WJEC A-LEVEL BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT BY2 OLD SPECIFICATION PAPERS

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01 – **LEGACY**

S16-1072-01

BIOLOGY – BY2

P.M. TUESDAY, 7 June 2016

1 hour 30 minutes

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Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**7**	
3.	**16**	
4.	**6**	
5.	**9**	
6.	**13**	
7.	**10**	
Total	**70**	

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010001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use pencil or gel pen. Do not use correction fluid.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.
The quality of written communication will affect the awarding of marks.

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Answer **all** *questions.*

1. *(a)* Photograph **A** below is of a mistletoe plant, *Viscum album*, attached to the branch of a tree. Photograph **B** shows an enlarged image of the mistletoe plant. Mistletoe plants attach to and penetrate the branches of a tree in order to obtain water and nutrients from the tree. This commonly reduces the growth of the host tree and can kill the portion of branch it grows on.



Photograph **A**



Photograph **B**

(i) Explain why mistletoe is referred to as being a parasite. [1]

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(ii) Mistletoe however is only partially parasitic. Use the information provided to explain this statement. [2]

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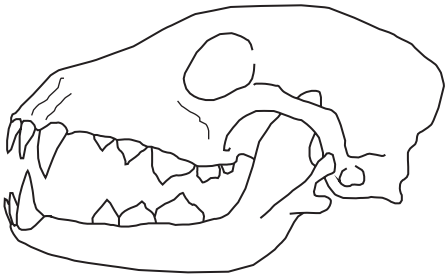
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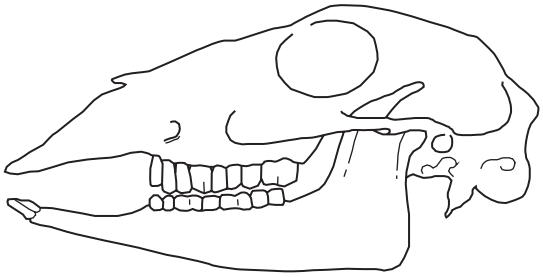
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(b) The diagrams below show the skulls of two different animals. For each of the animals, state their **mode of nutrition** and explain how their **dentition** is adapted to their mode of nutrition.



Animal **X**



Animal **Y**

Animal **X** [3]

Animal **Y** [3]

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2. *(a)* Below is a photograph of the dragonfly, *Aeshna caerulea*, which inhabits wetland areas of Scotland.



(i) State the name of the phylum to which it belongs. [1]

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(ii) State **two** characteristics, shown by the dragonfly, which could be used to place it into its phylum. [2]

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(iii) What is meant by the term *genus*? [1]

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(iv) State the genus to which this dragonfly belongs. [1]

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(b) Both dragonflies and birds have wings that enable them to fly, but are placed in different taxonomic groups. What conclusions can be drawn about the evolution of these structures? [2]

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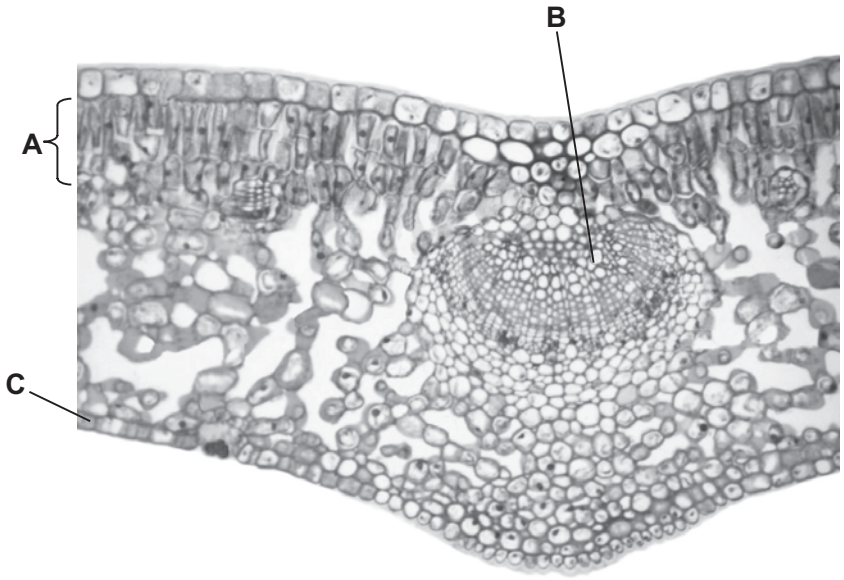
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3. The image below shows a transverse section of a leaf from the Chinese privet plant, *Ligustrum lucidum,* a mesophyte.



(a) Name **tissues A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) Describe **and** explain **four** ways in which the leaf is adapted to absorb sunlight. [4]

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(c) Explain why guard cells are important to the functioning of the plant. [2]

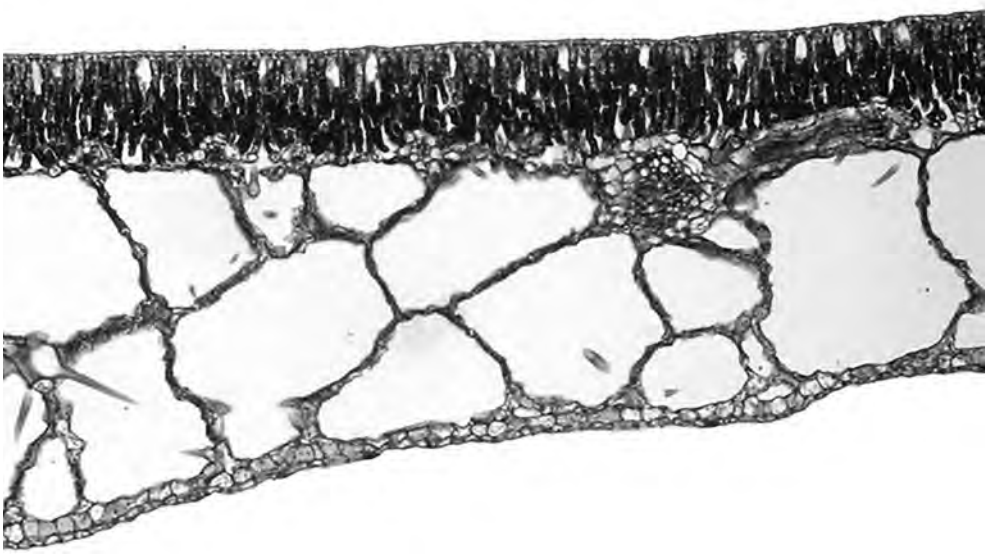
(d) Explain the mechanism which causes the stomatal pores to open. [4]

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(e) The photograph below is of a transverse section of a leaf from a different type of plant from that in part *(a)*. Both photographs are of the same scale.



State the **type** of plant from which this leaf was taken, giving reasons for your choice. [3]

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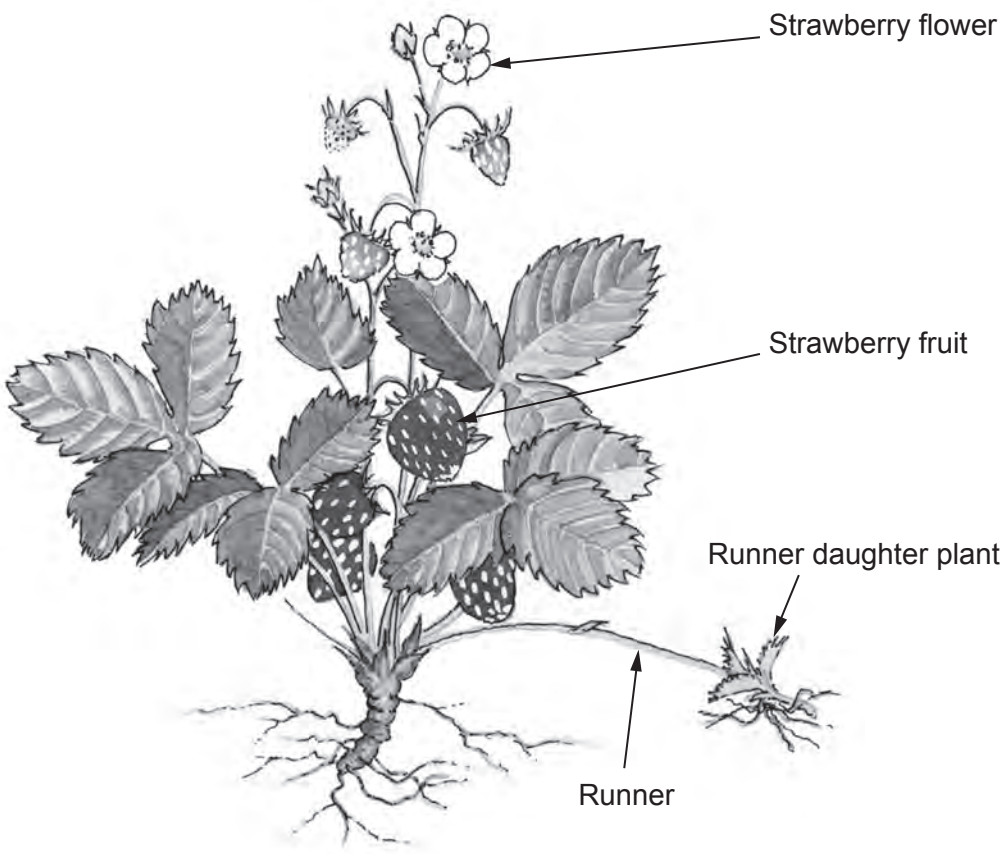
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4. This image shows a strawberry plant which is producing flowers and runners at the same time.



(a) Explain the advantage of the reproductive strategy shown by the plant above. [3]

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(b) Frogs and crocodiles are adapted to survive both on land *and* in water. Explain why frogs must return to the water to reproduce whereas crocodiles do not. [3]

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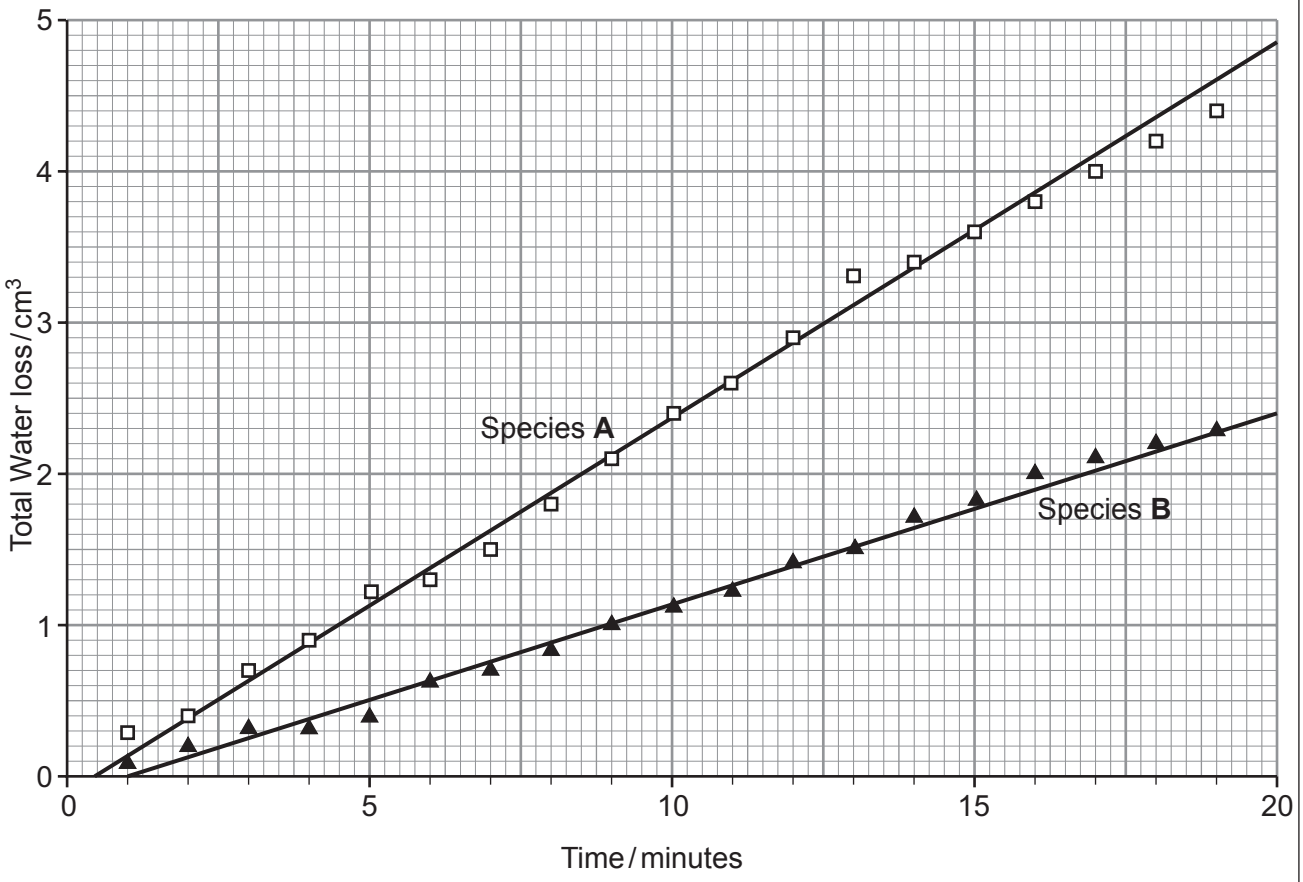
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5. *(a)* A student set up an experiment to investigate the rate of transpiration in two different species of plant. The data collected are shown in the graph below.



(i) State the name of the equipment that the student would have used to collect this data. [1]

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(ii) Describe how the student would have used this equipment to collect the data shown. [3]

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(b) Using the data from the experiment, calculate the rate of transpiration for species **A** between 5 and 15 minutes. [2]

Rate of transpiration = ... cm^3min^{-1}

(c) (i) Suggest the type of environment to which species **B** might be adapted. [1]

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(ii) Describe and explain **one** structural adaptation of the leaves of plant species **B** that could account for the rate of transpiration shown in the graph. [2]

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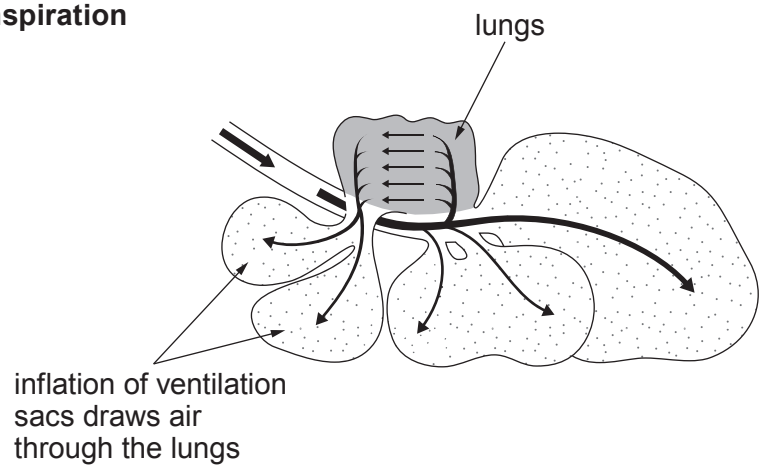
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6. The following passage has been adapted from the book 'Life Ascending' by Nick Lane:

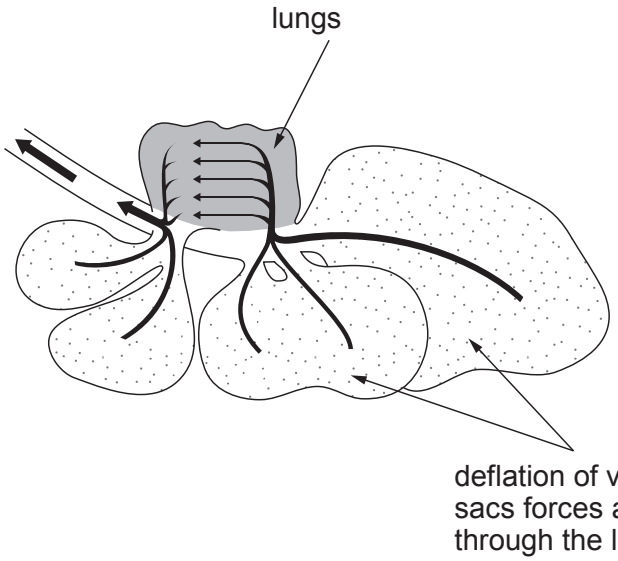
'Bird lungs are more efficient than mammal's lungs even at low altitudes. At high altitudes birds can extract more oxygen from the air than mammals. This is why migrating bar-headed geese (Anser indicus) can fly thousands of feet above the top of Everest.

Birds have a sophisticated one way system of interconnected ventilation sacs. Rather than entering the lungs directly, air first flows into the ventilation sacs and eventually exits via the lungs, giving a continuous through-flow of air through the lungs.

Inspiration



Expiration



Air flows continuously in the same direction through the lungs during both inspiration and expiration, while blood flows in the opposite direction, giving a highly efficient counter-current exchange of gases.'

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(a) Describe **three** features of the gas exchange surface in the goose. [3]

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(b) What is the advantage of birds having internal lungs for gas exchange? [1]

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(c) Explain why the counter-current exchange of gases is beneficial to the bar-headed goose. [4]

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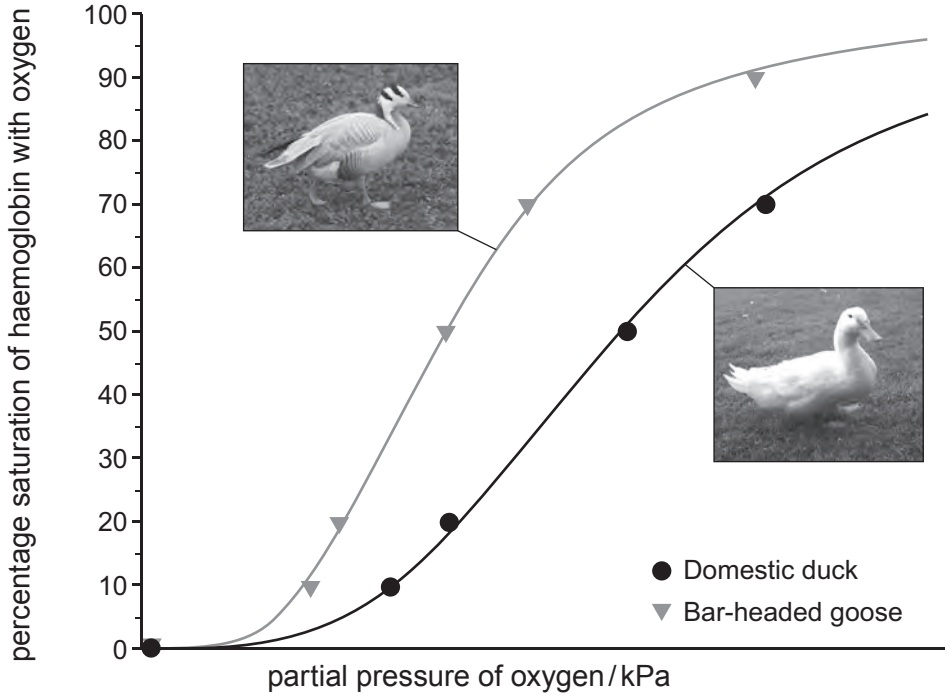
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(d) The diagram below shows the oxygen-haemoglobin dissociation curve for the bar-headed goose and a domestic duck.



(i) Use the information provided, and your own knowledge, to explain the relative position of the oxygen-haemoglobin dissociation curve for the bar-headed goose and suggest the importance of this. [4]

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(ii) What is the disadvantage to the bar-headed goose of the position of the dissociation curve? [1]

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7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Changes in pressure are essential for the flow of blood through the heart. Describe how these changes are initiated and explain their significance during a single cardiac cycle. [10]

Or, *(b)* The mammalian circulatory system is made up of different types of blood vessel. Describe and explain how the structure of these blood vessels relates to their function. [10]

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GCE MARKING SCHEME

SUMMER 2016

BIOLOGY - BY2 (LEGACY)
1072/01

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

S15-1072-01

BIOLOGY – BY2

P.M. MONDAY, 1 June 2015

1 hour 30 minutes

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Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**10**	
3.	**10**	
4.	**10**	
5.	**13**	
6.	**12**	
7.	**10**	
Total	**70**	

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Answer **all** *questions.*

1. The Snow Leopard, *Panthera uncia,* is an endangered species of big cat that is found in the mountainous regions of central Asia.

(a) (i) Complete the table below for the classification of the snow leopard. [2]

Kingdom	Animalia
Phylum	Chordata
	Mammalia
Order	Carnivora
	Felidae
Genus	
Species	

(ii) The snow leopard belongs to the phylum Chordata. Excluding characteristics common to the phylum in general, state **one** characteristic that is common to all vertebrates. [1]

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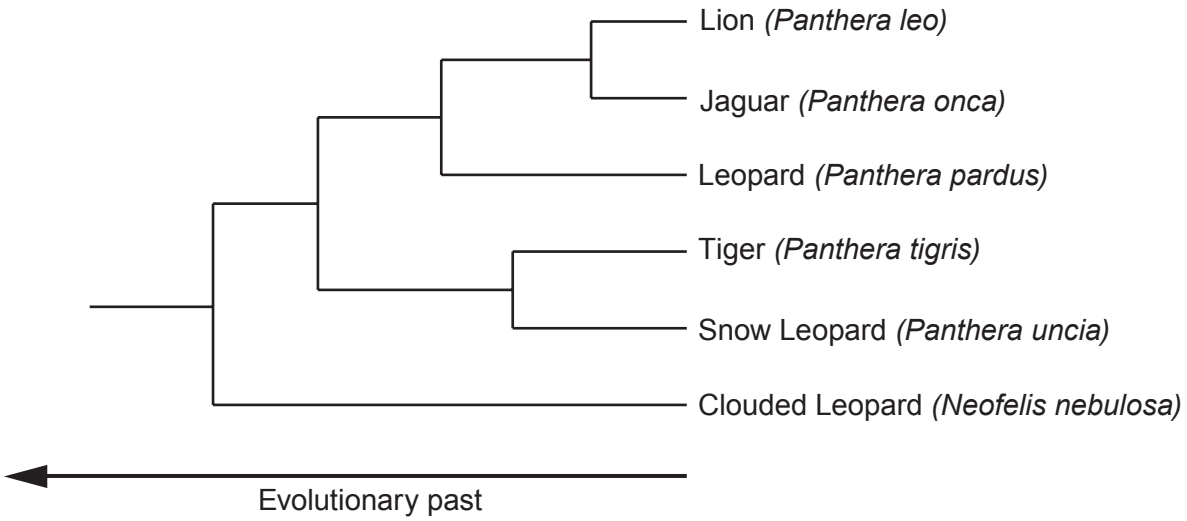
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(b) Below is part of the phylogenetic tree for the Felidae.



(i) Using evidence from the diagram, state which **two** cat species are likely to be most closely related. [1]

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(ii) Explain how the results of DNA profiling tests could have been used to determine that these two species were the most closely related. [1]

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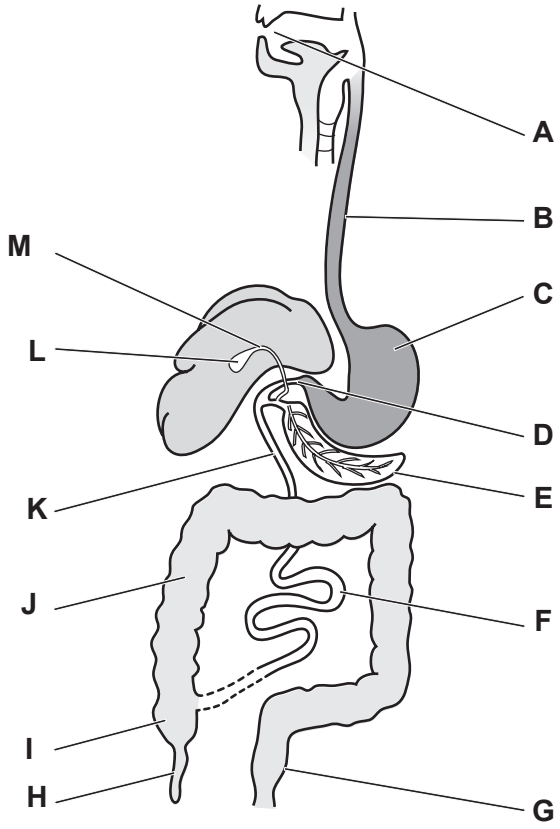
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2. Below is a diagram of the human gut.



(a) Using the letters from the diagram, indicate where the following occur. (Letters may be used once, more than once or not at all.) [4]

	Letter(s)
The main sites of mechanical digestion	
The site of lipase production	
The chemical digestion of protein begins	
The final stages of carbohydrate digestion	

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(b) The liver produces bile which contains both bile salts and hydrogen carbonate ions. Bile is stored in the gall bladder and is secreted into the duodenum. Bile salts emulsify lipids by breaking large lipid droplets into many smaller lipid droplets.

(i) Explain the importance of this process in the digestion of lipids. [2]

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(ii) Using your knowledge of digestion, suggest a function of the hydrogen carbonate ions. [1]

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(c) Humans are the primary host of the pork tapeworm, *Taenia solium*.

(i) Draw a labelled arrow on the diagram opposite to show where the adult tapeworm would be located. [1]

(ii) Using your knowledge of the tapeworm, explain why the tapeworm would be located in this region. [2]

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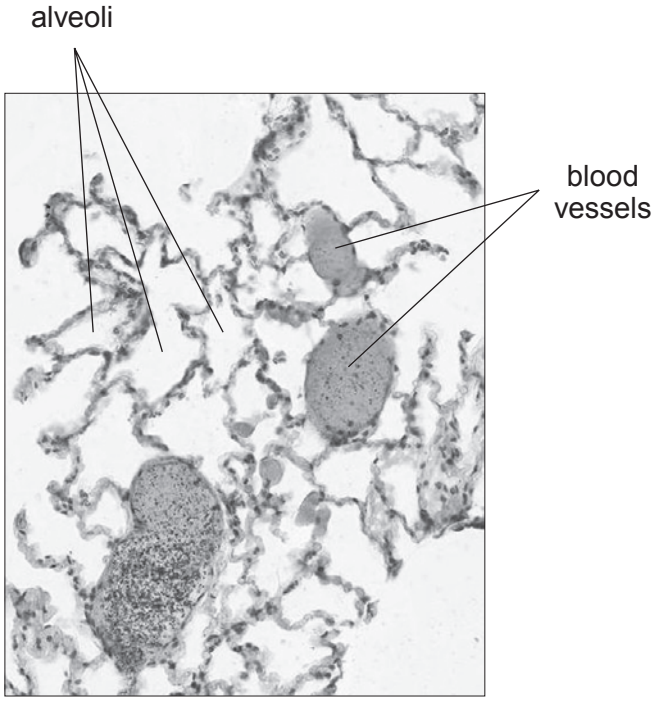
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3. Shown below is a micrograph of a section through part of a mammalian lung.



(a) Describe and explain how **two** features **shown in the micrograph** are adaptations for efficient gas exchange. [4]

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(b) (i) Describe and explain the process of expiration in a mammal. [4]

(ii) Mammals have a high oxygen demand. Suggest why they need a complex ventilation mechanism. [2]

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4. There are two types of reproduction, asexual and sexual.

(a) Explain **one** advantage to an organism in reproducing:

(i) asexually; [1]

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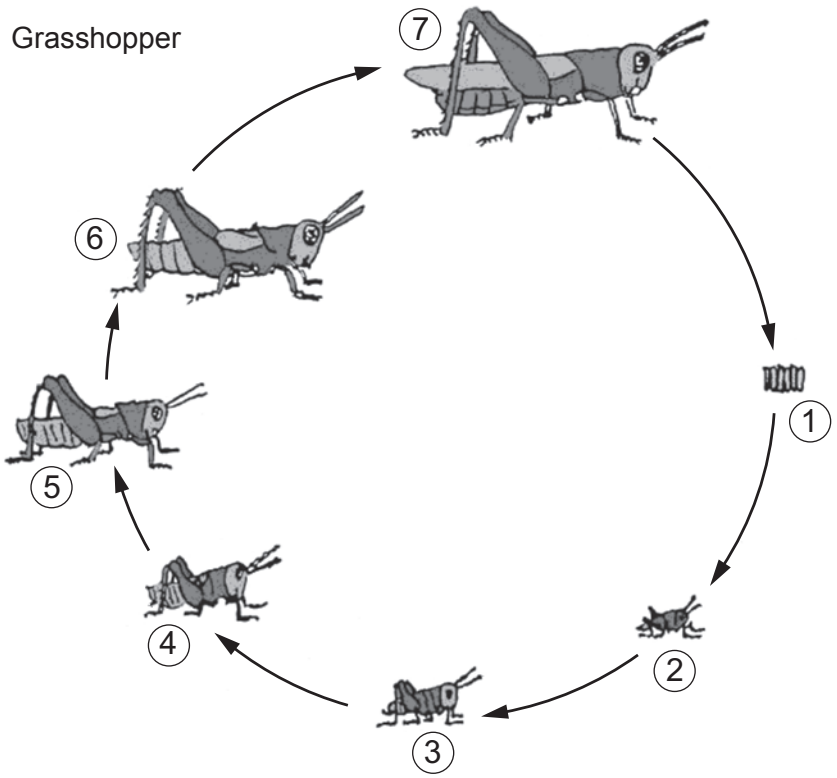
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(ii) sexually. [1]

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(b) Below is a diagram showing the lifecycle of a grasshopper.



(i) What is the name given to the type of insect lifecycle above? [1]

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(ii) A single stage in the insect's lifecycle is represented by the numbers 2-6. State the name given to this stage. [1]

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(iii) Describe **two** ways in which the lifecycle of a butterfly would differ from the lifecycle shown opposite. [2]

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(c) Below is a table showing aspects of reproduction in three different species of fish.

fish	diameter of egg (mm)	number of eggs released per year
cod	0.13	$3\text{-}7 \times 10^6$
dogfish	15.0	144
stickleback	2.0	60

Using the information above, suggest which species of fish:

(i) shows the greatest degree of parental care, give a reason for your answer; [2]

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(ii) will be the most developed when it hatches, give a reason for your answer. [2]

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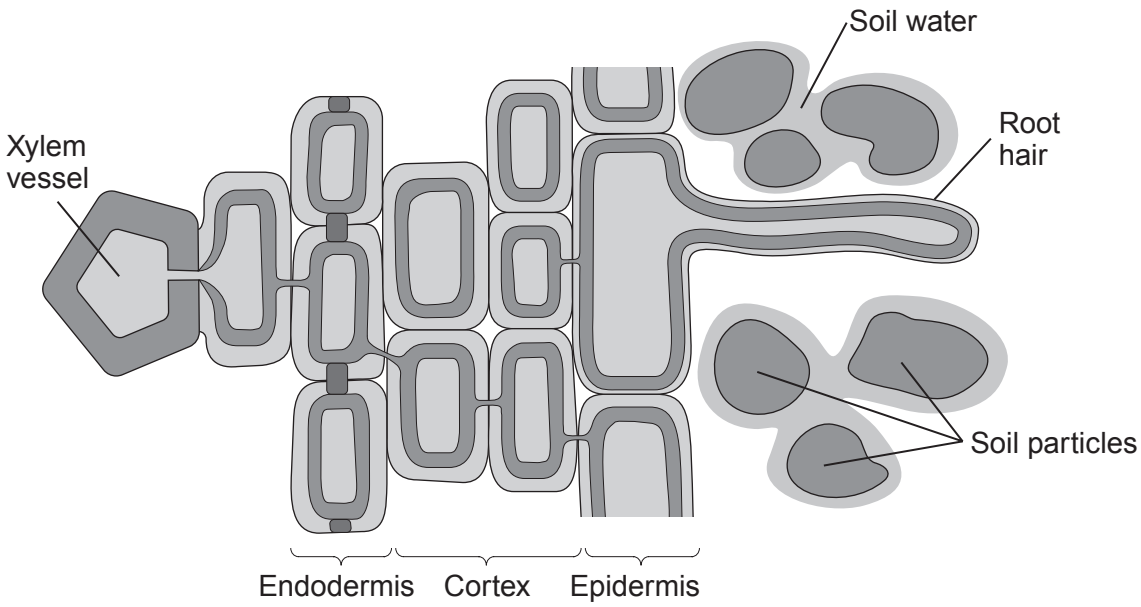
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5. Shown below is a diagram of a cross section through a root.



