GradeMax

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper reference **WBI11/01**

Biology

Advanced Subsidiary

Unit 1: Molecules, Diet, Transport and Health

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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SECTION A

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Mutations can give rise to cancer.

(a) What is a mutation?

(1)

☒ **A** a change in the amino acid sequence in DNA

☒ **B** a change in the amino acid sequence in a protein

☒ **C** a change in the base sequence in DNA

☒ **D** a change in the base sequence in a protein

(b) Name **two** types of mutation.

(1)

1 .....

2 .....

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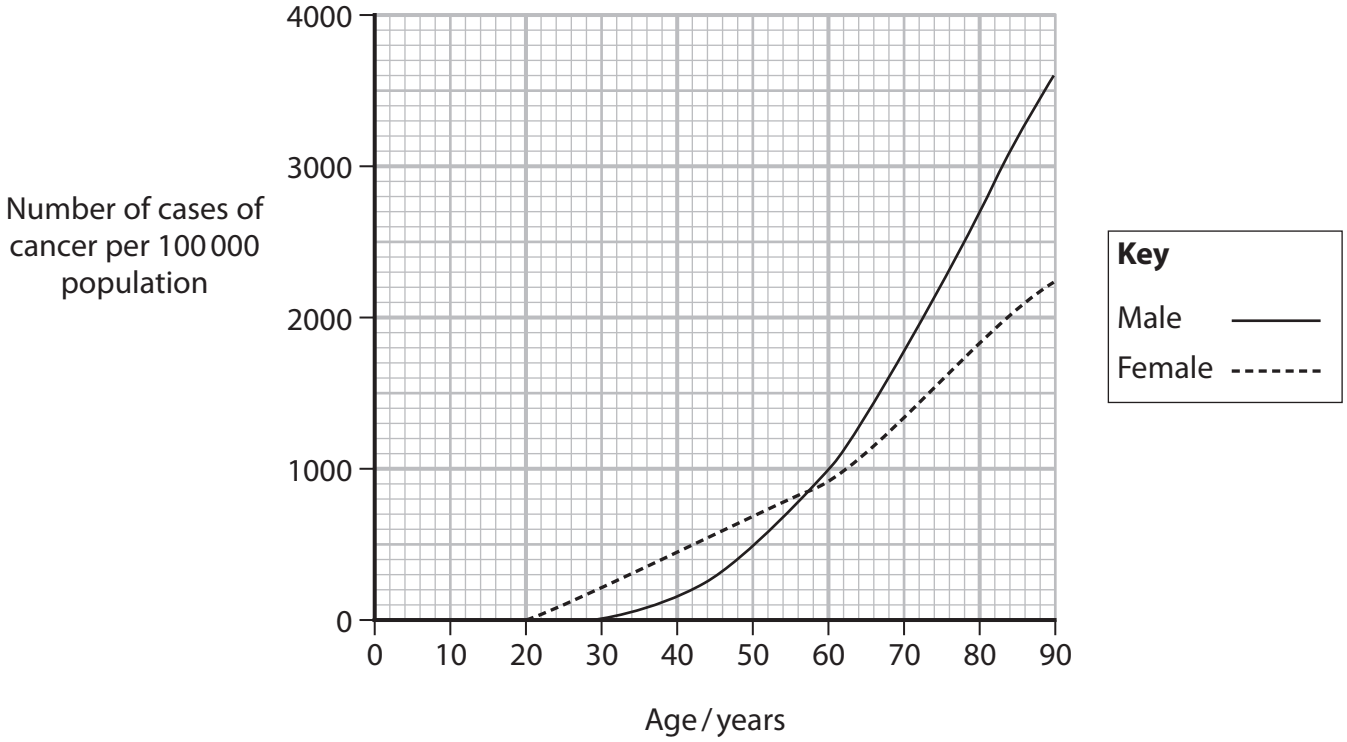
(c) The graph shows the number of cases of one type of cancer in a human population.



