Lifestyle, Health and Risk Part -3

Name: _____

Class: _____

Date: _____

Time:

Total Marks Available:

Total Marks Archived:

Level: Edexcel A level Biology

Subject: Biology

Exam Board: Pearson Edexcel Level 3 GCE AS and A level Biology A (Salters-Nuffield) and also Pearsons Edexcel AS and A Level Biology B (9BI0) - Is however suitable for use by AS and A level Biology Students of other Boards

Topic: Lifestyle, Health and Risk Part -3

Type: Topic Questions

To be used by all students preparing for Edexcel AS and A level Biology A and Biology B - Students of other Boards may also find this useful

Questions

Q1.

People with Guillain-Barré syndrome (GBS) suffer from a rapid onset of muscle weakness. It is thought that GBS is caused by damage to the peripheral nervous system.

The diagram shows some typical neurones.

(i) Which of these is a sensory neurone?

(1)

- **A** W
- **B** X
- **C** Y
- **D** Z

(ii) The axons of some neurones are surrounded by a myelin sheath.

The main component of myelin is a glycolipid.

Glycolipids are formed from lipids attached to a chain of

(1)

- ☒ **A** amino acids which are joined by glycosidic links
- ☒ **B** amino acids which are joined by peptide bonds
- ☒ **C** sugar molecules which are joined by ester bonds
- ☒ **D** sugar molecules which are joined by glycosidic links

(iii) Describe the role of the dendrites in a neurone.

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(Total for question = 5 marks)

Q2.

Obesity can be affected by both genetic and environmental factors. An indicator of obesity is the body mass index (BMI).

The effects of a gene called FTO, saturated fats and physical exercise on BMI were investigated. There are two alleles (FTO^T and FTO^C) at the FTO locus.

(i) Which of the following describes what is meant by the term locus?

(1)

- ☐ **A** genetic code for a protein
- ☐ **B** holds together sister chromatids
- ☐ **C** location of a gene on a chromosome
- ☐ **D** paternal part of a genome

(ii) Compare and contrast the structures of a saturated fatty acid and an unsaturated fatty acid. **(3)**

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(Total for question = 4 marks)

Q3.

An investigation was carried out to study the effect of alcohol concentration on heart rate in *Daphnia*.

In this investigation, *Daphnia* were placed into three groups of 10. Each group was placed in alcohol of a different concentration for five minutes.

After five minutes, each *Daphnia* was removed from the alcohol and its heart rate recorded every 15 seconds for one minute. A mean for each concentration was calculated.

The results are shown in the table.

Alcohol concentration / mol dm^{-3}	Mean *Daphnia* heart rate / beats per minute
0.00	221
0.17	176
0.34	97

(i) Give one reason why 10 *Daphnia* were used for each alcohol concentration. **(1)**

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(ii) Explain why the *Daphnia* were left for five minutes in the alcohol before the heart rate was recorded.

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(Total for question = 3 marks)

Q4.

An investigation was carried out to study the effect of alcohol concentration on heart rate in *Daphnia*.

Devise an investigation to find the lowest concentration of alcohol that has an effect on the heart rate of *Daphnia*.

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(Total for question = 5 marks)

Q5.

Devise a procedure that can be used to investigate the effect of cooking on the vitamin C content of cauliflower.

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(Total for question = 4 marks)

Q6.

Cells use ions in many different processes.

Explain why ions can dissolve in blood.

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(Total for question = 2 marks)

Q7.

Some lipoproteins may reduce fertility in mammals.

An investigation was carried out using mice of the same breed.

Female mice were divided into three groups, P, Q and R. Each group was given a different treatment.

The table shows the treatment given to the three groups of female mice.

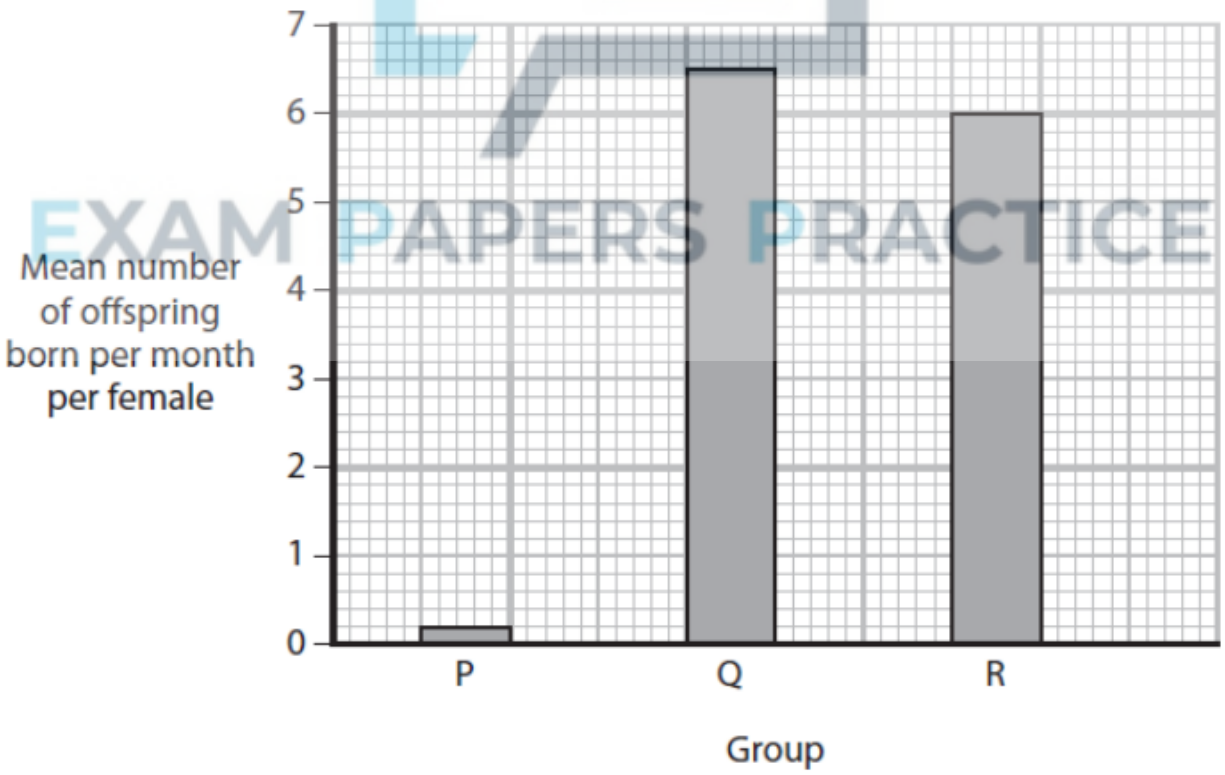
Group	Treatment
P	Genetically modified (GM) only
Q	Genetically modified and supplied with drug K
R	Supplied with drug K only