(a) Explain how a root hair cell is adapted to its function. [1]

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(b) Water can travel across the root via the apoplast and symplast pathways. Describe the difference between these two pathways. [2]

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(c) Describe and explain the role of the endodermis in the uptake of water into the xylem vessels and in generating root pressure. [4]

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(d) The transport of organic molecules through a plant can be monitored using radioactive tracers. If a plant is supplied with carbon dioxide containing the radioactive isotope, ^{14}C, then the radioactive carbon will be incorporated into organic molecules which can then be located using autoradiography.

(i) Name the leaf tissue where ^{14}C is incorporated into organic molecules. [1]

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(ii) Name the carbohydrate that is transported through the plant. [1]

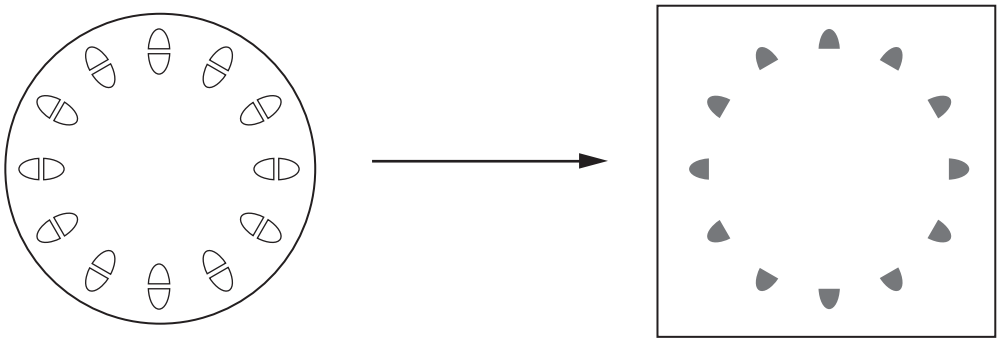
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(e) Below is a transverse section of a dicotyledon stem and an autoradiogram of the same section.



Transverse section of stem Autoradiogram

What conclusion about the transport of carbohydrates can be drawn from the autoradiogram? [1]

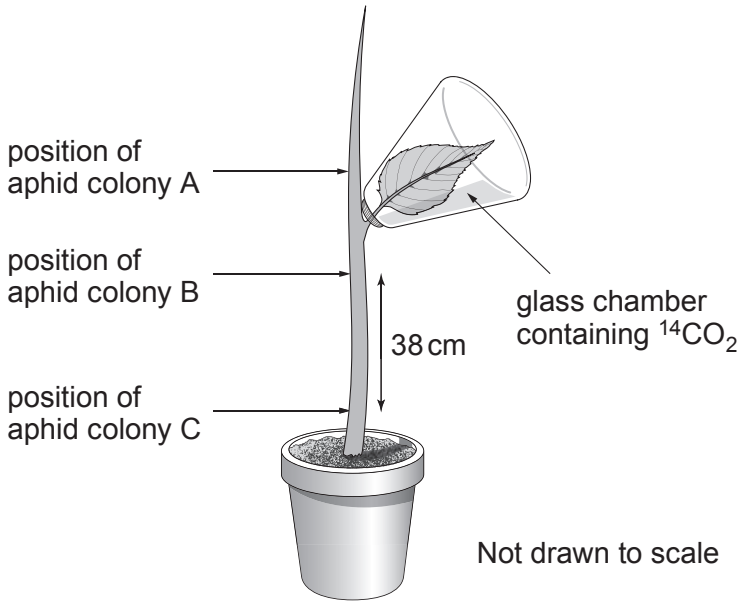
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(f) In an experiment, a single leaf of a plant was supplied with radioactively labelled carbon dioxide. Colonies of aphids were allowed to feed at various locations on the plant, as shown in the diagram below. During feeding, the aphids were anaesthetised and their bodies removed leaving their mouthparts in the plant. The solution of organic molecules flowing out of the mouthparts was then analysed.



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Aphid colony	Time after the start of the experiment when radioactivity was first detected in aphid mouth parts (hours)
A	1.0
B	1.0
C	2.5

(i) How does the evidence from the experiment show that there is bidirectional movement of organic molecules in the plant? [1]

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(ii) Use the information provided to calculate the rate of translocation ($cm\,min^{-1}$) of organic molecules through this plant. [2]

..... $cm\,min^{-1}$

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6. *(a)* Cardiac muscle is said to be myogenic (spontaneously active). What does this term mean? [1]

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(b) Describe the role of the following in the cardiac cycle:

(i) the sino-atrial node; [2]

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(ii) the Purkyne (Purkinje) fibres. [2]

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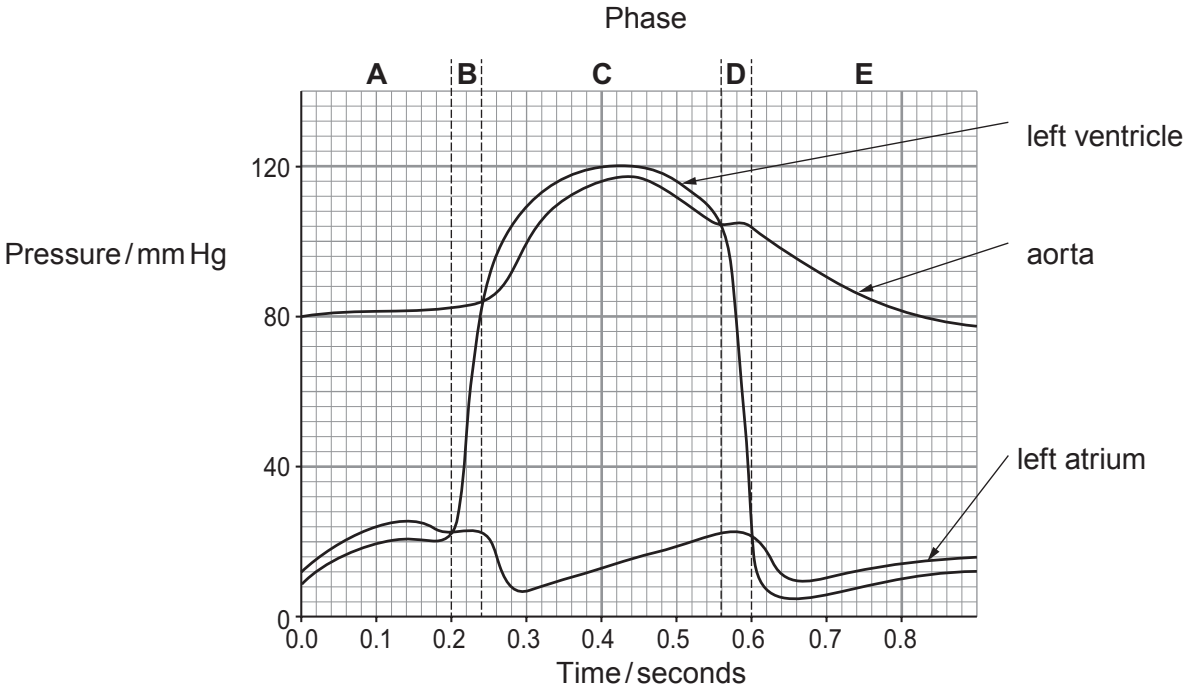
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(c) Below is a graph showing the pressure changes in the left side of the heart during one cardiac cycle.



(i) From the graph state the time when the following events occur. [2]

Event	Time / seconds
The atrio-ventricular (bicuspid) valve closes	
The aortic (semi lunar) valve closes	

(ii) Using the letters **A**-**E** from the top of the graph, state **a** phase when the following events occur. [3]

Event	Phase
Blood is flowing from the atria to the ventricles	
Blood is flowing from the ventricle to the aorta	
When there is no overall movement of blood through the heart	

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(iii) Explain how blood is prevented from flowing from the left ventricle to the left atrium. [2]

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7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Tissue fluid is important in exchange. Give an account of the formation of tissue fluid and how it is returned to the circulation. [10]

Or, *(b)* Describe the role of haemoglobin in the transport of oxygen. Explain how this is affected by different environmental conditions. [10]

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCE MARKING SCHEME

BIOLOGY/HUMAN BIOLOGY
AS/Advanced

SUMMER 2015

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

BIOLOGY – BY2

P.M. MONDAY, 2 June 2014

1 hour 30 minutes

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Question	**Maximum Mark**	**Mark Awarded**
1.	**15**	
2.	**13**	
3.	**10**	
4.	**13**	
5.	**9**	
6.	**10**	
Total	**70**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use pencil or gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the continuation pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

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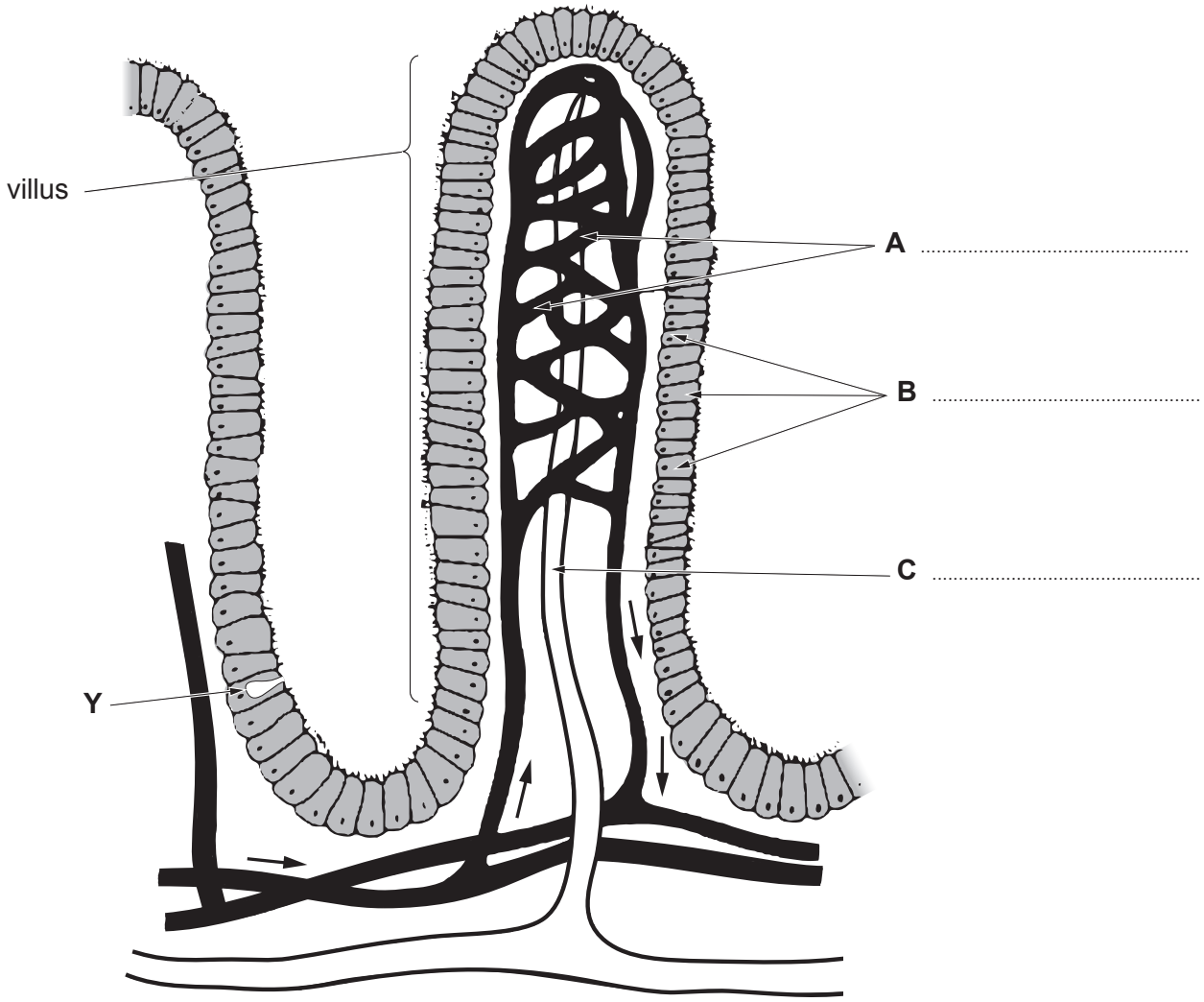
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Answer **all** *questions.*

1. The diagram below shows a villus of the small intestine.



(a) Complete the diagram above by naming the structures **A**, **B** and **C**. [3]

(b) With reference to the diagram **only**, describe and explain **two** features that are important in the functioning of the villus. [4]

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(c) (i) Name the substance secreted by cell type **Y**. [1]

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(ii) Explain **two** functions of the secretion of cell type **Y** in the process of digestion. [2]

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(d) Layers of smooth muscle are found in the wall of the small intestine.
Explain the role of these muscle layers in the process of digestion. [3]

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(e) Amino acids absorbed by structure **A** are transported to the liver. Describe the fate of the **excess** amino acids absorbed. [2]

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2. *(a)* (i) State what is meant by the term *transpiration*. [2]

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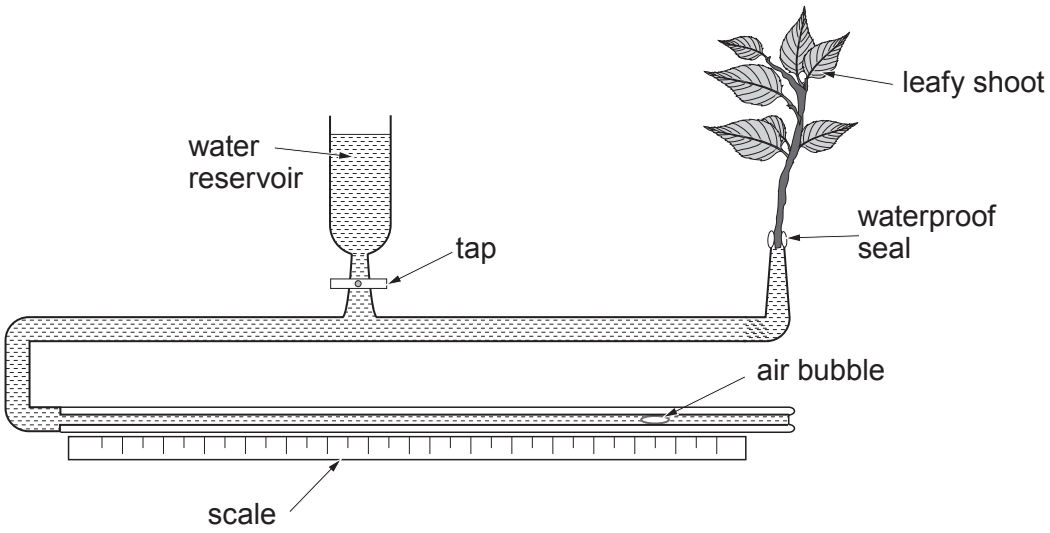
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(ii) Give **one** benefit of transpiration to a plant. [1]

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(b) The diagram below shows a piece of apparatus called a potometer which is used to measure the rate of transpiration.



(i) Suggest why the end of the shoot should be cut under water before being inserted into the potometer. [2]

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(ii) State what measurements would have to be made, in order to determine the rate of transpiration. [2]

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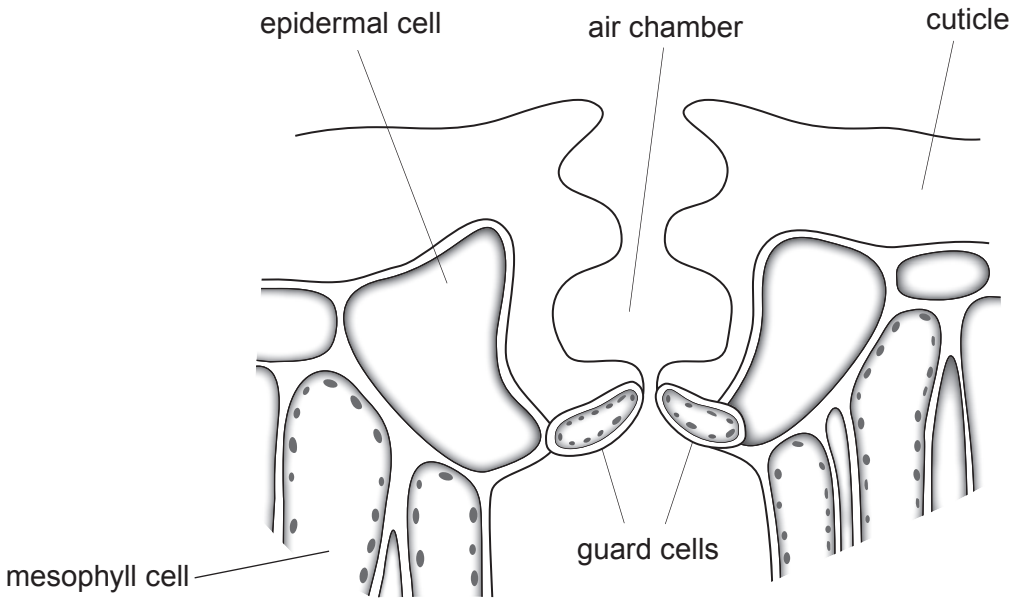
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(c) The diagram below shows a sunken stoma which is an adaptation found in the leaves of some plants that live in very dry conditions.



(i) State the general name for plants that live in, and are adapted for, dry conditions. [1]

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(ii) With reference to the diagram, explain how a sunken stoma is able to reduce transpiration. [3]

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(iii) Describe and explain **two** *other* adaptations which reduce the rate of transpiration in plants that live in very dry conditions. [2]

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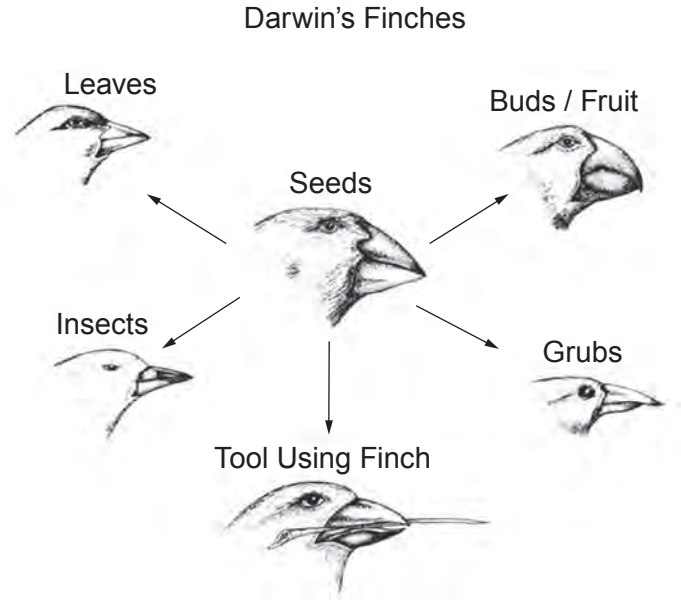
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3. *(a)* Darwin's finches are an example of a species diversifying into several forms to ensure long term survival.
The diagram below illustrates some of these different forms and their food sources.



(i) Name the evolutionary change illustrated by Darwin's finches as shown in the diagram above. [1]

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(ii) Describe the process which results in the evolutionary change shown in the diagram above. [4]

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(b) Although haemoglobin is found throughout the animal kingdom, its amino acid composition varies.

Human haemoglobin is a protein molecule containing 574 amino acids. The haemoglobin of a horse has 557 amino acids in common with humans and the haemoglobin of a gorilla has 572 amino acids in common with humans.

(i) Explain what this information indicates about the evolutionary relationship between the three animal species. [3]

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(ii) Name the technique used to compare the amino acid composition of haemoglobin in different animals. [1]

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(iii) How has this biochemical technique helped improve the classification of organisms? [1]

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4. *(a)* Bony fish rely on gills and gill filaments for gaseous exchange. Explain how the presence of gill filaments is an adaptation to gaseous exchange. [2]

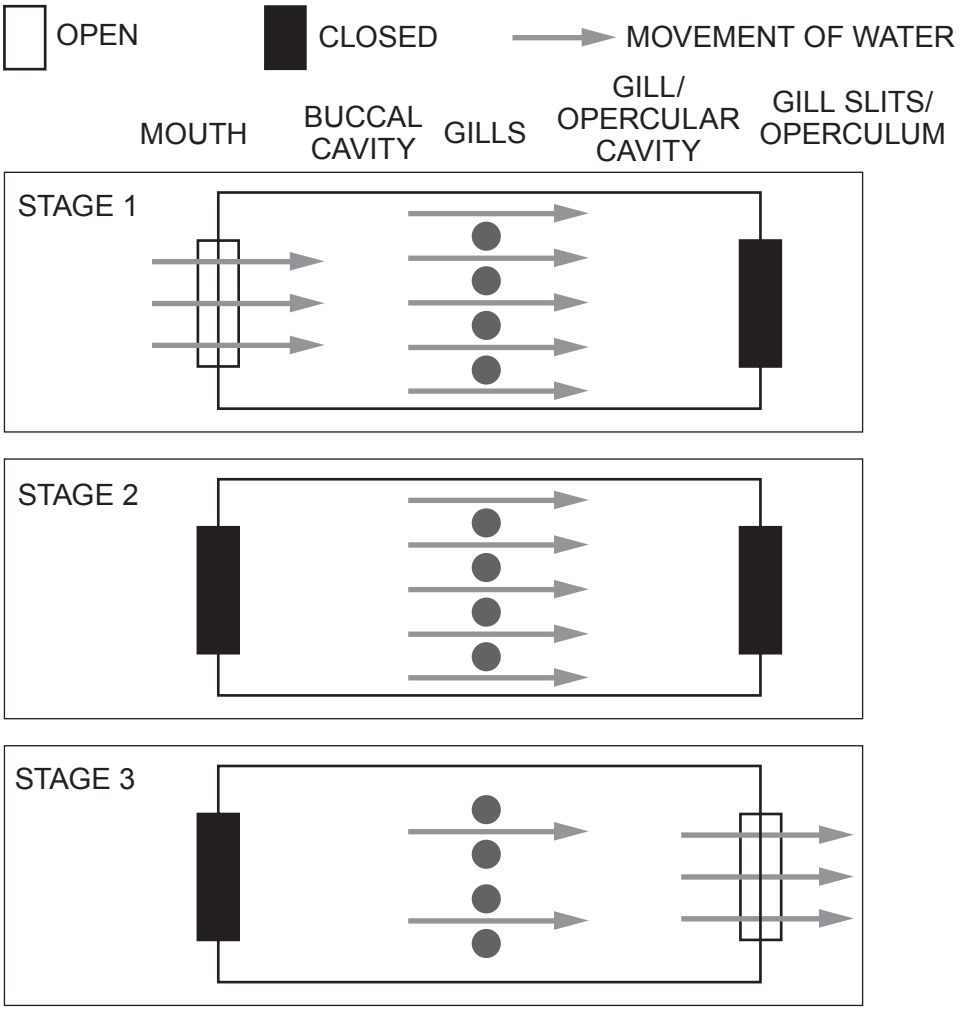
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(b) The system of ventilation in a bony fish enables water to be passed continuously over its gills whilst the fish is at rest.
The diagrams below show three stages in the process of ventilation.



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(i) Ventilation of the gills is achieved by pressure changes in the buccal and gill/ opercular cavities. Using information from the diagram opposite and your own knowledge describe the process of ventilation in a bony fish. [4]

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(ii) In order to further increase the efficiency of gas exchange, bony fish use a counter current flow. State what is meant by *counter current flow* and explain how this increases the efficiency of gas exchange in the bony fish. [3]

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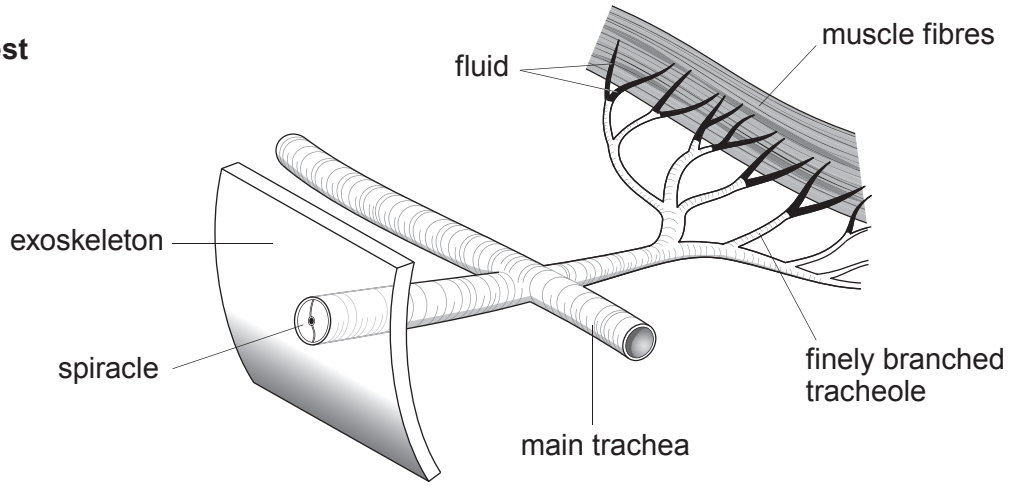
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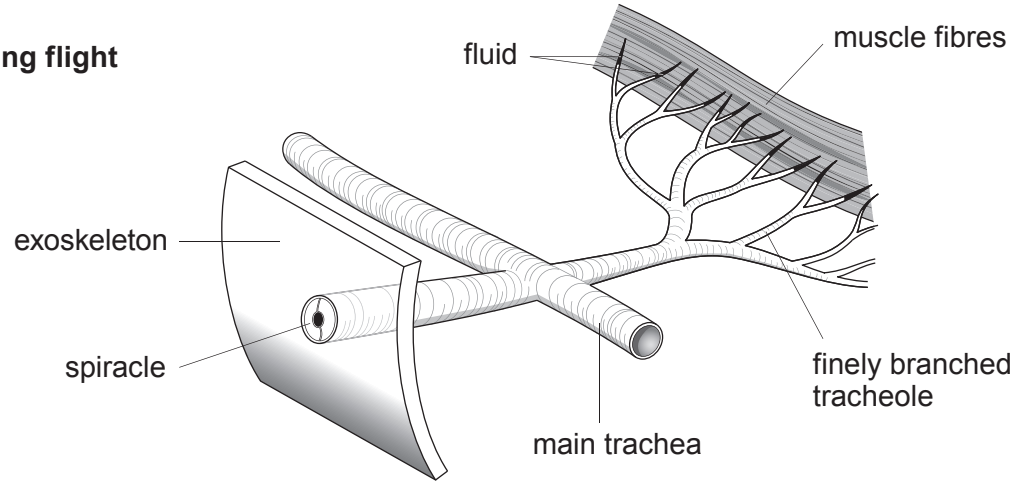
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(c) The diagrams below show insect tracheoles supplying muscle fibres at rest and during flight.

At rest



During flight



(i) The tracheoles are found on the outside of the muscle fibres.
Suggest why the maximum diameter of a muscle fibre never exceeds 20 μm in diameter. [2]

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(ii) Describe the change in fluid level in the tracheoles during flight. Suggest how this change benefits gaseous exchange during flight. [2]

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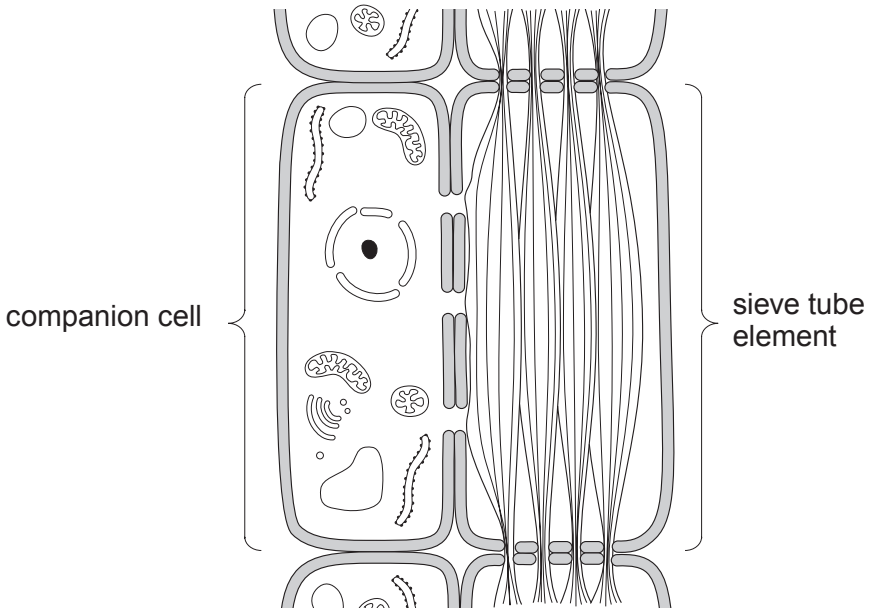
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5. The diagram below shows two types of cell that are found in phloem tissue.



(a) Name **two** other types of cell that are found in phloem. [2]

1 .....

2 .....

(b) The function of phloem is to transport organic molecules, such as sucrose, in a plant.

Using the diagram only, explain how **two** features of the sieve tube element enable the phloem to carry out its function. [4]

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(c) The mass flow theory is one explanation to account for the movement of solutes in the phloem.
Suggest why the presence of large numbers of mitochondria in the companion cells does **not** support this theory. [3]

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6. Answer **one** of the following questions.
Any diagrams included in your answers must be fully annotated.