Describe the effect of age and sex on the number of cases of cancer.

(3)

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(Total for Question 1 = 5 marks)

2 Warfarin is a drug used to treat people who have a blood clot.

(a) (i) Read through the following passage about warfarin.

Write on the dotted lines the most appropriate word or words to complete the passage.

(3)

Warfarin is used to treat people with blood clots as it lowers the number of clotting factors in the blood.

One clotting factor in blood is prothrombin.

Prothrombin is converted to the enzyme thrombin by .....

The ..... of thrombin binds to fibrinogen and as a result a

mesh of fibres and ..... is formed.

(ii) Which type of drug is warfarin?

(1)

☒ **A** an anticoagulant

☒ **B** an antihypertensive

☒ **C** a platelet inhibitor

☒ **D** a statin

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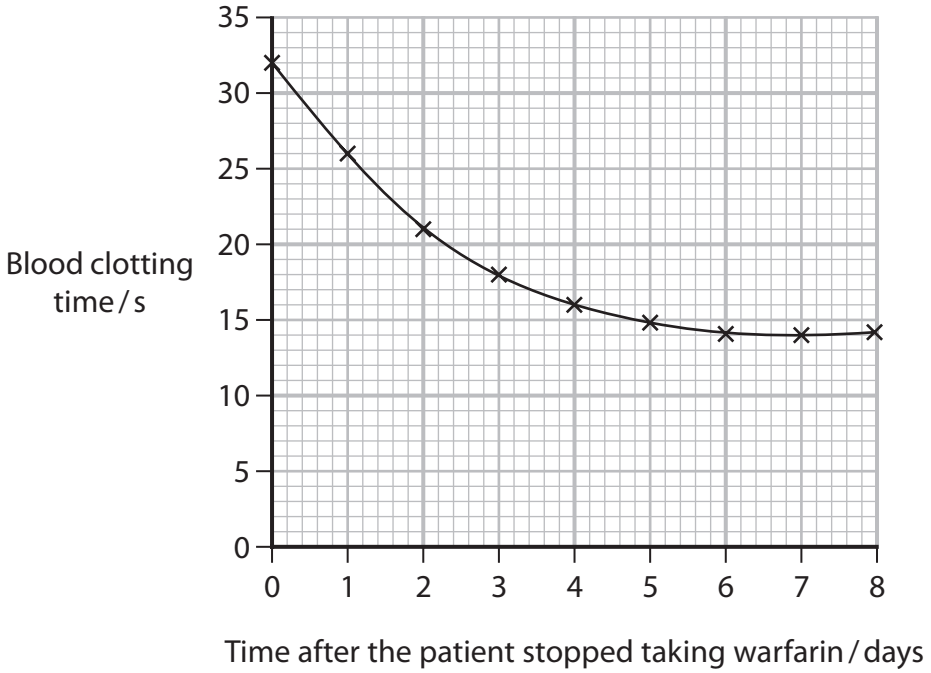
(b) The time taken for a blood sample to form a blood clot can be measured. This is called the clotting time.

The graph shows the blood clotting time after a patient has stopped taking warfarin.



Calculate the rate of decrease in the clotting time at two days after stopping taking warfarin.

Use a tangent for your calculation.

(2)

Answer .....

