

Hormonal Coordination on Humans

These practice questions can be used by students and teachers and is suitable for GCSE AQA Biology topic Questions 8641

Level: GCSE AQA Biology 8641

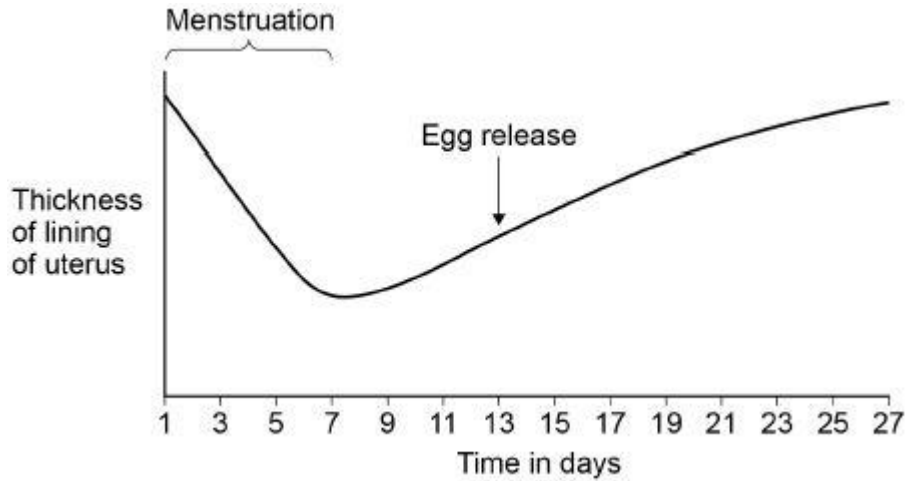
Subject: Biology

Exam board: GCSE AQA

Topic: Hormonal Coordination on Humans

Q1.

The graph below shows some changes that occur during the menstrual cycle.



- (a) The graph above shows that the lining of the uterus thickens between days 7 and 27.

What is the purpose of thickening the lining of the uterus?

Tick **one** box.

- To allow implantation of the embryo
- To break down waste
- To prevent sperm reaching the egg

(1)

- (b) Which hormone causes thickening of the lining of the uterus?

Tick **one** box.

- Auxin
- Oestrogen
- Testosterone

(1)

(c) On which day is fertilisation most likely to occur?

Use information from the graph above.

(1)

Contraception can be used to lower the chance of pregnancy.

(d) Draw **one** line from each method of contraception to how the method works.

Method of contraception	How the method works
Contraceptive pill	Barrier to prevent sperm reaching the egg
Diaphragm	Contains hormones to stop eggs maturing
Spermicidal cream	Kills sperm
	Slows down sperm production

(3)

(e) The table below gives information about some different methods of contraception.

Method	Number of pregnancies per 100 women in one year	Possible Side effects
Diaphragm and spermicidal cream	8	Usually none, but can cause bladder infection in some women
Condom	2	None
Contraceptive pill	1	Mood swings, headaches, high blood

		pressure, blood clots, breast cancer
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A man and a woman decide to use the condom as their method of contraception.

Suggest **three** reasons for this decision.

Use information from the table above and your own knowledge.

1.

2.

3.

(3)
(Total 9 marks)

Q2.

A person with Type 1 diabetes cannot make enough insulin.

(a) Which organ makes insulin?

Tick **one** box.

Adrenal gland

Pancreas

Pituitary gland

Thyroid



(1)

- (b) A person with Type 1 diabetes can control the concentration of glucose in the blood by injecting insulin.

Complete the sentences.

Choose answers from the box.

DNA	glycogen	kidney
liver	protein	skin

Insulin acts on an organ called the _____ .

This organ then takes in excess glucose from the blood and changes the glucose into _____ .

(2)

- (c) Insulin cannot be taken as a tablet. This is because insulin is a type of protein.

What would happen to the insulin in the tablet if it reached the stomach?

(1)

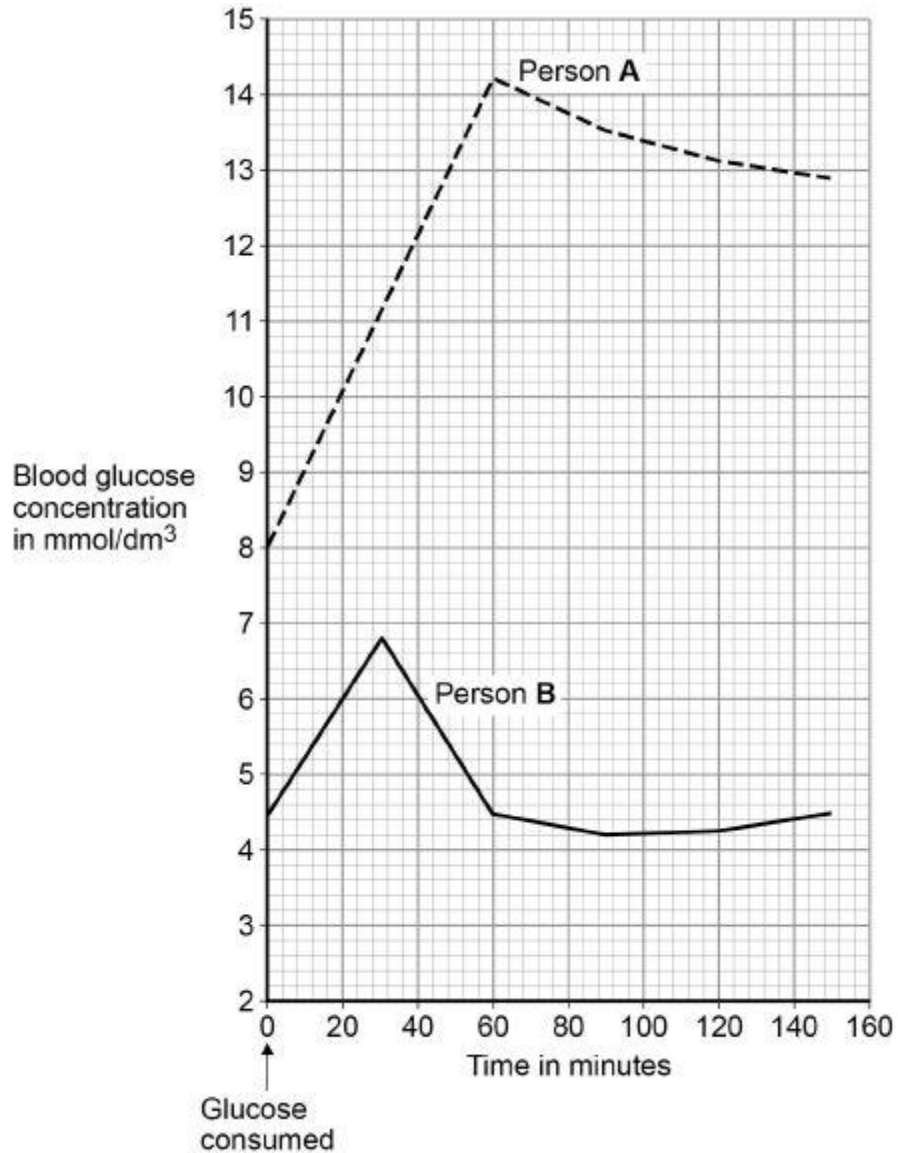
Two people each drank the same volume of a glucose drink.

Person **A** has Type 1 diabetes.

Person **B** does **not** have diabetes.

Figure 1 shows how the concentration of glucose in their blood changed.

Figure 1



- (d) How much higher was the **highest** concentration of glucose in the blood of person **A** than the **highest** concentration in person **B**?

Use information from **Figure 1**.

Answer = _____ mmol/dm³

(2)

- (e) Describe **one** other way that the results for person **A** were different from the results for person **B**.

Use information from **Figure 1**.

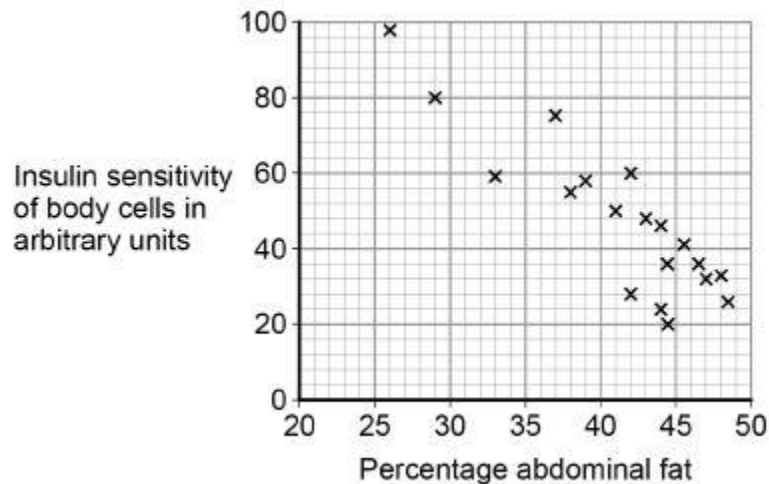
(1)

Type 2 diabetes is another form of diabetes. Type 2 diabetes is common in obese people.

People with Type 2 diabetes make enough insulin, but still cannot control their blood glucose concentration. This is because the body cells are not sensitive to the insulin.

Figure 2 shows information about abdominal fat and insulin sensitivity in body cells.

Figure 2



- (f) What type of relationship is shown in **Figure 2**?

Tick **one** box.

A negative correlation

No correlation

A positive correlation

(1)

(g) A person is at risk of developing Type 2 diabetes.

Suggest **two** ways the person could lower the chance of developing Type 2 diabetes.

1.

—

—

2.

—

—

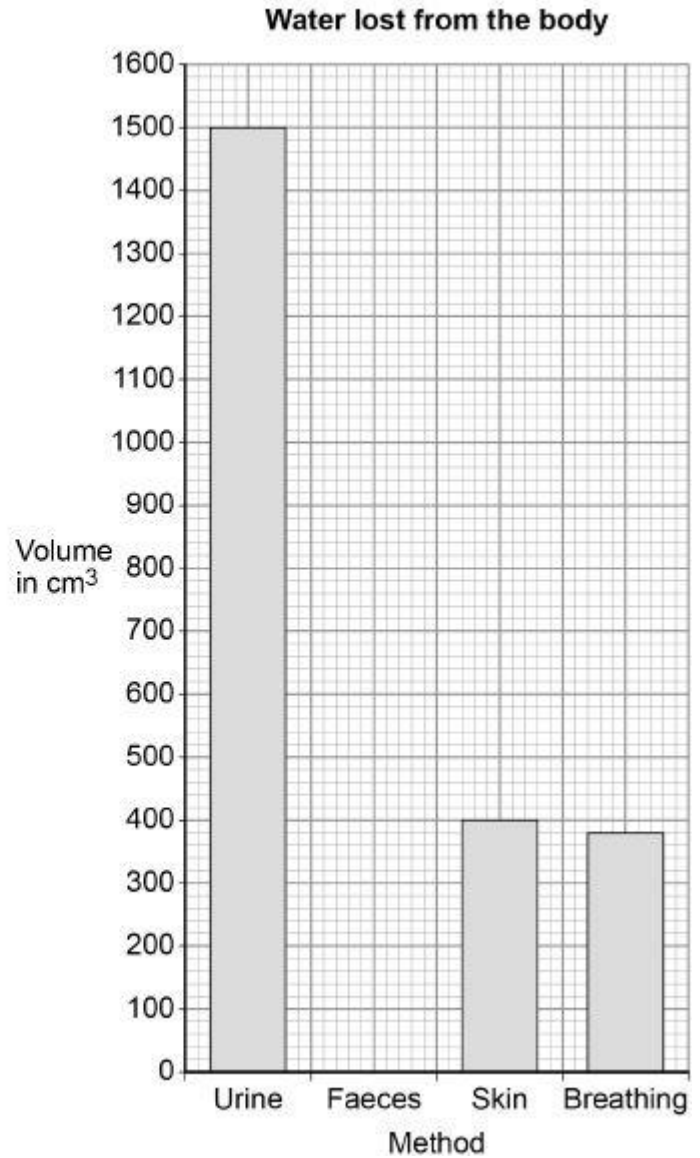
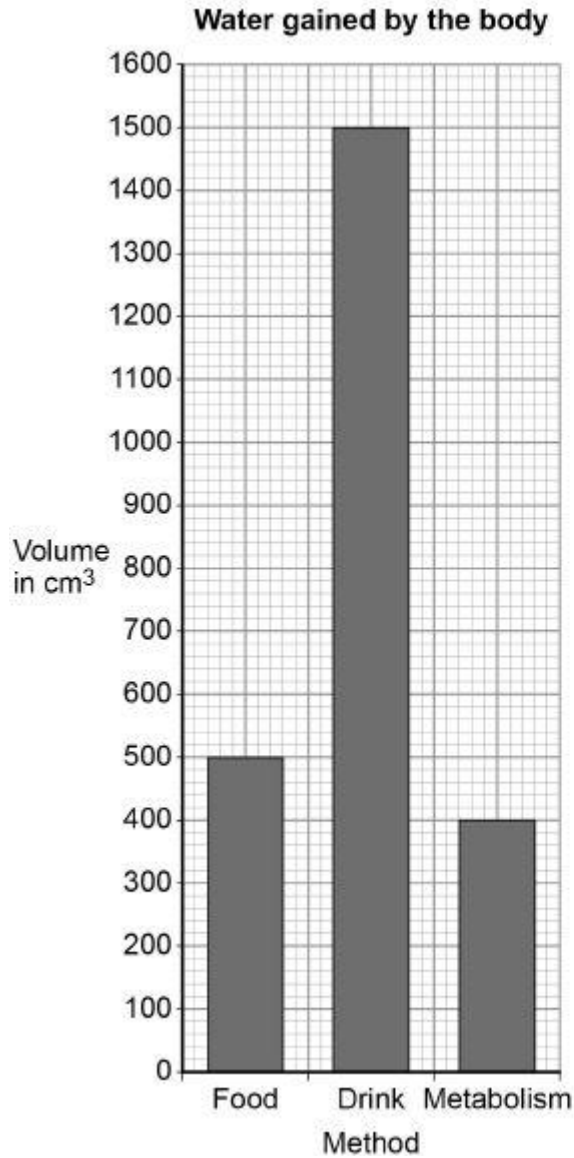
(2)

(Total 10 marks)

Q3.

It is important to maintain water balance in the body.

The graphs below show how much water a person gained and lost by different methods in one day.



When water is balanced, the volume of water taken in by the body is equal to the volume of water lost from the body.

- (a) Calculate the volume of water the person lost in one day in faeces.

Use information from the graphs above.

Volume lost in faeces = _____ cm³

(2)

(b) The graphs above show that one method of gaining water is by metabolism.

Which metabolic process produces water?

Tick **one** box.

Breakdown of protein to amino acids

Changing glycogen into glucose

Digestion of fat

Respiration of glucose

(1)

The next day, the person ran a 10-kilometre race.

The volume of water lost from the body through the skin and by breathing increased.

(c) Explain why more water was lost through the skin during the race.

(2)

(d) Explain why more water was lost by breathing during the race.

(3)
(Total 8 marks)

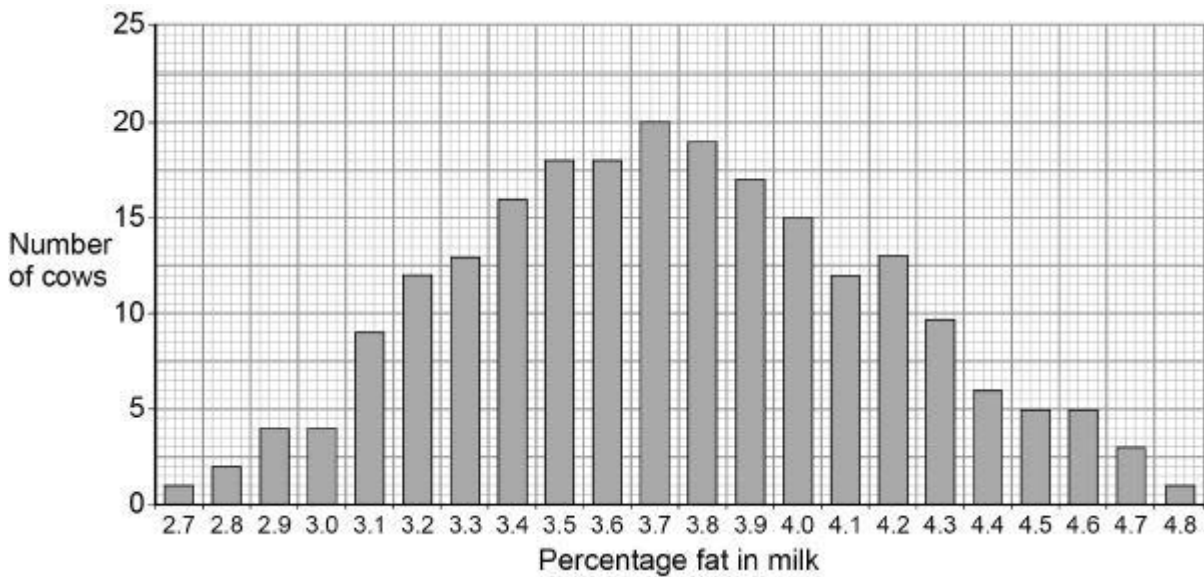
Q4.

Scientists want to breed cows that produce milk with a low concentration of fat.

Figure 1 shows information about the milk in one group of cows.

The cows were all the same type.

Figure 1



(a) In **Figure 1** the mean percentage of fat in the milk is equal to the modal value.

Give the mean percentage of fat in the milk of these cows.

Mean percentage = _____

(1)

(b) A student suggested:

‘The percentage of fat in milk is controlled by one dominant allele and one recessive allele.’

How many different phenotypes would this produce?

Tick **one** box.

2	
---	--

3	
---	--

22	
----	--

46	
----	--

(1)

(c) Give the evidence from **Figure 1** which shows the percentage of fat in the milk is controlled by several genes.

(1)

(d) One of the genes codes for an enzyme used in fat metabolism.

A mutation in this gene causes a reduction in milk fat.

The mutation changes one amino acid in the enzyme molecule.

Explain how a change in one amino acid in an enzyme molecule could stop the enzyme working.

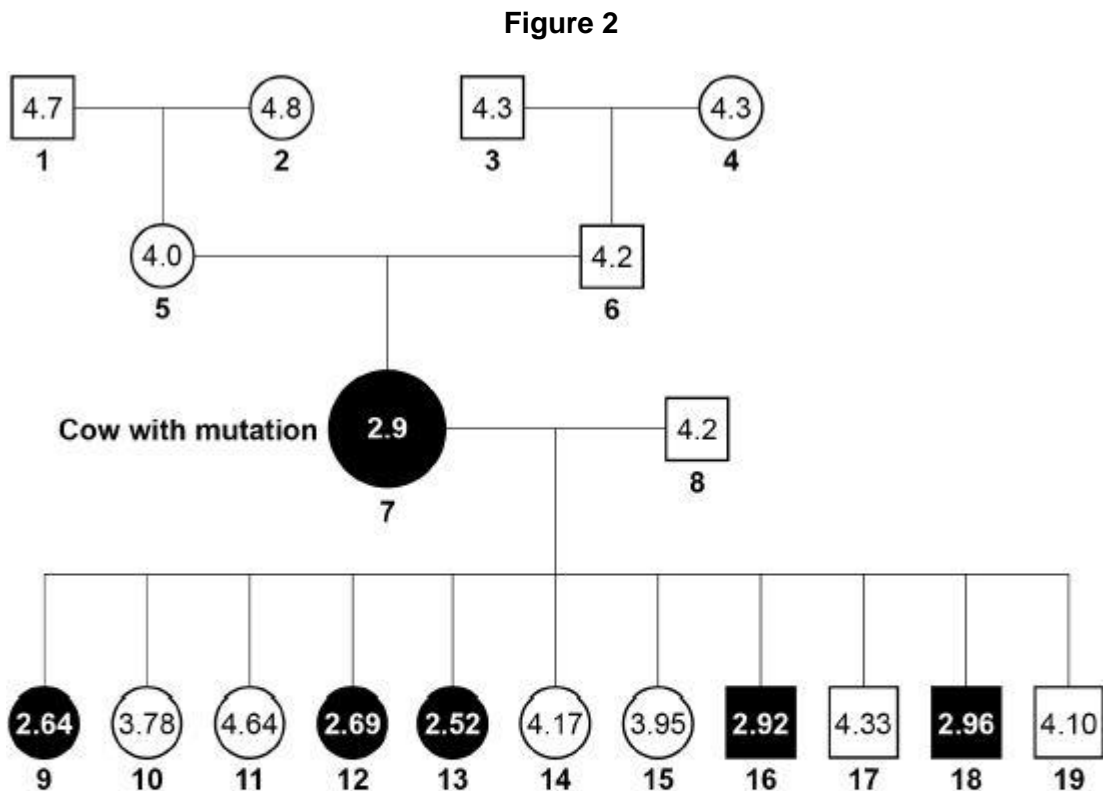
(3)

The scientists found one cow with a mutation.

The cow's milk contained only 2.9% fat.

Figure 2 shows the percentage of fat in the milk of cattle related to the cow with the mutation.

The values for male cattle are the mean values of their female offspring.



Key

- Female with low-fat milk
- Male whose female offspring have low-fat milk
- Female with high-fat milk
- Male whose female offspring have high-fat milk

(e) Animal **8** is homozygous.

The mutation in animal **7** produced a dominant allele for making low-fat milk.

Give evidence from **Figure 2** that animal **7** is heterozygous.

(1)

- (f) Animals **7** and **8** produced 11 offspring. These offspring were produced by in vitro fertilisation (IVF).

The embryos from IVF were transferred into 11 other cows.

Suggest why IVF and embryo transfer were used rather than allowing animals **7** and **8** to mate naturally.

(1)

- (g) Draw a Punnett square diagram to show a cross between animals **7** and **8**.

Identify which offspring produce low-fat milk and which offspring produce high-fat milk.

Use the following symbols:

D = dominant allele for making low-fat milk

d = recessive allele for making high-fat milk

(4)

- (h) The scientists want to produce a type of cattle that makes large volumes of low-fat milk.

The scientists will selectively breed some of the animals shown in **Figure 2**.

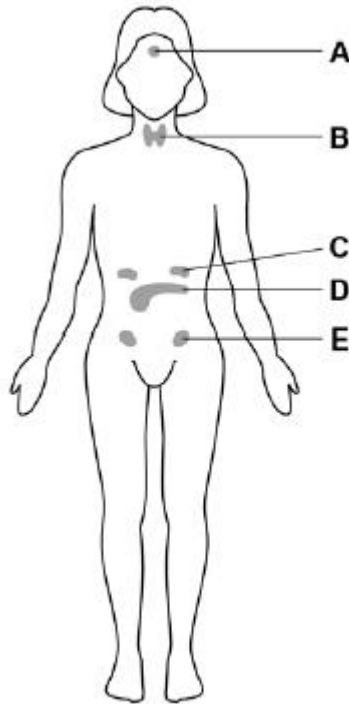
Describe how the scientists would do this.

(4)
(Total 16 marks)

Q5.

The menstrual cycle in a woman is controlled by hormones.

The diagram shows some of the glands in a woman's body that produce hormones.



The hormones that control the menstrual cycle are produced by the pituitary gland and by the ovaries.

(a) Which gland is the pituitary gland?

Tick **one** box.

A B C D E

(1)

(b) Which gland is the ovary?

Tick **one** box.

A B C D E

(1)

(c) Complete the sentence.

In the menstrual cycle, one egg is released approximately every _____ days.

(1)

(d) Which hormone is used in the oral contraceptive pill?

Tick **one** box.

- Adrenaline
- Insulin
- Progesterone
- Testosterone

(1)

(e) Describe how the oral contraceptive pill stops a woman becoming pregnant.

(2)

(f) Complete the sentences.

Choose the answers from the box.

adrenaline	insulin	oestrogen	progesterone	testosterone
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Development of the female secondary sex characteristics is controlled
by _____ .

Sperm production is stimulated by _____ .

(2)

(Total 8 marks)

Q6.

Many functions of the human body are controlled by chemicals called hormones.

(a) What is a hormone?

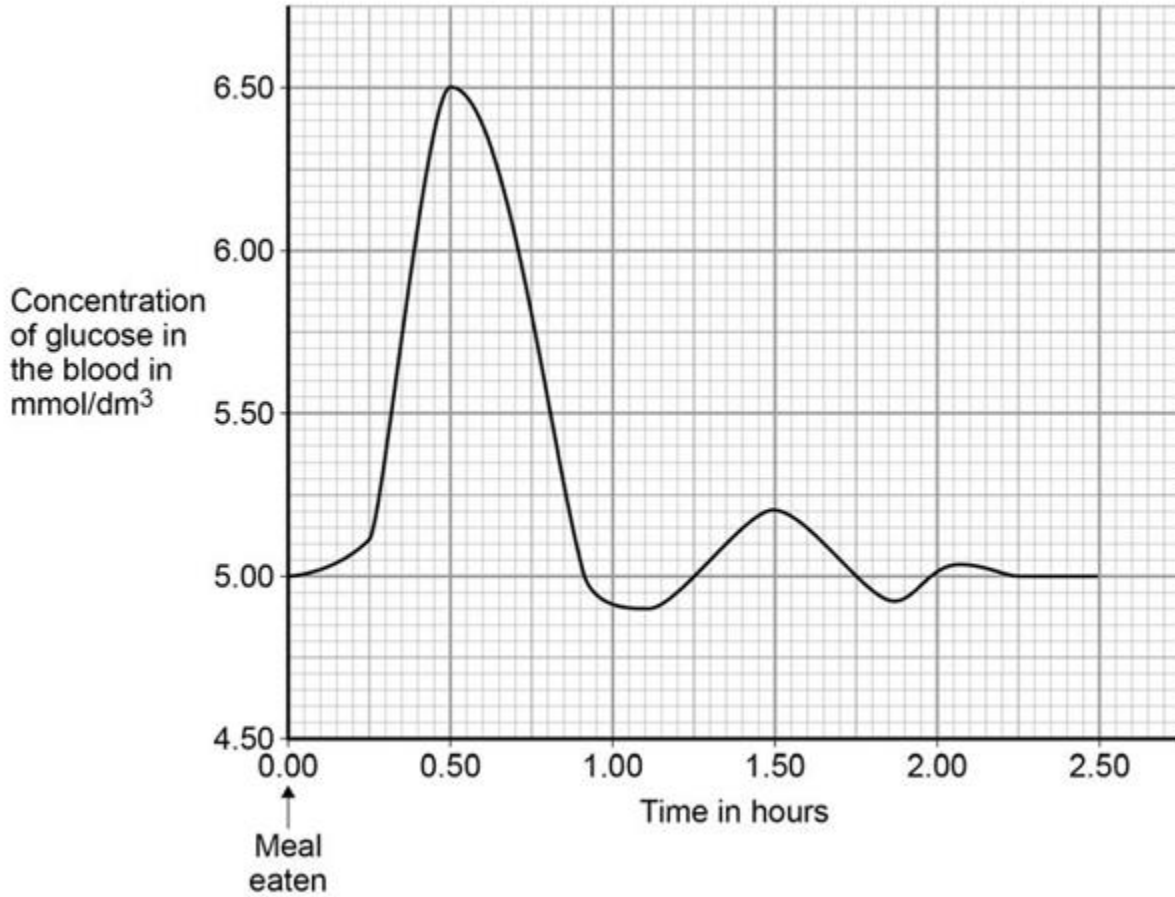
(3)

(b) Name the **two** hormones that control blood glucose concentration.

_____ and _____

(1)

The graph shows changes in the concentration of glucose in the blood of a healthy person following a meal.



- (c) Explain how negative feedback controls the blood glucose concentration during the first one and a half hours after the meal.

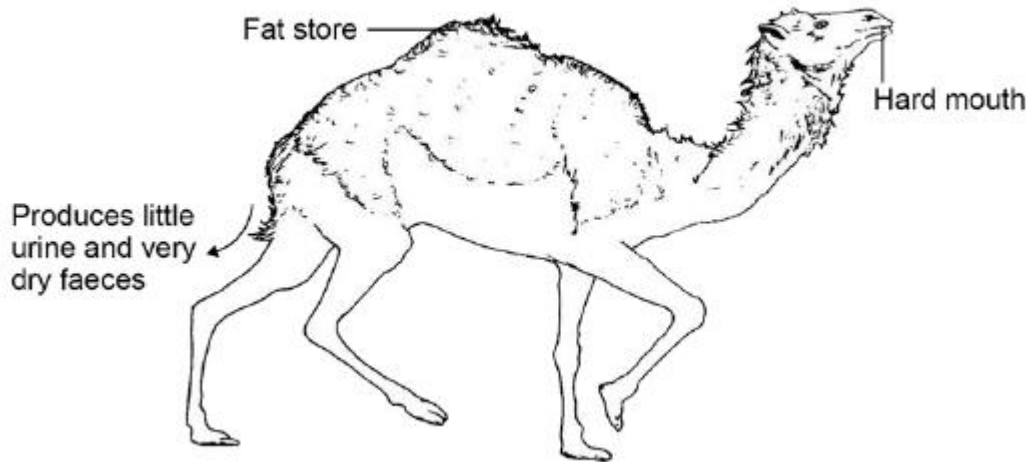
(4)
(Total 8 marks)

Q7.

Figure 1 shows a type of camel called a dromedary (*Camelus dromedarius*).

The dromedary lives in hot, dry deserts.

Figure 1



(a) One adaptation of the dromedary is 'temperature tolerance'.

This means that the animal's body temperature can rise by up to 6 °C before it starts to sweat.

Explain how temperature tolerance can help the dromedary to survive in the desert.

(2)

(b) Three more adaptations of the dromedary are given in **Figure 1**.

Give a reason why each adaptation helps the animal survive in the desert.

Fat store

Produces little urine and very dry faeces

Hard mouth

(3)

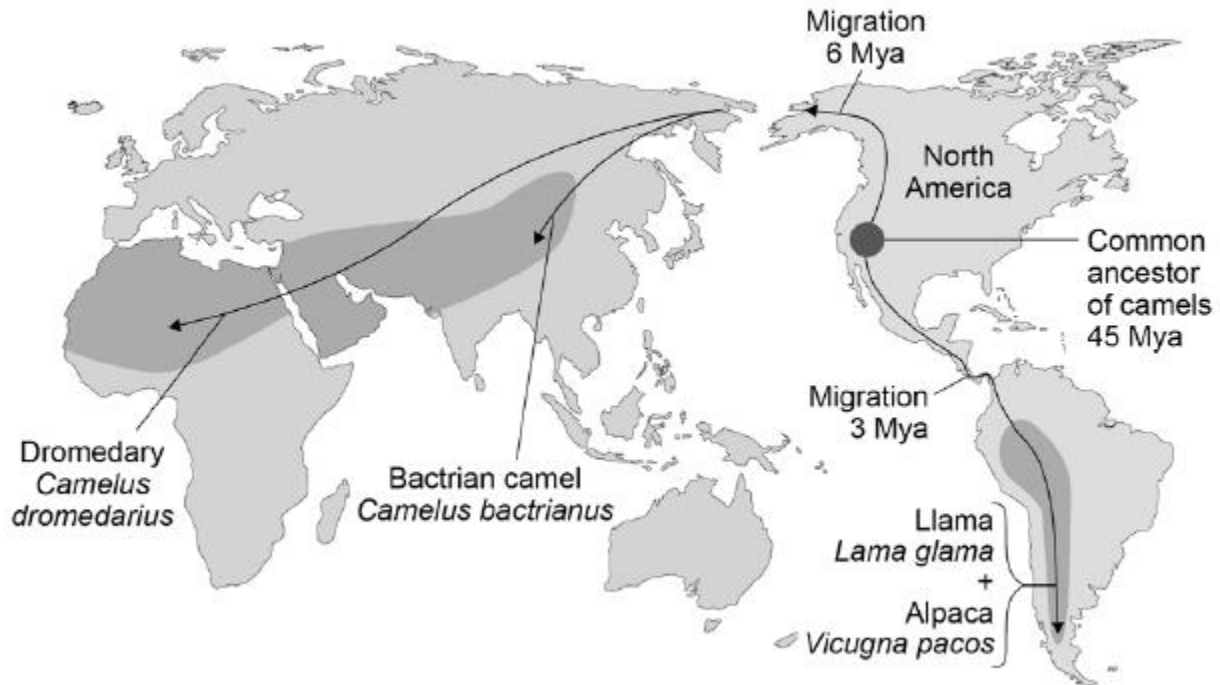
There are several species of the camel family alive today.

Scientists think these species evolved from a common ancestor that lived in North America about 45 million years ago (Mya).

Figure 2 shows:

- where four modern species of the camel family live today
- how the ancestors of these camels migrated from North America.

Figure 2



- (c) Which **two** of the four modern species of camel do scientists believe to be most closely related to each other?

Give the reason for your answer.

_____ and _____

Reason

(1)

- (d) Describe the type of evidence used for developing the theory of camel migration shown in **Figure 2**.

(2)

- (e) Explain how several different species of camel could have evolved from a common ancestor over 45 million years.

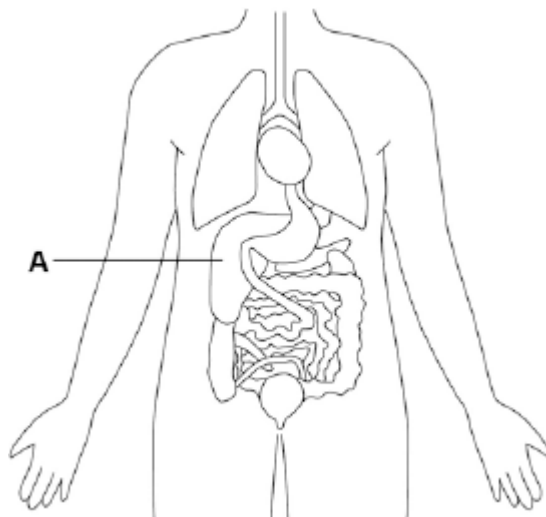
(6)

(Total 14 marks)

Q8.

Humans control their internal environment in many ways.

Look at the diagram below.



- (a) Name organ **A**.

(1)

- (b) Organ **A** stores glucose.

People with Type 1 diabetes cannot effectively control the levels of glucose in their blood.

Name the **hormone** people with **Type 1 diabetes** have to inject to decrease their blood glucose level.

(1)

(c) Which organ produces urine?

Tick **one** box.

Brain	<input type="checkbox"/>
Lungs	<input type="checkbox"/>
Kidney	<input type="checkbox"/>
Thyroid	<input type="checkbox"/>

(1)

(d) Marathon runners often drink sports drinks during a race.

Explain why.

(2)

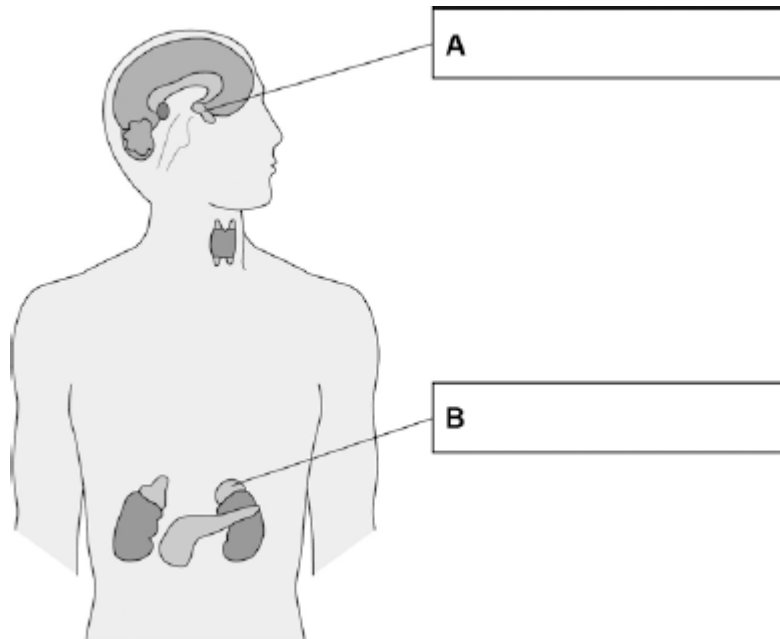
(Total 5 marks)

Q9.

Glands in the body produce hormones.

(a) Use words from the box to label gland **A** and gland **B** on the diagram below.

Adrenal	Pancreas	Pituitary	Testis	Thyroid
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(2)

(b) Which gland produces oestrogen?

Tick **one** box.

- Ovary
- Pancreas
- Testis
- Thyroid

(1)

(c) **Table 1** shows some methods of contraception.

Table 1

Type of contraception	Percentage (%) of pregnancies prevented
Oral pill	>99
Implant	99

Condom	98
Diaphragm	<96

Which method of contraception in **Table 1** is **least** effective at preventing pregnancy?

(1)

- (d) Which method of contraception in **Table 1** will protect against sexually transmitted diseases like HIV?

(1)

- (e) Another method of contraception is called the intrauterine device (IUD).

There are two main types of IUD:

- copper
- plastic.

Both types of IUD are more than 99% effective.

Look at **Table 2**.

Table 2

	Copper IUD	Plastic IUD
How the IUD works	<ul style="list-style-type: none"> • releases copper • copper changes the fluids in the uterus to kill sperm 	<ul style="list-style-type: none"> • releases a hormone • hormone thickens mucus from the cervix so the sperm have more difficulty swimming to the egg
Benefits	<ul style="list-style-type: none"> • prevents pregnancy for up to 10 years • can be removed at any time • can be used as emergency contraception 	<ul style="list-style-type: none"> • prevents pregnancy for up to 5 years • can be removed at any time
Possible	<ul style="list-style-type: none"> • very painful periods 	<ul style="list-style-type: none"> • painful periods

side effects	<ul style="list-style-type: none">• heavy periods or periods which last for a long time• feeling sick, back pain	<ul style="list-style-type: none">• light periods or no periods• feeling sick, headaches, breast pain, acne• hormones may affect mood• ovarian cysts
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Evaluate the use of the plastic IUD as a contraceptive compared to the copper IUD.

Use the information in **Table 2**.

(4)
(Total 9 marks)

Q10.

Homeostasis controls the internal conditions of the body.

- (a) Explain how blood glucose levels are controlled in the body of someone who does **not** have diabetes.

(4)

- (b) Compare how each type of diabetes is caused.
Suggest how each type of diabetes can be treated.

(4)

(c) Look at the table below.

Population of UK in 2015	6.5×10^7
Number of people diagnosed with diabetes	3.45×10^6
Estimated number of people with undiagnosed diabetes	5.49×10^5

Calculate the percentage (%) of the UK population estimated to have diabetes.

You should include both diagnosed and undiagnosed people in your calculation.

Give your answer to 2 significant figures.

Estimated percentage of population with diabetes = ____ %

(3)

(d) A urine test can be used to check for the presence of glucose in the urine.

Diabetes can also be diagnosed with a blood test to measure the concentration of blood glucose.

Suggest why a blood test is more reliable than a urine test.

(1)

- (e) A blood test called the glucose tolerance test checks how well the body processes glucose.

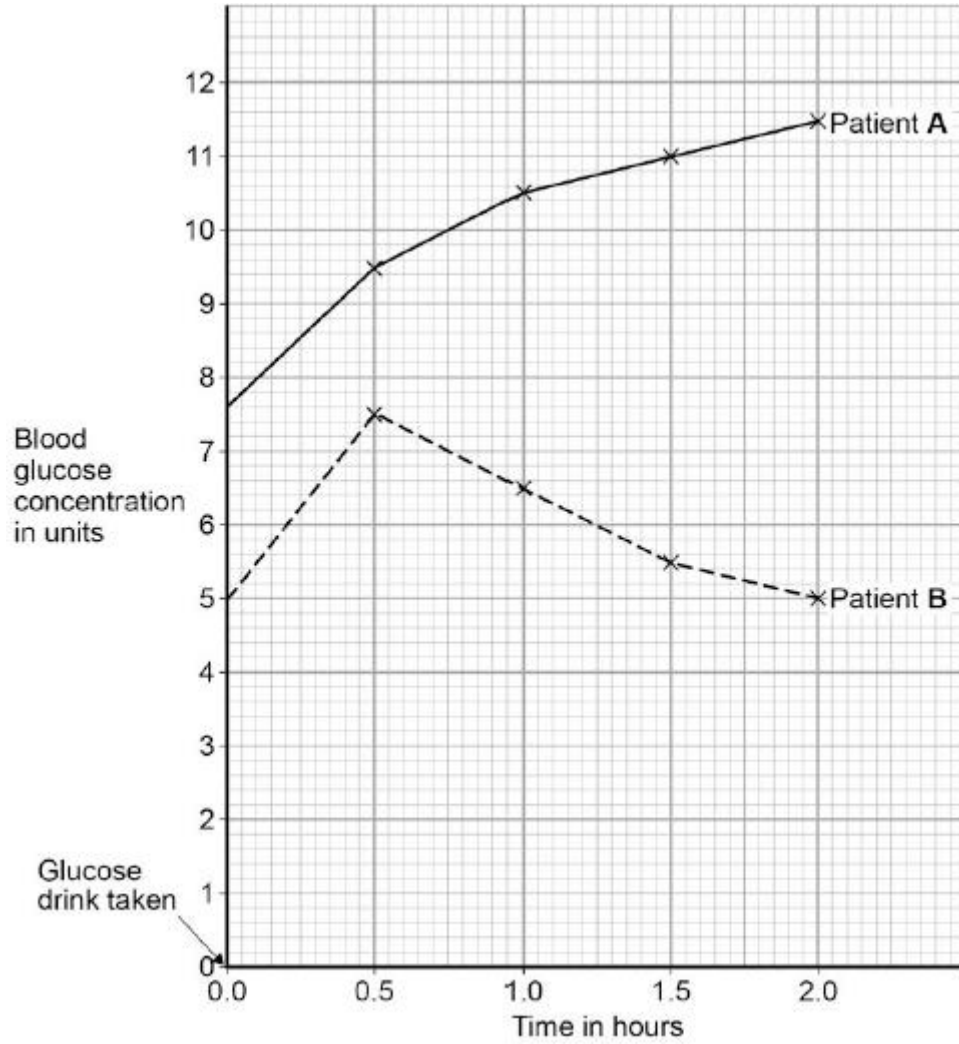
Concentrations of glucose in the blood are measured before and after drinking a glucose drink.

Patients are not allowed to eat food for 8 hours before the glucose tolerance test.

Suggest why patients are **not** allowed to eat for 8 hours before the test.

(1)

- (f) The diagram below shows the results of a glucose tolerance test for two patients, **A** and **B**.



Which patient has diabetes?

Justify your answer.

Patient _____

Justification _____

(2)
(Total 15 marks)

Q11.

Endocrine glands produce hormones.

- (a) Hyperthyroidism is caused by an overactive thyroid gland.

Suggest what would happen in the body of a person with hyperthyroidism.

(3)

- (b) Describe the roles of FSH and LH in the menstrual cycle.

(2)

- (c) The combined pill is a contraceptive that contains progesterone **and** oestrogen.

The 'mini-pill':

- is a contraceptive that **only contains** the progesterone hormone
- has to be taken at the same time each day to prevent pregnancy.

The success rate of the mini-pill in preventing pregnancy is lower than that of

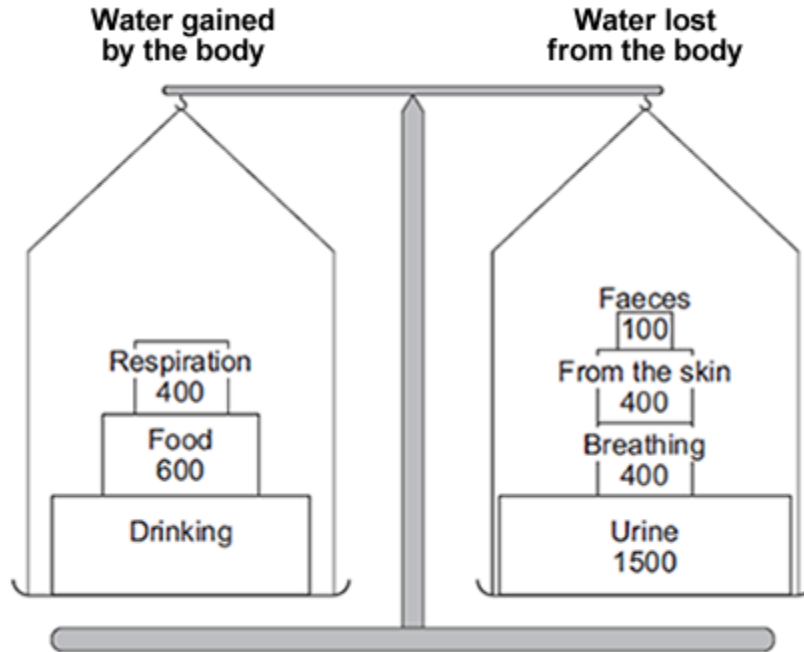
the combined pill.

Explain why missing a dose of the mini-pill would reduce the success rate of the mini-pill.

(4)
(Total 9 marks)

Q12.

The diagram below shows the water balance for a person on a cold day.
The numbers show the volume of water, in cm³, the person's body gained and lost.



- (a) (i) How much water was lost from the body on the cold day?

Draw a ring around the correct answer.

1800 cm³

2400 cm³

3300 cm³

(1)

- (ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance?

Volume of water = _____ cm³

(2)

- (b) (i) Name the process by which water is lost from the skin.

(1)

- (ii) Why does the body need to lose water from the skin?

(1)

(c) The next day was a hot day. The person gained the same volume of water and did the same activities.

(i) What effect did the increase in temperature have on the volume of water the person lost?

Tick (✓) **one** box.

Less water was lost through the skin.

More water was lost through the skin.

More water was lost in faeces.

(1)

(ii) What effect would the increase in temperature have on the volume of urine the person lost?

Draw a ring around the correct answer.

decrease

increase

no change

(1)

(Total 7 marks)

Q13.

Hormones are involved in controlling the menstrual cycle and fertility.

(a) (i) Use the correct answer from the box to complete the sentence.

auxin

follicle stimulating hormone (FSH)

thalidomide

A hormone produced by the pituitary gland is _____

(1)

(ii) Use the correct answer from the box to complete the sentence.

luteinising hormone (LH)	oestrogen	statin
---------------------------------	------------------	---------------

A hormone produced by the ovaries is _____ (1)

(b) (i) Why are fertility drugs given to some women?

(1)

(ii) A doctor injects fertility drugs into a woman. After the injection, the hormones travel to the woman's ovaries.

How do the hormones travel to the ovaries?

Draw a ring around the correct answer.

**through the
bloodstream**

**through the
neurons**

**through the
skin**

(1)

(c) Which **two** hormones are used in contraceptive pills?

Tick (✓) **two** boxes.

FSH	<input type="checkbox"/>	oestrogen	<input type="checkbox"/>
LH	<input type="checkbox"/>	progesterone	<input type="checkbox"/>

(2)

(Total 6 marks)

Q14.

(a) Which organ of the human body produces egg cells?

Draw a ring around the correct answer.

liver

ovary

testis

(1)

(b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

Draw a ring around the correct answer.

23

46

48

(1)

- (c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 1 shows how successful IVF was for women of different ages at one clinic.

Table 1

Age of women in years	Percentage of women who had a baby
<35	35
35–37	31
38–39	25
40–42	32
43–44	7
>44	0

- (i) A student thought that the result for women aged 40–42 was anomalous. Suggest why the student thought this result was anomalous.

(1)

- (ii) Describe the general trend in the results in **Table 1**.

You should ignore the anomalous result.

(1)

- (d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 2 shows the scientists' results.

Table 2

Age of women in years	Number of women per 1000 who had a baby with a faulty chromosome
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

- (i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

Answer = _____ times

(2)

- (ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 1** and **Table 2** in your answer.

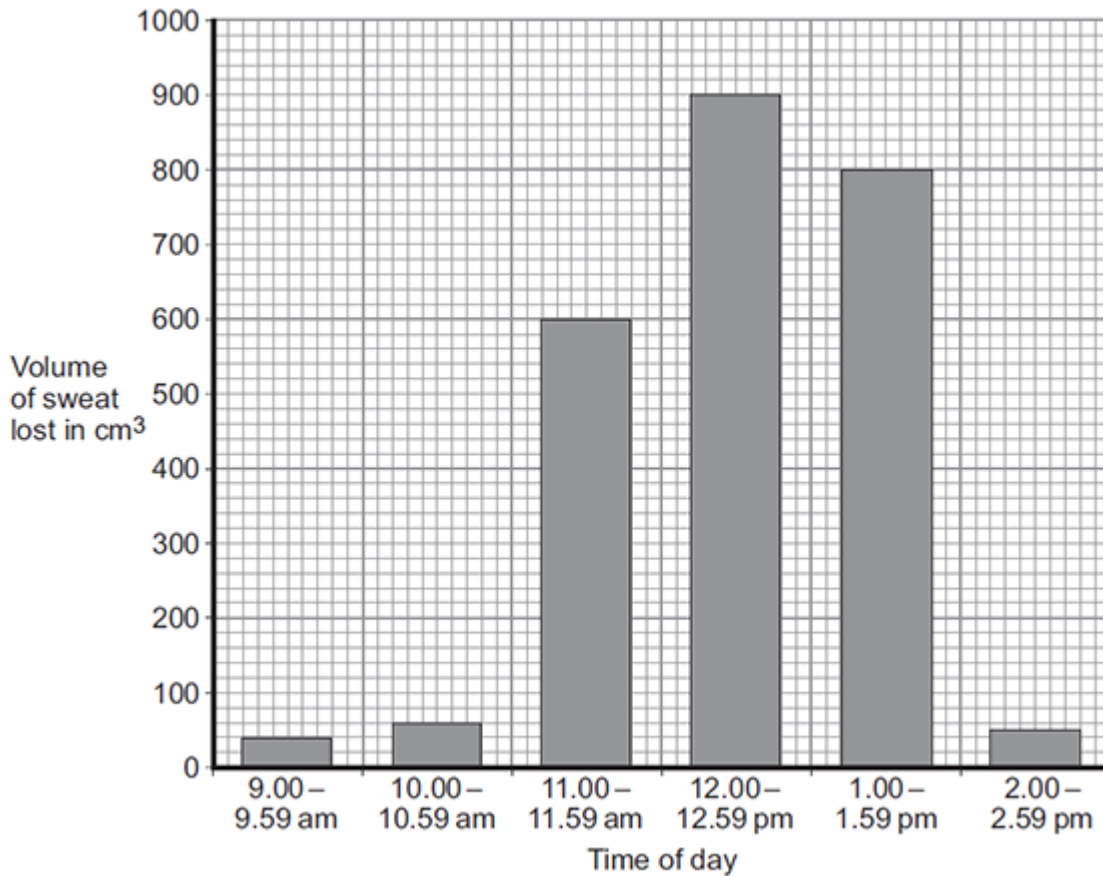
1.

2.

(2)
(Total 8 marks)

Q15.

A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. The graph below shows the results.



(a) (i) Suggest what happened at 11.00 am.

Tick (✓) **one** box.

The person moved into a cold room.

The person removed their coat.

The person started running a race.

(1)

- (ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm.

Total volume of sweat lost = _____ cm³

(1)

- (iii) Suggest **one** way the person could replace the water that was lost as sweat.

(1)

- (b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature?

Tick (✓) **one** box.

brain

kidney

pancreas

(1)

- (ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information?

Tick (✓) **one** box.

capillaries

glands

receptors

(1)

(c) How does sweating help to control body temperature?

(1)

(Total 6 marks)

Q16.

Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

(a) (i) Which organ monitors blood glucose levels?

Tick (✓) **one** box.

liver

pancreas

skin

(1)

(ii) What effect does insulin have on glucose in the blood?

Tick (✓) **one** box.

Insulin causes glucose to move into the cells.

Insulin increases the amount of glucose in the blood.

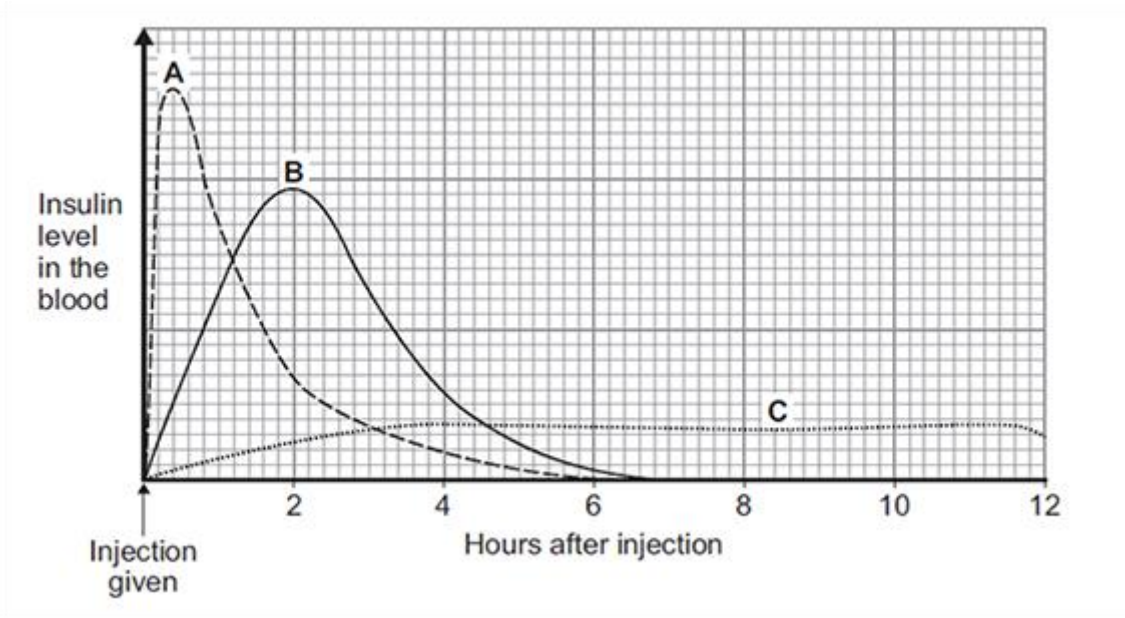
Insulin converts glucose to starch.

(1)

(b) Some people with diabetes inject insulin several times a day.

There are different types of insulin.

The graph shows some information about three different types of insulin, **A**, **B** and **C**.



(i) Which type of insulin, **A**, **B** or **C**, should a person with diabetes inject just before eating a meal high in carbohydrates?

Give a reason for your answer.

(2)

(ii) A woman with diabetes has a blood glucose level of 12 mmol per dm³ of

blood.

The woman's normal blood glucose level is 6 mmol per dm³.

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm³.

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

Number of units = _____

(1)

(c) Some people have pancreas transplants to treat diabetes.

Give **one** possible disadvantage of a pancreas transplant.

Tick (✓) **one** box.

The pancreas could be rejected.

The patient will need to inject insulin every day.

The patient's blood glucose levels may rise and fall too much.

(1)

(Total 6 marks)

Q17.

People with type 1 diabetes inject insulin to control their blood glucose level.

A pancreas transplant is another treatment for type 1 diabetes.