The GM mice have an increased concentration of high-density lipoproteins (HDLs) in their blood plasma.

Drug K was used to lower the blood plasma HDL levels.

The mice in each group were allowed to breed with non-genetically modified male mice and the number of offspring born was recorded.

The graph shows the results.



(i) The mice were all of one breed to improve data

(1)

- ☐ **A** accuracy
- ☐ **B** precision
- ☐ **C** quantity
- ☐ **D** validity

(ii) State a null hypothesis for this investigation.

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(iii) Comment on the effect of blood plasma HDL levels on the fertility of these female mice.

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(Total for question = 6 marks)

Q8.

As levels of activity increase, the heart can respond to the changing demand for oxygen. During the cardiac cycle there are pressure changes in the chambers of the heart.

Explain how pressure differences in the heart ensure efficient pumping of the blood into the arteries.

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(Total for question = 3 marks)

Q9.

Studies have provided evidence for a link between heart rate when a person is at rest and various medical conditions.

In one study, the relationships between resting heart rate and the percentage incidence of coronary heart disease and cancer were investigated.

The results are shown in the table.

Range of resting heart rate / beats per min	Number of individuals in each range	Percentage incidence of condition (%)	
		Coronary heart disease	Cancer
< 59	961	4.2	1.0
60–69	2277	6.0	1.5
70–79	2120	7.5	2.0
80–89	1202	8.0	2.5
90–99	576	8.2	4.0
> 99	379	7.9	3.8

(i) Comment on the evidence for a link between resting heart rate and the percentage incidence of coronary heart disease and cancer.

(5)

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(ii) Give two reasons why there were different numbers of people in each resting heart rate group.

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(iii) Give two reasons why the number of people in each resting heart rate group did not affect the validity of this investigation.

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(Total for question = 9 marks)

Q10.

Trypsin is an enzyme found in many groups of living organisms.

Trypsin specifically acts on a polypeptide to form amino acids.

State the type of chemical reaction catalysed by trypsin.

(1)

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(Total for question = 1 mark)

Q11.

Doctors sometimes prescribe beta-blockers for their patients.

Beta-blockers are a type of drug with antihypertensive properties.

Explain why beta-blockers are prescribed for some people.

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(Total for question = 2 marks)

Q12.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The cardiac cycle is the sequence of events in one heartbeat.
In humans, the cardiac cycle can be divided into three stages.

In the ventricular systole stage of the cardiac cycle, the

(1)

- **A** ventricles contract, atrioventricular valves close and semilunar valves open
- **B** ventricles contract, atrioventricular valves open and semilunar valves close
- **C** ventricles relax, atrioventricular valves close and semilunar valves open
- **D** ventricles relax, atrioventricular valves open and semilunar valves close

(Total for question = 1 mark)

Q13.

The cardiac output of the heart changes during exercise.

(a) During exercise, a person had a pulse rate of 140 beats per minute and a cardiac output of 17.0 dm^3 min^{-1}.