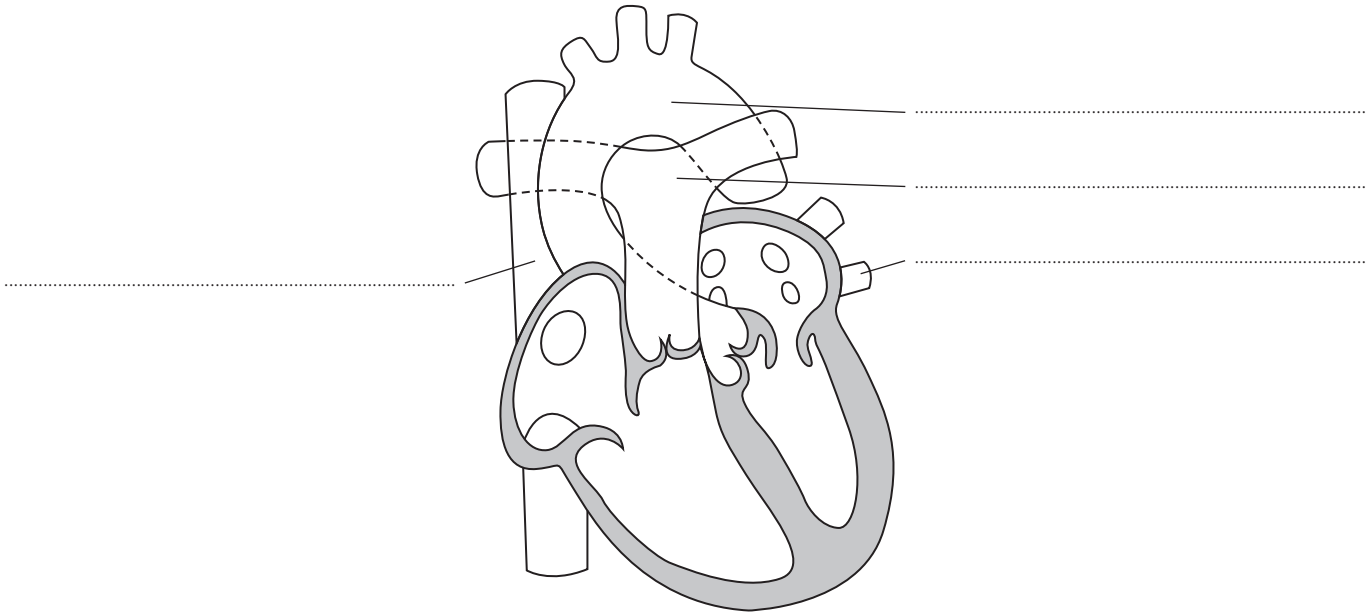
(Total for Question 2 = 6 marks)

3 Many animals have a heart and circulation.

(a) The diagram shows the structure of a human heart.

Label the diagram with the names of the four major blood vessels.

(3)



(b) The table shows some structures and the types of blood vessel that they are found in.

Put a cross ☒ in each row to show where these structures are found.

(3)

Structures	Found in arteries only	Found in capillaries only	Found in veins only	Found in arteries, capillaries and veins
Lining of endothelial cells	☒	☒	☒	☒
Valves along the length of the blood vessel	☒	☒	☒	☒
Wall only one cell thick	☒	☒	☒	☒