Either, *(a)* (i) Describe how carbon dioxide is transported from respiring tissues to the lungs. [6]

(ii) Explain how changes in carbon dioxide concentrations in the blood can lead to an increased oxygen supply for respiring tissues. [4]

Or *(b)* Describe the similarities and differences in the structure and functioning of arteries and xylem vessels. [10]

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END OF PAPER

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Question			Marking details	Marks Available
1	(a)		A = Capillary (network)/ capillaries ; B = Epithelial cell/ epithelial layer; C = Lacteal/ lymph vessel; NOT lymph node	3
	(b)		<table><tr><th>Feature</th><th>Explanation</th></tr><tr><td>Microvilli/ folded epithelium;</td><td>Increase/ large surface area/ greater {absorption/diffusion} (of digested products); increase catalytic surface area for digestion</td></tr><tr><td>(Dense/large) capillary network/ {good/rich} blood supply/ lots of capillaries;</td><td>{Transport/absorb} {glucose/amino acids] / maintain a {diffusion/concentration} gradient;</td></tr><tr><td>Presence of lacteal/ lymph vessel;</td><td>Absorb {lipids/fats/ fatty acids};</td></tr><tr><td>Thin epithelium/ epithelium one cell thick;</td><td>Short diffusion pathway;</td></tr></table>	Max 4
	(c)	(i)	Mucus;	1
		(ii)	{Lubricates/ reduces friction} (for passage of food); Prevents {auto digestion of /digestion of/ autolysis of/ the effect of acid/ enzymes on} the gut wall;	2
	(d)		Peristalsis; Correct action of circular and longitudinal muscles/ wave of muscle contraction; {Forces/pushes/ propels} food along/mixes food (for more efficient digestion/absorption); NOT move	3
	(e)		Deamination/ amino group removed; (amino groups) to urea; remainder to {carbohydrate/ glycogen};	Max 2
			Question 1 Total	**[15]**

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Question			Marking details	Marks Available
2	(a)	(i)	Loss of water vapour/evaporation of water; From leaf/stomata/lenticels;	2
		(ii)	Cooling effect/{supply/movement} of {mineral (ions)/water} /maintains transpiration {pull/stream} /required for photosynthesis /allows water to reach aerial parts;	1
	(b)	(i)	Prevent entry of air into xylem/ prevent formation of air bubble in xylem; Which would break {transpiration stream/ cohesive forces}/ block movement of water;	2
		(ii)	Diameter of capillary tube; Distance travelled by bubble; Time taken;	Max 2
	(c)	(i)	Xerophytes;	1
		(ii)	{High humidity/ humid atmosphere} in air chamber; Because {water vapour/humid air} not removed by wind/ water vapour trapped; This produces a {less steep / reduces} {water potential/ diffusion/concentration} gradient; Between inside of leaf and air chamber/ inside and outside of stoma;	Max 3
		(iii)	{Smaller/less/ rolled} leaves/spines + reduced surface area (exposed to environment); {Reduced number/closure of stomata} + less openings for water to be lost through; {Hairs on leaves/rolled leaves} + {increases humidity/ reduces {water potential/ diffusion/ concentration} gradient/ traps water vapour}; Thick cuticle + reducing evaporation from surface of leaf;	Max 2
			Question 2 Total	**[13]**

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Question			Marking details	Marks Available
3	(a)	(i)	Adaptive radiation;	1
		(ii)	Mutation (in common ancestor); (Leads to) variation/ change of beak (shape); Becomes specialised/ adapted {to occupy a particular {niche/environment}/eat particular food}; Have a selective advantage/ are better {suited/ adapted} to a particular environment/ better chances of survival/OWTTE; (More) reproduce and pass on {genes/ alleles};	Max 4
	(b)	(i)	Humans closely related to gorillas; More amino acids <u>in common</u>/ gorilla has 572 <u>in common</u> with Humans while horse has 557/ gorilla has 2 <u>different</u> from human while horse has 17 <u>different</u>; Share <u>more recent</u> common ancestor;	3
		(ii)	Chromatography/electrophoresis;	1
		(iii)	Reduces mistakes made in classification due to convergent evolution;	1
			Question 3 Total	**[10]**

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Question			Marking details	Marks Available
4	(a)		Increases surface area; Diffusion takes place (over whole area);	2
	(b)	(i)	Mouth opens/floor of buccal cavity lowered; Volume of {buccal cavity/inside the mouth} increases/pressure lowered inside {buccal cavity/mouth}; Water {pulled in from outside/ enters due to pressure difference}; Mouth closes **and** {buccal cavity then contracts/ floor of buccal cavity raises}; Water forced {across/through} gills (into gill cavity); Pressure in gill cavity increases; Forces open the operculum / gill slits;	Max 4
		(ii)	Blood flows across (gills/ filaments/ lamellae/ gill plates) in opposite direction to water; Blood always meets water containing a higher oxygen concentration/{diffusion/ concentration} gradient maintained/ equilibrium is never reached; Across entire {gill/ gas exchange surface}; Higher saturation of blood with oxygen achieved;	Max 3
	(c)	(i)	Diffusion pathway would be too long/ ensures a short diffusion pathway; Speed of diffusion too slow; To supply sufficient oxygen;	Max 2
		(ii)	Less fluid/ fluid moves into muscle fibres/ fluid level decreases; More area for gaseous exchange/ shorter diffusion pathway;	2
			Question 4 Total	**[13]**

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Question		Marking details	Marks Available
5	(a)	(Phloem) parenchyma; (Phloem) fibres;	2
	(b)	<table><tr><th>Feature</th><th>Explanation</th></tr><tr><td>Presence of <u>sieve</u> {plates/pores};</td><td>Permits bidirectional flow/ permits flow {from cell to cell/ through the plant};</td></tr><tr><td>{Few/no} organelles/ {thin/peripheral} cytoplasm;</td><td>No obstruction to flow of solutes;</td></tr><tr><td>Plasmodesmata;</td><td>Allows transport of {molecules/ ATP/ sucrose} from <u>companion cell</u> (to sieve tube element);</td></tr></table> Maximum of two features with matched explanation Explanation mark only given if feature correct	Max 4
	(c)	Mass flow is {a passive process/ not an active process}; From high to low {concentration/pressure}/ down a concentration gradient; {Mitochondria/energy/ATP} not required (in a passive process);	3
		Question 5 Total	**[9]**

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Question			Marking details	Marks available
6	(a)	A	(some) CO_2 {<u>dissolves</u> directly/ <u>in solution</u>} in the plasma;	
		B	(some)CO_2 {diffuses into/absorbed by} {red blood cells /erythrocytes};	
		C	(some) CO_2 combines with haemoglobin/ to form carbamino {haemoglobin/ compounds};	
		D	(most) CO_2 combines with water to give carbonic acid;	
		E	(catalysed) by carbonic anhydrase;	
		F	carbonic acid dissociates into hydrogen carbonate and hydrogen ions;	
		G	hydrogen carbonate ions pass out (into plasma);	
		H	(chloride shift) allows movement of Cl^- into red blood cells;	
		I	to maintain {electrical/ electrochemical} neutrality;	
		J	<u>increased</u> {conc/partial pressure} of CO_2 (dissolved in blood);	
		K	lowers pH of blood/blood becomes more acidic;	
		L	oxyhaemoglobin {accepts H^+/acts as a buffer};	
		M	reduces <u>affinity</u> of haemoglobin for oxygen;	
		N	<u>more</u> oxygen is released (from oxyhaemoglobin)/ <u>more</u> oxyhaemoglobin dissociates;	
		O	oxygen dissociation curve moves to the right/Bohr {shift/effect}; Accept credit from graph/ diagram	

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Question		Marking details	Marks available
(b)	A	Both are tubular/contain a lumen/ OWTTE;	
	B	Both have movement by mass flow/OWTTE;	
	C	Both movement along pressure gradients;	
	D	Both movement in one direction only;	
	E	Artery transports blood, xylem water;	
	F	Movement of liquid pulsatile in arteries, smooth in xylem;	
	G	Arteries living, xylem dead;	
	H	Pressure generated by heart in arteries, no pump for xylem;	
	I	Xylem vessels contain lignin;	
	J	Xylem has support function;	
	K	{Adhesive forces/ hydrophilic lining} in xylem;	
	L	Arteries have {muscle/elastic tissue}; can be shown on diagram	
	M	Arteries distend/recoil;	
	N	Smooth endothelium of artery/ endothelium reduces friction;	
	O	Artery <u>walls</u> composed of layers;	10
		Question 6 Total	**[10]**

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Other Names		2

GCE AS/A level

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BIOLOGY – BY2

P.M. TUESDAY, 14 January 2014

1 hour 30 minutes

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Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**12**	
3.	**12**	
4.	**11**	
5.	**12**	
6.	**9**	
7.	**10**	
Total	**70**	

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1. The table below shows certain characteristics of four kingdoms. If the characteristic is present in members of the kingdom this is shown with a tick (✓). If the characteristic is not present this is shown with a cross (**X**).

Complete the table below by giving the name of each kingdom. [4]

		Kingdom			
		.....	.....	.....	.....
Characteristic	Eukaryotic	✓	✓	**X**	✓
	Chloroplast	✓	**X**	**X**	some species
	Cell wall	✓	**X**	✓	some species
	Nucleus	✓	✓	**X**	✓

4

2. The atrio-ventricular node (AVN), bundle of His and Purkyne (Purkinje) fibres are specialised cardiac muscle tissues which are involved in the control of heartbeat.

(a) State the function of the following structures in the functioning of the heart.

(i) atrio-ventricular node (AVN); [2]

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(ii) bundle of His and Purkyne fibres. [2]

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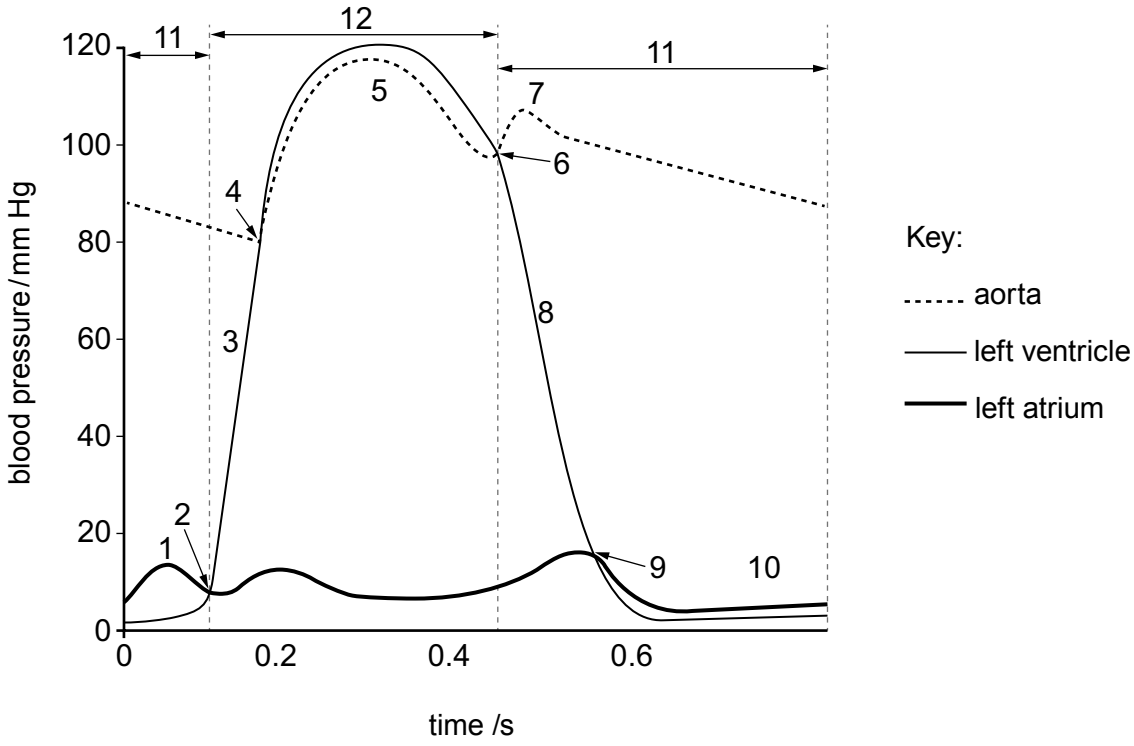
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The graph below shows the pressure changes in the left ventricle, left atrium and aorta during one cardiac cycle.



(b) The following statements list events or phases that occur during a cardiac cycle. State the numbers indicated on the graph above that correspond to **each** of the following statements. [8]

(i) ventricular diastole (ventricles are relaxing) .....

(ii) recoil of aorta .....

(iii) atrial systole .....

(iv) closing of semi-lunar valves .....

(v) opening of semi-lunar valves .....

(vi) atrio-ventricular valves close .....

(vii) ventricular systole (ventricles are contracting) .....

(viii) passive filling of atrium by venous return .....

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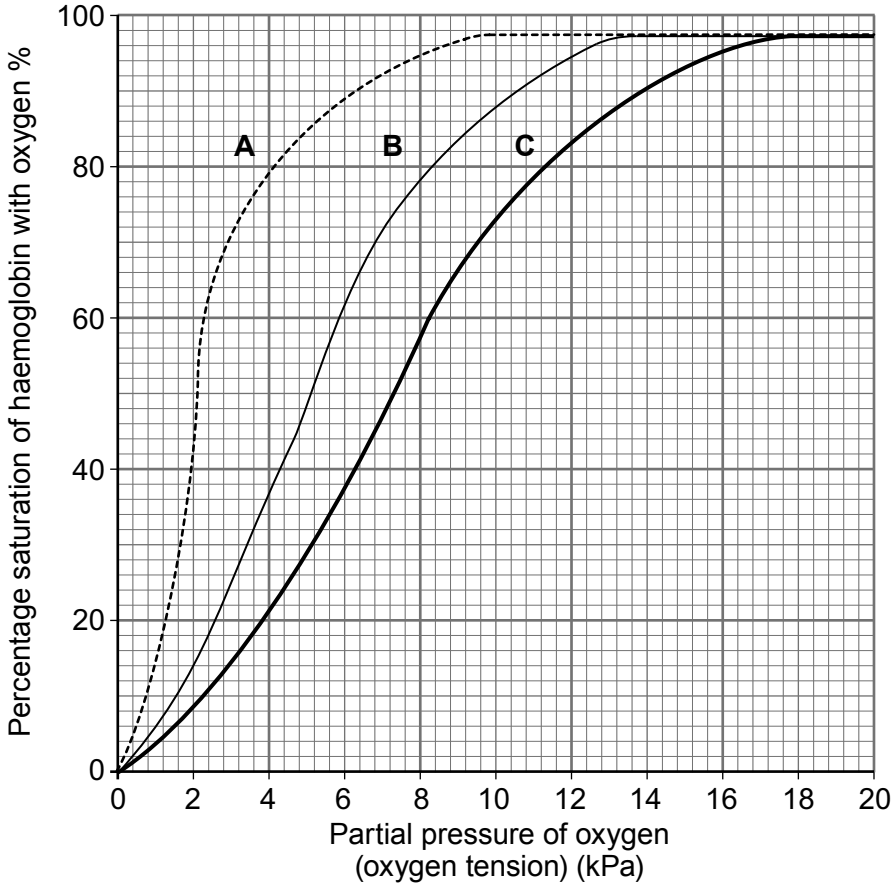
12

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3. *(a)* The graph below shows the oxygen dissociation curve for three mammals.

Graph **A** is the curve for a llama which is a mammal that lives at high altitudes. Graph **B** is the curve for a domestic cat and graph **C** is the curve for a mouse which is a small mammal with a high metabolic rate.



Key:

A = llama
B = domestic cat
C = mouse

(i) What is the percentage saturation of the cat's haemoglobin with oxygen when the partial pressure of oxygen in the muscle tissue of a cat is 3.0kPa.? [1]

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(ii) Explain the circumstances under which the partial pressure of oxygen may fall to 3.0kPa in muscle tissues. [2]

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(b) State which of the three curves represents the haemoglobin with the lowest affinity for oxygen at 3.0kPa. [1]

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(c) If the pH of the blood became more acidic, the position of curve **C** for the mouse would change.

(i) Draw on the graph opposite the new position of curve **C** when the blood becomes more acidic. [1]

(ii) Explain the benefits to the mouse of this change in position of curve **C**. [3]

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(d) Explain how curve **A** for the llama shows that its haemoglobin is well adapted for its environment. [3]

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(e) State which of the three curves could represent the oxygen dissociation curve of a lugworm. [1]

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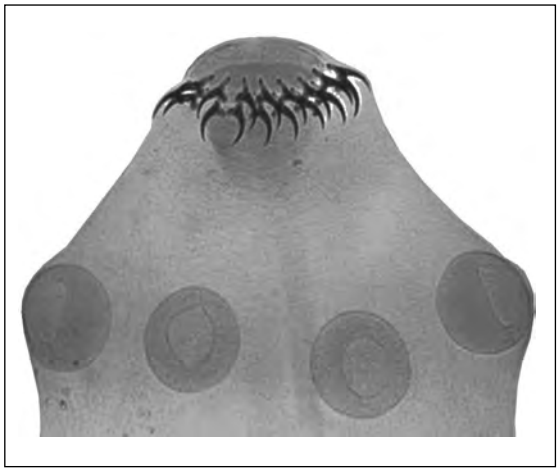
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4. The diagrams below show the gut parasites *Taenia solium* and *Echinococcus granulosus* (**A**) and the skull of a mammal (**B**).

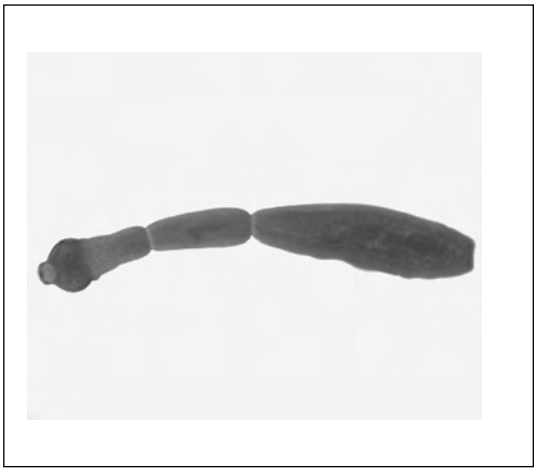
A

Taenia solium



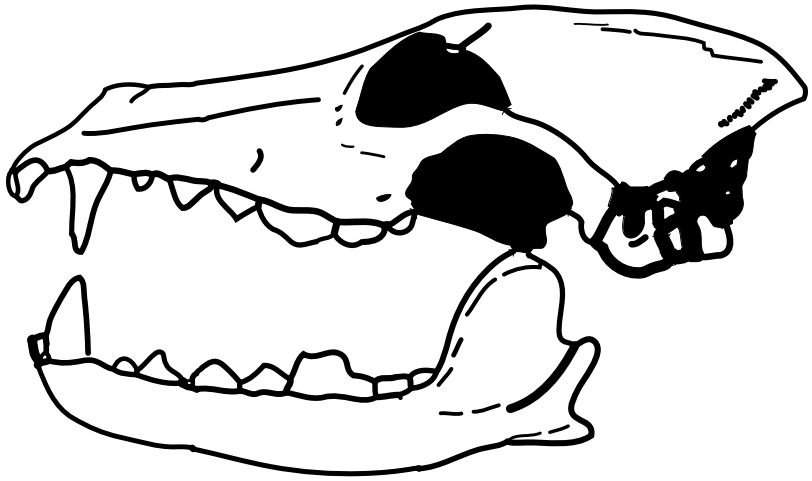
http://www.k-state.edu

Echinococcus granulosus



http://bioweb.uwlax.edu

B



(a) (i) State what is meant by the term *parasite*. [2]

.....

.....

.....

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(ii) Using the photographs in **A** opposite, and your own knowledge, state **three** features of the gut parasites that are adaptations to their parasitic way of life. [3]

.....

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(iii) State the type of diet eaten by the animal shown in diagram **B** opposite. Give reasons for your answer. [3]

.....

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.....

(b) Explain how a parasitic mode of nutrition is

(i) similar to the mode of nutrition used by the mammal in diagram **B** opposite, [1]

.....

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(ii) different from the mode of nutrition used by the mammal in diagram **B** opposite. [2]

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5. *(a)* Four Pea *(Pisum sativum)* leaves **A, B, C** and **D** were removed from a healthy plant and treated by applying a thin layer of grease to their upper and lower surfaces.
The leaves were then placed in an incubator at 60°C and weighed every two hours until there was no further change in mass.

The results are shown in the table below.

leaf	grease application (surface)	starting mass of leaf (g)	final mass of leaf (g)	change in mass (g)	percentage change in mass (%)
A	upper and lower	12.4	11.9	− 0.5	4.0
B	upper only	13.6	11.2		
C	lower only	13.8	12.7	− 1.1	8.0
D	neither	9.3	6.2	− 3.1	20.5

(i) Complete the table above by calculating the change in mass and percentage change in mass for leaf **B**.
Use the space below for your calculation. [2]

(ii) What does the data reveal about the distribution of stomata on the surfaces of the leaves? [3]

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(iii) Why were the leaves re-weighed *'until there was no further change in mass'*? [1]

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(b) The table below gives the stomatal densities of three other plant species.

	number of stomata/cm^2	
species	upper epidermis	lower epidermis
potato *(Solanum tuberosum)*	5 100	16 100
bean *(Phaseolus vulgaris)*	4 000	28 100
marram grass *(Ammophila sp)*	1 200	0

(i) Marram grass is adapted to grow in dry conditions. State the term used to describe plants that are adapted for dry conditions. [1]

.....

(ii) Marram grass exhibits leaf rolling. With reference to the **data** in the table above, suggest how Marram grass has adapted its distribution of stomata to conserve water. [3]

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(iii) State **two** further structural adaptations shown by Marram grass which help it to survive in dry conditions. [2]

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12

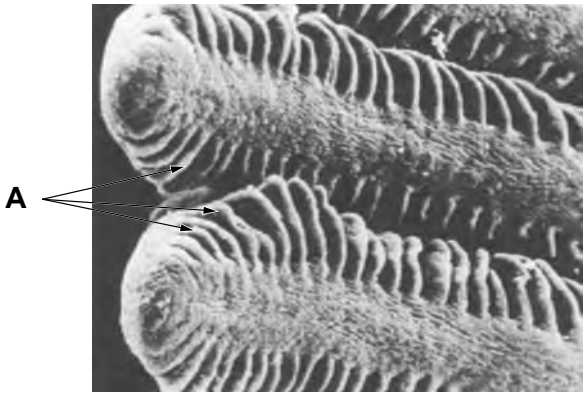
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6. The photograph below shows a scanning electron micrograph of fish gills.



http://ars.els-cdn.com/content/image

(a) Name the structures labelled **A** in the photograph above. [1]

.....

(b) Describe how a bony fish ventilates its gills and absorbs oxygen from water. [4]

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(c) Using the photograph above and your own knowledge, describe **four** similarities in the adaptations of the gill for gaseous exchange and a mammalian villus for the absorption of digested products. [4]

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7. Answer **one** of the following questions.
Any diagrams included in your answers must be fully annotated.

Either, *(a)* Describe the structural and reproductive characteristics of Angiosperms (flowering plants) that have led to their successful colonisation of land. [10]

Or *(b)* Describe the advantages and disadvantages of asexual reproduction. [10]

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Question	Marking details	Marks Available

1

Characteristic	**Plant;**	**Animal;** Accept animalia	**Prokaryote;** Accept prokaryotic	**Protoctista;** NOT protozoa/ fungi
Eukaryotic	✓	✓	×	✓
Chloroplast	✓	×	×	Some species
Cell wall	✓	×	✓	Some species
Nucleus	✓	✓	×	✓

4

Question 1 total **[4]**

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Question			Marking details	Marks Available
2	*(a)*	(i)	*atrio-ventricular node (max 2)* {collects/ receives} {wave of excitation/ impulses} from SAN; NOT signal passes on to{Purkyne fibres/Bundle of His}; allows delay before wave passed to ventricles/ stops atria and ventricles contracting at the same time;	2 2
		(ii)	*Bundle of His and Purkyne fibres* conducts wave to {base/ apex} of ventricles/ heart; ensures contraction (from base) upwards;	
	(b)	(i)	11;	1
		(ii)	7;	1
		(iii)	1;	1
		(iv)	6;	1
		(v)	4;	1
		(vi)	2;	1
		(vii)	12;	1
		(viii)	10;	1
			Question 2 Total	**[12]**

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Question			Marking details	Marks Available
3	*(a)*	(i)	24/ 25/26%;	1
		(ii)	Any two from (vigorous) exercise/ OWTTE; high levels of (aerobic) respiration; oxygen used/ needed (by muscle cells);	2 max
	(b)		C/mouse;	1
	(c)	(i)	curve to right of C;	1
		(ii)	Any three from (move to right) lowers affinity of haemoglobin for oxygen; more oxygen released/ oxygen more readily dissociates; at the same partial pressure of oxygen; for (aerobic) respiration;	3 max
	(d)		Any three from curve shows haemoglobin has high affinity for oxygen; can{ pick up/ absorb} oxygen at {low partial pressure/ high altitude}/ can be become saturated with oxygen {more easily/ lower partial pressure/ at altitude}; Llama lives at high altitudes where oxygen is scarce; small change in partial pressure results in a large change in % saturation;	3 max
	(e)		Curve A;	1
			Question 3 total	**[12]**

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Question			Marking details	Marks Available
4	*(a)*	(i)	organism that lives {on/in} another {organism/ host}; causes {harm/ damages} to host/ at the expense of the host;	2
		(ii)	Any three from {suckers/hooks} (for attachment to host gut); large surface area to volume ratio; {thin/ flattened}{proglottids/ segments}; covering resistant to host's digestive enzymes; NOT immune system hermaphrodite/ OWTTE; produces large number of eggs; no digestive system;	3 max
		(iii)	Any three from Carnivorous/ carnivore; {Large/ pointed} canines for {tearing/grasping flesh/ killing prey}; molars/premolars for {cutting/ slicing} meat; NOT tearing (small) incisors for {gripping/ stripping} flesh; carnassials teeth for {crushing/cutting}; vertical movement of jaws;	3 max
	(b)	(i)	obtains {food/ nutrients} from another organism/heterotrophic;	1
		(ii)	**A** {requires food digested by host/ no digestive system}, **B** {digests food itself/ has digestive system}; **A** absorbs food {externally/at surface}, **B** internal absorption;	2
			Question 4 Total	**[11]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	Change in mass = 11.2 - 13.6 = **-**2.4; % change in mass (-2.4/13.6) x 100 = 17.6/ 17.65 %; NOT 17.7	2
		(ii)	{greater percentage of water lost/ largest change in mass} when upper surface <u>only</u> is covered/ when lower surface is covered there is less change in mass; more stomata on lower surface; some water is lost through upper surface as{some/ few/ less} stomata present;	3
		(iii)	to ensure that {all of the / maximum loss of} water was lost from the leaves;	1
	(b)	(i)	xerophytes/xerophytic;	1
		(ii)	{lower density of/ less} stomata; (rolling causes) upper epidermis to face inwards/ stomata are on the inside of (rolled) leaf; <u>no</u> stomata on {lower/exposed} surface/ <u>all</u> stomata on the {upper/ inner} surface;	3
		(iii)	Any two waxy cuticle on lower surface; reduced leaf surface area; sunken stomata; hairs; long roots;	max 2
			Question 5 Total	**[12]**

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Question		Marking details	Marks Available
6	*(a)*	lamellae/gill plates;	1
	(b)	water {forced/ flows} over gill (filaments); by pressure changes/ OWTTE; (pumping) action of mouth and operculum/ OWTTE; water flows in opposite direction to blood/counter-current mechanism; maintains {diffusion/ concentration} gradient across {entire/ whole} gill (filament); as blood always meets water with a higher oxygen concentration/ equilibrium is never reached;	max 4
	(c)	Any four large surface area; {(dense) network/ large number} of capillaries; NOT good blood supply {thin/permeable} epithelium; moist; short diffusion pathway;	max 4
		Question 6 Total	**[9]**

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Question			Marking details	Marks Available
7				
	(a)	A	plants have well established root system/ OWTTE;	10 max
		B	leaves are thin/ large SA for photosynthesis/ gas exchange;	
		C	{waxy cuticle/ shed leaves in winter} to reduce water loss;	
		D	{stomata/ guard cells} to {control/ reduce} water loss;	
		E	xylem transport water;	
		F	phloem transports organic solutes/ amino acids;	
		G	xylem/ tracheids provide structural support;	
		H	brightly coloured {flowers/ petals/ scent/ nectar} to attract insects;	
		I	Adaptation of pollen to insect pollination e.g. sticky/ hooks;	
		J	large amounts and small sized pollen grains for wind pollination	
		K	pollen grains have hard coats to prevent desiccation;	
		L	no requirement for gametes to travel through water/ fluid;	
		M	resistant {coat/shell} around the seed to {withstand adverse conditions/ protect};	
		N	food store in seeds;	
		O	embryo develops in seed until {germination/ leaves are produced} (above ground);	
		P	seed dispersal adaptations/ appropriate example	

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Question		Marking details	Marks Available
7 *(b)*			
	A	reproduce by mitosis;	10 max
	B	genetically identical/clones;	
		advantages	
	C	less chance of mutation;	
	D	adapted to same conditions as parents/ owtte;	
	E	parent can provide support until independent;	
	F	example of asexual reproduction: strawberry/other appropriate named example;	
	G	no need for (second organism for) fertilisation/ only one parent is needed;	
	H	no wastage of gametes/ less energy wasted;	
	I	rapid increase in numbers/ large numbers produced;	
	J	no special mechanisms required;	
		disadvantages	
	K	lack of genetic variation {means more susceptible to wiping out/ less able to adapt};	
	L	(means more susceptible to wiping out) by disease;	
	M	(less able to adapt) environmental changes;	
	N	no chance of evolution/natural selection;	
	O	less chance of dispersal/ restricted to one niche;	
	P	more competition for resources;	
		Question 7 Total	**[10]**

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

BIOLOGY – BY2

A.M. MONDAY, 3 June 2013

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**13**	
3.	**13**	
4.	**12**	
5.	**5**	
6.	**9**	
7.	**10**	
Total	**70**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use pencil or gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the continuation pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

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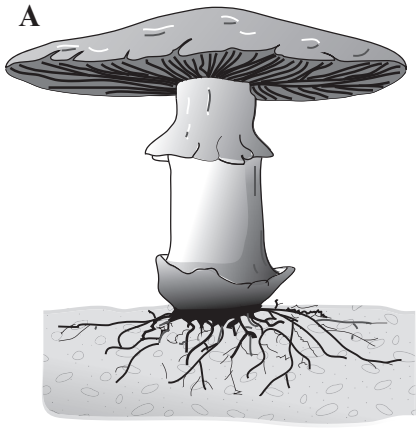
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1. *(a)* Complete the table on classification given below. [4]

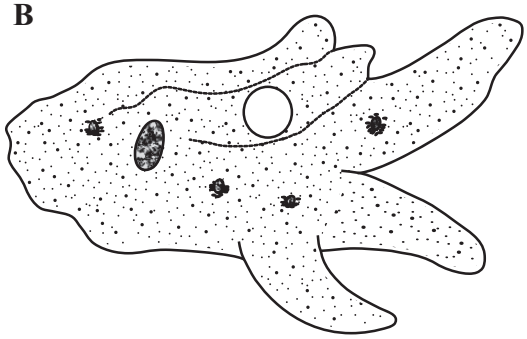
Kingdom	Phylum	Class	Genus
	Angiosperm	Dicotyledons	Ranunculus (Buttercup)
Animalia		Oligochaetae	Lumbricus (Earthworm)
Animalia		Mammalia	Rattus (Rat)
Animalia	Arthropoda		Locusta (Locust)

(b) The diagrams, **A** and **B** below, show two organisms from **two** other Kingdoms *not* given in the table.

A



B



(i) Name the **two** Kingdoms to which the two organisms belong. [2]

A .....

B .....

(ii) State **one** characteristic of each organism which is a feature of its Kingdom. [2]

A .....

B .....

8

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2. *(a)* Plants carry out the process of transpiration.

State what is meant by the term *transpiration*. [2]

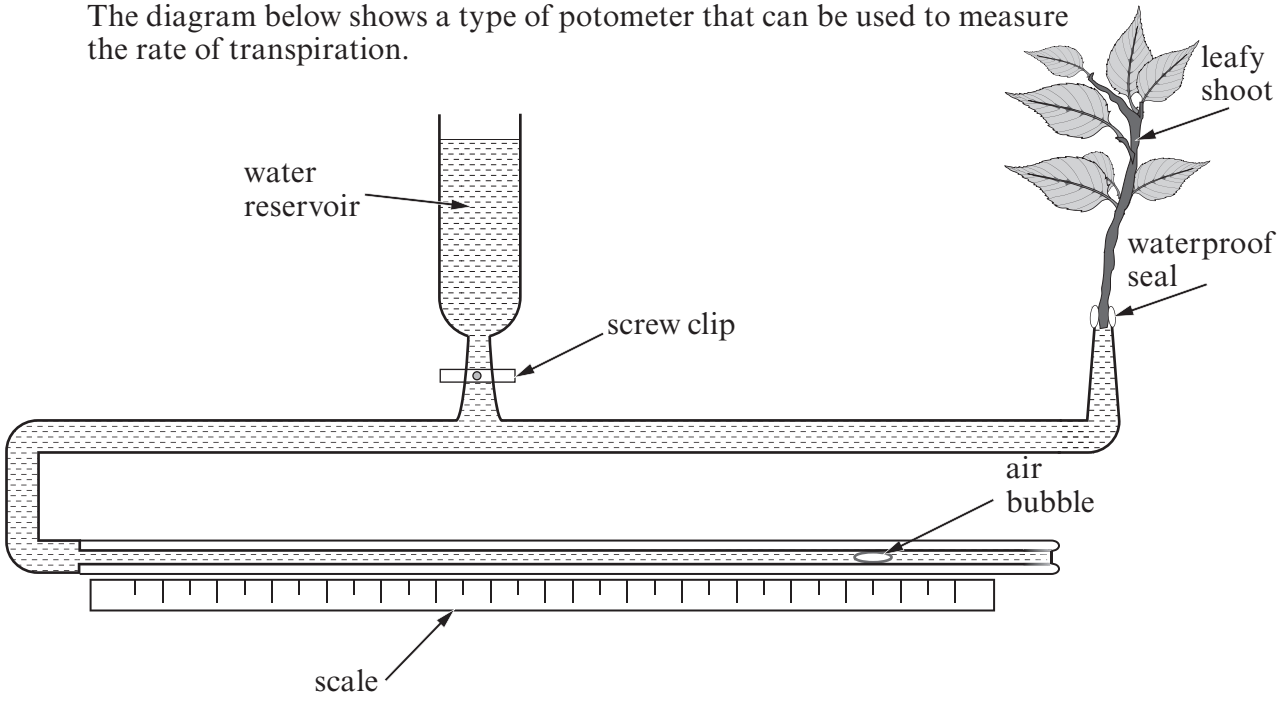
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The diagram below shows a type of potometer that can be used to measure the rate of transpiration.



