Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Monday 7 January 2019

Morning (Time: 1 hour 30 minutes) | Paper Reference **WBI11/01**

Biology

International Advanced Subsidiary/Advanced Level
Unit 1: Molecules, Diet, Transport and Health

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or **black** 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.*
- **Show all your working in calculations and include units where appropriate.**

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.*
- 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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P 6 0 7 8 8 A 0 1 3 2

Pearson

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 Carbohydrates are one of the main types of nutrient. They include polysaccharides, disaccharides and monosaccharides.

(a) (i) Which formula is correct for a monosaccharide?

(1)

☒ **A** $C_nH_nO_{2n}$

☒ **B** $C_nH_{2n}O_n$

☒ **C** $C_{2n}H_nO_n$

☒ **D** $C_{2n}H_{2n}O_n$

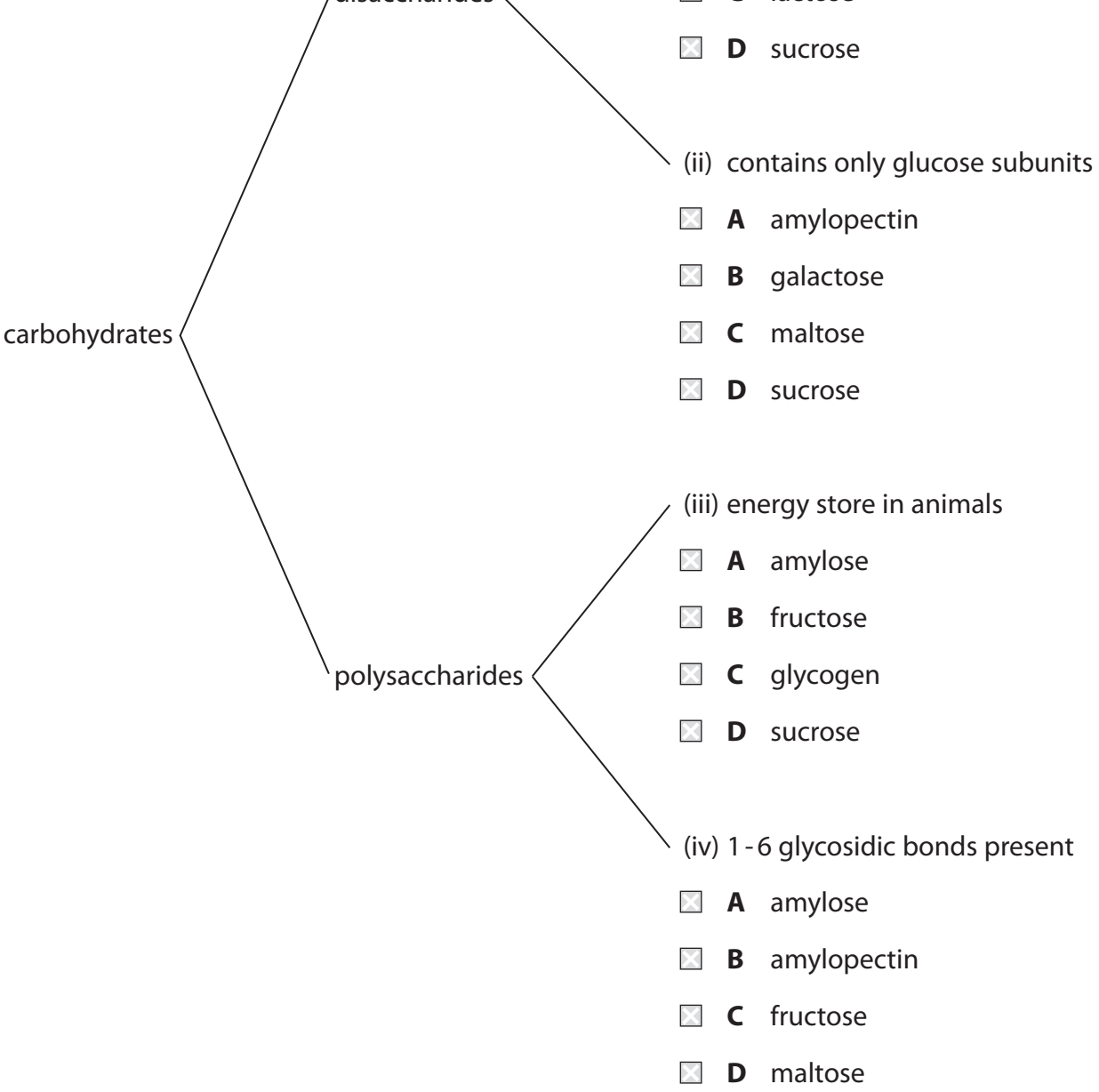
(ii) Name the reaction that joins two monosaccharides together to form a disaccharide.