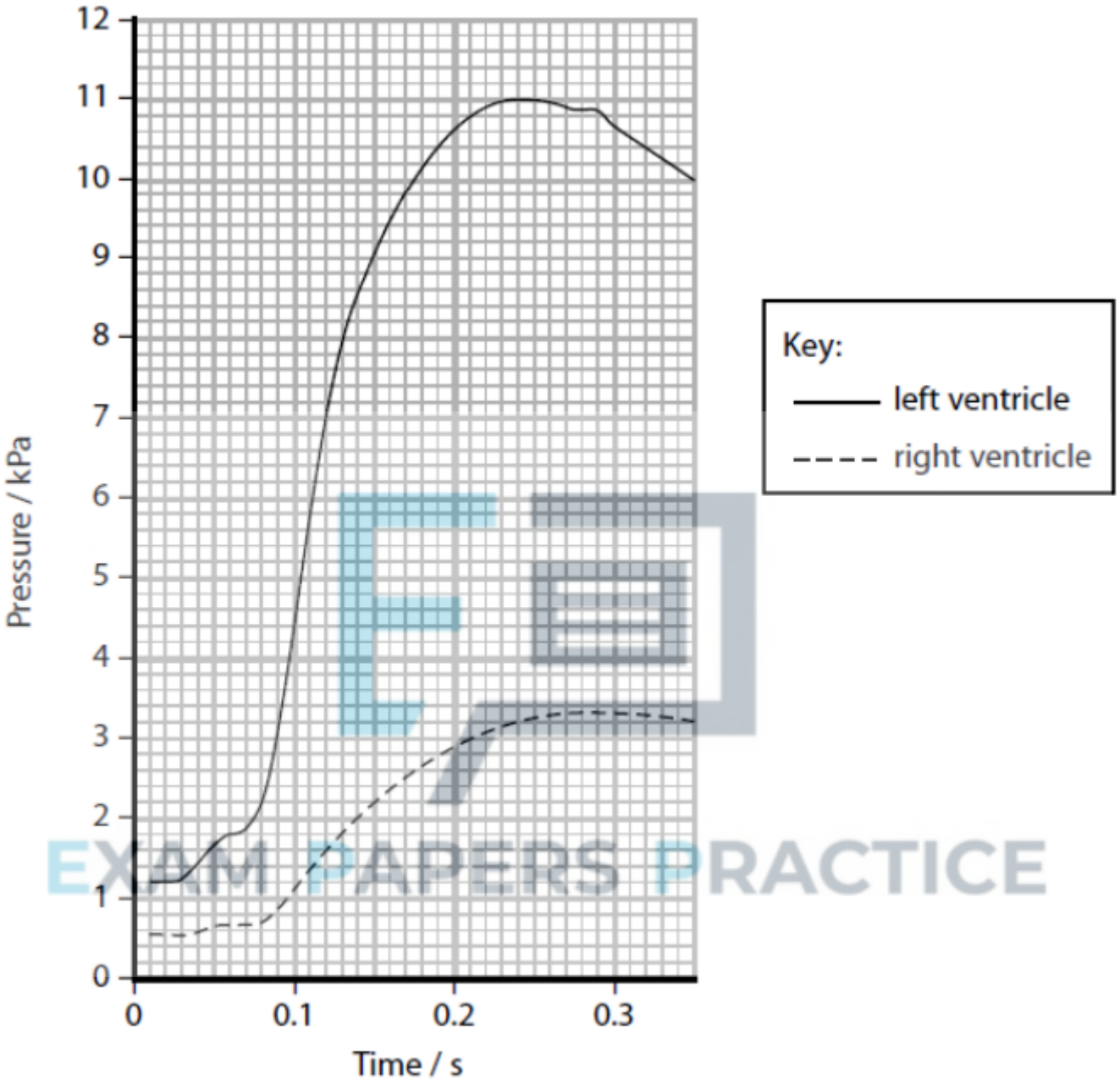
Calculate the stroke volume of the heart of this person.

(2)

Answer .....

(b) The maximum pressure in the left ventricle is 11.0 kPa and in the right ventricle 3.3 kPa.

The graph below shows the pressure changes in the two ventricles of the heart during part of the cardiac cycle.



(i) Explain why there is a difference in pressure in these two ventricles.

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(ii) Which row of the table shows the correct stage in the part of the cardiac cycle shown at 0.25 s in the graph?

(1)

		Stage in cardiac cycle	
		left ventricle	right ventricle
☒	A	diastole	diastole
☒	B	diastole	systole
☒	C	systole	diastole
☒	D	systole	systole

(Total for question = 6 marks)

Q14.

Nicotine is a drug found in the smoke of cigarettes.

The effect of inhaling nicotine on the circulatory system of rats was investigated. In this investigation, three variables were considered:

- the concentration of nicotine in blood plasma
- the diameter of the lumen of one artery
- blood pressure

Two groups of rats were treated as shown in the table.

Group	Number of rats in group	Nicotine dose / mg
A	6	1.0
B	6	0.1

(i) The concentration of nicotine in the blood plasma of the group A rats was recorded at different times and

the means calculated.

Time of sampling / minutes	Mean concentration of nicotine in blood plasma / ng cm^{-3}
0 (immediately after inhalation)	35.0 ± 9.3
30 (after inhalation)	24.1 ± 5.6

The means are shown in the table along with the range of data for each mean.

Determine the maximum rate of decrease in the concentration of nicotine in the blood plasma per minute after being given the nicotine.

(2)

Answer ..... ng cm^{-3} min^{-1}

(ii) The diameter of the lumen of one artery, in each of the 12 rats, was measured

when the rats were resting. The blood pressure of each rat was also measured and the mean blood pressure calculated.

The diameter of the lumen of the artery and the blood pressure of each rat were then recorded at intervals, for a total of 30 minutes. The rats inhaled nicotine for the first minute (0.0 to 1.0).

The table shows the results for the mean diameter of the lumen of the artery.

Time / minutes	Mean diameter of lumen / μm	
	Group A (1.0 mg nicotine)	Group B (0.1 mg nicotine)
0.0	48	48
0.5	44	44
1.0	49	45
2.0	52	48
5.0	57	52
10.0	55	48
15.0	49	48
30.0	49	48

Determine the effect of nicotine concentration on the percentage change in lumen diameter in the first minute.

