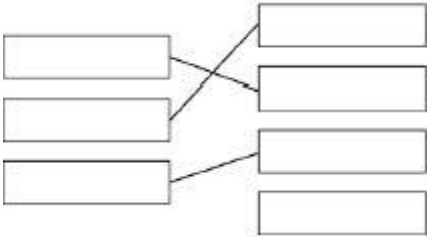


**Q1.**

(a) to allow implantation of the embryo 1

(b) oestrogen 1

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

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

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

low chance of pregnancy  
*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* 1

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

**[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

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- 120 1
- an answer of 120 scores 2 marks*
- (b) respiration of glucose 1
- (c) (more) sweating 1
- ignore reference to vasodilation / vasoconstriction*
- (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 1
- do **not** accept energy production  
do **not** accept energy needed for respiration*
- (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 1
- 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

*allow in this order only*

1

**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*both required for 1 mark correct spelling only for glucagon*

1

(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 / dm<sup>3</sup>)
- 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 / dm<sup>3</sup>) 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 / dm<sup>3</sup> (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 / *C.dromedarius*  
**and** bactrian / *C. bactrianus*  
*no mark for the names, but must be identified*  
**because**  
same genus  
*ignore 'both are Camelus'* 1
- (d) any **two** from:  
  - the fossil record
  - oldest fossils in N. America  
**or**
  - newer fossils in S. America / in Asia / in Africa  
*allow numbers for ages (45 Mya **and** 3 Mya / 6 Mya)*
  - chemical / DNA analysis of living species  
*allow radioactive dating of fossils* 2
- (e) isolation of separate camel populations by sea  
**or**  
by mountains 1
- habitat variation / described between populations  
*allow examples – biotic (e.g. food / predators) or abiotic* 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

**Q8.**

- (a) liver 1
- (b) insulin  
*do not accept glucagon* 1
- (c) kidney 1
- (d) to replace water / ions / salt  
  
(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

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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  $3.999 \times 10^6$  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

$$\frac{5.49 \times 10^6}{6.5 \times 10^7}$$

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 1

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

1

**[9]**

**Q12.**

- (a) (i) 2400 cm<sup>3</sup> 1
  
- (ii) 1400 (cm<sup>3</sup>)  
*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)  
*allow evaporation*  
*allow perspiration* 1
  
- (ii) any **one** from:  
  - for cooling
  - to maintain body temperature1



- (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  
*ignore to make them fertile*  
• to stimulate egg production / release / maturation  
• own levels of FSH / LH / hormone (too) low  
*allow to increase hormone / FSH / LH levels*  
*do not allow to increase oestrogen levels* 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 3<sup>rd</sup> value / it should be lower than the 3<sup>rd</sup> value / it should be between the 3<sup>rd</sup> and 5<sup>th</sup> 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  
*allow white blood cells / lymphocytes*  
*ignore phagocytes*

- 1
- 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  
*allow 9 or 10* 1
- (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<sup>+</sup> 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<sup>+</sup> 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

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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*

- (produces) antibodies 1
- (which) attack the antigens (on the transplanted kidney)  
*non-matching antigens insufficient* 1
- (ii) any **one** from: 1
- tissue typing (to find match)
  - treating with drugs that suppress the immune system
- accept treat with immunosuppressants.*

[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*



- (ii) any **two** from:
- take in water
  - take in ions / minerals / nutrients  
*accept salts / named ions*  
*ignore food*
  - anchorage / support
- (iii) asexual reproduction
- (b) (i) a tropism
- (ii) if tip exposed / **A** – grows / bends towards light  
*allow tip of **A** moves towards light*  
*ignore **A** responds to light*  
*allow remained 'straight'*
- 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*
- (c) (i) auxin
- (ii) hormone comes from the tip
- more on shady side / moves away from light  
*allow reference to right-hand side*
- stimulates growth
- more growth on shady side (than on light side)  
*answer must be comparative*  
*ignore phototropism*  
*ignore cell division*

[12]

**Q26.**

- (a) (i) 400  
*correct answer = 2 marks with or without working*  
*2600 – (1500 + 600 + 100)*  
**or**