(1)

(b) The diagram shows some information about carbohydrates.

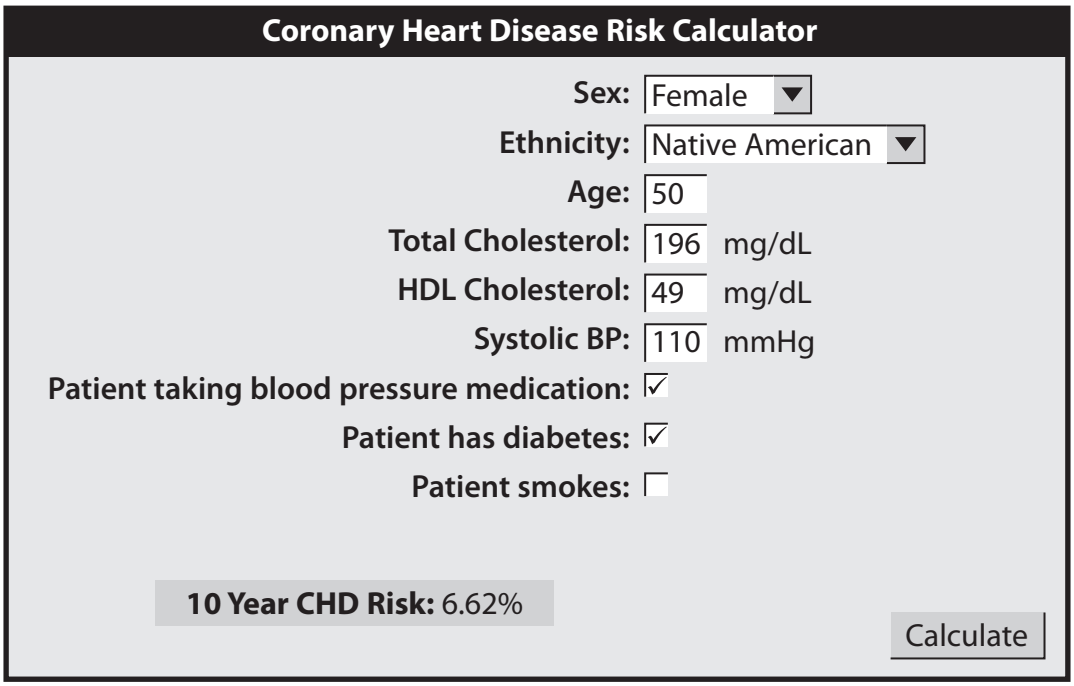
Which carbohydrate is being described in each of (i) to (iv)?

(4)



(Total for Question 1 = 6 marks)

2 The diagram shows a coronary heart disease (CHD) risk calculator.



(a) Which of the following is a medication to control blood pressure?

(1)

☒ **A** anticoagulant

☒ **B** antihypertensive

☒ **C** platelet inhibitor

☒ **D** statin

(b) Explain why the risk calculator takes into account total cholesterol and HDL cholesterol levels.

(2)

(c) Explain why the 10 Year CHD Risk would change if this person ticked the box next to the 'Patient smokes' on the risk calculator.