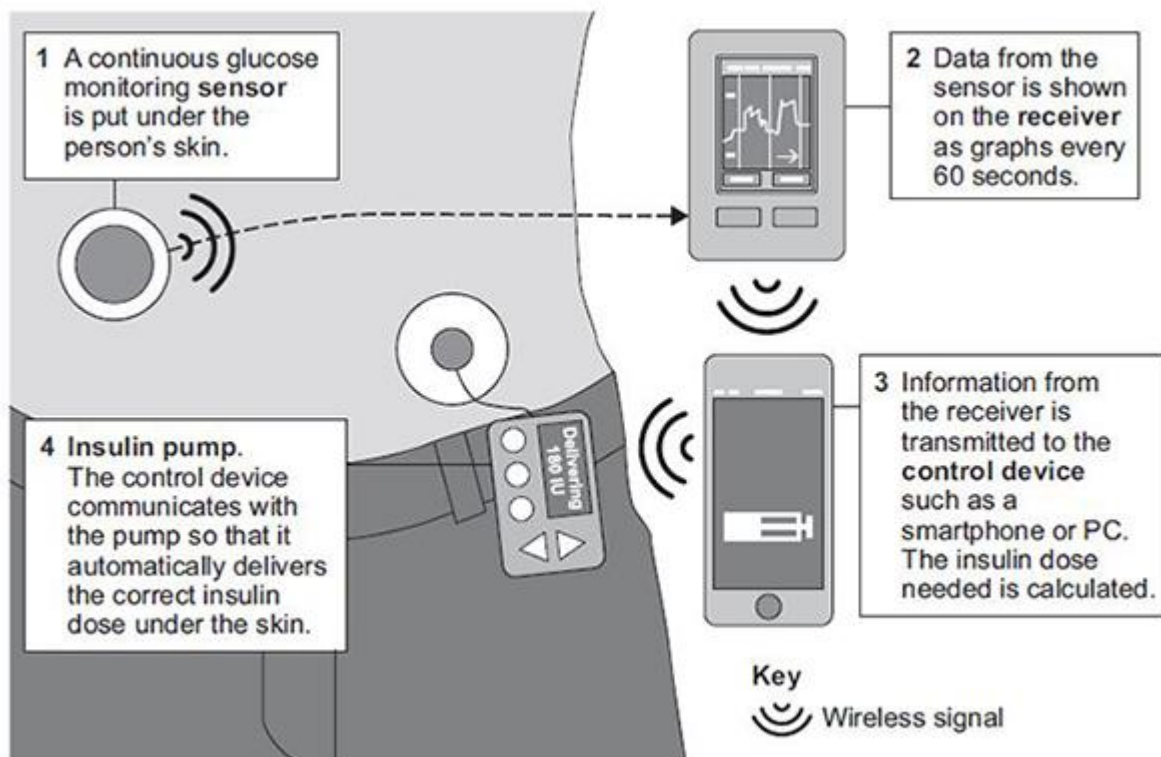
One risk of a pancreas transplant is organ rejection.

(a) Explain why a transplanted organ may be rejected.

(3)

(b) Scientists have developed an artificial pancreas to treat type 1 diabetes.

The diagram below shows how an artificial pancreas works.



(i) A woman with type 1 diabetes has an artificial pancreas. The woman eats a meal high in sugar. The meal causes her blood glucose level to rise.

Use information from the diagram above to describe what happens to bring the blood glucose level of the woman back to normal.

(4)

- (ii) The traditional way of monitoring and treating type 1 diabetes is to take a small sample of blood and put it on a test strip to find out how much insulin to inject.

Suggest **one** possible advantage, other than not having to do blood tests, of the method used in the diagram above.

(1)

(Total 8 marks)

Q18.

This question is about hormones.

- (a) (i) Hormones carry messages.

What type of messenger is a hormone?

Draw a ring around the correct answer.

chemical electrical environmental

(1)

(ii) Which part of the brain secretes hormones?

Draw a ring around the correct answer.

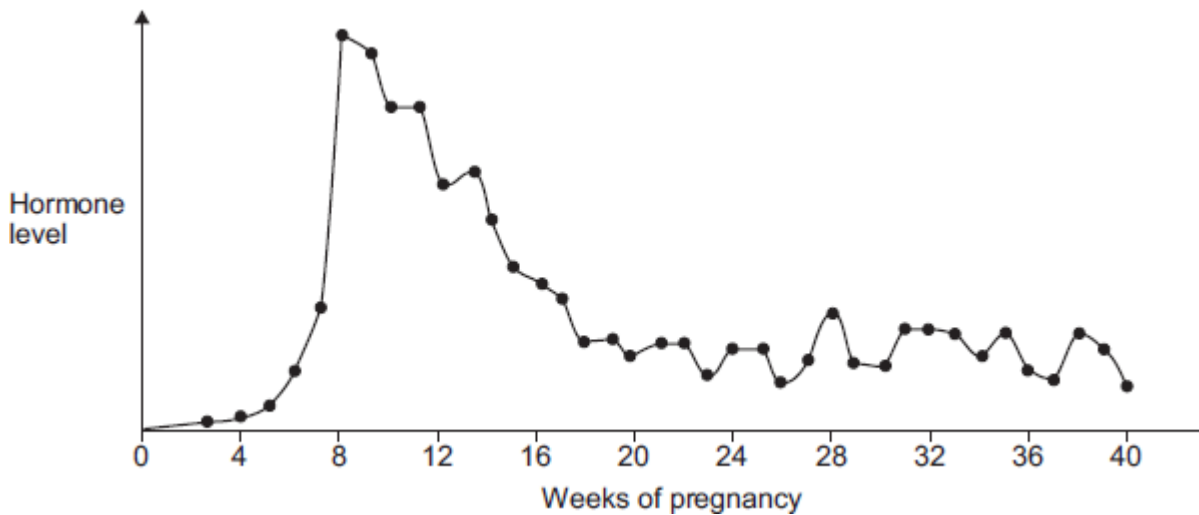
cerebellum
medulla
pituitary gland

(1)

(b) **Figure 1** shows the level of a pregnancy hormone over a 40-week pregnancy.

This hormone can be detected in a pregnancy test.

Figure 1



A woman takes a pregnancy test.

In which week of pregnancy is the test most likely to give a positive result?

Use information from **Figure 1**.

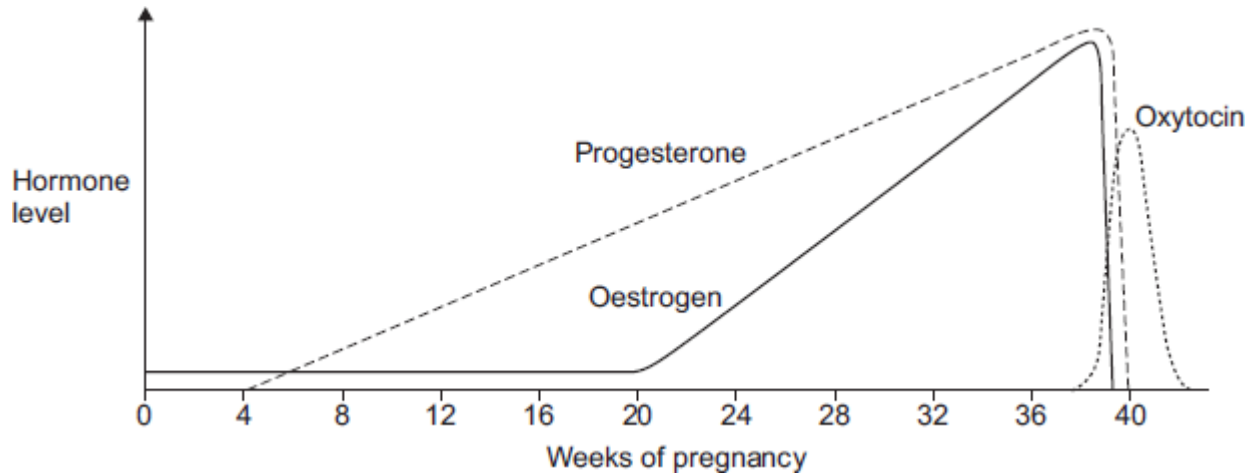
Write the correct answer in the box.

(1)

(c) **Figure 2** shows the levels of three other hormones during pregnancy.

The baby is usually born at about 40 weeks.

Figure 2



Adaptation by kind permission of Biozone International

- (i) Describe the patterns in the levels of oestrogen and progesterone from 0 to 36 weeks.

(4)

- (ii) Which hormone is likely to stimulate contractions of the uterus (womb) when the baby is born?

Use information from **Figure 2** to give a reason for your answer.

(2)
(Total 9 marks)

Q19.

- (a) Control systems help to keep conditions in the human body relatively constant.

What is the general name for the processes that keep body conditions relatively constant?

Draw a ring around the correct answer.

eutrophication homeostasis hydrotropism

(1)

- (b) The concentration of glucose in the blood is controlled by hormones.

Use the correct answer from the box to complete each sentence.

glucagon	glycerol	glycogen
kidney	liver	pancreas

When the blood glucose concentration increases, an organ called the _____ releases the hormone insulin.

Insulin causes glucose to move from the blood into the cells of the muscles and the _____ .

Inside these organs, the glucose is changed into a carbohydrate called _____ , which can be stored.

When the blood glucose concentration falls, another hormone is released, which causes the storage carbohydrate to break down into glucose again.

This hormone is called _____ .

(4)

- (c) A person with Type 1 diabetes does not make enough insulin.

The person needs to test their blood at intervals throughout the day.

If the concentration of glucose in their blood is too high, the diabetic person needs to inject insulin.

- (i) Insulin is a protein.

It must be injected and cannot be taken by mouth.

Explain why.

(2)

- (ii) Apart from injecting insulin, give **one other** way that a diabetic person could help to control the concentration of glucose in their blood.

(1)

- (d) Pet dogs have been trained to detect if the concentration of glucose in the blood of their diabetic owners is outside the normal healthy range. These dogs are called 'medical response dogs'.
The dogs respond in different ways. They may bark, jump up, or stare at their owners. They may even fetch a blood-testing kit.

- (i) Suggest what stimulus the dogs might be responding to when they behave like this.

- (ii) **Table 1** shows how the concentration of glucose varied in blood samples from five diabetic people. Measurements were made both before and after getting a medical response dog.

Table 1

		Mean percentage of blood samples with different concentrations of glucose from the five diabetic people			
		Number of blood samples measured	Low glucose	Within normal range of glucose	High glucose
Before getting a dog	1704	32.6	54.8	12.6	
After getting a dog	1724	18.6	61.6	19.8	

A survey was made of the effect of a medical response dog on the lives of 16 diabetic people.

Table 2 shows how well these diabetic people agreed with each statement in the survey.

Table 2

Statement in survey	Totally agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Totally disagree
I am more independent since getting my dog.	12	2	2	0	0
There are disadvantages to having a medical response dog.	0	0	4	4	8
I trust my dog to alert me when my sugar levels are low.	11	3	1	0	1
I trust my dog to alert me when my sugar levels are high.	6	7	0	1	2

Evaluate how useful medical response dogs are for warning diabetic people that the concentration of glucose in their blood is outside the normal range.

Use information from **Tables 1 and 2.**

(5)

- (e) **Table 3** shows the concentrations of some substances in the urine of a non-diabetic person and in the urine of a diabetic person.

Table 3

Substance	Concentration of substance in urine in g per dm ³	
	Non-diabetic person	Diabetic person
Protein	0	0
Glucose	0	2.0

Urea	20.0	19.5
Sodium ions	6.0	5.8

Compare the results for the non-diabetic person and the diabetic person.
Give reasons for any differences.

Use your knowledge of how the kidney works.

(5)
(Total 19 marks)

Q20.

- (a) Humans need to remove waste products from their bodies.

Which organ removes waste carbon dioxide from the body?

Tick (✓) **one** box.

Liver	<input type="checkbox"/>
Lung	<input type="checkbox"/>
Skin	<input type="checkbox"/>

(1)

(b) Kidneys make urine. Urine is stored in the bladder.

Which **one** of the following stages is involved in making urine in a healthy kidney?

Tick (✓) **one** box.

Filtering the blood	<input type="checkbox"/>
Reabsorbing all of the ions	<input type="checkbox"/>
Reabsorbing all of the water	<input type="checkbox"/>

(1)

(c) A healthy kidney keeps the correct amount of water in the blood.

If there is too much water in the blood, what might happen to the blood cells?

Tick (✓) **one** box.

They will take in water and burst.	<input type="checkbox"/>
There will be no change.	<input type="checkbox"/>

They will lose water and shrink.



(1)

(d) A child has kidney failure.

A doctor recommends dialysis to treat the kidney failure.

Before dialysis starts, the doctor measures the concentration of glucose and of urea in the child's blood.

The concentration of glucose in the dialysis fluid is 6 mmol per dm³.

The results are shown below in the table.

	Concentration in the blood before dialysis starts in mmol per dm ³
Glucose	6
Urea	28

(i) Suggest what the concentration of glucose in the blood will be **after** the dialysis treatment.

Draw a ring around the correct answer.

less than 6

6

more than 6

(1)

(ii) Suggest what the concentration of urea in the blood will be **after** the dialysis treatment.

Draw a ring around the correct answer.

less than 28

28

more than 28

(1)

(iii) Give a reason for your answer to part (d)(ii).

(1)

- (e) (i) Some patients have kidney transplants. Transplanted kidneys may be rejected by the body.

Use the correct answer from the box to complete the sentence.

antibodies	hormones	tissues
-------------------	-----------------	----------------

Transplanted kidneys have proteins on the surface of the cells. These proteins

may be attacked by the patient's _____ .

(1)

- (ii) It is important to prevent rejection of a new kidney.

Which **one** of the following helps to prevent the kidney from being rejected?

Tick (✓) **one** box.

Giving the patient antibodies	<input type="checkbox"/>
Giving the patient painkillers	<input type="checkbox"/>
Tissue typing the donor kidney	<input type="checkbox"/>

(1)

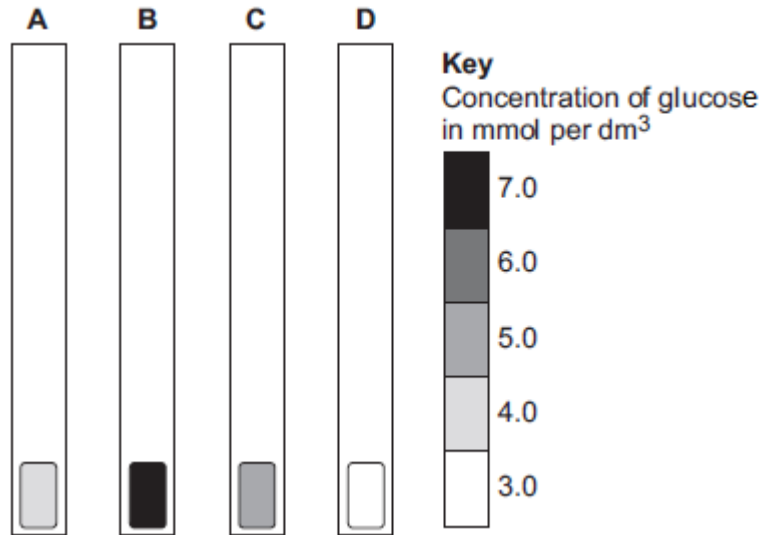
(Total 8 marks)

Q21.

Blood glucose concentration in humans must be kept between 4.4 and 6.1 mmol per dm³.

Four students, **A**, **B**, **C** and **D**, tested their blood glucose concentration with glucose testing strips.

The diagram shows the results of their tests and the key from the test strip bottle.



- (a) (i) Which student, **A**, **B**, **C** or **D**, has diabetes and has eaten a large piece of cake?

(1)

- (ii) Which student, **A**, **B**, **C** or **D**, is in most need of eating carbohydrates?

(1)

- (iii) Which student, **A**, **B**, **C** or **D**, has a healthy blood glucose concentration?

(1)

- (b) (i) Name the hormone that people with diabetes inject to prevent their blood glucose concentration from becoming too high.

(1)

- (ii) Blood glucose concentration is monitored in the body.

Which organ monitors blood glucose concentration?

Draw a ring around the correct answer.

brain

liver

pancreas

(1)
(Total 5 marks)

Q22.

Many runners drink sports drinks to improve their performance in races.

A group of students investigated the effects of three brands of sports drink, **A**, **B** and **C**, on the performance of three runners on a running machine. One of the runners is shown in the image below.



© Keith Brofsky/Photodisc/Thinkstock

Table 1 gives information for each drink.

Table 1

	Brand of sports drink		
Nutrient per dm ³	A	B	C

Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

- (a) (i) In the investigation, performance was measured as the time taken to reach the point of exhaustion.

Exhaustion is when the runners could not run anymore.

All three runners:

- ran on a running machine until the point of exhaustion
- each drank 500 cm³ of a different brand of sports drink
- rested for 4 hours to recover
- ran on the running machine again and recorded how much time they ran until the point of exhaustion.

The speed at which the runners ran was the same and all other variables were controlled.

The students predicted that the runner drinking brand **B** would run for the shortest time on the second run before reaching the point of exhaustion.

Use information from **Table 1** to suggest an explanation for the students' prediction.

(2)

- (ii) If the balance between ions and water in a runner's body is not correct, the runner's body cells will be affected.

Describe **one** possible effect on the cells if the balance between ions and water is **not** correct.

(1)

(b) When running, a runner's body temperature increases.

Describe how the brain monitors body temperature.

(3)

(c) (i) **Table 2** is repeated here to help you answer this question.

Table 2

Nutrient per dm ³	Brand of sports drink		
	A	B	C
Glucose in g	63	31	72
Fat in g	9	0	2
Ions in mg	312	332	495

People with diabetes need to be careful about drinking too much sports drink.

Use information from **Table 2** to explain why drinking too much sports drink could make people with diabetes ill.

(3)

- (ii) Other than paying attention to diet, how do people with diabetes control their diabetes?

(1)

(Total 10 marks)

Q23.

It is important to remove waste products from our bodies.

Healthy kidneys help to keep our internal environment constant.

- (a) Describe how a healthy kidney produces urine.

(5)

- (b) A child has kidney failure and is treated with dialysis.

Before the dialysis starts, the doctor measures the concentration of urea and glucose in the child's blood.

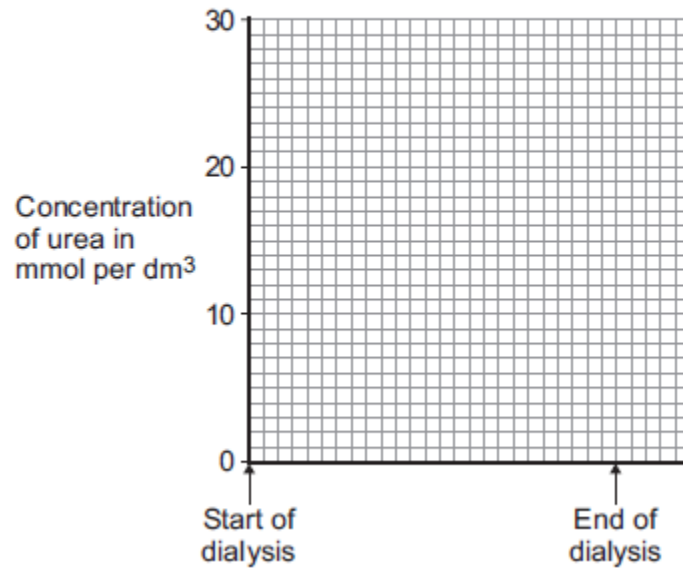
The table shows the results.

	Concentration in the blood before dialysis starts in mmol per dm ³
Urea	28
Glucose	6

The child has a normal blood glucose concentration.

- (i) Sketch a graph on **Figure 1** to suggest what will happen to the concentration of urea in the blood during dialysis.

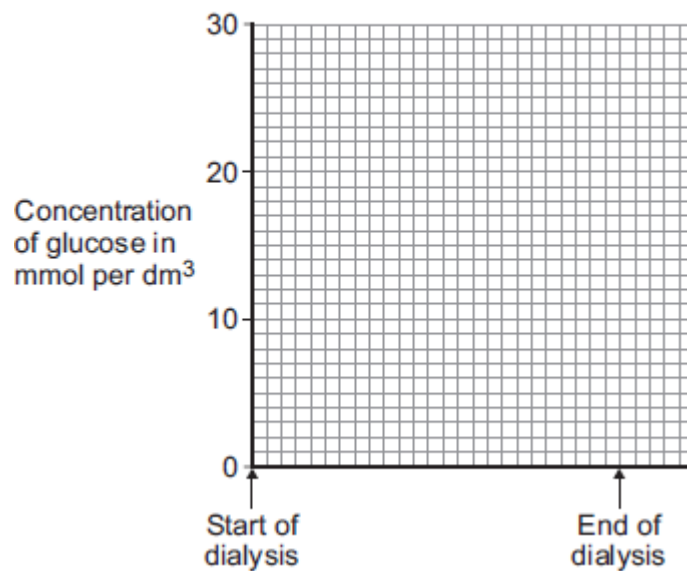
Figure 1



(1)

- (ii) Sketch a graph on **Figure 2** to suggest what will happen to the concentration of glucose in the blood during dialysis.

Figure 2



(1)

- (c) (i) Another way of treating kidney failure is with a kidney transplant.
A transplanted kidney can be rejected.

Explain why the new kidney may be rejected.

(3)

(ii) Describe **one** way in which doctors try to prevent kidney rejection.

(1)

(Total 11 marks)

Q24.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Homeostasis keeps conditions in the body relatively constant.

The amount of water in the body is controlled by homeostasis.

Kidney function is controlled by a gland in the brain.

Describe how the water content of the blood is controlled.

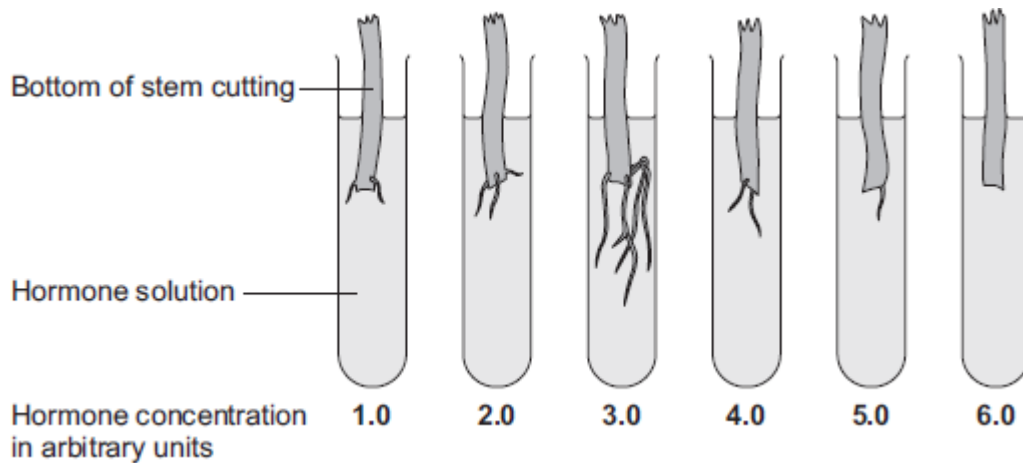
(Total 6 marks)

Q25.

- (a) A student investigated the effect of a plant hormone on the growth of roots by plant cuttings.

The student took six stem cuttings from the same plant. He put the cuttings in test tubes containing hormone solutions of different concentrations.

The image below shows the six cuttings after 2 weeks.



- (i) What is the best concentration of hormone for encouraging root growth?

_____ arbitrary units

(1)

- (ii) Give **two** functions of plant roots.

1.

2.

(2)

- (iii) Draw a ring around the correct answer to complete the sentence.

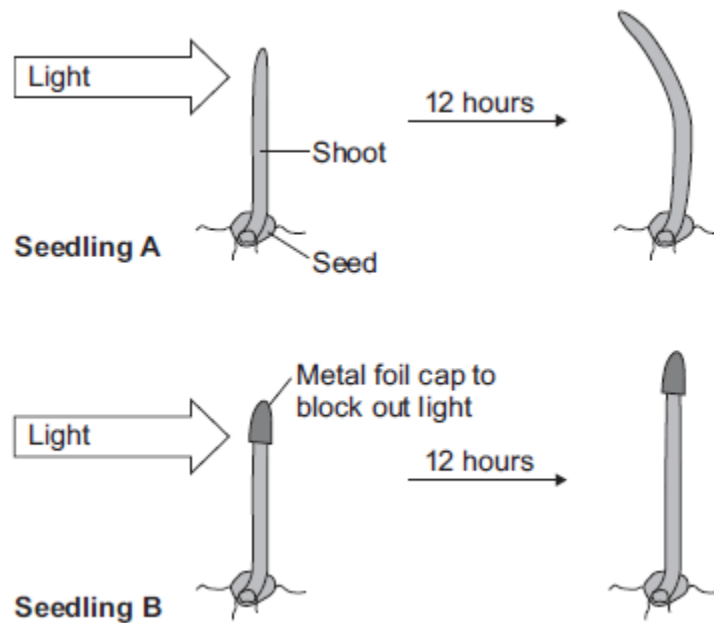
Taking cuttings to produce new plants is an example of

asexual reproduction.
genetic engineering.
sexual reproduction.

(1)

- (b) Another student investigated the effect of light, shining from one side, on the growth of plant shoots.

The diagram below shows how the student treated the shoots and the results she obtained after 12 hours.



- (i) What is the response to light shown by **Seedling A** called?

Tick (✓) **one** box.

cloning

a reflex

a tropism

(1)

- (ii) The student concluded that the shoot **tip** is sensitive to light.

What evidence is there in the diagram above for this conclusion?

(2)

(c) The seedling produces a hormone which helps to control its response to light.

(i) What is the name of the hormone?

Tick (✓) **one** box.

auxin

glucagon

glycerol

(1)

(ii) How does the hormone control the response of **Seedling A** to light shining from one side?

(4)
(Total 12 marks)

Q26.

It is important that the amount of water in the body is controlled.

- (a) The table below shows the main ways that a person takes in and loses water in one day.

Water taken in		Water lost	
Method	Volume in cm ³	Method	Volume in cm ³
Drink	1450	Urine	1500
Food	800	Sweat	600
Metabolic water	350	Breath	
		Faeces	100
Total	2600	Total	2600

- (i) Calculate the volume of water lost from the body through breathing.

Use information from the table above.

Volume of water lost through breathing = _____
cm³

(2)

- (ii) Metabolic water is water produced by aerobic respiration.

Complete the equation for aerobic respiration.

_____ + oxygen \longrightarrow _____ + water (+ energy)

(2)

- (iii) If the water intake stays the same, what will happen to the volumes of sweat and urine lost from the body on a much hotter day?

Draw a ring around the correct answer to complete each sentence.

The volume of sweat will

decrease.
increase.
stay the same.

The volume of urine will

decrease.
increase.
stay the same.

(2)

- (b) The kidneys help to control the water content of the body and the concentrations of substances dissolved in the body fluids. The kidneys do this by filtering the blood and then reabsorbing back into the blood the substances needed by the body.

The table above shows typical concentrations of some of the substances dissolved in a person's blood plasma, in the kidney filtrate, and in the urine.

Substance	Blood plasma in g per dm ³	Kidney filtrate in g per dm ³	Urine in g per dm ³
Protein	70	0	0
Glucose	1	1	0
Urea	0.3	0.3	20
Sodium ions	3	3	6

- (i) The table below shows that sodium ions are twice as concentrated in the urine as in the blood plasma.

Calculate how many times more concentrated **urea** is in the urine compared to the blood plasma.

Use information from the table.

Answer = _____ times more concentrated

(2)

(ii) What is the main cause of this increase in concentration of urea between the blood plasma and the urine?

Tick (✓) **one** box.

Increased urea production by the kidney

Reabsorption of water by the kidney

Increased deamination of amino acids by the liver

(1)

(iii) The table shows that both protein and glucose are found in the blood plasma but **not** in the urine.

Use your knowledge of kidney functioning to explain why.

Protein

Glucose

(4)

(c) Some people have kidney failure.

The two main types of treatment for kidney failure are dialysis and a kidney transplant operation.

Suggest reasons why most doctors think that a kidney transplant is better than

dialysis treatment.

(4)
(Total 17 marks)

Q27.

Phenylketonuria (PKU) is an inherited condition. PKU makes people ill.

(a) PKU is caused by a recessive allele.

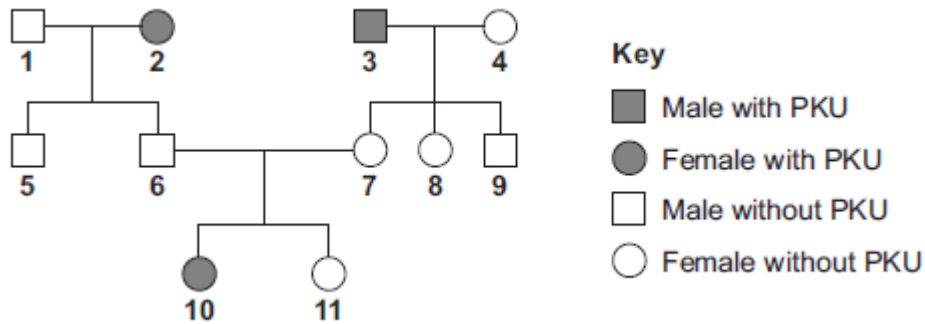
(i) What is an allele?

(1)

(ii) What is meant by recessive?

(1)

(b) The diagram below shows the inheritance of PKU in one family.



(i) Give **one** piece of evidence from the diagram that PKU is caused by a recessive allele.

(1)

(ii) Persons **6** and **7** are planning to have another child. Use a genetic diagram to find the probability that the new child will have PKU.

Use the following symbols in your answer:

N = the dominant allele for **not** having PKU

n = the recessive allele for PKU.

Probability = _____

(4)

(c) Persons **6** and **7** wish to avoid having another child with PKU.

A genetic counsellor advises that they could produce several embryos by IVF treatment.

(i) During IVF treatment, each fertilised egg cell forms an embryo by cell division.

Name this type of cell division.

(1)

- (ii) An embryo screening technique could be used to find the genotype of each embryo.

An unaffected embryo could then be placed in person 7's uterus.

The screening technique is carried out on a cell from an embryo after just three cell divisions of the fertilised egg.

How many cells will there be in an embryo after the fertilised egg has

divided three times?

(1)

- (iii) During embryo screening, a technician tests the genetic material of the embryo to find out which alleles are present.

The genetic material is made up of large molecules of a chemical substance.

Name this chemical substance.

(1)

- (d) Some people have ethical objections to embryo screening.

- (i) Give **one** ethical objection to embryo screening.

(1)

- (ii) Give **one** reason in favour of embryo screening.

(1)

(Total 12 marks)

Q28.

Human body temperature must be kept within narrow limits.

The image shows a cyclist in a race.



© Ljupco/iStock/Thinkstock

(a) Use the correct answer from the box to complete each sentence.

blood	brain	kidney	sweat	urine
--------------	--------------	---------------	--------------	--------------

The cyclist's body temperature is monitored by a centre in the _____

.

This centre is sensitive to the temperature of the cyclist's _____

.

If the cyclist's body temperature increases, his body increases the production of _____ .

(3)

(b) (i) Cyclists drink sports drinks after a race.

The table below shows the ratio of glucose to ions in three sports drinks, **A**, **B** and **C**.

	Sports drink		
	A	B	C
Ratio of glucose (g per dm³) to ions (mg per dm³)	15:14	12:1	2:7

The closer this ratio of glucose to ions is to 1:1 in a sports drink, the faster the body replaces water.

Which sports drink, **A**, **B** or **C**, would replace water fastest in an

athlete?

(1)

(ii) Why should sports drinks contain ions?

(1)

(iii) Why should a person with diabetes **not** drink too much sports drink?

(1)

(Total 6 marks)

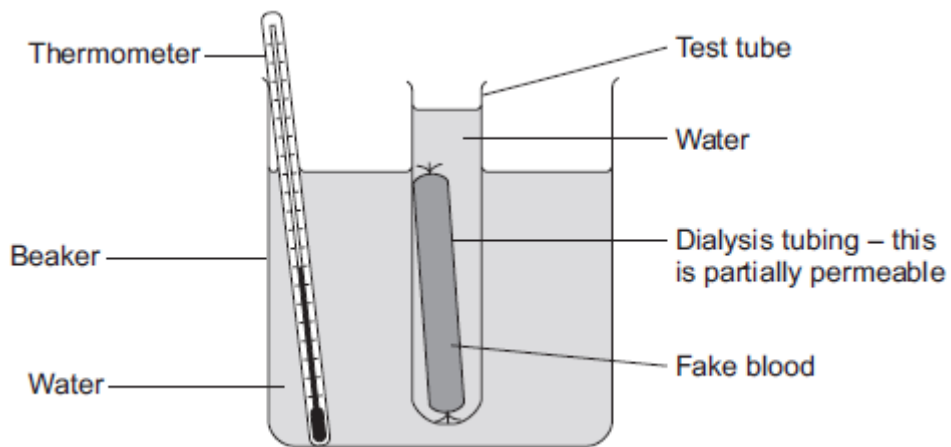
Q29.

A person's kidneys stop working. The person may be treated using a dialysis machine.

Some students made a model of a dialysis machine.

Figure 1 shows the students' model.

Figure 1



The fake blood contained:

- water

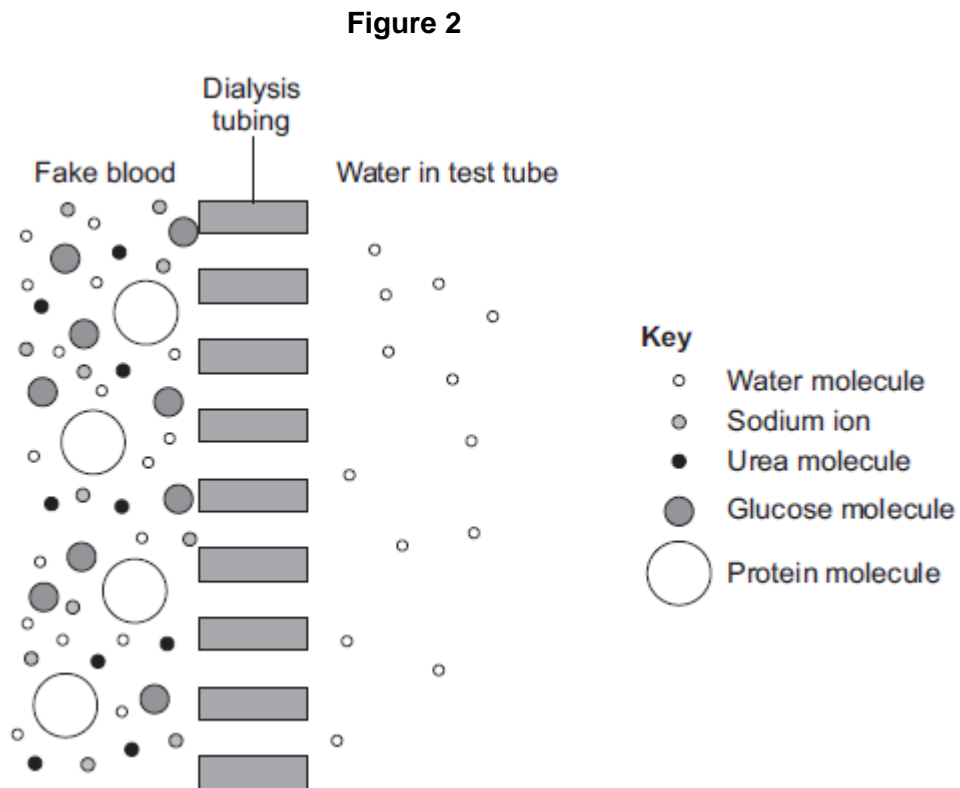
- sodium ions
- urea
- glucose
- protein.

(a) (i) Suggest why the students kept the water in the beaker at 37 °C.

(1)

(ii) The dialysis tubing separates the fake blood from the water in the test tube.

Figure 2 shows the fake blood, the dialysis tubing and the water in the test tube.



After 1 hour, the students tested the water in the test tube to see which substances had filtered through from the fake blood.

Name **one** substance that the students would find in the water in the test tube after 1 hour.

(1)

(iii) Give a reason for your answer to part **(a)(ii)**.

(1)

(iv) In hospitals, dialysis machines use dialysis fluid, not pure water.

Dialysis fluid contains the same concentration of useful substances as the blood.

Which substance is at the same concentration in dialysis fluid as in blood?

Tick (✓) **one** box.

Glucose

Insulin

Oxygen

(1)

(b) When the kidneys stop working, the person can be treated by a continuous process called CPD.

In CPD:

- dialysis fluid is put into the abdomen
- the fluid is changed four times a day at home
- changing the fluid takes about 45 minutes.

Suggest **two** advantages of having CPD instead of treatment on a dialysis machine.

1.

2.

(2)

(Total 6 marks)

Q30.

Blood is part of the circulatory system.

(a) (i) Give **one** function of white blood cells.

(1)

(ii) Which of the following is a feature of platelets?

Tick (✓) **one** box.

They have a nucleus.

They contain haemoglobin.

They are small fragments of cells.

(1)

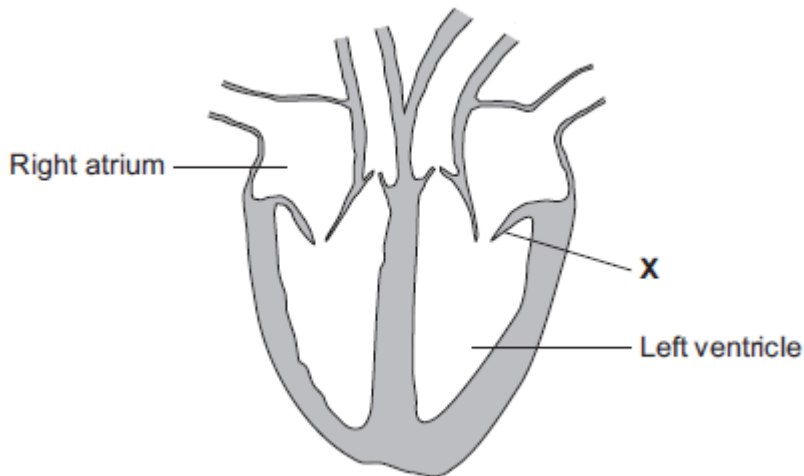
(b) Urea is transported by the blood plasma from where it is made to where the urea is excreted.

Complete the following sentence.

Blood plasma carries urea from where it is made in the _____
to the _____ where the urea is removed from the blood.

(2)

(c) The illustration shows a section through the human heart.



Structure **X** is a valve. If valve **X** stops working, it may need to be replaced.

A scientist is designing a new heart valve. The scientist knows that the valve must be the correct size to fit in the heart.

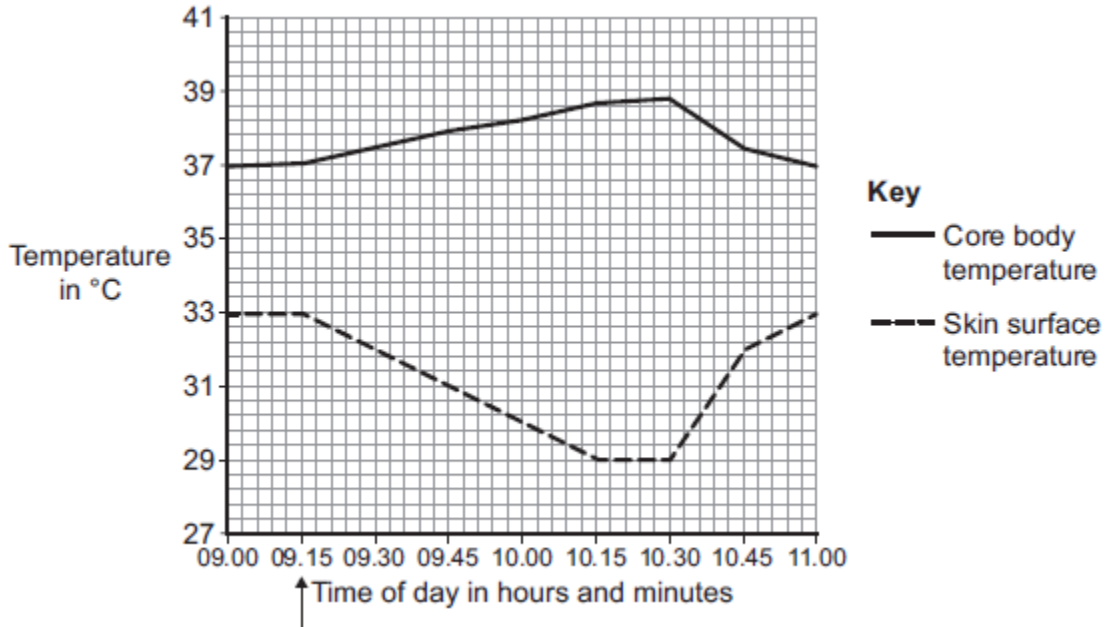
Suggest **two** other factors the scientist needs to consider so that the newly designed valve works effectively in the heart.

(2)

(Total 6 marks)

Q31.

The graph shows the core body temperature and the skin surface temperature of a cyclist before, during and after a race.



Start
of race

- (a) (i) When the cyclist finished the race, his core body temperature started to decrease.

How long did the race last?

(1)

- (ii) Describe and explain the different patterns shown in the core body temperature and skin surface temperature between 09.15 and 10.15.



Blank writing lines for answer (ii)

(6)

(iii) After 10.30, the core body temperature decreased.

Explain how changes in the blood vessels supplying the skin caused the skin surface temperature to increase.

Blank writing lines for answer (iii)

(2)

(b) During the race, the cyclist's blood glucose concentration began to decrease.

Describe how the body responds when the blood glucose concentration begins to decrease.

Blank writing line for answer (b)

(3)
(Total 12 marks)

Q32.

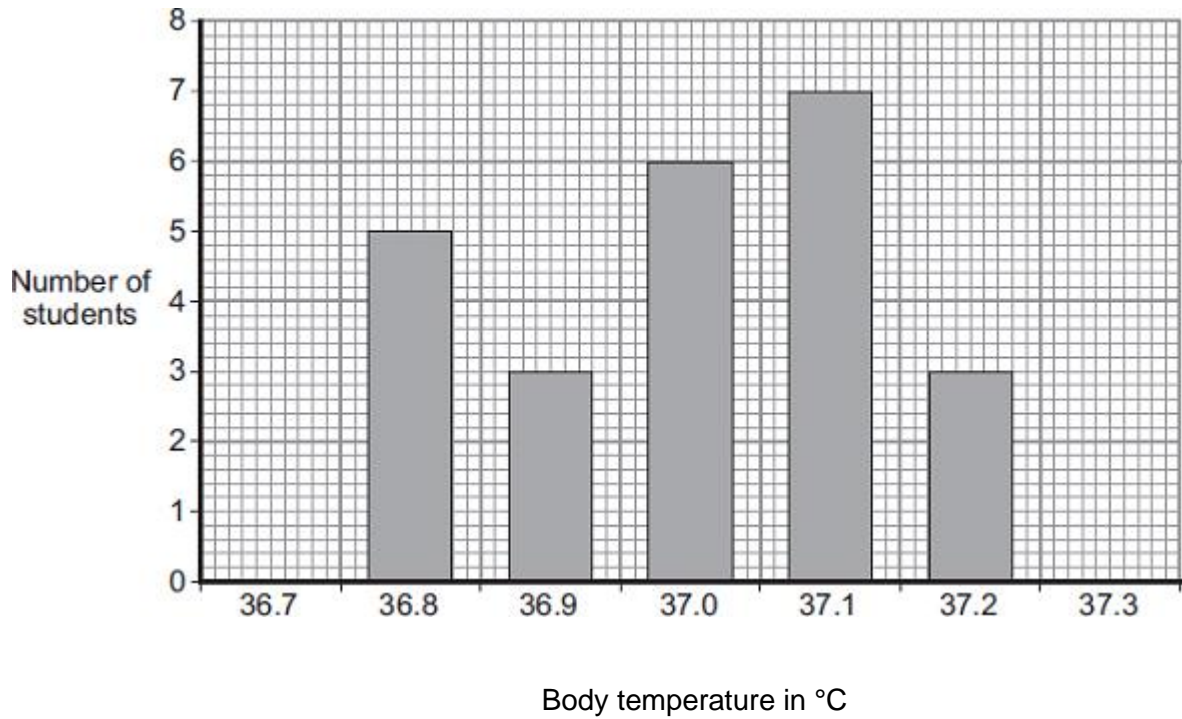
The body controls internal conditions.

- (a) Use words from the box to complete the sentences about water loss from the body.

kidneys	liver	lungs	skin
----------------	--------------	--------------	-------------

- (i) Water is lost in sweat via the _____ (1)
- (ii) Water is lost in urine via the _____ (1)
- (iii) Water is lost in the breath via the _____ (1)
- (b) Students investigated body temperature in the class.

The bar chart shows the results.



- (i) One student used the bar chart to calculate the mean body temperature of the class.
The student calculated the mean body temperature as 37.0 °C.

How did the student use the bar chart to calculate the mean?

(2)

- (ii) How many students had a body temperature higher than the mean of 37.0 °C

(1)

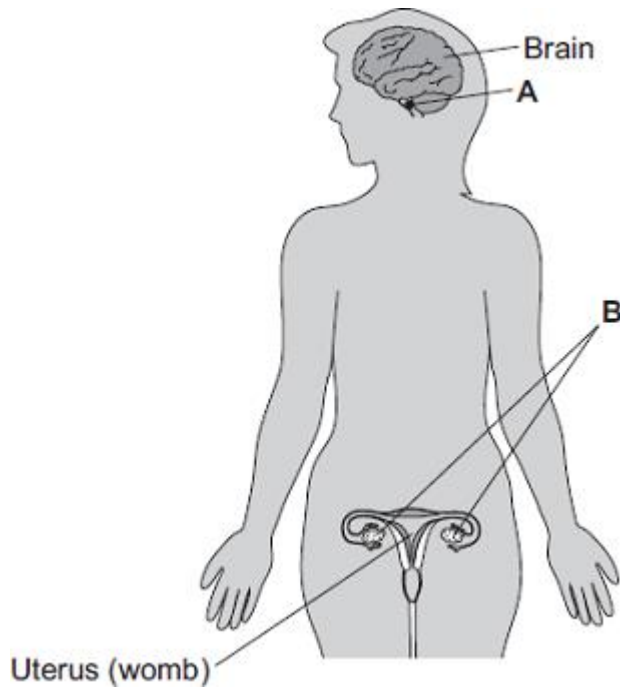
- (iii) Body temperature must be kept within a narrow range.

Why?

(1)
(Total 7 marks)

Q33.

The diagram shows the position of two glands, **A** and **B**, in a woman.



(a) (i) Name glands **A** and **B**.

A _____

B _____

(2)

(ii) Gland **A** produces the hormone Follicle Stimulating Hormone (FSH).

FSH controls changes in gland **B**.

How does FSH move from gland **A** to gland **B**?

(1)

- (b) (i) A woman is not able to become pregnant. The woman does not produce mature eggs. The woman decides to have In Vitro Fertilisation (IVF) treatment.

Which **two** hormones will help the woman produce and release mature eggs?

Tick (✓) **one** box.

FSH and Luteinising Hormone (LH)

FSH and oestrogen

Luteinising Hormone (LH) and oestrogen

(1)

- (ii) Giving these hormones to the woman helps her to produce several mature eggs. Doctors collect the mature eggs from the woman in an operation.

Describe how the mature eggs are used in IVF treatment so that the woman may become pregnant.

(3)

- (iii) IVF clinics have been set a target to reduce multiple births.

At least 76% of IVF treatments should result in single babies and a maximum of 24% of treatments should result in multiple births.

Suggest **one** reason why the clinics have been set this target to reduce multiple births.

(1)

- (c) Two clinics, **R** and **S**, used IVF treatment on women in 2007. Doctors at each clinic used the results of the treatments to predict the success rate of treatments in 2008.

The table shows the information.

	Total number of IVF treatments in 2007	Number of IVF treatments resulting in pregnancy in 2007	Predicted percentage success rate in 2008
Clinic R	1004	200	18–23
Clinic S	98	20	3–56

- (i) Compare the success rates of the two clinics in 2007.

(1)

- (ii) The range of the predicted success rate in 2008 for clinic **R** is much smaller than the range of the predicted success rate for clinic **S**.

Suggest why.

(2)
(Total 11 marks)

Q34.

Diabetes is a disease in which the concentration of glucose in a person's blood may rise to fatally high levels.

Insulin controls the concentration of glucose in the blood.

- (a) Where is insulin produced?

Draw a ring around **one** answer.

gall bladder

liver

pancreas

(1)

- (b) People with diabetes may control their blood glucose by injecting insulin.

- (i) If insulin is taken by mouth, it is digested in the stomach.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate

fat

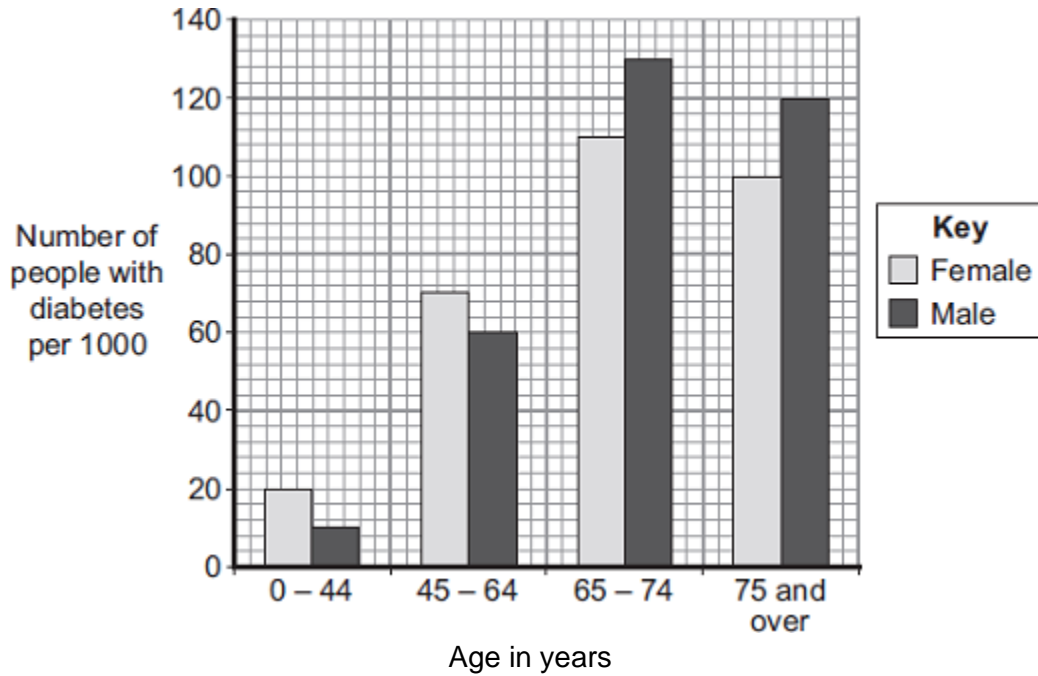
protein

(1)

- (ii) Apart from using insulin, give **one** other way people with diabetes may reduce their blood glucose.

(1)

- (c) The bar chart shows the number of people with diabetes in different age groups in the UK.



- (i) Describe how the number of males with diabetes changes between the ages of 0 – 44 years and 75 years and over.

(3)

- (ii) Compare the number of males and females with diabetes:

between the ages of 0 and 64 years

over the age of 65 years.

(2)
(Total 8 marks)

Q35.

- (a) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

(1)

- (b) In a healthy person, insulin prevents high levels of glucose in the blood. To make insulin, cells in the pancreas need amino acids.

Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to amino acids that cannot be stored in the body.



(3)
(Total 4 marks)

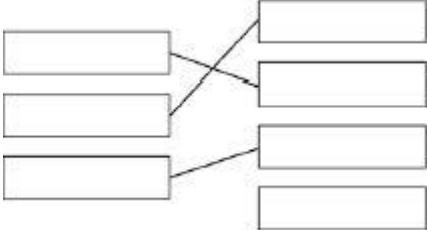
Mark schemes

Q1.

(a) to allow implantation of the embryo 1

(b) oestrogen 1

(c) 13 / 14 / 15 / 16 1
allow any number in range 13 to 16
allow any range within these values e.g. 14–16

(d)  1
extra line from a method cancels the mark 1
1

(e) more reliable than diaphragm / spermicidal cream 1
allow fewer pregnancies than diaphragm / spermicidal cream

low chance of pregnancy 1
allow only 1 more pregnancy than the pill (per 100 women per year)
allow almost as good as the pill
allow reference to one named example

no side effects 1
allow easy to get / buy
allow easy to use
allow prevent / reduce spread of STDs / gonorrhoea / HIV
ignore cost

[9]

Q2.

(a) pancreas 1

- (b) liver 1
- glycogen 1
- in this order*
- (c) would be digested / broken down (by enzymes / protease / pepsin / acid or to amino acids) 1
- allow denatured (by acid)*
- (d) use of 14.2 **and** 6.8 1
- 7.4 1
- allow an answer of 7.2 or 7.3 (using 14.1 and / or 6.9) for 1 mark*
- an answer of 7.4 scores 2 marks*
- (e) any **one** from: 1
- (person A's) results are higher
ignore A peaks at a higher level than B
 - (A) increases for a longer time **or** peaks later
 - (A) takes longer to decrease **or** takes longer to return to normal
allow other correct comparisons
allow a description using pairs of figures from graph at a given time
- allow converse comparisons with person B as the subject*
- (f) a negative correlation 1
- (g) less carbohydrate / sugar / fat in diet 1
- allow go on a diet*
allow eat less
allow balanced / healthy diet
- or**
- lose weight **or** maintain a healthy weight
ignore diet unqualified
- (more) exercise 1
- allow examples of exercise*

[10]

Q3.

- (a) 2400 **and** 2280
or
500 **and** 380

1

120

1

an answer of 120 scores 2 marks

- (b) respiration of glucose

1

- (c) (more) sweating
*ignore reference to vasodilation /
vasoconstriction*

1

(because) exercise releases heat

or

need to cool the body

or

need to lose heat

or

need to maintain body temperature

*do **not** accept energy being produced*

1

- (d) more energy needed
*do **not** accept energy production
do **not** accept energy needed for respiration*

1

(so) more (aerobic) respiration

1

(so) increased breathing (rate / depth) (to supply oxygen **or** remove carbon dioxide / water)

1

*'more' does not need to be stated a second time
to gain marking point 1 and marking point 2*

[8]

Q4.

- (a) 3.7

1

- (b) 2

1

- (c) (different combinations of alleles cause) many / 22 values
allow continuous variation

or

in-between values

- or**
large range of values
or
there are not only two values
allow there are not only 3 values if 3 is given in part (b)
- 1
- (d) different protein made
allow change in shape (of enzyme) or change in 3-D structure
ignore denature
- 1
- active site changed
- 1
- so substrate does not fit / bind
allow description of substrate
allow cannot form E-S complex
ignore lock and key description
- 1
- (e) produces (some) offspring with high-fat milk
or
not all offspring have low-fat milk
ignore reference to alleles
- 1
- (f) takes less time (to obtain results)
or
more offspring at the same time
allow other sensible suggestion – e.g. allows screening **or** *allow cow 7 to continue to produce eggs* **or** *avoid injury to cow 7 during mating or giving birth*
- 1
- (g) male gametes correct: d (and d)
- 1
- female gametes correct: D and d
- 1
- allow 1 mark if gametes are correct but gender not identified*
- correct derivation of offspring genotypes from given gametes
allow 2 × 2 **or** *2 × 1 derivation*
- 1
- Dd identified as low-fat **and** dd identified as high-fat in offspring
if DD offspring are produced, must also identify as low-fat
- 1

- (h) find female with low(est) fat in milk **and** high(est) milk yield
allow choose from 7, 9, 12, 13 which has the highest yield 1
- find male whose female offspring have high(est) milk yield **and** low(est) fat in milk
allow choose from 16 or 18 whose female offspring has the highest yield 1
- or**
- find female with lowest fat in milk
or cow 13 (1)*
**or allow female with high(est) milk yield*
- find male whose female offspring have high(est) milk yield (1)*
**or allow male whose female offspring have lowest fat in milk / male 16*
- cross the best (for both features) female with the best male 1
- select best offspring (for both features) from each generation and repeat for several generations 1
- [16]**

Q5.

- (a) **A** 1
- (b) **E** 1
- (c) 28
allow 27–29 1
- (d) progesterone 1
- (e) any **two** from:
- inhibits FSH production / release
 - prevents egg maturation
allow prevents egg growth
 - prevents ovulation
allow prevents egg release

- ignore prevents egg production* 2
- (f) oestrogen 1
- testosterone 1
- allow in this order only*

[8]

Q6.