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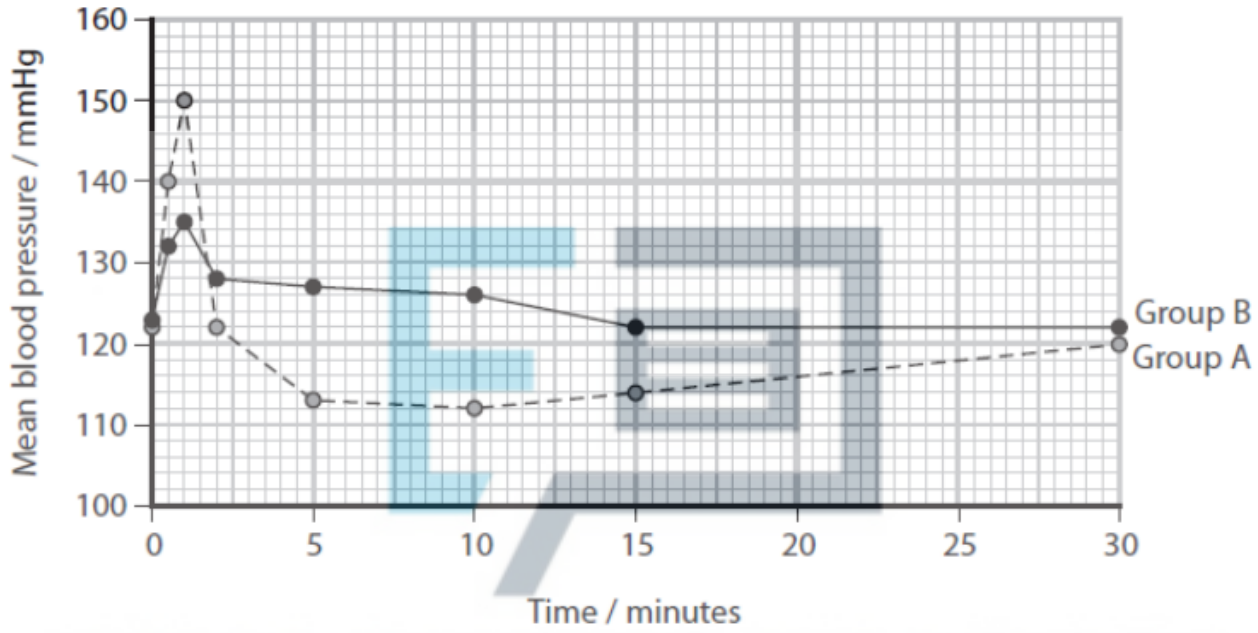
*(iii) The graph shows the results for the mean blood pressure for the two groups of rats. Nicotine was inhaled for the first minute.



It has been stated that:

'Nicotine gained from smoking cigarettes in humans causes an increase in blood pressure and a decrease in the lumen of arteries.'

Analyse all the data from this investigation using rats to evaluate the validity of this statement.

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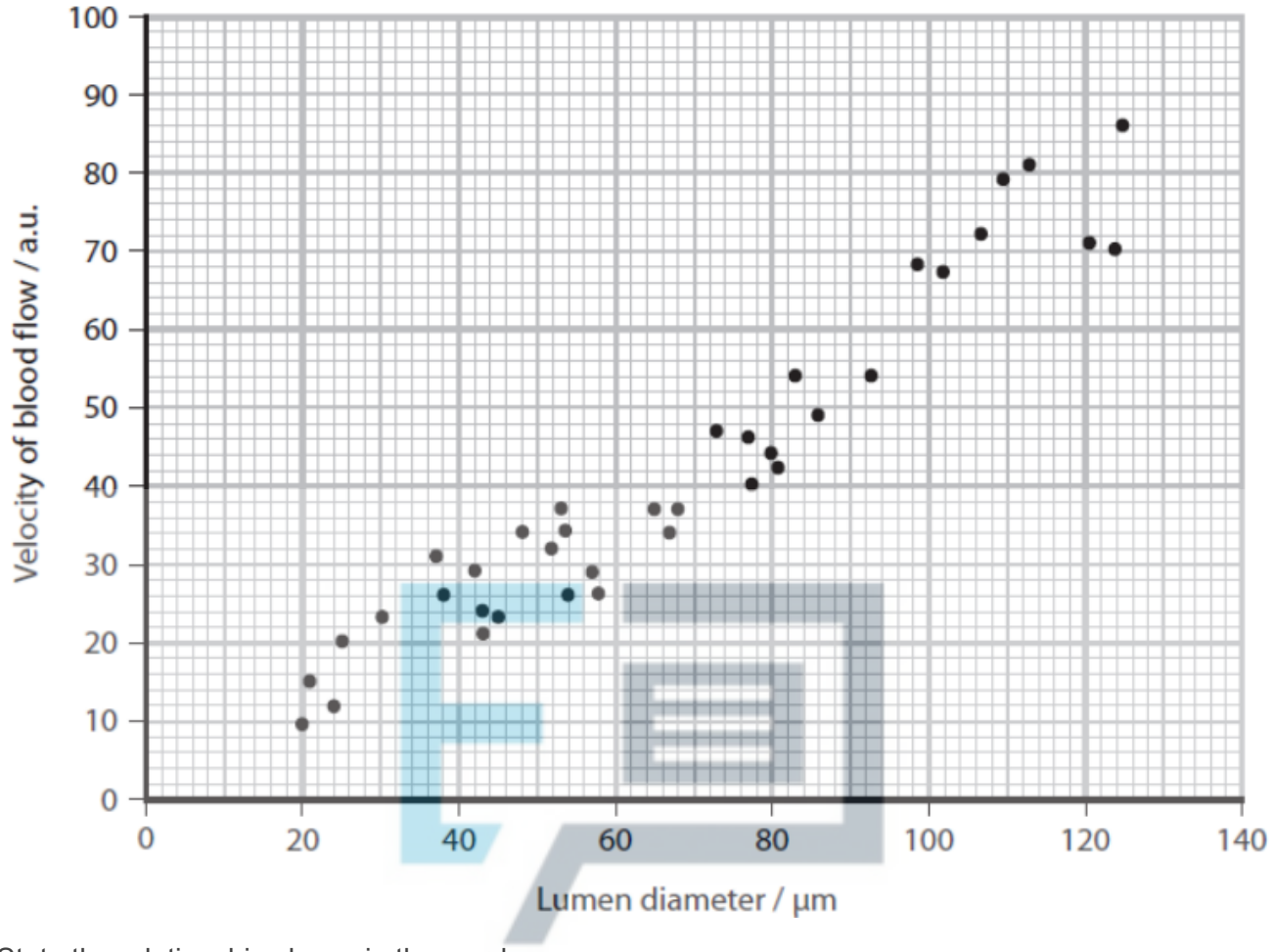
(Total for question = 10 marks)

Q15.