(3)

(d) (i) State one other factor that the risk calculator should include to improve the accuracy of the value for the 10 Year CHD Risk.

(1)

(ii) Predict the effect that taking this factor into account would have on the value for the 10 Year CHD Risk.

(1)

(iii) A person used this risk calculator.

Explain why the value obtained for the 10 Year CHD Risk may be an underestimate.

(2)

(Total for Question 2 = 10 marks)

3 Nucleic acids include DNA and RNA.

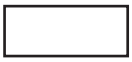
(a) Each single strand of a DNA molecule is synthesised from mononucleotides.

Draw a diagram to show two mononucleotides joined together in a single strand of DNA.

Use the symbols shown for each component in your diagram.

(3)

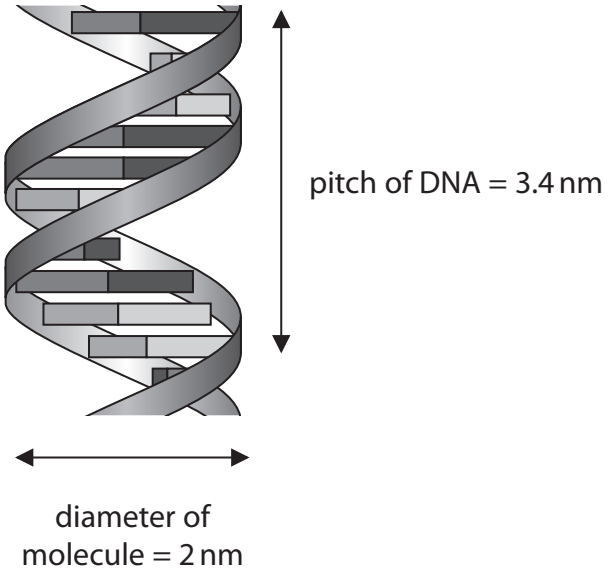
Phosphate group 

Base 

Pentose sugar 

Bond

(b) The diagram represents part of a DNA molecule.



The pitch is the length of one complete turn in the double helix.

There are 10 base pairs in one pitch.

(i) Calculate the distance between one base and the next base on one strand of DNA.

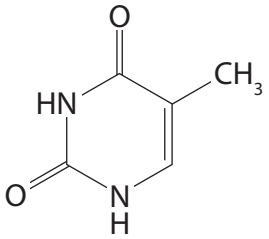
Give your answer to an appropriate number of significant figures.

(1)

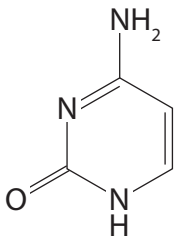
Answer ..... nm

(ii) The diagram shows the structure of thymine and four other bases, **P**, **Q**, **R** and **S**.

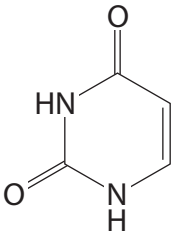
Bases **P** and **S** can form three hydrogen bonds each and bases **Q** and **R** can form two hydrogen bonds each.



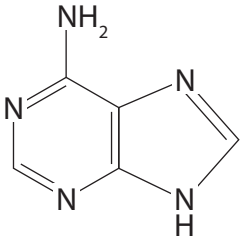
thymine



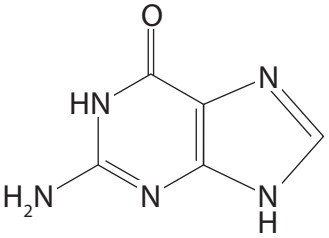
base **P**



base **Q**



base **R**



base **S**

Explain which of the four bases **P**, **Q**, **R** or **S** is adenine.

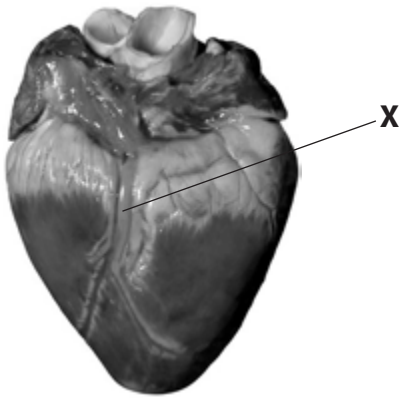
(2)

(c) Compare and contrast the structure of messenger RNA (mRNA) with the structure of transfer RNA (tRNA).