- (a) any **three** from:
- a (chemical) messenger
or
an organic substance
allow correct named example – e.g. protein / modified amino acid / catecholamine / steroid
 - made by the endocrine system / an endocrine gland / endocrine organ
allow made by / released from a (ductless) gland
 - affects (a) specific / target organ(s) / tissue(s)
 - released into the blood
allow carried by the blood
- 3

- (b) insulin **and** glucagon 1
- both required for 1 mark correct spelling only for glucagon*

- (c) **Level 2 (3-4 marks):**
Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

Level 1 (1-2 marks):
Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.

No relevant content (0 marks)

Indicative content

- (0–0.5 h:) glucose from meal enters blood
or
increase in blood glucose (to 6.5 mmol / dm³)
- glucose detected by pancreas
- pancreas secretes insulin
- (insulin causes) glucose to move (out of blood) into cells / liver
- liver converts glucose to glycogen
- causing a fall in blood glucose (after 0.5h)
- low blood glucose (< 5.0 mmol / dm³) detected by pancreas

- pancreas releases glucagon
- liver converts glycogen to glucose (which enters blood)
- blood glucose rises (after 1 h **or** to 5.2 mmol / dm³ (at 1.5 h))

[8]

Q7.

- | | | |
|-----|--|---|
| (a) | less sweating so less water loss | 1 |
| | (as) no / little water available in desert | 1 |
| (b) | (fat store) can be metabolised / respired to water | 1 |
| | (little urine...) conserve water | 1 |
| | (hard mouth) not damaged by spines on plants / on food
or
not damaged by hard / dry food | 1 |
| (c) | dromedary / <i>C.dromedarius</i>
and bactrian / <i>C. bactrianus</i>
<i>no mark for the names, but must be identified</i>
because
same genus
<i>ignore 'both are Camelus'</i> | 1 |
| (d) | any two from: <ul style="list-style-type: none"> • the fossil record • oldest fossils in N. America or • newer fossils in S. America / in Asia / in Africa
<i>allow numbers for ages (45 Mya and 3 Mya / 6 Mya)</i> • chemical / DNA analysis of living species
<i>allow radioactive dating of fossils</i> | 2 |
| (e) | isolation of separate camel populations by sea
or
by mountains | 1 |
| | habitat variation / described between populations
<i>allow examples – biotic (e.g. food / predators) or abiotic</i> | 1 |
| | genetic variation / mutation in each population | 1 |

45 million years is sufficient time to accumulate enough mutations 1

natural selection

or

better adapted survive to reproduce 1

pass on favourable allele(s)

allow gene(s) 1

[14]

Q8.

- (a) liver 1
- (b) insulin
- do not accept glucagon* 1
- (c) kidney 1
- (d) to replace water / ions / salt 1
- (that is) lost in sweat 1
- [5]**

Q9.

- (a) **A** – pituitary 1
- B** – adrenal 1
- (b) ovary 1
- (c) diaphragm
- allow phonetic spelling* 1
- (d) condom 1
- (e) **Level 2 (3–4 marks):**
- A detailed and coherent evaluation is provided which considers a range of advantages and disadvantages and comes to a conclusion consistent with the reasoning.
- Level 1 (1–2 marks):**
- An attempt to describe the advantages and disadvantages is made, which may not come to a conclusion. The logic may be inconsistent at times.

0 marks:

No relevant content.

Indicative content

advantages of the plastic IUD:

- is effective for longer than the copper IUD
- does not need to be replaced as often as the copper IUD
- although the pain of periods are more severe, the pain with the copper IUD is likely to be worse
- can reduce the bleeding during a period
- most of the possible side effects are not serious, eg feeling sick, acne and headaches.

disadvantages of the plastic IUD:

- needs to be implanted for a period of time before it is effective ie not emergency contraception
- can make the pain of period more severe
- can cause more side effects than the copper IUD
- can cause some more severe side effects such as cysts on the ovaries

an understanding that the side effects are only possible and may not necessarily occur

additional examiner guidance:

- pupils should add value to the points in the table and should not just be copies verbatim
- credit can also be given for other correct advantages and disadvantages from the candidates' own knowledge and understanding
- allow converse points if clearly made

4

[9]

Q10.

(a) if too high insulin released from pancreas

1

so glucose is moved into cells

allow glucose is stored

1

if too low, glucagon is released (from pancreas)

1

causes glycogen to be converted to glucose and released into the blood

1

(b) type 1 not enough / no insulin produced

1

whereas type 2 cells do not respond to insulin

1

type 1 is treated with injections of insulin

1

whereas type 2 is treated with diet and exercise

or

loss of weight

or

drugs

1

(c) $(3.45 \times 10^6) + (5.49 \times 10^5) = 3.999 \times 10^6$

or

$3\,450\,000 + 549\,000 = 3\,999\,000$

*allow 3.999×10^6 **or** $3\,999\,000$ with no working shown for 1 mark*

1

$$\frac{3.999 \times 10^6}{6.5 \times 10^7} \times 100$$

or

$$\frac{3\,999\,000}{65\,000\,000} \times 100$$

= 6.15

allow 6.15 with no working shown for 2 marks

allow for 1 mark for a calculation using either:

$$\frac{3.45 \times 10^6}{6.5 \times 10^7}$$

or

$$\frac{3\,450\,000}{65\,000\,000}$$

or

$$\frac{5.49 \times 10^5}{6.5 \times 10^7}$$

or

$$\frac{549\,000}{65\,000\,000}$$

1

6.2

allow 6.2 with no working shown for 3 marks

1

allow ecf from second step correctly rounded for 1 mark

(d) could be other reasons for glucose in urine

or

blood test gives current / immediate result, urine levels might be several hours old

or

not always glucose in urine

1

(e) results not affected by glucose from food

or

8 hours is sufficient time for insulin to have acted on any glucose from food eaten

or
so that there is a low starting point to show the effect

1

- (f) (patient **A**)
no mark for identifying A

glucose level much higher (than **B**)

1

and remains high / does not fall

1

[15]

Q11.

- (a) Too much thyroxine is released into the blood

1

which raises BMR

1

causing increase in formation of glycogen / lipids / proteins

or

increase in rate of respiration

or

increase in breakdown of excess proteins

1

- (b) FSH causes eggs to mature and stimulate ovaries to produce oestrogen

1

LH stimulates the egg to be released

1

- (c) (missing a dose causes a) dip / drop in progesterone levels

1

(therefore) FSH is not inhibited anymore

1

(therefore) LH is not inhibited anymore

1

(and consequently) an egg is matured and released

allow (and consequently) an egg is available to be fertilised

1

[9]

Q12.

- (a) (i) 2400 cm³

1

- (ii) 1400 (cm³)

allow 2 marks for ecf of correct answer to [answer given in (a)(i) – 1000]

allow 1 mark for $2400 - (600 + 400)$ or equivalent with no or incorrect answer

allow 1 mark for ecf of answer given in (a)(i) – 1000 or equivalent with no or incorrect answer

- | | | |
|-----|---|---|
| | | 2 |
| (b) | (i) sweat(ing) | |
| | <i>allow evaporation</i> | |
| | <i>allow perspiration</i> | 1 |
| | (ii) any one from: | |
| | • for cooling | |
| | • to maintain body temperature | 1 |
| (c) | (i) More water was lost through the skin. | 1 |
| | (ii) decrease | 1 |

[7]

Q13.

- | | | |
|-----|--|---|
| (a) | (i) follicle stimulating hormone / FSH | 1 |
| | (ii) oestrogen | 1 |
| (b) | (i) any one from: | |
| | • to help them have a baby / get pregnant | |
| | <i>ignore to make them fertile</i> | |
| | • to stimulate egg production / release / maturation | |
| | • own levels of FSH / LH / hormone (too) low | |
| | <i>allow to increase hormone / FSH / LH levels</i> | |
| | <i>do not allow to increase oestrogen levels</i> | 1 |
| | (ii) through the bloodstream | 1 |
| (c) | oestrogen | 1 |
| | progesterone | 1 |

[6]

Q14.

- | | | |
|-----|-------|---|
| (a) | ovary | 1 |
| (b) | 46 | 1 |

- (c) (i) does not fit the pattern
or
 it is higher than the 3rd value / it should be lower than the 3rd value / it should be between the 3rd and 5th values
do not allow use of incorrect figures 1
- (ii) As age increases % of women (having a baby) decreases 1
- (d) (i) 33

$$\frac{66}{2}$$
allow 1 mark for
if no answer / wrong answer 2
- (ii) low success rate 1
- more likely to have a baby with health problems / abnormalities / a faulty chromosome 1
- [8]**

Q15.

- (a) (i) The person started running a race. 1
- (ii) 2300 1
- (iii) drinking (water / sports drink)
or
 through eating 1
- (b) (i) brain 1
- (ii) receptors 1
- (c) cools us down
allow evaporates 1
- [6]**

Q16.

- (a) (i) pancreas 1
- (ii) Insulin causes glucose to move into cells. 1

- (b) (i) **A** 1
- rapid rise **or** fastest 1
- (ii) 2 1
- (c) The pancreas could be rejected. 1

[6]

Q17.

- (a) immune system 1
- allow white blood cells / lymphocytes*
- ignore phagocytes*
- produces antibodies 1
- (which) attack the antigens on the transplanted organ / pancreas
- allow transplanted organs have foreign antigens at start of explanation **and** linked to attacking the organ* 1
- (b) (i) change / rise detected by the sensor 1
- information used to calculate how much insulin she is going to need (bring her blood glucose back to normal) 1
- (pump delivers) insulin into the blood 1
- (causing) glucose to move into cells
- allow (liver) converts glucose to glycogen* 1
- max 2 if no ref. to artificial pancreas*
- (ii) any **one** from: 1
- it is more accurate **or** less chance of human error
 - (glucose) level will remain more stable **or** no big rises and falls in blood sugar levels
 - you don't forget to test and / or inject insulin
 - if ill or in coma insulin is still injected
- ignore continuous and automatic unqualified*

[8]

Q18.

- (a) (i) chemical

- 1
- (ii) pituitary gland 1
- (b) 8 1
- allow 9 or 10*
- (c) (i) any **four** from: 1
- progesterone starts being produced at 4 weeks / no progesterone before 4 weeks
 - and then / from 4 weeks increases
 - oestrogen at constant / low level (from 0) to 20 weeks
 - and then / from 20 weeks increases
 - from 20 – 36 weeks level of O rises more steeply than that of P
- or**
- P is always higher than O from 6 to 36 weeks
- if no other marks awarded, allow progesterone and oestrogen both increase / rise for 1 mark.*
- 4
- (ii) oxytocin 1
- level of oxytocin increases just before birth 1
- [9]**

Q19.

- (a) homeostasis 1
- (b) in sequence:
- pancreas 1
- liver 1
- glycogen
- correct spelling only* 1
- glucagon
- correct spelling only* 1
- (c) (i) broken down / digested 1
- further detail eg into amino acids / by enzymes / by proteases 1
- (ii) diet / eating less sugar / less fat

- ignore balanced diet*
- or**
- ignore 'dieting' / slimming diet*
- exercise
- accept pancreas transplant*
- 1
- (d) (i) sensible suggestion
eg (owner's) smell / sweating / change in owner's behaviour / dizziness / tiredness
- 1
- (ii) any **five** from:
- allow 1 mark for justified conclusion*
do not allow full marks unless at least 1 pro and 1 con.
- Pro:
- % below normal decreases
 - % in normal increases
 - reliable / repeatable / valid data as large number of samples
 - do not allow accurate / precise*
 - patients express satisfaction.
- Con:
- may not be reliable as blood glucose measurements for only 5 patients / survey of only 16 (dog owners)
 - % above normal increases / dogs are less good at detecting high glucose.
- 5
- (e) glucose in urine of diabetic (and not in the non-diabetic)
- 1
- urea and Na⁺ ions are similar in each / slightly lower in diabetic
- 1
- + any **three** from:
- no protein in either urine sample because protein too large / does not pass through filter
 - glucose passes through filter in kidney
 - ignore glucose is reabsorbed*
 - non-diabetic: the / all glucose is reabsorbed / taken back into blood
 - diabetic: (too much glucose so) cannot all be reabsorbed
 - because diabetic has high concentration of glucose in blood
 - urea and Na⁺ lower in diabetic because less water is reabsorbed (due to extra glucose in filtrate).
- 3
- [19]**
- Q20.**
- (a) Lung
- 1

- (b) Filtering the blood 1
- (c) They will take in water and burst 1
- (d) (i) 6 1
- (ii) less than 28 1
- (iii) urea not reabsorbed
or
 dialysis (fluid) has removed urea 1
- (e) (i) antibodies 1
- (ii) Tissue typing the donor kidney 1
- [8]**

Q21.

- (a) (i) **B** 1
- (ii) **D** 1
- (iii) **C** 1
- (b) (i) insulin 1
- (ii) pancreas 1
- [5]**

Q22.

- (a) (i) has the least amount of glucose
*allow least amount of fat **or** no fat* 1
- (to) transfer energy (for the run)
allow (to) release energy (for the run)
*do **not** allow produces energy*
*do **not** allow 'energy for respiration'* 1
- (ii) any **one** from:
 • cells will work inefficiently
 • absorb too much water / swell / overhydrate

- lose too much water / shrink / dehydrate
ignore turgid / flaccid
cells burst is insufficient
allow cramp in muscle.

1

(b) any **three** from:

- thermoregulatory centre
- (has temperature) receptors
- (which) monitor blood temperature (as it flows through the brain)
- (temperature) receptors in the skin
- (receptors) send impulses to the brain
ignore vasoconstriction / vasodilation / sweating
allow hypothalamus
impulses sent to the thermoregulatory centre = 2 marks.

3

(c) (i) (sports drinks) contain a lot of glucose

1

(a person with diabetes) does not produce insulin **or** does not produce enough insulin

allow (person with diabetes) has cells which do not respond to insulin

*do **not** allow insulin produced by liver*

1

so blood glucose / sugar levels will rise too high **or** to a dangerous level

1

(ii) inject insulin

or

have an insulin pump (fitted)

*do **not** allow swallow insulin*

accept exercise

accept inhale insulin

*accept take metformin **or** other correctly named drug*

allow pancreatic transplant

1

[10]

Q23.

(a) (the kidney) filters the blood

ignore refs to hormones and drugs

1

(and then) reabsorbs all of the glucose

1

reabsorbs some of the ions

allow salts

ignore minerals

- 1
- reabsorbs some of the water 1
- releases urea (in urine) 1
- (b) (i) should fall from 28 (to the end of dialysis)
ignore any line drawn after end of dialysis
allow + / - 0.5 square
graph line must fall to / below
below 15 1
- (ii) should stay level at about 6 throughout
ignore slight variations
allow + / - 1 square
ignore any line drawn after end of dialysis 1
- (c) (i) immune system
allow white blood cells / lymphocytes 1
- (produces) antibodies 1
- (which) attack the antigens (on the transplanted kidney)
non-matching antigens insufficient 1
- (ii) any **one** from:
 - tissue typing (to find match)
 - treating with drugs that suppress the immune system*accept treat with immunosuppressants.* 1

[11]

Q24.

Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a brief description of kidney function including a mention of pituitary gland **or** hormones but roles may be confused.

Level 2 (3 – 4 marks)

There is a clear description of kidney function in relation to fluctuations in blood water levels and the roles of the pituitary gland **or** hormone is mentioned with

correct role.

Level 3 (5 – 6 marks)

There is a clear and detailed scientific description of kidney function in relation to fluctuations in blood water levels and of the roles of the pituitary gland and ADH.

examples of biology points made in the response:

- if water content too low, ADH released
- from pituitary gland
- into the blood
- (causing) kidney reabsorbs more water
- more concentrated / small volume urine produced
- if water content too high, ADH lowered / not produced
- less water reabsorbed by kidney
- more dilute / larger volume urine produced

full marks may be awarded for detailed description of either water loss or gain

[6]

Q25.

(a) (i) 3.0

accept 3

1

(ii) any **two** from:

- take in water
- take in ions / minerals / nutrients
- accept salts / named ions*
- ignore food*
- anchorage / support

2

(iii) asexual reproduction

1

(b) (i) a tropism

1

(ii) if tip exposed / **A** – grows / bends towards light

*allow tip of **A** moves towards light*

*ignore **A** responds to light*

allow remained 'straight'

1

if tip covered / **B** – did not grow towards light / remained vertical

*ignore **B** does not respond to light*

ignore phototropism

*only **A** grows towards the light = 2 marks*

1

(c) (i) auxin

			1
	(ii)	hormone comes from the tip	1
		more on shady side / moves away from light <i>allow reference to right-hand side</i>	1
		stimulates growth	1
		more growth on shady side (than on light side) <i>answer must be comparative</i> <i>ignore phototropism</i> <i>ignore cell division</i>	1
			[12]
Q26.			
	(a)	(i)	400
			<i>correct answer = 2 marks with or without working</i>
			$2600 - (1500 + 600 + 100)$
			or
			$2600 - 2200$
			<i>for 1 mark</i>
			2
	(ii)	LHS: glucose	
		<i>accept C₆H₁₂O₆ / C₆H₁₂O₆ / sugar</i>	1
		RHS: carbon dioxide	
		<i>accept CO₂ / CO₂</i>	
		<i>do not accept CO² / CO</i>	1
	(iii)	(sweat) increase	1
		(urine) decrease	1
	(b)	(i)	66.7 / 66.67 / 66% / $\dot{66.6}$ / 67
			<i>accept answers in range</i>
			<i>correct answer = 2 marks with or without working</i>
			<i>or</i>
			<u>20</u>
			0.3 for 1 mark

or 66 / 66.6 / 66.66 / 66.67 / 67.0 for 1 mark
 (penalise excessive number of sig. figs. –1 mark) (eg no
 more than 2 decimal places)

2

(ii) reabsorption of water by the kidney

1

(iii) (protein) (too) big

1

cannot pass through filter / stays in blood / cannot enter kidney tubule

1

(glucose) small / can pass through filter

1

all taken back into blood / all reabsorbed

allow the glucose is reabsorbed

1

(c) any **four** from:

- transplant is permanent / dialysis is repetitive treatment / dialysis only short term
- kidney works all the time / dialysis intermittent
- concentrations in blood kept (\pm) constant / substances build up in blood between dialysis sessions
- poisoning / damage to body by build-up of substances (with dialysis)
- danger of infection / damage to blood vessels by needles (with dialysis)
- risk of blood clots with dialysis or anticlotting drugs (can lead to blood loss)
- long term expense of dialysis / excessive use of health service resources
- social point – inconvenience of dialysis described – can eat or drink without constraint with transplant

4

[17]

Q27.

(a) (i) one form of a / one gene

*do **not** allow 'a type of gene'*

allow a mutation of a gene

1

(ii) not expressed if dominant / other allele is present / if heterozygous

or

only expressed if dominant allele not present / or no other allele present

allow need two copies to be expressed / not expressed if

only one copy / only expressed if homozygous

1

(b) (i) two parents without PKU produce a child with PKU / **6** and **7** → **10**

- allow 'it skips a generation'* 1
- (ii) genetic diagram including:
accept alternative symbols if defined
- Parental gametes:
- 6: **N** and **n**
 and 7: **N** and **n** 1
- derivation of offspring genotypes:
- NN Nn Nn nn**
allow genotypes correctly derived from student's parental gametes 1
- identification: **NN** and **Nn** as non-PKU
OR nn as PKU
allow correct identification of student's offspring genotypes 1
- correct probability only: 0.25 / ¼ / 1 in 4 / 25% / 1 : 3
do not allow 3 : 1 / 1 : 4
do not allow if extra incorrect probabilities given 1
- (c) (i) mitosis
correct spelling only 1
- (ii) 8 1
- (iii) DNA
allow deoxyribonucleic acid
do not allow RNA / ribonucleic acid 1
- (d) (i) may lead to damage to embryo / may destroy embryos / embryo cannot give consent
allow avoid abortion
allow emotive terms – eg murder religious argument must be qualified
allow ref to miscarriage
allow idea of avoiding prejudice against disabled people
allow idea of not producing designer babies 1
- (ii) any **one** from:
- prevent having child with the disorder / prevent future suffering /

reduce incidence of the disease
ignore ref to having a healthy child
ignore ref to selection of gender

- embryo cells could be used in stem cell treatment

allow ref to long term cost of treating a child (with a disorder)
allow ref to time for parents to become prepared

1
[12]

Q28.

(a) brain

in correct order only

1

blood

1

sweat

1

(b) (i) A

1

(ii) to replace ions lost (in sweat)

accept salts

allow named examples, eg. prevent cramps

1

(iii) any **one** from:

- there is too much glucose / sugar in the sports drink
- they shouldn't have too much glucose / blood sugar
- it would cause their blood glucose / sugar to rise (too high)

1

[6]

Q29.

(a) (i) (37C is the same as human) body temperature

1

(ii) any **one** from:

- urea
- glucose
- sodium

ignore water

1

(iii) (as they are) small enough to pass through (the membrane)

*allow because there is a high concentration in the fake blood
and a low concentration in the water (so will diffuse across)*

1

(iv) glucose

1

(b) any **two** from:

- don't have to go to hospital **or** done at home rather than hospital
- less effect on lifestyle / can be mobile
- always filtering urea out
continuous is insufficient
- don't need a medical professional (to do it for you)
allow takes a shorter time
allow does not have to be connected to blood vessels
ignore 'less painful'

2

[6]

Q30.

(a) (i) defence against **or** destroy pathogens / bacteria / viruses / microorganisms
do not allow 'destroy disease'
accept engulf pathogen / bacteria / viruses / microorganism
accept phagocytosis
accept produce antibodies / antitoxins
allow immune response

1

(ii) they are small fragments of cells

1

(b) liver

in this order only

1

kidney(s)

1

(c) any **two** from:

- that it doesn't cause an immune response **or** isn't rejected / damaged by white blood cells
- whether it is a long lasting material / doesn't decompose / corrode / inert
- if it is strong (to withstand pressure)
- it will open at the right pressure
- that it doesn't cause clotting
- that it doesn't leak **or** it prevents backflow
- non toxic
ignore correct size

2

[6]

Q31.

(a) (i) 1 hour 15 mins / 1.25 hours / 75 mins
allow 1:15

- ignore 1.15 hours* 1
- (ii) increase in (core / body) temperature 1
ignore numbers 1
- (due to an) increase in respiration **or** more muscle contraction 1
- releasing energy (as a waste product)
allow produces 'heat'
*do **not** allow making energy* 1
- skin temperature decreases 1
- (because there is) sweating 1
- (which) evaporates and cools the skin
ignore references to vasodilation or vasoconstriction 1
- (iii) (there is) dilation of vessels (supplying skin capillaries)
allow vasodilation
allow blood vessels widen
ignore expand
*do **not** accept dilating capillaries or moving vessels* 1
- (so) more blood flows (near skin) (surface) **or** blood is closer (to the skin)
ignore ref to heat 1
- (c) pancreas detects (low) blood glucose 1
- produces glucagon
*do **not** allow glucagon made in the liver* 1
- (so) glycogen is converted to glucose
allow adrenaline released which increases conversion of glycogen to glucose
or
reduced insulin production so less glucose into cells / less glucose converted to glycogen
for 1 mark 1

[12]

Q32.

- (a) (i) skin 1
- (ii) kidneys
accept kidney 1
- (iii) lungs
accept lung 1
- (b) (i) multiply temperature by number of students at that temperature and add them up
allow (36.8 5) + (36.9 3) + (37.0 6) + (37.1 7) + (37.2 3)
allow 888 1
- divide by number of students
allow divide by 24 1
- (ii) 10 / ten 1
- (iii) so enzymes work (well)
ignore death / overheating / hypothermia
allow body reactions work (well) 1

[7]

Q33.

- (a) (i) **A** – pituitary
allow hypothalamus 1
- B** – ovary / ovaries 1
- (ii) in blood (stream)
accept in plasma
ignore dissolved 1
- (b) (i) FSH and Luteinising Hormone (LH) 1
- (ii) fertilised
OR
reference to sperm 1
- form embryos / ball of cells or cell division 1

(embryo) inserted into mother's womb / uterus
allow (fertilised egg) is inserted into mother's womb / uterus

1

(iii) any **one** from:

- multiple births lead to low birth weight
- multiple births cause possible harm to mother / fetus / embryo / baby / miscarriages
allow premature
ignore reference to cost / ethics / population

1

(c) (i) any **one** from:

- almost identical
allow S (slightly) more successful
- both approximately 20%

1

(ii) larger numbers (in clinic R) (in 2007)
allow only 98 (in S) (compared to 1004 (in R))

1

results likely to be more repeatable (in 2008)
allow more reliable
*do **not** accept more reproducible / accurate / precise*

1

[11]

Q34.

(a) pancreas

apply list principle

1

(b) (i) protein

apply list principle

1

(ii) any **one** from:

- (controlling / changing) diet
accept sugar(y foods) / named eg
ignore references to starch / fat / protein / fibre
- exercise
accept example, eg go for a run
- pancreas transplant
accept named drug eg metformin

1

- (c) (i) increase
ignore reference to women 1
- then fall 1
- relevant data quote (for male)
*eg max at ages 65–74 **or** starts at 10 (per thousand) **or** max at 130 (per thousand) **or** ends at 120 (per thousand)*
accept a difference between any pairs of numbers in data set
*accept quotes from scale eg '130' or '130 per thousand' but **not** '130 thousand'; to within accuracy of +/- 2 (per thousand)* 1
- (ii) (between 0 and 64) more females (than males) **or** less males (than females)
ignore numbers
allow eg females more diabetic than males 1
- (over 65) more males (than females) or less females (than males)
allow eg males more diabetic than females 1

[8]

Q35.

- (a) Pancreas
allow phonetic spelling 1
- (b) any **three** from:
max 2 if any one process goes on in wrong organ
- (amino acids) broken down
 - (amino acids) form urea
 - (amino acids broken down / converted **or** urea formed) in liver
 - (urea / broken down amino acids) removed / filtered by kidney
*do **not** allow amino acids filtered / removed by kidney*
 - (urine / urea / broken down amino acids) stored / held in bladder
*do **not** allow amino acids stored / held in bladder*

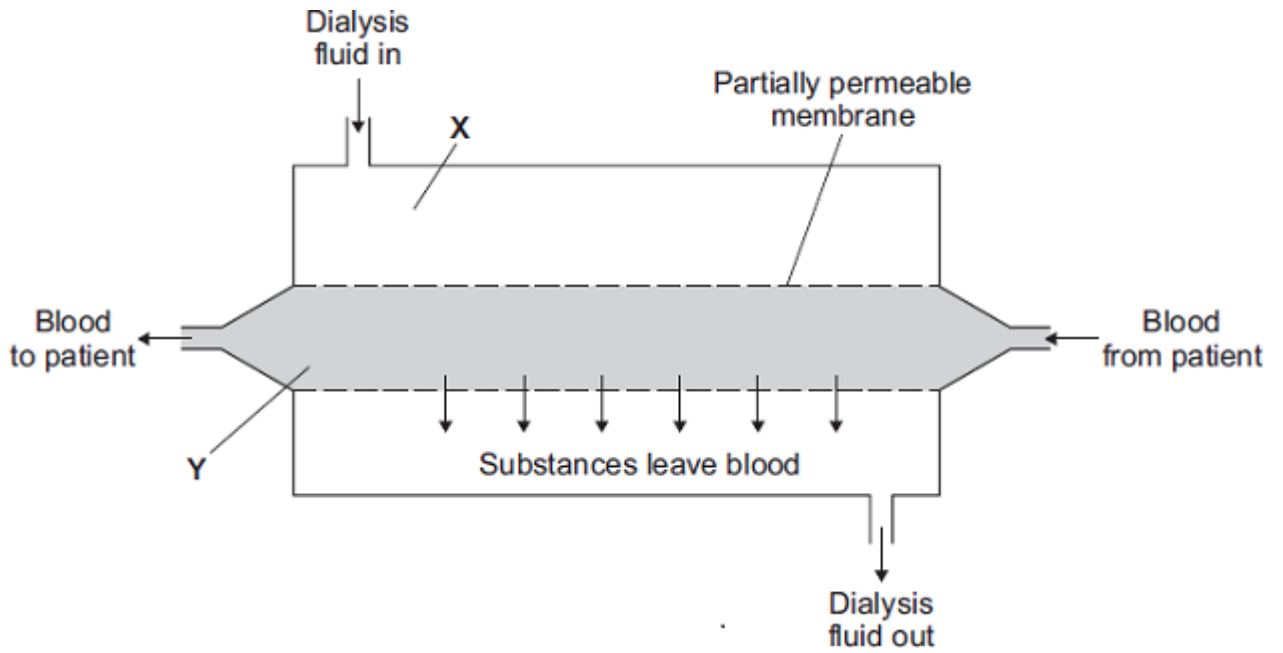
3

[4]

Q1.

People with kidney disease may be treated by dialysis.

The diagram shows a dialysis machine.



(a) Draw a ring around the correct answer to complete each sentence.

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

(i) This person lost mass mainly because

- | |
|-------|
| salt |
| urea |
| water |

was removed from the blood.

(1)

(ii) This substance was able to pass through the partially permeable membranes

because its molecules are

- | |
|--------|
| large. |
| round. |
| small. |

(1)

(iii) The concentration of sodium ions at X is 3.15 grams per dm³.

At the end of a dialysis session, the most likely concentration of sodium ions

at Y would be

- | |
|------|
| 0.00 |
| 3.15 |
| 6.30 |

grams per dm³.

(1)

(b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment	Cost per year in pounds
Dialysis	30 000
Kidney transplant: operation + first year's medical care medical care in each further year	51 000 5 000

(i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is the dialysis treatment? _____ pounds

(1)

(ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis.

How many years would it take?

Draw a ring around **one** answer.

2 years

3 years

4 years

(1)

(iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is it necessary to suppress the immune system ?

(1)

(Total 6 marks)

Q2.

Urine consists of water, ions and other substances such as urea.

Urine is formed in the kidney by filtering the blood.

The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

Substance	Diameter of molecule in nanometres
-----------	------------------------------------

A	10 to 20
B	1
C	0.6
D	0.5
E	0.2

Use information from the table and your own knowledge to answer the questions.

- (a) (i) Which substance, **A**, **B**, **C**, **D** or **E**, is protein?

(1)

- (ii) Protein is **not** found in the urine of a healthy person.

Explain why.

(2)

- (b) Substance **B** is **not** found in the urine of a healthy person.
Suggest an explanation for this.

(2)

- (c) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.

The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is **not** found in the urine of a healthy person, but haemoglobin can be found in the urine of a person with haemolytic anaemia.

Explain why.

(3)
(Total 8 marks)

Q3.

The number of cases of Type 2 diabetes in the UK is increasing rapidly.

- (a) Describe how insulin and glucagon help control the blood sugar concentration in a healthy person.

(6)

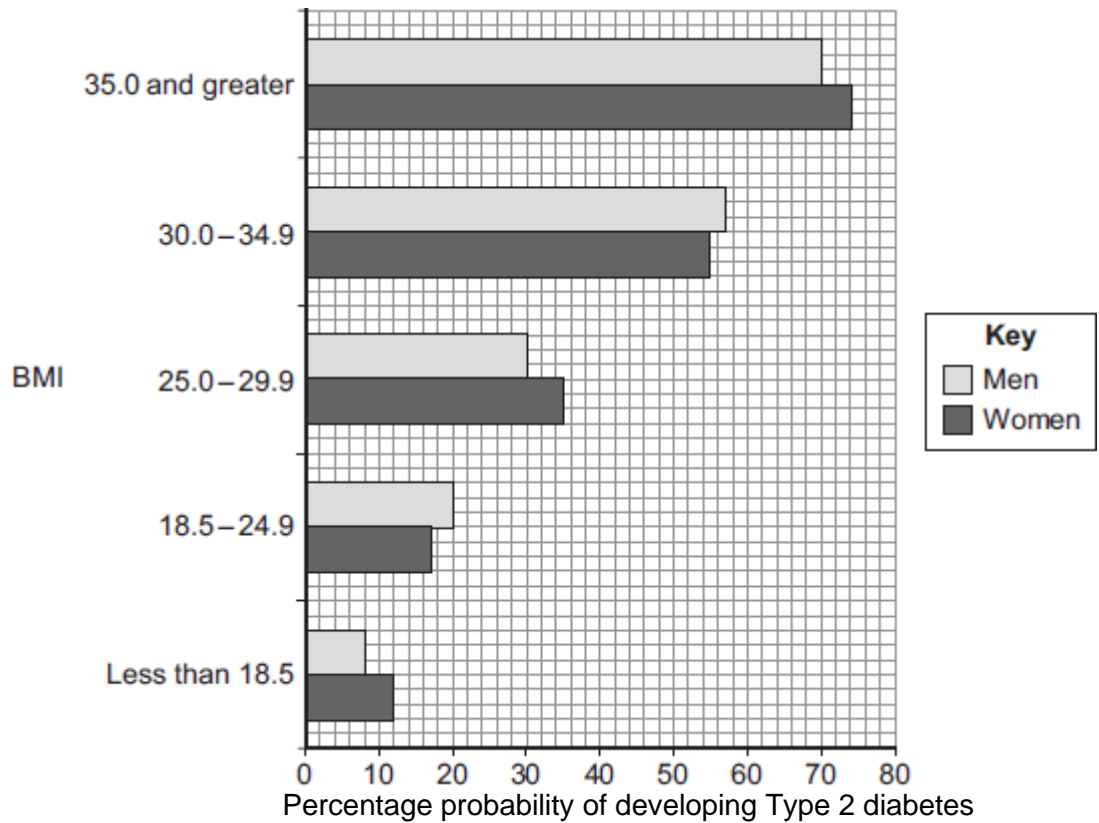
(b) What is Type 2 diabetes?

(1)

(c) Body mass index (BMI) is a person's body weight divided by the square of his or her height.

(i) **Graph 1** shows the relationship between BMI and the percentage probability of developing Type 2 diabetes.

Graph 1

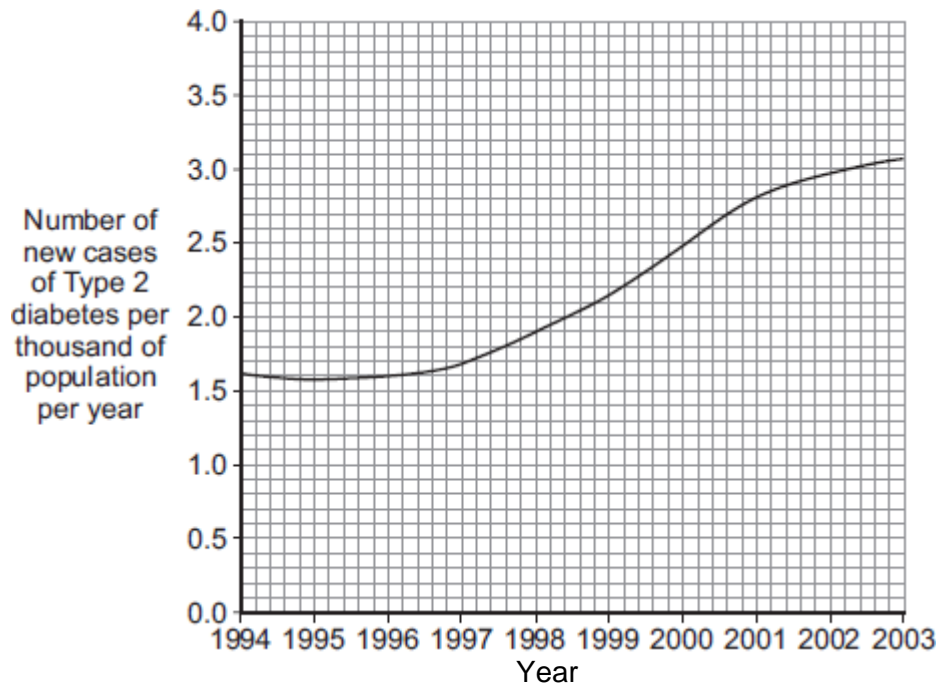


Suggest an explanation for the relationship between BMI and the risk of developing Type 2 diabetes.

(2)

- (ii) **Graph 2** shows changes in the number of new cases of Type 2 diabetes in the UK.

Graph 2



Suggest explanations for the trend shown by the data in **Graph 2**.

(3)

(Total 12 marks)

Q4.

One factor that may affect body mass is *metabolic rate*.

- (a) (i) What is meant by *metabolic rate* ?

(1)

- (ii) Metabolic rate is affected by the amount of activity a person does.

Give **two** other factors that may affect a person's metabolic rate.

1. _____

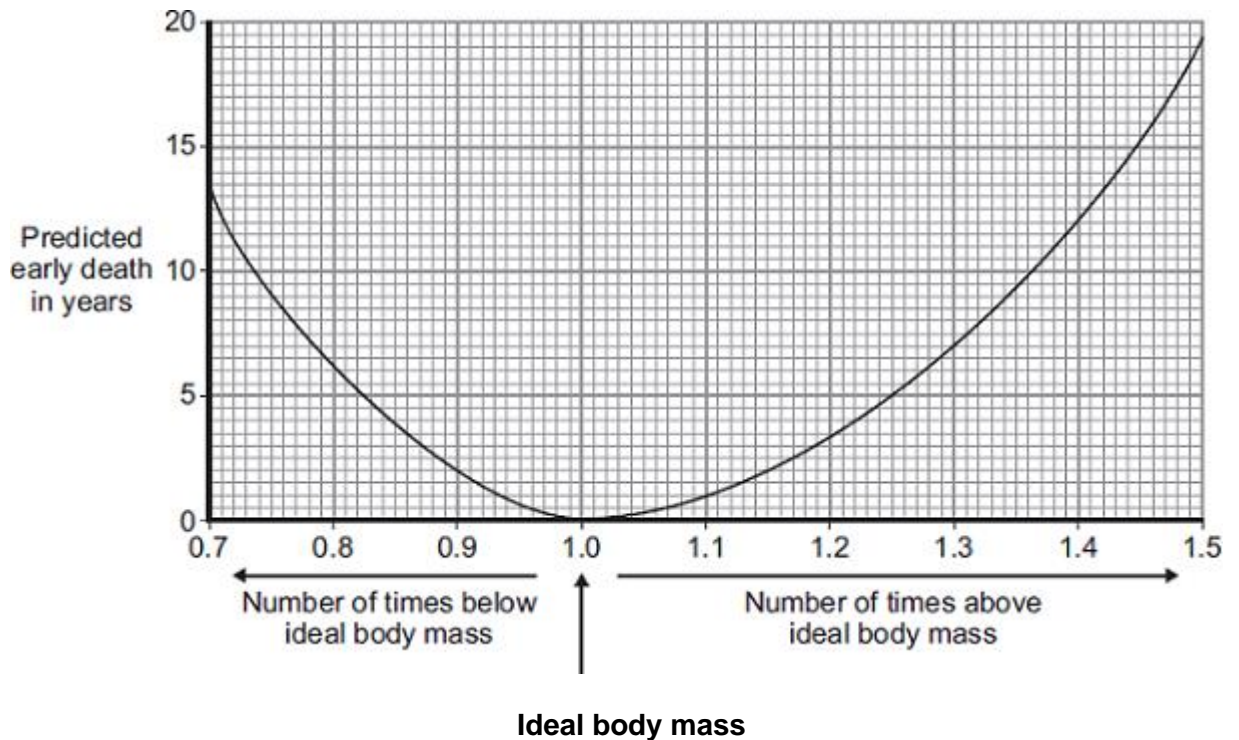
2. _____

(2)

- (b) Predicted early death is the number of years that a person will die before the mean age of death for the whole population. The predicted early death of a person is affected by their body mass.

Scientists have calculated the effect of body mass on predicted early death.

The graph shows the results of the scientists' calculations.



The number of times above or below ideal body mass is given by the equation:

$$\frac{\text{Actual body mass}}{\text{Ideal body mass}}$$

In the UK the mean age of death for women is 82.

A woman has a body mass of 70 kg. The woman's ideal body mass is 56 kg.

- (i) Use the information from the graph to predict the age of this woman when she dies.

Age at death = _____ years

(2)

(ii) The woman could live longer by changing her lifestyle.

Give **two** changes she should make.

1. _____

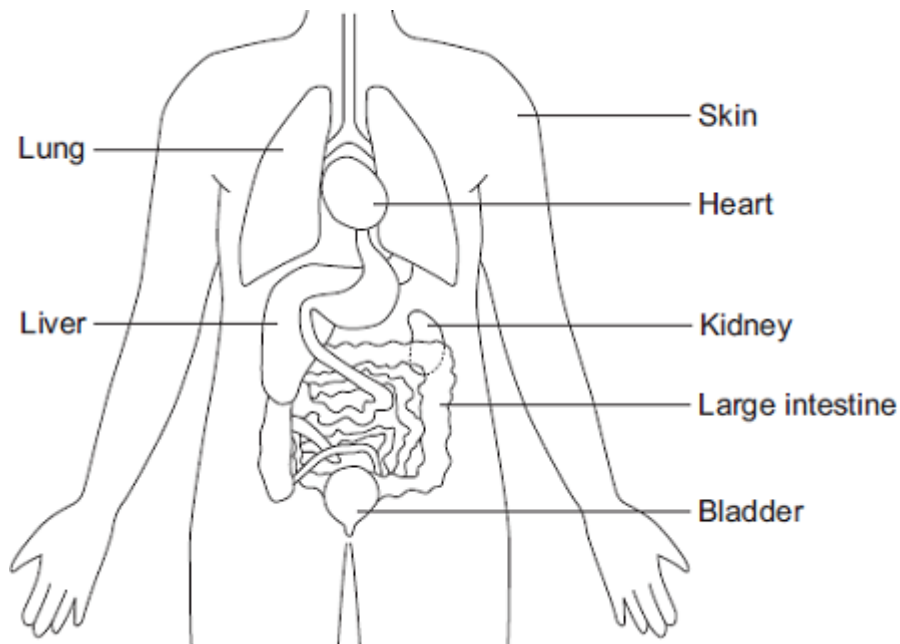
2. _____

(2)

(Total 7 marks)

Q5.

The diagram shows some of the organs of the human body.



(a) Which organ labelled on the diagram:

(i) produces urine _____

(1)

(ii) stores urine _____

(1)

(iii) produces urea _____

(1)

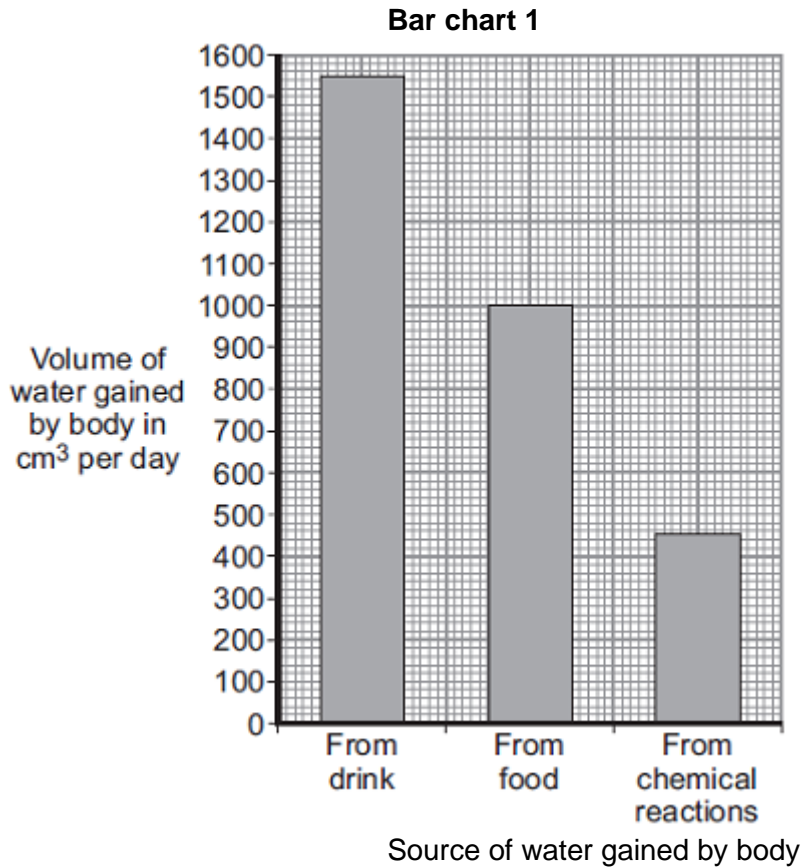
(iv) gets rid of carbon dioxide _____

(1)

(v) helps to control body temperature? _____

(1)

(b) **Bar chart 1** shows the volume of water the human body gains each day.



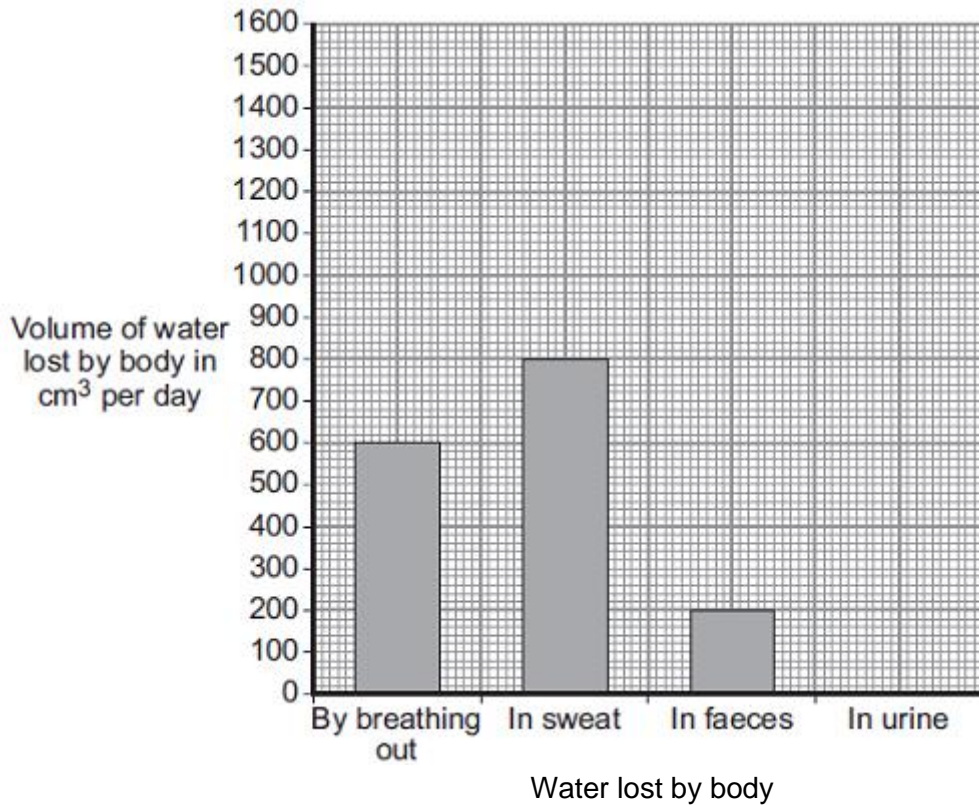
(i) Calculate the total volume of water the body gains each day.

Total volume of water gained = _____ cm³

(2)

Bar chart 2 shows the volume of water lost each day by breathing out, in sweat and in faeces.

Bar chart 2



- (ii) Calculate the total volume of water lost each day by breathing out, in sweat and in faeces.

Volume = _____ cm³

(1)

- (iii) The volume of water the body loses must balance the volume of water the body gains.

Use your answers to part (b)(i) and part (b)(ii) to calculate the volume of water lost in urine.

Volume of water lost in urine = _____ cm³

(1)

- (iv) Plot your answer to part (b)(iii) on **Bar chart 2**.

(1)

- (v) After taking some types of recreational drugs, the kidneys produce very little urine.

What happens to the body cells if the kidneys produce very little urine?

(1)

(Total 11 marks)

Q6.

Type 1 diabetes develops when the body does not produce enough insulin.

(a) Which organ produces insulin?

(1)

(b) One treatment for diabetes is to inject insulin.

The table gives the properties of four different types of insulin, **A**, **B**, **C** and **D**.

Type of insulin	Time taken for the insulin to begin to work in minutes	Time taken for insulin to reach maximum concentration in the blood in minutes	Time when insulin is no longer effective in hours
A	15-20	30-90	3-4
B	30-60	80-120	4-6
C	120-240	360-600	14-16
D	240-360	600-960	18-20

(i) Some people with diabetes need to inject insulin just before a meal to stop a big increase in blood sugar concentration.

Which type of insulin, **A**, **B**, **C** or **D**, should these people with diabetes inject just before a meal?

Give the reason for your answer.

(2)

(ii) A person with diabetes is told to inject type **B** insulin immediately after breakfast at 09.00.

The person with diabetes is told to then inject a second type of insulin at lunchtime at 12.00.

The second type of insulin should keep the blood sugar level under control for

the rest of the 24 hours.

Which type of insulin, **A**, **C** or **D**, should this person with diabetes inject at lunchtime?

Give the reason for your answer.

(2)

(iii) Apart from injecting insulin, give **one** other way in which Type 1 diabetes can be controlled.

(1)

(Total 6 marks)

Q7.

The pancreas and the liver are both involved in the control of the concentration of glucose in the blood.

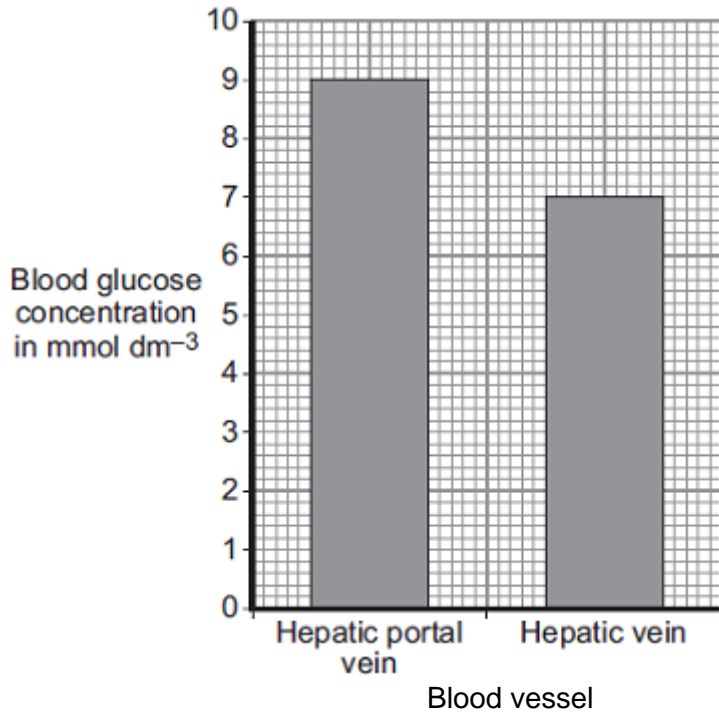
The liver has two veins:

- the hepatic portal vein taking blood from the small intestine to the liver
- the hepatic vein taking blood from the liver back towards the heart.

Scientists measured the concentration of glucose in samples of blood taken from the hepatic portal vein and the hepatic vein. The samples were taken 1 hour and 6 hours after a meal.

Graph 1 shows the concentration of glucose in the two blood vessels 1 hour after the meal.

Graph 1

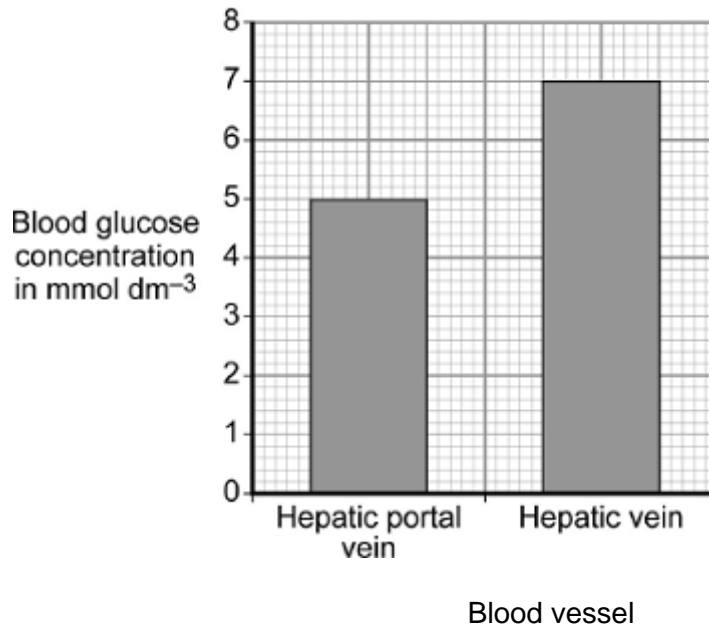


- (a) The concentration of glucose in the blood of the two vessels is different. Explain why.

(3)

- (b) **Graph 2** shows the concentration of glucose in the two blood vessels 6 hours after the meal.

Graph 2



- (i) The concentration of glucose in the blood in the hepatic portal vein 1 hour after the meal is different from the concentration after 6 hours.

Why?

(1)

- (ii) The person does **not** eat any more food during the next 6 hours after the meal.

However, 6 hours after the meal, the concentration of glucose in the blood in the hepatic vein is higher than the concentration of glucose in the blood in the hepatic portal vein.

Explain why.

(3)

(Total 7 marks)

Q8.

The human body produces many hormones.

(a) (i) What is a *hormone*?

(1)

(ii) Name an organ that produces a hormone.

(1)

(iii) How are hormones transported to their target organs?

(1)

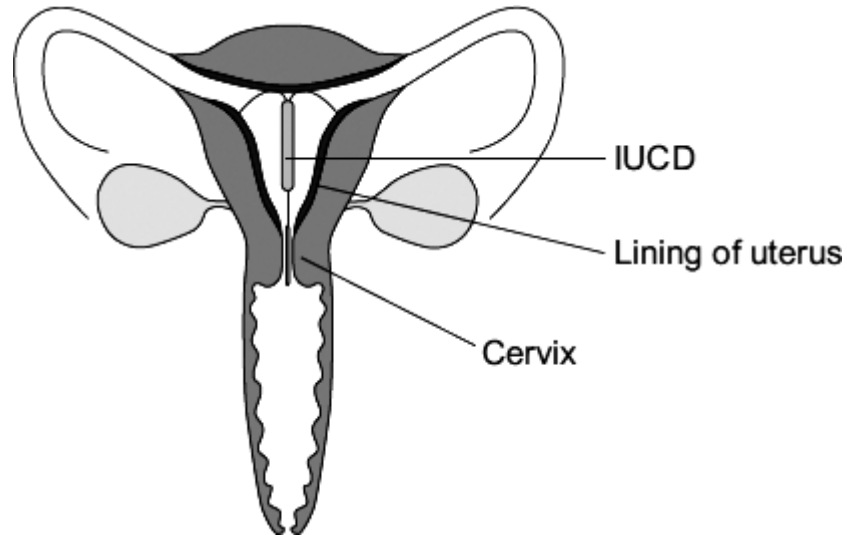
(b) Describe how the hormones FSH, oestrogen and LH are involved in the control of the menstrual cycle.

(3)

(Total 6 marks)

Q9.

The diagram shows an intra-uterine contraceptive device (IUCD).



The IUCD is put inside the uterus (womb). The IUCD contains a hormone. The hormone diffuses directly into the uterus. The supply of hormone in the IUCD lasts for about five years.

The hormone works by:

- causing the cervix to produce a thick plug of mucus
- causing the lining of the uterus to become very thin.

For every 1000 women using the IUCD for one year about 2 women become pregnant. There are about 10 pregnancies for every 1000 women using the contraceptive pill for one year.

Evaluate the use of the IUCD compared with the contraceptive pill.

Use the information in this question and your own knowledge and understanding.

Remember to give a conclusion to your evaluation.

(Total 4 marks)

Q10.

Diabetes is a disease in which a person's blood glucose concentration may rise.

Doctors give people drugs to treat diabetes.