(b) State **two** practical measures which should be taken when setting up the apparatus to ensure the potometer functions correctly. Give reasons for your answers. [4]

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(c) Water passes through the xylem of the root and stem of a plant before reaching its leaves.

(i) Name the original source of energy that moves water through a plant. [1]

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(ii) Explain how water moves up the xylem. [2]

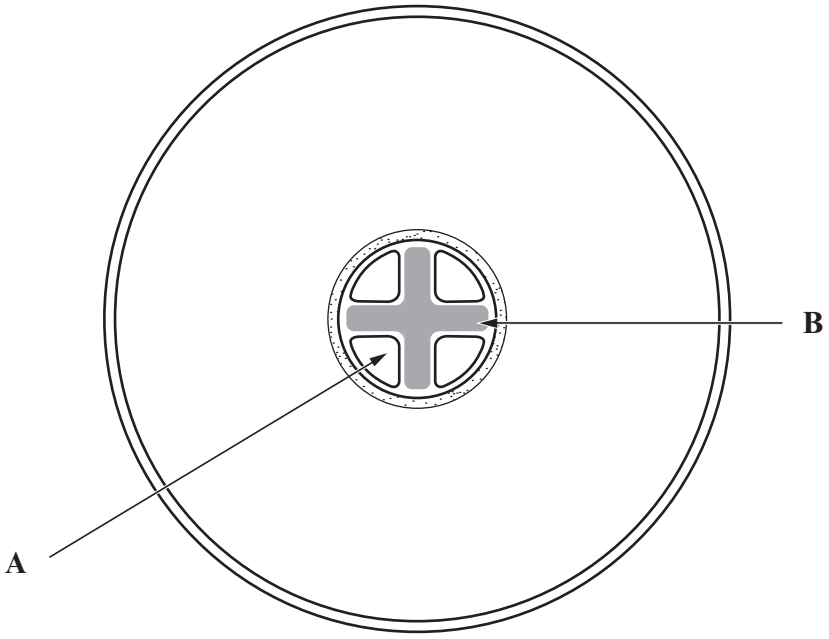
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(d) The diagram below shows the cross section of a root.



(i) Name the **two** tissues labelled **A** and **B** on the diagram above. [2]

A ..... **B** .....

(ii) Explain how it is possible to tell that the diagram above is of a root and not a stem. [2]

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3. *(a)* Describe and explain the process of **inspiration** in a mammal. [4]

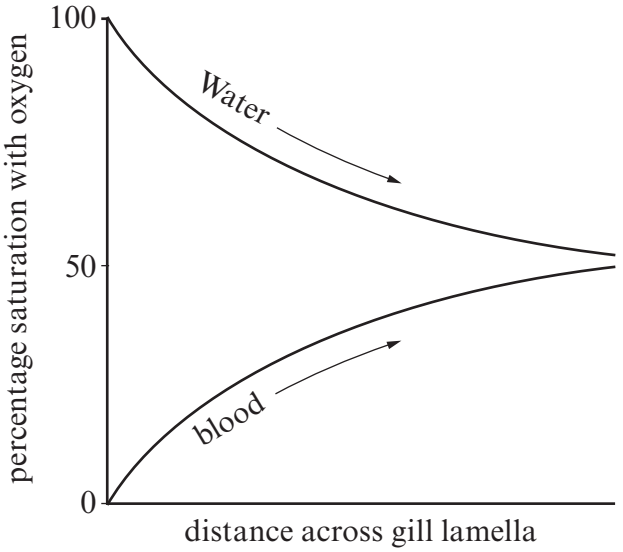
(b) (i) Explain how counter current flow works in the gills of bony fish. [4]

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The graph below shows another type of flow.



(ii) Name the type of flow shown in the graph above. [1]

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(iii) Explain why this is less efficient than counter current flow. [2]

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(c) Suggest why gill filaments/ lamellae would not provide an efficient gas exchange surface on land. [2]

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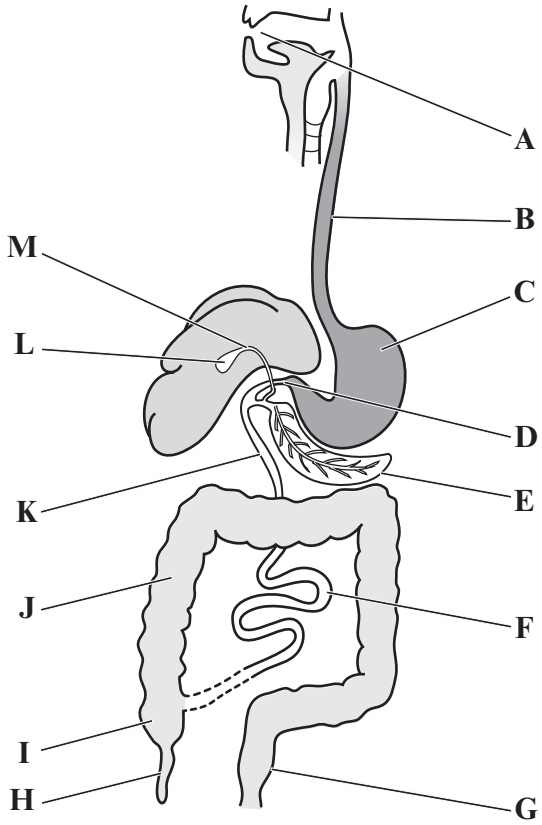
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4. The diagram below shows the human alimentary canal.



(a) Use a letter or letters from the diagram above to answer the following questions. [6]

(i)	Which is the most acidic region of the alimentary canal?	
(ii)	In which **two** areas are proteins, carbohydrates and lipids digested together?	
(iii)	Where does the process of protein digestion begin?	
(iv)	Where is the main site of lipase production?	
(v)	The section of the alimentary canal where most absorption of digested products occurs.	
(vi)	The section of the alimentary canal whose main function is to absorb water.	

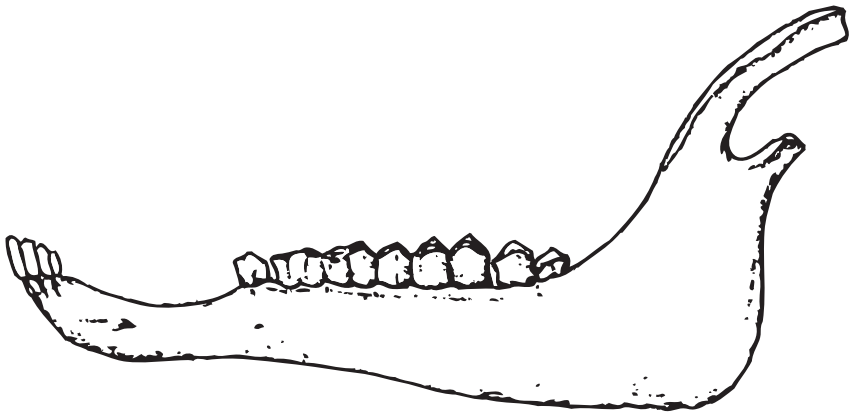
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The diagram below shows the lower jaw of a mammal.



(b) Use the information in the diagram above to:

(i) State the name given to describe the mode of nutrition of this mammal. [1]

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(ii) Explain how the jaw and teeth shown above are adapted for this mode of nutrition. [3]

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(iii) Explain how the **gut** of this mammal is adapted for digestion. [2]

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5. The tapeworm, *Taenia solium,* is a parasite of humans.

(a) State what is meant by the term *parasite*. [2]

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The tapeworm consists of a head with no mouth, followed by a large number of thin flat segments called proglottids.

(b) Describe how the tapeworm is adapted to obtain its nutrients. [3]

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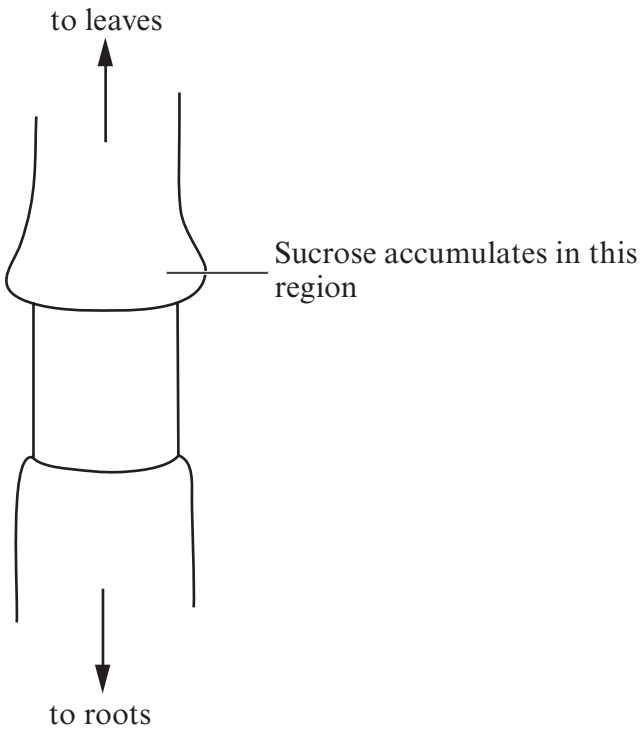
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6. *(a)* The diagram below shows part of a plant stem with the tissue external to the xylem removed, a technique known as ringing.

An accumulation of sucrose was found in the region shown.



(i) Explain why this accumulation of sucrose occurred. [3]

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(ii) Name **one** other type of organic molecule that is likely to accumulate with the sucrose. [1]

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(b) If the growing points of the shoot of the plant are removed there is a greater accumulation of sucrose.

Explain why there is a greater accumulation of sucrose. [2]

(c) Explain fully the likely effect of the removal of the ring of tissue on the concentration of sucrose **below** the ring. [3]

9

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7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Describe how the reproductive strategies of vertebrates show a gradual adaptation to the colonisation of land.

Or *(b)* Describe how arteries and veins are structurally adapted to their functions. [10]

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END OF PAPER

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Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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<table>
<tr><th colspan="3">Question</th><th>Marking details</th><th>Marks Available</th></tr>
<tr><td>1.</td><td>(a)</td><td></td><td>
<table>
<tr><td>Kingdom</td><td>Phylum</td><td>Class</td><td>Genus</td></tr>
<tr><td>Planta(e)/ plant(s);</td><td></td><td></td><td></td></tr>
<tr><td></td><td>Annelid(s)/ annelida</td><td></td><td></td></tr>
<tr><td></td><td>Vertebrate/ vertebrata/ chordate/ chordata;</td><td></td><td></td></tr>
<tr><td></td><td></td><td>Insect/ insecta;</td><td></td></tr>
</table>
</td><td>4</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>A = Fungi;
B = Protoctist(a)/ protoctists/ protists; NOT protozoa</td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>A (reproduce by) spores/ hyphae/ mycelium/ chitin walls/ heterotrophic/ saprophytic/ eukaryotic;
Accept description of saprophytic</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td>B membrane bound organelles present/ eukaryotic/ no tissue differentiation/ (mainly) single celled organisms/ unicellular;</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Question 1 total</td><td>[8]</td></tr>
</table>

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Question			Marking details	Marks Available
2.	(a)		loss of water <u>vapour</u>/ <u>evaporation</u> of water; from (surface of) leaf /through stomata; Accept lenticels	2
	(b)	(i)	TWO precautions and TWO reasons • Shoot cut under water/inserted under water/flood inside of apparatus with water/ assemble under water; to prevent air entering/ bubbles; • Shoot with large number of leaves; to ensure measurable rate of transpiration; • Avoid wetting leaves/ ensure leaves are dry; blocks stomata/ reduces rate of transpiration; • Leave time for apparatus to settle down; allow plant to adapt to new conditions/ to equilibrate; • Seal joints with Vaseline/ ensure screw clip is closed; to prevent air entering apparatus/ prevent leakage; • Ensure bubble set at appropriate position/ right hand end; to enable a (suitable) reading to be taken; Reference to not allowing air bubbles to enter = 1 mark (if no precautions are given)	4 max
	(c)	(i)	Sun(light);	1
		(ii)	Molecules of water moving together/ water pulled up; Because of <u>cohesion</u> of <u>molecules</u>; <u>adhesion</u> to (walls of) {<u>xylem</u>/ hydrophilic lining/ vessel wall}; root pressure {forces/ pushes} water upwards; IGNORE capillarity	2 max
	(d)	(i)	A= phloem; B= xylem;	2
		(ii)	{Xylem/ vascular <u>tissue</u>} is at the centre/ xylem is star shaped/ central stele; NOT bundle No vascular <u>bundles</u>/ peripheral vascular <u>bundles</u> in stem; Endodermis visible in root/ no pith;	2 max
			Question 2 total	**[13]**

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Question			Marking details	Marks Available
3.	(a)		Any 4 Intercostal muscles <u>contract</u> <u>and</u> ribs move <u>up and out</u>; Diaphragm (muscles) <u>contract</u> <u>and</u> diaphragm <u>flattens</u>; (Internal) volume of <u>thorax</u> increases; accept chest reject lungs Pressure in lungs/ thorax decreases; {High<u>er</u>/ <u>difference</u> in} air <u>pressure</u> outside {forces/ pushes/ moves/ drawn} air into lungs;	4
	(b)	(i)	blood flows across (gills/ filaments/ lamellae/ gill plates) in opposite direction to water; water always has more oxygen than blood/ (oxygen) {diffusion/ concentration} gradient maintained; oxygen passes from water into blood; across entire {gill/ gas exchange} surface; NOT longer higher saturation of blood with oxygen/ more oxygen taken up;	4
		(ii)	Parallel (flow);	1
		(iii)	Equilibrium is reached (part way across the gill plates/ lamellae)/{diffusion/ concentration} gradient not maintained; {Lower percentage saturation with/ <u>only</u> 50% saturation} oxygen/ less oxygen uptake/ less diffusion of oxygen; NOT slower	2
	(c)		gills dry out; prevents oxygen from dissolving on surface of gills; gills may {stick together/not open as easily/ collapse}; decrease in surface area; (Explanation cannot be accepted alone)	2 max
			Question 3 Total	**[13]**

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Question			Marking details	Marks Available
4.	(a)	(i)	C/ D;	1
		(ii)	K and F;	1
		(iii)	C;	1
		(iv)	E;	1
		(v)	F;	1
		(vi)	J;	1
	(b)	(i)	Herbivorous/ herbivore;	1
		(ii)	{large/ridged/WM shape} {molars/premolars} for grinding; {diastema/space with no teeth/ gap between teeth} to assist with {chewing/ (tongue to) manipulate food/ cud}; {well developed/ sharp/ long} incisors for {biting/ cutting/ slicing/ tearing} (vegetation); loose articulation/ jaw moves in a {horizontal/ circular} plane; Very small/ no canines; open roots to allow continuous growth of molars;	3max
		(iii)	Four chambered stomach (NOT four stomachs) / rumen/ large caecum; Contain cellulose digesting bacteria/ have cellulase producing bacteria; NOT cellulose eating bacteria Long gut {to allow extra time for digestion of cellulose/ cellulose harder to digest}; Cud is regurgitated for further chewing;	2
			Question 4 Total	**[12]**

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Question			Marking details	Marks Available
5.	(a)		Parasites (are organisms that) live {on/ in} {another organism/ host} and obtain {nourishment/ nutrients} from it; at the expense of /causing harm to the host;	2
	(b)		attaches to gut wall by {hooks and suckers/ scolex}; {large/ high/ increased} surface area to volume ratio; {digested products/ nutrients} in host gut absorbed into tapeworm; short diffusion pathway;	3 max
			Question 5 Total	**[5]**

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Question			Marking details	Marks Available
6.	(a)	(i)	sucrose is produced in (photosynthesising) leaf/ leaves are the source of sucrose; sucrose travels in phloem; phloem removed (by the ringing process); sucrose cannot flow to roots/ is blocked;	3 max
		(ii)	amino acids/hormones/ florigen;	1
	(b)		sucrose used for {cell wall formation/ cell division/ mitosis/ respiration}; {Less/ no} sucrose used (by growing areas/sinks as they have been removed); therefore more will pass down stem; NOT accumulation	2 max
	(c)		sucrose not replaced from above (the ring); so concentration decreases; as movement towards root continues; and sucrose used in respiration/storage/ converted to starch/ growth/ active transport;	3 max
			Question 6 Total	**[9]**

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Question			Marking details	Marks Available
7.	(a)	(i)	*A.* Fish/ amphibians show external fertilisation; B. Fertilised {egg/ zygote/ embryo} develops outside body of parent; C. Many eggs/ young produced; D. Ensures some survive; E. Reptiles / Bird / Mammals internal fertilisation; F. This allows gametes to be independent of water; G. Increased chance of fertilisation/ fewer gametes {needed/ wasted}; H. (Evolution of an) amniote egg; I. eggs surrounded by protective shell/ preventing dessication; J. Birds incubate eggs outside mothers body; K. Mammals – development inside mothers body; L. Nutrients/ oxygen via placenta; M. Young born well developed; N. Birds/ mammals exhibit parental care; O. Relationship between parental care and number of offspring produced; **Question 7 Total**	**[10]**

Fish/ amphibians

Reptiles/ birds mammals

Reptiles/ birds

mammals

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Question			Marking details	Marks Available
	(b)		A. wall consists of three layers/ diagram of artery + vein labelled correctly; B. smooth endothelial (lining); C. to reduce friction; D. {outer layer/ tunica externa} of collagen (can be on diagram) E. to resist/prevent overstretching; F. artery has a thick wall to resist pressure; G. contain a thick layer of elastic tissue; H. { for elastic recoil/ small lumen} to maintain pressure; I. Smooth muscles in {small arteries/ arterioles} {regulate blood flow/pressure/ ref to vasoconstriction}; J. arteries closer to the heart have more elastic tissue; K. semilunar valves in aorta/ pulmonary artery; L. Veins have valves to {prevent backflow of blood/ to maintain unidirectional flow}; M. Walls are thin(ner) because blood at lower pressure; N. (skeletal) muscle contraction returns blood to heart; O. Large lumen reduces resistance to flow/ friction; **Question 7 Total**	**[10]**

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

BIOLOGY/HUMAN BIOLOGY – BY2

P.M. TUESDAY, 15 January 2013

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**11**	
3.	**10**	
4.	**10**	
5.	**10**	
6.	**10**	
7.	**10**	
Total	**70**	

1072
010001

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
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The quality of written communication will affect the awarding of marks.

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1. The species is the basic unit by which biodiversity is measured.

(a) Define the term *species*. [2]

.....

.....

(b) Some data on biodiversity is shown below.

	Estimated number of species		
	Britain	Borneo	World
Latitude (how far North of equator)	53°N	1° N	
Fish (freshwater)	38	394	>8500
Amphibians	6	100	>4000
Reptiles	6	105	6500
Birds (breeding residents)	210	600	9881
Mammals	48	288	4327

(i) Which vertebrate class in the table above shows the greatest biodiversity?

..... [1]

(ii) Using the table above, the percentage of the world's species of reptiles found in Britain was calculated as 0.09%. Calculate the percentage of the world's species of reptiles found in Borneo. [1]

.....

(iii) Describe how the data above confirms the general pattern of biodiversity across the globe, from poles to equator. [1]

.....

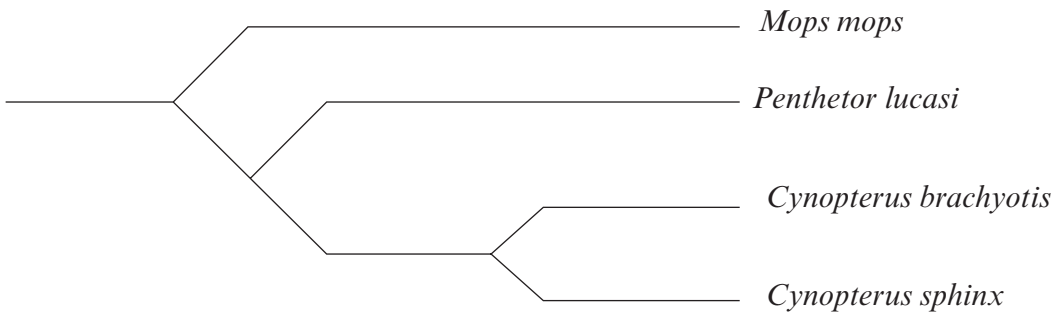
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(c) There are 288 species of mammals in Borneo, of which 102 belong to the order Chiroptera (bats). The following diagram is a phylogenic tree showing the evolutionary relationship between some of the bats.



(i) Suggest, by marking an **X** on the phylogenic tree above, the position of an ancestor common to *Penthetor lucasi* and *Cynopterus sphinx* but not common to *Mops mops*. [1]

(ii) What do the latin names of *Cynopterus brachyotis* and *Cynopterus sphinx* tell us about their classification? [1]

.....

.....

(d) The wings of bats show similar morphology to the flippers of seals but have completely different morphology to the wings of insects. State the terms applied to structures that show

(i) common structure but different functions; [1]

.....

(ii) common functions but different structures. [1]

.....

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2. In animals gas exchange occurs across respiratory surfaces.

(a) Describe **three** properties that all respiratory surfaces must possess and explain why they must have them. [3]

Property .....

Reason .....

.....

.....

Property .....

Reason .....

.....

.....

Property .....

Reason .....

.....

.....

(b) The Flat-headed Frog, *Barbourula kalimantanensis*, is found in fast-flowing mountain streams and is the only known lungless frog.

(i) Suggest how this frog carries out gas exchange without lungs. [1]

.....

(ii) How do the conditions in the mountain stream aid gas exchange? [2]

.....

.....

(iii) Give **two** reasons why gills do not function effectively on land. [2]

.....

.....

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(c) Define counter-current flow as seen in the gills of bony fish, and explain why counter current flow makes gas exchange more efficient. [3]

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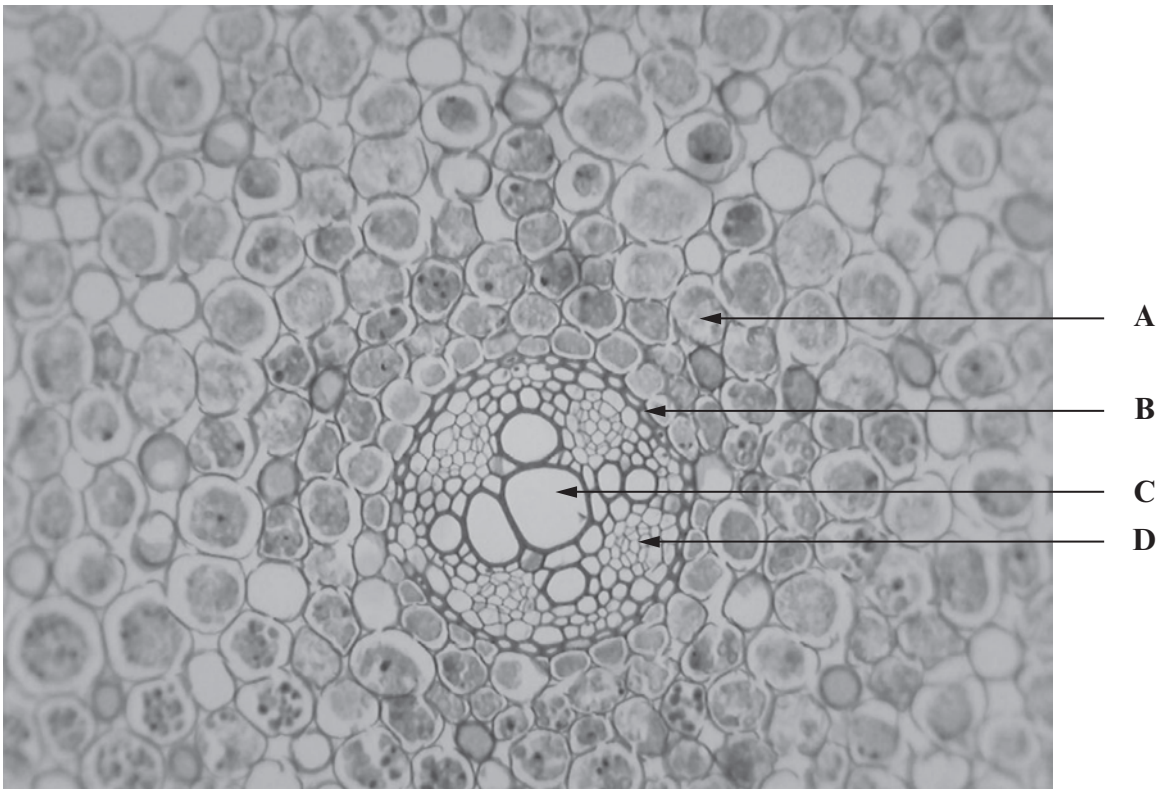
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3. Roots of higher plants contain vascular tissues, the photomicrograph below shows a transverse section through the central part of a buttercup *(Ranunculus sp.)* root.

(a) Name the tissues labelled **A-D** on the photomicrograph of a root. [2]

A ..... **B** .....

C ..... **D** .....



(b) Name the tissue shown in the photomicrograph above which [1]

is strengthened with lignin .....

has sieve tubes. .....

(c) State the function of

(i) sieve tube cells [1]

.....

.....

(ii) companion cells. [1]

.....

.....

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(d) Some water moves across the root cortex through the vacuolar pathway, from vacuole to vacuole of adjacent cells.

(i) Name and describe **two** *other* pathways by which water moves across the root cortex. [4]

Name of pathway .....

Description .....

.....

.....

.....

Name of pathway .....

Description .....

.....

.....

.....

(ii) How does the Casparian strip affect the route water takes into the stele? [1]

.....

.....

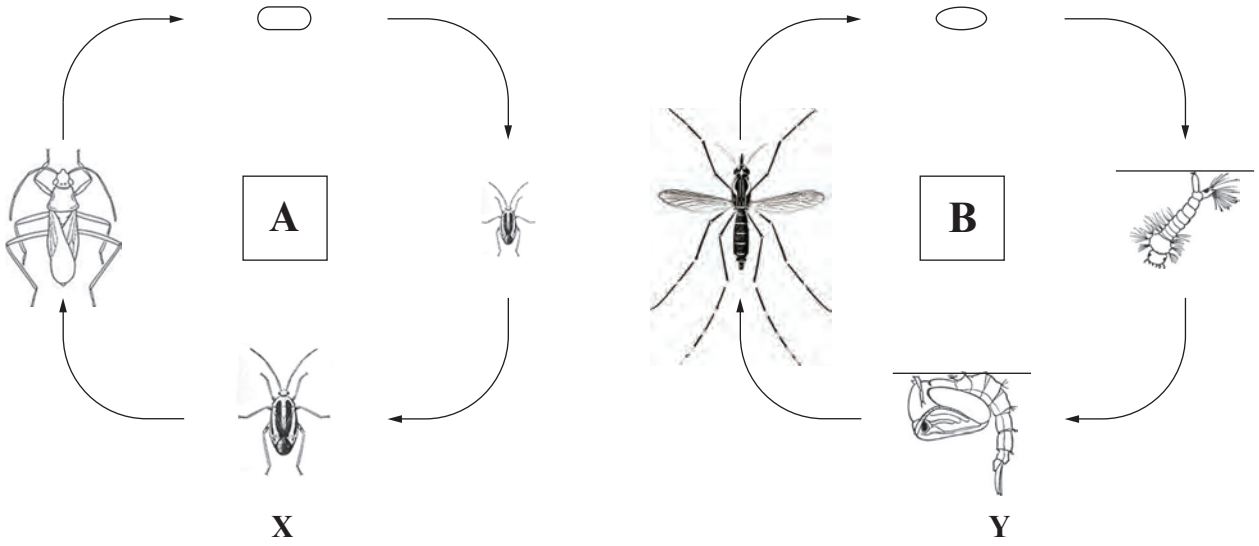
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4. Insects are amongst the animals best adapted to life on land. Their exoskeleton provides a protective waterproof covering, however it creates a problem for growth. The diagrams below show how insects' reproductive strategies help to overcome this problem.



X **Y**

(a) (i) Name the types of life cycle shown above. [1]

A ..... **B** .....

(ii) Name the stages **X** and **Y** shown in the life cycles above. [1]

X ..... **Y** .....

(b) State why having an exoskeleton is a problem for growth and explain how the problem of growing with an exoskeleton is overcome in life cycle **A**. [3]

.....

.....

.....

.....

(c) Reptiles and birds are adapted to reproduce on land by producing amniote eggs. Describe **two** features of an amniote egg. [2]

.....

.....

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(d) The development of embryos takes place internally in mammals. List **three** ways in which this is an advantage over externally laid eggs. [3]

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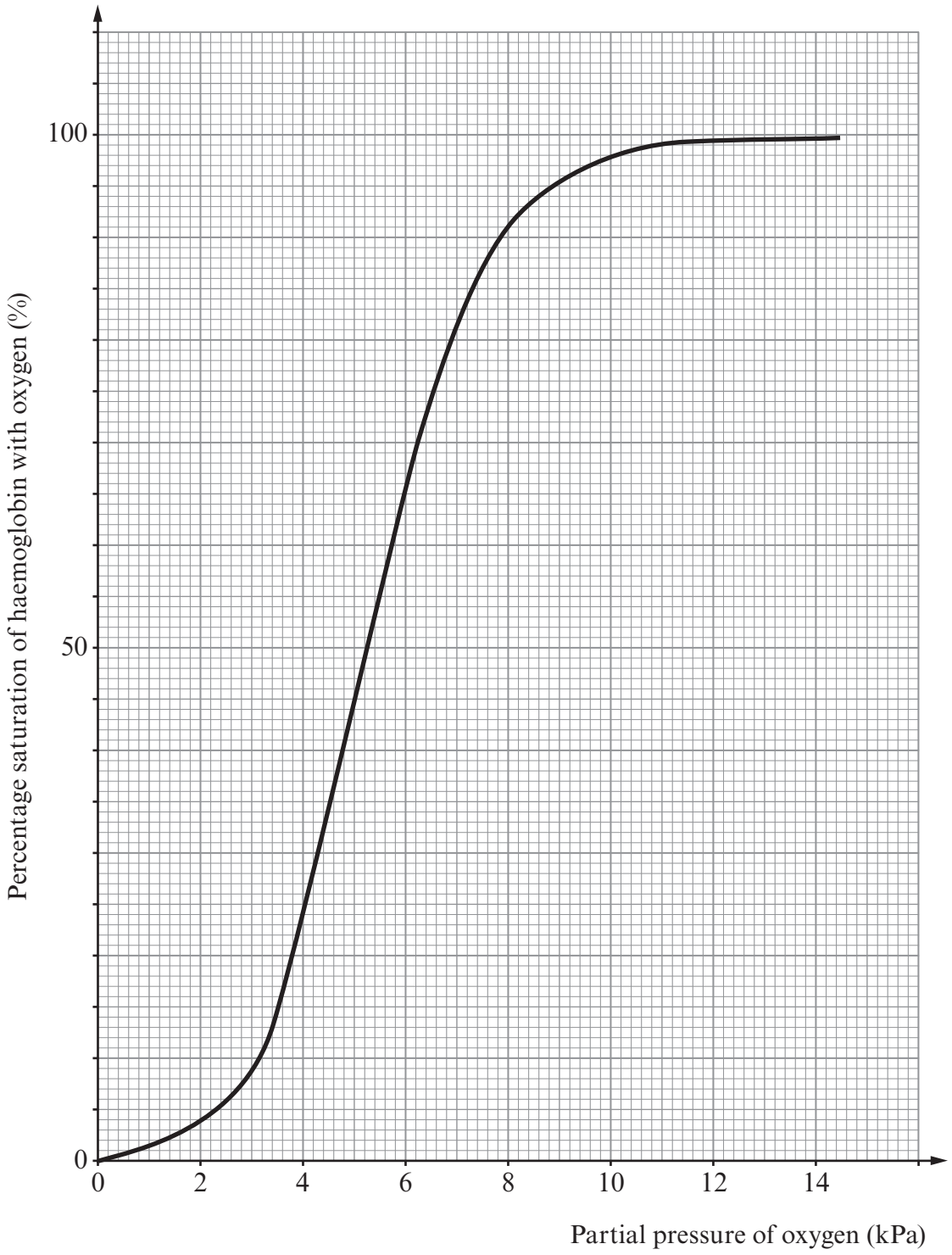
Examiner only

5. The graph below shows the relationship between partial pressure of oxygen and the percentage saturation of haemoglobin in the blood of a human **adult**.