(4)

(Total for Question 3 = 10 marks)

4 The photograph shows a mammalian heart.



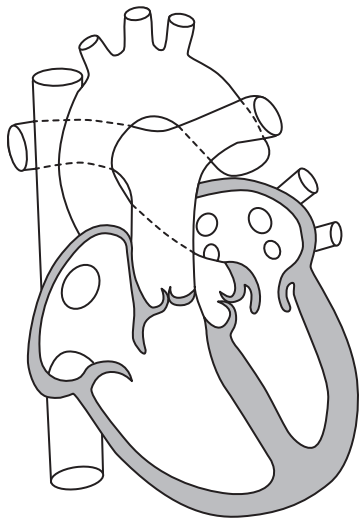
The blood vessel labelled **X** is a branch from the aorta.

The aorta is one of the major blood vessels of the heart.

(a) Explain why it is important that blood vessel **X** branches directly from the aorta.

(3)

(b) The diagram shows the internal structure of a mammalian heart.



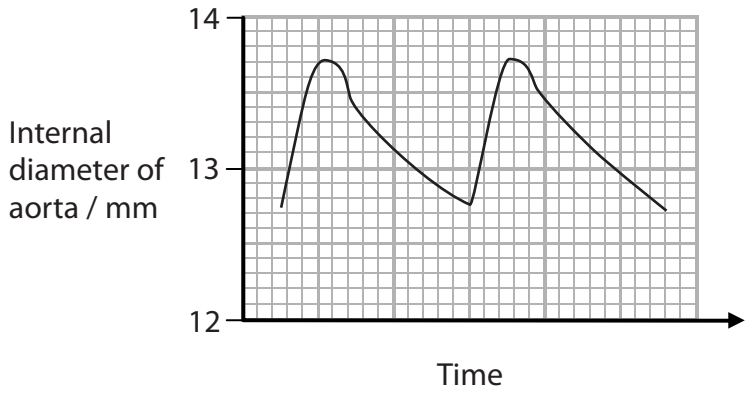
(i) Explain which stage of the cardiac cycle is shown in this diagram.

(2)

(ii) Draw arrows on the diagram to show the flow of blood through the left side of the heart and into the aorta.

(3)

(c) The graph shows the changes in the internal diameter of the aorta during two cardiac cycles.



Explain the changes in the internal diameter of the aorta.

(3)

(Total for Question 4 = 11 marks)

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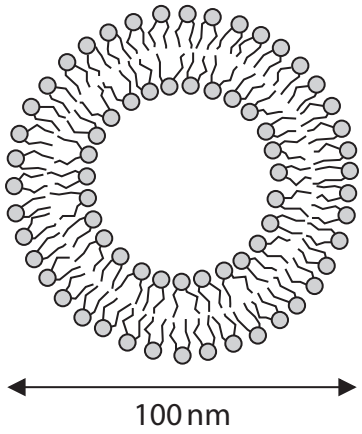
5 Liposomes are spherical structures composed of phospholipids. They can be made by adding phospholipids to water.

Liposomes can be used to study membrane permeability.

(a) The diagram shows a liposome.



(i) Calculate the volume of this liposome, using the formula

$$V = \frac{4}{3}\pi r^3$$

(2)

Answer .....

(ii) Explain the arrangement of phospholipids in liposomes.

(2)

.....

.....

.....

.....

.....

.....