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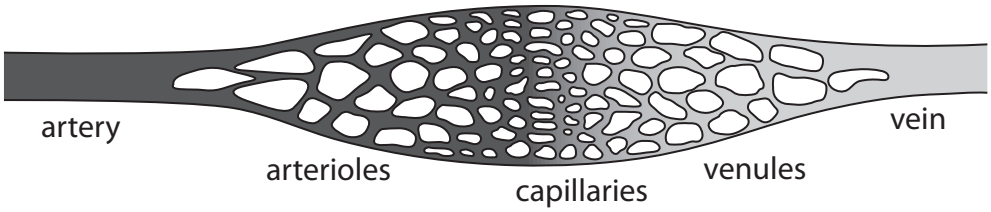
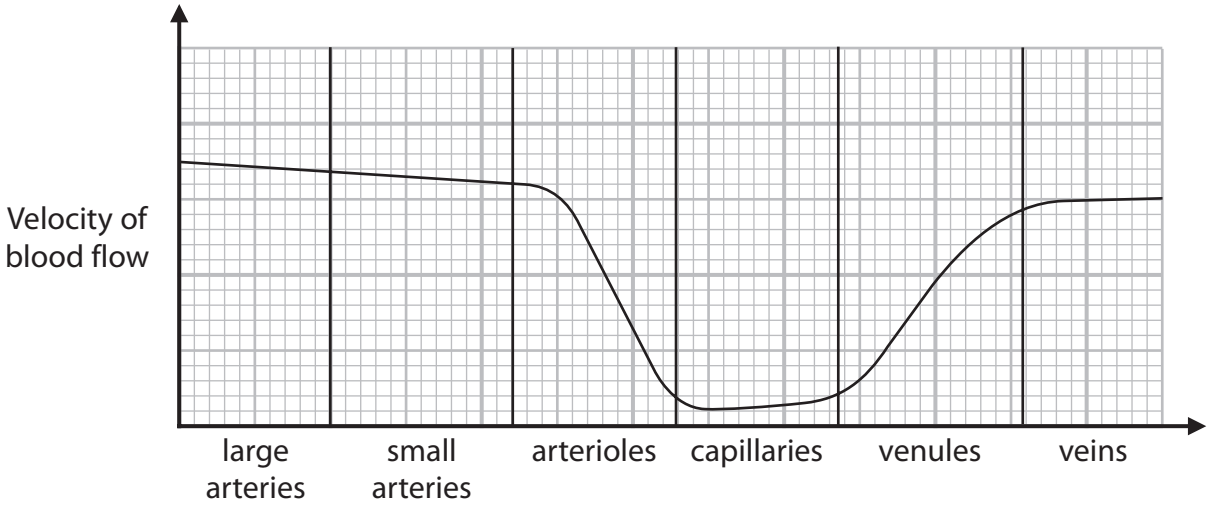
(c) The graph shows the velocity of the blood as it flows through the arteries into the capillaries and then into the veins.





Describe the changes in the velocity of the blood as it flows from an artery to a vein.

(3)

(Total for Question 3 = 9 marks)

4 The butterfly is an insect that feeds on nectar produced by flowers.

The photograph shows a butterfly feeding on a flower.



(Source: James Schwabel / Alamy Stock Photo)

(a) The nectar in flowers contains nutrients including sugars, amino acids and lipids.

(i) The sugars in the nectar are fructose, glucose and sucrose.

Which of these contain glycosidic bonds?

(1)

☒ **A** fructose only

☒ **B** sucrose only

☒ **C** fructose and glucose

☒ **D** fructose and sucrose

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(ii) Which row of the table describes how amino acids are joined together to form a protein?

(1)

		name of bond	type of reaction
☒	**A**	ester	condensation
☒	**B**	ester	hydrolysis
☒	**C**	peptide	condensation
☒	**D**	peptide	hydrolysis