(a) (i) State the name given to the curve shown on the graph below. [1]

.....

(ii) Draw another curve on the axes below showing the relationship for **human foetal** haemoglobin. [1]



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(iii) Explain the advantage of the position of the curve for **human foetal** haemoglobin. [2]

.....

.....

.....

.....

(b) (i) What would happen to the curve for adult haemoglobin if the partial pressure of carbon dioxide increased? [1]

.....

.....

(ii) What is the name of this effect? [1]

.....

(iii) Explain the mechanism and the significance of this effect during exercise. [4]

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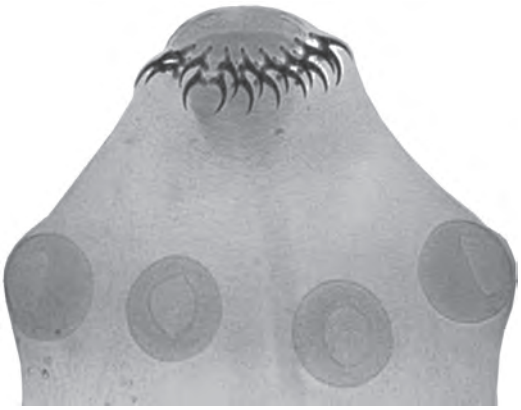
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6. The photograph below shows the scolex (head region) of an adult tapeworm *(Taenia solium)*.



[www.k-state.edu, original photograph by S.J. Upton]

(a) Define the term *parasite*. [2]

.....

.....

.....

(b) (i) Identify **two** structures shown in the photograph above which are adaptations to allow the tapeworm to survive in the gut of a human. [1]

.....

.....

(ii) Explain how the **two** structures you have identified in part *(b)*(i) help the adult tapeworm to survive. [2]

.....

.....

.....

.....

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(c) Tapeworms have no mouth or digestive system.

State why the adult tape worm does not need a digestive system and explain how the tape-like shape of the worm's body enables it to feed without a mouth or gut. [3]

(d) Describe how the tapeworm's reproductive strategy helps to ensure its survival. [2]

10

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7. Answer **one** of the following questions.

Any diagram included in your answer must be fully annotated.

Either, *(a)* Give an account of the sequence of events that takes place during the digestion and absorption of a meal containing carbohydrate and protein. [10]

Or *(b)* Describe how the sequence of events that takes place during the cardiac cycle is initiated and controlled. [10]

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END OF PAPER

10

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GCE BIOLOGY - BY2

Mark Scheme - January 2013

Question			Marking details	Marks Available
1	*(a)*		A species is a group of organisms that {can interbreed/ reproduce}; (under natural conditions) produce fertile offspring;	2
	(b)	(i)	birds;	1
		(ii)	Borneo {1.61/ 1.62/1.6};	1
		(iii)	(Least at poles to) {greatest/ increasing} at equator;	1
	(c)	(i)	X at second split from left or anywhere along that line;	1
		(ii)	Same genus(but different species)/ tells us the genus;	1
	(d)	(i)	homologous;	1
		(ii)	analogous;	1
			Question 1 total	**[9]**

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Question			Marking details	Marks Available
2	*(a)*		Thin – small diffusion distance; Accept small diffusion distance/ pathway Large surface area- (large contact with air) for <u>diffusion/ gas exchange</u>/ OWTTE; Moist- allow gases to <u>dissolve/ gases go into solution</u> (to cross membrane); Not diffuse into Permeable-to allow <u>gases</u> to pass through (the respiratory surface); NOT blood supply	3 max
	(b)	(i)	Through {(general) body surface/skin}; NOT gills	1
		(ii)	<u>Fast</u> flowing; maintains {concentration/ diffusion} gradient/absorbs more oxygen at surface/ OWTTE;	2
		(iii)	They dry out/ unable to remain moist/ lose water; They clump together (because of surface tension.)/ collapse/ lie on top of each other;	2
	(c)		Blood flows (across gill) in <u>opposite</u> direction to water; NOT different direction {Concentration/ diffusion} gradient is maintained across whole surface/ {concentration/ diffusion} gradient is maintained constantly/ blood always meets water with a higher oxygen concentration/ equilibrium is never reached ; NOT concentration gradient maintained for longer/ maintains a high concentration gradient A greater concentration of oxygen in the blood is achieved/ allows more oxygen to diffuse in/ higher % saturated blood/ allows more {diffusion/ exchange} of gases/ more take up of oxygen/ ORA; NOT makes it more efficient alone	3
			Question 2 total	**[11]**

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Question			Marking details	Marks Available
3	*(a)*		A – Cortex/ parenchyma B – Endodermis; C – Xylem; D – Phloem. 2 marks for all 4, 1 mark for 2 or 3	2
	(b)	(i)	Xylem **Both** correct for 1 mark	1
		(ii)	Phloem; NOT letters only	
	(c)	(i)	{Translocation/ movement/ transport/ carry NOT flow} of {products of photosynthesis/ sucrose/organic compounds/ sugars/ amino acids}/ description of source to sink/ translocation; (NOT nutrients/ other named sugar/ named ions)	1
		(ii)	Carry out {metabolism/respiration} /to supply (sieve cells) with {energy/ATP}/ contain mitochondria for {ATP/ active transport}; NOT contain organelles that the sieve cells do not have/ not loading sieve cell	1
	(d)	(i)	Apoplast; – via cell walls; NOT plasmodesmata	2
			Symplast; – via {cytoplasm/ plasmodesmata};	2
			[1 mark for name, 1 mark for correct route, for each]	
		(ii)	Makes the water pass through {symplast/living part of cell/ cytoplasm}/ prevents it going through {apoplast/ cell walls}; NOT impermeable alone/ makes water take another route	1
			Question 3 Total	**[10]**

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Question			Marking details	Marks Available
4	*(a)*	(i)	A- incomplete metamorphosis B-complete metamorphosis **BOTH**;	1
		(ii)	X- {nymph/ larva/ instar} Y- pupa (accept chrysalis/ cocoon/ pupal stage) **BOTH**;	1
	(b)		(Exoskeleton is) {rigid/ hard/ non- living/ does not grow/ owtte}; They shed (the exoskeleton)/ ecdysis/ moult; Then grow (a new one)/ allows growth/ vulnerable whilst hardening ;	3
	(c)		Fluid filled cavity (surrounded by a membrane); {Protective/ hard/ leathery} {shell/ outer covering/ coat}; (embryo within) yolk sac/ food store/ yolk for nutrition/ own internal nutrient supply; [any 2]	2
	(d)		(the young are retained) for a {considerable/ longer} time in the mother's womb or uterus; (The embryo is) nourished there from {the mother's blood supply /the placenta}/ {unlimited nutrients/ OWTTE}; Protection – qualified; The young are {born in a relatively advanced state of development/ well developed/ more advanced growth in womb}; [Any 3] NOT parental care/ ref to number of offspring	3
			Question 4 Total	**[10]**

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Question			Marking details	Marks Available
5	*(a)*	(i)	(Oxygen) dissociation (curve);	1
		(ii)	similar shaped curve drawn to left of given curve; (must start/ end at same points) NOT above 100%	1
		(iii)	{Foetal haemoglobin/ it} has {higher greater} affinity for oxygen (than adult)/ picks up oxygen easier/ more readily forms oxyhaemoglobin/ reaches saturation at lower partial pressures; NOT more quickly (this ensures) oxygen moves from mother('s blood) to foetus (in the placenta);	2
	(b)	(i)	Move to right;	1
		(ii)	Bohr;	1
		(iii)	(Muscles/ cells give off) more carbon dioxide/ higher partial pressure of carbon dioxide; carbon dioxide dissolves to make carbonic acid/lowering pH; which reduces affinity of Haemoglobin for oxygen/reference to Hydrogen displacing Oxygen from Haemoglobin/ oxygen dissociates more readily; (more) oxygen is released added demand when muscles need it (for aerobic respiration)/ OWTTE;	4
			Question 5 Total	**[10]**

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Question			Marking details	Marks Available
6	*(a)*		Parasites are organisms that (live on or in another organism called the host and) {obtain nourishment / feed on it}; at the expense of /causing harm to the host; NOT negative effect unqualified	2
	(b)	(i)	Hooks+ suckers **both**;	1
		(ii)	Any 2 Attach the worm (to the wall of the gut)/ for attachment; the worm does not get moved along/ resisting peristalsis; passed out with undigested food remains/ prevents it being egested;	2
	(c)		(It lives surrounded by) food that has been digested/ broken down by the {host/ human's digestive system/ OWTTE}; (It is very long –) gives a large surface area (to absorb digested food); (It is flat/ thin –) short distance for diffusion; NOT thin membrane	3
	(d)		Any 2 It lays large numbers of {eggs/ larva/ embryos/ offspring}; eggs can resist adverse conditions/ OWTTE; correct reference to hermaphroditism; Not asexual reproduction	2
			Question 6 Total	**[10]**

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Question			Marking details	Marks Available
7	*(a)*	A	In buccal cavity/ mouth;	
		B	teeth (and tongue) {mechanically/ physically} break down food /to provide large surface area;	
		C	(Saliva added from) salivary glands;	
		D	(saliva) contains mucus to lubricate;	
		E	Amylase substrate is starch, product is maltose/ disaccharides;	
		F	Stomach adapted for protein digestion/ protein digestion {starts/ begins} in stomach/ proteins are partially digested in the stomach;	
		G	Produces hydrochloric acid/ low pH in stomach;	
		H	Peptidase/Pepsin's substrate is {protein/ polypeptides}, products are {polypeptides/peptides}; reject ref to other enzymes	
		I	Small intestine (is adapted to) completes (protein /carbohydrate) digestion/ Description of {disaccharide/ polpeptide} digestion in small intestine;	
		J	Named enzyme produced by small intestine;	
		K	Two named enzymes produced by pancreas;	
		L	correct reference to endo- exo- peptidases;	
		M	Absorption takes place in the ileum/small intestine;	
		N	Villi / microvilli increase surface area;	
		O	Glucose/ monosaccharides/ products are absorbed by diffusion <u>and</u> active transport;	

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Question			Marking details	Marks Available
7	*(b)*	A	Heart (muscle) is myogenic;	1
		B	It can contract without any nerve stimulation;	1
		C	The stimulus to contract originates in the sinoatrial node (SAN);	1
		D	Which controls the rate of beating / acts as pacemaker;	1
		E	It is situated in the wall of right atrium/auricle. (on diagram);	1
		F	Electrical impulse from the SAN causes the two atria/auricles to contract;	1
		G	Thin layer of connective tissue prevents the stimulus spreading to the ventricles;	1
		H	At the bottom of the wall separating the two atria /auricles is the atriventricular node AVN. (on diagram);	1
		I	This delays the impulse (about 0.1 sec) before passing it to the ventricles;	1
		J	The impulse is sent to the apex /tip of the ventricles;	1
		K	Along bundle branches / Bundle of His;	1
		L	And is conveyed upwards along Purkinje/ Purkyne fibres;	1
		M	Causing (a wave of) ventricular contraction starting from the lowermost part of the ventricles;	1
		N	The SAN may be stimulated by various factors to change its pacing;	1
		0	One example – hormones (adrenalin), exercise, body temperature, etc. (allow ref. autonomic nervous system;	1
			Question 7 Total	**[10]**

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

BIOLOGY – BY2

P.M. MONDAY, 21 May 2012

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**6**	
3	**6**	
4	**8**	
5	**8**	
6	**11**	
7	**16**	
8	**10**	
Total	**70**	

1072
010001

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The quality of written communication will affect the awarding of marks.

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1. Complete the following table using the characteristics to identify each kingdom. [5]

Characteristics	*Kingdom*
Heterotrophic eukaryotes Cell wall of chitin Reproduce by spores	
Heterotrophic Multicellular eukaryotes No cell wall Nervous coordination	
Eukaryotes Single celled No tissues differentiation	
Unicellular Microscopic No membrane bound organelles Cell wall not cellulose Cell wall made of murein	
Multicellular eukaryotes Photosynthetic Cellulose cell wall	

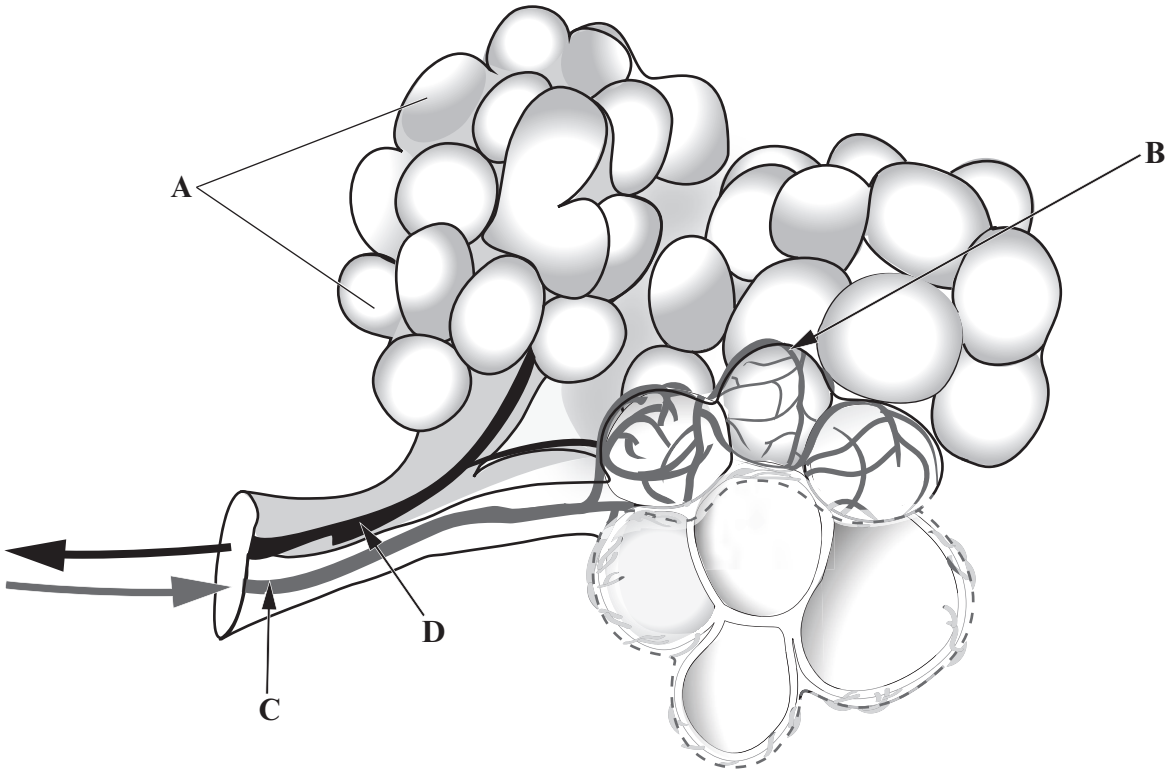
(Total 5 marks)

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2. The image below shows part of the lung viewed under high magnification. The arrows indicate direction of blood flow.



(a) (i) Identify the structures **A** and **B**. [1]

A .....

B .....

(ii) Identify the blood vessels which connect **C** and **D** to the heart. [1]

C .....

D .....

(b) State two important structural features of **A visible in the diagram**. [2]

1 .....

2 .....

(c) Briefly explain how inspiration is brought about. [2]

.....

.....

.....

(Total 6 marks)

1072 010003

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3. Define the following terms and give an example of a different organism for each. [6]

Parasite

.....

.....

Example .....

Autotroph

.....

.....

Example .....

Saprophyte or saprobiont

.....

.....

Example .....

(Total 6 marks)

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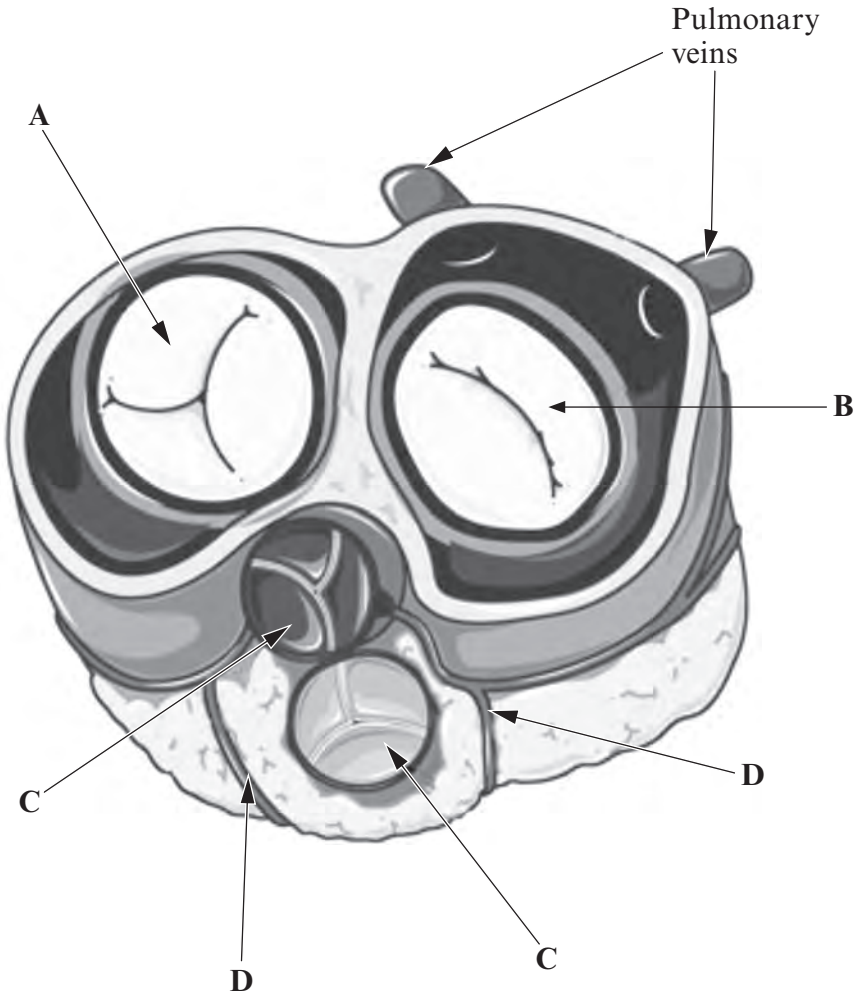
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4. The diagram below shows a section of a human heart, cut just above the heart valves, as seen from above.



(a) Name valves **A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) Name blood vessels **D** which are found on the surface of the heart and explain their function. [2]

.....

.....

.....

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(c) (i) Explain why valve **B** often has to be replaced because it ceases to work effectively and why valve **A** rarely needs replacing. [1]

.....

.....

.....

(ii) What would happen to the flow of blood if the valve is damaged? [1]

.....

.....

(iii) Suggest **one** symptom a person with a failing valve **B** may have. [1]

.....

(Total 8 marks)

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5. The photograph below shows a scanning electron micrograph of fish gills.

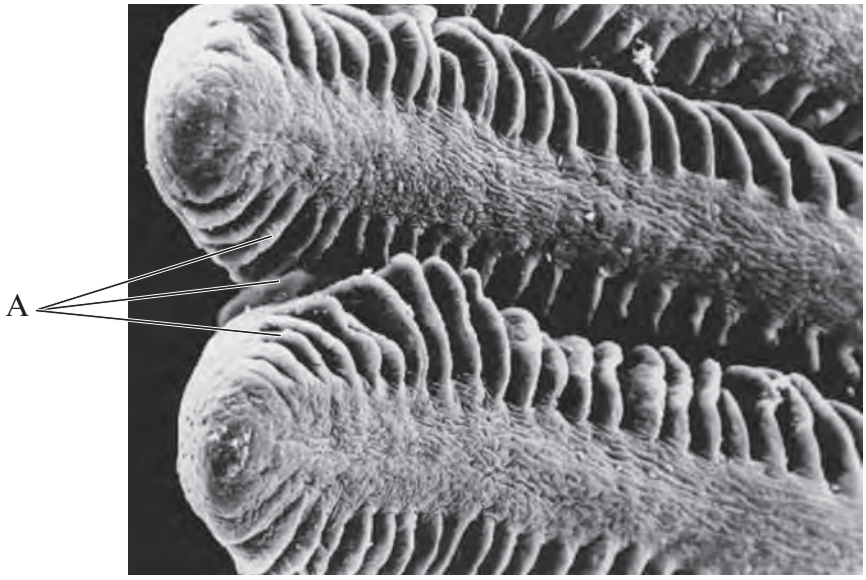


Photo courtesy of Electron Microscopy Unit, Royal Holloway University of London

(a) Identify structures **A**. [1]

.....

(b) Using the photograph above and your own knowledge, describe **three** features of fish gills which allow them to achieve efficient gas exchange. [3]

1. .....

2. .....

3. .....

(c) Water is a dense medium with a low oxygen content. Explain how bony fish have overcome the problems of oxygen uptake in water. [4]

.....

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.....

(Total 8 marks)

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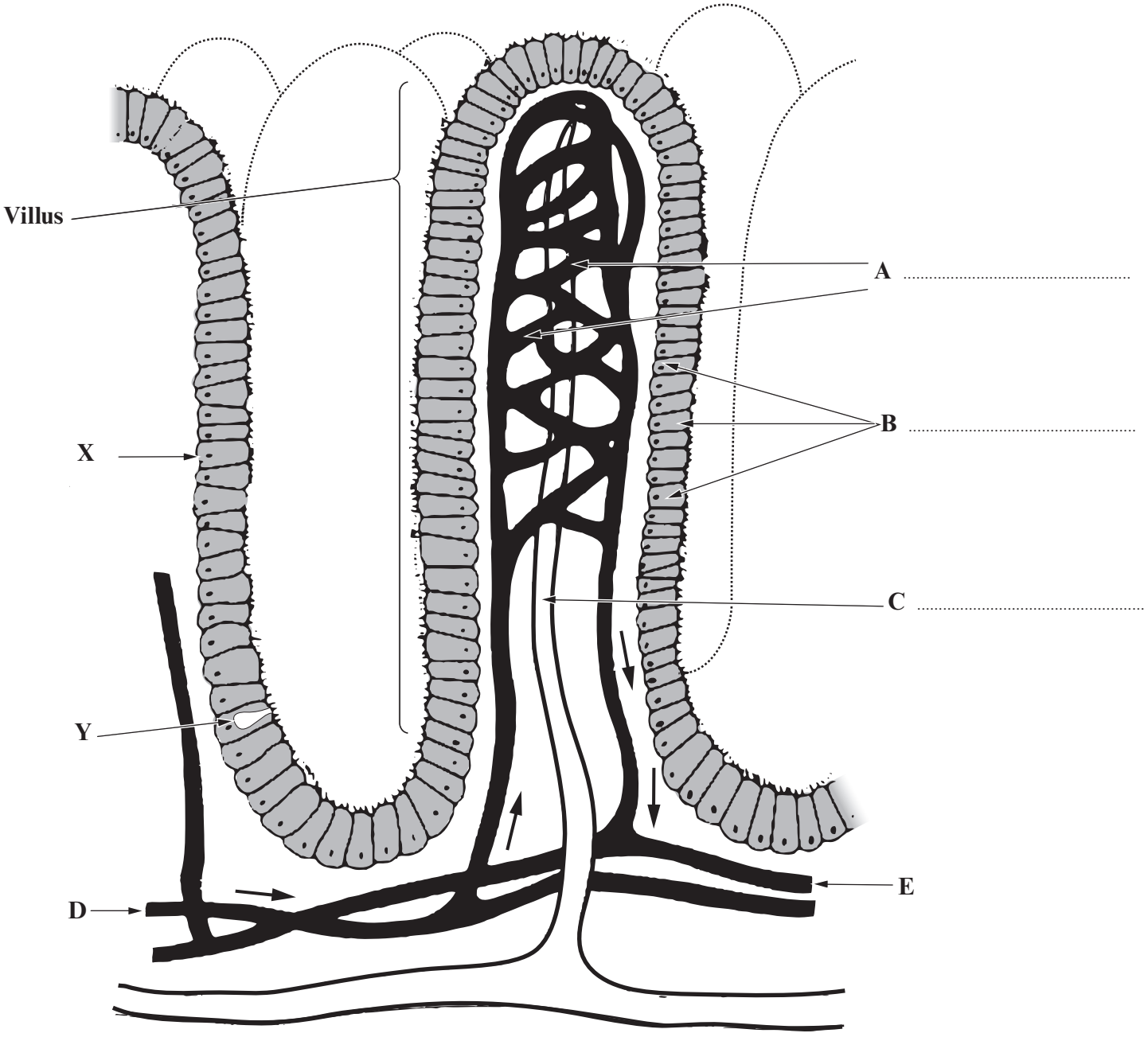
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6. The following diagram shows a longitudinal section of the small intestine.



(a) Complete the diagram by labelling structures **A**, **B** and **C**. [3]

(b) Identify the types of blood vessels shown by **D** and **E**. [2]

D .....

E .....

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(c) Describe **two** features associated with cell **X** and explain why each is important for the cell to function efficiently. [4]

Feature 1 .....

Importance .....

.....

.....

Feature 2 .....

Importance .....

.....

.....

(d) Cell **Y** is vital to the functioning of the intestine. What is the name of this cell and what is its function? [2]

Name .....

Function .....

(Total 11 marks)

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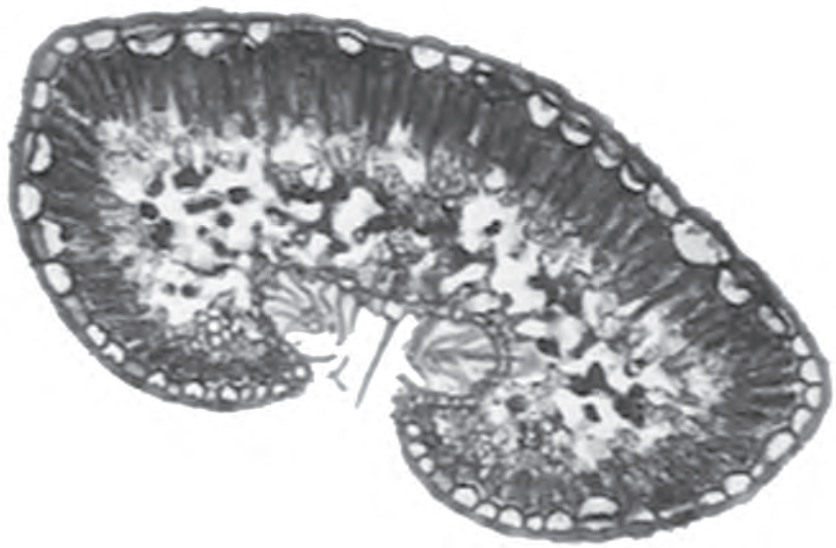
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7. The photograph below shows a transverse section through the leaf of heather *(Erica cinerea)*. This heather lives in a dry, windy environment.



(a) (i) State **three** features of the leaf shown above which indicate that it lives in a dry environment. [3]

Feature 1 .....

Feature 2 .....

Feature 3 .....

(ii) Explain how any **one** of these features help *Erica* live in a dry environment. [1]

.....

(b) What name is given to plants that live in dry environments? [1]

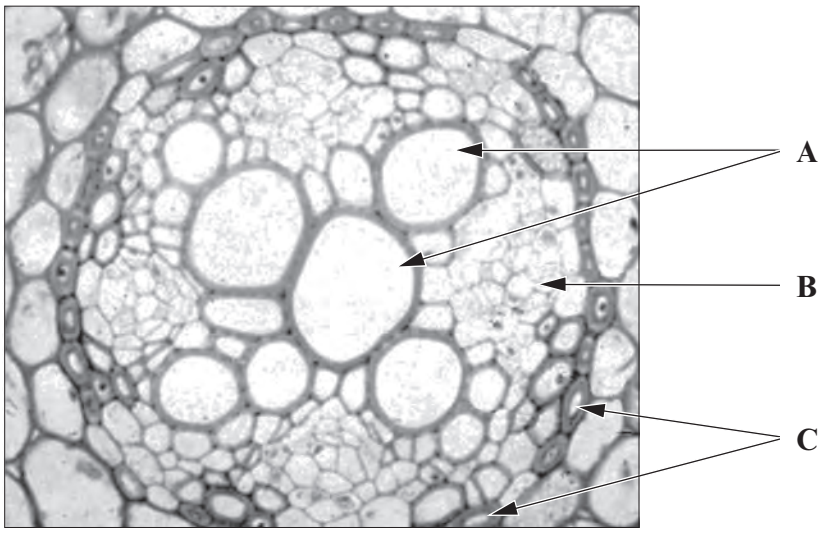
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(c) The diagram below shows a transverse section of a buttercup *(Ranunculus sp.)* root as seen under high power with a light microscope.



(i) Name tissue **A** and explain its role in the plant. [2]

.....

.....

(ii) Name tissue **B** and explain its role in the plant. [2]

.....

.....

(iii) Name cells **C**. [1]

.....

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(iv) Draw a simple longitudinal section of cell **C** clearly labelling the special feature of this cell. [2]

(v) Explain how cell **C** carries out its function in the uptake of water and minerals in the plant. [4]

.....

.....

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.....

.....