- 2600 – 2200  
for 1 mark
- 2
- (ii) LHS: glucose  
accept  $C_6H_{12}O_6$  /  $C_6H_{12}O_6$  / sugar
- 1
- RHS: carbon dioxide  
accept  $CO_2$  /  $CO_2$   
do **not** accept  $CO^2$  /  $CO$
- 1
- (iii) (sweat) increase
- 1
- (urine) decrease
- 1
- (b) (i) 66.7 / 66.67 / 66% /  $\dot{66.6}$  / 67  
accept answers in range  
correct answer = 2 marks with **or** without working  
or  
20  
0.3 for 1 mark
- 2
- or 66 / 66.6 / 66.66 /  $\dot{66.6}$  / 67.0 for 1 mark  
(penalise excessive number of sig. figs. –1 mark) (eg no more than 2 decimal places)
- (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



- (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  
*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

**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.**

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

**Q2.**

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

**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 -  $\frac{1}{2}$  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  $\frac{1}{2}$  square ignore width*

1

- (v) cells swell / overhydrated /  
damaged  
*accept poisoned (by urea)*

1



**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 O<sub>2</sub>  
do **not** accept O, O<sub>2</sub> or O<sup>2</sup>*

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*



- (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*

(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

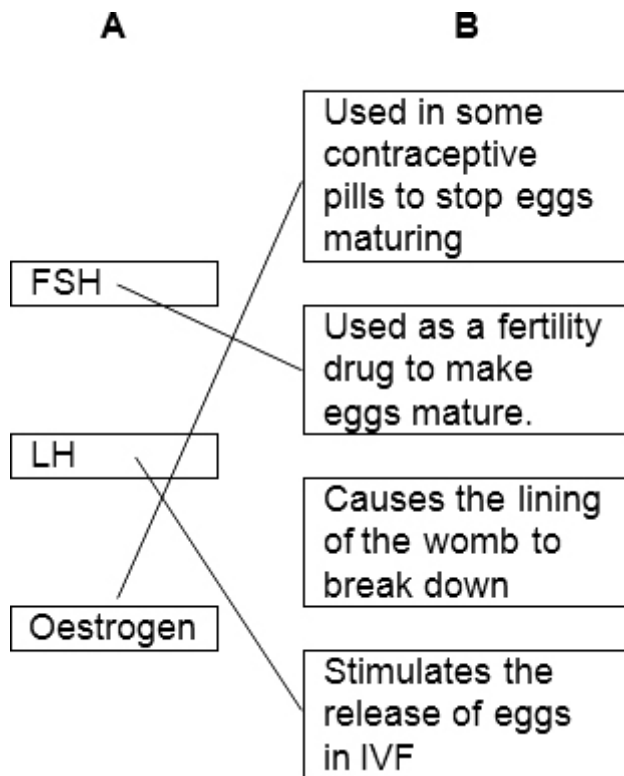
1

[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  
*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*  
2
- (c) need to replace water lost / prevent dehydration / keep hydrated  
*idea of balancing input and output*  
1
- from / by (more) sweat  
*ignore other losses*  
1
- (d) kidney  
1

**[8]****Q19.**

- (a) (i) insulin  
*accept glucagon (correct spelling only)*  
1
- (ii) pancreas  
*accept phonetic spelling  
allow pancrease*  
1
- (b) (i) 11(.0)  
*accept in range 10.5-11 (.0)*  
1
- (ii) any **two** from:  
*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
- 2



(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

[3]

**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



**Q31.**

(i) pituitary

1

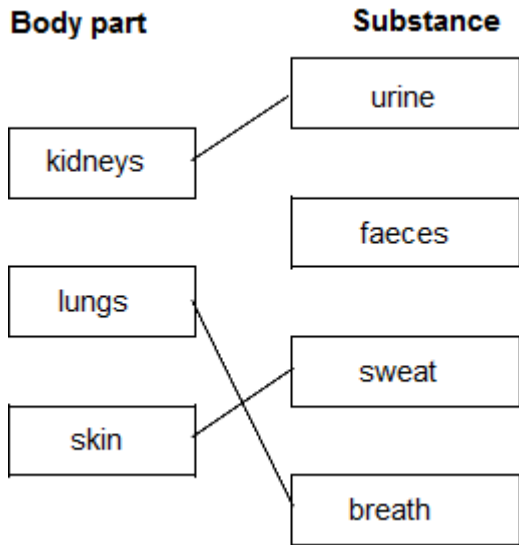
(ii) ovary

1

[2]