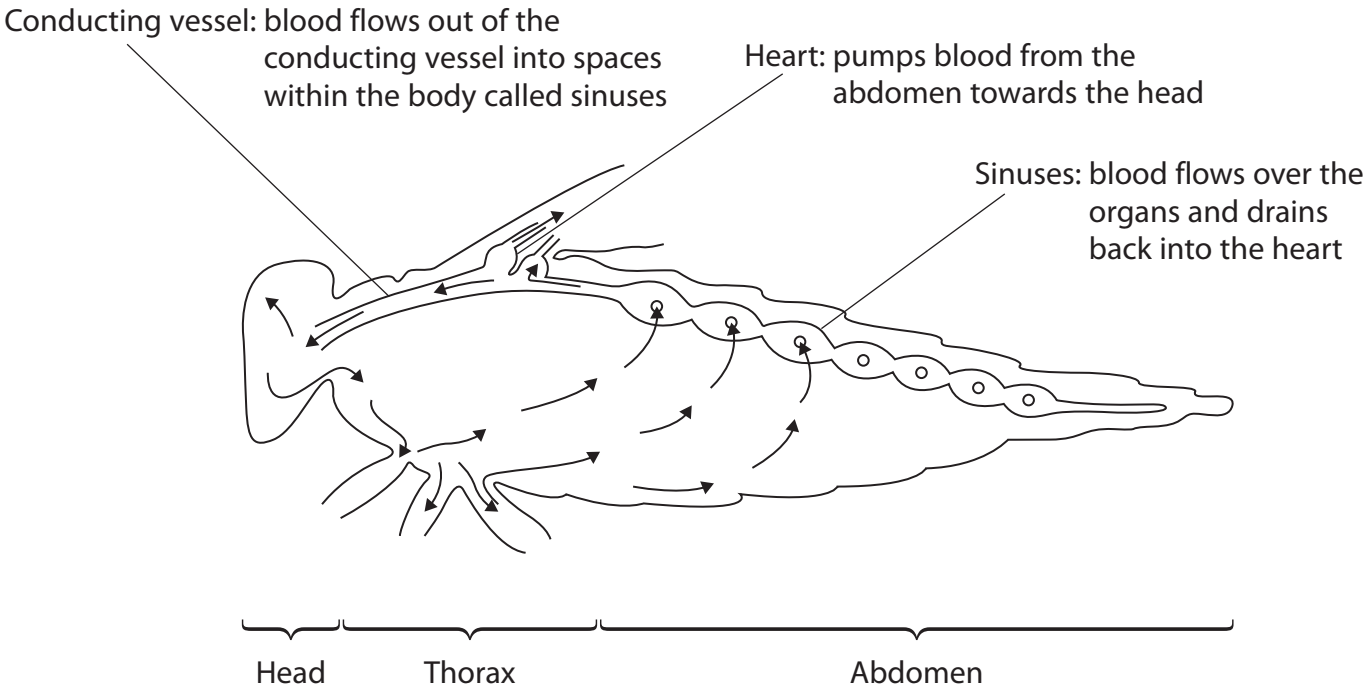
(iii) Which row of the table describes a saturated lipid?

(1)

		carbon-carbon double bonds	carbon : hydrogen ratio
☒	**A**	absent	higher than in an unsaturated fatty acid chain
☒	**B**	absent	lower than in an unsaturated fatty acid chain
☒	**C**	present	higher than in an unsaturated fatty acid chain
☒	**D**	present	lower than in an unsaturated fatty acid chain

(b) The circulatory system of an insect is described as an open system. This means that the blood is not contained inside blood vessels but flows through cavities called sinuses.

The diagram shows part of the circulatory system of an insect.



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(i) The length of the head of a butterfly is 4 mm, the thorax is 6 mm and the abdomen is 18 mm.

Estimate the surface area to volume ratio of the butterfly.

Assume that the insect is a cylinder of diameter 4 mm and the surface area is 360 mm^2.

(2)

Answer .....

(ii) Explain why the circulation of a butterfly is different from the circulation of a mammal.

(2)

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(iii) The blood flowing through the sinuses of the butterfly is separated from the organs by collagen.

Describe the structure of collagen.

(2)

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(Total for Question 4 = 9 marks)

5 Genetic screening can be used to test for aneuploidy.

Aneuploidy is the presence of an abnormal number of chromosomes in a cell.

Aneuploidy can affect the miscarriage rate of implanted embryos.

Following screening, only embryos with the correct number of chromosomes are implanted into the female.

The table shows the miscarriage rate of two groups of implanted embryos:

- embryos not screened for aneuploidy
- embryos screened and shown not to have aneuploidy.

Age range of women at implantation / years	Miscarriage rate (%)	
	Implanted embryos not screened for aneuploidy	Implanted embryos screened and shown not to have aneuploidy
<35	12.0	11.2
35 to 37	16.8	13.0
38 to 40	25.0	13.6
41 to 42	37.9	16.3
>42	58.8	17.2

(a) Explain how this data shows that there is a correlation between the age of the women and the miscarriage rate.

(2)

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(b) (i) Explain the conclusions that can be made from these data about the causes of miscarriage.

(2)

(ii) Explain why conclusions made using these data may not be valid.