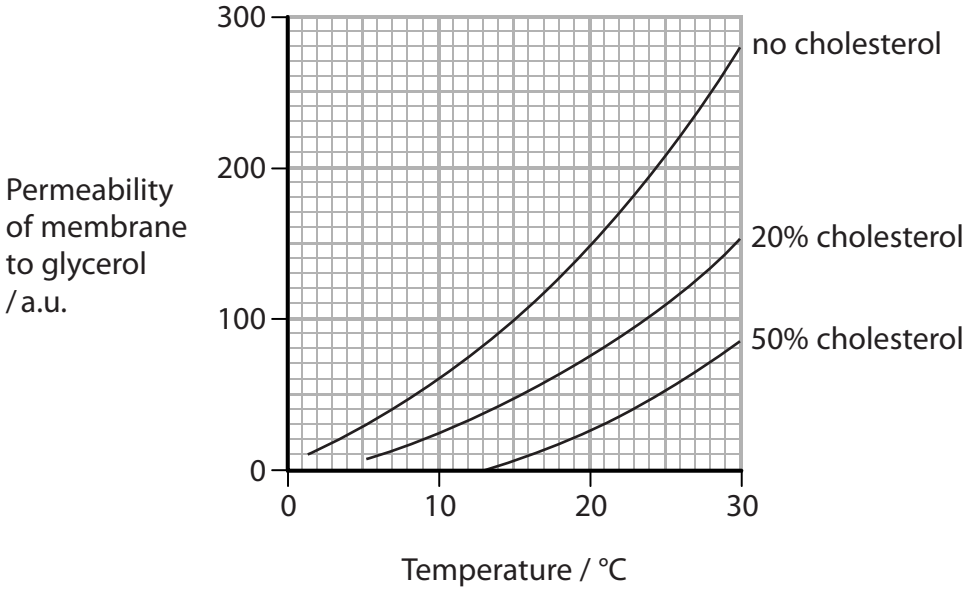
(b) The presence of cholesterol in the membrane affects membrane permeability.

A student investigated the effect of cholesterol on the permeability of liposomes to glycerol at different temperatures.

Liposomes were made by replacing 20% and 50% of the phospholipid with cholesterol.

Liposomes without cholesterol were also made.

The graph shows the results of this investigation.



(i) How does glycerol pass through the liposome membrane?

(1)

- ☒ **A** active transport
- ☒ **B** diffusion
- ☒ **C** endocytosis
- ☒ **D** osmosis

(ii) Describe the effects of cholesterol and temperature on membrane permeability, as shown in the graph.

(3)

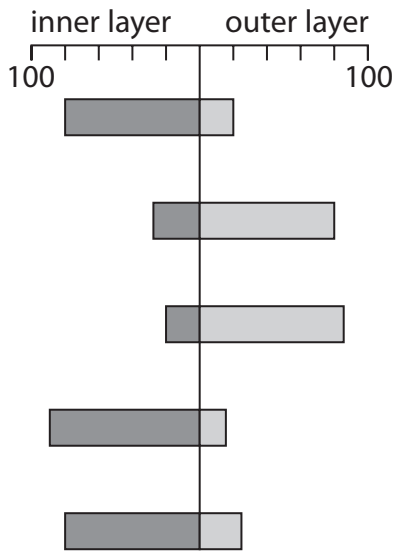
(iii) Explain why cholesterol and temperature affect membrane permeability.

(2)

(Total for Question 5 = 10 marks)

6 Platelets are involved in the blood clotting process.

(a) The table shows the phospholipid content of the membranes of platelets.

Phospholipid	Percentage of total membrane phospholipids (%)	Percentage distribution of phospholipids in the membrane (%)
phosphatidylethanolamine	30	
phosphatidylcholine	27	
sphingomyelin	23	
phosphatidylserine	15	
other types	5	

When platelets trigger the blood clotting process, more phosphatidylserine molecules move into the outer layer of the membrane.

(i) Estimate the ratio of phosphatidylserine in the inner layer to that in the outer layer before the blood clotting process is triggered.

(1)

Answer .....

(ii) Describe the effect that the movement of phosphatidylserine into the outer layer will have on the content of phospholipids in the membranes of platelets.

(2)

(iii) Describe how the movement of phosphatidylserine into the outer layer results in the production of thrombin in the blood clotting process.