The table shows some of the side effects on the body of four drugs, **A**, **B**, **C** and **insulin**, used to treat diabetes.

Drug	Side effects on the body
A	Weight loss Liver, kidney and heart damage Feeling of sickness
B	Weight gain Damage to some cells in pancreas
C	More water is kept in the body Weight gain Increased chance of bone breakage in women
Insulin	A little more water is kept in the body Weight gain Increased risk of lung damage

- (a) Which drug, **A**, **B**, **C** or **insulin**, is most likely to result in an increase in blood sugar concentration in some people?

Explain your answer.

Drug _____

Explanation

(2)

- (b) (i) Drugs **A**, **B** and **C** can be taken as tablets.

The chemicals in the tablets are absorbed into the blood from the digestive system.

Insulin is a protein.

Insulin **cannot** be taken as a tablet.

Why?

_____ (1)

(ii) Other than using drugs, give **two** methods of treating diabetes.

1. _____

2. _____

(2)

(Total 5 marks)

Q11.

Doctors use dialysis to treat patients with kidney failure.

The table shows the sizes of molecules of some of the substances found in blood plasma.

Substance	Size of molecule in arbitrary units
Water	18
Sodium ion	23
Urea	60
Glucose	180
Albumin (a blood protein)	68 000

(a) Use information from the table to answer the questions.

(i) Albumin is a blood protein. Albumin is **not** removed from the blood during dialysis.

Explain why.

(2)

(ii) During a dialysis session, one patient's body mass decreased by 2 kilograms.

This decrease was mainly due to removal from the blood of one of the substances in the table.

Which substance was this? _____

(1)

- (iii) The substance you named in part (a)(ii) was able to pass through the dialysis membrane.

Draw a ring around the correct answer to complete the sentence.

The substance passed through because the

membrane was

- impermeable.
- partially permeable.
- surrounded by capillaries.

(1)

- (b) For most patients, a kidney transplant is better than continued treatment using dialysis.

Kidney transplants have some disadvantages.

Give **two** disadvantages of kidney transplants.

1. _____

2. _____

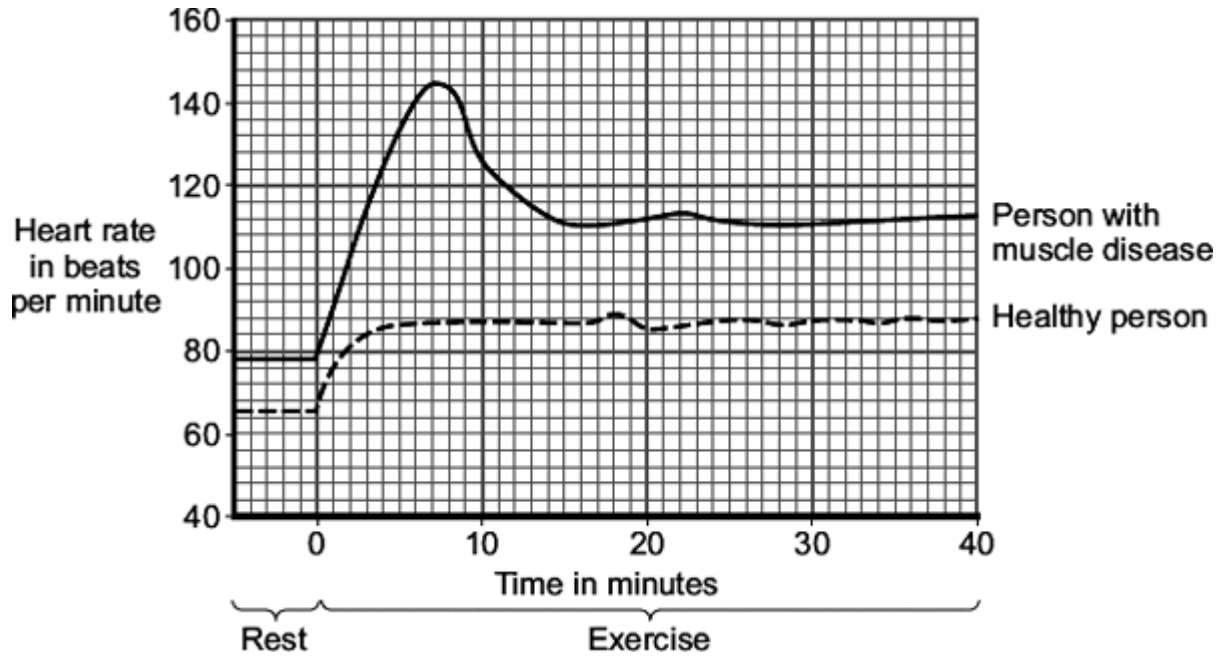
(2)

(Total 6 marks)

Q12.

Two people did the same amount of gentle exercise on an exercise cycle. One person had a muscle disease and the other had healthy muscles.

The graph shows the effect of the exercise on the heart rates of these two people.



- (a) Describe **three** ways in which the results for the person with the muscle disease are different from the results for the healthy person.

To gain full marks in this question you need to include data from the graph in your answer.

1. _____

2. _____

3. _____

(3)

- (b) The blood transports glucose to the muscles at a faster rate during exercise than when a person is at rest.

- (i) Name **one** other substance that the blood transports to the muscles at a faster rate during exercise.

(1)

- (ii) People with the muscle disease are not able to store glycogen in their muscles.

The results shown in the graph for the person with the muscle disease are different from the results for the healthy person.

Suggest an explanation for the difference in the results.

(3)
(Total 7 marks)

Q13.

Use your knowledge of how the kidney works to answer the following questions.

- (a) Blood plasma contains mineral ions, glucose, urea and proteins.

Explain why urine contains mineral ions and urea, but **no** glucose or protein.

(4)

- (b) A man ate and drank the same amounts of the same substances and he did the same amount of exercise on two different days. On one of the two days the weather was hot and on the other day the weather was cold.

The man's urine contained a higher concentration of mineral ions and urea on the hot day than on the cold day.

Explain why.

(4)
(Total 8 marks)

Q14.

Thalidomide is a drug that was developed in the 1950s.
In the 1950s some pregnant women took thalidomide to prevent morning sickness during pregnancy.

Today, thalidomide is **not** used to prevent morning sickness.

- (a) (i) Give **one** medical use of thalidomide, today.

(1)

- (ii) Today, before a woman is given thalidomide, she is

- checked to see if she is pregnant
- told to use two different methods of contraception at the same time.

Give the reason why:

the woman is checked to see if she is pregnant

the woman is told to use two different methods of contraception at the same time

(2)

- (b) The information is about two types of contraceptive pill used by women.

Combined pill

- contains two hormones
- is taken for 21 days, then no pills are taken for 7 days
- > 99 % effective at preventing pregnancy
- increases chance of headaches
- increases chance of breast cancer
- decreases chance of cancer of the ovary

Mini-pill

- contains one hormone
- must be taken at the same time every day
- < 99 % effective at preventing pregnancy
- increases chance of breast cancer

(i) Which **two** hormones does the combined pill contain?

Draw a ring around **two** answers.

LH oestrogen progesterone FSH

(2)

(ii) Give **two** advantages of taking the combined pill and **not** the mini-pill.

(2)

(iii) Give **one** advantage of taking the mini-pill and **not** the combined pill.

(1)

(Total 8 marks)

Q15.

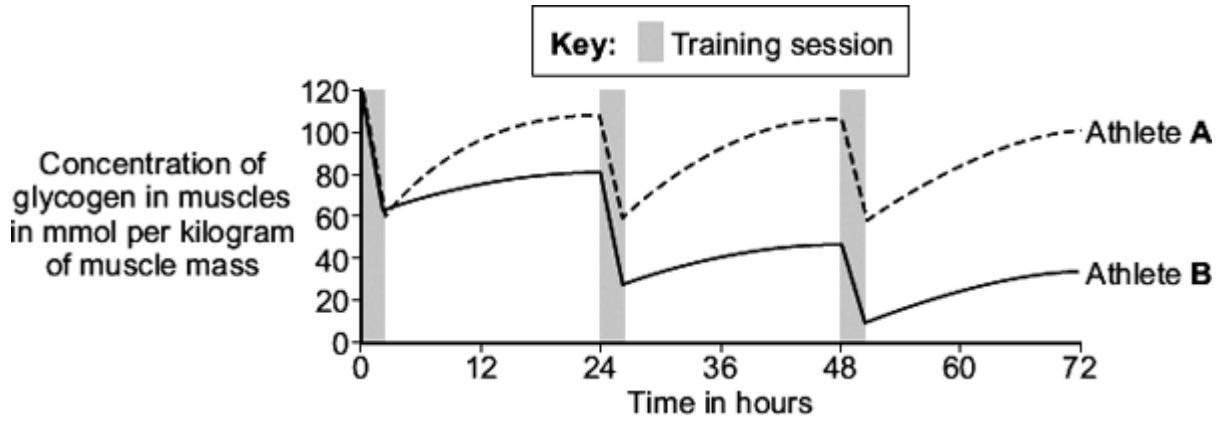
Glycogen is stored in the muscles.

Scientists investigated changes in the amount of glycogen stored in the muscles of two 20-year-old male athletes, **A** and **B**.

Athlete **A** ate a high-carbohydrate diet. Athlete **B** ate a low-carbohydrate diet.

Each athlete did one 2-hour training session each day.

The graph shows the results for the first 3 days.



(a) (i) Give **three** variables that the scientists controlled in this investigation.

(3)

(ii) Suggest **two** variables that would be difficult to control in this investigation.

(2)

(iii) Describe **one** way in which the results of Athlete **B** were different from the results of Athlete **A**.

(1)

(b) Both athletes were training to run a marathon.

Which athlete, **A** or **B**, would be more likely to complete the marathon?

Use information from the graph to explain your answer.

(4)
(Total 10 marks)

Q16.

(a) **List A** gives the names of three hormones.

List B gives information about the three hormones.

Draw a line from each substance in **List A** to the correct information in **List B**.

List A Hormone

List B Information

FSH

Used in some contraceptive pills to stop eggs maturing

LH

Used as a fertility drug to make eggs mature

Oestrogen

Causes the lining of the womb to break down

Stimulates the release of eggs in IVF

(3)

(b) The table gives information about three methods of giving hormones to stop a woman becoming pregnant.

	The 'pill'	The 'patch'	The 'implant'
How the hormone is given	Swallowed each day for 21 days out of every 28 days.	Stuck onto the skin. Each patch lasts three weeks. There is a one week gap between each patch.	Needs an operation to put it under the skin. Lasts for up to 5 years.

Use the information in the table to answer these questions.

- (i) Which of the three methods is likely to be the most reliable?

_____ (1)

- (ii) Explain why you chose this method.

 _____ (1)

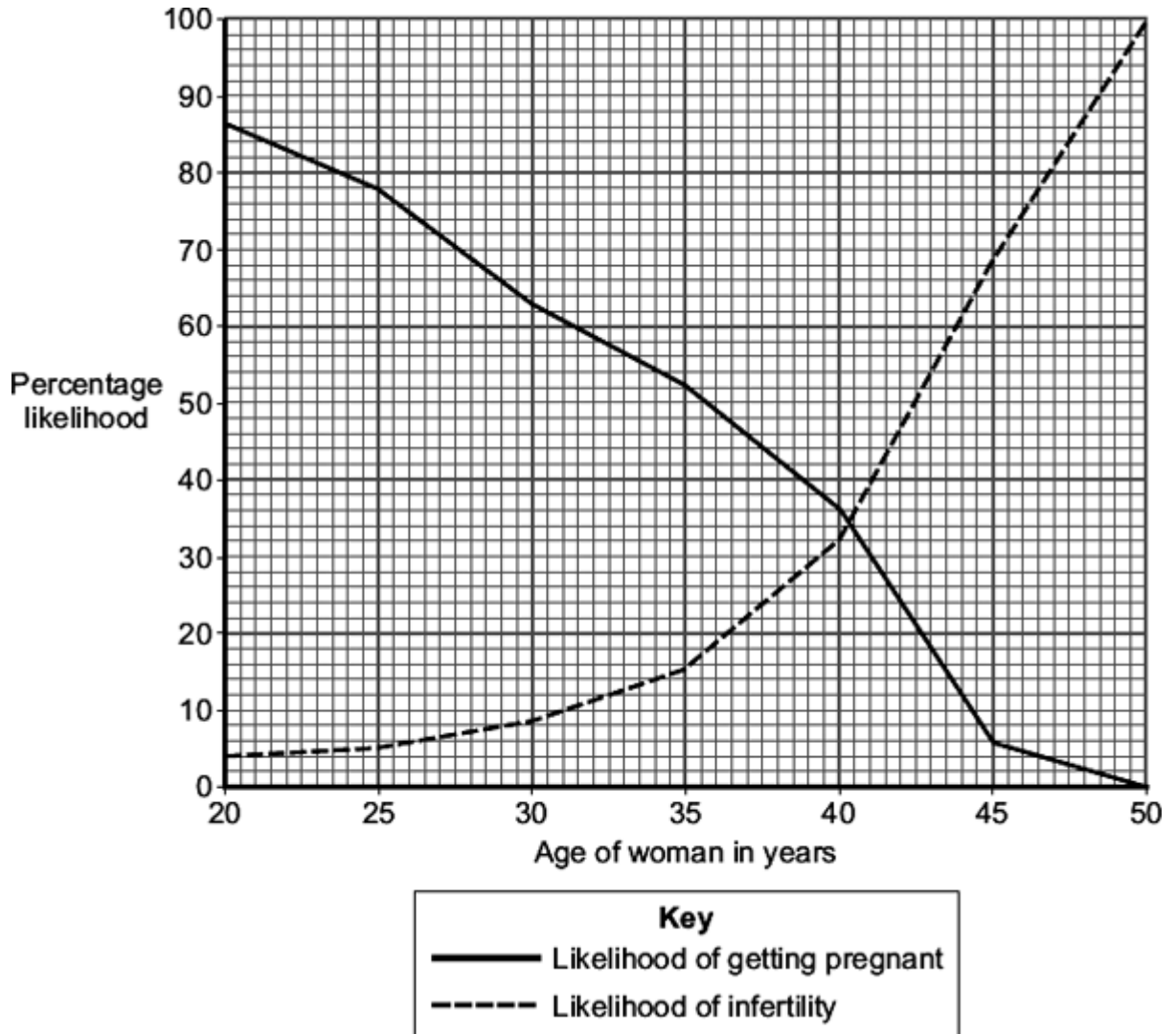
- (iii) Give **one** disadvantage of the method you have chosen.

_____ (1)
(Total 6 marks)

Q17.

The graph shows how the likelihood of getting pregnant and the likelihood of infertility change with a woman's age.

The data is for healthy women who have unprotected sexual intercourse during one year.



(a) Use information from the graph to answer this question.

A woman in her mid-twenties is thinking about waiting until her late-thirties before she has children.
 A doctor advises the woman not to wait.

Explain why the doctor gives this advice.

(2)

(b) The hormones FSH and LH are used in fertility treatment.

Give the function in fertility treatment of:

(i) FSH

(1)

(ii) LH.

(1)

(c) In the first stage of in-vitro fertilisation (IVF), eggs from the mother are fertilised with sperm from the father.

Describe the next stages of IVF.

(2)

(Total 6 marks)

Q18.

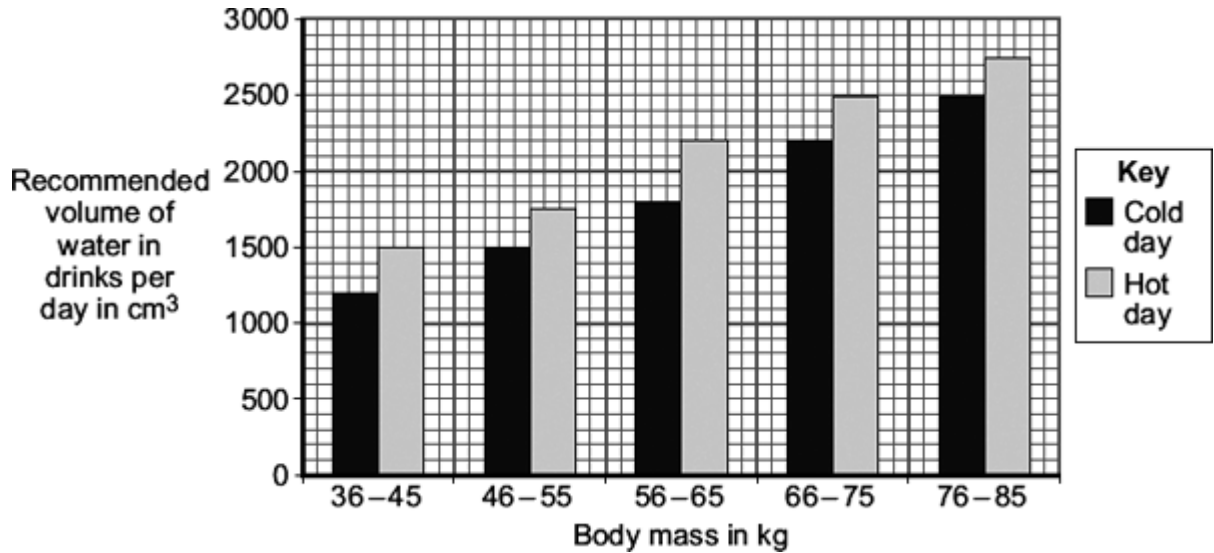
The volume of water the body needs depends on a number of factors.

(a) Water enters the body in drinks.

Give **one** other way the body can get water.

(1)

(b) The chart shows the recommended volume of water that women of different body masses should drink, on a cold day and on a hot day.



- (i) Describe the relationship between body mass and the recommended volume of water that a woman should drink.

(1)

- (ii) What is the recommended volume of water that a 70 kg woman should drink on a cold day?

_____ cm³

(1)

- (iii) While following a diet, the 70 kg woman loses 10 kg of body mass.

Calculate how much less water she is recommended to drink on a cold day.

Use information from the chart.

Show clearly how you work out your answer.

Answer = _____ cm³

(2)

- (c) It is recommended that women should drink more water on a hot day than on a cold day.

Why?

(2)

- (d) Excess water is lost from the body in urine.

Name the organ that produces urine.

(1)

(Total 8 marks)

Q19.

It is important that the concentration of glucose (sugar) in the blood is controlled.

- (a) (i) Which hormone controls the concentration of glucose in the blood?

(1)

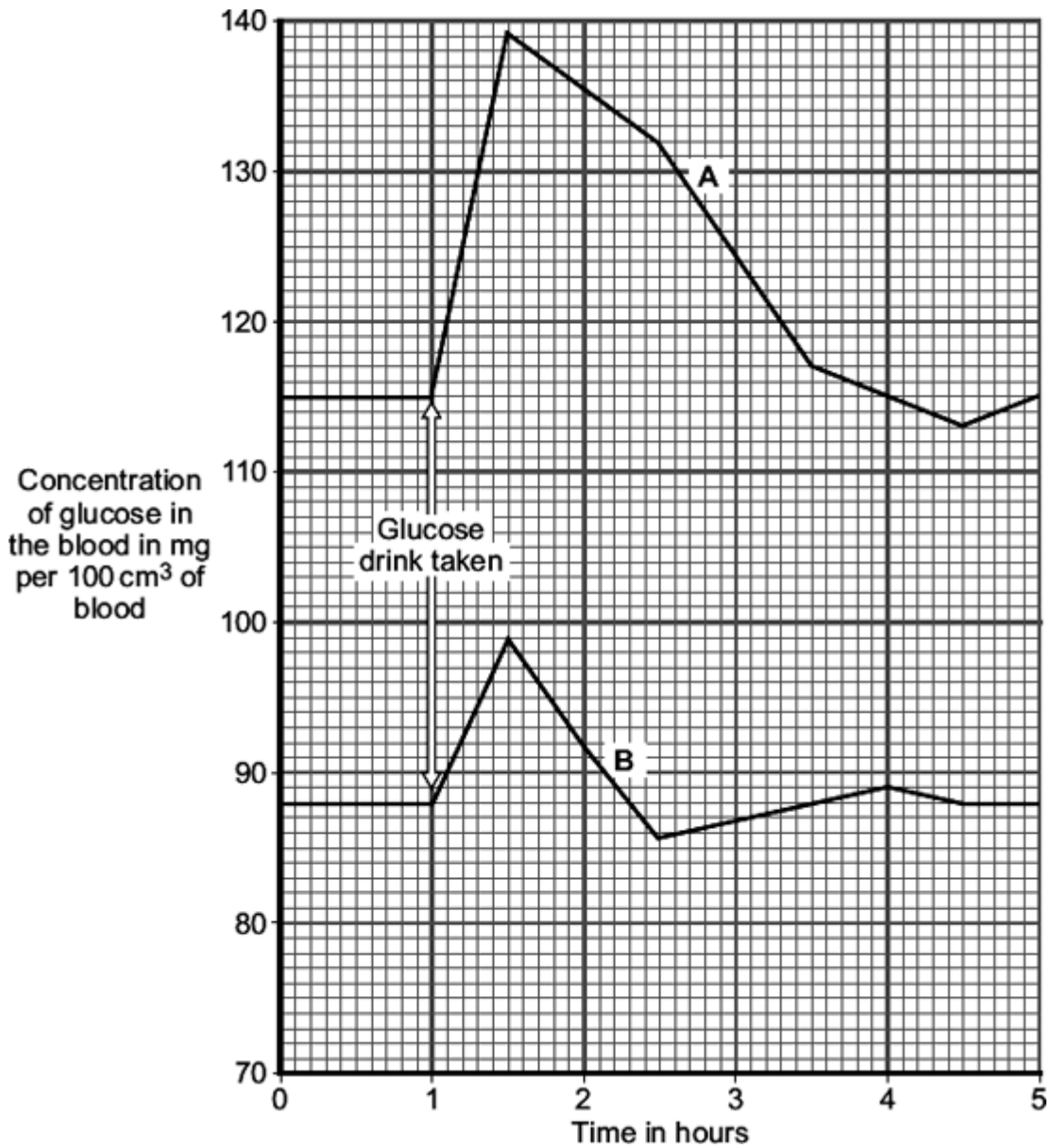
- (ii) Which organ produces this hormone?

(1)

- (b) The concentration of glucose in the blood of two people, **A** and **B**, was measured every half an hour.

One hour after the start, both people drank a solution containing 50 g of glucose.

The graph shows the result.



(i) By how much did the blood glucose concentration in person **B** rise after drinking the glucose drink?
 _____ mg per 100 cm³ of blood

(1)

(ii) A doctor suggests that person **A** has diabetes.
 Give **two** pieces of evidence from the graph to support this suggestion.

1. _____

2. _____

(2)

- (iii) Give **one** reason for the fall in blood glucose concentration in person **B**, shown in the graph.

(1)

(Total 6 marks)

Q20.

The kidneys produce urine.

The table shows the composition of a sample of urine from one person.

Substance	Percentage
Ions	2.5
Urea	2.6
Water	

- (a) (i) Calculate the percentage of water in this sample of urine.

Show clearly how you work out your answer.

Percentage of water = _____ %

(2)

- (ii) The urine of a healthy person does **not** contain protein.

What is the reason for this?

Tick (✓) **one** box.

Protein molecules in the plasma cannot pass through the filter in the kidney.

Protein molecules in the plasma can pass through the filter in the kidney and are then reabsorbed.

There are no protein molecules in the plasma.

(1)

- (b) Dialysis can be used to treat a person with kidney disease.

Draw a ring around the correct answer to complete each sentence.

(i) The dialysis machine contains membranes that are

fully permeable.
impermeable.
partially permeable.

(1)

(ii) At the end of a dialysis session, the concentration of substances in the blood

would be

higher than
lower than
the same as

 the concentration of substances in the dialysis fluid.

(1)

(c) For most patients, a kidney transplant is better than continued treatment by dialysis.

Kidney transplants have some disadvantages.

Give **one** disadvantage of a kidney transplant.

(1)

(Total 6 marks)

Q21.

Blood plasma is a solution of glucose, and many other substances, in water.

The urine of a healthy person contains water but does not contain glucose.

(a) Name **two** more substances found in the urine of a healthy person.

1. _____

2. _____

(2)

(b) (i) Describe what happens to the glucose in the blood of a healthy person when the blood enters the kidney.

(3)

- (ii) A diabetic person's blood often contains a high concentration of glucose.
The urine of a diabetic person may contain glucose.
Suggest an explanation why.

(2)

(Total 7 marks)

Q22.

In-vitro fertilisation (IVF) is used to help some women get pregnant.

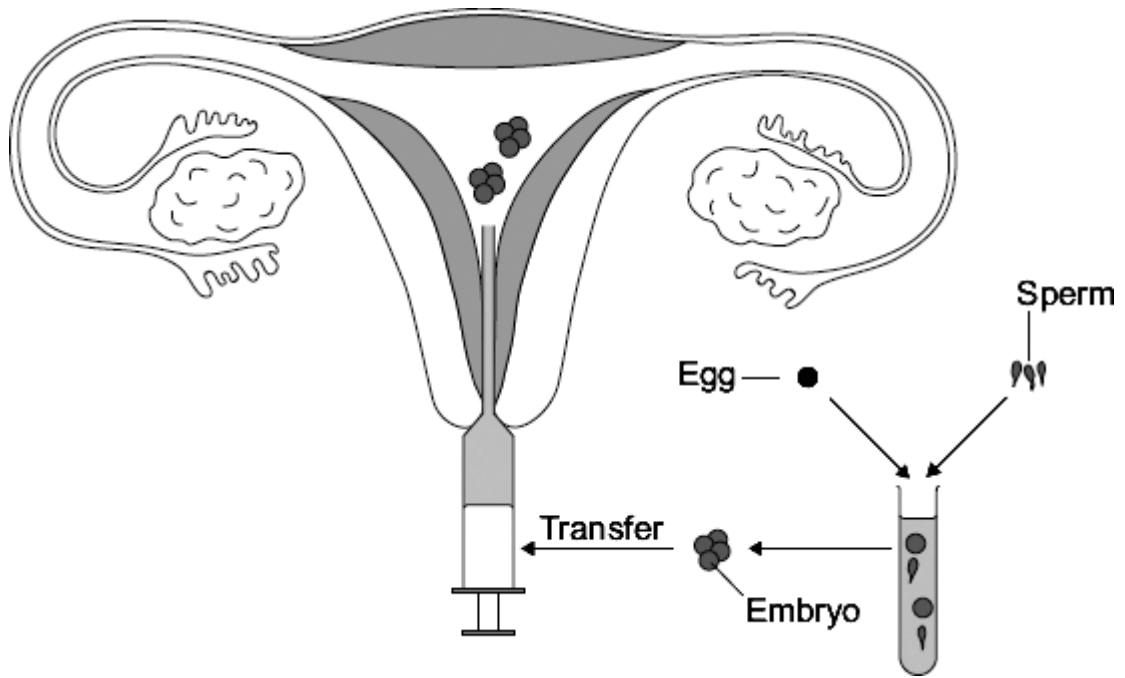
- (a) Name the **two** hormones used in IVF treatment.

1. _____

2. _____

(2)

- (b) The diagram shows the process of IVF.

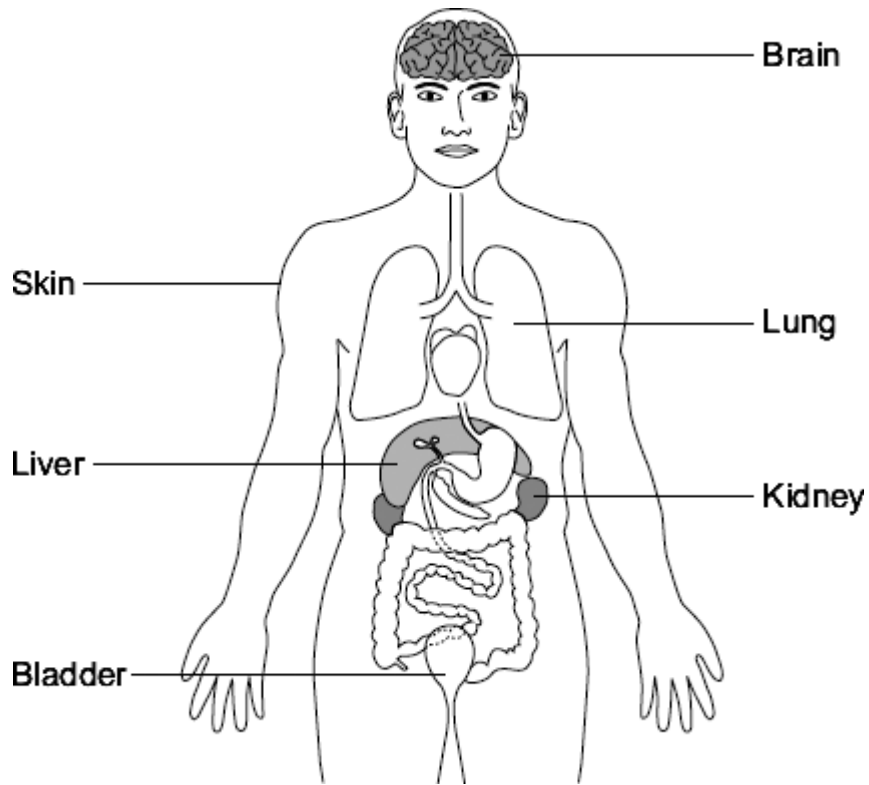


Describe the process of IVF. Use information from the diagram to help you.

(4)
(Total 6 marks)

Q23.

- (a) The diagram shows organs which help to control conditions inside the body.



Draw a ring around the correct answer to complete each sentence.

(i) Carbon dioxide is removed from the body by the

- kidney.
lung.
skin.

(1)

(ii) Urine is made in the

- kidney.
lung.
skin.

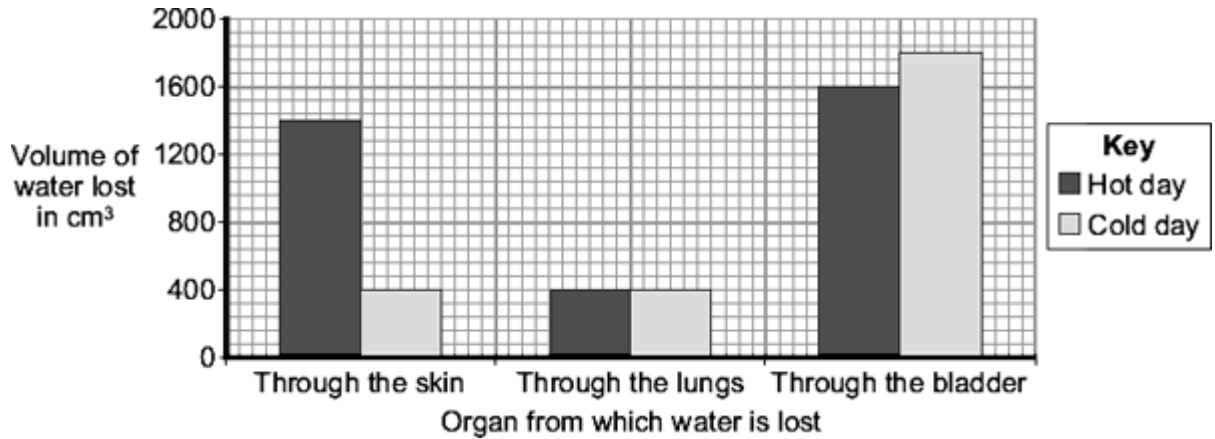
(1)

(iii) Urine is stored in the

- bladder.
liver.
skin.

(1)

(b) The bar chart shows the volume of water lost from different organs of the body. The information is shown for a hot day and for a cold day.



(i) Look at the bar chart.

How does the volume of water lost on the hot day compare with the volume of water lost on the cold day for each organ?

Complete the table using words from the box.

the same	less	more
-----------------	-------------	-------------

Organ	Volume of water lost on a hot day compared with volume of water lost on a cold day
Skin	
Lungs	
Bladder	

(3)

(ii) In total, more water is lost on the hot day than on the cold day.

How does the increase in the volume of water lost on the hot day help to control the body temperature?

(1)

(Total 7 marks)

Q24.

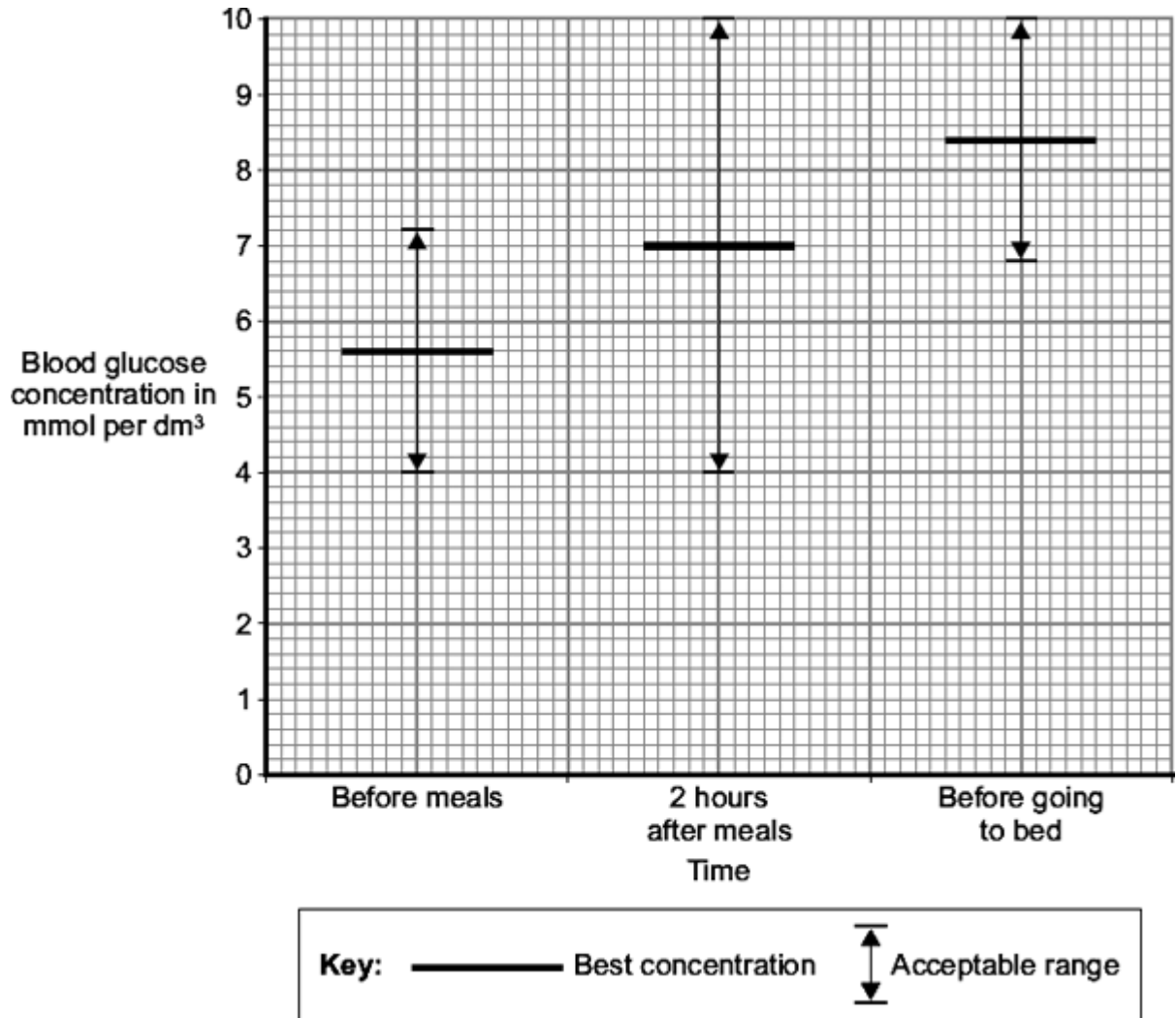
In diabetics blood glucose concentrations are sometimes abnormal.

(a) Name the organ that monitors the concentration of glucose in the blood.

(1)

(b) Diabetics can measure their blood glucose concentration.

The graph shows the best blood glucose concentration and the acceptable range of blood glucose concentration at different times.



What is the acceptable range for the blood glucose concentration before meals?

From _____ to _____ mmol per dm³

(1)

(c) The amount of insulin a diabetic injects can be changed so that blood glucose concentration is kept near to the best level.

Two hours after eating breakfast a diabetic measures his blood glucose concentration.

His blood glucose concentration is 13 mmol per dm³.

He reads these instructions:

- for every 2 mmol per dm³ of blood glucose *above* the best concentration, inject

1 unit *more* of insulin

- for every 2 mmol per dm³ of blood glucose *below* the best concentration, inject 1 unit *less* of insulin.

How should he change his normal insulin injection to bring his blood glucose level to the best concentration?

Show clearly how you work out your answer.

Answer = _____

(3)

(Total 5 marks)

Q25.

- (a) Urine contains mineral ions, and other substances, dissolved in water.

What effect will each of the activities in **Table 1** have on the concentration of mineral ions in the urine?

Use words from the box to complete **Table 1**.

increase	decrease	stay the same
-----------------	-----------------	----------------------

Table 1

Activity	Concentration of mineral ions in urine
Drinking a large bottle of water	
Eating salty foods such as potato crisps	

(2)

(b) A person with kidney disease may be treated by having a kidney transplant.

Table 2 shows the effect of a person's age on the success of a kidney transplant.

Table 2

	Age of patient	
	50-59 years	Over 60 years
Percentage of kidneys rejected	38	23
Percentage of kidneys which continued to work for at least 5 years	82	87
Percentage of patients who survived for at least 10 years	82	76

Some doctors think that people over 60 years of age should not be given transplants.

From the data in the table, do you agree with these doctors?

Draw a ring around your answer. **Yes / No**

Give **two** reasons for your answer.

1. _____

2. _____

(2)

(Total 4 marks)

Q26.

Urine consists of water, ions and other substances such as urea.

Urine is formed in the kidney by filtering the blood.

The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

Substance	Diameter of molecule in nanometres
A	10 to 20

B	1.0
C	0.6
D	0.5
E	0.2

Use information from the table and your own knowledge to answer the questions.

- (a) (i) Which substance, **A**, **B**, **C**, **D** or **E**, is protein?

(1)

- (ii) Explain why protein is **not** found in the urine of a healthy person.

(1)

- (b) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.

The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is **not** found in the urine of a healthy person, but can be found in the urine of a person with haemolytic anaemia.

Explain why.

(3)

(Total 5 marks)

Q27.

Hormones control the menstrual cycle.

(a) Name **two** of the hormones involved in the menstrual cycle.

1. _____

2. _____

(2)

(b) Hormones are used in some types of contraception.

Complete the sentence.

When used as contraceptives, hormones stop _____ becoming mature.

(1)

(c) There are several ways of using hormones as contraceptives.

These include:

- taking a contraceptive pill each day for 21 days of the menstrual cycle
- using a contraceptive implant.

The contraceptive implant is put under the skin of a woman's arm.

The implant releases contraceptive hormones for three years before the implant needs to be replaced.

(i) Suggest **one** advantage of using this implant rather than taking contraceptive pills.

(1)

(ii) Suggest **one** disadvantage of using this implant rather than taking contraceptive pills.

(1)

(Total 5 marks)

Q28.

Hormones can be used as contraceptives.

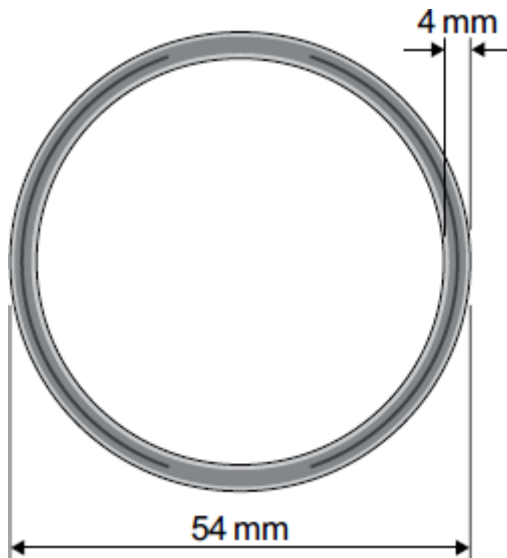
(a) Explain **one** way in which a hormone can prevent conception (pregnancy).

(2)

- (b) Two methods of giving contraceptive hormones to a woman are the vaginal ring and the hormone implant.

Vaginal ring

The vaginal ring is a flexible ring 54 mm in diameter containing hormones.



The woman puts in and takes out the vaginal ring herself; there is no ‘wrong’ way to put the ring in.

Each ring is designed for one cycle of use, which is three weeks of continuous ring use, followed by one week without the ring.

About 0.3 % of women become pregnant in the first year of ring use.

4 % of women stop using the ring because of vaginal discomfort.

Hormone implant

A health professional puts the hormone implant under the skin of the woman’s arm. The implant releases contraceptive hormones for three years before the implant needs to be replaced.

The hormone implant is 100 % effective.

About 2 % of women stop using the hormone implant, mainly because of irregular menstrual bleeding.

Evaluate the use of the vaginal ring compared with the hormone implant.

Remember to give a conclusion to your evaluation.

(4)
(Total 6 marks)

Q29.

Our bodies control the concentration of glucose in the blood.

Draw a ring around the correct answer to complete each sentence.

- (a) The concentration of glucose in the blood is controlled by a

hormone called

carbohydrase.
insulin.
protease.

(1)

- (b) This hormone is produced by the

intestine.
stomach.
pancreas.

(1)

- (c) If the body does not produce enough of this hormone,

the person develops

diabetes.
cystic fibrosis.
Huntington's disease.

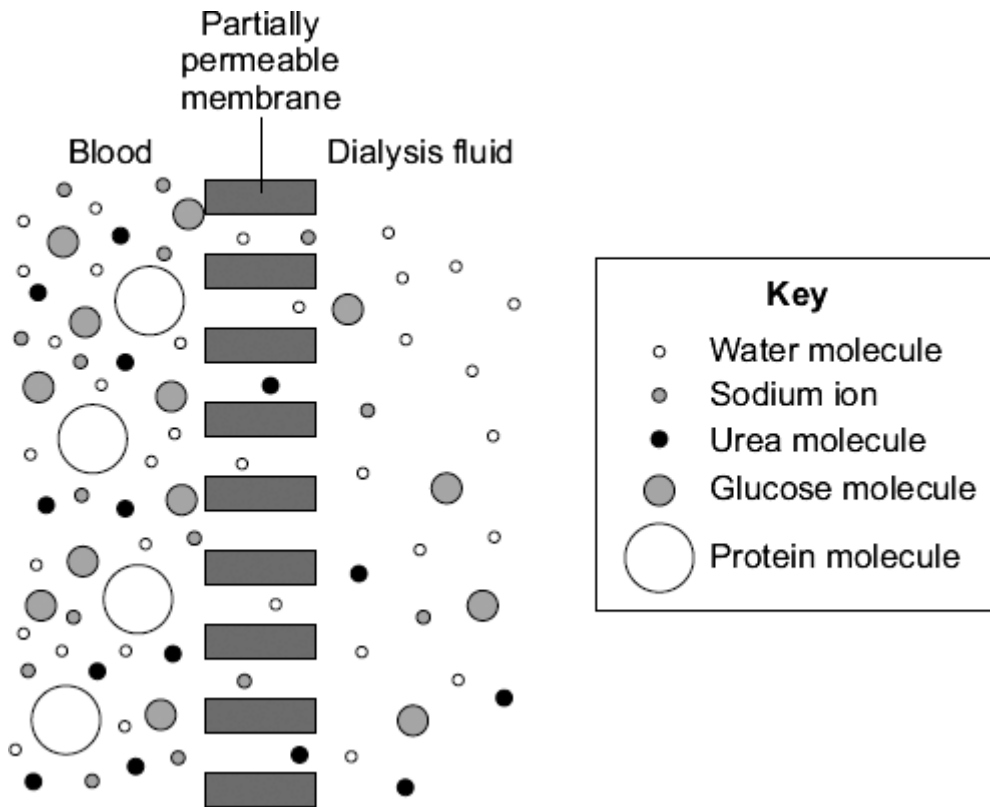
(1)

(Total 3 marks)

Q30.

Dialysis can be used to treat a person with kidney disease.

The diagram shows blood and dialysis fluid separated by a partially permeable membrane.



Blood plasma and dialysis fluid contain several substances dissolved in water.

The table shows the concentrations of some of these substances in dialysis fluid and in the blood plasma of a person with kidney disease immediately before dialysis.

Substance	Concentration of substance in grams per dm ³	
	Blood plasma of person with kidney disease	Dialysis fluid
Sodium ions	3.26	3.15
Urea	0.45	0.00
Glucose	0.90	0.99
Protein	60.00	0.00

- (a) Protein molecules are **not** able to move from the blood to the dialysis fluid. Use information from the diagram to explain why.

(1)

- (b) Urea molecules move from the blood into the dialysis fluid.
- (i) Give the name of this type of movement. _____ (1)
- (ii) Why do the urea molecules move in this direction?
Use information from the table to help you to answer this question.

_____ (1)
- (c) The concentration of sodium ions in the blood plasma will change during dialysis.
Suggest a value for the concentration of sodium ions in the plasma at the end of dialysis.
Use information from the table.
Concentration of sodium ions = _____ grams per dm³ (1)
- (d) For most patients a kidney transplant is better than continued treatment by dialysis.
- (i) Give **two** advantages of having a kidney transplant rather than treatment by dialysis.
1. _____

2. _____
_____ (2)
- (ii) Give **two** possible disadvantages of having a kidney transplant.
1. _____

2. _____
_____ (2)
- (Total 8 marks)**

Q31.

The human menstrual cycle is controlled by hormones.

Name the gland which produces:

(i) FSH

_____ (1)

(ii) oestrogen.

_____ (1)

(Total 2 marks)

Q32.

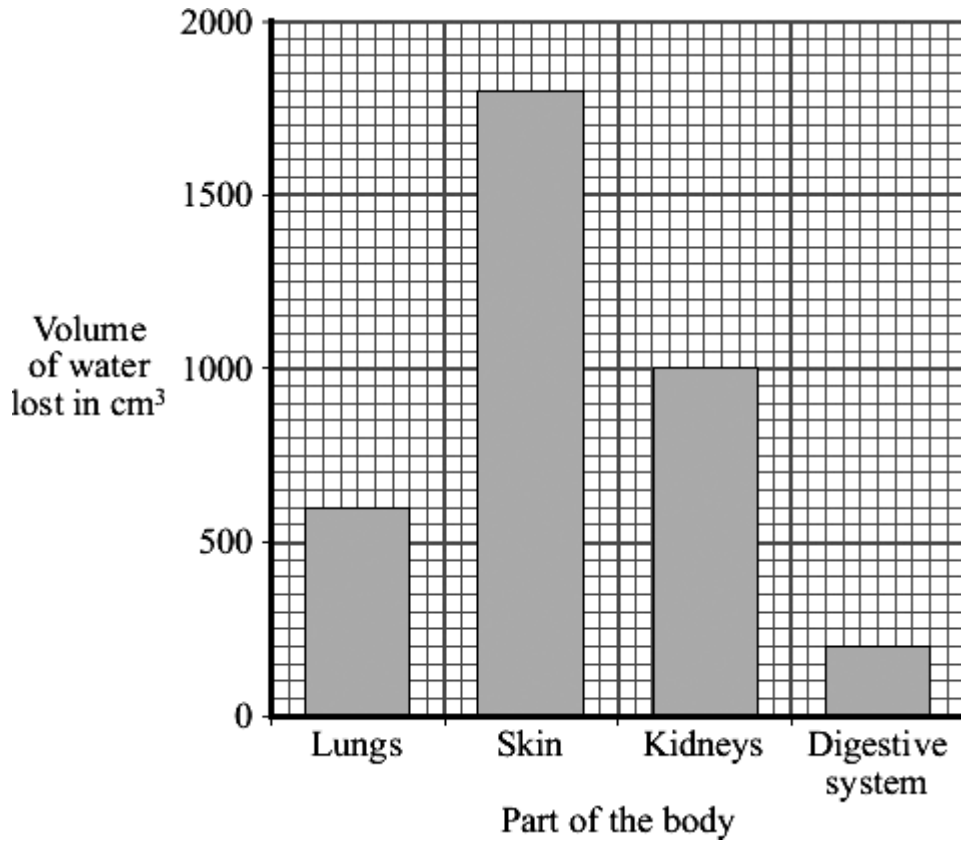
Water is lost from several parts of the body.

(a) Draw **one** line from each body part to the substance in which water is lost.

Body Part	Substance
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Kidneys</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Urine</div>
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Lungs</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Faeces</div>
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Skin</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Sweat</div>
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">Breath</div>

(3)

(b) The bar chart shows the volume of water a person lost from different parts of the body during a warm day.



(i) What volume of water was lost through the skin on the warm day?

Tick (✓) **one** box.

- 600 cm³
- 1600 cm³
- 1800 cm³

(1)

(ii) What effect would colder weather have on the amount of water lost through the skin?

Draw a ring around your answer.

decreases

increases

stays the same

(1)

(iii) Give a reason for your answer.

(1)

(c) What effect does cold weather generally have on the amount of urine produced?

Draw a ring around your answer.

decreases

increases

stays the same

(1)

(Total 7 marks)

Q33.

Diabetes is a disease in which blood glucose (sugar) concentration may rise more than normal.

(a) Which organ in the body monitors this rise in blood sugar?

Draw a ring around your answer.

liver

pancreas

stomach

(1)

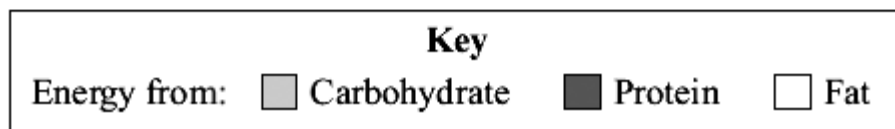
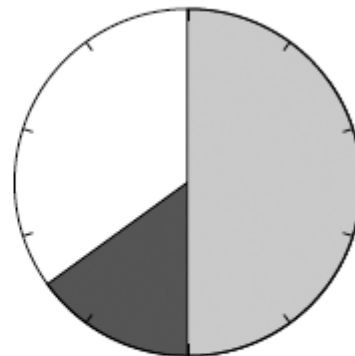
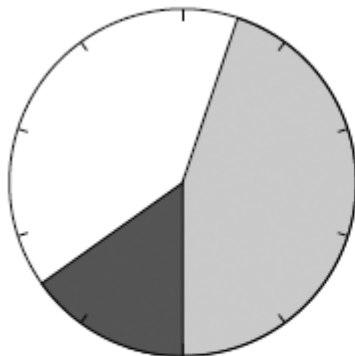
(b) One way of treating diabetes is by careful attention to diet.

Chart 1 shows the recommended diet for a person with diabetes.

Chart 2 shows a diet for a person without diabetes.

Chart 1 Person with diabetes

Chart 2 Person without diabetes



How is the recommended diet of a person with diabetes different from the diet of a person without diabetes?

Use information from the charts.

Tick (✓) **two** box.

The diabetic should get more energy from fat.

The diabetic should get more energy from protein.

The diabetic should get less energy from carbohydrate.

The diabetic should get less energy from protein.

(2)

(c) Other than diet, give **one** way in which diabetes may be treated.

(1)

(Total 4 marks)

Q34.

(a) (i) Which organ in the body monitors the concentration of glucose (sugar) in the blood?

(1)

(ii) In a healthy person, insulin prevents high levels of glucose in the blood.
How does it do this?

(1)

(b) There are two forms of diabetes.

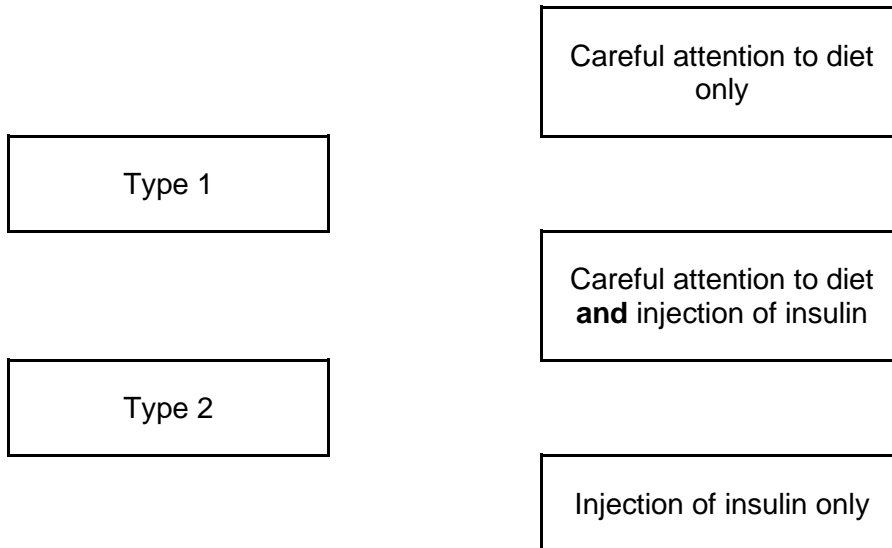
In type 1 diabetes, the body produces little or no insulin.
In type 2 diabetes, the body cells do not respond to insulin.

There are two ways in which diabetes can be treated.

Draw lines to join the type of diabetes to the way or ways in which it can be treated.

Type of diabetes

Treatment



(2)

(c) To make insulin, cells in the pancreas need amino acids.
 A *small section of DNA* in the pancreas cells is involved in making insulin from the amino acids.

(i) Insulin is a hormone.

What type of substance is insulin?

Draw a ring around **one** answer.

carbohydrate **lipid** **protein**

(1)

(ii) What term is used to describe the *small section of DNA* which controls the production of insulin?

(1)

(iii) Amino acids cannot be stored in the body.

Describe, as fully as you can, what happens to the excess amino acids.

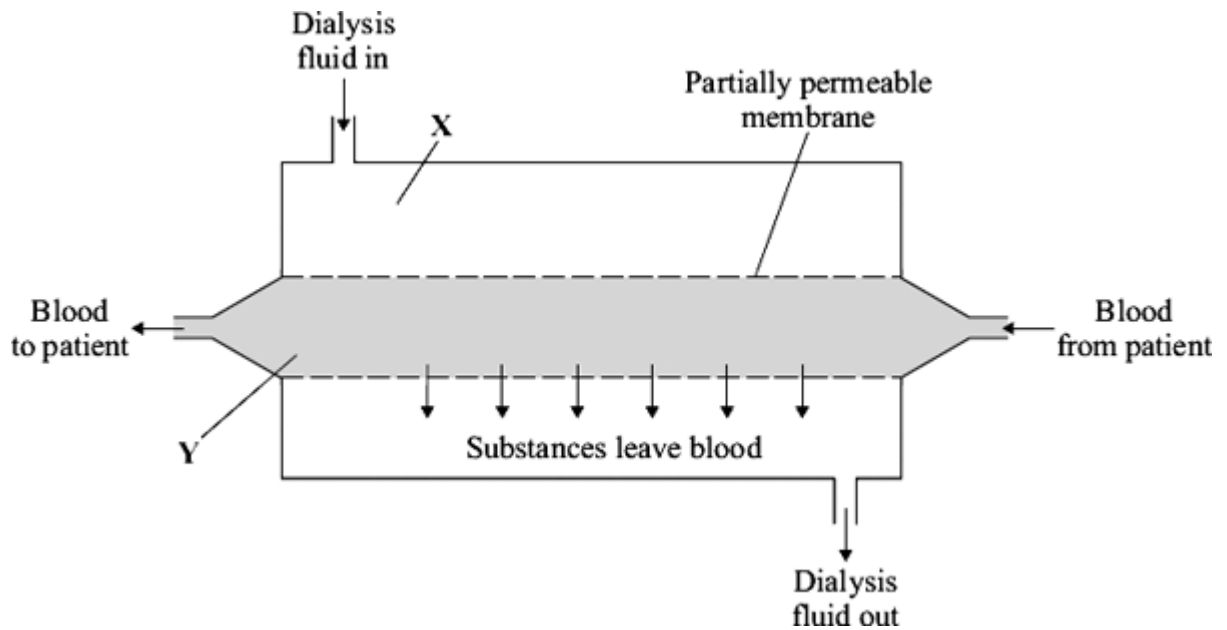
You may wish to use the following words in your explanation:

liver **kidneys** **bladder**

(3)
(Total 9 marks)

Q35.