(3)

(c) Discuss the implications of screening embryos for aneuploidy before implantation.

(3)

(Total for Question 5 = 10 marks)

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6 Acute hepatic porphyria (AHP) is a very rare genetic disorder.

A drug has been developed to treat AHP.

(a) This drug was tested in a clinical trial involving 94 patients from 18 countries.

The drug was given to 48 of the patients. The other 46 patients were a control group.

(i) Comment on the design of this clinical trial.

(2)

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(ii) Each patient was given 2.5 mg of the drug per kg of body mass, once a month.

The drug is available as a solution with a concentration of 189 mg cm^{-3}.

Calculate the volume of drug that was given each month to a patient with a body mass of 64 kg.

(2)

Answer .....

(iii) Nausea was experienced by 27% of the patients receiving this drug.

Calculate the number of patients who experienced nausea.

(2)

Answer .....

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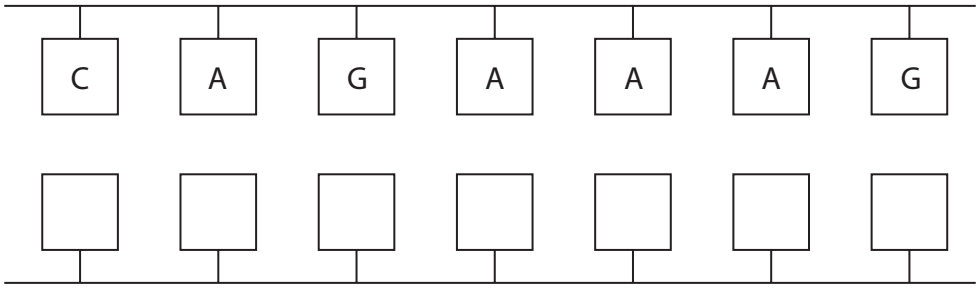
(b) This drug is a double-stranded RNA molecule.

(i) The diagram shows part of the base sequence on one of the RNA strands.

Complete the diagram to show the base sequence on the other RNA strand.

(2)



(ii) Describe the bonding in this double-stranded RNA molecule.

(3)

(iii) In AHP, toxic porphyrin molecules build up.

The synthesis of the haem component of haemoglobin involves several steps.

Each step in the synthesis of haem is catalysed by a different enzyme.

This drug works by interfering with the mRNA copies from the gene coding for one of these enzymes.

Explain how the action of this drug helps patients with AHP.

(3)

(Total for Question 6 = 14 marks)