(Total 16 marks)

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8. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Distinguish between the two types of reproduction used by organisms and state the advantages and disadvantages of each. [7]

Explain how the reproductive strategies of flowering land plants have led to their success. [3]

Or *(b)* Explain what is meant by transpiration. Describe the factors affecting transpiration. [7]

Describe how you could use a potometer to investigate one of these factors. [3]

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(Total 10 Marks)

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Questions	Marking details	Marks Available
1.	Fungi; Animalia / animal; Protoctista; Accept Protists; Prokaryotae / Monera; NOT bacteria; Plantae/plant;	
	Question total	**5**

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Questions			Marking details	Marks Available
2.	(a)	(i)	A Alveoli/alveolar sacs; B Capillary (network); Both for 1 mark.	1
		(ii)	C Pulmonary artery; D Pulmonary vein; Both for 1 mark.	1
	(b)		**Any 2** Thin <u>alveolus</u> (walls) /one <u>cell</u> thick; NOT membrane or thin alone. Large surface area / highly folded; (volume – neutral) Large number of capillaries (or implied);	2
	(c)		Contraction of <u>intercostal</u> muscles **<u>and</u>** diaphragm OR ribcage moves up and out **<u>and</u>** diaphragm flattens / contract; Increased volume **<u>and</u>** decreased pressure **<u>so</u>** air moves in(to lungs);	2
			Question total	**6**

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Questions	Marking details	Marks Available
3.	Parasites {live in / on a} host and obtain nourishment {at the expense of / do harm to} the host; NOT feed (can be neutral) Tapeworm / ticks / leeches / fleas / headlice / roundworm / plasmodium / malaria parasite / any parasite;	2
	Autotrophs use {(simple) inorganic molecules / carbon dioxide and water} to synthesise {(complex) organic compounds / named organic compound / sugars}; NOT food Plant / named Plant / Algae / Bacteria must be qualified by chemosynthetic;	2
	Saprobionts {secrete enzymes onto the food outside the body / feed by extracellular digestion} and absorb (or e.q.) the (soluble) products (by diffusion); NOT ingest Bacteria / Fungi / or named;	2
	Question total	**6**

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Questions			Marking details	Marks Available
4.	(a)		A Right atrio-ventricular / tricuspid.	1
			B Left AV valve / bicuspid / mitral	1
			Award one mark for identifying both Atrioventricular Valves but not right and left.	
			C Semi lunar valves.	1
	(b)		Coronary;	2
			Supplies oxygen / blood to the heart muscle / wall / tissue / cells OR correct function for vein;	
	(c)	(i)	Valve {exposed to / works at} a higher pressure (in left ventricle)/ {Right ventricle pumps blood at / valve A exposed to} lower pressures (to lungs);	1
		(ii)	Blood leaks back (from ventricle) to atrium;	1
		(iii)	Breathlessness / fluid retention / fatigue / rapid or irregular heartbeat / blue lips / oedema / lower bp / faint / heart murmur;	1
			Question total	**8**

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Questions		Marking details	Marks Available
5.	(a)	(Gill) lamellae / filaments / plates;	1
	(b)	**Any 3** Large surface area (for diffusion); (volume neutral) Thin / short diffusion pathway; Permeable; Good blood supply or implied; NOT transport system NOT moist.	3
	(c)	Water is forced over the gill by {ventilation mechanisms / pressure differences / continuous swimming}; Unidirectionally / one way flow; Countercurrent flow of blood and water / or description of; {Diffusion / concentration} gradient is maintained or description of; over the entire gill surface; High affinity Hb;	4
		Question total	**8**

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Questions		Marking details		Marks Available
6.	(a)	A	Capillaries; NOT blood vessels;	1
		B	Epithelium / epithelial cells; NOT endothelium;	1
		C	Lacteal; NOT lymph;	1
	(b)	D	Arteriole;	1
		E	Venule;	1
	(c)	Microvilli:		1
		Increase SA for diffusion / uptake of molecule / digestion (of molecules);		1
		Mitochondria:		1
		(Synthesis of) ATP for active transport;		1
	(d)	Goblet cell / mucus secreting cell; NOT Brunner's gland.		1
		Secretes / makes mucus; Accept even if named incorrectly above.		1
			Question total	**11**

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Questions			Marking details	Marks Available
7.	(a)	(i)	**Any 3** Has a reduced surface area / surface area:volume ratio; Thick cuticle; Curled / rolled (downwards with the stomata inside); Hairs (to trap water vapour);	3
		(ii)	Any scientifically correct explanation of their chosen feature / cuticle – comment on waterproofing / curled – trapping water / SA – less area over which water can be lost / stomata – trapping water vapour;	1
	(b)		Xerophyte;	1
	(c)	(i)	Xylem; Transports water (and minerals);	2
		(ii)	Phloem; Transports carbohydrates / sugars / products of photosynthesis / sucrose / amino acids; Not glucose/nutrients	2
		(iii)	Endodermis / starch sheath.	1
		(iv)	Decent diagram of endodermis cell; Endodermis – with Casparian strip/band clearly labelled;	2

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Questions	Marking details	Marks Available
(v)	**Any 4** Waterproof / Casparian strip / band / suberin; Blocks the apoplast pathway; Selective uptake / Active uptake / transport of minerals (by endodermis cells); Into symplast pathway; Active transport of minerals into pericycle; Water follows by osmosis; Water and minerals move into xylem vessels;	4
	Question Total	**16**

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Question	Marking details	Marks Available
8. (a)	A. Reference to Asexual **and** sexual; B. Asexual produces offspring that are genetically identical / clones; C. By mitosis; D. Allows (rapid) colonisation in favourable / stable conditions OR outcompetes (slower) sexual reproduction; E. But if conditions / or e.g. such as temp change / unstable or disease occurs; F. All individuals may die / none may have resistance / species may not be able to adapt; G. Sexual reproduction produces offspring that are genetically different; H. (Gametes) produced by meiosis; I. Genetic variability allows a species to adapt to environmental change /evolution; J. Slower/needs a partner (usually) / asexual faster; **7 Max** K. Relationship with animals / insects for pollination; L. Relationship with animals / insects for seed dispersal; M. Pollen can survive dessication / without water; N. Seed with stored food enables the embryo plant to grow until leaves form / are exposed to sunlight; O. Seed has a resistant (coat) to withstand adverse conditions; **3 Max**	
	Question total	**10**

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Question	Marking details	Marks Available
8. (b)	A. Transpiration is the loss/evaporation of water (vapour) from (inside) the leaves (and stem) of a plant; B. Through stomata; C. Down a water potential gradient; D. High TEMPERATURE increases (Rate of) Transpiration / ORA; E. Correct explanation of effect of temp / increased kinetic energy / rate of movement of water molecules; F. Increased AIR MOVEMENT / eq which increases (Rate of) Transpiration / ORA; G. Correct explanation of effect of wind / increasing diffusion gradient; H. High HUMIDITY which decreases (Rate of) Transpiration / ORA; I. Plus correct explanation / decreased diffusion gradient; J. High LIGHT INTENSITY which increases (Rate of) Transpiration / ORA; K. Because it causes stomatal opening; **7 Max** L. Set up under water / with a continuous column of water / make sure air cannot get in / it is air tight / equilibration; M. Any description of how to change one factor / may be apparent on diagram; N. Volume of water / movement of bubble taken up per unit time is measured; O. To give a (close) approximation of transpiration rate; **3 Max**	
	Question Total	**10**

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

BIOLOGY/HUMAN BIOLOGY – BY2

P.M. WEDNESDAY, 18 January 2012

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**10**	
2.	**7**	
3.	**18**	
4.	**10**	
5.	**15**	
6.	**10**	
Total	**70**	

1072
010001

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

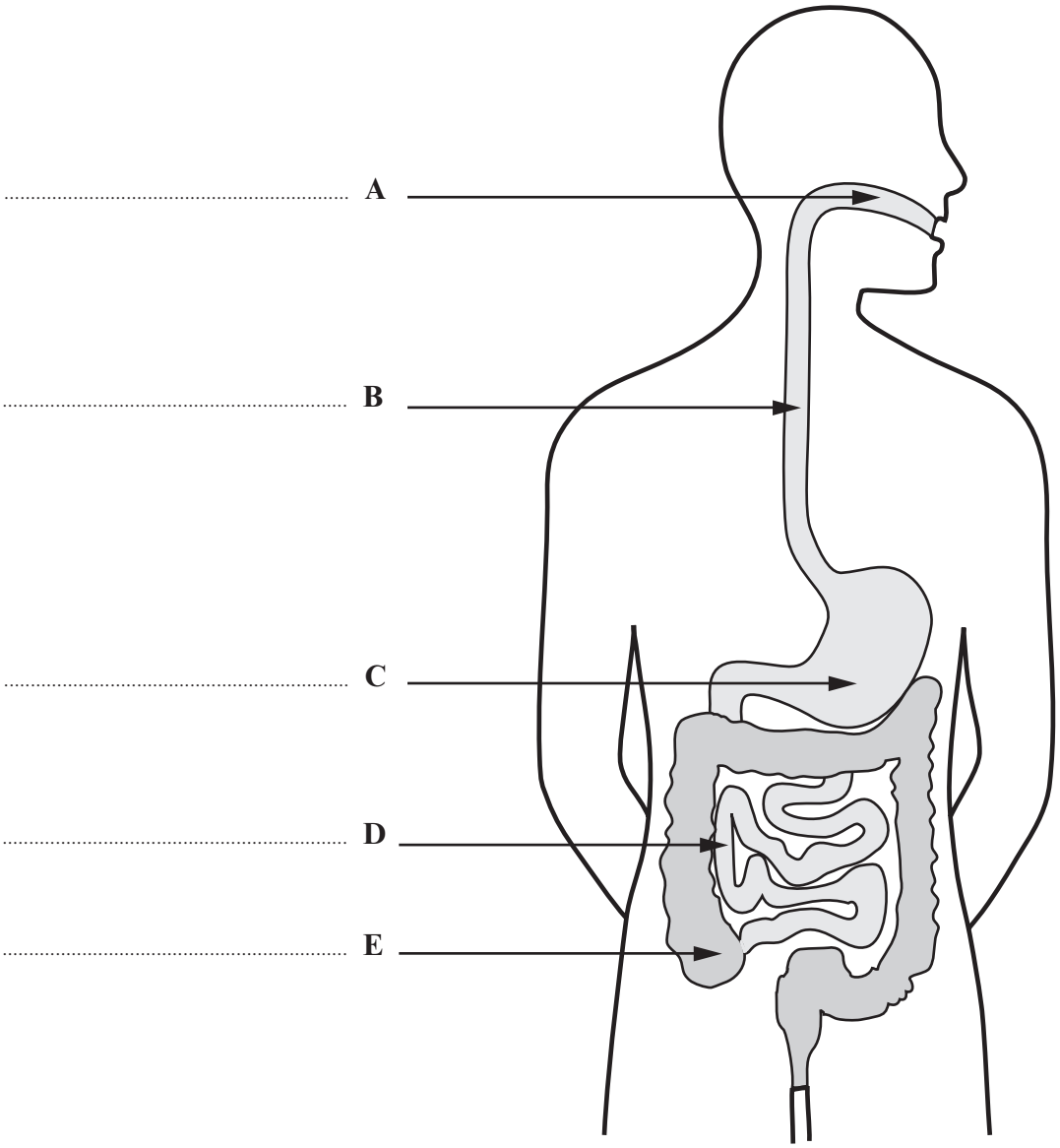
The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

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1. The diagram below shows a simplified diagram of the human digestive system.



(a) Label parts **A** to **E** on the diagram. [1]

(b) Using letters from the diagram identify the **main** regions in the human gut where the following processes take place.

(i) Digestion .....

(ii) Absorption ..... [2]

(c) Explain why the human digestive system is divided into several regions. [1]

.....

.....

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(d) The adult pork tapeworm, *Taenia solium*, is a parasite of the region labelled **D** on the diagram opposite.

(i) What is meant by the term *parasite*? [2]

.....

.....

.....

(ii) Suggest why it is of benefit to the tapeworm to live in this region of the digestive system. [1]

.....

.....

(e) Describe how tapeworms such as *Taenia solium* are adapted to overcome the following problems associated with living in the human digestive system. [2]

Peristalsis.

.....

.....

Digestive enzymes.

.....

.....

(f) Suggest why tapeworms produce large numbers of eggs. [1]

.....

.....

(Total 10 marks)

1072 010003

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2. The photographs show two species of swallowtail butterfly.



Two-tailed Swallowtail
(*Papilio multicaudata***)**



Blue Mountain Swallowtail
(*Papilio ulysses*)

(a) Butterflies belong to the same phylum as lobsters and spiders.

(i) Name the phylum to which these organisms belong. [1]

.....

(ii) Describe **two** features that all members of this phylum have in common. [2]

.....

.....

(b) Based on their physical characteristics the species of butterfly shown above are believed to be closely related. However, the Two-tailed Swallowtail is found in the USA while the Blue Mountain Swallowtail is found in Indonesia. It is possible that these species of butterfly may have become similar in form due to **convergent evolution**.

(i) State what is meant by the term *species.* [1]

.....

.....

(ii) Name the taxonomic **level** which suggests that the butterflies are closely related. [1]

.....

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(iii) Identify **one** method that could be used to confirm whether these butterflies are closely related or are the result of convergent evolution. [1]

.....

(iv) Describe how this method would show whether the butterflies are closely related. [1]

.....

.....

(Total 7 marks)

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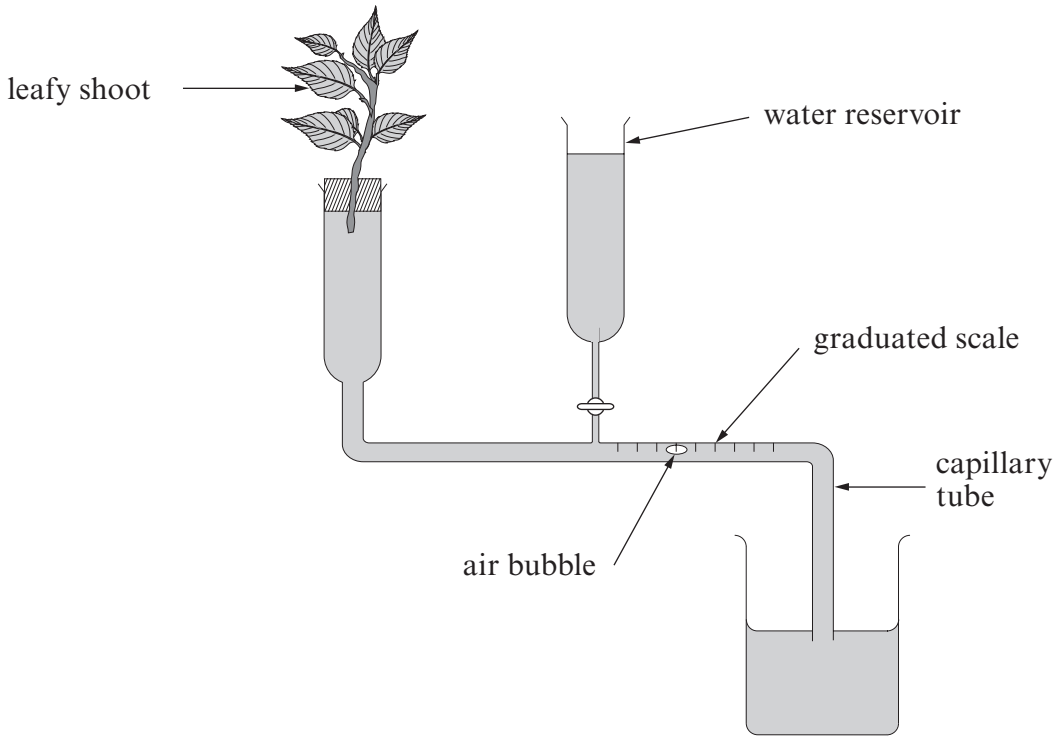
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3. *(a)* State the name of the process by which plants lose water from their leaves. [1]

.....

(b) The apparatus shown in the diagram was used to study how wind speed affects the rate at which a leafy shoot loses water.

The same shoot was exposed to air moving at different speeds. At each speed the distance moved by the air bubble in 5 minutes was recorded.



Name the apparatus shown in the diagram. [1]

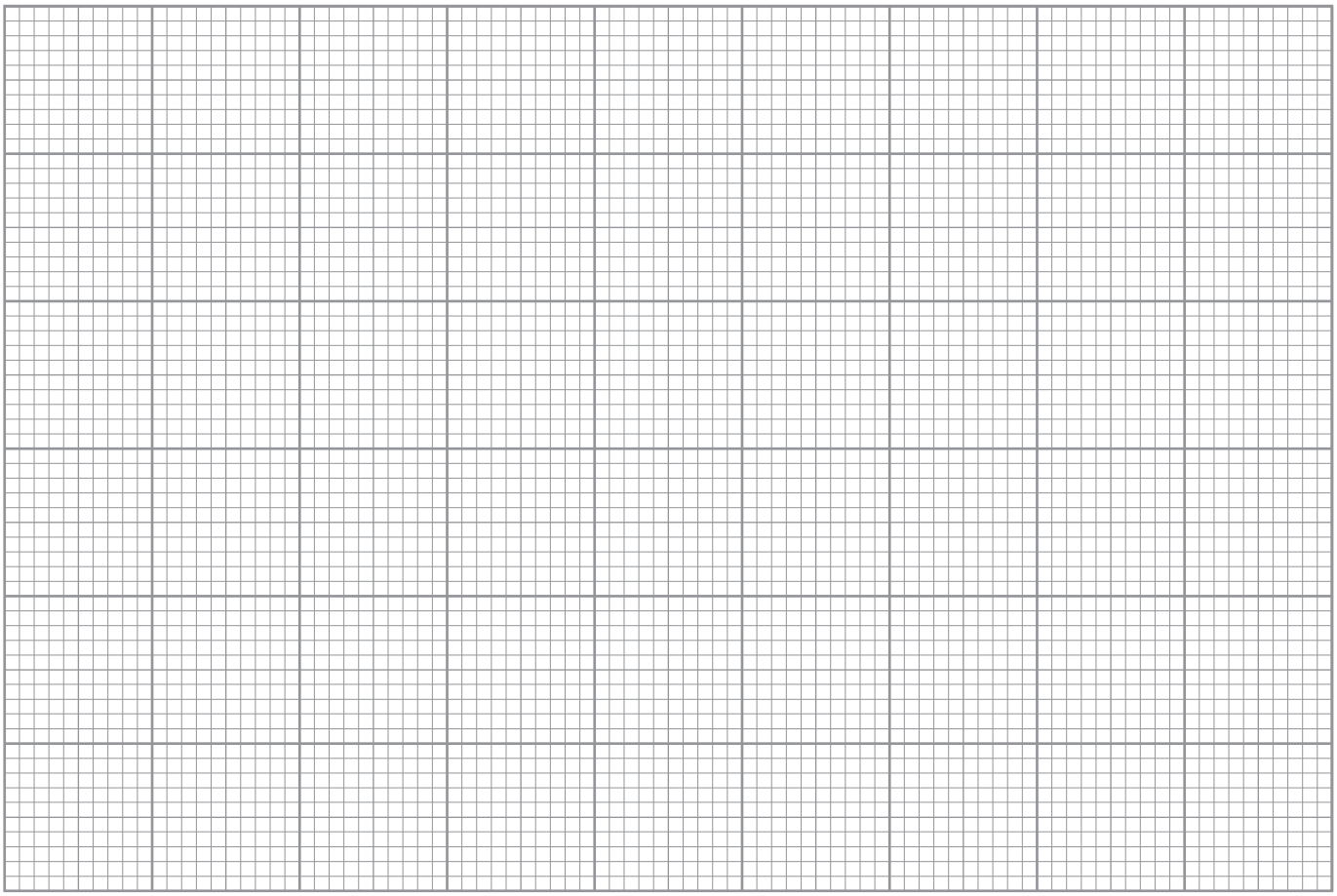
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(c) The table below shows the results of the investigation.

Wind speed / m s^{-1}	0	5.0	10.0	15	20	25.0
Distance travelled by air bubble / mm	50	195	260	285	300	275

(i) Plot the data as a graph on the grid provided. [4]

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(ii) Describe and explain the effect of wind speed on the distance travelled by the air bubble as the wind speed increased from 0 to 20 ms^{-1}. [2]

.....

.....

.....

(iii) Describe **one** theory that would explain how water moves up the stem of the leafy shoot. [3]

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(d) The results show that at wind speeds above 20ms^{-1} the distance travelled by the bubble decreased. One explanation for this decrease could be due to the closure of the stomata by guard cells.

Describe the role of **each** of the following in the operation of guard cells in closing stomata.

(i) K^+ (potassium ions). [1]

.....

.....

(ii) Water potential of the cells. [1]

.....

.....

(iii) Unevenly thickened cell walls. [1]

.....

.....

(e) Humidity and temperature also affect the rate at which water is lost from leaves.

In the table below underline the correct word to show whether **an increase** in each factor would increase or decrease the rate of water loss from plants and explain how each factor causes this change. [4]

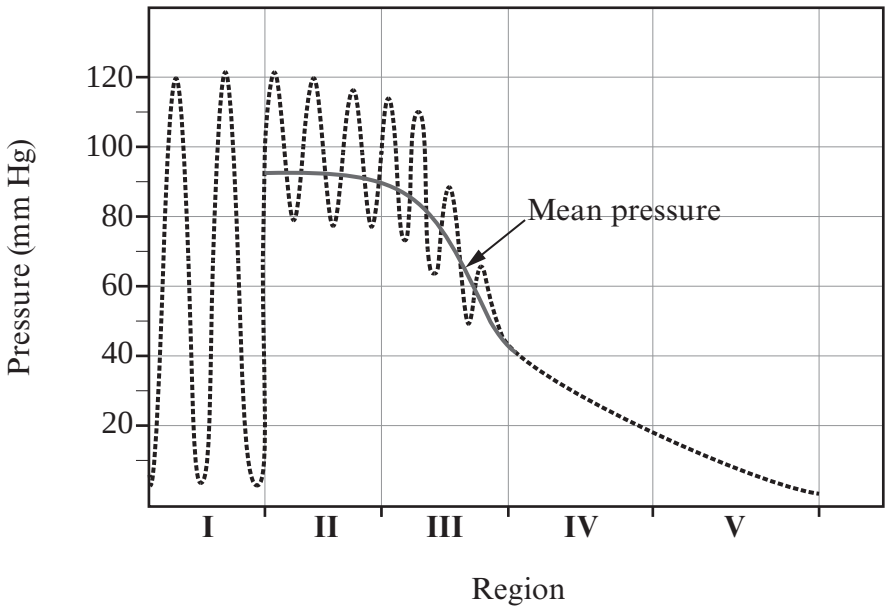
Factor	*Effect on rate of water loss*	*Explanation*
Increased humidity	Increase / Decrease	
Increased temperature	Increase / Decrease	

(Total 18 marks)

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4. *(a)* The graph below shows how the blood pressure changes as the blood is transported through the human circulatory system.



(i) Region **I** of the graph shows the blood pressure in the left ventricle and region **II** shows the blood pressure in the aorta.

Explain fully the reasons for the differences in the maximum and minimum blood pressure in the left ventricle and the aorta. [3]

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(ii) Why does the blood pressure decrease so rapidly in region **III**? [1]

.....

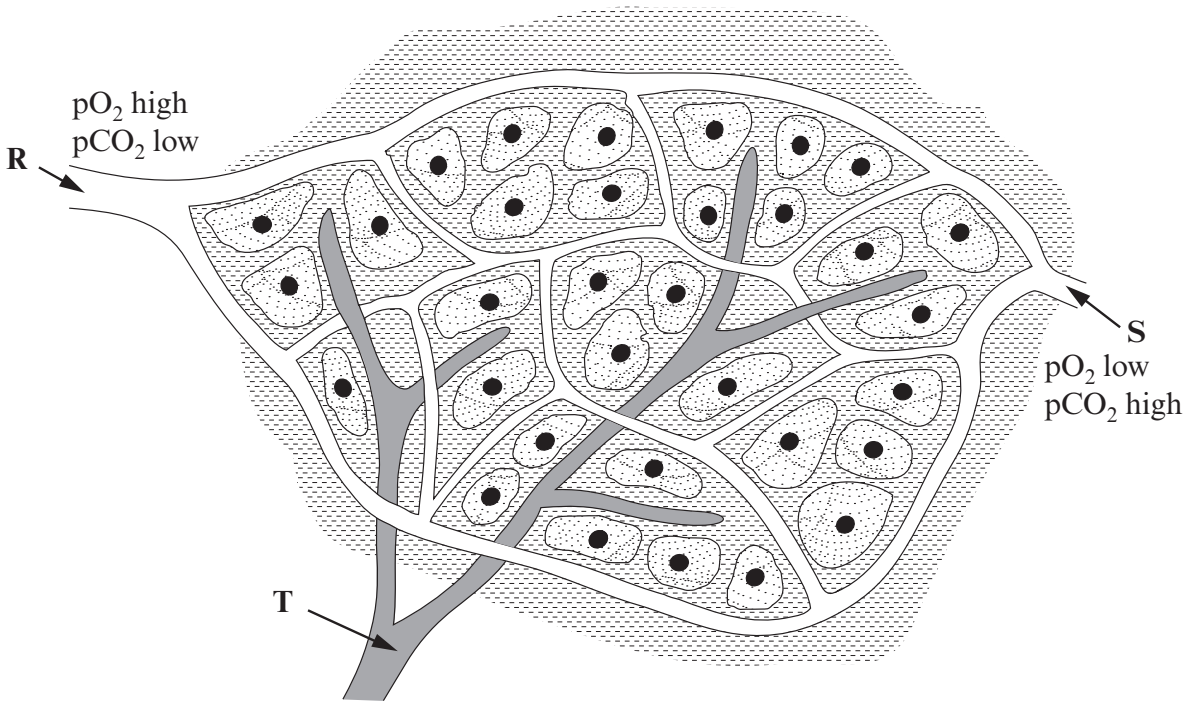
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Turn over.

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(b) The diagram below shows the blood supply to the cells of the body tissues. The relative amounts of oxygen and carbon dioxide in the blood vessels are given.



(i) Which of vessels **R** and **S** represents the arterial end of the blood supply to the tissues? Give a reason for your answer. [2]

.....

.....

.....

(ii) Explain how differences in the hydrostatic and osmotic pressures between the arterial and venous ends of the blood supply results in the formation of tissue fluid. [3]

.....

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(iii) What is the function of the vessel labelled **T** in the diagram? [1]

.....

.....

(Total 10 marks)

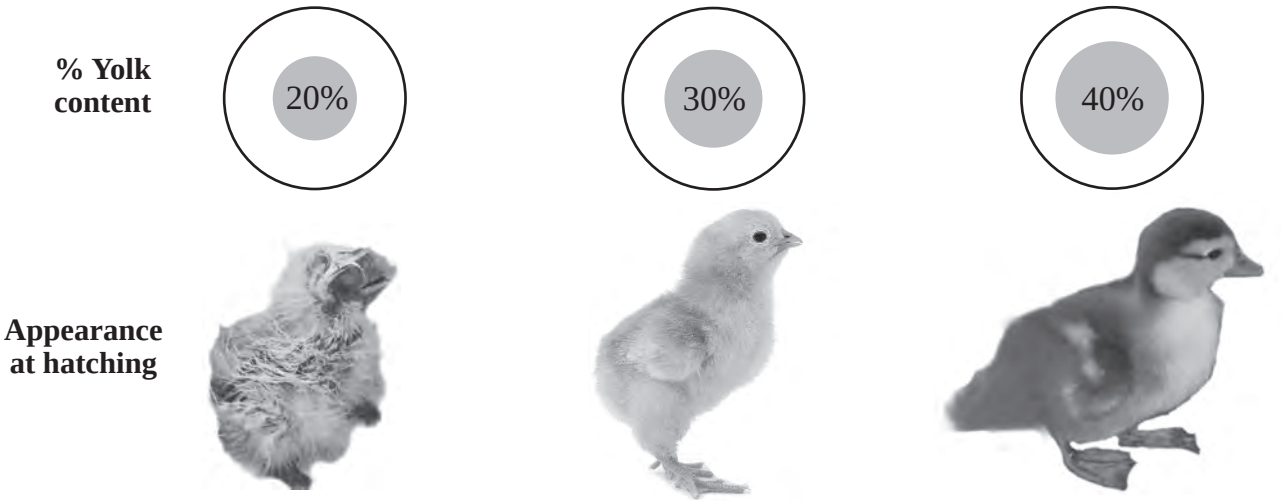
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5. *(a)* The different classes of vertebrates show a gradual change from an aquatic to a terrestrial existence.
Tick (✓) the boxes in the table below, to show the class or classes of vertebrates to which each statement refers. [4]

Statement	*Fish*	*Amphibia*	*Reptiles*	*Birds*	*Mammals*
Fertilisation is **always** internal					
Eggs are laid in an aquatic environment					
The embryo is surrounded by a membrane called the amnion					
Both fertilisation and embryo development are **always** internal					

(b) The diagram shows the percentage of yolk found in the eggs of three different species of birds and the appearance of the chicks at hatching.



(i) Explain why the chick hatched from the egg with 20% yolk would need the greatest level of parental care after hatching. [2]

.....

.....

(ii) Suggest a reason why organisms that provide a high level of parental care to their young often produce fewer offspring. [2]

.....

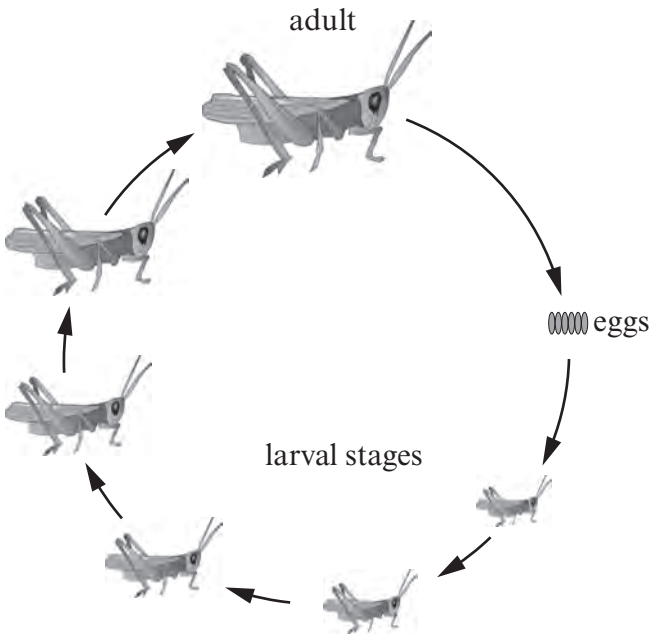
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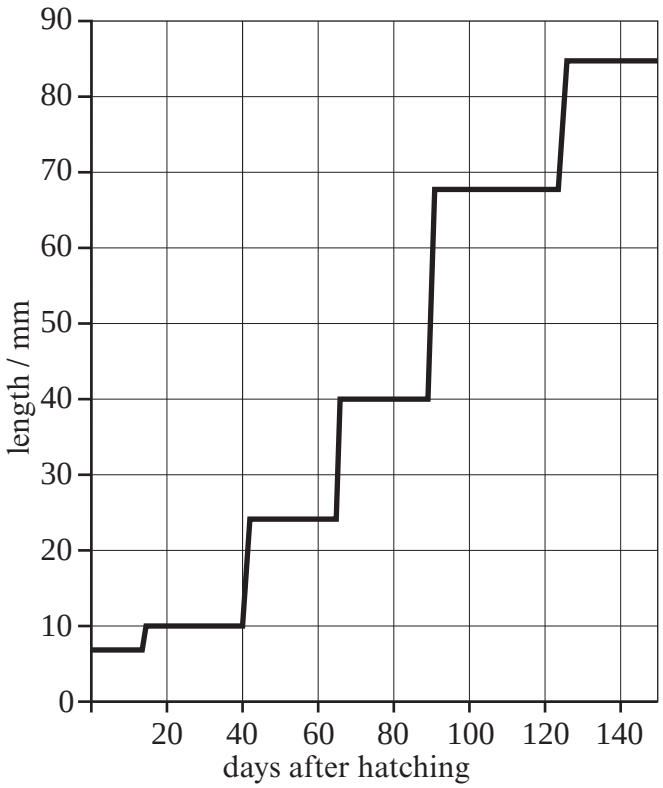
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(c) Insects are a group of organisms adapted to a terrestrial way of life.

The diagrams below show the stages in the life cycle of a locust and the length of the insect at different times following hatching.





(i) Name the type of insect life cycle shown by the locust. [1]

.....

(ii) What name is given to the different larval stages shown in the diagram? [1]

.....

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(iii) Use your knowledge and understanding of this type of insect life cycle to explain the changes in length of the insect following hatching. [3]

.....

.....

.....

.....

.....

(d) As an adaptation to life on land, insects have evolved a different system of gaseous exchange to vertebrates.

Complete the following sentences, about gaseous exchange, by inserting the most appropriate words to fill in the blanks. [2]

Insects have a system of tubes, called ....., instead of lungs. These transport oxygen directly to the cells. Air enters these tubes through pores called ..... .

(Total 15 marks)

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6. Answer **one** of the following questions.

Any diagrams included in your answers must be fully annotated.