People with kidney disease may be treated by dialysis.
The diagram shows a dialysis machine.



(a) Draw a ring around the correct answer to complete each sentence.

A person loses mass during dialysis. One patient lost 2.2 kilograms during a dialysis session.

(i) This person lost mass mainly because the substance

- | |
|-------|
| salt |
| urea |
| water |

was removed from the blood.

(1)

(ii) This substance was able to pass through the partially permeable membrane

because its molecules are

- | |
|--------|
| large. |
| round. |
| small. |

(1)

(iii) The concentration of sodium ions at **X** is 3.15 grams per dm³.

At the end of a dialysis session, the most likely concentration of sodium ions

at **Y** would be

0.00
3.15
6.85

 grams per dm³.

(1)

(b) The table shows the cost, in the UK, of treating one patient who has kidney disease.

Treatment	Cost per year in pounds
Dialysis	30 000
Kidney transplant: operation + first year's medical care medical care in each further year	51 000 5 000

(i) During the first year, dialysis treatment is cheaper than a kidney transplant.

How much cheaper is dialysis treatment? _____ pounds

(1)

(ii) After some time, the cost of treating a patient by a transplant operation would be cheaper than continual treatment by dialysis.

How many years would it take?

Draw a ring around **one** answer.

2 years

3 years

4 years

(1)

(iii) A transplant patient needs to take drugs for the rest of his life to suppress the immune system.

Why is this necessary?

(1)

(Total 6 marks)

Mark schemes

Q1.

- | | | |
|-------------------------|---|------------|
| (a) (i) water | 1 | |
| (ii) small | 1 | |
| (iii) 3.15 | 1 | |
| (b) (i) 21 000 | 1 | |
| (ii) 2 years | 1 | |
| (iii) prevent rejection | 1 | |
| | | [6] |

Q2.

- | | | |
|---|---|------------|
| (a) (i) A | 1 | |
| (ii) (protein) molecule is large
<i>ignore letters</i> | 1 | |
| cannot pass through filter
<i>(protein is) too big to get through the filter = 2 marks</i> | 1 | |
| (b) B is taken back into the blood or
B is reabsorbed | 1 | |
| reabsorbed completely | | |
| or reabsorbed after filtration | 1 | |
| (c) RBC is too big to pass through filter | 1 | |
| Haemoglobin is inside red blood cells
or haemoglobin released when RBC bursts | 1 | |
| Haemoglobin is small enough to pass through filter
or haemoglobin diameter | 1 | |
| | | [8] |

Q3.

- (a) any **six** from:
- hormone(s) / named produced by pancreas
 - if blood glucose levels are too high, insulin is produced / released
 - allowing glucose to move from the blood into the cells / named eg liver
 - glucose is converted to glycogen
 - if blood glucose levels fall, glucagon is produced / released
 - glycogen is converted to glucose
 - causing glucose to be released into the blood
- 6
- (b) diabetes that occurs when the body (cells) do not respond / are less responsive to insulin
- 1
- (c) (i) higher BMIs due to increase in mass / weight (relative to height) / obesity
- 1
- obesity / being overweight / being fat is a (significant) risk factor for Type 2 diabetes
- allow causes Type 2 diabetes*
- 1
- (ii) any **three** from:
- related to described change in diet eg fast foods
 - and less exercise
 - which increases the chance of obesity / increases BMI
 - increased awareness has helped to slow the increase
- 3

[12]

Q4.

- (a) (i) rate of chemical reactions (in the body)
- 1
- (ii) any **two** from:
- heredity / inheritance / genetics
 - proportion of muscle to fat **or** (body) mass
allow (body) weight / BMI
 - age / growth rate
 - gender
*accept hormone balance or environmental temperature
ignore exercise / activity*
- 2
- (b) (i) 77
- correct answer with or without working gains 2 marks
allow 1 mark for 70 / 56 or 1.25 or 5*

- 2
- (ii) increase exercise
accept a way of increasing exercise
- 1
- reduce food intake
accept examples such as eat less fat / sugar
allow go on a diet or take in fewer calories
ignore lose weight
ignore medical treatments such as gastric band / liposuction
- 1

[7]

Q5.

- (a) (i) kidney
- 1
- (ii) bladder
- 1
- (iii) liver
- 1
- (iv) lung(s)
- 1
- (v) skin
- 1
- (b) (i) 3000
allow 2970 to 3030
correct answer gains 2 marks with or without working
if answer incorrect allow 1 mark for evidence of 1550 + 450 + 1000 (allow tolerance of + or - ½ square on each)
- 2
- (ii) 1600
allow 1570 to 1630
- 1
- (iii) 1400
allow (b)(i) – (b)(ii)
- 1
- (iv) correct plot from (b)(iii)
tolerance ½ square ignore width
- 1
- (v) cells swell / overhydrated /
 damaged
accept poisoned (by urea)
- 1

[11]

Q6.

(a) pancreas

allow phonetic spelling

1

(b) (i) A

1

shortest / quicker time (to work)

1

(ii) D

1

acts for longest time

mark dependent on D

allow D will last until 09.00 / breakfast / 24 hours

1

(iii) diet / exercise

*if 'diet' is qualified, then will need correct qualification, e.g.
'less carbohydrate / sugar'*

accept pancreas transplant / stem cell treatment

1

[6]

Q7.

(a) (concentration high) in the hepatic portal vein is blood with glucose absorbed from the intestine

1

concentration is lower in the hepatic vein because insulin

1

(has caused) glucose to be converted into glycogen

1

or

allows glucose into liver cells

(b) (i) (after 6 hours) most of the glucose has been absorbed from the intestine **or** from food into the blood

1

(ii) because glucagon (made in the pancreas) causes

if biological terms incorrectly spelt they must be phonetically accurate

*do **not** accept glucagon made / produced by the liver*

1

glycogen to be converted into glucose

1

glucose released into blood

allow the liver maintains the correct / constant level of glucose in the blood

1

[7]

Q8.

(a) (i) any **one** from:

- chemical messenger / message
allow substance / material which is a messenger
- chemical / substance produced by a gland
allow material produced by a gland
- chemical / substance transported to / acting on a target organ
- chemical / substance that controls body functions

1

(ii) gland / named endocrine gland
brain alone is insufficient
allow phonetic spelling

1

(iii) in blood / plasma **or** circulatory system **or** bloodstream
accept blood vessels / named
*do **not** accept blood cells / named*

1

(b) *each hormone must be linked to correct action*
apply list principle
ignore the gland producing hormone

FSH stimulates oestrogen (production) / egg maturation / egg ripening
ignore production / development of egg

1

oestrogen inhibits FSH
allow oestrogen stimulates LH / build up of uterine lining

1

LH stimulates egg / ovum release / ovulation
accept LH inhibits oestrogen
accept LH controls / stimulates
growth of corpus luteum
ignore production of egg

1

[6]

Q9.

any **three** from:

*max 2 if only advantages **or** only disadvantages discussed*

ignore 'side effects' unqualified
ignore side effects produced by hormones

advantages of IUCD over pill eg

- can't forget to take it / have to take pill every day
*do **not** allow last 5 years unless qualified*
- effect much longer than pill
- more effective in preventing pregnancy
*do **not** allow reference to figures unless qualified*
- stops sperm entering uterus

disadvantages of IUCD over pill eg

- pain / uncomfortable / risk of infection / may damage uterus
- prevents fertilised egg developing / 'embryo rights'
allow kills embryo
- needs replacement by doctor / nurse / professional
or access to IUCD is more difficult than pill
or IUCD is harder to come off than pill

3

argued conclusion

*must include a preference and a reference to **both***
advantages and disadvantages
***or** one is better in a given situation but the other is better in a*
different situation

1

[4]

Q10.

(a) B

1

less / no insulin (produced) **or** insulin produced in pancreas
allow pancreas can't monitor (blood) sugar (level)
ignore pancreas can't control (blood) sugar (level)
allow increased glucagon production
*allow A as liver stores less glucose / sugar for **2** marks only*

1

(b) (i) (it / protein / insulin) digested / broken down
if ref to specific enzyme must be correct (protease / pepsin)
ignore denatured
*do **not** accept digested in mouth / other incorrect organs*

1

(ii) any **two** from:

ignore injections

- (attention to) diet
*accept examples, eg eat less sugar(y food) **or** eat small regular meals*
allow eat less carbohydrate / control diet
ignore cholesterol or balanced / healthy diet
- exercise
ignore keep fit / healthy
- (pancreas) transplant / stem cells / genetic engineering

2

[5]

Q11.

(a) (i) (too) big

1

cannot fit / pass through filter / through (pores) in membrane / cannot be filtered
too big to be filtered = 2 marks

1

(ii) water

1

(iii) partially permeable

1

(b) any **two** from:

- hazards of operation / named eg
- may be rejected **or** need to use immunosuppressant drugs / long term drug use **or** transplant may need to be replaced
- susceptible to other infections
- shortage of donors
- high initial cost

2

[6]

Q12.

(a) person with muscle disease:

allow reverse argument for healthy person

any **three** from:

NB all points are comparative except peak (point 3)

*allow use of **two** approximate figures as a comparison*

- higher resting rate **or** higher at start

- when exercise starts / then increases more / more rapidly
accept description eg rise fall
 - peaks (then falls)
 - levels off later than healthy person
 - higher rate during exercise
if no other marks awarded allow 1 mark for 'it's higher'
 - greater range
- 3
- (b) (i) oxygen
- accept adrenaline*
- accept O₂*
- do **not** accept O, O2 or O²*
- 1
- (ii) cannot release sugar / glucose (from glycogen)
- or**
- cannot store glucose / sugar (as glycogen)
- 1
- need to receive glucose / sugar (from elsewhere)
- ignore oxygen*
- 1
- for energy / respiration / cannot store energy
- ignore aerobic / anaerobic*
- 1
- [7]

Q13.

- (a) proteins are not filtered
- 1
- glucose is filtered and (re)absorbed
- allow glucose (completely) reabsorbed*
- 1
- ions are filtered and some (re)absorbed
- allow some ions are reabsorbed*
- 1
- urea is filtered [and some / none (re)absorbed]
- allow some / no urea is reabsorbed*
- 1
- (b) more / a lot of sweating occurred
- accept converse arguments for cold day*
- 1

- more / a lot of water loss (by sweating) 1
- more / a lot of water reabsorption / more water absorption by the kidney 1
- lower volume of urine
allow less urine / less water in urine 1

[8]

Q14.

- (a) (i) any **one** from:
ignore cancer / AIDS
- as a sleeping pill
*do **not** accept morning sickness*
 - treating leprosy 1
- (ii) thalidomide causes birth defects / abnormalities / described
in this order
ignore kill / harm / damage baby 1
- to be (more) sure of not getting pregnant
*allow to be certain there is no baby **or** in case one doesn't work* 1
- (b) (i) oestrogen 1
- progesterone 1
- (ii) any **two** from:
- reduce chances of ovarian cancer
 - more effective (in preventing pregnancy)
 - no pills (to remember) for 7 days (out of every 28)
allow only taken for 21 days (out of 28)
 - doesn't have to be taken at the same time every day 2
- (iii) less chance of headaches
ignore won't get headaches
- or**
 less chance of forgetting

allow lower dose of hormone
allow fewer side effects
ignore only contains one hormone

1

[8]

Q15.

(a) (i) any **three** from:

if diet given as answer = max 2

- age (of athlete)
- gender (of athlete)
- starting concentration of glycogen
- type / intensity of exercise
- length of exercise period

• number of training sessions

if none of these points gained amount of exercise = 1 mark

- time interval between exercise sessions

- exercise at same time of day

if last four points not awarded allow time (for exercise) for 1 mark

ignore references to amount of energy

ignore they are both athletes

3

(ii) any **two** from:

- intensity of exercise

- amount of exercise between sessions

- starting concentration of glycogen

- fitness / health

- metabolic rate / respiration rate

- amount / mass of muscle / physique

- aspects of diet qualified, eg amount of food eaten

*do **not** accept amount of carbohydrate*

if no other marks awarded allow height / mass / weight for 1 mark

2

(iii) (B has) less glycogen

he = B

- or (B's glycogen) fell more
accept use of approximate figures
- or (B's glycogen) built up less
allow other correct observations from graph eg A is lower at end of first session
ignore rate of fall

1

(b) athlete **A** (no mark)

to gain full marks 'more' must be given at least once

athlete **A** had more glycogen / **B** has less (only if A chosen to complete marathon)
*accept converse argument for **B***

1

(glycogen / glucose) used in respiration
ignore anaerobic

1

(more) energy released / available in athlete **A**
allow 'energy made'

1

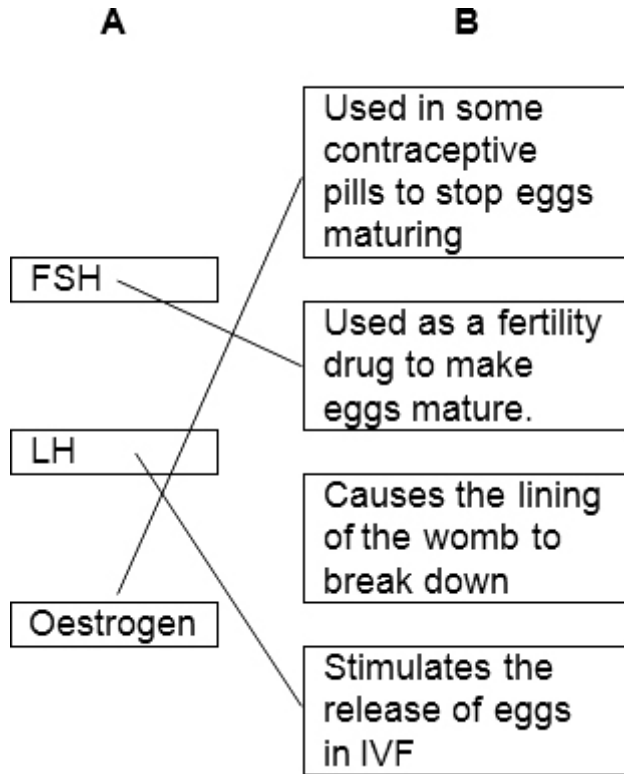
and either energy used for movement / muscle action / to run
or
(extra) glycogen → (more) glucose

1

[10]

Q16.

(a)



mark each line from left hand box
two lines from left hand box cancels mark for that box

3

(b) (i) implant

1

(ii) any **one** from:

allow explanation for their method in (b)(i)

- lasts for 5 years / long(est)
 - cannot forget to take / replace it / lose it
 - (hormone) there all the time
- ignore expense*
- ignore STDs*
- ignore side effects*

1

(iii) any **one** from:

accept correct disadvantage for wrong method in (b)(i)

- needs surgery / operation
- allow it could go wrong*
- painful
 - infection
 - have to wait five years for a child or more difficult to have a change of mind

ignore expense
ignore STDs
ignore side effects

1

[6]

Q17.

- (a) chance of getting pregnant decreases with age
ignore figures

1

chance of infertility increases with age

1

- (b) (i) causes eggs to mature
allow growth
*do **not** accept produced*
*do **not** accept releases egg*
ignore references to oestrogen / LH / uterus / womb

1

- (ii) causes egg release
*do **not** accept matures egg / growth of egg / produces egg*
ignore references to other hormones and uterus / womb

1

- (c) embryo
allow (fertilised) egg divides

1

insert (embryo) into womb / uterus
ignore electric shock

1

[6]

Q18.

- (a) any **one** from:

- (in) food / named
allow eating
- (from) respiration
*do **not** allow breathing*

1

- (b) (i) the greater / heavier the body mass the more water (should be drunk)
ignore references to hot / cold day
accept positive (relationship)
ignore figures unqualified

1

- (ii) 2200 1
- (iii) 400 2
*award 2 marks for correct answer, irrespective of working
 allow ecf from b(ii) for 2 marks
 if no answer or incorrect answer: 2200 - 1800 or b(ii) - 1800
 gains 1 mark*
- (c) need to replace water lost / prevent dehydration / keep hydrated 1
idea of balancing input and output
- from / by (more) sweat 1
ignore other losses
- (d) kidney 1

[8]

Q19.

- (a) (i) insulin 1
accept glucagon (correct spelling only)
- (ii) pancreas 1
*accept phonetic spelling
 allow pancrease*
- (b) (i) 11(.0) 1
accept in range 10.5-11 (.0)
- (ii) any **two** from: 2
ignore numbers unless comparative
- high(er) concentration (of blood glucose) (anywhere / any time)
*accept 115 not 88
 139 not 99*
 - large(r) increase (in concentration after the drink)
accept increase by 24 not 11 / their b(i)
 - fast(er) / steep(er) rise
*accept it takes 3 hours not 1 ¼ hours to get back to original level
 accept it takes a long time to get back to normal*
 - slow(er) fall

(iii) any **one** from:

- insulin present / produced
accept glucagon not produced
- (used in) respiration
allow exercise
- taken into cells
allow converted to glycogen
allow taken into liver (cells) / muscle (cells)
allow produce / make energy

1

[6]

Q20.

(a) (i) 94.9

correct answer with or without working
if answer is incorrect 100 - (2.5 + 2.6) gains 1 mark

2

(ii) protein molecules in the plasma cannot pass through the filter in the kidney

1

(b) (i) partially permeable

1

(ii) the same as

1

(c) any **one** from

- hazards of operation / named example
- may be rejected / need to use immunosuppressant drugs / need to find (tissue) match
allow long term drug use
- not enough donors
allow a long waiting list
- transplants have a limited life

1

[6]

Q21.

(a) any **two** from:

allow 2 correctly named substances for 2 marks
ignore water

- urea

- ions / salt(s) / correct named example
ignore minerals
 - second correct named example
 - hormones / named example
 - allow ammonia
 - allow creatinine
 - allow uric acid
 - allow bile pigment
- 2
- (b) (i) glucose filtered (into kidney tubule)
accept Bowman's capsule
- 1
- glucose reabsorbed **or** glucose taken back into blood
- 1
- all glucose taken back into blood / all reabsorbed
- 1
- (ii) not all glucose reabsorbed
- 1
- because not enough time / length **or** too high
a concentration in tubule / not enough carriers
- 1

[7]

Q22.

- (a) FSH / follicle stimulating hormone
allow FHS
either order
- 1
- LH / luteinizing hormone
- 1
- (b) any **four** from:
- egg(s) collected from ovary
 - (eggs) mixed with sperm **or** fertilisation occurs
allow eggs and sperm put into tube
 - fertilised egg divides
 - embryo formed
 - (embryos) inserted into womb / uterus

ignore references to vagina

- FSH matures egg **and** LH releases eggs 4

[6]

Q23.

- (a) (i) lung 1

- (ii) kidney 1

- (iii) bladder 1

- (b) (i) more 1

the same 1

less
allow synonyms 1

- (ii) cools / reduces temperature
or
prevent overheating
ignore reference to sweat 1

[7]

Q24.

- (a) pancreas
allow phonetic spelling 1

- (b) 4(.0) to 7.2 **or** 7.2 to 4(.0) 1

- (c) $13 - 7 = 6$
working shows 6 = 1 mark 1

$6/2 = 3$ units
accept the correct answer to the calculation, 3 units, for 2 marks, irrespective of working 1

increase (dose)
accept indication of increase, eg extra / more / + could be in

working lines

1

[5]

Q25.

(a) in table, in sequence:

allow descriptions for increase / decrease

decrease

1

increase

1

(b) **No**

older have lower % / less chance of rejection (than younger) (1)

allow figures

older have higher % / more chance of still working (after 5 years than younger)

allow figures

allow in older patients kidney works for longer

1

or

Yes

allow max 1 mark if Yes

older have lower % / less chance of surviving (at least 10 years than younger)

allow older people are more likely to die

1

[4]

Q26.

(a) (i) A

1

(ii) (protein molecule is) too large to pass through the filter / cannot pass through the filter

1

(b) RBC is too big to / cannot pass through filter

1

haemoglobin released when RBC bursts

or

haemoglobin inside RBC in a healthy person

1

haemoglobin is small enough to / can pass through filter

or

haemoglobin diameter < pore diameter

or
haemoglobin only 5.5 nanometres

1

[5]

Q27.

(a) any **two** from:

- FSH
do not accept FHS
- LH
do not accept LSH
- oestrogen
allow progesterone as alternative to any hormone

2

(b) egg(s) / egg cell(s) / ova

- do not accept ovaries*
- do not accept fertilised eggs*

1

(c) (i) any **one** from:

- ignore faster*
- don't have to take (pill) every day
ignore side effects
- can't forget to take
ignore cost
- more reliable
- lasts 3 years / lasts longer
- hormone level in blood more constant

1

(ii) any **one** from:

- ignore cost*
- eg painful (to insert) / uncomfortable / causes rash
ignore side effects unqualified
- woman can't take it out
- more difficult to stop treatment
- needs to be removed if woman decides to become pregnant
allow have to wait three years to become pregnant

1

[5]

Q28.

- (a) inhibit FSH production
ignore LH production
ignore wrong hormone 1
- so egg does not mature
ignore egg production / egg release / egg development 1
- (b) any **three** comparisons: eg
- ease of insertion compared ie ring easily inserted by woman whereas implant needs professional **or** no damage to skin with ring
*comparisons must be made ie two separate lists will gain no marks unless the lists are linked by eg whereas / however / on the other hand **and** the points are made in the same order in both lists*
 - length of delivery compared eg 3 weeks for ring whereas 3 years for implant **or** delivery longer for implant
or
 woman has to remember to insert ring whereas does not have to remember to insert implant
ignore cost
 - effectiveness compared eg 0.3 % failure with ring whereas nil for implant **or** implant more effective
 - number giving up compared eg 4 % for ring whereas 2 % for implant **or** fewer women give up using implant
or ring might cause vaginal discomfort whereas implant may cause irregular menstrual bleeding 3

reasoned conclusion (normally at the end)
ie must state 'better because...' 1

[6]

Q29.

- (a) insulin
extra ring drawn cancels the mark 1
- (b) pancreas
extra ring drawn cancels the mark 1
- (c) diabetes
extra ring drawn cancels the mark 1

Q30.

- (a) (protein molecules too) big **or** larger than pore size
allow cannot fit through the pores / hole / gaps 1
- (b) (i) diffusion 1
- (ii) high to low concentration
ignore along gradient / across gradient
or high concentration in blood, low concentration in dialysis fluid
allow there is none in dialysis fluid
or down concentration gradient
or correct use of numbers 1
- (c) any value between 3.15 and 3.25 (inclusive) 1
- (d) (i) any **two** from:
- kidney works all the time **or** dialysis works for short time
ignore enables an active life
 - or**
dialysis needs regular trips to hospital / regular treatment / long term treatment
accept kidney transplant is one off treatment
 - kidney maintains correct concentration all the time **or** no build-up as between dialysis sessions
 - no need to regulate diet **or** correct example – eg low salt / low protein / low fluid intake as with dialysis
 - cheaper in the long term
- 2
- (ii) any **two** from:
- rejection / described **or** need to use immunosuppressants **or** need to take drugs for life
allow may need later replacement
 - susceptible to other infections
 - hazards of operation / anaesthetic
 - shortage of donors / match

- high initial cost

2

[8]

Q31.

(i) pituitary

1

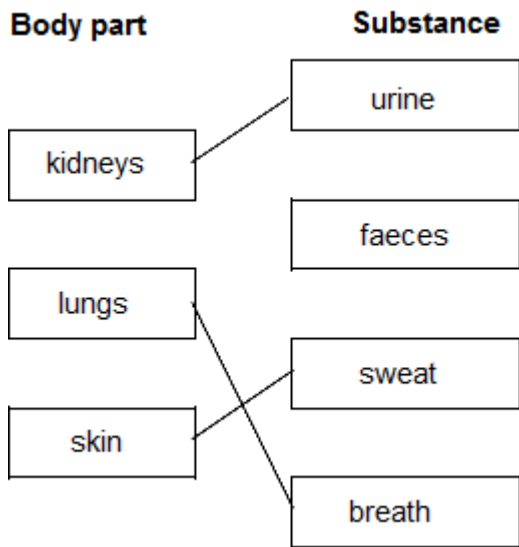
(ii) ovary

1

[2]

Q32.

(a)



*1 mark per correct line
extra line from a body part cancels the mark*

3

(b) (i) 1800 cm³

1

(ii) decreases

1

(iii) any **one** from:

- less / no sweat
- less / no cooling (needed)
- less / reduce / no heat loss / keep warm

1

(c) increases

1

[7]

Q33.

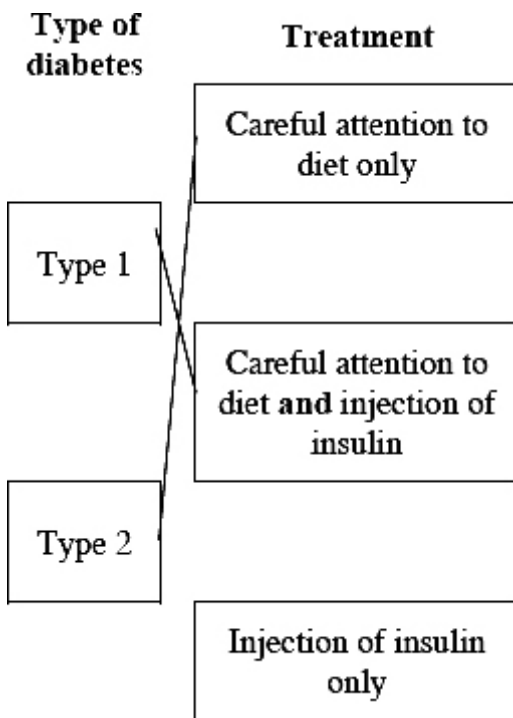
- (a) pancreas 1
- (b) the diabetic should get more energy from fat 1
- the diabetic should get less energy from carbohydrate 1
- (c) (use) insulin 1

allow pancreas / stem cell transplant
*do **not** allow injection / transplant / stem cells / tablets alone*
ignore exercise

[4]

Q34.

- (a) (i) pancreas 1
- allow phonetic spelling*
- (ii) (increases movement of) glucose into cells / organs / named 1
- allow (glucose) converted to glycogen / fat*
allow (glucose) used in (increased) respiration
*do **not** allow hybrid spellings of glycogen*



- (b)
- 1 mark per correct line*
extra line from a type of diabetes cancels the mark

2

- (c) (i) protein 1
- (ii) gene / allele 1
- (iii) any **three** from:
max 2 if any one process goes on in the wrong organ
- (amino acids) broken down /converted
 - (amino acids) form / into urea
 - (break down / convert / urea formed) in liver
 - (urea / broken down amino acids) removed / filtered by kidney
 - (urea / broken down amino acids) in urine
 - (urine / urea / broken down amino acids) stored / held in bladder 3

[9]

Q35.

- (a) (i) water 1
- (ii) small 1
- (iii) 3.15 1
- (b) (i) 21 000 1
- (ii) 2 years 1
- (iii) prevent rejection 1

[6]

Q1.

A person had diseased kidneys.

The table shows the concentrations of dissolved substances in this person's urine.

Substance	Concentration in grams per dm ³
Protein	6
Glucose	0

Amino acids	0
Urea	21
Mineral ions	19

(a) One of the substances found in this person's urine would **not** be found in the urine of a healthy person.

(i) Name this substance. _____

(1)

(ii) Explain why this substance would **not** be found in the urine of a healthy person.

(2)

(b) A person with diseased kidneys may be treated by dialysis.

Explain how dialysis treatment restores the concentrations of dissolved substances in the blood to normal levels.

(4)

(Total 7 marks)

Q2.

The *Invozell* device below is used in a new IVF (in-vitro fertilisation) treatment. Sperm and eggs are placed in the device which is then placed in the woman's vagina.



The table compares standard IVF treatment with *Invozell* IVF treatment.

	Standard IVF treatment	<i>Invozell</i> IVF treatment
Success rate	29.6 %	19.7 %
Cost	£2500	£900
Laboratory equipment needed	Extra equipment needed	None
Fertility problems that can be treated	100 %	50 %
Hormone treatment needed	Yes	Yes
When the embryos can be seen	Within hours	After 3 days

Using **only** the information given in the table, answer these questions.

- (a) Give **two** advantages of *Invozell* IVF treatment compared with standard IVF treatment.

1. _____

2. _____

(2)

- (b) Give **two** disadvantages of *Invozell* IVF treatment compared with standard IVF

treatment.

1. _____

2. _____

(2)
(Total 4 marks)

Q3.

Drinking after exercise to replace the water lost in sweat is called rehydration. Scientists at a Spanish university investigated rehydration after exercise.

- 24 students took part in the investigation.
- All the students ran on a treadmill in a temperature of 40 °C until they were exhausted.
- 12 of the students were each given half a litre of beer to drink.
- The other 12 students were each given half a litre of tap water to drink.
- Both groups of students were then allowed to drink as much tap water as they wanted.
- The scientists measured how quickly each student rehydrated.
- The students who had been given beer rehydrated 'slightly better' than the ones given only water.

A newspaper reported the investigation.

The headline was



The newspaper headline was **not** justified.

Explain why.

(Total 3 marks)

Q4.

A new fertility treatment that could allow women to have IVF in their lunch hour has been developed.

In standard IVF:

- Eggs are fertilised with sperm in a dish in a laboratory.
- Any resulting embryos are incubated and monitored in a laboratory for three to five days.
- The best embryo is transferred to the woman's womb.

Standard IVF treatment can also be used in cases where the male is infertile. In this treatment a sperm nucleus is injected into an egg. The average success rate for standard IVF treatment is 29.6 per cent.

In the *Invozell* technique:

- The *Invozell* device, shown below, is a sealed capsule that allows fertilisation to take place inside the woman's body, in the vagina.



- Eggs are removed from the ovaries while the woman is under sedation.
- The eggs and sperm are put into the *Invozell* capsule.
- The capsule is placed inside her vagina.
- After three days the capsule is removed and the best embryo is transferred to the

woman's womb.

This IVF treatment can be performed in a doctor's surgery because at no time are eggs, sperm or embryo stored outside the body. No costs are involved for laboratory incubation.

The *Invozell* company tried the technique on 800 women with a success rate of 19.7 per cent.

- (a) In both IVF treatments a woman is given hormones to stimulate her ovaries.

Name the **two** hormones that stimulate the ovaries.

_____ and _____

(2)

- (b) Evaluate the use of the *Invozell* technique compared with standard IVF treatment.

Remember to give a conclusion as part of your evaluation.

(4)

(Total 6 marks)

Q5.

Diabetes is a disease in which the concentration of glucose in a person's blood may rise to fatally high levels. Insulin controls the concentration of glucose in the blood.

- (a) Where is insulin produced?

Draw a ring around **one** answer.

gall bladder

liver

pancreas

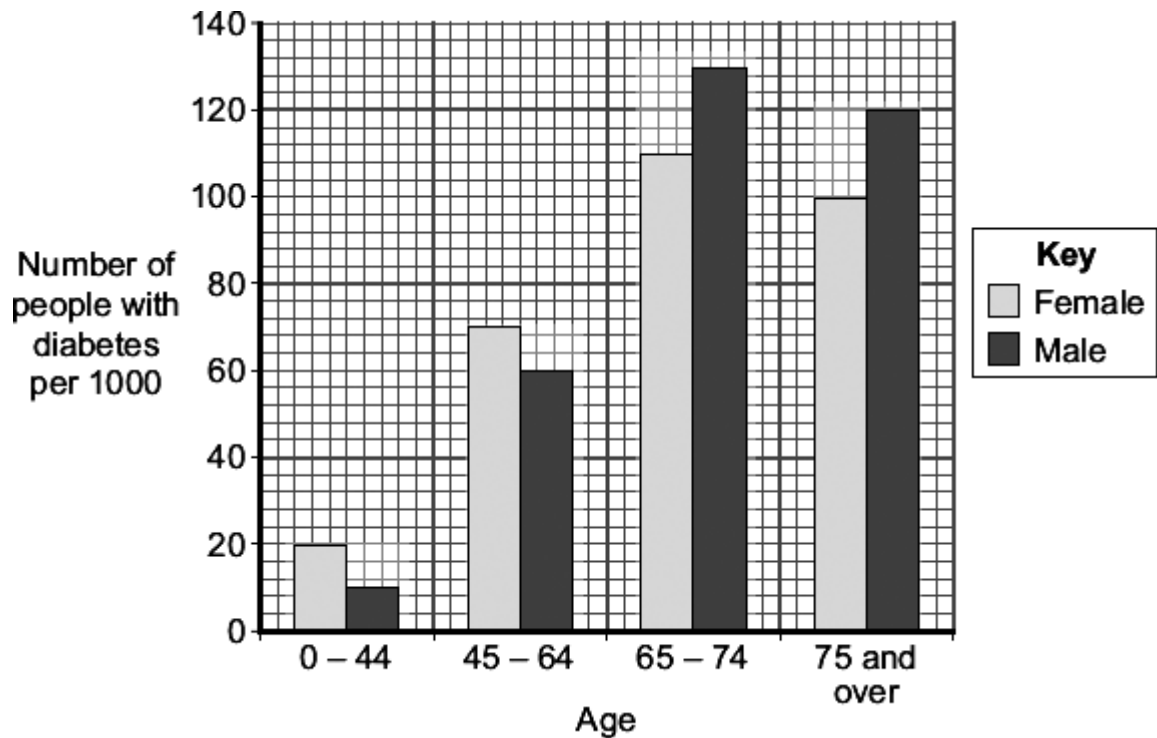
(1)

(b) Diabetics may control their blood glucose by injecting insulin.

Apart from using insulin, give **one** other way diabetics may reduce their blood glucose.

(1)

(c) The bar chart shows the number of people with diabetes in different age groups in the UK.



(i) Describe how the number of males with diabetes changes between the ages of 0 - 44 and 75 and over.

(3)

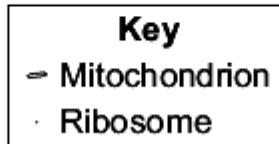
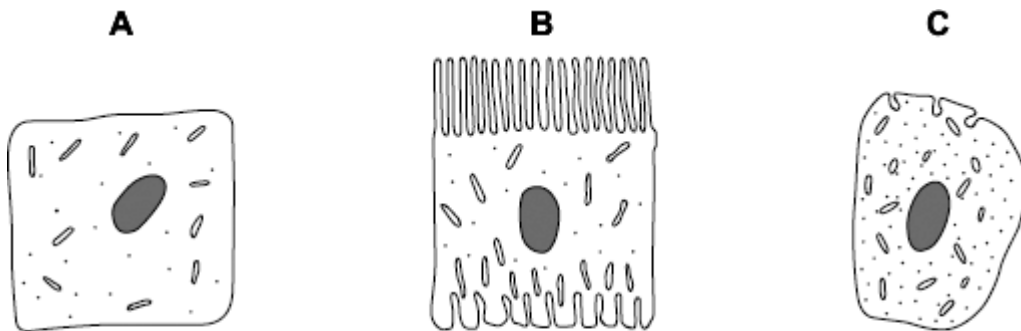
(ii) Compare the number of males and females with diabetes:
between the ages of 0 and 64 years

over the age of 65.

(2)
(Total 7 marks)

Q6.

Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to have adaptations to increase diffusion into or out

of the cell?

Give **one** reason for your choice.

(1)

(b) (i) Cell **C** is found in the pancreas.

Name **one** useful substance produced by the pancreas.

(1)

(ii) Use information from the diagram to explain how cell **C** is adapted for

producing this substance.

(2)
(Total 4 marks)

Q7.

Conditions inside the body must be kept constant.

(a) Urea must be removed from the body.

(i) Name the organ which makes urea.

(1)

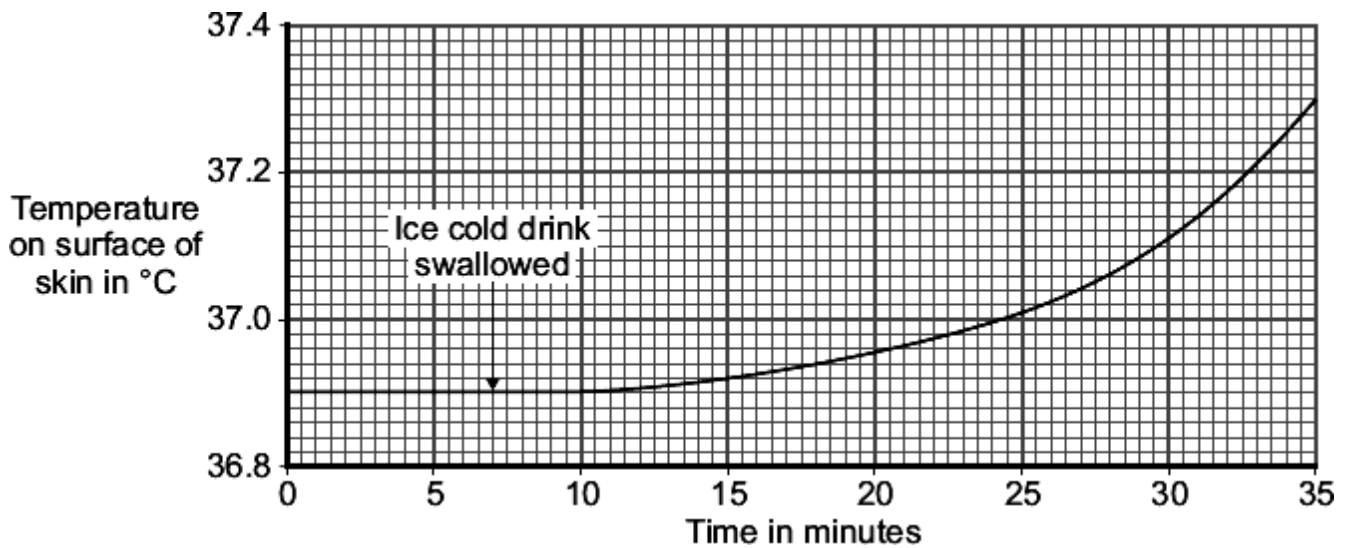
(ii) Which organ removes urea from the body?

(1)

(iii) What is urea made from?

(1)

A man sat in a room where the temperature was maintained at 40 °C. The temperature on the surface of his skin was monitored for 35 minutes. He swallowed an ice cold drink at the time indicated on the graph.



- (b) The sweat glands contribute to the change in the temperature on the surface of the skin shown on the graph.

Explain how.

(2)

- (c) The blood vessels near the surface of the skin also contribute to the changes in skin temperature shown on the graph.

- (i) How do the blood vessels in the skin change when the core body temperature falls?

(1)

- (ii) How does this change in the blood vessels explain the change in the skin temperature shown on the graph?

(1)

(Total 7 marks)

Q8.

The table shows the concentrations of some substances in the blood plasma, kidney filtrate and urine of one person.

Substance	Concentration in grams per dm ³		
	Plasma	Filtrate	Urine
Protein	78.0	0.0	0.0
Glucose	0.8	0.8	0.0
Urea	0.3	0.3	20.0
Sodium ions	2.8	2.8	3.5

(a) Draw a ring around the correct answer to complete each sentence.

(i) Protein is **not** found in the filtrate.

This is because protein molecules are

too large to pass through the filter.
used up in respiration.
reabsorbed into the blood.

(1)

(ii) Glucose is found in the filtrate but **not** in the urine.

This is because glucose is

too large to pass through the filter.
used up in respiration.
passed through the filter, then reabsorbed into the blood.

(1)

(iii) The concentration of urea is much higher in the urine than in the filtrate.

This is because

urea is made by the kidney.
water is reabsorbed from the filtrate into the blood.
glucose and salts are reabsorbed from the filtrate into the blood.

(1)

(iv) The fluid entering the bladder

will contain

water, protein, glucose, urea and sodium ions.
water, urea and sodium ions.
water, glucose, urea and sodium ions.

(1)

(b) An athlete ran a 10-kilometre race on a cold day. He then ran the same race on a hot day. He ate and drank the same on each day.

Draw a ring round the correct answer to complete each sentence.

(i) On the **hot** day this athlete will produce

more urine.
less urine.
the same amount of urine.

(1)

(ii) On the **hot** day the athlete's urine will be

- more concentrated.
- less concentrated.
- the same concentration.

(1)
(Total 6 marks)

Q9.

Diffusion and active transport take place in healthy kidneys.

(a) Explain what is meant by:

(i) diffusion _____

(2)

(ii) active transport _____

(2)

(b) Describe, as fully as you can, how urine is produced by the kidneys.

(5)
(Total 9 marks)

Q10.

In-vitro fertilisation (IVF) is used to help infertile women to have babies.

The table gives statistics from one clinic that gives IVF treatment.

	Age of women given IVF treatment			
	Under 35 years	35 – 37 years	38 – 39 years	40 – 42 years
Number of women treated	425	208	106	53
Number of single births	90	44	17	1
Number of sets of twins	24	8	4	1
Number of sets of triplets	1	0	0	0

Use data from the table to help you to answer these questions.

- (a) How many of the women aged 38 – 39 had babies?

(1)

- (b) What proportion of the treated women aged 35 – 37 had twins?

(1)

- (c) For which age group was IVF treatment most successful?

(1)

- (d) Give **two** disadvantages of IVF treatment.

1. _____

2. _____

(2)

(Total 5 marks)

Q11.

Waste products, such as carbon dioxide and urea, have to be removed from the body.

Draw a ring around the correct answer to complete each sentence.

(a) Carbon dioxide is produced by

breathing
diffusion
respiration

(1)

(b) Most carbon dioxide leaves the body through the

kidneys
lungs
skin

(1)

(c) Urea is produced in the

kidneys
liver
lungs

(1)

(d) Urea is produced from the breakdown of

amino acids
glucose
urine

(1)

(Total 4 marks)

Q12.

Diabetes is a disease in which a person's blood glucose concentration rises to higher levels than normal.

Diabetes is caused by insufficient insulin being produced.

(a) (i) Which organ monitors blood glucose concentration?

(1)

(ii) Insulin reduces the concentration of glucose in the blood.

Describe how insulin does this.

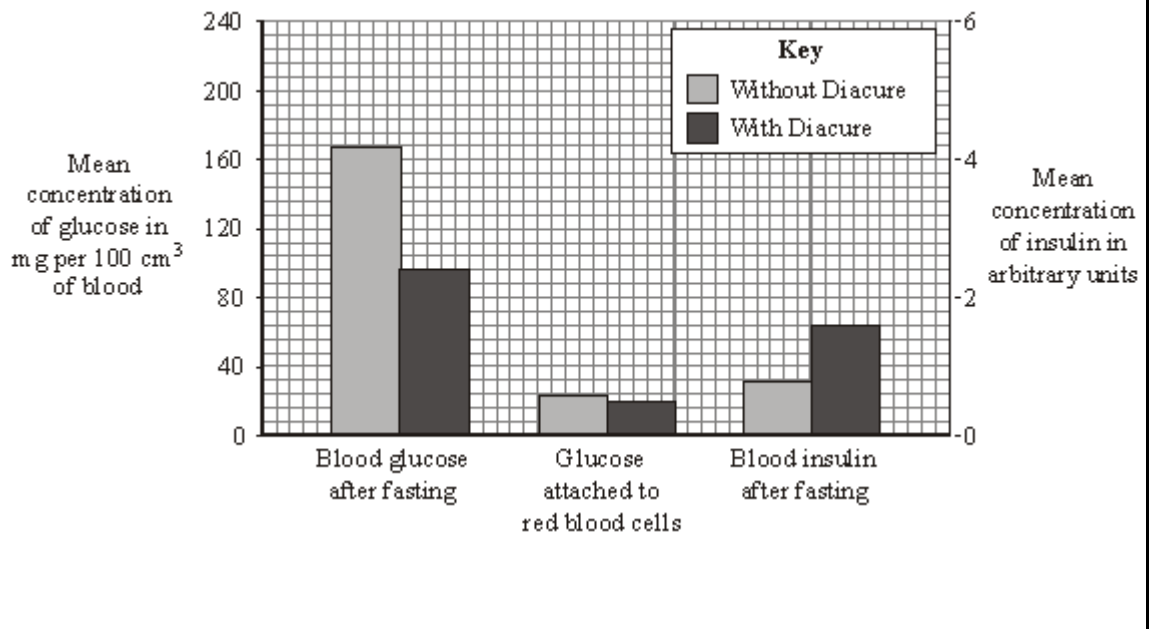
(1)

(b) A person with diabetes can be monitored in three ways:

- measuring the blood glucose concentration after fasting (going without food for 12 hours)
- measuring the amount of glucose attached to red blood cells: this is a measure of the average blood glucose concentration over the previous three months
- measuring the concentration of insulin in the blood after fasting

The manufacturer of a new treatment for diabetes, called Diacure, publishes the following two claims.

1. 98.6% of all people who used Diacure reported an improvement in their condition.
2. An independent study of 30 diabetic patients showed a significant reduction in blood glucose concentrations and a significant increase in insulin production, as shown by the graph.



(i) Which of the manufacturer's claims is **not** based on scientific evidence?

(1)

(ii) Why might the data in this study be unreliable?

(1)

(iii) The manufacturer did **not** draw attention to the data for the amount of glucose attached to red blood cells.

Suggest an explanation for this.

(2)

(iv) The study of diabetic patients was carried out by an independent company.

Why is it important that the study should be independent?

(1)

(Total 7 marks)

Q13.

(a) The kidney controls the amount of water in the body.

The table shows the volume of water filtered from the blood and the volume of urine produced in one day.

	Volume in dm ³
Water filtered from blood	180
Urine	2

Calculate the volume of water reabsorbed into the blood.

Show clearly how you work out your answer.

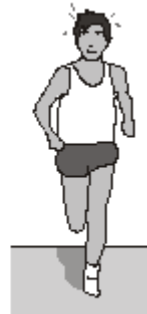
Volume of water reabsorbed = _____ dm³

(2)

- (b) On a hot sunny afternoon, Man **A** sat in the shade, drinking beer. Man **B** went jogging in the desert.



Man **A**



Man **B**

As a result, the volume and concentration of the urine of the two men were different.

Complete the table by writing the word '**higher**' or '**lower**' in each box.

The first line has been completed for you.

	Man A	Man B
Volume of urine produced	higher	lower
Volume of water reabsorbed by the kidneys		
Concentration of urine		

(2)

(Total 4 marks)

Q14.

Urine consists of water, ions and other substances such as urea.

Urine is formed in the kidney by filtering the blood.

The diameter of the pores in the filter is about 6 nanometres.

The table shows the diameters of the molecules of some of the substances in the blood.

Substance	Diameter of molecule in

	nanometres
A	10 to 20
B	1.0
C	0.6
D	0.5
E	0.2

Use information from the table and your own knowledge to answer the questions.

- (a) (i) Which substance, **A**, **B**, **C**, **D** or **E**, is protein? (1)

- (ii) Explain why protein is **not** found in the urine of a healthy person.

(2)

- (b) Substance **B** is **not** found in the urine of a healthy person.

Suggest an explanation for this.

(2)

- (c) Haemolytic anaemia is a disease in which some of the red blood cells burst open.

Small amounts of haemoglobin may be found in the urine of a person suffering from haemolytic anaemia.

The diameter of a haemoglobin molecule is 5.5 nanometres.

Haemoglobin is **not** found in the urine of a healthy person, but can be found in the urine of a person with haemolytic anaemia.

Explain why.

(3)
(Total 8 marks)

Q15.

Two types of fertility treatment are in-vitro fertilisation (IVF) and in-vitro maturation (IVM).

- (a) Describe the role of hormones in IVF treatment.

(3)

- (b) Read the passage about fertility treatment.

During normal IVF, a woman undergoes several weeks of hormone injections.
The treatment can lead to a condition called ovarian hyperstimulation syndrome resulting in a build-up of fluid in the lungs. Very rarely, it can cause death. The syndrome occurs in about 1 % of standard IVF cycles, but in about 10 % of the IVF cycles of some women. An IVF cycle may cost up to £4300.

In IVM, hormone treatment lasts for less than 7 days. Eggs are then collected from the ovaries while they are still immature. Each egg is then matured in a laboratory for up to 48 hours before being injected with a single sperm.
A few days after fertilisation, the embryos are implanted into the mother's womb. The cost of each IVM cycle is £1700.

An IVM expert says: "In IVM treatment there's a small risk of abnormalities in the sex chromosomes and also of birth deformities and

cancer in the babies. These risks are not massive but they are greater than in IVF.”

Evaluate the use of IVM rather than IVF in treating infertility.

Remember to give a conclusion to your evaluation.

(4)
(Total 7 marks)

Q16.

Water can be lost from the body in several ways.
The table shows the volume of water lost by a man on a cold day.

Way in which water is lost	Volume of water lost in cm ³
In urine	2000
Through skin	600
Breathed out	300
In faeces	100
Total	3000

(a) Calculate the proportion of water that the man lost through his skin.

Show clearly how you work out your answer.

Proportion = _____

(2)

(b) More water is lost through the skin on a hot day than on a cold day.

(i) Explain why.

(1)

(ii) To maintain water balance in the body, the total volume of water taken in must equal the total volume of water lost.

Give **two** ways this is achieved on a hot day, when compared to a cold day.

Tick (✓) **two** boxes.

The volume of water in the urine decreases.

The volume of water in the faeces increases.

The volume of water taken as food or drink increases.

The volume of water breathed out decreases.

(2)

(c) Use words from the box to complete the sentences.

bladder	kidney	liver	stomach
----------------	---------------	--------------	----------------

The body cannot store amino acids.

The body converts the amino acids it cannot use into urea.

(i) Urea is made in the _____

(1)

(ii) Urea is removed from the blood by the _____

(1)

(iii) Urine is stored in the _____

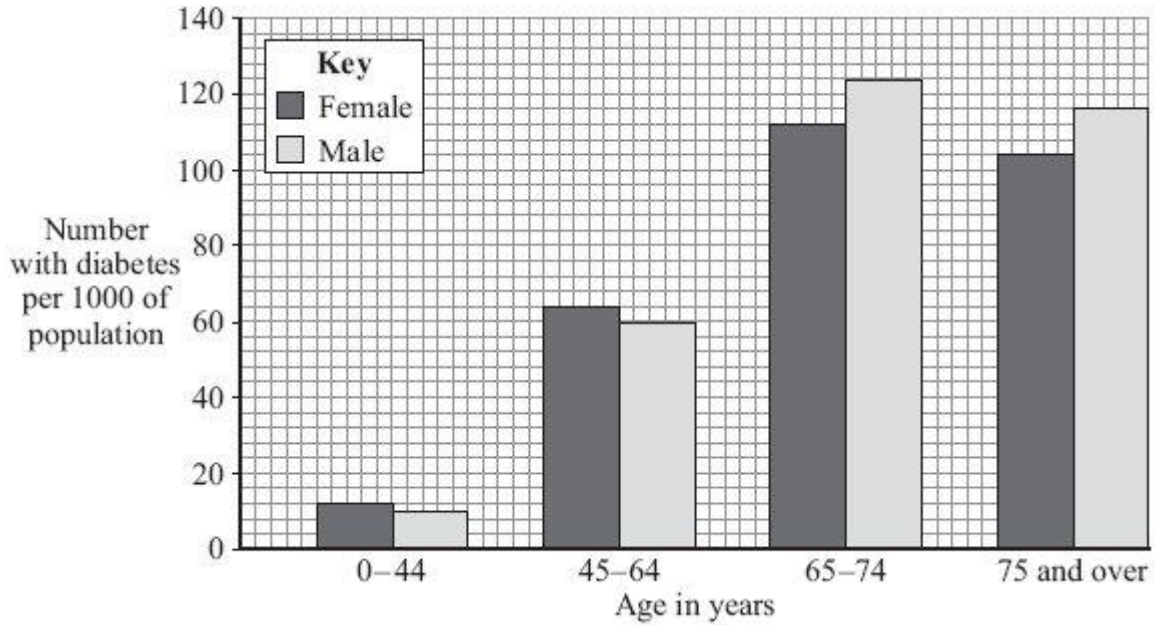
(1)

(Total 8 marks)

Q17.

Diabetes is caused when the body does not produce enough insulin.

(a) The bar graph shows the number of people with diabetes per 1000 of population.



- (i) How many more males aged between 45 and 64 years of age have diabetes than males under 45 years of age?

Show clearly how you work out your answer.

Answer _____ per 1000 of population

(2)

- (ii) Describe the way in which the number of females with diabetes changes with age.

(2)

- (b) One way of treating diabetes is by injecting insulin.

Insulin is a protein.

- (i) If insulin is taken by mouth, it is broken down in the digestive system.

Where in the digestive system would insulin be broken down?

Draw a ring around your answer.

liver

mouth

stomach

(1)

(ii) Give **one** way of treating diabetes instead of using insulin.

(1)

(Total 6 marks)

Q18.

Insulin controls blood glucose concentration.

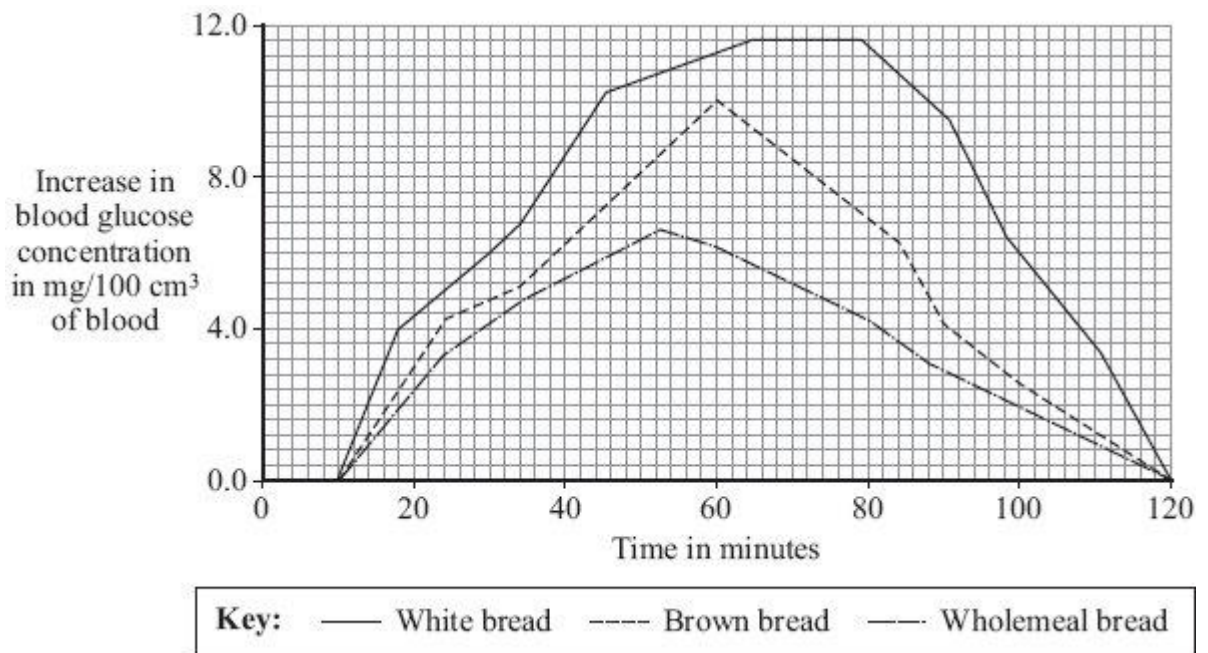
(a) The rate at which blood glucose concentration changes is affected by the food eaten.

In an experiment a person who does not have diabetes ate two slices of white bread.

The change in her blood glucose concentration was recorded over the next 120 minutes.

The experiment was repeated; first with two slices of brown bread and then with two slices of wholemeal bread.

The graph shows the results of the three experiments.