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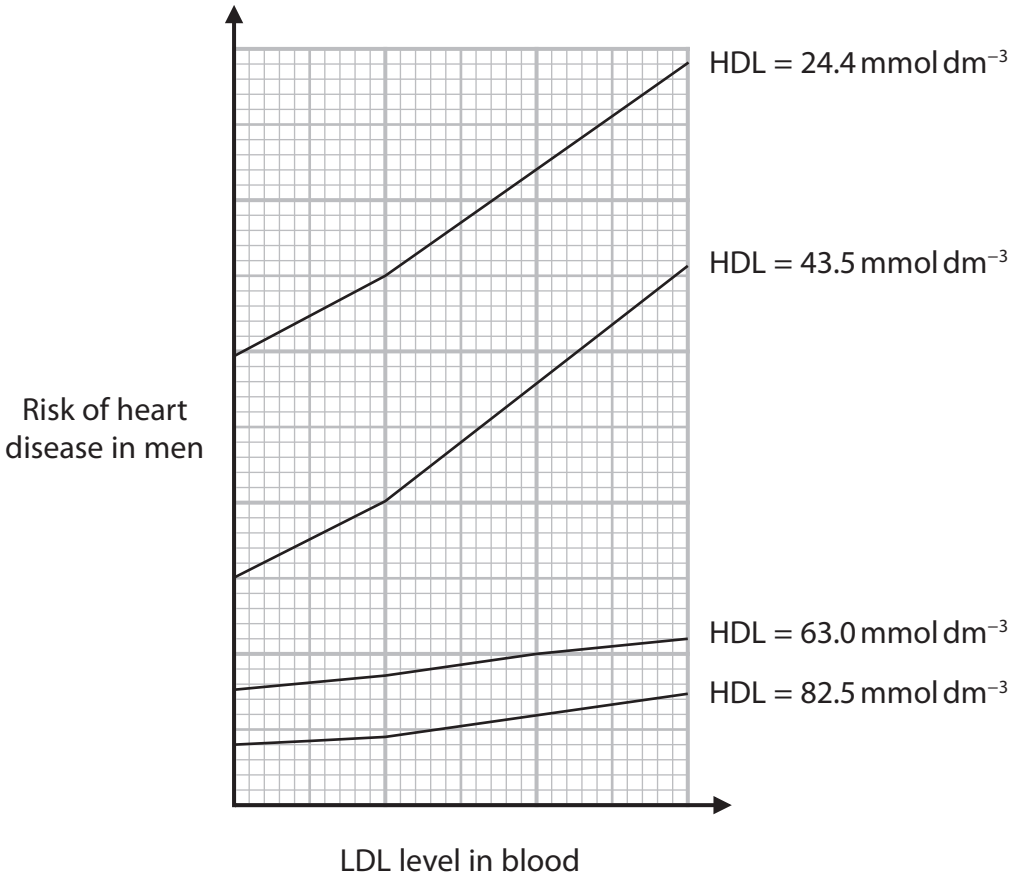
7 A number of factors affect the risk of a person developing heart disease.

One factor affecting this risk is the level of high-density lipoprotein (HDL) in the blood.

*(a) The graph shows the effects of HDL levels and low-density lipoprotein (LDL) levels in the blood on the risk of men developing heart disease.



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For men, a blood HDL level greater than 40 mg dm^{-3} is thought to be optimal.

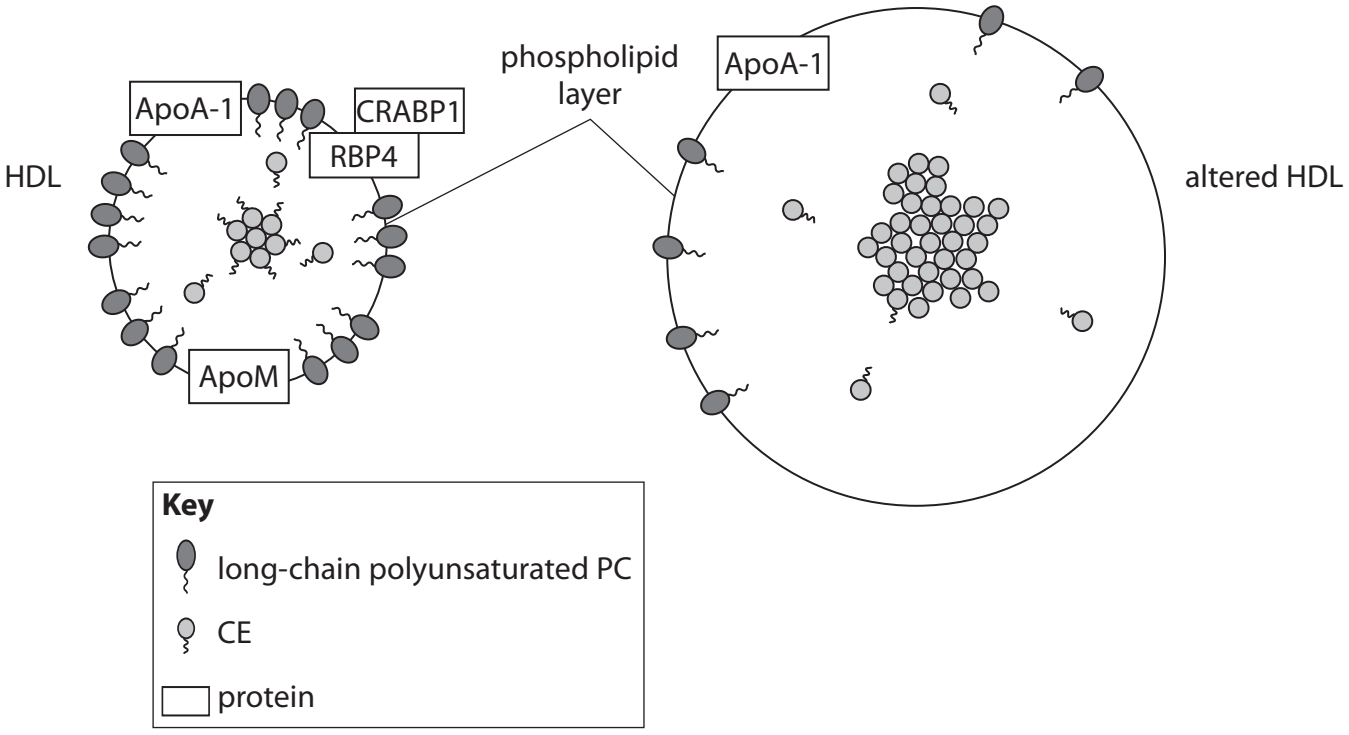
Explain why a man with a blood HDL level greater than 40 mg dm^{-3} may still have a high risk of developing heart disease.