The diameter of the inside of a blood vessel (lumen diameter) affects the speed of blood flow.

The graph shows the relationship between the lumen diameter of blood vessels and the velocity of blood flow.



State the relationship shown in the graph.

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(Total for question = 1 mark)

Q16.

Blood clotting is a process that is affected by genes.

Some people are at an increased risk of a condition called deep vein thrombosis (DVT). Blood clots form in the veins of people with DVT.

There are two alleles in a population, a wild type allele and G20210A.

The table shows the risk of DVT for people with different genotypes in this population.

Genotype	Risk of DVT / number of people with DVT per 1000 individuals
Homozygous wild type	1.0
Heterozygous for G20210A	2.5
Homozygous for G20210A	20.0

(i) Determine the effect of the allele G20210A on the risk of an individual developing DVT in this population.

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(ii) The frequency of the G20210A allele in a population of 10 000 individuals was investigated.

In this population, 50 individuals were homozygous for G20210A.

Calculate the number of individuals in the population who were heterozygous for the G20210A allele, using the Hardy-Weinberg equation:

$$p^2 + 2pq + q^2 = 1.0$$

(3)

Answer .....

(Total for question = 5 marks)

Q17.

Mucopolysaccharides are complex molecules found in the human body.

Mucopolysaccharides can be broken down by enzymes.

Describe how an enzyme could break down the polysaccharide component of mucopolysaccharides.

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(Total for question = 2 marks)

Q18.

Mucopolysaccharides are complex molecules found in the human body.

Mucopolysaccharides are large molecules containing unbranched polysaccharides.

Describe the structure of an unbranched polysaccharide.

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(Total for question = 2 marks)

Q19.

Blood from the lungs returns to the left side of the heart in the pulmonary vein. The pulmonary vein does not have valves.

(i) Describe how the atrioventricular (AV) valves work during one cardiac cycle. (2)

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(ii) The structure of the pulmonary vein is different from the structure of the pulmonary artery.

Explain how this difference is related to the function of the pulmonary vein. (2)

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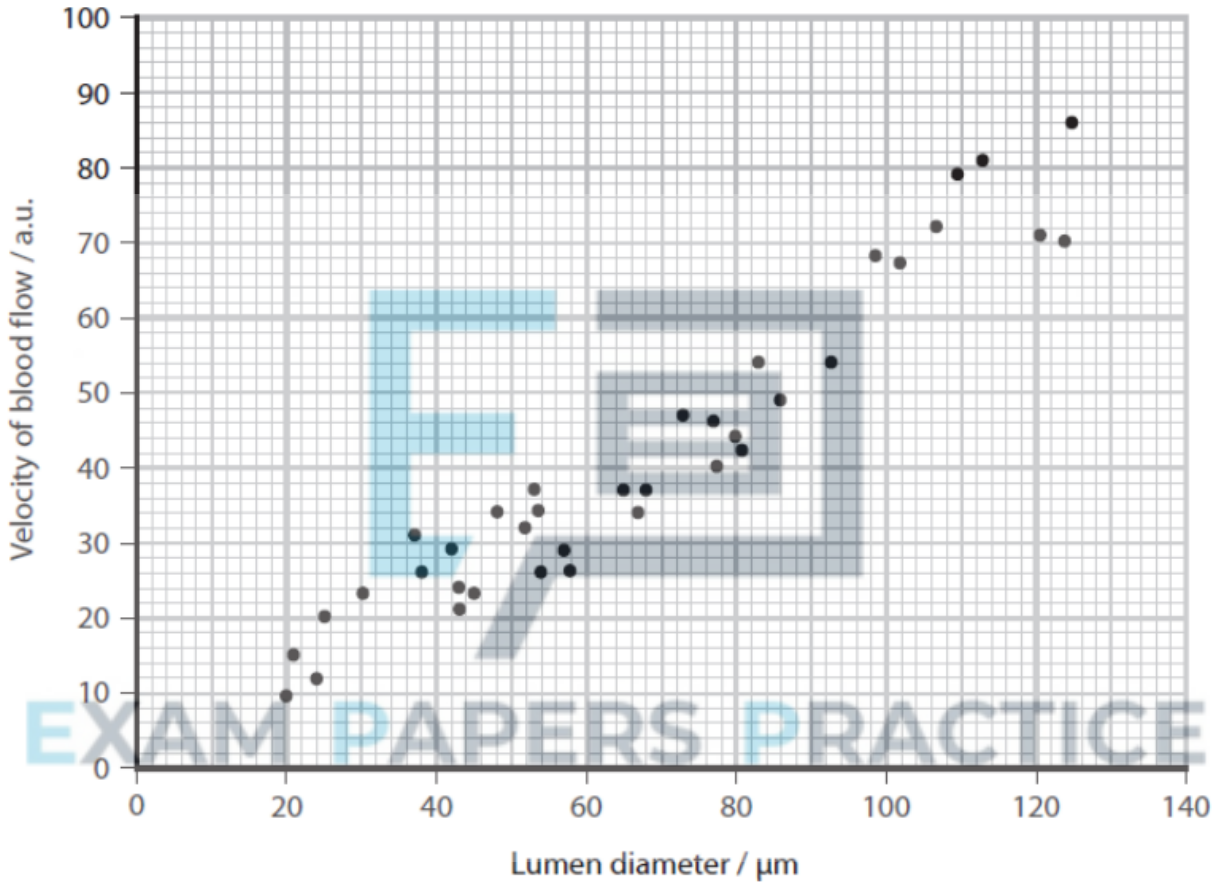
(Total for question = 4 marks)

Q20.