(4)

(b) Thrombin inhibitors are drugs that have an effect on the time taken for blood to clot.

Explain why thrombin inhibitors affect the time taken for blood to clot.

(4)

(Total for Question 6 = 11 marks)

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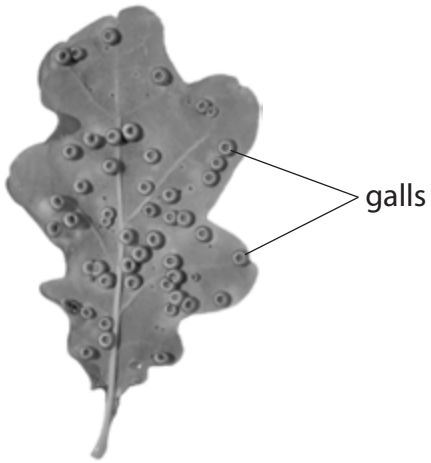
7 Some insects lay eggs inside leaves. This causes the leaves to produce swellings called galls.

The galls supply the developing insects with nutrients and protect them from the external environment.

The photograph shows galls on a leaf.



In an investigation, the concentrations of protein molecules and amino acids found in healthy leaves, leaves with galls and in the galls themselves were determined.

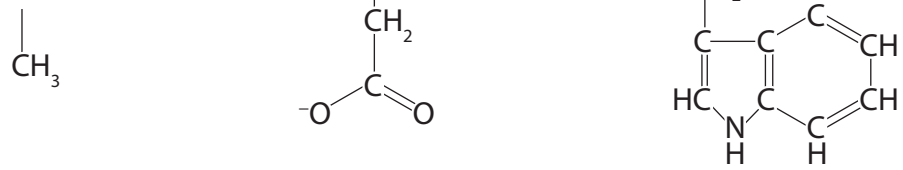
(a) The insects were removed from each gall before the investigation.

Suggest why the insects were removed from the galls.

(2)

(b) The amino acids were extracted and dissolved in a non-polar organic solvent.

(i) The diagram shows the R group of the amino acids, alanine, aspartate and tryptophan.



alanine aspartate tryptophan

Which row of the table describes the solubility of these amino acids in a non-polar organic solvent?

(1)

	Solubility in a non-polar organic solvent		
	Most soluble ⟶		**Least soluble**
☒ **A**	alanine	aspartate	tryptophan
☒ **B**	alanine	tryptophan	aspartate
☒ **C**	aspartate	alanine	tryptophan
☒ **D**	aspartate	tryptophan	alanine

(ii) The solubility of an amino acid can be determined by measuring the maximum mass of the amino acid that dissolves in a known volume of solvent.

The solubility of the amino acid histidine in a solvent is 43.5 g dm^{-3}.

The mass of the amino acid leucine that dissolves in 250 cm^3 of the same solvent is 5.5 g.

Calculate how many times more soluble histidine is than leucine.