Use the information in the graph and your own knowledge to support your answer.

(6)

(b) Very high levels of cholesterol in the blood can alter the structure of HDL. This altered HDL is less effective in reducing the risk of heart disease.

The diagram shows the structure of HDL in blood with a low level of cholesterol and altered HDL in blood with a high level of cholesterol.



(Source: https://www.sciencedirect.com/science/article/pii/S0735109717373448)

(i) Compare and contrast the structure of HDL with altered HDL.

(3)

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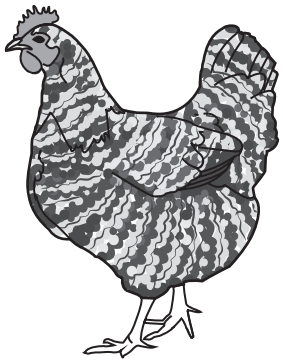
(ii) The antioxidant properties of altered HDL are reduced.

Explain the effect that this has on reducing the risk of heart disease.

(3)

(Total for Question 7 = 12 marks)

8 The drawing shows a speckled chicken. These chickens have a mixture of black and white feathers.



The colour of the feathers of a chicken is an example of codominance.

One parent of this speckled chicken had white feathers and the other parent had black feathers.

(a) Describe the difference between each of the following pairs of terms, using feather colour to illustrate your answer.

(i) Gene and allele

(3)

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(ii) Genotype and phenotype

(3)

(b) A black chicken was mated with a speckled chicken. They had 25 chicks.

Determine the expected number of speckled chicks.

You **must** use a genetic diagram.

(3)

Answer .....

(c) In an experiment, several pairs of speckled chickens were mated together.

They produced 480 chicks.

The table shows the expected number of speckled chicks, white chicks and black chicks. It also shows the actual number of each type of chick.

Steps in the calculation for the statistics test	Colour of feathers of chicks		
	Speckled	White	Black
Observed number (O)	243	125	112
Expected number (E)	240	120	120
(O-E)			
$\frac{(O-E)^2}{E}$			

This table can be used in a statistics test.

(i) Name the statistics test being used to analyse these data.

(1)

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(ii) Complete this table to show the missing values.

(2)

(iii) Calculate $\sum \frac{(O-E)^2}{E}$

(1)

Answer .....

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(iv) Explain how a critical value table could be used to accept or reject a null hypothesis for this experiment.

(2)

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(Total for Question 8 = 15 marks)

TOTAL FOR PAPER = 80 MARKS

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