The diameter of the inside of a blood vessel (lumen diameter) affects the speed of blood flow.

The graph shows the relationship between the lumen diameter of blood vessels and the velocity of blood flow.



(i) Explain how the development of cardiovascular disease (CVD) could affect the velocity of blood flow.

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(ii) Explain why a change in the velocity of blood flow will affect the function of the heart muscle.

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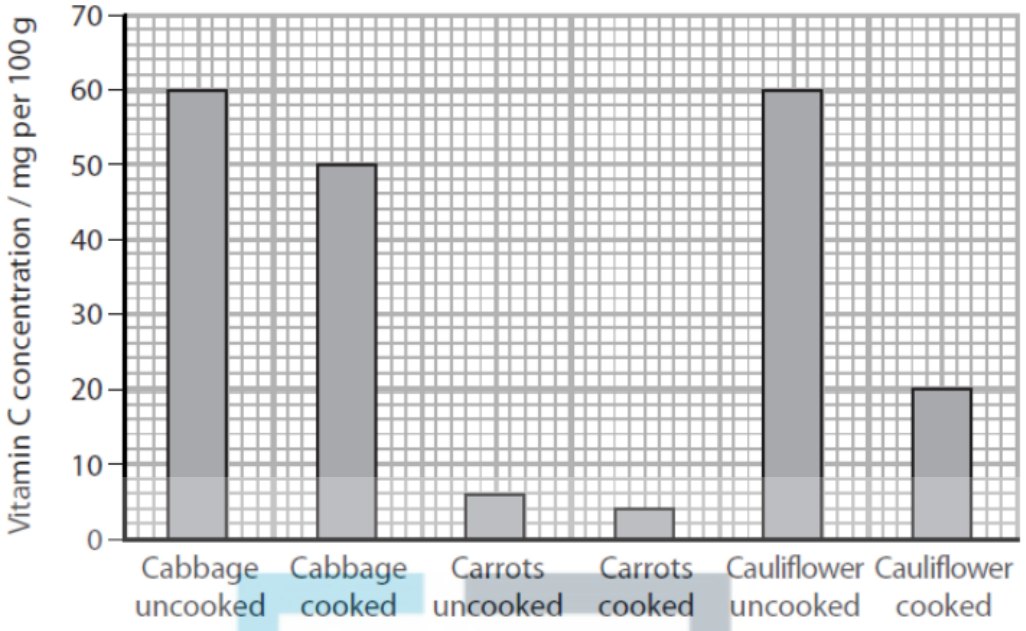
(Total for question = 4 marks)

Q21.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Vitamin C has antioxidant properties. The human body cannot make or store vitamin C. A healthy diet must contain vitamin C.

The graph shows the concentration of vitamin C in a variety of cooked and uncooked vegetables.



(i) How many of the following conclusions are valid for these results?

- cooking destroys all of the vitamin C
- each vegetable contains less vitamin C when it is cooked than when it is uncooked
- cabbage contains the most vitamin C

(1)

☐ **A** 0

☐ **B** 1

☐ **C** 2

☐ **D** 3

(ii) The recommended daily value (DV) of vitamin C for men is 90 mg.

Calculate the mass of cooked cauliflower that would provide 90 mg of vitamin C. (2)

Answer .....

(Total for question = 3 marks)

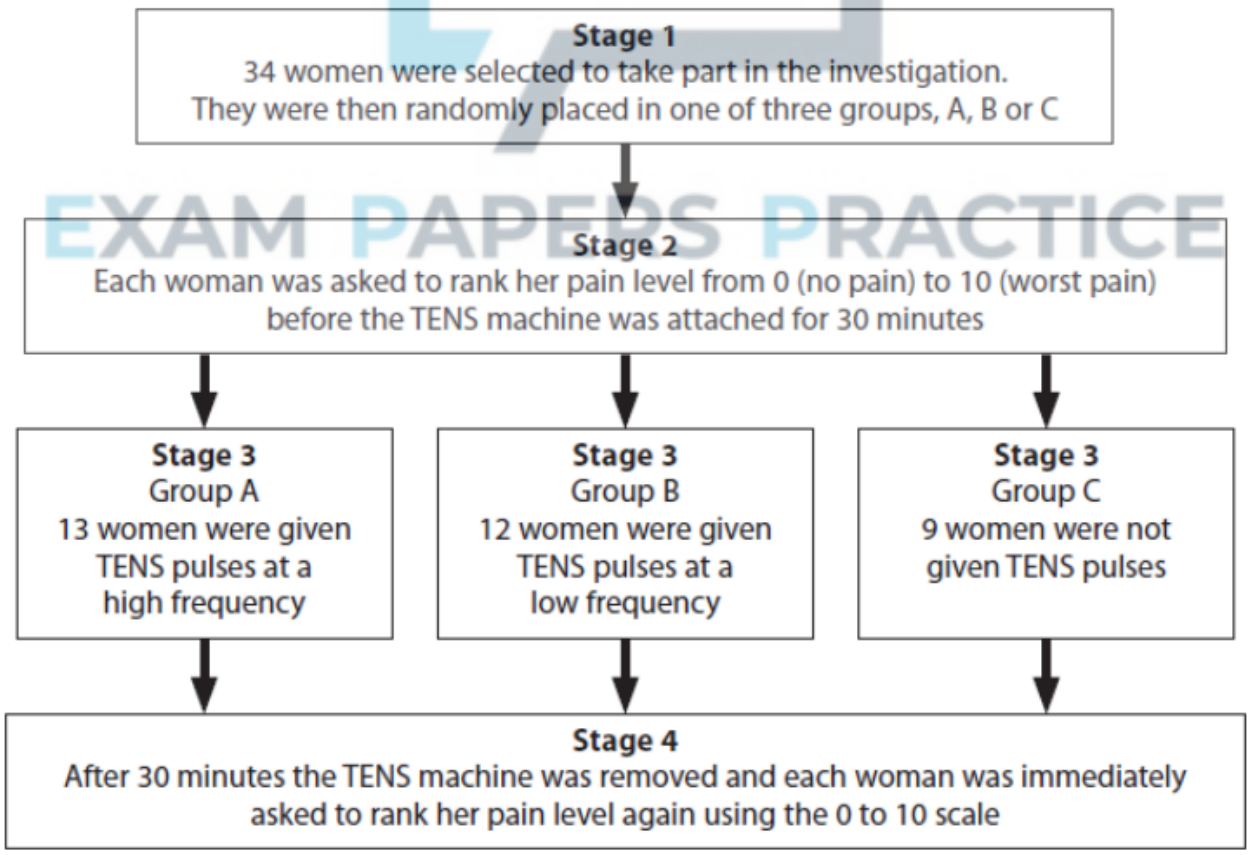
Q22.