**Q32.**

(a)



1 mark per correct line  
extra line from a body part cancels the mark

3

(b) (i) 1800 cm<sup>3</sup>

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

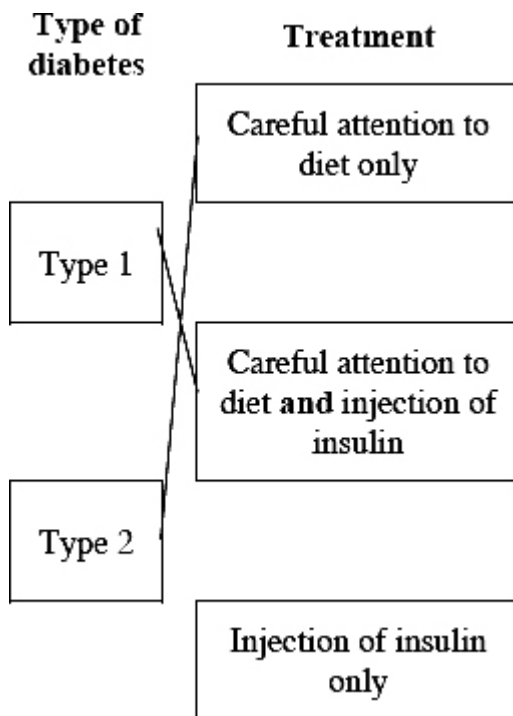


- (b) the diabetic should get more energy from fat 1
- the diabetic should get less energy from carbohydrate 1
- (c) (use) insulin 1
  - allow pancreas / stem cell transplant*
  - do **not** allow injection / transplant / stem cells / tablets alone*
  - ignore exercise*

[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) 2
  - 1 mark per correct line*
  - extra line from a type of diabetes cancels the mark*

- (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) (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

**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*
- (c) (i) increase 1  
*ignore reference to women*
- 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  $\pm 2$*  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

**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 <i>allow heat gained from room</i>	1	
			[7]
<b>Q8.</b>			
(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]
<b>Q9.</b>			
(a)	(i) movement of atoms / molecules / ions <i>accept particles</i> <i>allow dissolved substances</i> <i>ignore reference to membranes</i>	1	
	(substance) moves from high to low concentration <i>allow down the gradient ignore</i> <i>across / along / with a gradient</i>	1	
	(ii) any <b>two</b> from: <ul style="list-style-type: none"><li>• movement of molecules / ions <i>accept particles</i> <i>allow dissolved substances this point <u>once</u> only in (a)(i) and (a)(ii)</i></li><li>• from low to high concentration <i>allow up / against the gradient</i> <i>ignore across / along / with a gradient</i></li><li>• requires energy / respiration <i>accept requires ATP</i></li></ul>	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
- (b) 1/26 or 8/208 or 4/104 or 2/52 **or** 3.8%  
*allow 'out of' in each case*
- (c) under 35
- (d) any **two** from:

1

- low success rate **or** not always successful
- high number of multiple births
- expensive
- stressful / emotional
- side effects

2

2

**[5]****Q11.**

- (a) respiration  
*clear indication eg tick, underlining, others crossed out*

1

- (b) lungs

1



Biology

Mark scheme

- (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 ( $\pm 1$ )* 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

[7]

**Q13.**

- (a) 178  
  
*ignore working or lack of working*  
*correct working: 180 – 2 but no answer / wrong answer = 1 mark*

(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

[8]

**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

[7]

**Q16.**

- (a)  $\frac{1}{5}$  / 20% / 1 in 5 / 1 : 4 / 0.2 /  
*any correct proportion*  
*ignore working*  
*do **not** allow 1 : 5*



$$\frac{600}{3000} / 600 : 2400 / 600 \text{ in } 3000$$

*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

*do not allow if extra incorrect reference to filtration made*

1



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

award **both** marks for correct answer, irrespective of working  
1500 + 2000 + 500 gains **1** mark