(i) Which type of bread would be most suitable for a person with diabetes?

Type of bread _____

Give **two** reasons for your answer.

1. _____

2.

(2)

- (ii) Explain, as fully as you can, the reasons for the changes in blood glucose concentration when the person ate the brown bread.

(4)

- (b) *Pancreatic-cell transplantation* is a new treatment for diabetes. Insulin-making cells are taken from up to three dead donors. The cells are kept alive before being injected into the diabetic in a small operation. The cells soon begin to make insulin.

In one recent study 58 % of recipients of pancreatic-cell transplants no longer needed insulin injections.

Give the advantages and disadvantages of the new treatment for diabetes compared with using insulin injections.

(3)

(Total 9 marks)

Q19.

(a) Which **two** of the following substances are found in the urine of a healthy person?

Tick (✓) **two** boxes.

Glucose

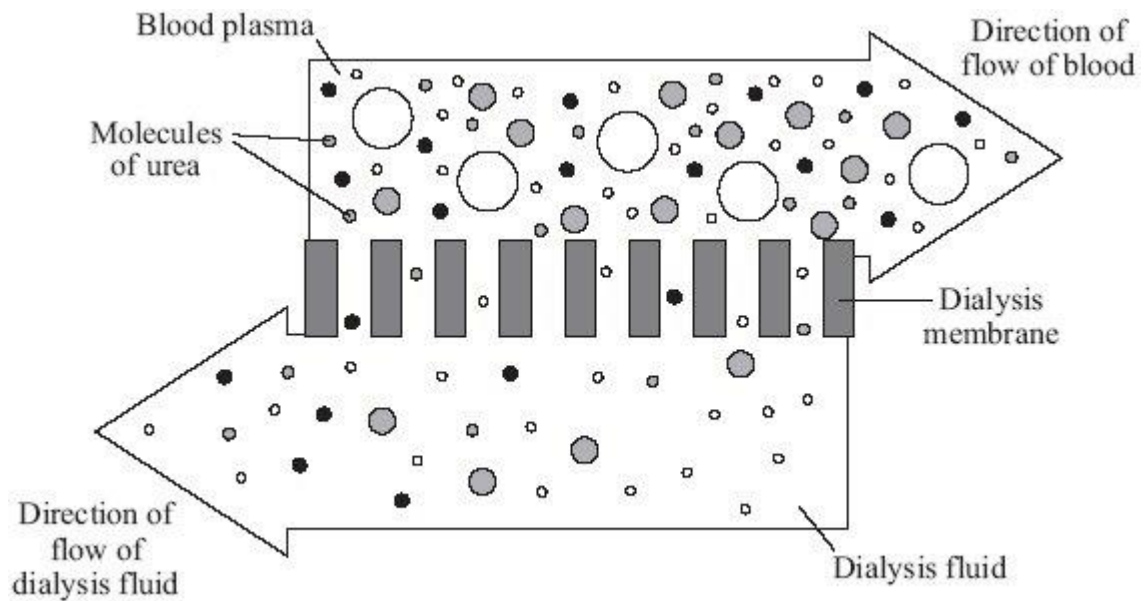
Mineral ions

Proteins

Water

(2)

(b) A person with kidney disease can be treated by dialysis. The diagram shows how dialysis works. The circles represent molecules of different substances.



Draw a ring around the correct word or phrase to complete each sentence.

(i) During dialysis, urea moves out of the blood cells
blood plasma
dialysis fluid .

(1)

(ii) During dialysis, urea moves into the blood cells
blood plasma .

dialysis fluid

(1)

(iii) Urea moves by the process of

diffusion
digestion
transpiration

(1)

(iv) To allow the movement of urea, the dialysis membrane is

impermeable
partially permeable
thick

(1)

(v) The urea can pass through the membrane because

the urea molecules are

large
round
small

(1)

(c) For most patients a kidney transplant is better than continued dialysis treatment.

Tick (✓) **one** box to complete the sentence.

One major problem with a kidney transplant is that

drug treatment is needed to suppress the immune system.

hospital visits are needed three times a week.

yearly costs are higher than for dialysis.

(1)

(Total 8 marks)

Q20.

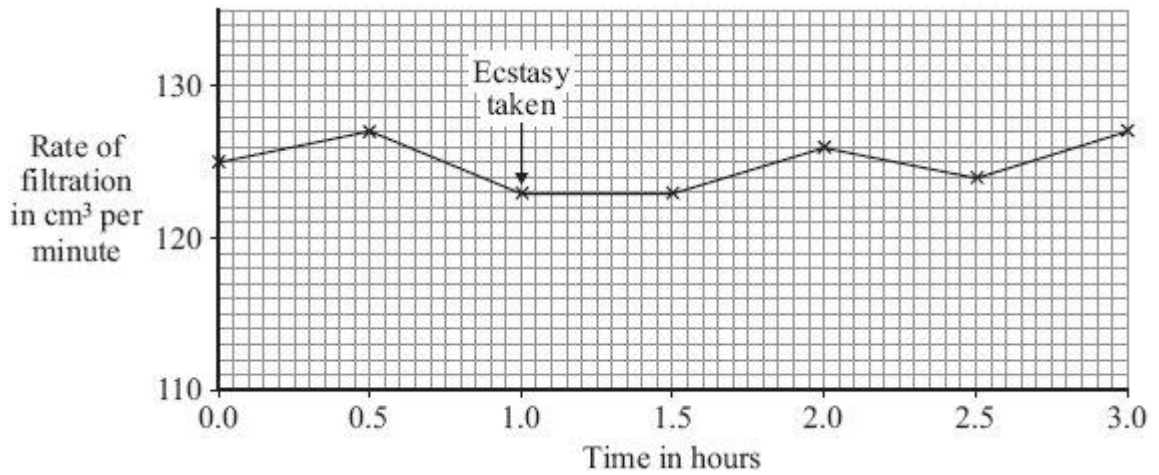
Taking the drug ecstasy affects the rate of urine flow from the kidneys.

Graph 1 shows the rate of filtration by the kidneys of a healthy person.

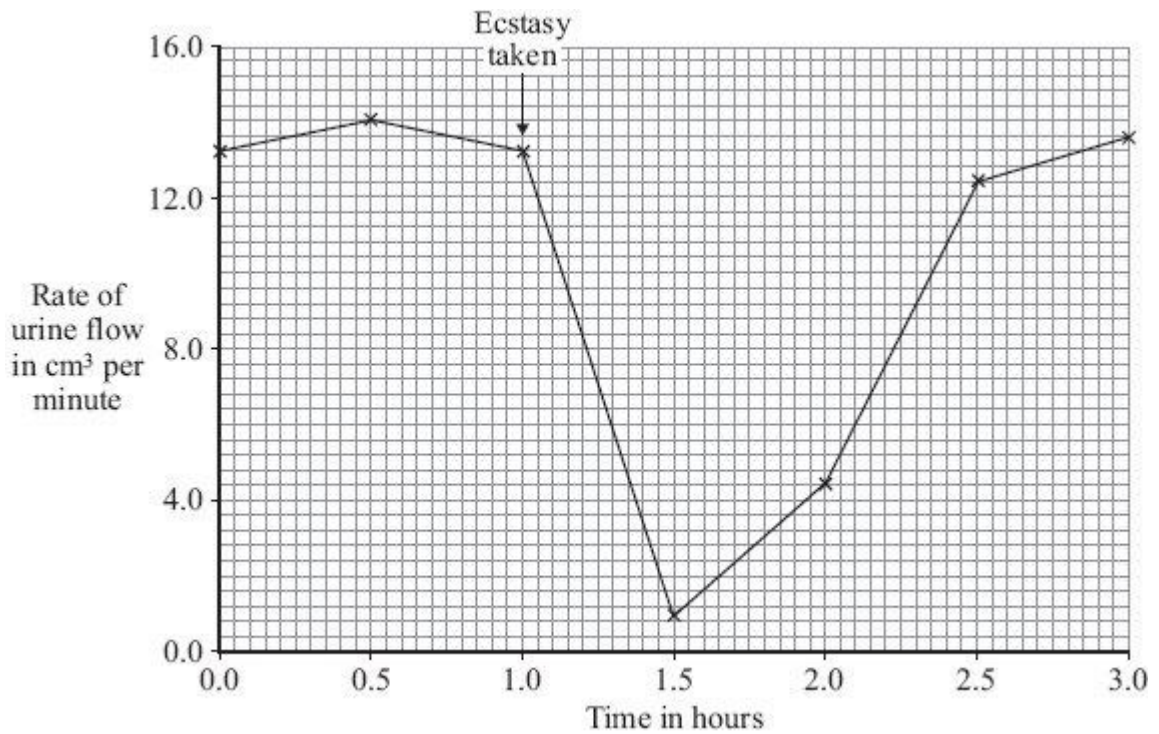
Graph 2 shows the rate of urine flow from the kidneys of the same person.

One hour after the first measurement, the person took ecstasy.

Graph 1



Graph 2



(a) Describe the effect of taking ecstasy on

(i) the rate of filtration

(1)

(ii) the rate of urine flow.

(1)

(b) Use information from the graphs and your understanding of how the kidney works to answer the following questions.

(i) Suggest an explanation for the change in the rate of urine flow after the person took ecstasy.

(2)

(ii) After a person has taken ecstasy, the concentration of ions in the blood changes.

Suggest an explanation for this.

(2)

(Total 6 marks)

Q21.

(a) Use words from the box to complete the sentences about controlling conditions in our bodies.

kidneys	liver	lungs	skin
----------------	--------------	--------------	-------------

(i) When we breathe out, water leaves the _____

(1)

(ii) When we sweat, water leaves the body through the _____

(1)

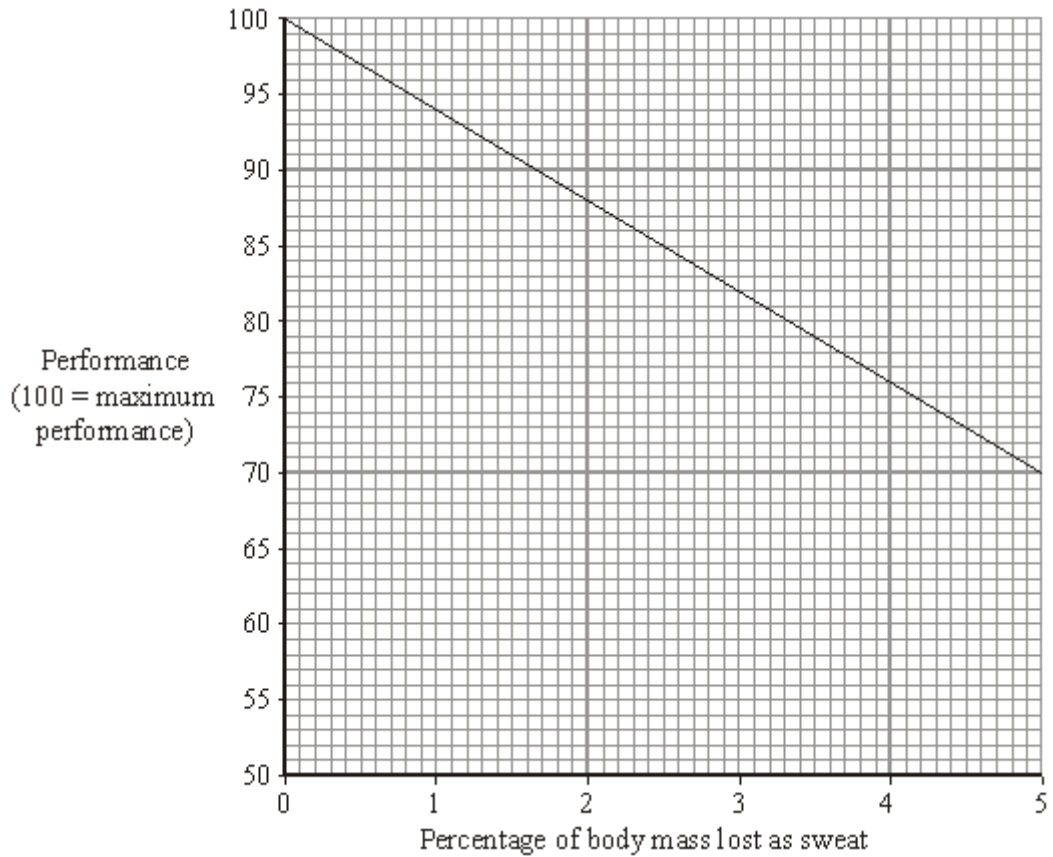
(iii) Excess water leaves the body in a liquid called urine.

Urine is produced by the _____

(1)

(b) We lose a lot of sweat during exercise. When this happens, we cannot perform as well as we could at the start of the exercise.

The graph shows the effect of losing sweat on the performance of an athlete.



(i) Describe the effect of losing sweat on performance.

(1)

(ii) How can athletes reduce this effect on performance?

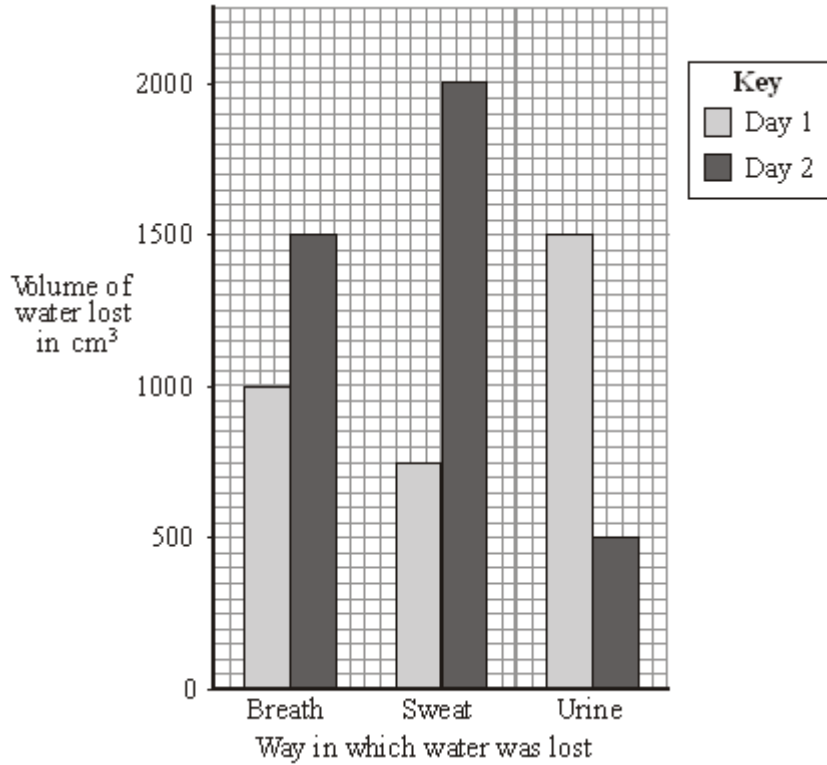
(1)

(Total 5 marks)

Q22.

The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.



(a) The total volume of water lost on day 1 was 3250 cm³.

How much water was lost on day 2? Show all your working.

_____ cm³

(2)

(b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day _____

Give **two** reasons for your answer.

1. _____

2. _____

(2)

(c) (i) Which **one** of these is a chemical reaction that produces water in the body?

Put a tick (✓) in the box next to your choice.

Breathing

Osmosis

Respiration

Sweating

(1)

(ii) How does sweating help the body?

(1)

(iii) If the body loses more water than it gains, it becomes dehydrated. The concentration of the solution surrounding the body cells increases. This causes the cells to lose water.

By which process do cells lose water?

Put a tick (✓) in the box next to your choice.

Breathing

Osmosis

Respiration

Sweating

(1)

(Total 7 marks)

Q23.

The pancreas is involved in digestion and controlling the internal conditions of the body.

(a) Name **two** digestive enzymes produced by the pancreas.

1. _____

2. _____

(2)

(b) Diabetes may be caused by a lack of insulin.

Part of the treatment for someone with diabetes is to pay careful attention to the diet.

(i) Give **one** symptom of diabetes.

(1)

(ii) Give **one** way in which a diabetic may be advised to change their diet.

(1)

(iii) How does this change in diet help the diabetic?

(1)

(iv) State **one** other way in which the symptoms of diabetes may be treated.

(1)

(c) Many of the cells in the pancreas contain large numbers of ribosomes.

What is the function of ribosomes in a cell?

(1)

(Total 7 marks)

Q24.

(a) (i) Urine is made in the kidneys and stored for a few hours before being released from the body.

In which organ of the body is urine stored? Draw a circle around **one** answer.

bladder

large intestine

liver

(1)

(ii) Which **two** of the following substances are **not** found in the urine of a healthy person?

Tick (✓) **two** boxes.

glucose

mineral ions	<input type="checkbox"/>
protein	<input type="checkbox"/>
urea	<input type="checkbox"/>

(2)

- (b) A person with kidney disease may be treated by dialysis or by having a kidney transplant.

Read the information about dialysis and kidney transplants.

- A person needs 3 dialysis sessions a week, each lasting about 8 hours.
- Intake of protein and salt in the food is kept low between dialysis sessions.
- For each patient, dialysis costs £30 000 per year.
- The use of a general anaesthetic can sometimes cause brain damage.
- Drugs to suppress the immune system are given after a kidney transplant.
- A transplant costs £20 000 in the first year plus £6500 in each of the following years for drugs.

Use this information to answer the questions.

- (i) Give **two** advantages of treatment by having a kidney transplant rather than treatment by dialysis.

1. _____

2. _____

(2)

- (ii) Give **one** disadvantage of treatment by having a kidney transplant.

(1)

- (c) The table shows the amounts of some substances in the blood of one patient before dialysis and after dialysis.

Substance	Concentration in blood plasma in grams per dm ³
-----------	---

	Before dialysis	After dialysis
Sodium ions	2.88	3.00
Potassium ions	0.22	0.14
Urea	4.50	0.30

During dialysis, substances are removed from the blood.

- (i) Which substance in the table decreased in concentration the most during dialysis?

_____ (1)

- (ii) By how much did the concentration of this substance decrease?

_____ grams per dm^3 (1)

(Total 8 marks)

Q25.

- (a) Why is glucose found in the blood but not in the urine? Use your knowledge of how the kidney works to explain your answer as fully as you can.

(3)

- (b) The table shows the concentrations of dissolved substances in the urine of a healthy person and the urine of a person with one type of kidney disease.

Substance	Concentration in grams per dm^3	
	Urine of healthy person	Urine of person with kidney disease
Protein	0	6
Glucose	0	0

Amino acids	0	0
Urea	21	21
Mineral ions	19	19

- (i) Suggest an explanation for the difference in composition of the urine between the healthy person and the person with the kidney disease.

(2)

- (ii) The person with the kidney disease could be treated either by using a dialysis machine or by having a kidney transplant operation.

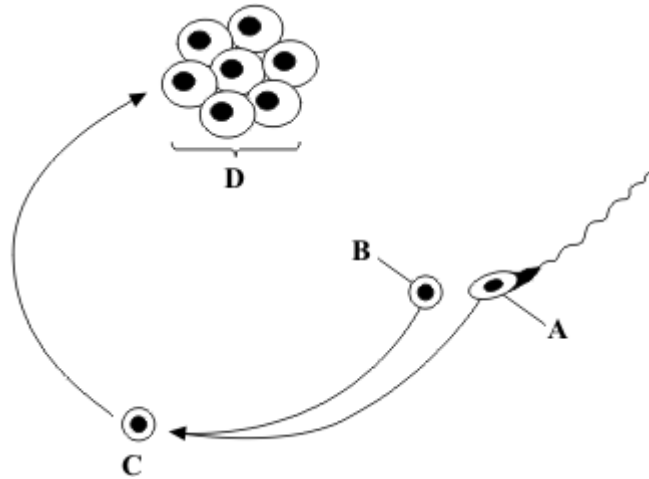
What are the advantages and disadvantages of having a kidney transplant operation rather than dialysis?

(4)

(Total 9 marks)

Q26.

The diagram shows some of the stages in IVF (in-vitro fertilisation).



(a) Use words from the box to name structures **A**, **B**, **C** and **D**.

egg embryo fertilised egg ovary sperm

Structure **A** _____

Structure **B** _____

Structure **C** _____

Structure **D** _____

(4)

(b) What do the doctors do next with structure **D**?

(2)

(c) The table gives statistics for an IVF clinic.

	Age of women treated			
	Below 35 years	35-37 years	38-39 years	40-42 years
Number of women treated	414	207	106	53
Number of women who produced one baby	90	43	17	1

Number of women who produced twins	24	8	4	1
Number of women who produced triplets	1	0	0	0

- (i) About what proportion of the treated women aged 35 – 37 produced one or more babies?

Draw a ring around your answer.

one quarter one third half

(1)

- (ii) IVF treatment is not given by this clinic to women over 42 years of age.

Use data from the table to explain why.

(2)

- (iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest **one** reason for this.

(1)

(Total 10 marks)

Q27.

The volume of water that the body loses must balance the volume of water that it gains.

Tables 1 and **2** show losses and gains of water by the body in one day.

Table 1
Losses of water by the body

Method	Volume in cm ³
breathing	300
sweating	600
faeces	
urine	100
Total	2400

Table 2
Gains of water by the body

Method	Volume in cm ³
drinking	1300
food	800
chemical reactions	300
Total	2400

- (a) (i) Calculate the volume of urine lost by the body.

Show clearly how you work out your answer.

Volume of urine lost by the body = _____ cm³

(2)

- (ii) What proportion of water gained by the body comes from food?

Put a tick (✓) in the box next to your choice.

$\frac{1}{4}$

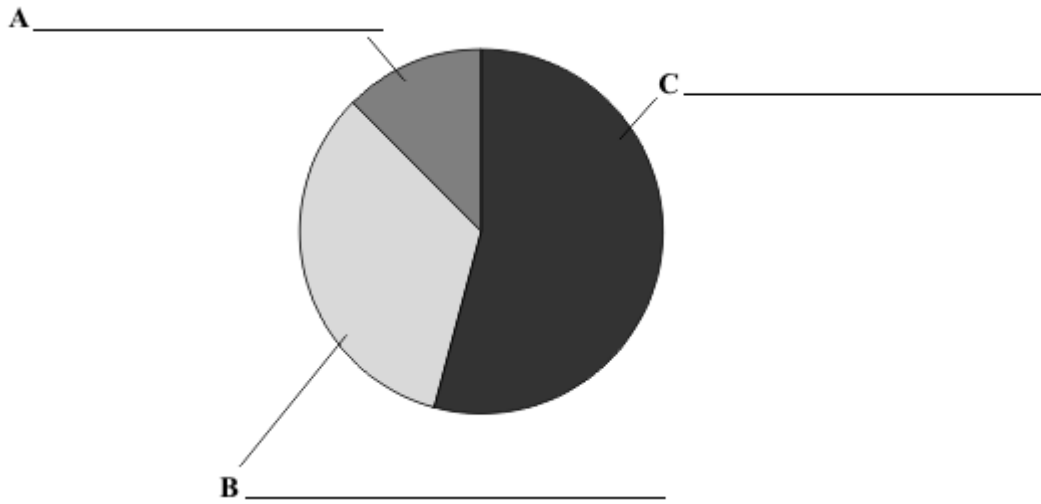
$\frac{1}{3}$

$\frac{1}{2}$

(1)

- (b) One pupil decided to show the figures from **Table 2** as a pie chart.

Label sections **A**, **B** and **C** of the pie chart.



(1)

(c) How does sweating help the body?

(1)

(d) On a hotter day, the volumes of water lost and gained will be different.

What differences will there be?

Tick (✓) **two** answers from the list.

- More sweat produced
- More faeces produced
- More food eaten
- Less urine produced
- Less liquid drunk

(2)

(Total 7 marks)

Q28.

The hormone insulin is a protein. Insulin is produced in the pancreas and controls blood glucose concentration.

(a) Which organ in the body monitors blood glucose concentration?

(1)

- (b) We now know that a lack of the hormone insulin causes diabetes. In the early twentieth century there was no known cure for diabetes.

Frederick Banting and Charles Best carried out a number of experiments on dogs.

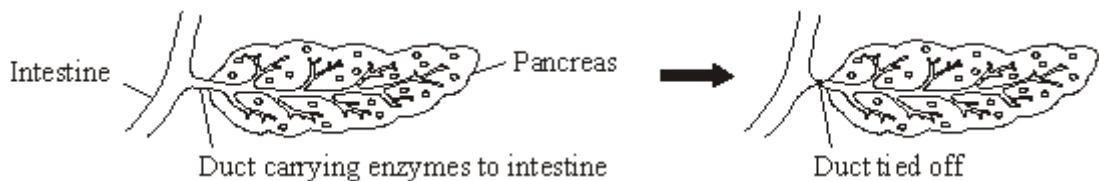
In the first experiment they removed part of the pancreas from a healthy dog (dog **A**). They ground up the pancreas tissue and injected an extract into dog **B**, whose pancreas had been removed to make it diabetic. Dog **B**'s diabetes was **not** cured.

Banting thought that an enzyme produced in the pancreas of dog **A** had digested the hormone before it was injected.

Name the enzyme that might have been responsible for digesting the hormone.

(1)

- (c) In the second experiment with another healthy dog, Banting and Best tied off the duct which normally carries digestive enzymes out of the pancreas. This did **not** kill the dog.



- (i) The dog survived even though enzymes from the pancreas could not digest food in the intestine.

Explain why the dog survived.

(1)

- (ii) As a result of these experiments, a method was developed to extract insulin from the pancreas.

Insulin is used to treat humans with diabetes.

The amount of insulin injected needs to be carefully controlled.

Explain why.

(1)

(d) Evaluate the use of dogs in experiments of this type.

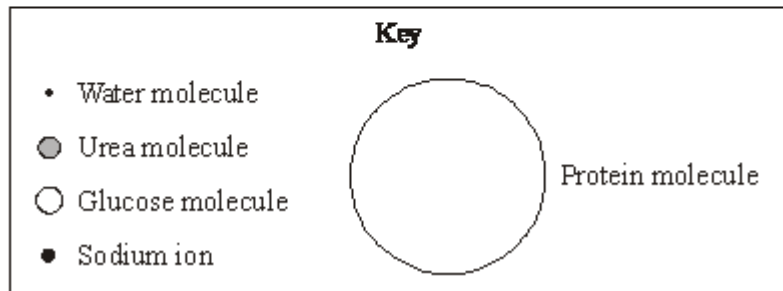
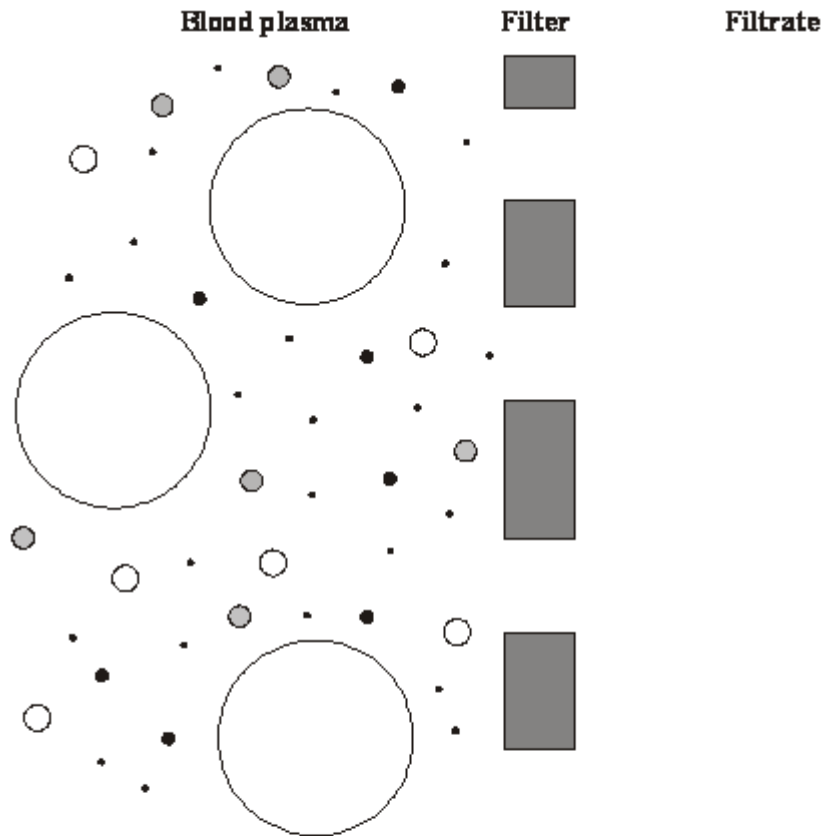
Remember to include a conclusion to your evaluation.

(3)
(Total 7 marks)

Q29.

The kidneys filter the blood.

The diagram shows the site of filtration in the kidney.



(a) Use information from the diagram to answer this question.

Put a tick (✓) in the box next to every substance that will pass through the filter from the blood plasma into the filtrate.

One has been done for you.

- | | |
|-------------|---|
| glucose | ✓ |
| urea | |
| water | |
| sodium ions | |

protein

(2)

(b) Proteins and glucose are not present in the urine of a healthy person.

(i) Use information from the diagram to explain why protein is not found in the urine of a healthy person.

(1)

(ii) Complete the sentence by drawing a ring around the correct answer.

After filtration, all the glucose is

reabsorbed
released
respired

(1)

(c) An athlete trained on a hot day and on a cold day. On each day, he did the same amount of exercise and drank the same volume of water.

Complete the sentences by drawing a ring around the correct answer.

(i) On the hot day, the athlete would produce

less
more
the same amount of

urine.

(1)

(ii) This is because he would produce

less
more
the same amount of

sweat.

(1)

(Total 6 marks)

Q30.

The table shows the concentrations of some substances in one person's blood plasma, kidney filtrate and urine.

Substance	Concentration in grams per dm ³		
	Plasma	Filtrate	Urine

Water	900.0	900.0	950.0
Protein	78.0	0.0	0.0
Glucose	0.8	0.8	0.0
Amino acids	0.4	0.4	0.0
Urea	0.3	0.3	20.0
Sodium ions	2.8	2.8	3.5

- (a) (i) Protein is **not** present in the filtrate.

Explain why.

(1)

- (ii) Glucose is filtered out of the blood by the kidney and is then completely reabsorbed back into the blood.

What is the evidence for this in the table?

(2)

- (iii) Glucose is reabsorbed into the blood by active transport.

Give **two** ways in which active transport differs from diffusion.

1. _____

2. _____

(2)

- (b) The concentration of urea is much higher in the urine than in the filtrate.

Explain what causes this.

(1)
(Total 6 marks)

Q31.

Long distance runners are advised to take several drinks during a race.

The table gives the composition of two drinks, Isotonic and Cola.

Drink	Sugar concentration in grams per litre	Sodium ion concentration in mmol per litre	Chloride ion concentration in mmol per litre
Isotonic	73	24	12
Cola	105	3	1

Explain why Isotonic would be the best drink for a long distance runner on a hot day.

(Total 2 marks)

Q32.

Read the passage about IVF (in-vitro fertilisation) and embryo-splitting.

“IVF is not as successful as we would like it,” says scientist Michael Tucker.
“On average, only one in five or one in six of all the embryos that we generate in the IVF lab will develop as far as full-term delivery as a baby.”
“There is a way to perhaps double those odds. A new, identical embryo is split off from the original embryo made in the IVF lab.”
“What we are really doing is creating an identical twin,” says scientist Dr Hilton Kort.
“And that’s what happens in nature every day. Cloning is creating a replica of a person or an animal.”

(a) Explain why the two embryos will develop into identical twins.

(2)

- (b) Explain why the embryos are **not** clones of their parents.

(2)

- (c) The scientists want to develop this technique, but are afraid to do so because public opinion might be against the technique.

Suggest an explanation for this.

(1)

(Total 5 marks)

Q33.

Hormones are used in contraceptive pills.

- (a) Explain how a contraceptive pill works.

(2)

- (b) Read the information about the trialling of the first contraceptive pill.

The Pill was developed by a team of scientists led by Gregory Pincus. The team needed to carry out large scale trials on humans.

In the summer of 1955, Pincus visited the island of Puerto Rico. Puerto Rico is one of the most densely populated areas in the world. Officials supported birth control as a form of population control. Pincus knew that if he could demonstrate that the poor, uneducated women of Puerto Rico could use the pill correctly then so could women anywhere in the world.

The scientists selected a pill with a high dose of hormones to ensure that no pregnancies would occur while test subjects were taking the drug. The Pill was found to be 100% effective when taken properly. But 17% of the women in the study complained of side effects. Pincus ignored these side

effects.

The women in the trial had been told only that they were taking a drug that prevented pregnancy. They had not been told that the Pill was experimental or that there was a chance of dangerous side effects.

Evaluate the methods used by Pincus in trialling the contraceptive pill.

(5)
(Total 7 marks)

Q34.

(a) We control many conditions inside our bodies.

Name **three** conditions which are controlled inside our bodies.

1. _____
2. _____
3. _____

(3)

(b) Hormones are used to control fertility in women.

Use words from the box to complete the sentences.

antibiotic	contraceptive drug	fertility drug	vaccine
-------------------	---------------------------	-----------------------	----------------

A woman can prevent pregnancy by taking a _____

A woman can be helped to become pregnant by taking a _____

(2)

(c) Some drugs are addictive.

(i) Name **one** addictive drug.

(1)

(ii) Explain why it is very difficult to give up using an addictive drug.

(2)

(Total 8 marks)

Q35.

A woman's fertility can be controlled by using hormones.

(a) Some contraceptive pills contain oestrogen.

Name the gland which produces oestrogen.

(1)

Women are being encouraged to use longer-term methods of contraception to reduce their chances of having an unwanted pregnancy.

The table summarises four long-term methods of contraception.

Method	What it is	How it works	How long does it last?	Chances of getting pregnant	Side effects
Hormone implant	Rod containing slow-release hormone inserted under the skin	Stops ovaries releasing eggs	3 years	Less than 1 in 1000	Acne in some women
Hormone	Injection that	Stops ovaries	12 weeks	Less than 4	Weight gain

injection	slowly releases hormone	releasing eggs		in 1000	in some women
IUD	Small plastic and copper coil placed in womb	Stops fertilized eggs developing in womb	5–10 years	Less than 20 in 1000	Heavier or more painful periods in some women
IUS	Plastic device containing slow-release hormone placed in womb	Stops fertilized eggs developing in womb	5 years	Less than 10 in 1000	Irregular periods in some women

(b) Which of the methods in the table is the most reliable?

_____ (1)

(c) What is the advantage of using long-term contraception methods instead of taking a contraceptive pill every day?

 _____ (1)

(d) The IUD is the least reliable of the contraceptive methods shown in the table. Use information from the table to suggest a reason for this.

 _____ (1)

(e) Some people have ethical objections to the use of an IUD or an IUS.

Suggest **one** reason why people might object to their use.

 _____ (1)

(f) (i) Explain how the hormone in the implants prevents the ovary releasing eggs.

(2)

(ii) Hormones can also be used as 'fertility drugs'.

Explain how a fertility drug helps a woman to become pregnant.

(2)

(Total 9 marks)

Mark schemes

Q1.

- (a) (i) protein 1
- (ii) (protein molecules too) large 1
- cannot pass through filter **or** can't leave blood **or** can't pass into kidney tubule / named part
- NB holes in the filter are too small = 2 marks* 1
- (b) any **four** from:
- use of partially permeable membrane **or** only small molecules can pass through membrane
 - dialysis fluid has 'ideal' concentrations of solutes
allow correct named example
 - diffusion of waste substances out of blood
accept named example – eg urea
- or**
waste passes from high to low concentration
- reference to equilibrium (between plasma & dialysis fluid)
accept reference to counterflow to maintain concentration gradient
- 4

[7]

Q2.

- (a) costs less 1
- no / less equipment needed 1
- (b) any **two** from:
- lower success rate / only 19.7% success rate
 - not all cases can be treated
or
only 50% of cases can be treated
 - embryo can't be seen until third day
- 2

[4]

Q3.

only 24 students tested **or** only one test **or** reference to lack of controls eg gender / age
1

students could drink as much water as they wanted

or

some students drank more water than others

or

some students drank water and beer

1

differences only slight

ignore effects of beer or promotion of beer drinking

1

[3]

Q4.

(a) FSH / follicle stimulating (hormone)

1

LH / luteinising (hormone)

either order

1

(b) any **three** from:

*max 2 if only advantages **or** only disadvantages discussed
allow reverse arguments*

advantages of InvoCell eg

- low(er) cost
- quick(er)
- laboratory / incubator / equipment not needed
- more convenient

ignore can be done in doctors surgery

3

disadvantages of InvoCell eg

- low(er) success rate
- embryo development cannot be monitored
- can not be used where male is infertile
- only tested on 800 women
- (risk of) infection / pain in vagina

ignore sedation

argued conclusion

*must include reference to **both** advantages and disadvantages and must be at end of answer*

1

[6]

Q5.

(a) pancreas

1

(b) any **one** from

- (controlling / changing) diet

accept descriptions as to how diet could be changed eg eat less sugar(y foods) ignore reference to fat / protein

- exercise

accept example eg go for a run

- pancreas transplant

accept named drug eg metformin

1

(c) (i) increase

ignore reference to women

1

then fall

1

relevant data quote (for male)

max at ages 65 - 74

*eg starts at 10 (per thousand) **or** max at 130 (per thousand)*

***or** ends at 120 (per thousand)*

accept a difference between any pairs of numbers in data set

quoting of scale or per thousand but not 'thousands'

accuracy ± 2

1

(ii) *ignore numbers*

(between 0 and 64) more females (than males) / less males

allow eg females more diabetic than males

1

(over 65) more males (than females) / less females

1

[7]

Q6.

(a) B

no mark for ÉBÉ, alone

large(r) surface / area **or** large(r) membrane

accept reference to microvilli

accept reasonable descriptions of the surface

*do **not** accept wall / cell wall*

ignore villi / hairs / cilia

1

(b) (i) any **one** from:

- insulin / hormone

if named hormone / enzyme must be correct for pancreas

- enzyme / named enzyme

1

(ii) many ribosomes

1

(ribosomes) produce protein

accept insulin / hormone / enzyme named is (made of) protein

or

allow many mitochondria (1)

provide energy to build protein **or** to make protein (1)

accept ATP for energy

1

[4]

Q7.

(a) (i) liver

1

(ii) kidney

allow urethra / bladder

ignore ureter

1

(iii) (excess) protein / named / amino acids

accept amino / ammonia

1

(b) less / no sweating

allow ideas of how sweat glands change in order to reduce sweating

1

less heat lost / evaporation

- 1
- (c) (i) become narrower / constrict
allow contract / get smaller etc
allow less blood flows through vessels
*do **not** allow capillaries become narrower **or** reference to movement of vessels*

- 1
- (ii) reduced / no heat loss
allow heat gained from room

[7]

Q8.

- (a) (i) too large to pass through the filter
1
- (ii) passed through the filter, then reabsorbed into blood
1
- (iii) water is reabsorbed from the filtrate into the blood
1
- (iv) water, urea and sodium ions
1
- (b) (i) less urine
1
- (ii) more concentrated
1

[6]

Q9.

- (a) (i) movement of atoms / molecules / ions
accept particles
allow dissolved substances
ignore reference to membranes
1

(substance) moves from high to low concentration
allow down the gradient ignore
across / along / with a gradient
1

- (ii) any **two** from:
- movement of molecules / ions
accept particles
allow dissolved substances this point once only in (a)(i) and (a)(ii)

- from low to high concentration
allow up / against the gradient
ignore across / along / with a gradient
- requires energy / respiration
accept requires ATP

2

- (b) • **filtration** of blood **or**
described re small (molecules)through / large not
ignore diffusion

1

max **four** from:

- **reabsorption** / substances taken back into blood
- (reabsorption) of all of the sugar / glucose
- (reabsorption) of some of ions / of ions as needed by body
- (reabsorption) of some of water / of water as needed by the body
- urea present in urine
accept urea not reabsorbed
- reabsorption of water by osmosis / diffusion **or** reabsorption of sugar / ions by active transport

4

[9]

Q10.

- (a) 21

1

- (b) 1/26 or 8/208 or 4/104 or 2/52 **or** 3.8%
allow 'out of' in each case

- (c) under 35

2

- (d) any **two** from:

- low success rate **or** not always successful
- high number of multiple births
- expensive
- stressful / emotional
- side effects

2

[5]

Q11.

- (a) respiration
clear indication eg tick, underlining, others crossed out 1
- (b) lungs 1
- (c) liver 1
- (d) amino acids 1

[4]

Q12.

- (a) (i) pancreas
allow phonetic spelling 1
- (ii) glucose into cells / liver / muscles
allow any named organ / cell
allow turned into / stored as glycogen
but
do not allow hybrid spellings for glycogen
allow increases respiration
allow stored as / turned into fat 1
- (b) (i) reference to “98.6% of all people who used Diacure reported an improvement in their condition”.
allow claim 1 / 1 / the first one 1
- (ii) (only) 30 patients **or** not enough / not many patients
allow only one trial or only done once or not repeated
ignore bias 1
- (iii) little effect / difference
allow no effect
allow only drops by 4 (± 1) 1
- suggest drug is not effective (in long term)
allow wouldn't persuade people to take it 1
- (iv) avoid bias / owtte
eg company could change / ignore results / might lie
ignore fair / accurate / reliable / valid 1

Q13.

(a) 178

ignore working or lack of working
correct working: 180 – 2 but no answer / wrong answer = 1 mark

2

(b)

Man A	Man B
higher	lower
lower	higher
lower	higher

all 4 cells correct = **2** marks
 2 or 3 cells correct = **1** mark
 0 or 1 cells correct = **0** mark

2

[4]

Q14.

(a) (i) **A**

1

(ii) (protein) molecule is large
ignore letters

1

cannot pass through filter

(protein is) too big to get through the filter = 2 marks

1

(b) **B** is taken back into the blood **or** **B** is reabsorbed

1

reabsorbed completely
or reabsorbed after filtration

1

(c) RBC is too big to pass through filter

1

Haemoglobin is inside red blood cells
or haemoglobin released when red blood cell bursts

1

Haemoglobin is small enough to pass through filter
or haemoglobin diameter < pore diameter

1

Q15.

(a) any **three** from

*if oestrogen **or** progesterone used = max 2*

*if both oestrogen **and** progesterone used = max 1*

- FSH used / given / injected
- LH used / given / injected
- FSH causes eggs to mature
- LH stimulates egg release
ignore effects of oestrogen and progesterone

3

(b) max **two** pros for IVM / it from:

*allow max **two** cons for IVF*

- cheaper
- less hormones used
- ovarian hyperstimulation **or** the syndrome less likely
allow 'it's safer for the mother'
ignore 'more risks' unqualified
- IVM treatment shorter

2

con for IVM

*allow max **one** pro for IVF*

- small risk of abnormal sex chromosomes / birth defects / baby cancer
allow 'more risk to baby'
ignore 'more risks' unqualified

1

evaluation

eg IVM better because less risk to mother outweighs small risk to baby

or

IVF better because no risk to baby and a small risk to mother

must include an appreciation that there are two sides to the argument

1

Q16.

- (a) $\frac{1}{5}$ / 20% / 1 in 5 / 1 : 4 / 0.2 /
any correct proportion
ignore working
*do **not** allow 1 : 5*
- $\frac{600}{3000}$ / 600 : 2400 / 600 in 3000
*award **1** mark for*
*selection of 3000 **and** 600*
- 2
- (b) (i) sweat / sweating / perspiring
allow cooling / for cooling / to lose heat / to cool
- 1
- (ii) the volume of water in the urine decreases.
- 1
- the volume of water taken as food or drink increases.
- 1
- (c) (i) liver
apply list principle
- 1
- (ii) kidney
apply list principle
- 1
- (iii) bladder
apply list principle
- 1

[8]

Q17.

- (a) (i) 50
*award **2** marks for correct answer irrespective of working*
*award **1** mark for selection of 60 **and** 10*
- 2
- (ii) any **two** from:
- increases
 - (then) decreases
 - highest at 65 – 74 (years old) **or** maximum 112 (per thousand)
allow peaks at 65 - 74
ignore comparisons with men
- 2
- (b) (i) stomach

1

- (ii) any sensible reference to diet **or** carbohydrate intake **or** pancreas / stem cell transplant
eg eat less / no sugary food or eat more fibre or go on a diet or watch what you eat
ignore eat more protein
*do **not** accept reduce salt*

1

[6]

Q18.

- (a) (i) (wholemeal bread)
 any **two** from:

lower maximum / peak / less change

1

slower rise / change

ignore references to rate of fall or first to peak

need to take less insulin / less likely to hyper

no mark for identifying the type of bread but max 1 mark if not identified

1

- (ii) any **four** from:

- amylase / carbohydrase
- starch to sugar
allow starch to glucose
- (sugar) absorbed / diffused / passes into blood
- correct reference to pancreas
allow once only as rise or fall
- insulin produced
- glucose (from blood) into cells / tissue / organ **or** named tissue / organ
allow glucose to glycogen
- glucose used in respiration / for energy
max 3 for explaining rise
max 3 for explaining fall

4

- (b) any **three** from:

advantages (compared to insulin injections):

- (may be) permanent / cure

- no / less need for self monitoring
- no / less need for insulin / injections
ignore reference to cost
- no / less need for dietary control

disadvantages (compared to insulin injections):

- low success rate
- (may) still need insulin / dietary control
- operation hazards
- risk of infection from donor
- rejection / need for drugs to prevent rejection
*max 2 if only advantages or only disadvantages discussed
can give converse if clear that it relates to insulin injections*

3

[9]

Q19.

(a) mineral ions

1

water

each extra box ticked cancels 1 mark

1

(b) (i) blood plasma

1

(ii) dialysis fluid

1

(iii) diffusion

1

(iv) partially permeable

1

(v) small

1

(c) drug treatment is needed to suppress the immune system

1

[8]

Q20.

(a) (i) no effect / little effect

1

(ii) reduced

- ignore reference to later increase* 1
- (b) (i) more (re)absorption 1
do not allow if extra incorrect reference to filtration made
- or** more (material) taken into blood
 of water
*allow **only** if linked to reabsorption*
*do **not** accept water if in a list of substances* 1
- (ii) ions in blood diluted 1
- or** concentration of ions decreases
 increased water reabsorption
do not allow if extra incorrect reference to filtration made
- or** more water present in blood
accept sensible alternative suggestion
eg reabsorption of ions disrupted 1

[6]

Q21.

- (a) (i) lungs 1
- (ii) skin 1
- (iii) kidneys 1
- (b) (i) (as sweat lost,) performance falls 1
- (ii) drink water / sports drink
ignore antiperspirant 1

[5]

Q22.

- (a) 4000 2
*award **both** marks for correct answer, irrespective of working*
1500 + 2000 + 500 gains 1 mark
- (b) day 2 (no mark)

any **two** from:

max 1 mark if correct day not identified or if no day given

- more (water in) breath / breathing
- more (water in) sweat / sweating
accept a lot of sweating
- less (water in) urine
if no other marks awarded allow 1 mark for more water lost on day 2

2

(c) (i) respiration

1

(ii) cools / removes heat out

ignore 'maintains body temperature' unqualified

1

(iii) osmosis

1

[7]

Q23.

(a) any **two** from:

- amylase / carbohydrase
- protease
allow trypsin
- lipase

2

(b) (i) high / above normal blood sugar
or cannot control blood sugar

allow other symptoms

*eg frequent / plentiful urination **or** sugar in urine **or** thirst **or** weight loss **or** coma*

ignore consequential effects eg blood pressure / circulation / glaucoma / tiredness

1

(ii) any **one** from:

- small / regular meals
- low sugar (meals) or low GI / GL **or** carbohydrates as starch
allow high fibre

- ignore reference to low carbohydrate* 1
- (iii) any **one** from:
- keep constant(blood) sugar **or** prevent high (blood) sugar **or** reduces surge / rush of sugar into blood
 - reduce the need for insulin 1
- (iv) (take) insulin 1
allow pancreas transplant
- (c) protein / hormone / enzyme synthesis **or** synthesis of named example **or** combine amino acids 1
- [7]

Q24.

- (a) (i) bladder 1
- (ii) glucose 1
- protein
extras – CANCEL 1
- (b) (i) any **two** from:
- kidney functions all the time / not just 3 × 8 h sessions a week
allow direct quotation of correct points from the list
 - can eat high-protein foods / high salt foods
allow can eat anything
 - cheaper
 - waste of time 2
- (ii) have to take (immunosuppressant) drugs / consequence of this
 eg catch infections / may suffer brain damage / possible
 rejection of kidney **or** become ill more easily
or
 risk of brain damage (due to anaesthetic)
allow direct quotation of correct points from the list 1
- (c) (i) urea 1

(ii) 4.2

1

[8]

Q25.

(a) any **three** from:

- glucose enters blood from gut / liver / glycogen
- glucose is filtered out of the blood
ignore 'diffusion'
- glucose is (a) small (molecule)
- taken / etc back into the blood / reabsorbed
*allow absorbed into the blood but **not** absorbed unqualified*
- by active transport
ignore diffusion

3

(b) (i) in a healthy person

protein not present because proteins are large (molecules)
or because cannot pass through (filter)

1

in person with disease

lets protein through (filter) owtte

1

(ii) advantages:

up to any **three** from:

- no build-up of toxins / keeps blood conc. \pm constant
ignore 'kidney works all the time'
- prevent high blood pressure
- don't need restricted diet / restricted fluid intake
or time wasted on dialysis
- blood clots may result from dialysis
- infection may result from dialysis
- with dialysis, blood may not clot properly
due to anti-clotting drugs
- cost issues (ie transplant cheaper)

3

disadvantages: **at least one** from:

- rejection / problem finding tissue match
- use of immuno-suppressant drugs → other infections
- dangers during operation / example described
must have at least one advantage and at least one disadvantage for full marks

1

[9]

Q26.

(a) A sperm

1

B egg

1

C fertilised egg

1

D embryo

1

(b) insert into mother

ignore fertilise / check fertilisation / check viability

1

womb / uterus

1

(c) (i) one quarter

1

(ii) no / little chance of success over 42

the statement 'only 2 out of 53 became pregnant / had babies' gains 2 marks

1

reference to table of only 2 women became pregnant

1

(iii) so fewer twins / multiple births

or

multiple births more dangerous

1

[10]

Q27.

(a) (i) 1400

award 2 marks for correct answer if no working shown

2400 – (300 + 600 + 100) or equivalent for 1 mark

2

- (ii) $\frac{1}{3}$ 1
- (b) **A:** chemical reactions
B: food
C: drinking
*all **three** required for 1 mark* 1
- (c) cools / reduces temperature
allow 'maintaining body temperature' owtte
*do **not** allow regulate unqualified*
ignore reference to urea
numerical references to temperature should be correct 1
- (d) more sweat produced 1
 less urine produced 1
- [7]**

Q28.

- (a) pancreas 1
- (b) protease
allow proteinase 1
- (c) (i) (same) enzymes / named enzymes produced in other parts /
 named parts of digestive system
if named, enzymes and part must be correct 1
- (ii) diet / activity varies / amount of glucose in blood varies
accept too much insulin leads to coma / hypo / low blood sugar
accept too little insulin leads to coma / hyper / high blood sugar 1
- (d) any **two** from:
 pros
 • less / no experimentation on humans
 • dogs (more) similar to humans (than lower / named organisms)

- it allows us to find a treatment **or** improves medical understanding
accept allows us to find a cure

cons

- harmful / cruel to dogs
accept kills dogs
- dogs may not be (metabolically) like humans

2

conclusion justified by argument

1

[7]

Q29.

(a)

glucose	<input checked="" type="checkbox"/>
urea	<input checked="" type="checkbox"/>
water	<input checked="" type="checkbox"/>
sodium ions	<input checked="" type="checkbox"/>
protein	<input type="checkbox"/>

all 3 correct = 2 marks
2 correct = 1 mark
0 or 1 correct = 0 marks

max 2

- (b) (i) protein cannot pass through filter

or

protein (too) large

or

protein stays in the blood

1

- (ii) reabsorbed

1

- (c) (i) less

1

(ii) more 1

[6]

Q30.

(a) (i) protein is large (molecule) / too big to pass through filter 1

(ii) glucose is present in the filtrate
ignore units 1

or

0.8 in filtrate

no glucose is present in the urine

or

0 in urine 1

(iii) active transport – up / against (concentration) gradient
it = active transport throughout 1

or

from low to high (concentration)

uses energy / ATP

accept needs specific carrier / specific protein (in cell membrane) for 1 mark

1

(b) water reabsorption / taken out
other substances cancel mark

or

water taken into blood / body 1

[6]

Q31.

any **two** from:

- more or most ions / sodium / chloride **or** replaces ions / sodium / chloride
*do **not** accept more ions / sodium / chloride for energy*
- lost in sweat
- to keep blood concentration constant

- less sugar therefore less chance of 'sugar rush'

[2]

Q32.

- (a) have identical genes / chromosomes / genetic material 1
- since asexual reproduction
accept mitosis 1
- (b) mixture of genes / chromosomes / genetic material from two parents 1
- accept meiosis* 1
- sexual reproduction / fusion of gametes 1
- (c) public misunderstand technique as cloning **or** worried about large numbers of clones **or** moral / ethical / religious issues **or** unnatural process **or** scientists must not play god **or** technique may lead to embryo death 1
- do **not** allow mark for embryos lost* 1

[5]

Q33.

- (a) inhibits FSH (production / secretion) 1
- (therefore) no eggs mature / released
if no other marks gained allow 1 mark for no eggs produced 1

or

effect of FSH on ovary described
references to LH are neutral

- (b) *maximum 4 marks if no conclusion*

Pros max 2marks from 4 marks e.g.

- large scale trial gave better results
- chose uneducated women so that if these women could use it correctly, women elsewhere would be able to cons max 3 marks from 4 marks e.g.
- used pill with high dose of hormone – **either** so results not valid for general use of hormone **or** dangerous
- side effects ignored

- women not told pill was experimental / pill might have side effects
 - no placebo
 - should have tried a range of doses
 - should have done pre-trial to check for side effects
- 4
- conclusion 1 mark e.g.
 trials flawed therefore cons outweigh pros
- accept reverse e.g. trials flawed but pros outweigh cons
- 1

[7]

Q34.

- (a) any **three** from:
- water
allow breathing / oxygen / carbon dioxide
 - ions / minerals / salts
allow sodium / chloride, other ions neutral
 - temperature
allow heat
 - blood sugar
 - heart rate
 - blood pressure
ignore urea
- 3
- (b) contraceptive drug
- 1
- fertility drug
- 1
- (c) (i) eg nicotine, alcohol, cocaine, heroin, painkillers, tranquilisers, LSD
allow cannabis / weed or other alternative names
allow tobacco
ignore smoking / ecstasy
- 1
- (ii) alters body chemistry **or** craving / needing / dependence
allow psychological dependence
- 1
- withdrawal symptoms on stopping
allow withdrawal described

allow 'feel ill without it'

1

[8]

Q35.

(a) ovary or ovaries

1

(b) (hormone) implant

1

(c) do not have to remember to take

1

(d) does not involve hormone

allow coil may be dislodged

or

it is a mechanical method

allow egg is fertilised / released

allow not preventing egg fertilisation / release

1

(e) involves death of fertilised egg

allow embryo / baby for fertilised egg

or

(regard) fertilised egg as human

ignore against religion only

allow fertilised egg is alive

or

stops fertilised egg developing

ignore side effects

1

(f) (i) inhibit FSH (production)

allow inhibits LH

1

so no eggs mature / develop / are produced

allow (LH) stimulates egg release

ignore progesterone

1

(ii) contains FSH

allow contain LH

1

which causes egg to mature / develop / be produced

allow (LH) stimulates egg release

or

in women whose FSH is low

1

[9]

Q1.

A runner might drink a special 'sports drink' at intervals during a marathon race. The table shows the substances present in a sports drink.

Substance	Percentage
Water	
Sugar	5.0
Ions	0.2

- (a) Complete the table to show the percentage of water in the sports drink. (1)
- (b) The runner sweats and also breathes heavily during the race.
- (i) Why does the runner need to sweat?