Some women need to have surgery to aid childbirth. This can lead to pain after surgery.

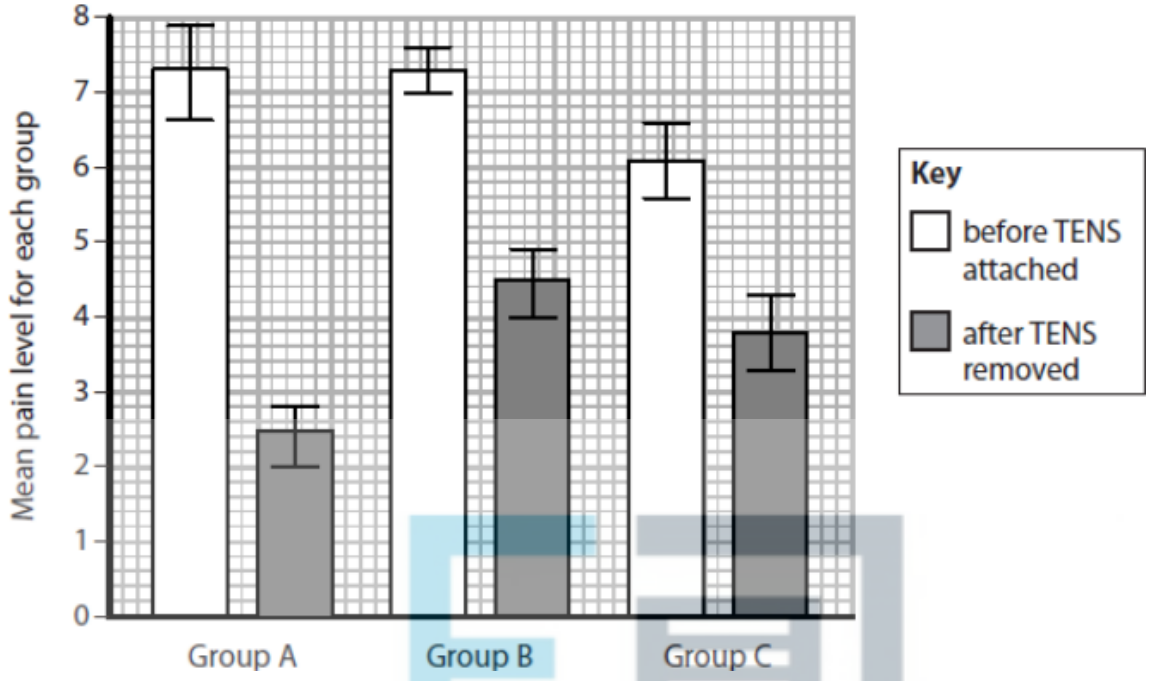
A TENS (transcutaneous electrical nerve stimulation) machine releases regular pulses of electricity onto the skin surface and can be used in pain relief.

An investigation was carried out to study whether the frequency of the pulses from a TENS machine could help these women with their pain relief.

The diagram shows how the investigation was carried out.



The results and range of data for the investigation are shown in the graph.



Determine the effectiveness of the use of a TENS machine in relieving pain following surgery. (4)

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(Total for question = 4 marks)

Q23.

Changes in diet are affecting the health of people in the UK.

The table shows mean data for adult males in the UK in 1967 and 50 years later in 2017.

Year	Mean mass / kg	Mean height / cm	Mean BMI
1967	73	172	24.7
2017	84	178	

The National Health Service (NHS) states that BMI can be used to assess the weight category of an adult male. The table shows these categories.

Category	BMI range
Underweight	$\leqslant$18.4
Healthy weight	18.5 – 24.9
Overweight	25.0 – 29.9
Obese	$\geqslant$30.0

The mean BMI for adult males in 1967 indicates that they were in the healthy weight category. Use the BMI formula to determine the mean weight category for adult males in 2017.