Either, *(a)* Describe the uptake of water by plants from the soil into the xylem. [7]

Explain the role of ions in this process. [3]

Or *(b)* Explain why large, multi-cellular organisms have evolved special surfaces for gaseous exchange. [3]

Describe and explain how terrestrial mammals are adapted for gaseous exchange in air. [7]

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(Total 10 marks)

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BY2

Question			Answer		Mark
1.	(a)		Label parts **A** to **E** on the diagram. all correct		1
			A mouth / buccal cavity		
			B oesophagus / gullet/ esophagus		
			C stomach		
			D small intestine / duodenum / ileum		
			E large intestine / colon		
	(b)	(i)	digestion A C D		1
		(ii)	absorption D E		1
	(c)		different parts carry out different functions / provide different conditions for enzymes/different food groups digested in different areas		1
	(d)	(i)	lives <u>in</u> or <u>on</u> another organism NOT lives off of	max	2
			obtains nourishment/ nutrients/ products of digestion from the host		
			provides no benefit / causes harm to its host		
		(ii)	region D has high concentration of products of digestion / tapeworm can absorb nutrients/ nourishment from the digested food		1
	(e)		**peristalsis:**		1
			hooks / suckers / scolex to attach to the gut wall NOT hookers		
			digestive enzymes:		
			(thick) cuticle / secretes mucus / secretes enzyme inhibitors NOT coating/covering / waxy cuticle		1
	(f)		increases chance of (species) survival / infecting a new (intermediate) host/ many eggs will not survive		1

Question Total 10

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Question			Answer		Mark
2.	(a)	(i)	Arthropoda		1
		(ii)	jointed legs exoskeleton fluid-filled body cavity / haemocoel/ open circulatory system Segmentation/ segmented body NOT large brain	max	2
	(b)	(i)	a group of organisms that can interbreed / breed with each other to produce fertile offspring		1
		(ii)	Genus		1
		(iii)	DNA base sequencing / hybridisation/ sequencing analysis/ DNA electrophoresis Not DNA analysis/ analysis alone genetic fingerprinting or profiling/ amino acid sequencing of proteins / differences in protein structure (not: biochemical methods unqualified) NOT compare DNA/ genes		1
		(iv)	high level of similarity shows that they are closely related / converse argument. Needs to relate to 2 a (iii)		1
				Question Total	**7**

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Question			Answer	Mark
3.	(a)	(i)	Transpiration/ evapotranspiration	1
	(b)		Potometer NOT podometer	1
	(c)	(i)	graph:	4
			Axes Correct and labelled. Using labels from table, axes correct. 1	
			Scale Appropriate with over half of paper used. (1)	
			Plot All correct, +/- 1 small square (1)	
			Curve/ Line Well drawn through points (1)	
		(ii)	as wind speed increased distance travelled increased;	2 max
			NOT rate of transpiration	
			wind removed water vapour from leaf surface / removes diffusion shells / removes water molecules from the leaf's microclimate/	
			increased diffusion gradient between inside and outside of leaf	
			(not: blows water away)	
		(iii)	water lost from leaves / by transpiration; max	3
			causes tension on water molecules;	
			cohesive force between water molecules ;	
			adhesive forces between water molecules and xylem/vessel walls;	
			water molecules pulled into / up xylem/ vessel	
			NOT hydrostatic / root pressure	
	(d)	(i)	Pumped/ moved out of guard cells/ no longer pumped in	1
		(ii)	increased water potential , so water moves out	1
		(iii)	decreased water, so decreases volume of cell/ flaccid/ cause walls to move together	1

(e)

Factor	Effect on rate of water loss	Explanation
increased **Humidity**	~~**Increase**~~ **/ Decrease**	Reduces concentration/diffusion gradient/ water potential gradient between inside and outside leaf
increased **Temperature**	**Increase / ~~Decrease~~**	Greater rate of evaporation from surface of leaf / increased KE (of water molecules)

Question Total 18

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Question			Answer	Mark
4.	(a)	(i)	Contraction of {left ventricle/ ventricular systole} causes a {surge / increase in blood pressure}; pressure drops when the {left ventricle relaxes/ ventricular diastole}; pressure in aorta does not fall to zero because of the closing of the {aortic / semi-lunar valve}; {elastic recoil/ elasticity} of the arteries maintains blood pressure.	3
		(ii)	Friction/ resistance with vessel walls / increased cross-sectional / surface area of arterioles / blood vessels distance from heart increased causes progressive pressure drop/ Not reference to capillaries	1
	(b)	(i)	R; highest pO_2 / oxygen level OR lowest pCO_2 / carbon dioxide	2
		(ii)	**at arterial end**: max hydrostatic pressure (forcing liquid out of capillaries) greater than the osmotic pressure (drawing water in) **at venous end**: hydrostatic pressure has decreased; water potential gradient / high osmotic pressure in capillary or osmotic pressure greater than hydrostatic pressure causes an inward flow ORA; not all water (re)absorbed into capillary, reject all references to blood	3
		(iii)	Drains/ removes (excess) tissue fluid from the tissues / prevents build up of tissue fluid / return (excess) tissue fluid to blood via lymphatic system NOT ref to waste products alone	1
			Question Total	**10**

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Question		Answer	Mark
5.	(a)	1 mark each correct ROW	4

Statement	Fish	Amphibia	Reptiles	Birds	Mammals
1. Fertilisation is always **internal**			✓	✓	✓
2. Eggs are laid in an aquatic environment	✓	✓			
3. The embryo is surrounded by a membrane called the amnion			✓	✓	✓
4. Both fertilisation and embryo development are always **internal**					✓

(b) (i) lowest supply of {nutrients / food}; max 2

embryo cannot complete development inside egg/ {poorly/less} developed at hatching;

embryo unable to care for itself after hatching / parents have to {feed / keep warm} (due to lack of feathers)/ cannot feed itself;

(ii) more {time / energy/ resources} used to care for offspring/ more offspring would need too much {time / energy/ resources} to look after; 2

increased chance of survival of offspring/ less competition between offspring;

(c) (i) incomplete metamorphosis NOT stage metamorphosis 1

(ii) nymphs / instars 1

(iii) nymphs {go through a series of moults/ shed exoskeleton several times} (to become the adult); NOT skin/ outer layer 3

exoskeleton is {hard/ limits growth};

exoskeleton can only {be stretched/ grow} when newly formed/ {length/ size} can only increase following a moult;

rapid increase in length before exoskeleton hardens

(d) Tracheae/ tracheoles; NOT trachea 1

spiracles 1

Question Total 15

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Question		Answer		Mark
6.	(a)	Describe the uptake of water by plants from the soil into the xylem		7
		Explain the role of ions in this process.		3
		A water absorbed by the root hair cells		
		B (water can be) {absorbed into / moves through} cell walls		
		C moves (across cortex) via apoplast route		
		D (can also move) across plasma membrane / into cytoplasm by osmosis		
		E (water) moves from the cytoplasm of one cell to the next via plasmodesmata		
		F (called the) symplast route		
		G (water can also) move through cytoplasm <u>and</u> vacuoles via vacuolar route		
		H Casparian strip / band in walls of endodermal cells		
		I made of suberin / waterproof		
		J stops apoplast route / water forced into symplast route	Max	7
		K ions absorbed into root hair cells by active transport		
		L Ions lowering water potential in root hair cells		
		M at the endodermis ions absorbed into cytoplasm by active transport/ uptake		
		N ions travel (through pericycle) into xylem		
		O lowers water potential in xylem		
		P ref to lower water potential in root hair cells or xylem increasing osmotic gradient between soil (solution) and cell contents / creates osmotic gradient across root	Max	3
			Question Total	**10**

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(b) Explain why large, multi-cellular organisms have evolved specialised surfaces for gaseous exchange. 3

Describe and explain how terrestrial mammals are adapted for gaseous exchange in air. 7

A metabolic needs (approx) proportional to volume/ larger organisms need more oxygen

B Larger organisms external surface insufficient for gas exchange

C diffusion (of respiratory gases) proportional to surface area

D surface area : volume ratio is too small/ larger animals have a smaller SA:vol ratio (to supply metabolic needs)

E diffusion distances too large

F not enough O_2 can diffuse / O_2 cannot diffuse fast enough (to the cells furthest from surface) (to meet metabolic needs)

G {gas exchange surface folded/ large number of alveoli} - to increase surface area

H internal lungs

I (to) reduce water / heat loss NOT prevent

J gaseous exchange takes place in the alveoli

K thin walls - reduce diffusion distance

L (layer of) moisture – for gases to dissolve in

M blood supply/ capillaries – {maintain concentration / diffusion gradient (between alveolar air and blood)/ transport absorbed gases}

N haemoglobin (in erythrocytes) – transport of oxygen

O ventilation mechanism/ description of ventilation mechanism

P (to) replace stale air with fresh air / enable continuous exchange of gases max 7

Question Total 10

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Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A level

1072/01

BIOLOGY – BY2

P.M. THURSDAY, 26 May 2011

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**8**	
3	**8**	
4	**10**	
5	**7**	
6	**11**	
7	**10**	
8	**10**	
Total	**70**	

1072
010001

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

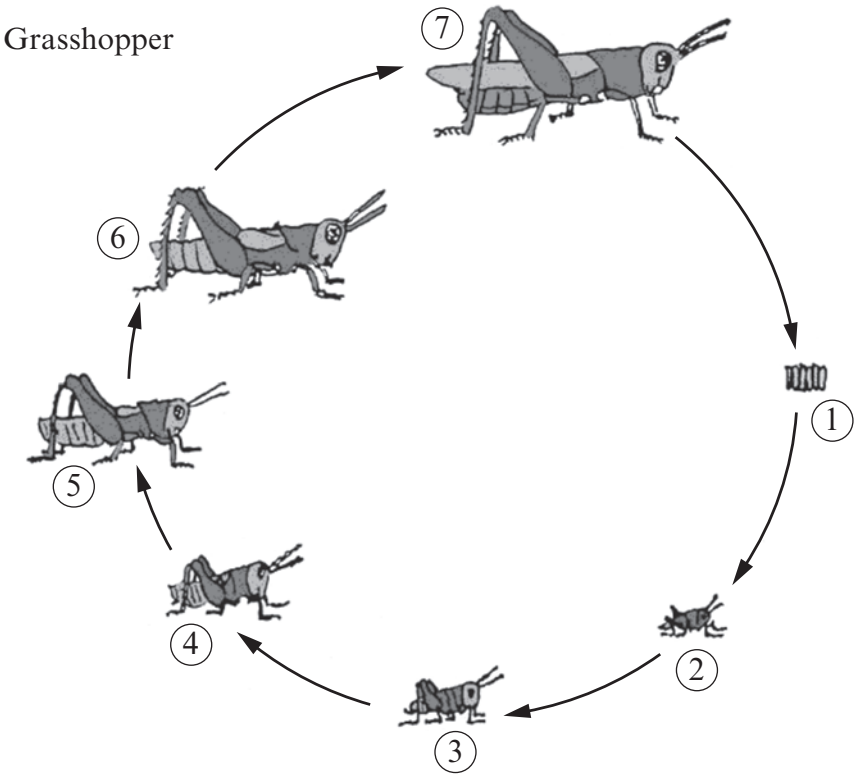
The number of marks is given in brackets at the end of each question or part-question.

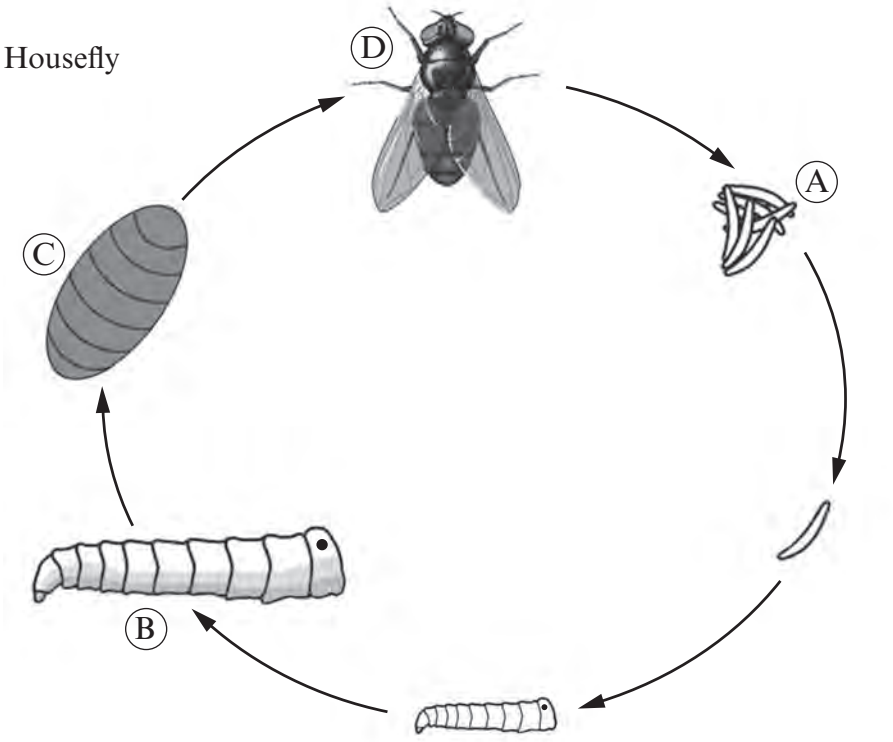
You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

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1. The two diagrams below show life cycles of two different groups of insects (not drawn to scale).





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(a) (i) What name is given to the type of life cycle of the grasshopper? [1]

.....

(ii) Name the stages labelled

1, ...

7, ...

2-6. ..... [2]

(b) (i) What name is given to the type of life cycle of the housefly? [1]

.....

(ii) Name the stages labelled

A, ...

B, ...

C, ...

D. ..... [2]

(Total 6 marks)

1072 010003

Turn over.

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2. Twenty thousand years ago, cheetahs *(Acinonyx jubatus)* roamed throughout the savannahs and plains of four continents: Africa, Asia, Europe, and North America.



About 10 000 years ago - because of climate changes - all but one species of the cheetah became extinct. With the drastic reduction in their numbers, close relatives were forced to breed and the cheetah became genetically inbred, meaning that all cheetahs are closely related.

(a) Classify the cheetah. [3]

Phylum .....

Class .....

Genus .....

(b) Name **one** feature that a cheetah has which allows the correct identification of each of its phylum and class. [2]

Feature of the phylum

.....

Feature of the class

.....

(c) The drastic reduction in the numbers of cheetah results in the loss of genetic diversity in the population. What term is applied to this? [1]

.....

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(d) (i) What biochemical method could have been used to determine that all cheetahs are closely related? [1]

.....

(ii) What would the results show? [1]

.....

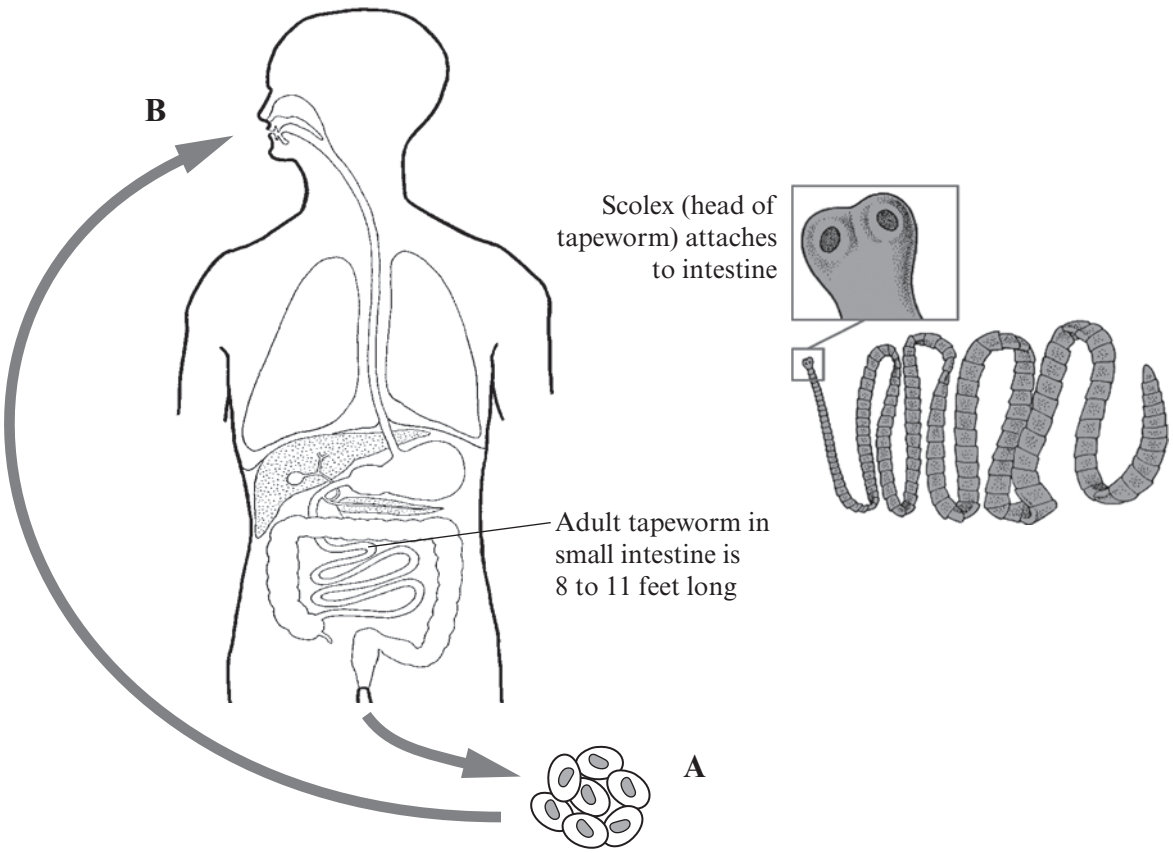
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(Total 8 marks)

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3. The diagram below shows the life cycle of the pork tapeworm *Taenia solium*.



(a) Describe the sequence of events which occur between A and B, from passing of the tapeworm eggs in human faeces to the infection of another human host. [2]

.....

.....

.....

(b) Give **three** features of the tapeworm which show how the parasite is adapted to its way of life. [3]

.....

.....

.....

.....

(c) What **two** simple precautions can be taken to avoid infection by the pork tapeworm? [2]

.....

.....

.....

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(d) The drug used to treat infections is Praziquantel which works by inducing severe spasms and paralysis of the worm's muscles.
Suggest how this may cause the removal of the tapeworm. [1]

.....

.....

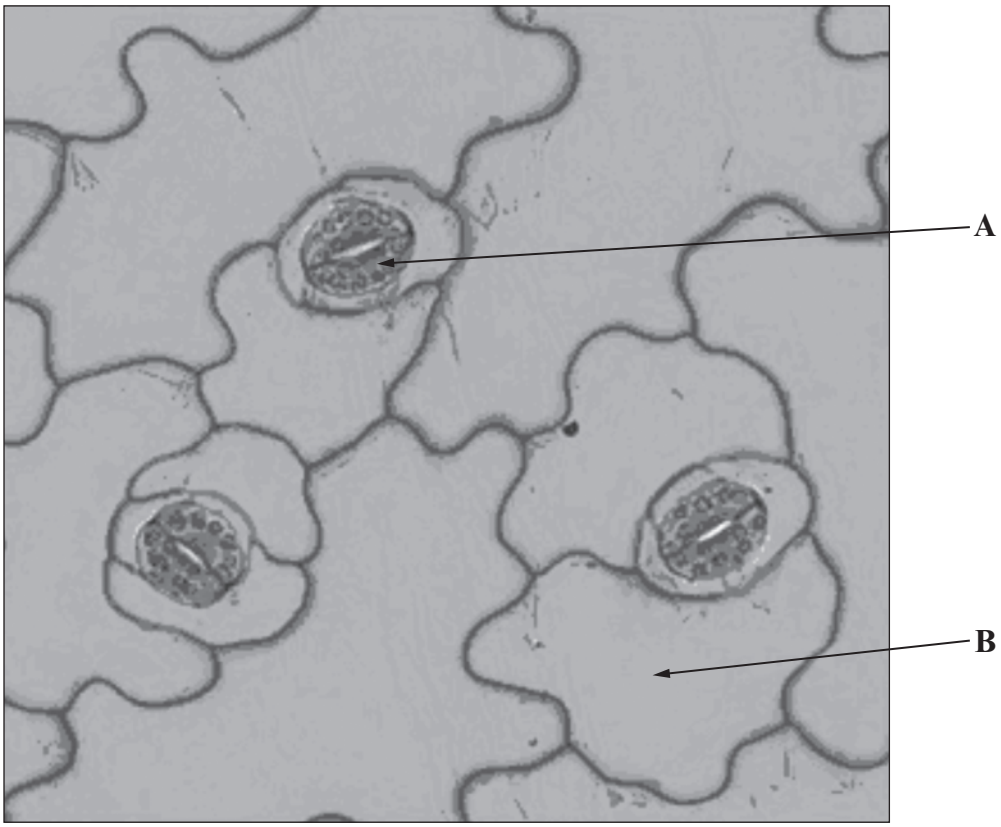
(Total 8 marks)

1072
010007

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4. The photograph below shows the surface view of stomata found on the lower surface of Kalanchoe (*Kalanchoe* sp.) leaves.



© Image by J. Adds, courtesy of SAPS

(a) Identify cells **A** and **B**. [2]

A .....

B .....

(b) Give **two** functions of stomata in leaves. [2]

.....

.....

.....

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(c) Explain how the flow of water into cells **A** leads to opening of stomatal pores. [4]

.....

.....

.....

.....

.....

.....

.....

(d) When cells **A** were treated with cyanide the stomatal pores failed to open. Explain why cyanide is having this effect on these cells. [2]

.....

.....

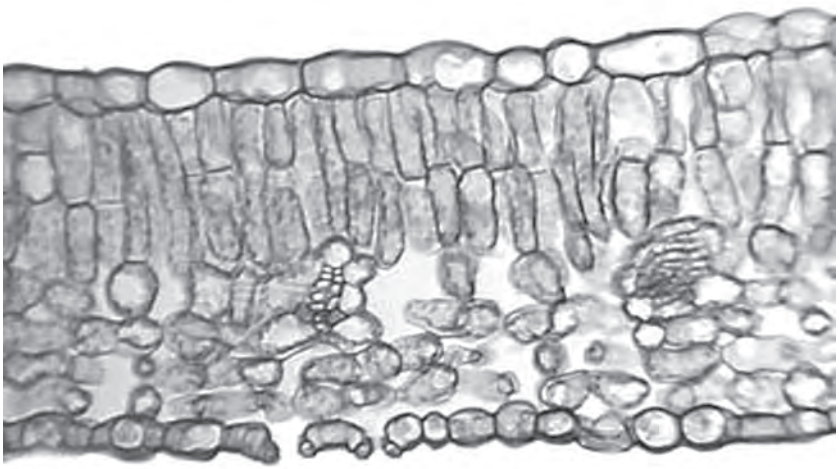
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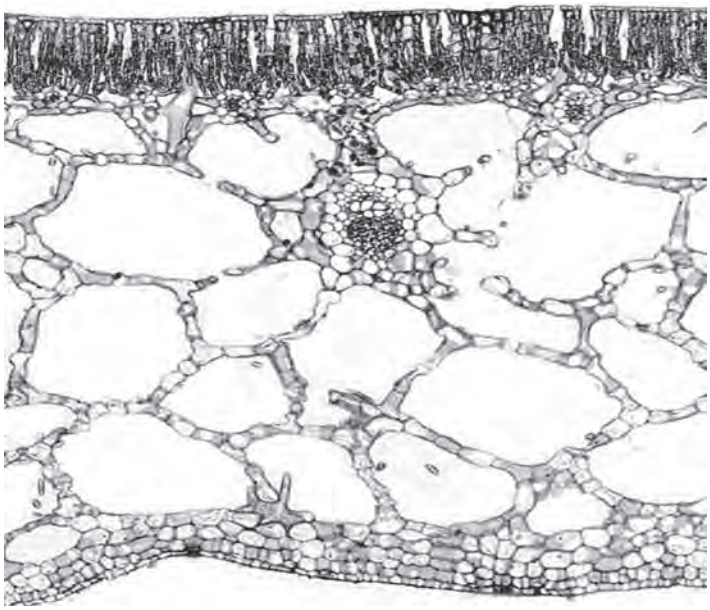
(Total 10 marks)

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5. The photographs below show sections of two leaves from two species of plant. *Ligustrum* is a mesophyte plant.



TS *Ligustrum* leaf (Privet)



TS *Nymphaea* leaf (Waterlily)

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(a) What type of plant is *Nymphaea*? [1]

.....

(b) Using the information in the photographs, describe **two** visible differences between the two species. [2]

.....

.....

.....

(c) State **three** adaptations of *Nymphaea* for living in an aquatic environment and state why each is important. [3]

.....

.....

.....

.....

.....

.....

(d) Give **one** feature of *Ammophila* (Marram Grass) which shows how it is adapted to its environment. [1]

.....

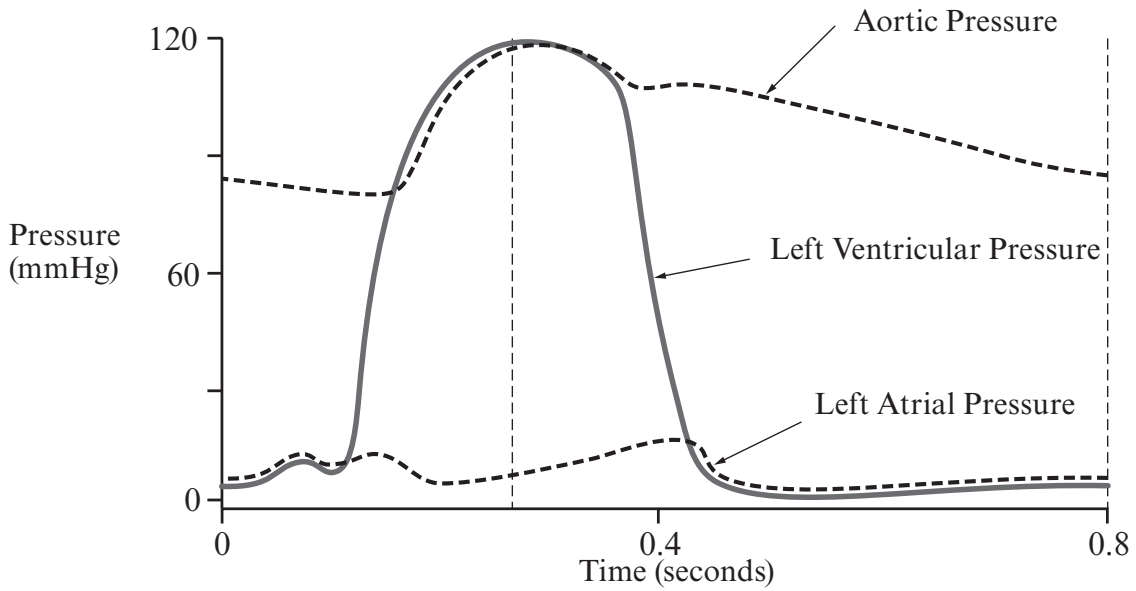
(Total 7 marks)

Turn over.

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6. The cardiac cycle diagram below depicts changes in aortic pressure, left ventricular pressure, left atrial pressure during a single cycle of cardiac contraction and relaxation.



(a) On the diagram above:

(i) Indicate with a letter **A** where the aortic semi lunar valve opens and with a **B** where it closes. [2]

(ii) Indicate with a letter **C** where the left atrioventricular (bicuspid) valve opens and with a **D** where it closes. [2]

(b) Why does the ventricular pressure fall to zero, whilst the aortic pressure does not fall below 80 mmHg? [2]

.....

.....

(c) Using the information in the diagram above, calculate the rate of heartbeat for one minute. Show your working. [2]

Answer .....

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The table below shows the pressure in different areas of the heart.

Region of heart	***Maximum** Pressure (mmHg)*
Right Atrium	4
Right Ventricle	25
Pulmonary Artery	25
Left Atrium	10
Left Ventricle	120
Aorta	120

(d) Using the information in the table above, explain the difference in pressures between the **left atrium**, **left ventricle** and **right ventricle**. [3]

.....

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.....

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.....

.....

(Total 11 marks)

Turn over.

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7. An experiment was carried out to determine the effect of bile salts on the digestion of lipids. After equilibration at 37°C each tube contained:

1 cm^3 enzyme
5 cm^3 full cream milk
2 cm^3 sodium carbonate
6 drops of phenolphthalein pH indicator.

Bile salts were added to tube B and boiled enzyme used in tube C.

In alkaline solutions above pH10 phenolphthalein indicator is pink.
In solutions below pH 8.3 it is colourless.

The colour changes of the solutions are shown in the table below.

	*Tube **A*** *No bile salts*	*Tube **B*** *Plus bile salts*	*Tube **C*** *Boiled enzyme*
Initial colour of indicator in experiment	Pink	Pink	Pink
Colour of indicator after 5 minutes	Pink	Colourless	Pink
Colour of indicator after 10 minutes	Pink	Colourless	Pink
Colour of indicator after 15 minutes	Colourless	Colourless	Pink

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(a) Name the enzyme used in this experiment. [1]

.....

(b) (i) Explain the change in colour of indicator from pink to colourless. [2]

.....

.....

(ii) Using your knowledge of lipid digestion in the gut, explain the results seen in the tubes **A** and **B**. [3]

.....

.....

.....

.....

.....

(c) Explain fully the results of tube **C**. [3]

.....

.....

.....

.....

.....

(d) Suggest why the experiment was carried out using full cream milk. [1]

.....

(Total 10 marks)

Turn over.

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8. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Discuss the adaptations shown by different terrestrial animals for gas exchange. [10]

Or, *(b)* Using a suitably drawn and labelled graph, explain what is meant by the oxygen dissociation curve for normal adult mammalian haemoglobin and, using additional lines on the graph, explain how this differs according to the environment in which the organism lives. [10]

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(Total 10 marks)

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No.			Answer	Mark
1.	**(a)**	(i)	Incomplete metamorphosis	1
		(ii)	1 egg } 1 mark for both (not: zygote) 7 adult/imago } 2-6 nymphs (allow: instar)	2
	(b)	(i)	Complete metamorphosis	1
		(ii)	A Egg B Larva (allow: maggot) C Pupa (allow: chrysalis / cocoon) D Adult/Imago (1 mark per pair) Any 2 per mark	2
				Total 6 marks
2.	**(a)**		Chordata (allow: vertebrata)	1
			Mammalia/mammals	1
			Acinonyx	1
	(b)		Phylum: vertebral column/backbone well developed brain/CNS enclosed in a cranium internal skeleton (any 1)	1
			Class: endothermic (not: warm blooded) Lungs Hair / fur Double circulation Internal gestation / mammary glands /feed young on milk (allow: give birth to live young / placenta)	
			Sweat glands (any 1)	1
	(c)		(Genetic/population) bottleneck (not: low gene pool)	1
	(d)	(i)	Electrophoresis Genetic/DNA fingerprinting / DNA hybridisation / DNA profiling (not: DNA analysis) / protein sequencing (any 1)	1
		(ii)	That the DNA / sequence of bases/ genes/proteins shared between individuals is very high / closely match (allow: ref. banding patterns very similar)	1
				Total 8 marks

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No.		Answer	Mark
3.	(a)	Eggs/faeces eaten by pigs/livestock	
		Tapeworm eggs in muscle	
		Undercooked meat eaten containing cysts/eggs / parasite/infected meat	2
		(any 2)	
	(b)	Suckers and hooks on (scolex/head)	
		Thick cuticle (not: coat)	
		Large numbers of embryos/eggs produced	
		(not: reproduce in huge numbers; allow: ref. offspring)	
		Resistant stages / secretion of chemicals to block the hosts digestive enzymes / immune system	
		No digestive system	
		Hermaphrodite/eq	
		Large surface area to volume ratio	3
		(any 3)	
	(c)	Ensure meat is well/thoroughly cooked/meat inspection (not: check the meat)	1
		Do not spread untreated sewage on land (not: sewage treatment unqual)	1
	(d)	Prevents scolex/hooks/suckers from holding on(to intestine) (allow: ref. worm)	1
			Total 8 marks

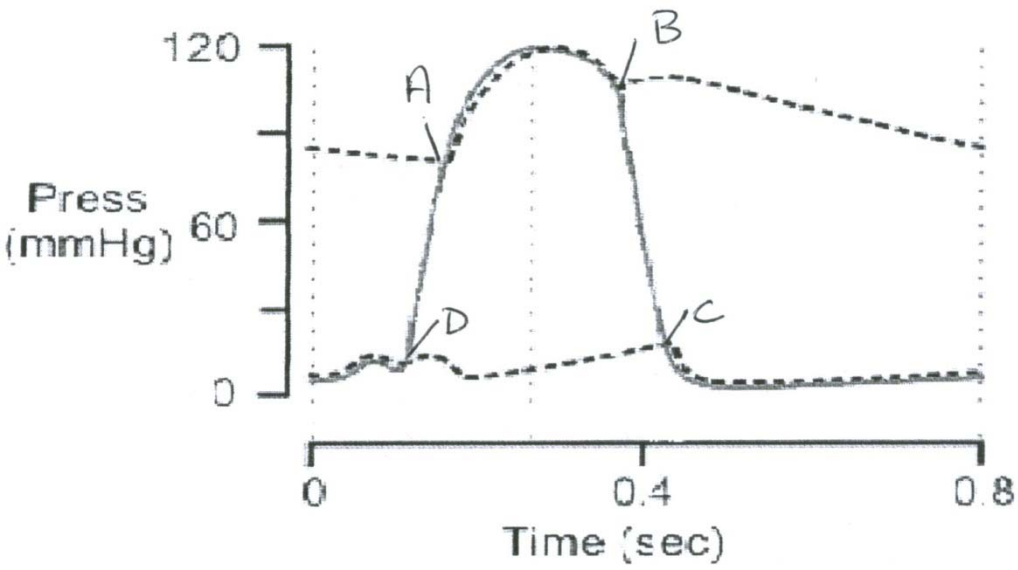
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No.		Answer	Mark
4.	**(a)**	A Guard cells	1
		B Epidermis/al cells (not: epithelium)	1
	(b)	Allow gas exchange/CO_2 / O_2 to enter and leave the leaf	1
		Control water (vapour) loss (allow: prevents water loss qual. e.g. by closing at night not: allows transpiration)	1
	(c)	Active transport/ pumping of K^+ ions into the guard cells and starch-malate	1
		conversion **lowers Ψ**	1
		Water flows in by <u>osmosis</u> or down a water potential gradient	1
		Guard cell becomes <u>turgid</u>	1
		<u>Inner</u> wall of guard cell is inelastic/thicker so guard cells curve /bends away from each other	
	(d)	Cyanide stops respiration/is respiratory inhibitor/stops ATP synthesis	1
		Stopping <u>active transport</u> (of K^+) into (guard) cell	1
			Total 10 marks

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No.		Answer	Mark
5.	(a)	Hydrophyte	1
	(b)	Large <u>air spaces</u> in *Nymphaea,* smaller in *Ligustrum* (not: ref. thicker spongy mesophyll / thickness of epidermis / more air spaces) Stomata on upper surface of leaf in *Nymphaea,* not in *Ligustrum* (any 2) Comparison needed. Accept converse of points	2
	(c)	Large air spaces for buoyancy/diffusion/floating Stomata on upper surface so allowing gas exchange with the air Thin cuticle as little water (vapour) loss (not: no cuticle) Little support tissue as buoyed by water Little xylem as surrounded by water Air spaces in stems allowing diffusion of gases (any 3)	3
	(d)	Rolled leaves (not: curled) Hairs Thick cuticle Sunken stomata (allow: in pits not grooves) Deep rooted Extra support tissue in leaf (any 1)	1
			Total 7 marks

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6. **(a)** 2

(i) One mark for each correctly labelled point. 2

(ii) One mark for each correctly labelled point.