(1)
- (ii) Which **two** substances in the table are lost from the body in sweat?

(1)
- (iii) Which substance in the table is lost from the body during breathing?

(1)
- (c) How does the sugar in the sports drink help the athlete during the marathon?

(2)
- (Total 6 marks)**

Q2.

Kidney transplants were introduced in the twentieth century as one way of treating patients with kidney failure.

- (i) Give **one** other way of treating kidney failure.

(1)

(ii) The patient's body may reject a transplanted kidney unless doctors take precautions.

Some of these precautions are listed below.

- A donor kidney is specially chosen.
- The recipient's bone marrow is treated with radiation.
- The recipient is treated with drugs.
- The recipient is kept in sterile conditions.

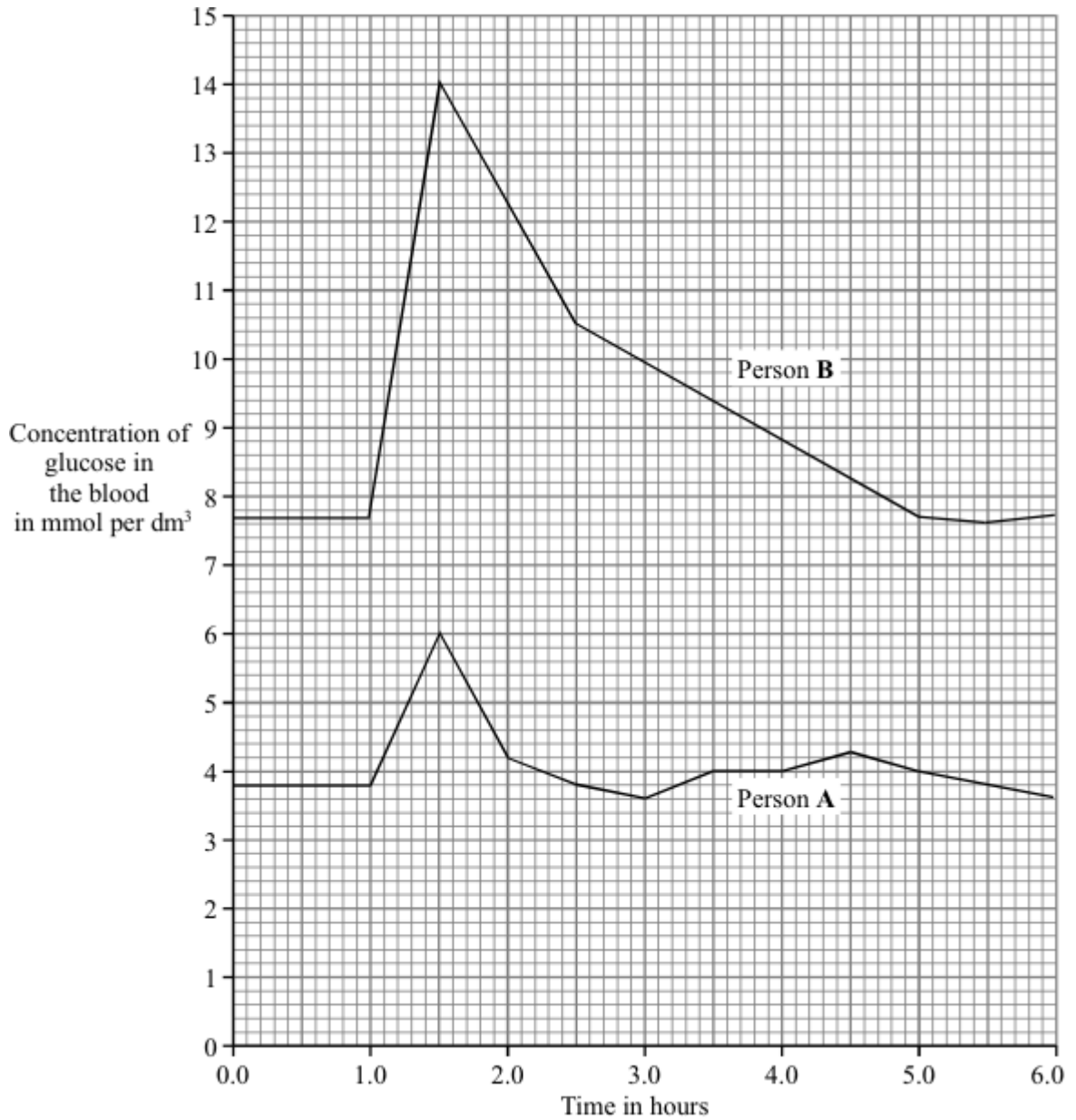
Explain how **each** of these precautions may help the patient to survive.

(4)

(Total 5 marks)

Q3.

The graph shows the concentration of glucose in the blood of two people. Person **A** is a non-diabetic. Person **B** has diabetes. Each person ate 75 grams of glucose at 1.0 hours.



- (a) (i) What was the maximum concentration of glucose in the blood of Person **A**?
 _____ mmol per dm³ (1)
- (ii) After eating the glucose, how long did it take for the concentration of glucose in the blood of Person **B** to return to normal?
 _____ hours (1)
- (b) A diabetic person does not produce enough insulin.
- (i) Which organ produces insulin?
 _____ (1)

(ii) Write the letter **X** on the graph to show one time when the blood of Person **A** would contain large amounts of insulin.

(1)

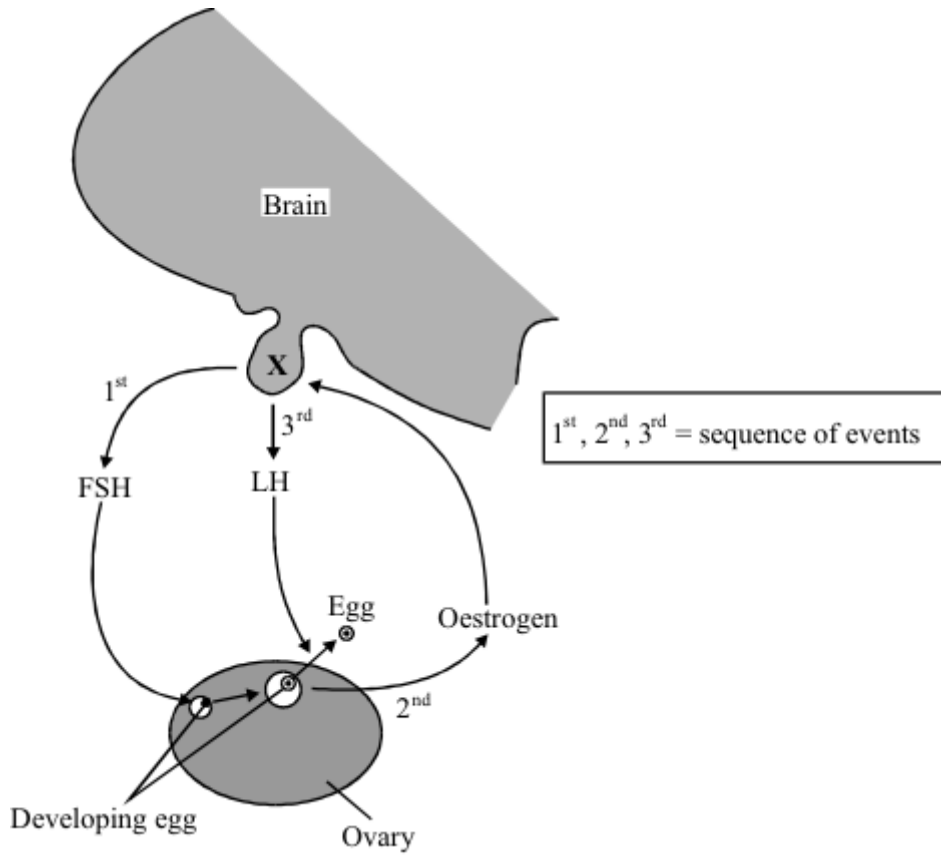
(c) A high concentration of glucose in the blood can harm body cells as a result of osmosis.
Explain why.

(4)

(Total 8 marks)

Q4.

The diagram shows how three hormones, FSH, LH and oestrogen, work together in a woman's body.



(a) Name the part of the brain labelled X.

(1)

(b) Use information from the diagram and your own knowledge to explain why some oral contraceptive pills contain oestrogen.

(3)

(Total 4 marks)

Q5.

The table shows the concentrations of some substances in human blood plasma, in the

filtrate produced by the kidney and in the urine.

Substance	Concentration in grams per dm ³		
	Blood plasma	Filtrate	Urine
Glucose	1.0	1.0	0.0
Amino acids	0.5	0.5	0.0
Urea	0.3	0.3	20.0
Protein	80.0	0.0	0.0
Ions	7.2	7.2	15.0
Water	912.0	990.0	970.0

(a) Explain why:

(i) the concentration of glucose in the filtrate is the same as in the blood plasma;

(1)

(ii) there is no glucose present in the urine.

(1)

(b) Suggest why there is no protein present in either the filtrate or the urine.

(1)

(c) The volume of water removed in the urine is variable. Explain how the human body reduces the volume of urine produced when less water is consumed.

(3)
(Total 6 marks)

Q6.

When people suffer from kidney failure, they may be treated with a dialysis machine. The patients' blood is passed through the machine where the composition of the blood is adjusted.

- (a) Name a waste substance, carried in the blood, which is removed by the dialysis machine.

(1)

- (b) Doctors sometimes give these patients dialysis treatment, rather than a kidney transplant.

Suggest **four** reasons for this.

(4)
(Total 5 marks)

Q7.

Hormones are sometimes used to regulate human reproduction.

- (a) (i) What is a hormone?

(1)

- (ii) How are hormones transported around the body?

(1)

- (b) Describe the benefits and possible problems that may result from the use of hormones to regulate human reproduction. You should refer to fertility drugs and contraceptives in your answer.

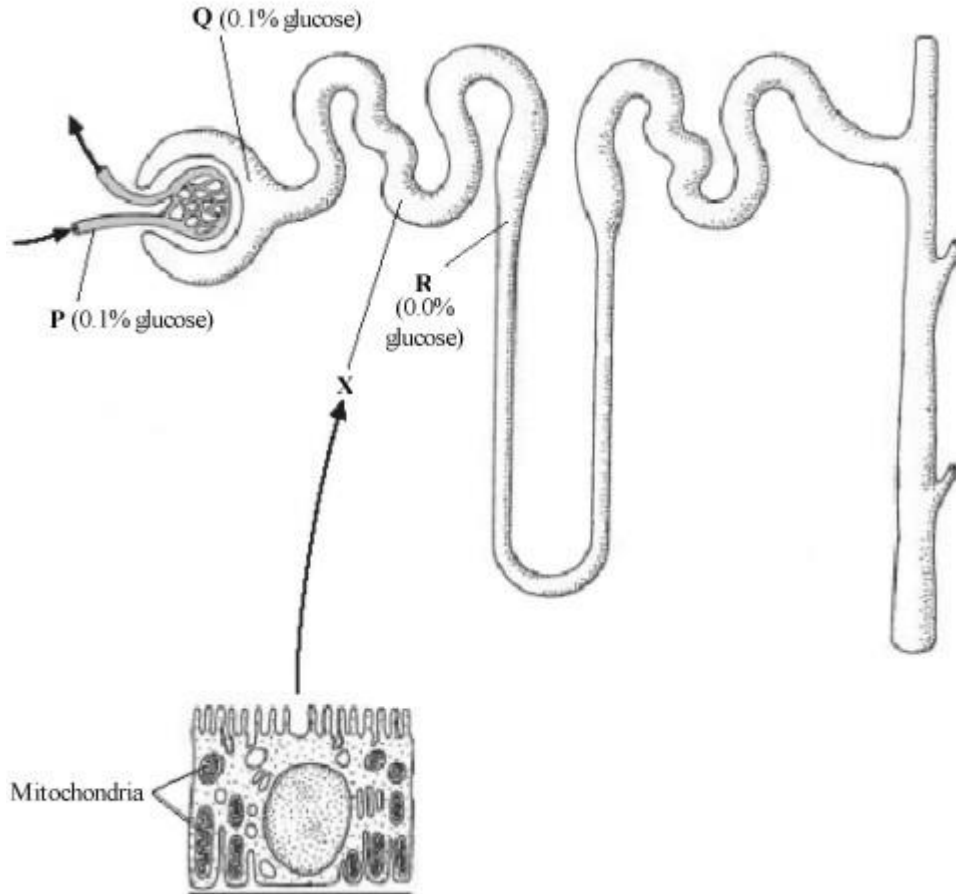
To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

(4)

(Total 6 marks)

Q8.

The diagram shows the structure of a kidney tubule.



Cell in wall of Region X.

All of these cells have **large numbers** of mitochondria.

- (a) Give the full name of the process which takes place in the mitochondria.

(2)

- (b) The concentration of glucose in the blood at **P**, and in the fluid at **Q**, is 0.1 per cent. The concentration of glucose in the fluid at **R** is 0.0 per cent.

Use information from the diagram, and your own biological knowledge, to explain the change in glucose concentration from point **P** through to point **R**.

(5)
(Total 7 marks)

Q9.

Oestrogen, luteinising hormone (LH) and follicle stimulating hormone (FSH) work together to coordinate the menstrual cycle. A woman will be infertile if her pituitary gland does not release enough follicle stimulating hormone (FSH).

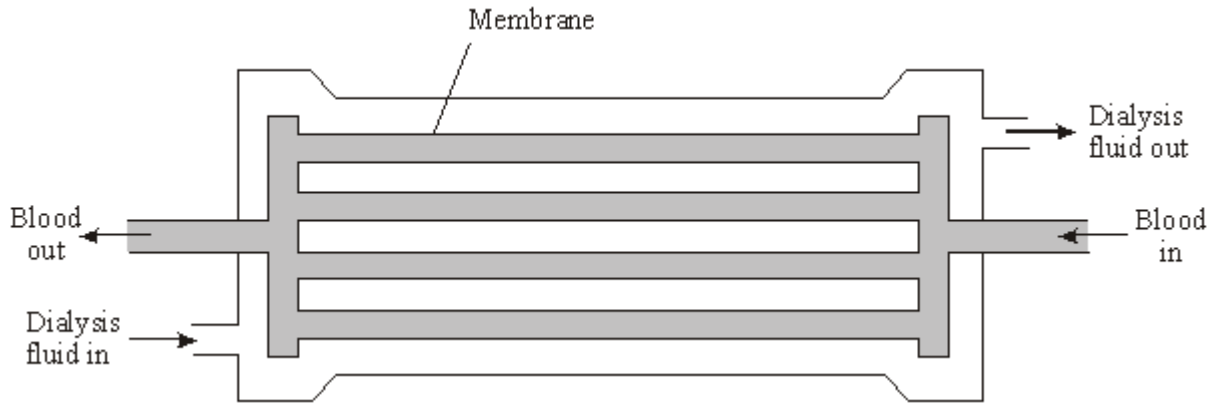
Explain how injections of FSH could increase her chances of having a baby.

(Total 3 marks)

Q10.

A woman suffers a minor infection that affects her kidneys. She is sent to hospital for treatment with a dialysis machine.

A simplified diagram of a dialysis machine is shown below.



(a) Explain why the membrane is important in the dialysis machine.

(2)

(b) Some of the components of the woman's blood and of the dialysis fluid entering the machine are shown in the table.

Component	Woman's blood entering machine	Dialysis fluid entering machine
Blood cells	✓	✗
Glucose	✓	✓
Urea	✓	✗

Key: ✓ = present ✗ = absent

Use the information in the table to explain the composition of the dialysis fluid entering the machine.

(4)

(c) One alternative to treatment with a dialysis machine is to have a kidney transplant.

Suggest why a kidney transplant might **not** be suitable in this woman's case.

(2)

(d) Before dialysis treatment begins, the dialysis machine must be filled with blood. The woman has blood group **O**.

(i) What features of her blood make it group **O**?

(2)

(ii) Why must the blood in the dialysis machine, before her treatment begins, also be blood group **O**?

(1)

(Total 11 marks)

Q11.

(a) Why is the removal of water from the body an example of homeostasis?

(1)

(b) Why is homeostasis important in the body?

(1)

(c) This system also excretes a substance called urea.

What is excretion, and why is it necessary in the body?

(2)
(Total 4 marks)

Q12.

Coordination of the body can be affected by chemicals called hormones

- (a) (i) Where are hormones produced?

(1)

- (ii) How do hormones move around the body?

(1)

- (b) Insulin is a hormone.

- (i) Where is insulin produced?

(1)

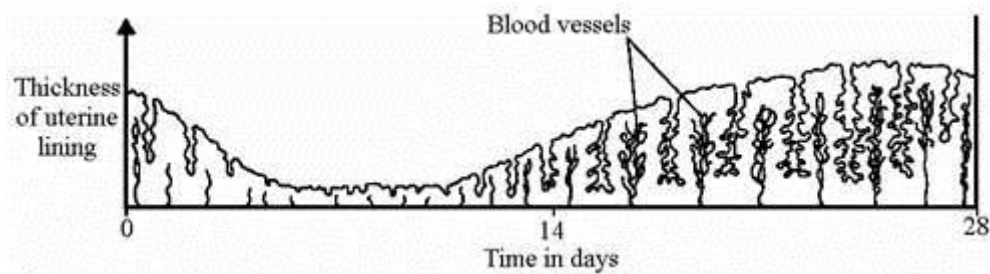
- (ii) Explain the role of insulin in controlling blood sugar levels.

(4)

(Total 7 marks)

Q13.

- (a) The diagram shows changes in the uterus lining during 28 days of a menstrual cycle.



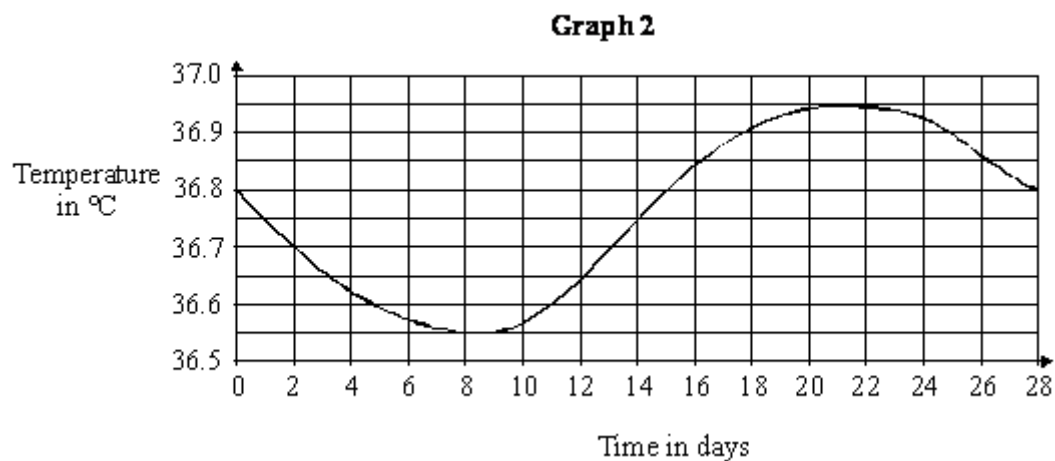
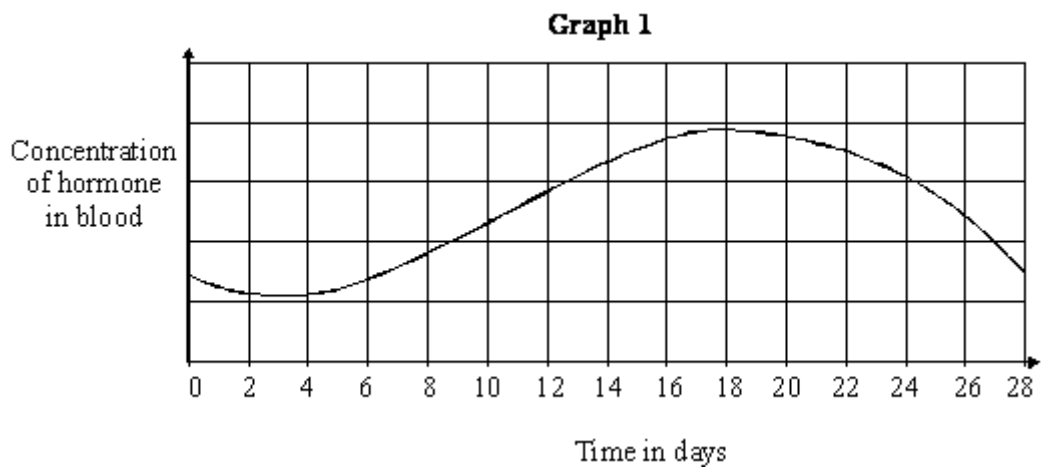
Describe how changes in the lining shown in the diagram adapt it for its function if an egg is fertilised.

(3)

- (b) The concentration of a certain hormone in the blood of a woman was measured during her menstrual cycle. The woman's temperature was also measured each day during this cycle.

Graph 1 shows the results obtained for the measurement of the concentration of the hormone.

Graph 2 shows the results obtained for the measurement of her body temperature.



- (i) What evidence is there that changes in the concentration of the hormone may

be connected with changes in body temperature?

(1)

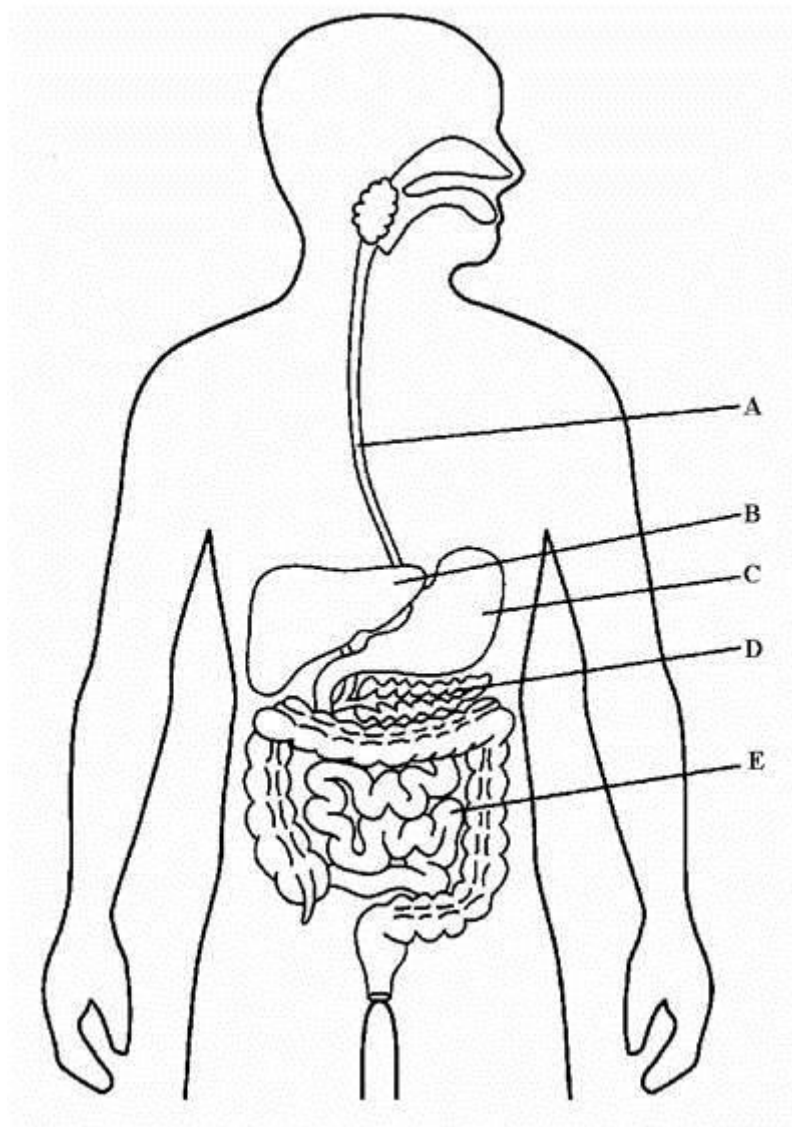
(ii) What is the difference between the minimum and maximum temperatures shown by **Graph 2**? Show your working.

(2)

(Total 6 marks)

Q14.

The diagram shows part of the human digestive system.



(i) Name part **B**.

(1)

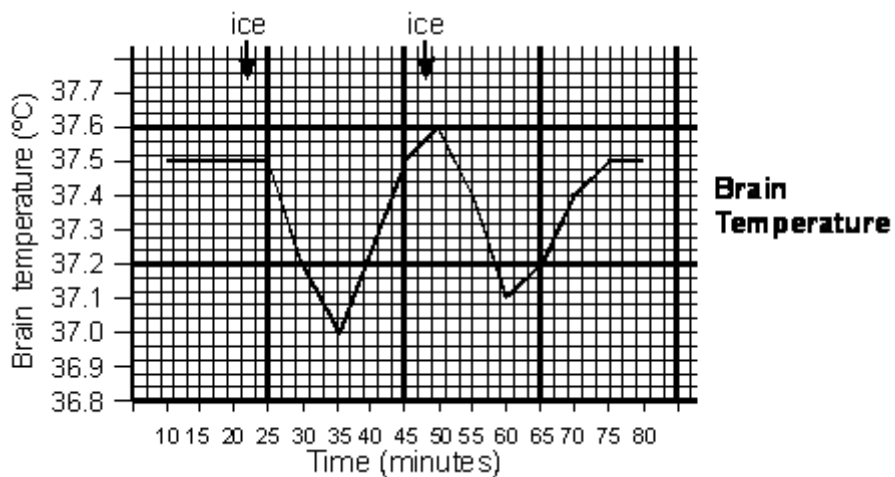
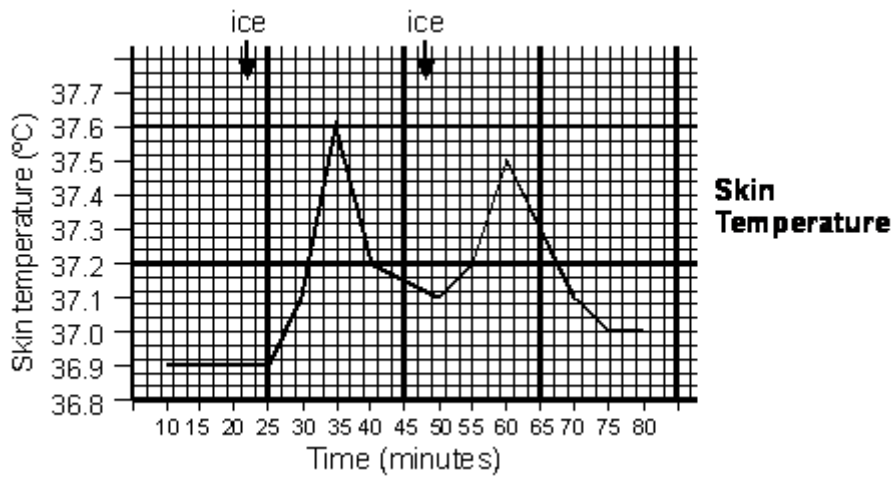
(ii) Describe the role of **B** and **D** in reducing blood sugar levels.

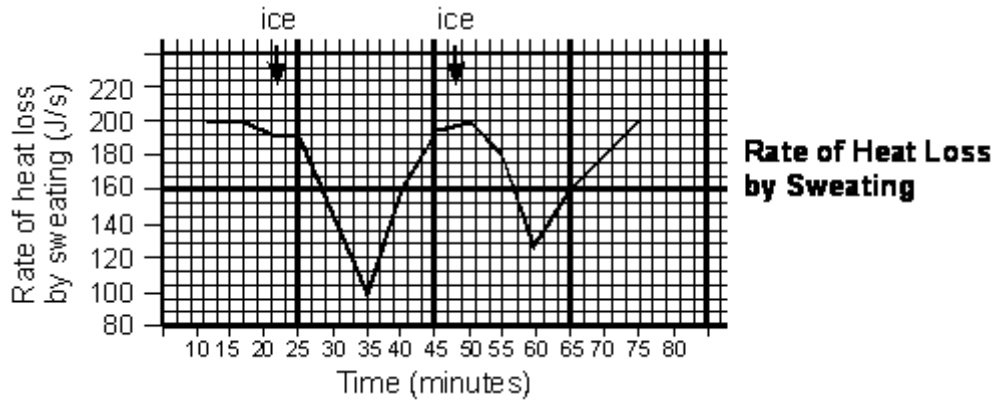
(2)

(Total 3 marks)

Q15.

The graphs show the results of an investigation into the control of sweating in humans. The subject was placed in a chamber where the temperature was maintained at 45°C. The subject swallowed ice at the times indicated on the graphs.





(a) What was the relationship between swallowing ice and the subject's

(i) skin temperature?

(1)

(ii) brain temperature?

(1)

(iii) rate of heat loss by sweating?

(1)

(b) Explain, as fully as you can, why the subject's brain temperature, skin temperature and rate of heat loss by sweating were affected by swallowing ice in the way shown by the graphs.

(8)
(Total 11 marks)

Q16.

(a) Describe, as fully as you can, the job of

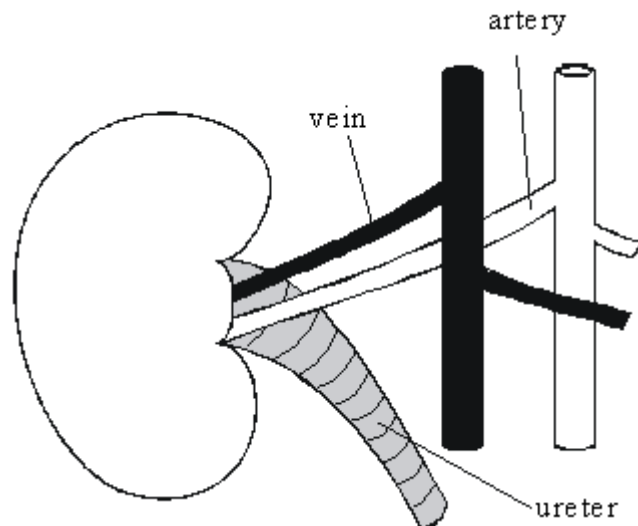
(i) the circulatory system.

(2)

(ii) the digestive system.

(3)

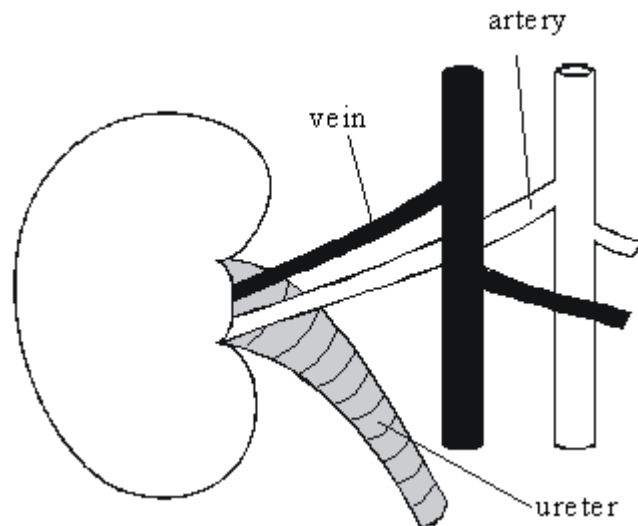
(b)



The drawing shows a kidney, its blood supply and the ureter (a tube which carries urine from the kidney to the bladder). The amount and composition of the urine flowing down the ureter change if the blood in the artery contains too much water. Describe these changes and explain how they take place.

(4)
(Total 9 marks)

Q17.



- (a) The drawing shows a kidney, its blood supply and the ureter (a tube which carries urine from the kidney to the bladder). The amount and composition of the urine flowing down the ureter changes if the blood in the artery contains too much water. Describe these changes and explain how they take place.

(4)

(b) (i) Describe, as fully as you can, **two** methods of treating patients who suffer from kidney failure.

1. _____

2. _____

(4)

(ii) Compare the advantages and disadvantages of the two methods of treatment which you have described.

(5)

(Total 13 marks)

Q18.

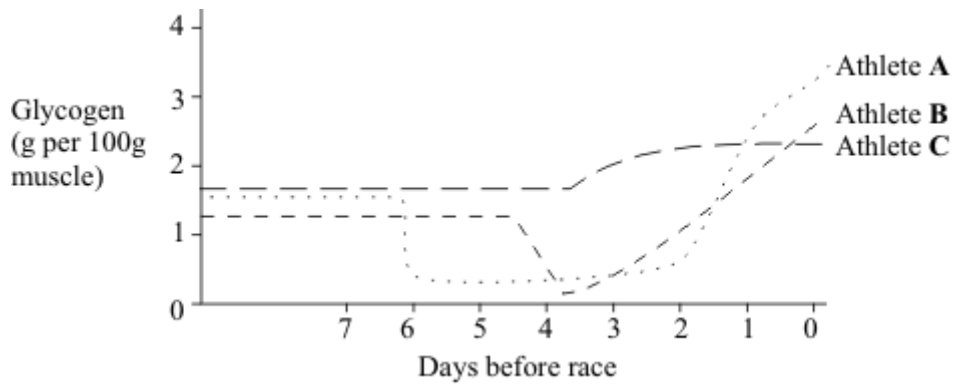
Marathon runners are recommended to have a high carbohydrate diet prior to a race. Three athletes tried out three dietary regimes prior to a marathon race.

These three dietary regimes were as follows.

Athlete A	Up to 7 days before the race	-	Normal mixed diet
	7 days before the race	-	Prolonged extreme physical activity

- 6-3 days before the race - Protein and fat diet; no carbohydrate
- 2 and 1 days before the race - Large carbohydrate intake
- Athlete B** Up to 5 days before race - Normal mixed diet
- 5 days before the race - Prolonged extreme physical activity
- 4-1 days before the race - Large carbohydrate intake
- Athlete C** Up to 4 days before the race - Normal mixed diet
- 4-1 days before the race - Large carbohydrate intake

The graph below shows the effect of each of these dietary regimes on glycogen levels in the athletes' muscles



- (a) (i) What is the immediate effect of extreme physical activity on the glycogen content of muscles?

(1)

- (ii) Describe how this effect occurs.

(3)

- (b) (i) Evaluate the three regimes as preparation for a marathon race.

(3)

- (ii) Suggest a possible explanation for the different effects of the three regimes.

(2)

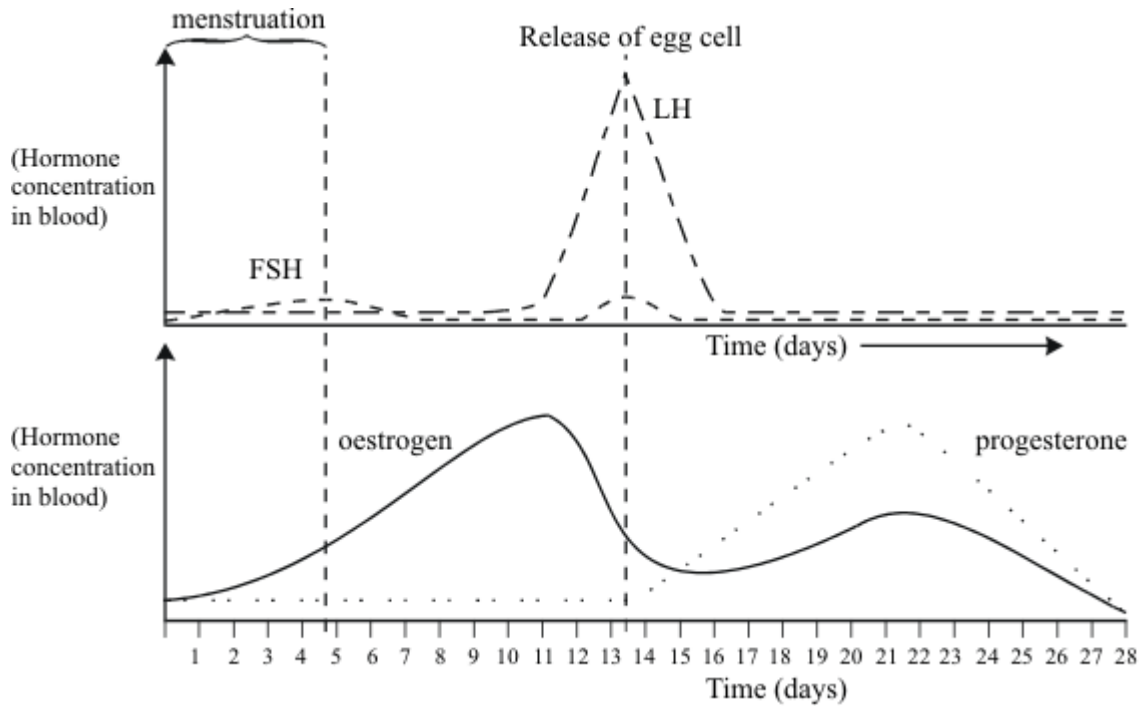
(Total 9 marks)

Q19.

- (a) Describe, as fully as you can, how a human foetus gets rid of the carbon dioxide produced during respiration.

(3)

- (b) The female menstrual cycle is controlled by a number of hormones. The graph below shows the concentrations of four of these hormones at different times during the menstrual cycle.



The functions of the four hormones include:

FSH – stimulates the development of immature cells into eggs in the ovary.

LH – stimulates the release of the mature egg cell.

Oestrogen – stimulates production of LH, but inhibits FSH production.

Progesterone – inhibits production of both LH and FSH.

Use this information to explain as fully as you can:

- (i) how the concentration of oestrogen can affect and control the development and release of an egg during the monthly cycle;

(3)

- (ii) why progesterone continues to be produced throughout pregnancy.

(3)

- (c) Explain, as fully as you can, how one or more of these hormones could be used to treat infertility.

(3)

- (d) A hormone called mifepristone is used in low doses as a female contraceptive. Higher doses can be used to induce an abortion. As a consequence mifepristone is often referred to as 'the morning-after pill'. The use of mifepristone is currently tightly controlled by the medical profession.

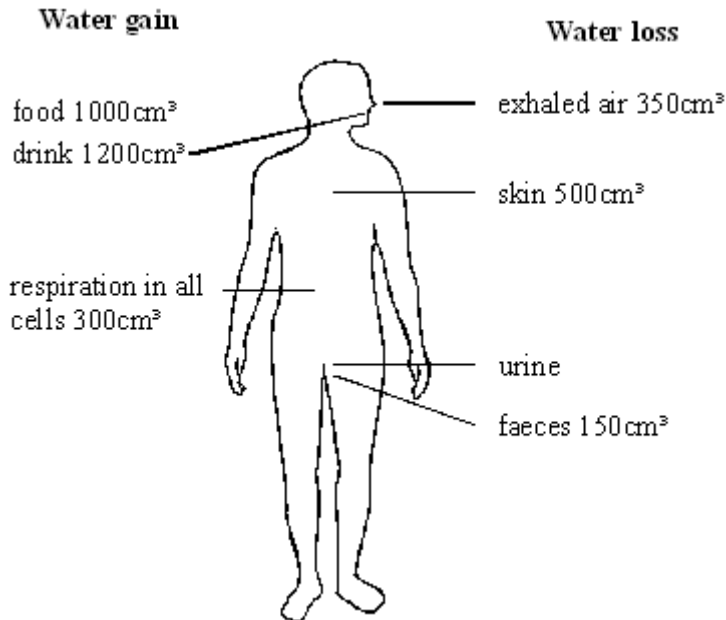
Evaluate the benefits and problems which might arise from making this hormone more freely available.

(4)

(Total 16 marks)

Q20.

The diagram shows the mean daily input and output of water for an adult.



The kidneys keep the water content of the body constant by controlling the volume of water passed out in the urine.

- (i) Use data from the diagram to calculate the mean daily output of water in urine. Show your working.

Answer _____ cm³

(2)

- (ii) Describe how the amount of water in the body is controlled by the kidneys.

(3)

(Total 5 marks)

Q21.

Read the following passage which is from an advice book for diabetics.



Insulin Reactions

Hypoglycaemia or 'hypo' for short, occurs when there is too little sugar in the blood. It is important always to carry some form of sugar with you and take it immediately you feel a 'hypo' start. A hypo may start because:

- you have taken too much insulin, or
- you are late for a meal, have missed a meal altogether, have eaten too little at a meal, or
- you have taken a lot more exercise than usual.

The remedy is to take some sugar.

An insulin reaction usually happens quickly and the symptoms vary – sweating, trembling, tingling of the lips, palpitations, hunger, pallor, blurring of the vision, slurring of speech, irritability, difficulty in concentration.

Do not wait to see if it will pass off, as an untreated 'hypo' could lead to unconsciousness.

(a) Many diabetics need to take insulin.

(i) Explain why.

(2)

(ii) Explain why there is too little sugar in the blood if too much insulin is taken.

(3)

(iii) Explain why there is too little sugar in the blood if the person exercises more than usual.

(3)

- (b) Suggest why sugar is recommended for a 'hypo', rather than a starchy food.

(3)

- (c) Explain how the body of a healthy person restores blood sugar level if the level drops too low.

(3)

- (d) Explain, using insulin as an example, what is meant by negative feedback.

(3)

(Total 17 marks)

Q22.

The kidneys remove waste materials from the liquid part of the blood.

- (a) What name is given to the solution of waste stored in the bladder? _____

(1)

- (b) The table shows the concentration of certain substances

- in the liquid part of the blood
- in the liquid that has just been filtered from the blood in the kidneys

- in the solution in the bladder.

SUBSTANCE	CONCENTRATION (%)		
	IN LIQUID PART OF BLOOD	IN LIQUID THAT HAS BEEN FILTERED IN THE KIDNEYS	IN LIQUID IN THE BLADDER
Protein	7.0	0	0
Salt	0.35	0.35	0.5
Glucose	0.1	0.1	0
Urea	0.03	0.03	2.0

- (i) Which **one** of these substances does **not** pass into the liquid that is filtered in the kidneys?

_____ (1)

- (ii) Suggest **one** reason why this substance does **not** pass out of the blood.

_____ (1)

- (c) What happens to the glucose in the liquid that is filtered in the kidneys?

_____ (1)

- (d) Explain why the concentration of urea in the liquid in the bladder is much greater than the concentration of urea in the liquid that is filtered in the kidneys.

_____ (1)

(Total 5 marks)

Q23.

The kidneys remove waste materials from the liquid part of the blood.

The table shows the concentration of certain substances

- in the liquid part of the blood
- in the liquid that has just been filtered from the blood in the kidneys
- in the solution in the bladder.

SUBSTANCE	CONCENTRATION (%)		
	IN LIQUID PART OF BLOOD	IN LIQUID THAT HAS BEEN FILTERED IN THE KIDNEYS	IN LIQUID IN THE BLADDER
Protein	7.0	0	0
Salt	0.35	0.35	0.5
Glucose	0.1	0.1	0
Urea	0.03	0.03	2.0

- (a) (i) Which **one** of these substances does **not** pass into the liquid that is filtered in the kidneys?
- _____ (1)
- (ii) Suggest **one** reason why this substance does **not** pass out of the blood.
- _____ (1)
- (b) Explain why the concentration of urea in the liquid in the bladder is much greater than the concentration of urea in the liquid that is filtered in the kidneys.
- _____ (1)
- _____ (1)
- (c) (i) Describe how a kidney dialysis machine works.
- _____ (3)
- _____ (3)
- _____ (3)
- _____ (3)
- (ii) Use the data in the table to suggest the concentration that the salt in the dialysis fluid should be. Explain your answer.
- Concentration _____
- Explanation _____

(2)
(Total 8 marks)

Q24.

High levels of oestrogen inhibit the production of FSH by the pituitary gland.

- (i) Explain how this is an example of negative feedback.

(2)

- (ii) One drug that is used to treat female infertility is clomiphene. Clomiphene blocks the inhibitory effect of oestrogen on FSH production.

Explain how this may help in the treatment of infertility.

(2)

(Total 4 marks)

Q25.

- (a) Explain, as fully as you can, why respiration has to take place more rapidly during exercise.

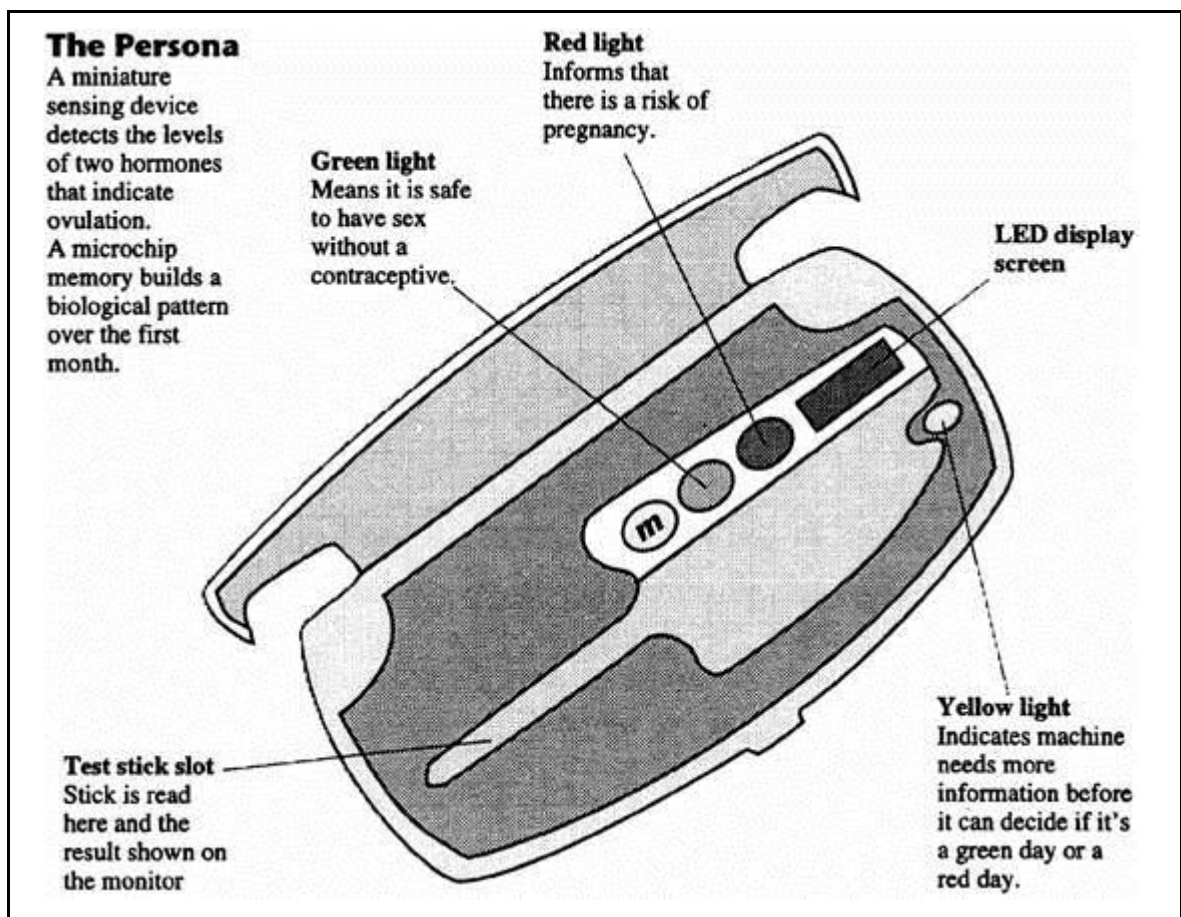
(2)

- (b) During exercise the process of respiration produces excess heat. Explain how the body prevents this heat from causing a rise in the core (deep) body temperature.

(4)
(Total 6 marks)

Q26.

In women, two hormones control ovulation (the release of eggs from the ovaries). The drawing shows a monitoring machine which women can use to measure the amounts of the two hormones. A test stick is dipped in the woman's urine each morning, then placed in a slot in the machine.



- (a) The machine monitors the levels of two hormones.
 - (i) What is a hormone?

(1)

(ii) How are hormones transported around the body?

(1)

(b) A woman is unlikely to become pregnant if she has sex on the days when the machine shows a green light during the test. Use information from the drawing to suggest why.

(1)

(Total 3 marks)

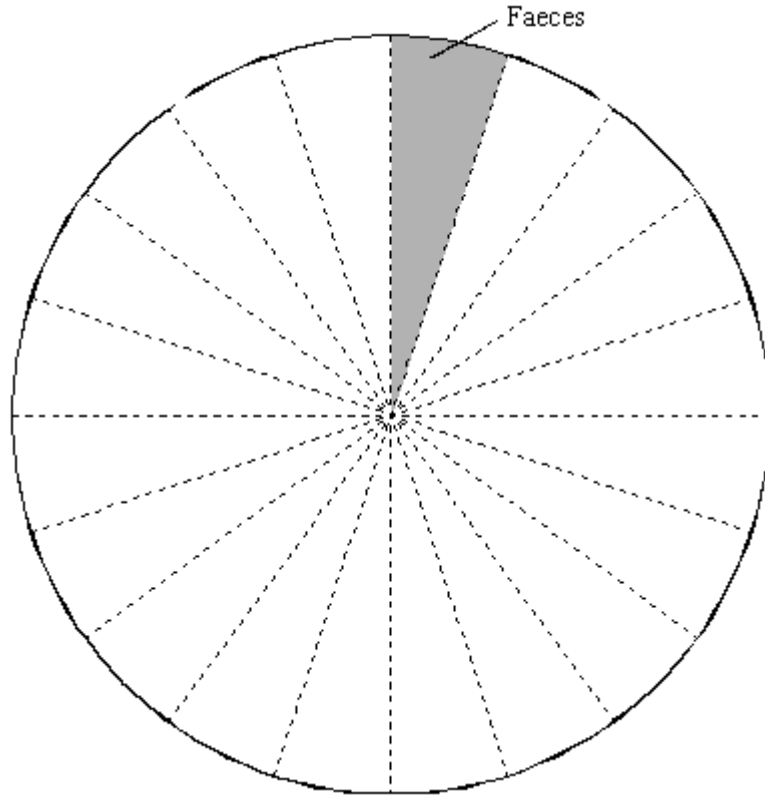
Q27.

The table shows how much water is lost in different ways from a student's body.

Way in which water is lost	Percentage of total
Breath	15
Faeces	5
Sweat	50
Urine	30

(a) Complete the pie chart.

One part has been done for you. Remember to label the pie chart.



(3)

- (b) The table is about waste products which are removed from the student's body.
 Complete the table by using the correct words from the box.

amino acids breath circulation digestion fatty acids
 glucose respiration sweat urine

Waste product	How it is produced	How it leaves the body
carbon dioxide	by _____	in _____
urea	from _____	in _____

(4)

(Total 7 marks)

Q28.

The monthly cycle of women is controlled by hormones.

- (a) Name the **two** glands that secrete these hormones.

1. _____
2. _____

(2)

(b) Describe **two** ways in which fertility in women can be controlled by giving hormones.

1. _____

2. _____

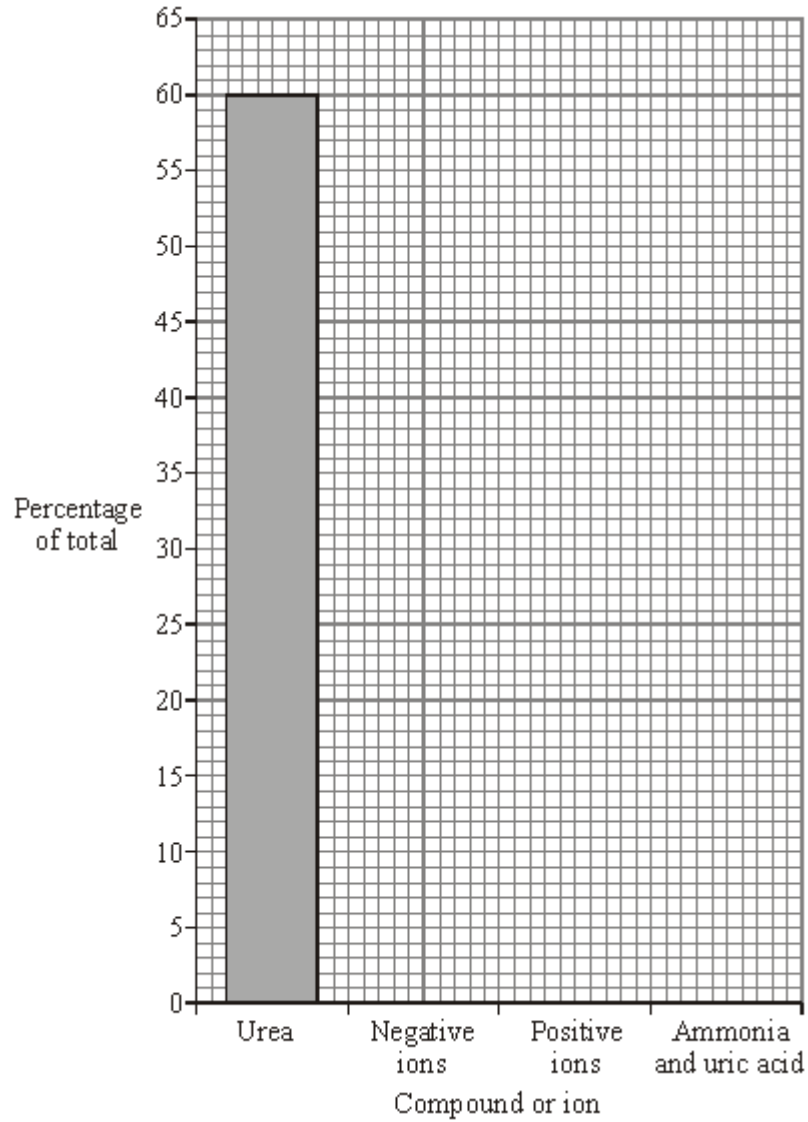
(2)
(Total 4 marks)

Q29.

(a) The table shows the compounds and ions dissolved in a student's urine.

Compound or ion	Percentage of total
urea	60
negative ions	25
positive ions	10
ammonia and uric acid	5

(i) Complete the bar chart. One bar has been drawn for you.



(2)

- (ii) There is a total of 10 g of compounds and ions dissolved in a sample of this student's urine. Calculate the mass of urea in the sample. Show clearly how you work out your answer.

Mass of urea _____ g

(2)

- (b) Use words from the box to complete the sentences.

anus bladder kidneys liver lungs

Plasma transports carbon dioxide from the body to the _____ .

Plasma transports urea from the _____ to the _____ .

(3)

(Total 7 marks)

Q30.

This question is about the hormones that control the monthly cycle in women.

Complete the sentences.

Hormones control the monthly release of an egg from a woman's _____ .

They also control the thickness of the lining of her _____ .

Hormones that are given to women to stimulate the release of eggs are called _____ drugs.

Hormones that are given to women to prevent the release of eggs are called oral _____ .

(Total 4 marks)

Q31.

The table shows the amounts of some of the substances filtered, reabsorbed and excreted by the kidneys in one day.

Substance	Amount filtered	Amount reabsorbed	Percentage reabsorbed	Amount excreted
water		178.5 litres	99.2 %	1.5 litres
urea	56 g	28 g	50 %	28 g
glucose	800 units	800 units	100 %	0
sodium	25 200 units	25 050 units		150 units
chloride	18 000 units	17 850 units	99.2 %	150 units

(a) Calculate the amount of water filtered by the kidneys in one day.

Amount _____ litres

(1)

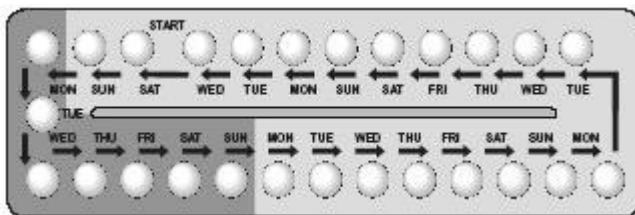
(b) Calculate the percentage of the filtered sodium that was reabsorbed. Show clearly how you work out your answer.

Percentage reabsorbed _____

(1)
(Total 2 marks)

Q32.

The picture shows some birth control (contraceptive) pills for women.