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(2)

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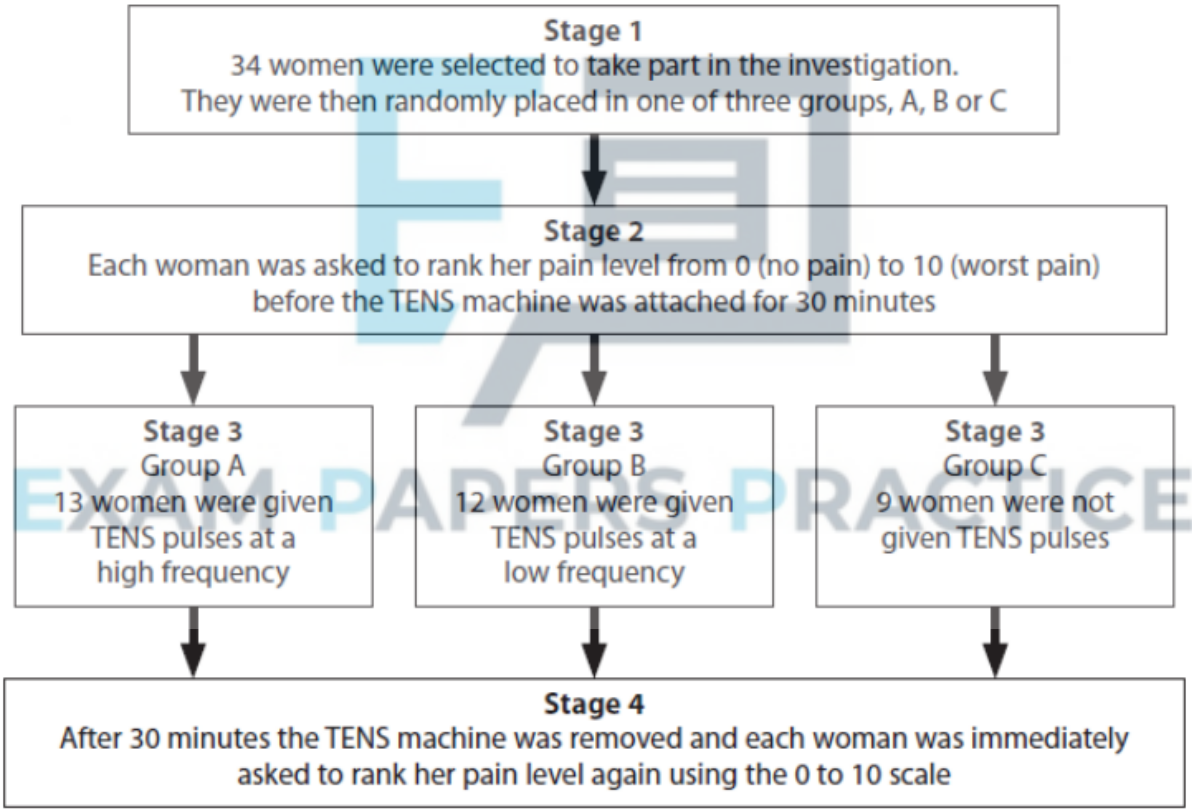
(Total for question = 2 marks)

Q24.

Some women need to have surgery to aid childbirth. This can lead to pain after surgery.

A TENS (transcutaneous electrical nerve stimulation) machine releases regular pulses of electricity onto the skin surface and can be used in pain relief.

An investigation was carried out to study whether the frequency of the pulses from a TENS machine could help these women with their pain relief.
The diagram shows how the investigation was carried out.



Describe how the 34 women were selected in stage 1 to ensure that this investigation was valid.

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(Total for question = 2 marks)

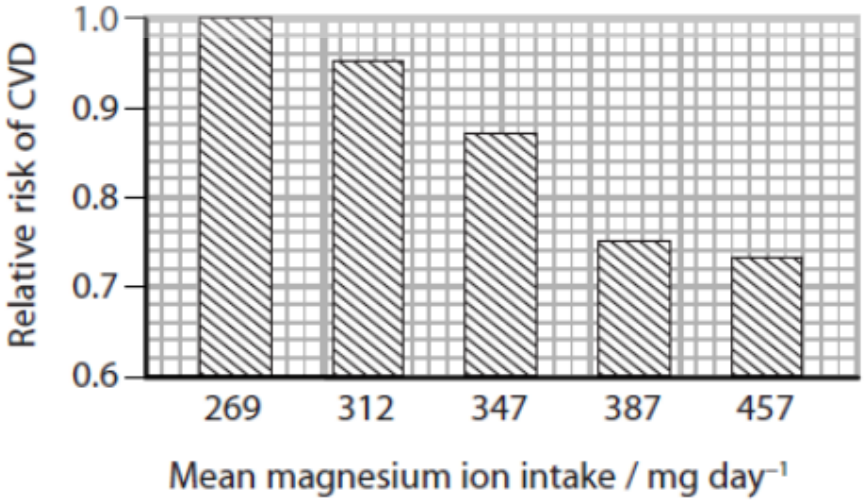
Q25.

Cardiovascular disease (CVD) is a major cause of death and disability in the UK.
The relationship between magnesium ions in the diet and CVD has been studied.

In one study, magnesium ions were added to the diets of a group of men. The effect of this on the relative risk of CVD was recorded.

The mean normal dietary intake of magnesium ions is 269 mg day^{-1}.

The results of the study are shown in the graph.



(i) Which of the following statements can be made about the relationship between an increased magnesium ion intake and the risk of CVD in this study?

(1)

An increased magnesium ion intake

- **A** causes an increase in CVD
- **B** causes a reduction in CVD
- **C** is correlated with an increase in CVD
- **D** is correlated with a reduction in CVD

(ii) What is the daily increase in magnesium ion intake that reduces the relative risk of CVD by 0.13?

(1)

- **A** 43 mg day^{-1}
- **B** 78 mg day^{-1}
- **C** 118 mg day^{-1}
- **D** 347 mg day^{-1}

(Total for question = 2 marks)