2

(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 owtte  
*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



- (iv) (take) insulin  
*allow pancreas transplant*
- (c) protein / hormone / enzyme synthesis **or** synthesis of named example  
**or** combine amino acids

1

1

1

[7]

**Q24.**

- (a) (i) bladder
- (ii) glucose
- protein  
*extras – CANCEL*
- (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
- (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*
- (c) (i) urea
- (ii) 4.2

1

1

1

2

1

1

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  $\rightarrow$  other infections
  - dangers during operation / example described  
*must have at least one advantage and at least one disadvantage for full marks*
- 1



**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*



- (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*
- (d) more sweat produced
- less urine produced

[7]

**Q28.**

- (a) pancreas
- (b) protease  
*allow proteinase*
- (c) (i) (same) enzymes / named enzymes produced in other parts /  
named parts of digestive system  
*if named, enzymes and part must be correct*
- (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*
- (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



conclusion justified by argument

1

[7]

**Q29.**

(a)

glucose

urea

water

sodium ions

protein

*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*



- (b) mixture of genes / chromosomes / genetic material from two parents  
*accept meiosis*
- sexual reproduction / fusion of gametes
- (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  
*do **not** allow mark for embryos lost*

1

1

1

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) 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 CO<sub>2</sub>, 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  
*ignore islets of langerhans* 1



- (ii) 'X' anywhere between  $>1$  and  $\leq 2$  hours  
*anywhere in that column*

1

- (c) any **four** from:

water movement

*do **not** accept solution*

out of cells

dilute to concentrated solution

*accept reference to correct gradient -*

*high  $\Psi$  to low  $\Psi$  **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

*accept excreted*

4

- (c) problem may be temporary **or** has minor infection **or** problem could be cured by other means

1

operation / transplants carry risk

*accept rejection*

1

- (d) (i) no antigens

1

on (the surface) of red blood cells

1

- (ii) would cause agglutination / clumping if different

*ignore clotting and coagulation*

1

[11]

### Q11.

- (a) water content (within the body/blood) is kept constant/ regulated/within very narrow limits/kept right

*do not accept general definition of homeostasis*

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**

*n.b. faeces is not an excretory product but may be neutral*

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

**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

**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

*allow corpus luteum*

(b) idea of stimulating release of eggs

1

preventing release of eggs

*allow FSH increases fertility*

*accept contraception / contraceptive pill*

*/ morning after pill*

*allow oestrogen decreases fertility*

*accept progesterone affects uterus lining*

*do not credit simply 'a hormone to*

*increase fertility or a hormone to*

*decrease fertility'*

*do not credit 'pill' unqualified*

*or injections*

*do not accept just FSH or oestrogen*

*or IVF with no effect stated*

1

[4]

**Q29.**

(a) (i) all plots correct

*Tolerance  $\pm \frac{1}{2}$  square*

*allow 1 mark for 2 correct plots*

2

(ii) 6

*correct answer with no working = 2*

*allow 1 mark for  $(60 \div 100) \times 10$*

*N.B. correct answer from incorrectly recalled relationship / substitution = 0*

2

(b) lungs

1

liver

1

kidneys

1

[7]

**Q30.**

ovaries

*accept ovary*



womb

*accept uterus*

1

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.**



Biology

Mark scheme

- (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
- [8]

**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

[5]

**Q1.**

(a) increases  
*gains 1 mark*

**but**  
70 × 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*  $\frac{170 - 1.5}{170} \times 100$

*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 210cm<sup>3</sup>/to 3x level after 1 hour  
rises to 280cm<sup>3</sup>/to 4x level after 1½ hour  
*reference to 280cm<sup>3</sup>/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 800cm<sup>3</sup> 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  $\text{cm}^3$  more sweat 6 x more sweat  
250  $\text{cm}^3$  less urine  $\frac{1}{4}$  / 25% less urine  
*any four • for 1 mark each*  
*[Do not allow just figures quoted from the table]* 4



(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 cm<sup>3</sup> more/less or n times more/less*

*for 1 further mark*

sweat 250 more    6 x more  
urine 250 less    ¼/25% 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]*



(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)*

4

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]**