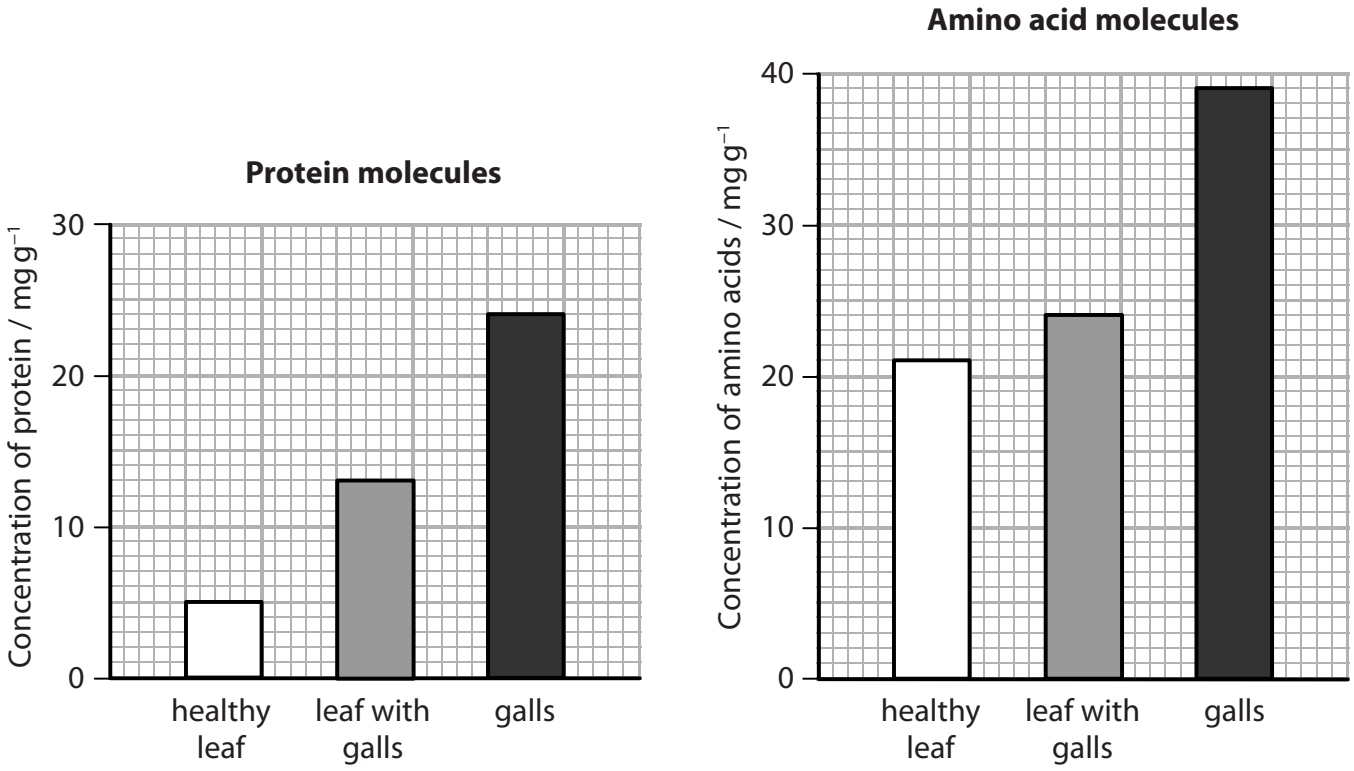
(2)

Answer .....

*(c) The gall-forming insects secrete saliva into the plant tissues.

The saliva contains enzymes that change the nutrients in the leaf and cause the galls to form.

The graphs show the concentrations of protein molecules and amino acid molecules in tissues from a healthy leaf, tissues from a leaf with galls and in the galls themselves.



The table shows the abundance of five amino acid molecules.

Amino acid	Abundance in tissues of a healthy leaf	Abundance in tissues of a leaf with galls	Abundance in galls
alanine	++	+	++
arginine	++	–	++
histidine	–	–	++
leucine	+	+	+
tryptophan	–	–	–

Key

++ most abundant

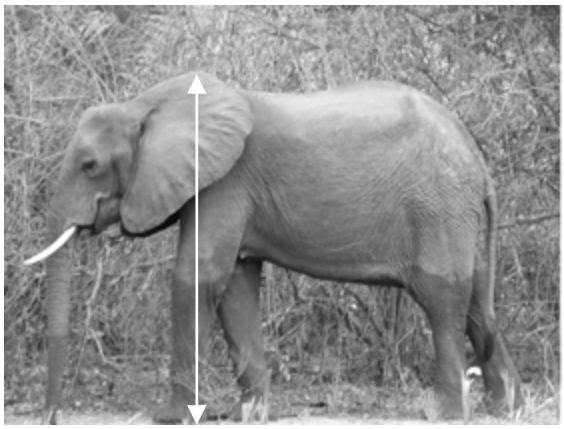
– absent

Explain the results of this investigation. Use the information in both graphs and the table to support your answer.