These are some facts about using the birth control pills:

- birth control pills are 99 per cent effective in preventing pregnancy
- the hormones in the pills have some rare but serious side effects
- this method of birth control gives no protection against sexually transmitted diseases
- the hormones in the pills give protection against some women's diseases
- the woman has to remember to take the pill every day
- the woman's monthly periods become more regular.

Use the information above to answer these questions.

(a) Give **two** advantages of using birth control pills.

1. _____

2. _____

(2)

(b) Give **two** disadvantages of using birth control pills.

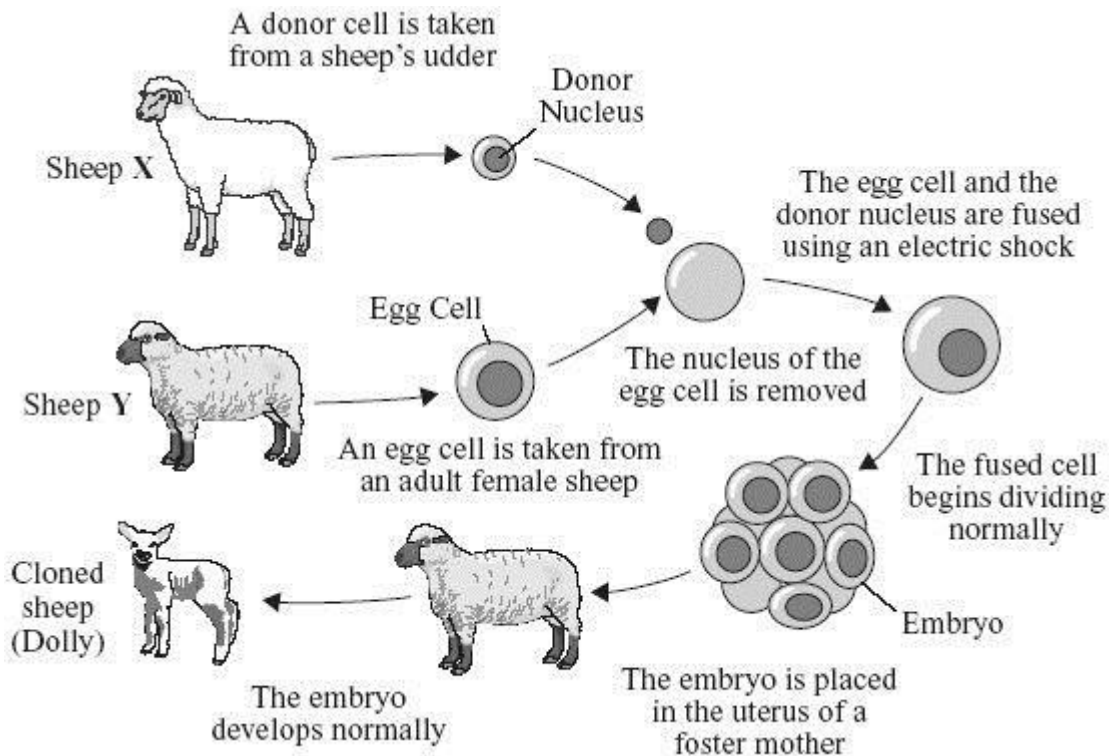
1. _____

2. _____

(2)
(Total 4 marks)

Q33.

The diagram shows how Dolly the sheep was cloned.



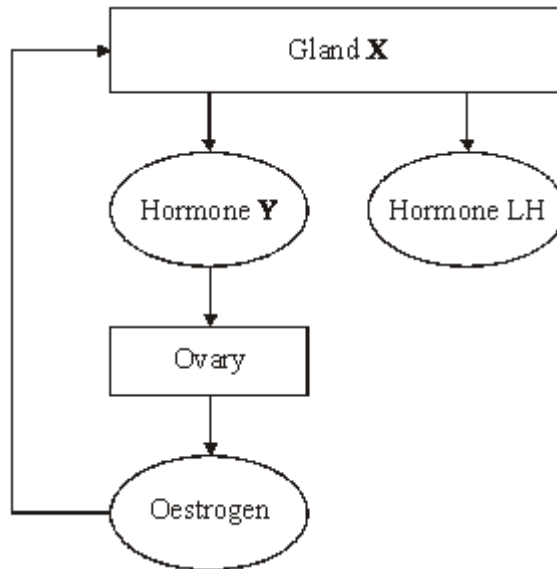
(a) Name the type of cell division that occurs:

(i) as the egg cell is produced; _____

(ii) as the fused cell begins to divide normally. _____

(2)

(c) The diagram below shows the relationships between the glands and hormones that control the menstrual cycle of a woman.



(i) Name:
 gland X; _____
 hormone Y. _____

(2)

(ii) Give **two** effects of the hormone oestrogen on gland X.

1. _____

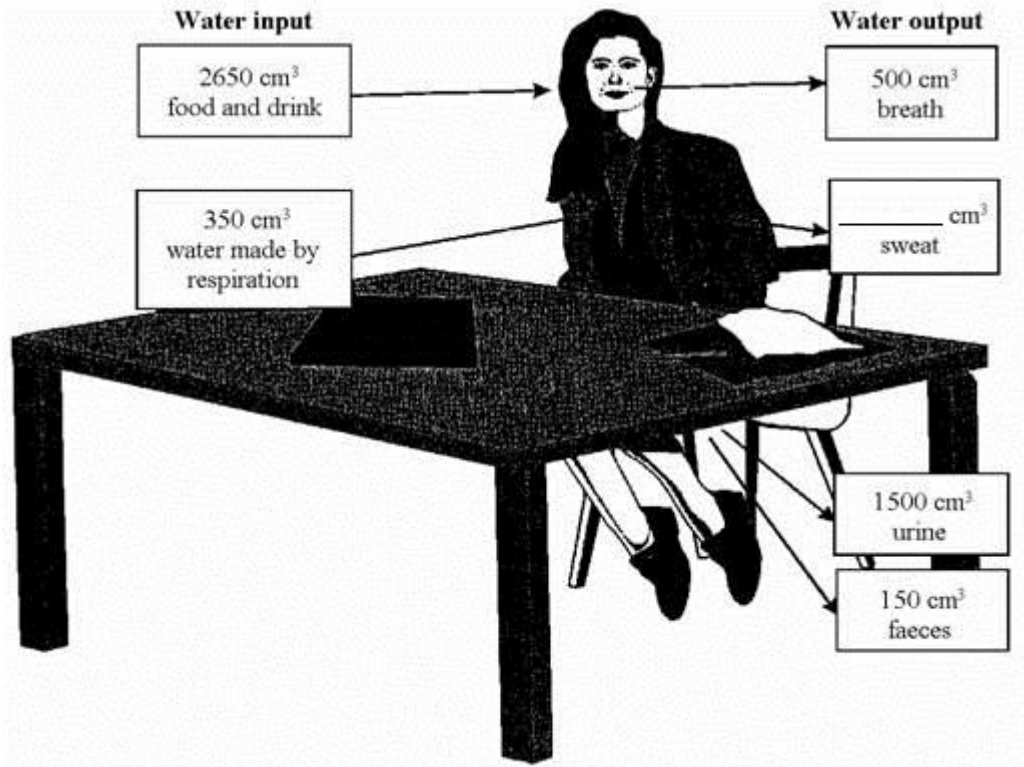
2. _____

(2)
(Total 6 marks)

Q34.

The diagram shows a water balance for a girl who spends most of the day working at a desk. It is not complete.

(a) Complete the diagram by writing in the volume of sweat produced.



(1)

- (b) The next day she spent much of the day training, doing many different types of exercise.

State how **each** of the following would change and why it would be different from the previous day.

- (i) The amount of water given off as sweat.

(2)

- (ii) The amount of water breathed out.

(2)

- (iii) The amount of urine passed, if she had the same water intake as on the previous day.

(2)

(c) Which organ controls the amount of water in the body?

(1)
(Total 8 marks)

Q35.

Information is passed to target organs in the body by hormones.

(a) (i) How do hormones travel around the body?

(1)

(ii) What name is given to the organs that secrete hormones?

(1)

(b) Explain the cause of diabetes and how it is controlled.

(3)
(Total 5 marks)

Mark schemes

Q1.

- (a) 94.8 1
- (b) (i) to cool (the body) / maintain (body) temperature
*do **not** accept let out heat* 1
- (ii) water **and** ions 1
- (iii) water ignore CO₂, and vapour 1
- (c) any **two** from:
used in respiration
provides energy
(energy) needed for movement / running / muscle action 2

[6]

Q2.

- (i) dialysis (machine) or kidney machine 1
- (ii) (specially chosen kidney) similar tissue type
accept same blood group 1
- (irradiation of bone marrow) to stop white cell production
allow any named white blood cell 1
- (treated with drugs) suppress immune system 1
- (sterile conditions) avoid exposure to pathogens / infection 1

[5]

Q3.

- (a) (i) 6 1
- (ii) 4 1
- (b) (i) pancreas

- 1
- 1
- (c) any **four** from:
- water movement
do **not** accept solution
- out of cells
- dilute to concentrated solution
accept reference to correct gradient -
high ∇ to low ∇ **or** high to low 'water concentration'
must be unambiguous – i.e. **not** 'high to low concentration'
accept low to high concentration
- reference to partially / selectively
permeable membranes **or** described
- cells shrink / get smaller
allow crenated
ignore plasmolysed / flaccid / floppy
etc
- 4
- [8]**

Q4.

- (a) pituitary (gland / body) 1
- (b) oestrogen inhibits the release of FSH
ignore references to LH 1
- FSH stimulates follicle development / causes egg to develop
or no follicle / egg development if high oestrogen
accept growth / maturing / ripening for development 1
- no ovulation / no egg release
do **not** accept no egg to be fertilised 1
- [4]**

Q5.

- (a) (i) glucose passes through the filter / from plasma to filtrate
ignore diffuses 1

(ii) glucose is reabsorbed or glucose taken back into the blood
ignore filtered

1

(b) protein (molecules) are (too) large (to pass through the filter)

1

(c) any **three** from:

blood becomes more concentrated / too salty / has lower water potential **or** too little water in the blood

hypothalamus detects this

release of ADH

by pituitary

increased reabsorption of water

3

[6]

Q6.

(a) urea

1

(b) any **four** from:

- suitable for short term
accept reverse arguments with respect to transplants
- no long term drug treatment
- no rejection chance
- no / less risk during surgery
accept risk of anaesthetic
- operations unsuitable / risky for weakness / old age
- risk of infection
- no (suitable) kidneys available for transplant / long waiting list /
- less painful

4

[5]

Q7.

(a) (i) any **one** from:

- chemical messenger

- chemical / substance released in one part to have effect elsewhere in body
- chemical / substance which affects another / target organ / tissues / cells
allow chemical from endocrine gland

1

- (ii) in blood / circulatory system / any named part including plasma
extra wrong answer would cancel example
not red blood cells

1

(b) **Quality of written communication:**

correct use of at least two relevant scientific terms spelt phonetically
e.g. pregnancy, ovulation, FSH, oestrogen, progesterone, ovary, follicle, circulation, thrombosis, feminisation, sperm count, STD
Q ✓ or Q ✗

1

any **three** from:

Oral contraceptives:

(benefit)

- prevent (unwanted) pregnancy **or** prevent egg release
- regulate menstrual cycle / periods

(problems)

- prolonged use may prevent later ovulation / cause infertility
- named side-effect on female body
e.g. circulatory problems / weight gain / nausea / headache / breast cancer / mood swings
- increased promiscuity / increase in STD's / STI's
- named side-effect on environment
e.g. feminisation of fish **or** lowered sperm count in human males

Fertility drugs:

(benefit)

- can enable woman to have children **or** to become pregnant
or stimulates egg release

(problem)

- multiple births
*for full marks must score at least **one** re contraceptives **and***

at least **one** re fertility drugs
if unclear which type of hormone maximum **2** marks from 3

3

[6]

Q8.

(a) aerobic

1

respiration

'anaerobic respiration' = 1 mark

1

(b) any **five** from:

- glucose is a small molecule
- glucose passes through filter **or** glucose is filtered out of blood **or** glucose enters the capsule / kidney tubule / Q
- glucose reabsorption **or** glucose taken (back) into blood
*do **not** accept 'filtered' into blood / out of tubule*
- cells lining tubule have microvilli / shape described **or** cells lining tubule have large surface area
- active transport
- up concentration gradient
- use of energy / ATP
- long tubule for more reabsorption

5

[7]

Q9.

any **three** from:

FSH stimulates growth / maturing of follicle(s) / eggs

FSH stimulates oestrogen release

oestrogen stimulates development of uterus lining

oestrogen stimulates LH release / production

LH stimulates ovulation / egg release

[3]

Q10.

(a) semi / selectively / partially / differentially permeable

- | | |
|--|---|
| | 1 |
| separates blood and dialysis fluid | 1 |
| (b) any four from: | |
| blood cells cannot pass through membrane | |
| glucose retained in blood | |
| to stop water passing into blood / osmosis | |
| no (net) diffusion | |
| urea removed from blood by diffusion | |
| <i>accept excreted</i> | 4 |
| (c) problem may be temporary or has minor infection or problem could be cured by other means | 1 |
| operation / transplants carry risk | |
| <i>accept rejection</i> | 1 |
| (d) (i) no antigens | 1 |
| on (the surface) of red blood cells | 1 |
| (ii) would cause agglutination / clumping if different | |
| <i>ignore clotting and coagulation</i> | 1 |

[11]

Q11.

- | | |
|--|---|
| (a) water content (within the body/blood) is kept constant/ regulated/within very narrow limits/kept right
<i>do not accept general definition of homeostasis</i> | 1 |
| (b) because optimum conditions are needed for processes within the body / enzyme reactions
or
because there is a need to maintain a steady internal environment | 1 |
| (c) excretion is the removal from the body of waste products
<i>n.b. faeces is not an excretory product but may be neutral</i> | 1 |
| because waste products would (build up and) become toxic/poisonous/harmful | |

*do **not** accept makes us ill*
*do **not** accept block up system*
*do **not** accept unwanted products*

1

[4]

Q12.

(a) (i) endocrine glands **or** endocrine system
allow a specific named gland

1

(ii) (dissolved) in the blood(stream) **or** plasma

1

(b) (i) pancreas **or** islets of Langerhans

1

(ii) (it **or** insulin) lowers blood sugar level [1]

(by) (speeding up **or** increasing)
 conversion of glucose to glycogen [1]

in the liver [1]

(and) speeding up **or** increasing uptake of glucose by body cells [1]

4

[7]

Q13.

(a) any **three** from

increased thickness **or** build up for
 attachment of zygote **or** so zygote can
 implant;

allow gives more room for blood vessels

3

increased blood vessels to provide
 nutrients for zygote;

*allow embryo **or** fetus **or** baby
or egg for zygote*

becomes thicker to form placenta;

increased surface area for attachment
 of zygote;

increased glands for secretion;

(b) (i) rise in hormone corresponds with rise
 in temperature;

*allow peak of hormone at same time as increased
 temperature **or** when hormone high, temperature is high*

*allow change in hormone concentration followed by change in temperature **or** when hormone rises followed shortly by rise in temperature **or** graphs follow same pattern **or** graphs are nearly the same*

1

(ii) maximum 36.90 °C

1

minimum 36.55 °C;

0.35 °C;

*allow **both** marks for correct answer **or one** mark for 0.35 if clearly round up **or** round down allow one mark for working if correct*

1

[6]

Q14.

(i) liver

1

(ii) liver **or** B stores glycogen
or pancreas **or** D makes insulin

1

clear description of link

1

[3]

Q15.

(a) (i) increased shortly after ingestion then drops;

(ii) decreased shortly after ingestion then rises;

(iii) decreased shortly after ingestion then rises
each for 1 mark

3

(b) 8 of:
ingestion of ice cools blood flowing in (gut wall);
brain temperature lowered;
reduced blood temperature detected by brain;
impulses sent to sweat glands;
sweat production decreased/sweat pores close;
evaporation of sweat reduced;
it is evaporation of sweat which cools skin/heat loss is less;
therefore skin temperature rises;
because external temperature greater than body temperature;
sensibly linked example;

each for 1 mark

8

[11]

Q16.

- (a) (i) transport of substances **or** named substance **or** blood around the body
each for 1 mark 2
- (ii) breaks down (**not digests**) food absorption (into blood)
each for 1 mark 3
- (b) water filtered from blood
 smaller proportion reabsorbed
 therefore larger volume
 of dilute urine produced
each for 1 mark 4

[9]

Q17.

- (a) water filtered from blood
 smaller proportion reabsorbed therefore larger volume of dilute urine produced
each for 1 mark 4
- (b) (i) use of dialysis machine which restores concentrations of
 substances in blood to normal levels
 transplant of healthy kidney **or** compatible kidney
each for 1 mark 4
- (ii) 5 of e.g.:
 dialysis needs much time attached to machine
 consequent effect on lifestyle (qualified) need for special diet
 transplant gives 'normal' life (qualified)
 transplant cheaper in long term
 risk attached to transplant operation
 shortage of donors etc.
each for 1 mark 5

[13]

Q18.

- (a) (i) reduced sharply
for 1 mark 1
- (ii) converted to glucose which is respired to produce energy
(allow answers in terms of glucagon)
gains 3 marks 3
- (b) (i) athlete A's was most effective
 since resulted in highest muscle glycogen level on day of race

for energy release during race

for 1 mark each

3

- (ii) e.g. excess carbohydrate stored as glycogen rather than fat in short term particularly if glycogen stores depleted

for 1 mark each

2

[9]

Q19.

- (a) moves from foetal blood to mothers blood via placenta

for 1 mark each

3

- (b) (i) 3 of e.g.
rising levels of oestrogen
result in an increased LH level when LH level peaks
egg release stimulated

any 3 for 1 mark each

3

- (ii) 3 of e.g.
continues to inhibit FSH production and to inhibit LH production
so that no eggs are matured or released
Because of danger to later conceived fetus if 2 develop in uterus

any 3 for 1 mark each

3

- (c) 3 of e.g.
FSH could stimulate eggs to mature in woman whose own level of FSH too low
LH could stimulate egg release where woman's own LH production depressed by oestrogen

any 3 for 1 mark each

3

- (d) **maximum two benefits e.g.**
prevents unwanted pregnancy when mother's physical health at risk
or when mental health at risk
or following e.g. rape

maximum two problems e.g.
involves killing 'foetus' rather than preventing gametes meeting
may lead to irresponsible attitude to sexual behaviour
reference to ethical/religious attitudes

for 1 mark each

4

[16]

Q20.

- (i) 2500 – 1000
= 1500

for 1 mark each

- 2
- (ii) 3 of
 filter blood
 reabsorb water
 in sufficient quantities to keep body water content constant
 produce dilute urine if water content of body high/reverse argument
any 3 for 1 mark each

3

[5]

Q21.

- (a) (i) • blood sugar rises because
 • insufficient insulin secreted by body
for 1 mark each

2

- (ii) • increase in rate of conversion
 • of glucose to glycogen
 • in liver
for 1 mark each

3

- (iii) • muscles use more glucose from blood
 • in respiration
 • to release energy needed for exercise
for 1 mark each

3

- (b) 3 of
 sugar soluble
 therefore absorbed
 quicker than starch
 which has to be digested
any 3 for 1 mark each

3

- (c) • increased secretion of glucagons
 • by pancreas
 • results in increases rate of conversion of glycogen into glucose
for 1 mark each

3

- (d) 3 of e.g.
 higher blood sugar level results in increased secretion of insulin
 effect of insulin is to lower blood sugar
 which in turn reduces rate of insulin secretion
 overall result is to keep fluctuations in sugar level to a minimum
any 3 for 1 mark each

3

[17]

Q22.

- (a) urine
for 1 mark 1
- (b) (i) protein
for 1 mark 1
- (ii) e.g. molecules too large
for 1 mark 1
- (c) reabsorbed into blood
for 1 mark 1
- (d) e.g. most of water reabsorbed but little urea
for 1 mark 1

[5]

Q23.

- (a) (i) protein
for 1 mark 1
- (ii) e.g. molecules too large
for 1 mark 1
- (b) e.g. most of water reabsorbed, but little urea
for 1 mark 1
- (c) (i) restores concentration of dissolved substances, to normal level,
wastes pass into dialysis fluid
for 1 mark each 3
- (ii) the same (0.35) or slightly below (<0.35),
so that concentration of salts in blood remains constant
for 1 mark each 2

[8]

Q24.

- (i) reduction in FSH levels will lead to reduction of oestrogen production,
therefore oestrogen production is negatively affected
by high oestrogen levels
for 1 mark each 2

- (ii) high levels of FSH,
more likely to lead to egg release/maturation
for 1 mark each

2

[4]

Q25.

- (a) more energy needed,
for increased muscular activity
for 1 mark each

2

- (b) increased sweat production,
evaporation of sweat cools body,
vasodilation OWTTE,
more heat loss (by radiation)
for 1 mark each

4

[6]

Q26.

- (a) (i) *idea that chemical / substance that controls / co-ordinates bodily process*
for 1 mark
reject chemical messenger unless qualified as above, - reject
ref. to one hormone only

1

- (ii) in the blood
for 1 mark

1

- (b) *idea that*
device indicates / detects low levels / no hormones / relevant hormone
for 1 mark

1

[3]

Q27.

- (a) all sectors correctly plotted – 2 marks one plotting error only – 1 mark
2 **or** more plotting errors 0 marks
breath = 3 sectors
urine = 6 sectors
sweat = 10 sectors

2

- all sectors labelled
allow 2 labelled only

1

- (b) respiration

1

breath	1
amino acids	1
urine	1

[7]

Q28.

(a) pituitary (gland)	1
ovaries	1
<i>allow corpus luteum</i>	
(b) idea of stimulating release of eggs	1

preventing release of eggs	
<i>allow FSH increases fertility</i>	
<i>accept contraception / contraceptive pill</i>	
<i>/ morning after pill</i>	
<i>allow oestrogen decreases fertility</i>	
<i>accept progesterone affects uterus lining</i>	
<i>do not credit simply 'a hormone to</i>	
<i>increase fertility or a hormone to</i>	
<i>decrease fertility'</i>	
<i>do not credit 'pill' unqualified</i>	
<i>or injections</i>	
<i>do not accept just FSH or oestrogen</i>	
<i>or IVF with no effect stated</i>	
	1

[4]

Q29.

(a) (i) all plots correct	
<i>Tolerance $\pm \frac{1}{2}$ square</i>	
<i>allow 1 mark for 2 correct plots</i>	
	2
(ii) 6	
<i>correct answer with no working = 2</i>	
<i>allow 1 mark for $(60 \div 100) \times 10$</i>	
<i>N.B. correct answer from incorrectly</i>	
<i>recalled relationship / substitution = 0</i>	
	2
(b) lungs	1

liver

1

kidneys

1

[7]

Q30.

ovaries

accept ovary

1

womb

accept uterus

1

fertility

*accept FSH
do **not** accept fertilisation*

1

contraceptive(s)

*allow birth control
accept oestrogen **or** progesterone
do **not** accept pill alone*

1

[4]

Q31.

(a) 180 **or** 179.9

1

(b) 99.4

1

[2]

Q32.

(a) any **two** for one mark each

answers should relate to the ideas in the list

birth control pills are 99 % effective in preventing pregnancy

the hormones in the pills give protection against some women's diseases

condom (neutral)

the woman's monthly periods become more regular

2

(b) any **two** for one mark each

answers should relate to the ideas in the list

the hormones in the pills have some rare but serious side effects

only 99% effective

this method of birth control provides no protection against sexually transmitted disease

a woman has to remember to take a pill every day

2

[4]

Q33.

(a) (i) meiosis

1

(ii) mitosis

1

(c) (i) **X** pituitary

1

Y FSH

1

(ii) stimulates LH production

1

inhibits FSH production / production of **Y**

1

[6]

Q34.

(a) 850

1

(b) (i) more

because exercise makes us sweat **or** work harder

accept to cool the body

do not credit body hotter or giving off more heat

2

(ii) more

because she respire more

*accept she breathes (in and out) more **or** heavier **or** faster*

2

(iii) less

because (more) water has been lost by sweating **or** breathing out **or** other methods

accept arguments about conservation of water

2

(c) kidney

1

Q35.

- (a) (i) in blood **or** the circulation system **or** plasma
accept arteries and veins or blood vessels
do not accept slowly or in blood cells 1
- (ii) glands
accept endocrine glands or endocrine
do not accept a named gland 1
- (b) the pancreas
accept islets of Langerhans 1
- any **one** from
 does not produce (sufficient) insulin
 (blood) sugar is not (properly) controlled 1
- insulin injections **or** inhalers
accept diet or tablets to make the
pancreas produce insulin 1

Q1.

The table compares the percentages of various substances in a person's blood and their urine.

Substance	Blood	Urine
Water	92.00%	95.00%
Glucose	0.10%	0
Salt	0.37%	0.60%
Urea	0.03%	2.10%

- (a) How does the level of urea in urine compare with the level of urea in the blood?

- (b) The kidney produces urine by filtering the liquid part of blood and then re-absorbing some of the filtered substances.

Use this information to explain the difference in the level of urea in urine compared

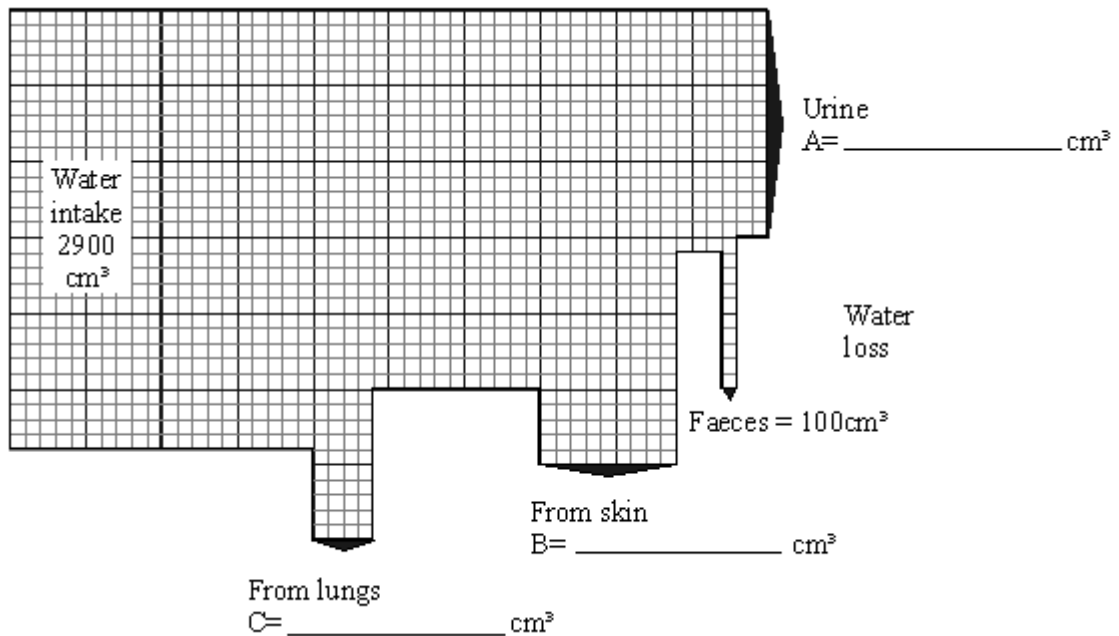
to the level of urea in blood.

(2)
(Total 4 marks)

Q2.

The diagram shows the amount of water lost by an adult in one day.

The width of the arrows shows how much water is lost in each way.



(a) Work out from the diagram the water loss for urine, skin and lungs and write the correct figures in the spaces on the diagram.

(4)

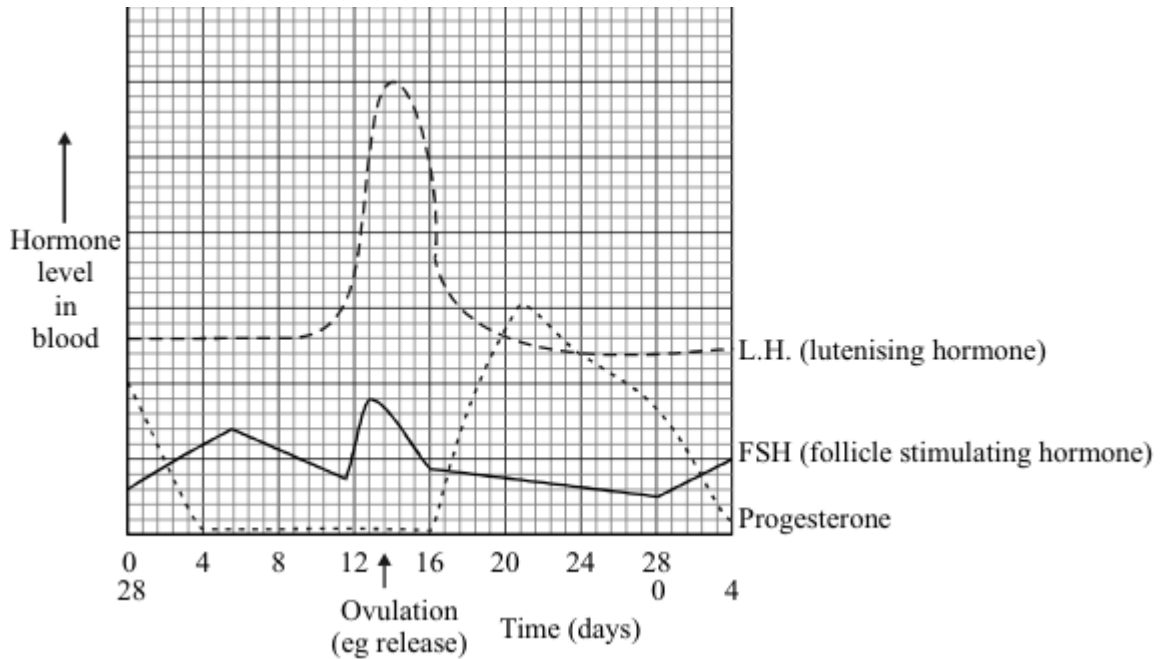
(b) When it is hot, much more water is lost from the skin. Which other method of water loss would also change significantly?

Explain your answer.

(3)
(Total 7 marks)

Q3.

The graph shows changes in the levels of three hormones in a menstrual cycle.



- (a) What does the graph suggest the stimuli might be which cause the egg to be released?

(3)

- (b) One type of contraceptive pill keeps the level of progesterone high for most of the cycle.

Suggest how this might work.

(2)

- (c) Outline **two** arguments for and **two** against using hormones as contraceptives.

For: 1 _____

For: 2 _____

Against: 1 _____

Against: 2 _____

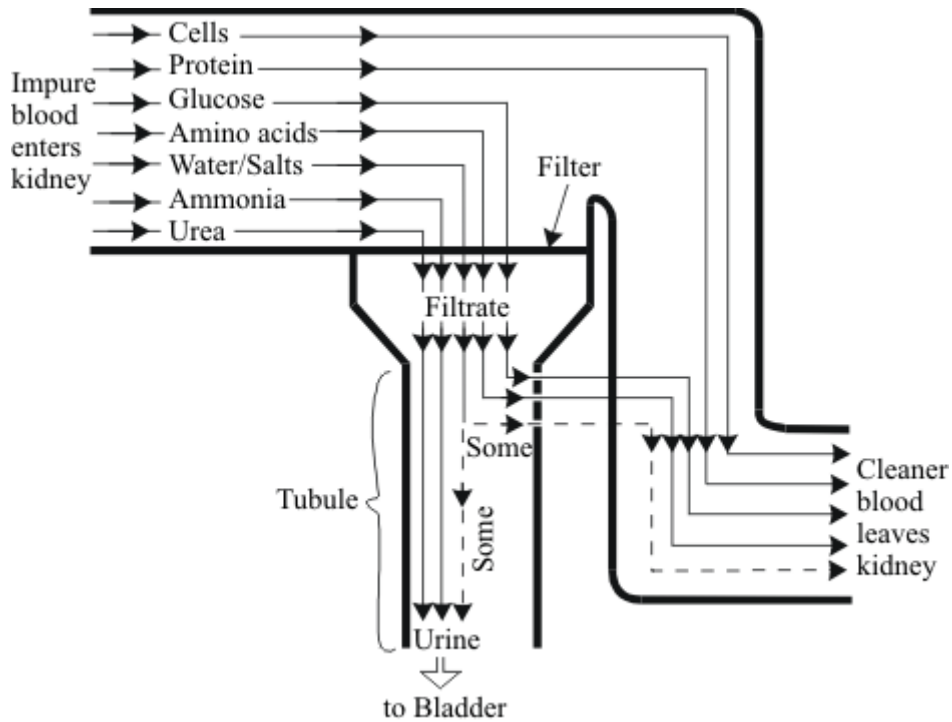
(4)
(Total 9 marks)

Q4.

The job of our kidneys is to remove unwanted substances from our blood.

Substances which are needed in the blood must not be lost.

The flow-diagram below shows how the kidneys do this job.



(a) Describe what happens to the glucose and amino acids in the kidney.

(4)

(b) A man has 5 litres of blood in his body.

- In one day:
- the kidneys filter out 170 litres of liquid from the blood.
 - he produces 1.5 litres of urine.

(i) What % of the filtered liquid is reabsorbed?

(2)

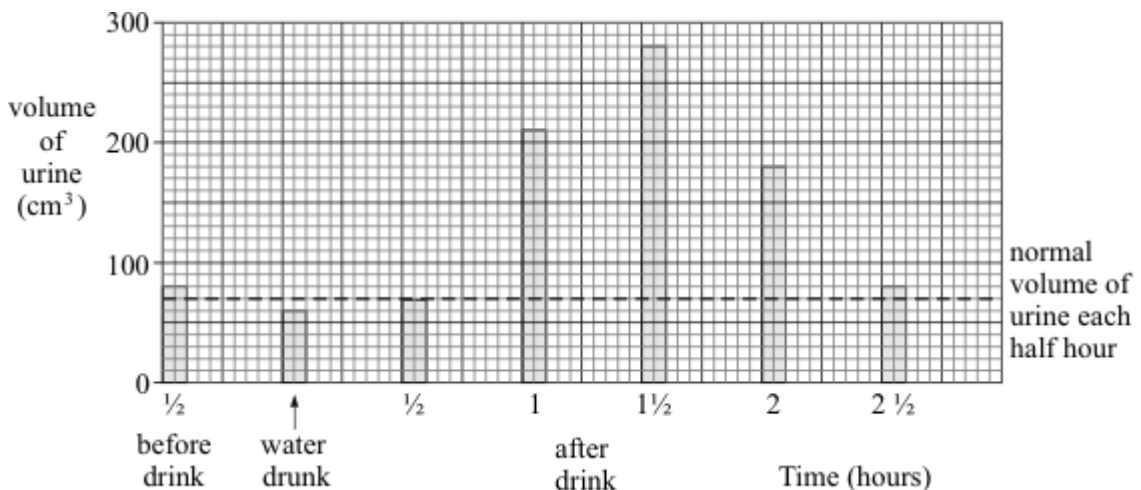
(ii) The man became ill because his kidneys would not absorb as much of the filtered liquid.

Write down **two** ways the man would be affected by this.

(2)

(c) In an experiment the man drank 800cm³ of water.

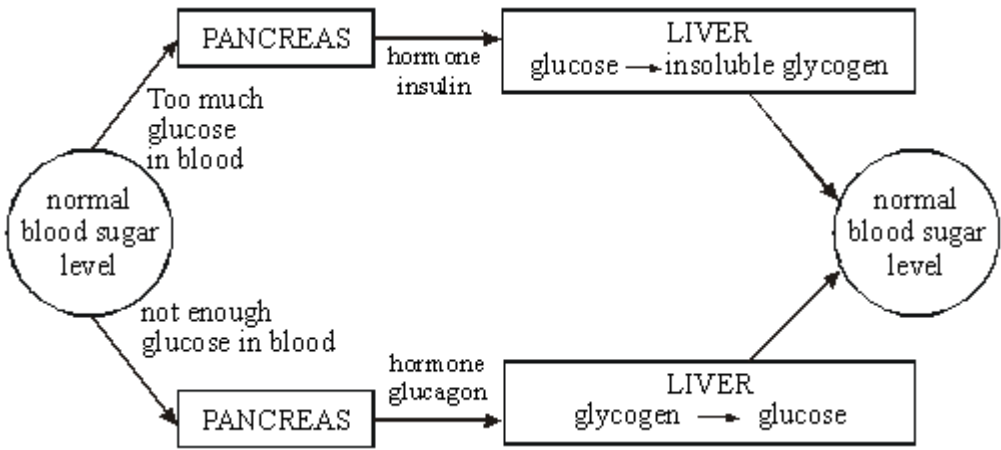
The diagram shows the effect this had on the volume of urine the man produced each 30 minutes.



Describe, in as much detail as you can, how drinking the water affected the volume of urine produced afterwards.

(5)
(Total 13 marks)

Q5.



The diagram shows how the blood sugar level is controlled in the body.
 Explain fully what would happen if somebody ate some glucose tablets.

(Total 4 marks)

Q6.

Kidneys are important as they remove waste from blood and balance our water needs.
 Kidney failure can be treated by transplant or dialysis using a kidney “machine”.

The money for expensive treatment for a few people could be used to provide more patients with less expensive treatment for other complaints.

Dialysis – kidney “machines”
Most expensive
Need own machine or share machine in hospital
Restricted life – special diet, must return to machine
Can be used while patient waits for transplant

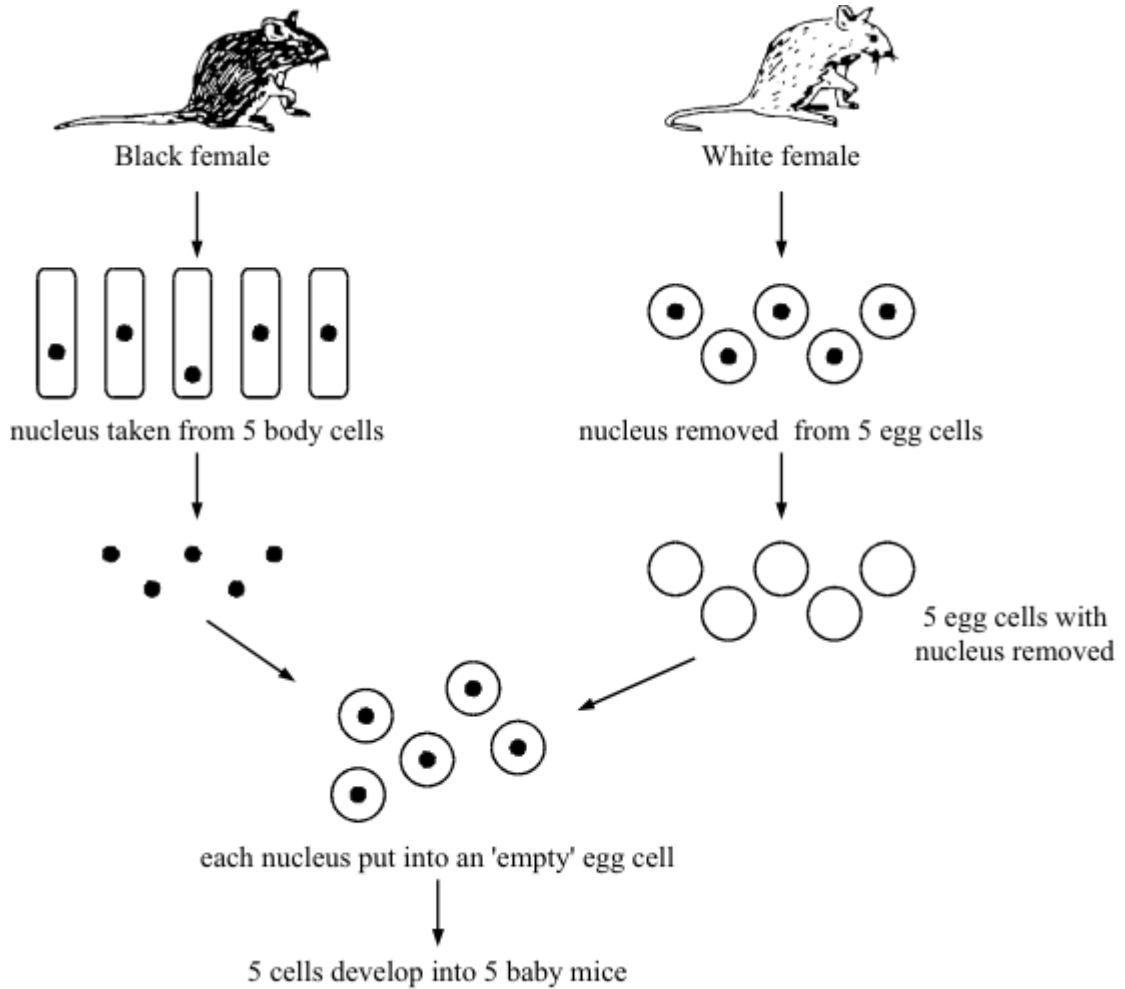
Kidney transplant
Very expensive but cheaper than dialysis
Need kidney from relative or from “newly” dead person
Independent
Transplant may be rejected

Discuss the advantages and disadvantages of using dialysis or kidney transplants to keep people alive.

(Total 5 marks)

Q7.

The diagram shows how you can breed mice without using male sex cells.



- (a) (i) What type of reproduction is shown above?
- _____ (1)
- (ii) Which part of the nucleus carries the information to make a mouse black or white?
- _____ (1)
- (iii) Carefully describe how the baby mice
- (A) compare with each other, _____
- _____
- (B) compare with the parent mice _____
- _____ (3)
- (b) Mice normally reproduce in a similar way to humans.
- (i) Which organs in the white mouse released the five egg cells?

(1)

- (ii) What treatment could you give the white mouse to make her release more eggs?

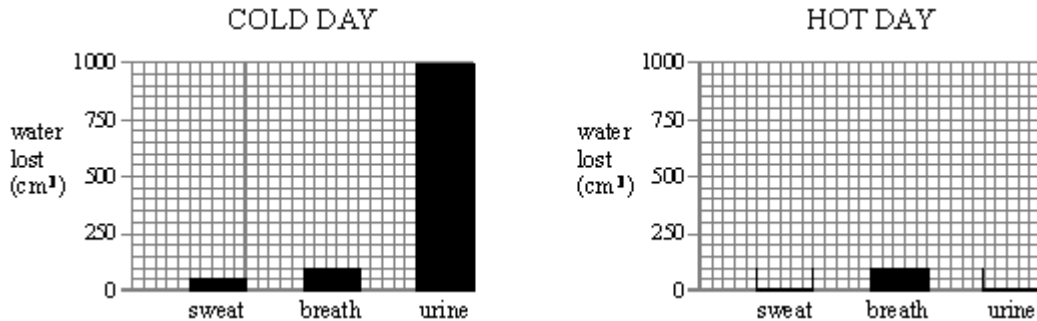
(1)
(Total 7 marks)

Q8.

The table shows how much water is lost from a boy's body on a cold day and on a hot day.

WATER LOST (cm ³)	COLD DAY	HOT DAY
in sweat	50	300
in breath	100	100
in urine	1000	750

- (a) Use the figures in the table to complete the bar-chart for a hot day.



(2)

- (b) How do the figures for the hot day compare with those for the cold day?
Answer in as much detail as you can.

(4)

- (c) The boy does the same things for the same amount of time on both days.
Explain why the amounts of water lost in sweat and urine change.

Sweat _____

Urine _____

(2)
 (Total 8 marks)

Q9.

The table shows how much water is lost from a boy's body on a cold day and on a hot day.

WATER LOST (cm ³)	COLD DAY	HOT DAY
in sweat	50	300
in breath	100	100
in urine	1000	750

- (a) How do the figures for the hot day compare with those for the cold day?
 Answer in as much detail as you can.

(2)

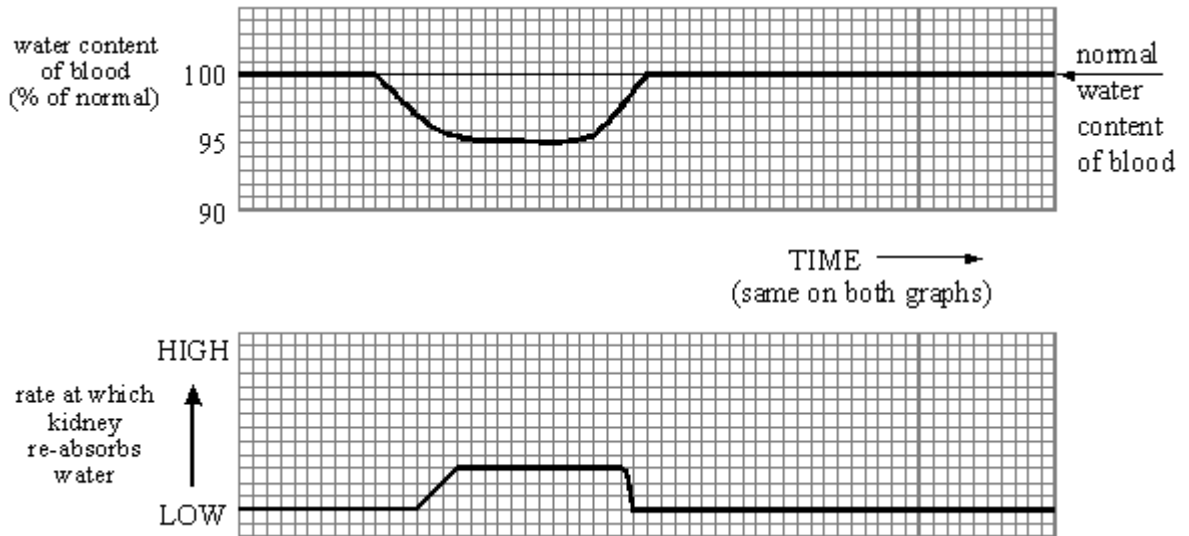
- (b) The boy does the same things for the same amount of time on both days.
 Explain why the amounts of water lost in sweat and urine change.

Sweat _____

Urine _____

(2)

- (c) The rate at which the kidney re-absorbs water depends on the percentage of water in the blood.



Describe, as fully as you can, what the graphs tell you.

(4)

(d) How does your body control the rate at which your kidney re-absorbs water?

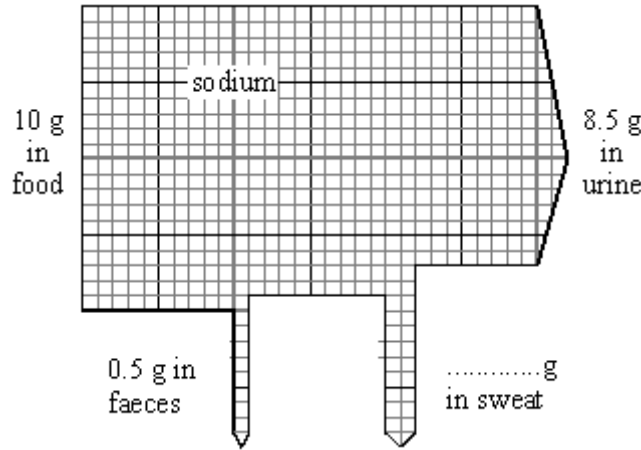
(2)

(Total 10 marks)

Q10.

To stay healthy, the amount of sodium in your body must not change very much.

On average, a girl takes in 10 grams of sodium a day in the food she eats.
The diagram shows what happens to this sodium.



(a) Add the missing figure to the diagram. (1)

(b) Choose words from this list to complete the sentences below.

bladder kidneys lungs skin

Sweat is produced by the girl's _____

Urine is produced by the girl's _____

(2)

(c) The girl goes on holiday to a very hot place.
Her diet stays the same but she now loses 12 g of sodium each day in sweat.

(i) How will this affect the amount of sodium she loses each day in her urine?

(1)

(ii) What should the girl do to make sure that her body still contains enough sodium?

(1)

(Total 5 marks)

Q11.

A woman wants to have a baby. She has been told that her body is not making and releasing eggs. However she has thousands of cells which could develop into them. A possible treatment is to give her a hormone called FSH. This hormone will start the development of these cells.

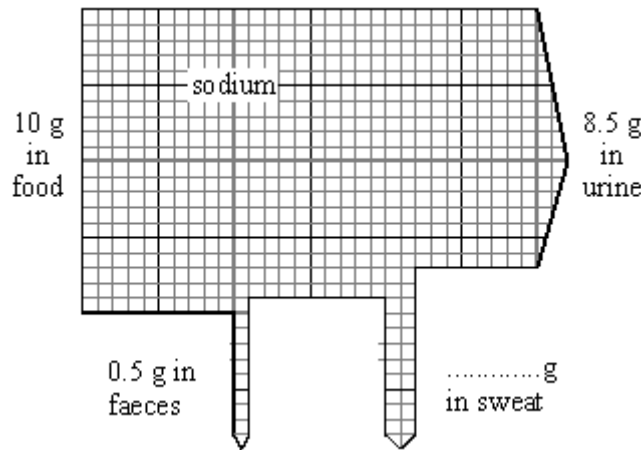
Once the eggs have developed, explain what causes their release.

(Total 4 marks)

Q12.

To stay healthy, the amount of sodium in your body must not change very much.

On average, a girl takes in 10 grams of sodium a day in the food she eats.
The diagram shows what happens to this sodium.



(a) Add the missing figure to the diagram. (1)

(b) The girl goes on holiday to a very hot place.
Her diet stays the same but she now loses 12g of sodium each day in sweat.

(i) How will this affect the amount of sodium she loses each day in her urine?

(1)

(ii) What should the girl do to make sure that her body still contains enough sodium?

(1)

(c) Usually, there is no glucose in urine. All of the glucose is re-absorbed from your kidney tubules back into your blood. Complete the following sentences to describe how this happens.

The glucose is re-absorbed by a process called _____

This process is needed because some of the glucose is re-absorbed against

(2)

(Total 5 marks)

Mark schemes

Q1.

(a) increases
gains 1 mark

but
70 x more (concentrated)
gains 2 marks

2

(b) *idea that*
water is reabsorbed;
urea is not reabsorbed (as much)
each for 1 mark

(credit (much) more water reabsorbed
than urea)
gains 2 marks

2

[4]

Q2.

(a) $A > B > C$;
 $A + B + C = 2\ 800$;
one number correct
two numbers correct
each for 1 mark

4

(b) urine;
less produced;
kidneys absorb more water
or
to maintain (water) balance
each for 1 mark

3

[7]

Q3.

(a) LH or FSH (only one mentioned)
gains 1 mark

- but**
LH and/or FSH (both mentioned)
gains 2 marks
- rises (sharply)
for 1 further mark 3
- (b) FSH or LH level kept low
no ovulation/egg not released
for 1 mark each 2
- (c) for:
very effective/prescribed/
personal preference/convenient/
promote family values
any two for 1 mark each
- against:
upset internal environment
named side effects (allow two)
religious belief
no protection against VD/AIDS
long-term effects
moral belief
any two for 1 mark each 4

[9]

Q4.

- (a) *idea:*
filtered
for 1 mark
- reabsorbed
gains 1 mark
- but**
all reabsorbed
gains 2 marks
- correct reference to blood
for 1 mark 4
- (b) (i) *evidence of* $\frac{170 - 15}{170} \times 100$
gains 1 mark

but
 99(.1)(%)
gains 2 marks

2

(ii) *idea:*
 more urine
for 1 mark

body dries out/dehydrates
or
 needs to drink more
for 1 mark

2

(c) no effect for first half hour/until 1 hour
 rises to 210cm³/to 3x level after 1 hour
 rises to 280cm³/to 4x level after 1½ hour
reference to 280cm³/1½ hour as maximum level
 falls to (near) normal after 2½ hours
 comparison of rates of change e.g. rapid then slower rise and/or steady fall
 not all of 800cm³ excreted (extra to normal)
each for 1 mark to max. of 5
(do not credit simply rises then falls)

5

[13]

Q5.

idea:
 glucose level rises
 pancreas releases insulin
 glucose → glycogen (in liver)/removes xs glucose
 glucose level falls/returns to normal
for 1 mark each

[4]

Q6.

- cost of dialysis and transplant compared
 - *idea that* both expensive and may need to balance cost against other medical priorities
 - restricted diet/movement with dialysis
- and**
- no restriction/independence for transplant
each for 1 mark
 - *idea that* donated kidney may not be available
 - transplant may be rejected/dialysis consistently reliable

[Credit problem of finding body access points for repeated dialysis over the long term]

[5]

Q7.

- (a) (i) asexual / non-sexual / cloning *[not artificial]*
for 1 mark 1
- (ii) gene / allele / chromosome / DNA
for 1 mark 1
- (iii) A) same / look alike / similar
gains 1 mark
- but** same sex / all female / all black / identical / clones
gains 2 marks
- B) same as the black (female)
for 1 mark 3
- (b) (i) ovaries [not reproductive organs]
for 1 mark 1
- (ii) hormones / fertility drugs / FSH
for 1 mark
- Allow LH
[Do not allow oestrogen / fertility treatment] 1

[7]

Q8.

- (a) sweat – 6 squares high
urine – 15 squares high
each to < half a square for 1 mark each 2
- (b) for *hot day (assumed unless otherwise stated)*
- same in breath
 - same total
 - more in sweat* / sweats more
 - less in urine* / urinates less
 - correct quantification of either * eg $x\text{cm}^3$ more / less or **n** times more / less
250 cm^3 more sweat 6 × more sweat
250 cm^3 less urine ¼ / 25% less urine
any four • for 1 mark each
[Do not allow just figures quoted from the table]

(c) *ideas that*

- you sweat more **to keep cool** on a hot day
- urine adjusted (by kidneys) to keep balance / to keep same total loss
each for 1 mark
[Accept "more sweat therefore less urine"]
[Credit ideas from (c) if given in (b)]

2

[8]

Q9.

(a) breath same + sweat more* + urine less* (*All three needed*)

or
total same but split differently
for 1 mark

**either change correctly quantified eg*
x cm³ more/less or n times more/less
for 1 further mark

sweat 250 more 6 x more
urine 250 less 1/4/25% less

2

(b) *ideas that*

- you sweat (more) **to keep cool** on a hot day
- urine adjusted (by kidneys) to keep balance / to keep same total loss
each for 1 mark

(NB credit these answers if in (a) candidates have answered more fully than expected)

2

(c) *ideas that*

- when blood water normal/100% / steady kidney re-absorbs water at low/steady rate
- when blood water percentage falls, the rate at which kidney re-absorbs water rises
- when blood water percentage rises again, is high/normal the rate at which kidney re-absorbs water falls
- 97 / 97.5% / 98% (of normal) blood water is the point at which the kidney's reabsorption rate starts to increase / decrease
each for 1 mark

[allow idea that there is delay between blood water percentage changing and rate of re-absorption changing]

4

- (d) *any reference to hormone(s) / pituitary (gland)*
gains 1 mark

but
 ADH or hormone(s) from pituitary (gland)
gains 2 marks
(do not allow 'brain')

2

[10]

Q10.

- (a) 1
for 1 mark

1

- (b) skin
 kidneys
for 1 mark each

2

- (c) (i) *idea that*
 there will be less / no sodium (per day) (in her urine)
for 1 mark

1

- (ii) *idea that*
 she should take in more sodium (chloride) / salt
(allow stay indoors / in shade or be less active)
for 1 mark

1

[5]

Q11.

oestrogen produced
gains 1 mark

but N.B. sequence important here
 oestrogen produced by ovary
gains 2 marks

LH produced
gains 1 mark

but
 LH produced by pituitary
gains 2 marks

LH causes egg release

for 1 mark

[4]

Q12.

(a) 1

for 1 mark

1

(b) (i) there will be less / no sodium (per day) (in her urine)

for 1 mark

1

(ii) *idea that*
she should take in more (sodium (chloride) / salt)
(*allow* stay indoors / in shade **or** be less active)

for 1 mark

1

(c) active transport / uptake
(*do not allow* diffusion / osmosis)
the concentration / gradient

for 1 mark each

2

[5]