(6)

(Total for Question 7 = 11 marks)

8 The photographs show two mammals, an elephant and a mouse.



Magnification ×0.02

(a) The height of a mouse is 3 cm.

Calculate how many times taller an elephant is than a mouse.

Use the white line drawn on the photograph of the elephant to calculate this value.

(2)

Answer .....

(b) The respiratory system of an elephant is different from that of other mammals.

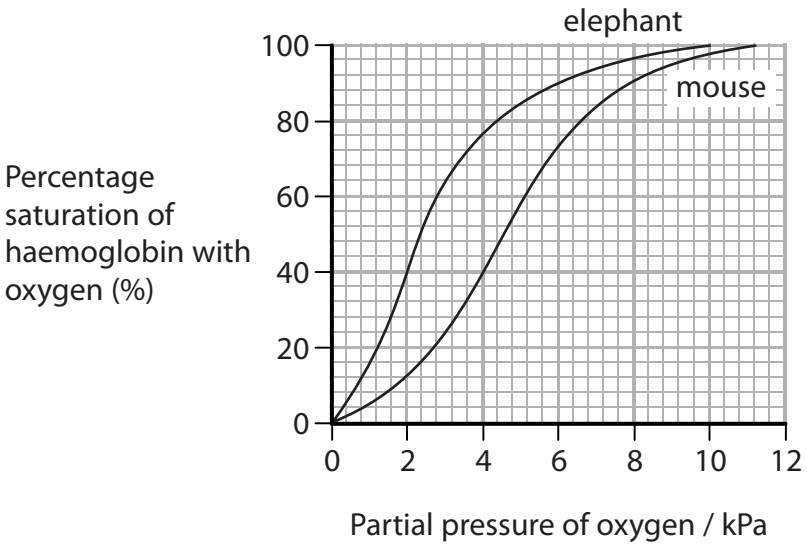
The lungs are attached to the chest cavity wall and diaphragm by collagen fibres.

Describe how the lungs of an elephant are adapted for gas exchange.

(3)

*(c) Graph 1 shows the oxygen dissociation curve of haemoglobin for a mouse and for an elephant.

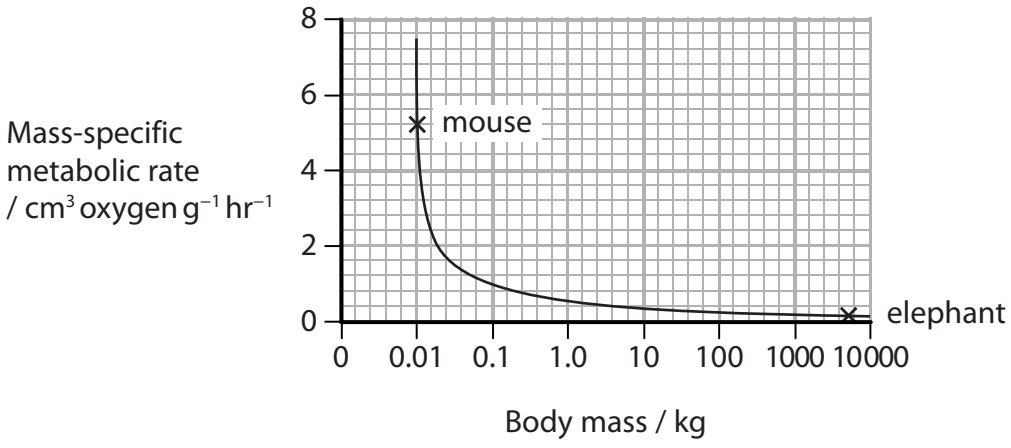
Graph 1



Graph 2 shows the mass-specific metabolic rate for a mouse and for an elephant.

Mass-specific metabolic rate is a measure of how much oxygen is needed for chemical reactions per gram of body tissue.

Graph 2



Explain the difference in the oxygen dissociation curves of haemoglobin for a mouse and for an elephant.

Use the information in both graphs to support your answer.

(6)

(Total for Question 8 = 11 marks)

TOTAL FOR PAPER = 80 MARKS

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