(b) The (aortic) semi lunar valve closes
so preventing backflow of blood into the ventricle

(left) ventricle relaxing / diastole

2 from 3 2

(c) One heartbeat takes 0.8 seconds

Therefore $\frac{60}{0.8}$ seconds

= 75 (beats per minute) 2

2 marks for correct answer, if incorrect could give 1 for correct figures and equation.

(d) Correct ref. to wall/muscle thickness affecting pressure
Atrium pushes blood into the ventricle which is very close.

The ventricle has to push blood around the entire body.

The right ventricle has to push blood to the lungs which need a lower blood pressure/closer.

3 from 4. Points require qualification not just description
(not: ref. gravity) 3

Total 11 marks

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No.			Answer	Mark
7.	(a)		Lipase	1
	(b)	(i)	Hydrolysis of lipids/fats (not: digestion) Releasing fatty acids Causing a more acid pH/reducing pH (linked with previous point) (any 2)	2
		(ii)	Presence of bile salts (in tube B) causes the emulsifying of lipids Increasing surface area For action of lipase (not: ref enzymes) Fatty acids are released more quickly/eq so pH becomes acidic more quickly/in less time (any 3)	3
	(c)		Lipase/enzyme is denatured/tertiary structure altered Active site has changed shape Lipid/substrate will not fit into active site No hydrolysis of lipid/no fatty acids released (any 3)	3
	(d)		More fatty acids/products Quicker change in colour/faster reaction (any 1) (not: high fat content)	1
				Total 10 marks

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8. **(a)** General re any examples

A Large S.A. qualified e.g.
B Moist surface for diffusion e.g.
C Short diffusion pathway qualified e.g. thin walls etc.
D Circulatory system with blood pigments/haemoglobin
E Internal lungs minimise loss of water / heat (not: in reference to frogs)
F Ventilation mechanism / or description e.g. ref insect abdominal movements
G Ensures fresh oxygen is brought to /carbon dioxide removed from gas exchange surface/maintain concentration gradients.

<u>Frogs</u>

H Inactive (frog) amphibian uses its moist skin for gas exchange
I Active (frog) amphibian uses lungs
J tadpole stage uses gills

<u>Reptiles and birds</u>

K More efficient lungs than amphibians
L Air sacs act as bellows

<u>Insects</u>

M Have a branched chitin lined system / presence of tracheae
N With openings called spiracles;
O Gases exchange directly with tissues/No blood pigment/ haemoglobin present

10 of the 15 marks available

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(b) Diagram

A. With correct axes PPO_2
oxygen partial pressure (KPa) allow: oxygen tension
% Saturation of haemoglobin with oxygen
B. Correct numbers

C. Correct shaped curve for adult haemoglobin, labelled

D. Correct position of curve for fetal haemoglobin, labelled

E. Correct position of curve for Llama/lugworm, labelled or curve to left labelled animal at light altitude
(note: Lines not to go over 100%)

Text

F. Sigmoid / S shaped being more efficient

G. More/easier O_2 loading in lungs/fully saturated at (relatively) low partial pressure
H. Significance of this for living at altitude / low PPO_2

I. More O_2 delivered to tissues
J. Reduced affinity for O_2 at lower partial pressures

K. Bohr Effect reduces haemoglobin affinity for O_2 / more O_2 is delivered to respiring tissues

L. Correct biological explanation for this – acidity reduces affinity Hb for O_2

M. Ref. myoglobin or position on graph

N. Correct explanation for foetal haemoglobin curve position, i.e. ref. affinity

O. Correct explanation for Llama/lugworm curve position i.e. ref. affinity higher
(Note: G+H in context of loading and marks transferable to different organisms;
I+J in context of unloading)

10 of the 15 marks available

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Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

1072/01

BIOLOGY – BY2

P.M. TUESDAY, 18 January 2011

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**6**	
2	**9**	
3	**5**	
4	**11**	
5	**11**	
6	**11**	
7	**7**	
8	**10**	
Total	**70**	

1072
010001

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

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1. *(a)* Name the route that water takes when it passes through plant tissues via the cell walls. [1]

.....

(b) As the size of an organism increases which ratio decreases? [1]

.....

(c) An organism that manufactures its own food from inorganic chemicals is called an [1]

.....

(d) What is the role of the intercostal muscles in the thorax of a mammal? [1]

.....

(e) Give **two** advantages to a mammal of having internal lungs. [2]

.....

.....

(Total 6 marks)

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2. The table below lists various features of the human alimentary canal. Tick (✓) the boxes to show the region(s) where each feature occurs.

Feature	*Mouth*	*Stomach*	*Duodenum*	*Ileum*	*Large Intestine*
Villi present					
Site of mechanical breakdown of food					
Connects with bile duct					
Microorganisms secrete vitamins					
Carbohydrate digestion takes place					
pH 2-3					
Brunner's glands secrete alkaline fluid					
Main region of water absorption					
Protein digestion begins					

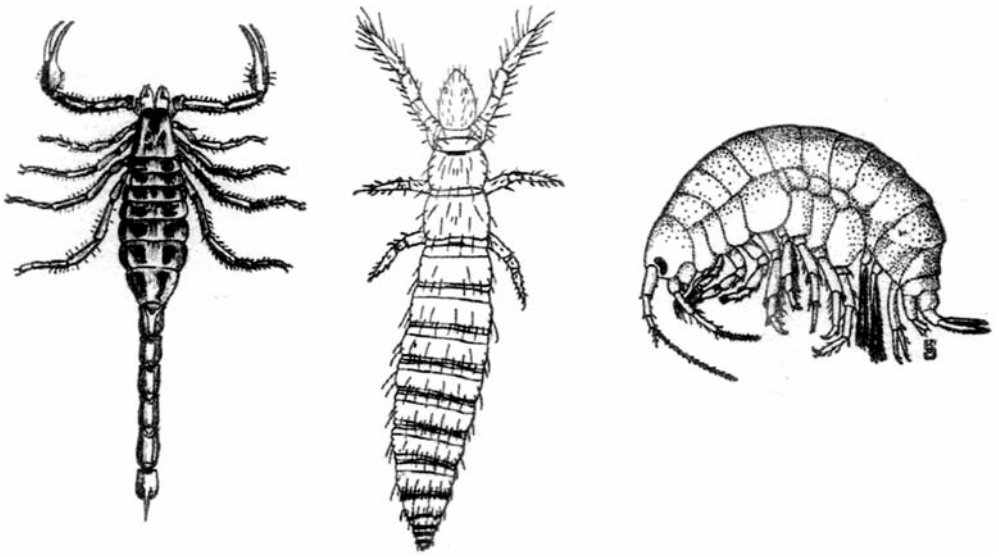
(Total 9 marks)

1072 010003

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3. The animals in the diagram below belong to the phylum Arthropoda.



(a) Apart from having an exoskeleton, name **two** other features **that you can see in the diagram** that members of the Arthopoda have in common. [2]

.....

.....

(b) Give **one** advantage and **one** disadvantage of an exoskeleton. [2]

Advantage .....

.....

Disadvantage .....

.....

(c) Each of the animals above belongs to one of the four main sub-groups of the Arthropoda. Name the taxonomic level of these sub-groups. [1]

.....

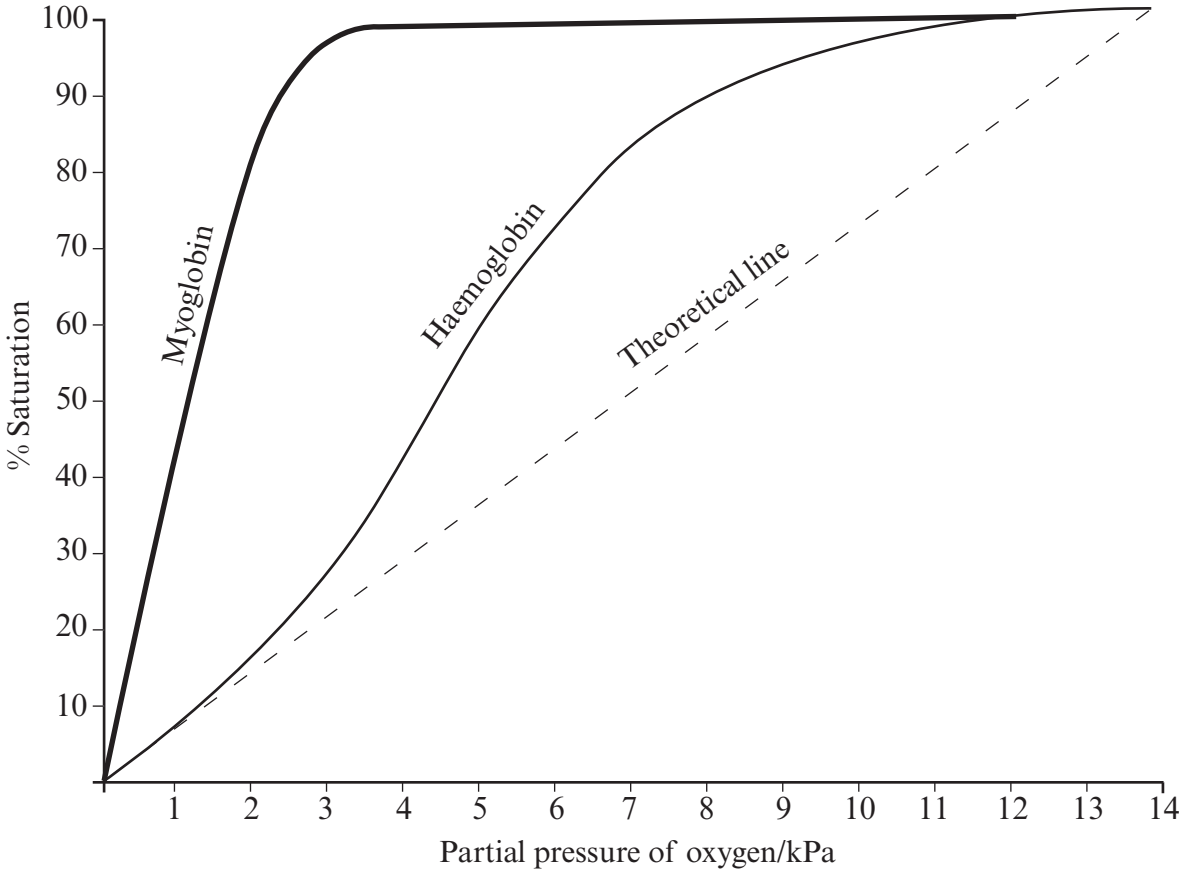
(Total 5 marks)

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4. The oxygen requirement of active muscle tissue is normally provided by oxyhaemoglobin. The diagram below shows the uptake of oxygen by haemoglobin at different partial pressures of oxygen. The dotted line represents a theoretical situation in which the rate of uptake was proportional to the concentration of oxygen.



(a) List the **two** ways in which the shape of the haemoglobin dissociation line differs from the theoretical line. [2]

1. .....

2. .....

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(b) The partial pressure of oxygen in the lungs is usually about 13kPa and in muscle tissue usually below 5kPa.
Explain the biological significance of the differences between the haemoglobin dissociation line and the theoretical line:

(i) at a partial pressure of 13kPa; [1]

.....

.....

(ii) at a partial pressure of 4kPa; [1]

.....

.....

(iii) when the partial pressure changes from 8kPa to 5kPa. [1]

.....

.....

.....

1072 010007

(c) Describe how oxygen is released from the haemoglobin molecule. [3]

.....

.....

.....

.....

.....

(d) The other dissociation curve on the diagram is for a myoglobin molecule. Suggest how myoglobin can perform a useful function in muscle tissue. [3]

.....

.....

.....

.....

.....

(Total 11 marks)

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5. *(a)* Define the term *parasite*. [2]

.....

.....

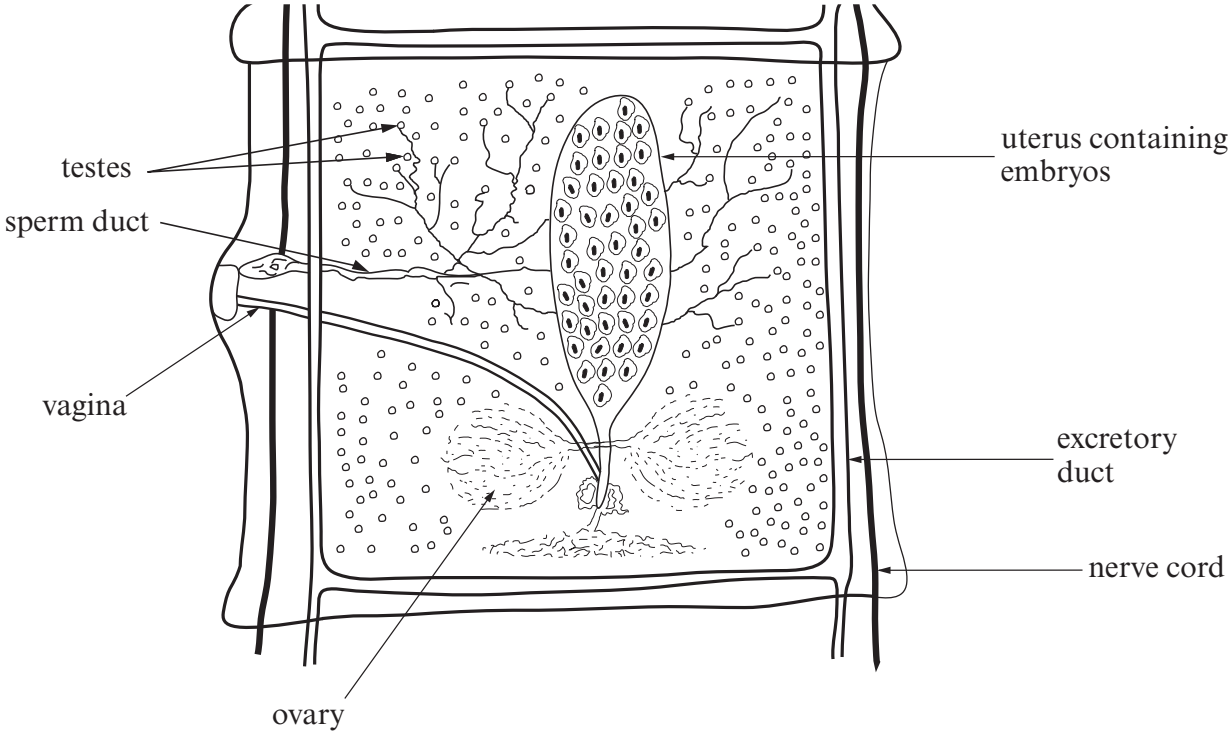
(b) Name **two** characteristics of tapeworms which are adaptations to their parasitic life. [2]

.....

.....

.....

The diagram below shows one segment of a tapeworm found in the human gut. All segments in the body are identical.



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(c) (i) One organ system found in almost all animals is absent from the tapeworm. By reference to the diagram, name this system. [1]

.....

(ii) How does the animal survive without this system? [2]

.....

.....

.....

(d) (i) Name **two** features of the worm's reproductive system, shown in the diagram, which are adaptations to its parasitic existence. [2]

1. .....

2. .....

(ii) Explain the importance of each of these features in the worm. [2]

1. .....

.....

2. .....

.....

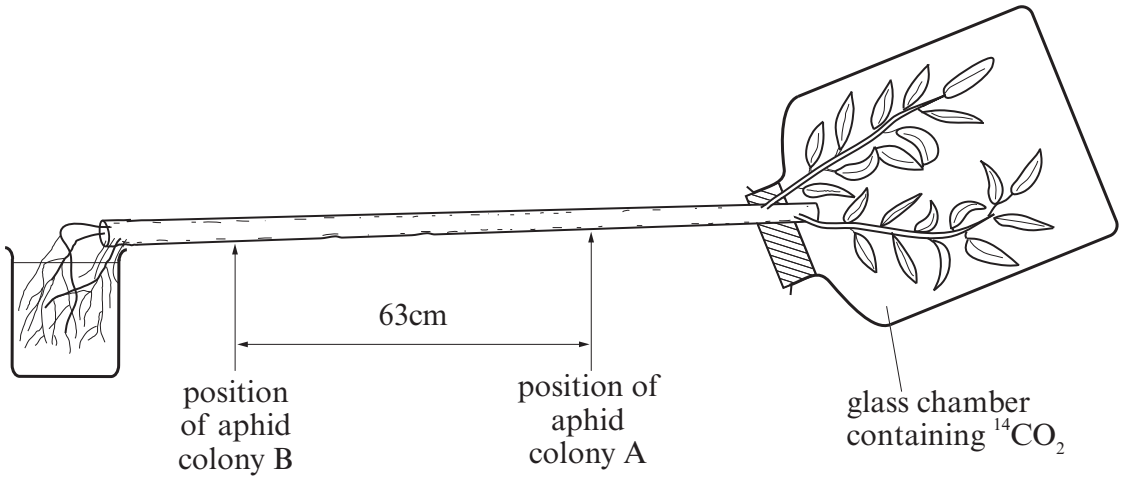
(Total 11 marks)

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6. The diagram shows an experiment in which the leaves of a plant were exposed to radioactive carbon dioxide. Two colonies of aphids (greenfly) were allowed to feed on the stem of the plant and their excreta was collected at regular intervals. This excreta was scanned for radioactivity.



(a) Radioactivity was first recorded in colony A, 2½ hours after the start of the experiment. In colony B no radioactivity appeared until five hours after the start of the experiment. Calculate the rate of movement of the radioactive carbon along the stem. [3]

.....

.....

(b) (i) Explain what is meant by the terms *source* and *sink*. [2]

.....

.....

.....

(ii) Name a source and a sink shown in the diagram. [2]

.....

.....

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(c) (i) Name the radioactive molecule which was transported from source to sink. [1]

.....

(ii) What is the name given to this form of transport in a plant? [1]

.....

(d) Name the tissue and the type of cell where you would expect the greatest amount of radioactivity to be detected. [2]

.....

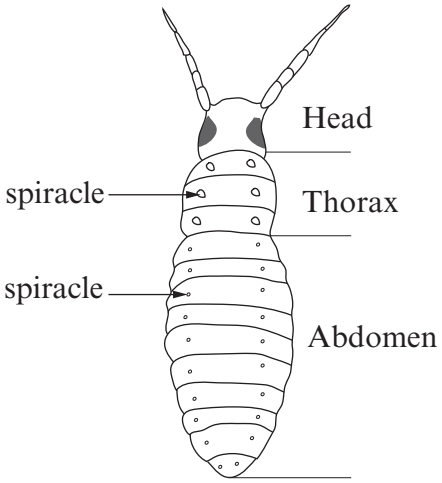
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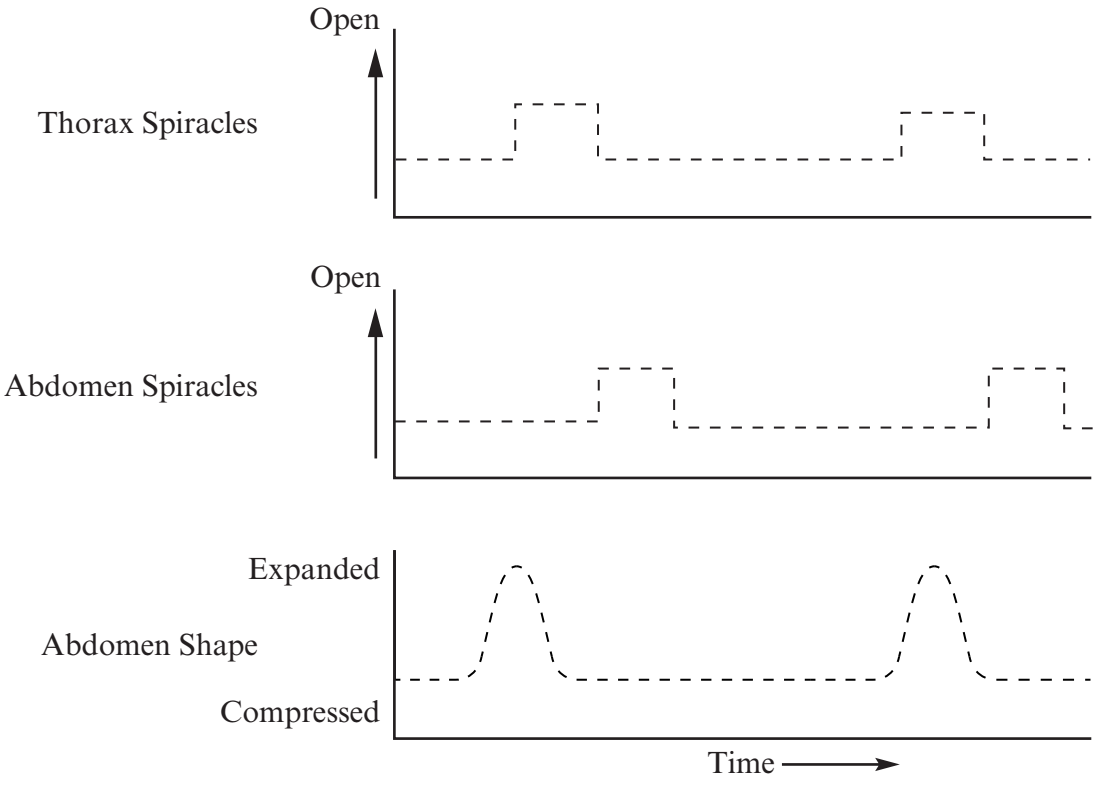
(Total 11 marks)

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7. The diagram represents the pattern of spiracles of an insect (legs and wings removed). The spiracles are openings into the continuous internal tracheal network which carries respiratory gases to and from the tissues. Each spiracle has a valve which can be closed or opened to control the flow of air into the body.
The graphs below the diagram show the opening and closing of the spiracles in the insect at rest and also how regular muscular movements stretch and contract the abdomen.





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(a) Compare the relationship between the movements of the thoracic spiracles and those in the abdomen. [2]

.....

.....

(b) (i) Describe, using the graph, how the change in shape of the abdomen is related to spiracle movements. [2]

.....

.....

.....

(ii) Suggest how this ventilates the tracheal system. [2]

.....

.....

.....

(c) The graph shows that there are long periods when the spiracles are closed. Explain why this is important for the insect's survival. [1]

.....

.....

(Total 7 marks)

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Examiner only

8. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Describe the **structure** of the circulatory system in a mammal. [10]

Or *(b)* Describe the **structure** of the leaf of a flowering plant, explaining how this structure is adapted to the functions of the leaf. [10]

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(Total 10 marks)

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Q.1

(a) apoplast **[1]**

(b) surface area:volume **[1]**

(c) autotroph **[1]**

(d) move ribs/enlarge thorax **[1]**

(e) reduces heat loss;
reduces water loss;
protection (by ribs)
(any 2) **[2]**

Q.2

	Mouth	**Stomach**	**Duodenum**	**Ileum**	**Large Intestine**
Villi present			*	*	
Site of mechanical breakdown of food	*	*			
Connects with bile duct			*		
Microorganisms secrete vitamins					*
Carbohydrate digestion takes place	*		*	*	
pH 2-3		*			
Brunner's glands secretes alkaline fluid			*		
Main region of water absorption					*
Protein digestion begins		*			

1 mark for **each** correct line **[Total 9 marks]**

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Q.3 (a) Segmented body **[1]**
Jointed limbs **[1]**

(b) Water proof – terrestrial adaptation **[1]**
Limits growth / necessitates moulting **[1]**

(c) Class **[1]**

[Total 5 marks]

Q.4 (a) Haemoglobin line is S-shaped;
Actual line rises much more steeply between 2kPa and 7kPa/is steeper in the middle;
Theoretical line shows no flattening at top;
Haemoglobin shows higher saturation throughout.
(Any two) **[2]**

(b) (i) Only haemoglobin is fully saturated at pp in lung **[1]**

(ii) Haemoglobin carries much more oxygen for the muscle than the theoretical situation. **[1]**

(iii) Compared with theoretical, haemoglobin gives up its oxygen much more readily as oxygen pp falls. **[1]**

(c) Accumulation of carbon dioxide / carbonic acid. **[1]**
causes fall in pH / increased acidity. **[1]**
which releases oxygen from oxyhaemoglobin. **[1]**

(d) Myoglobin is saturated/has high affinity for oxygen at very low pp **[1]**
acts as an oxygen store **[1]**
used when muscle is exercising heavily/working hard **[1]**

[Total 11 marks]

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Q.5 (a) An organism that lives on, in or off a host **[1]**
The host is harmed. **[1]**

(b) Possession of hooks / suckers/ thick cuticle (any 2) **[2]**

(c) (i) Digestive system (allow: circulatory/respiratory system) **[1]**

(ii) Absorption of host nutrients **[1]**
over the parasite's body surface **[1]**

(d) (i) 1. Large number of embryos **[1]**
2. Male and female organs present (hermaphrodite) **[1]**

(ii) 1. High offspring mortality/difficult to reach new host. **[1]**
2. Fertilises its own eggs/mating impossible. **[1]**

[Total 11 marks]

Q.6 (a) Time to travel 63 cm = 5-2 $\frac{1}{2}$ = 2 $\frac{1}{2}$ hours or 150 minutes **[1]**
Rate = 63 × 2/5 or 63/150 **[1]**
= 25.2 cm/hr or 0.42 cm/min **[1]**
(Correct answer showing no working =3, units missing or incorrect= -1)

(b) (i) Source – region where photosynthate/sugar/carbohydrate is produced and exported. **[1]**
Sink – region where photosynthate is used/stored. **[1]**

(ii) Source – leaves **[1]**
Sink – roots (accept aphid colony) **[1]**

(c) (i) Sucrose **[1]**

(ii) Translocation **[1]**

(d) Phloem and sieve tubes (allow: mesophyll and palisade cells) **[2]**

[Total 11 marks]

Q.7 (a) Thoracic spiracles open first / just before abdominal spiracles
Abdominal spiracles open as thoracic spiracles close.
Abdominal spiracles close just after the thoracic spiracles.
Abdominal spiracles open for the same length of time as thoracic spiracles
(Any 2) **[2]**

(b) (i) Thoracic spiracles open when the abdomen expands **[1]**
Abdomen is compressed before abdominal spiracles open **[1]**

(ii) Acting as a pump to draw air in via the thoracic spiracles, **[1]**
through the system and forces it out via the abdominal spiracles. **[1]**

(c) Excessive water loss prevented / rapid dehydration if spiracles left open. **[1]**

[Total 7 marks]

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Q.8 (a) A. Double circulation / left and right sides of heart completely separated. **[1]**

B. RHS atrium connected to ventricle through tricuspid valve. **[1]**

C. LHS atrium connected through bicuspid or mitral valve. **[1]**

D. Vena cava brings deoxygenated blood from body to right atrium. **[1]**

E. Pulmonary artery carries blood from right ventricle to lungs. **[1]**

F. Pulmonary vein brings blood from lungs to left atrium. **[1]**

G. Aorta carries blood from left ventricle to general body circulation. **[1]**

H. Backflow is prevented by semi lunar valves **[1]**

I. Heart is a pump driven by muscle which is thickest in left ventricle. **[1]**

J. The coronary artery, supplies the heart muscle. **[1]**

K. Aorta then branches into arteries and smaller arterioles supplying all body tissues. **[1]**

L. Arteries - small lumen; thick layer of elastic tissue/muscle; endothelial lining. **[1]**

M. Veins - wide lumen; little elastic tissue/thin muscle layer; endothelial lining; **[1]**

N Veins have (pocket) valves along their length. **[1]**

O. Capillaries – endothelium only/ one cell thick; connection between arteries and veins. **[1]**

[Ten marks can be awarded from the fifteen available]

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(b)

A. Leaf is flat and thin / large surface to volume ratio. **[1]**

B. Large surface area for light trapping. **[1]**

C. Thin to give short diffusion distance into leaf. **[1]**

D. Transparent epidermal layer. **[1]**

E. Covered by cuticle. **[1]**

F. Prevents water loss. **[1]**

G. Palisade mesophyll - vertically arranged packed cells or contain abundant chloroplasts. **[1]**

H. Arrangements gives maximum light absorption. **[1]**

I . Spongy mesophyll with large intercellular spaces. **[1]**

J . Allows room for movement of respiratory gases and water vapour. **[1]**

K. Diffusion of gases in and out of leaf through stomata. **[1]**

L. Stomatal pore surrounded by two guard cells. **[1]**

M. Change in water potential / pressure bends guard cells to open stomata. **[1]**

N. This change is related to photosynthetic activity so gas exchange only occurs when it is required. **[1]**

O. Closure at other times prevents water loss. **[1]**

[Ten marks can be awarded from the fifteen available]

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Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

1072/01

BIOLOGY – BY2

A.M. TUESDAY, 8 June 2010

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**9**	
3	**10**	
4	**9**	
5	**10**	
6	**17**	
7	**10**	
Total	**70**	

1072 01 01

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

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1. *(a)* State the term for the following:

(i) a group of organisms which can interbreed to produce fertile offspring. [1]

.....

(ii) the process of moving the respiratory medium over the respiratory surface. [1]

.....

(iii) plants adapted to grow submerged in water. [1]

.....

(b) Distinguish between *apoplast* and *symplast* pathways. [2]

.....

.....

.....

(Total 5 marks)

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2. *(a)* (i) Draw two diagrams to show the shape and relative thickness of the cell walls of guard cells in stomata when open and closed. [2]

Stomatal pore open

Stomatal pore closed

(ii) What organelles are present in guard cells but not in the other epidermal cells of a leaf? [1]

.....

(b) What is the advantage of stomata opening during the daytime and closing at night? [2]

.....

.....

.....

(c) Explain the mechanism by which light causes the opening of stomatal pores. [4]

.....

.....

.....

.....

.....

(Total 9 marks)

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3. *(a)* In mammals, haemoglobin is carried within red blood cells.

(i) Describe **one** unusual feature of these cells. [1]

.....

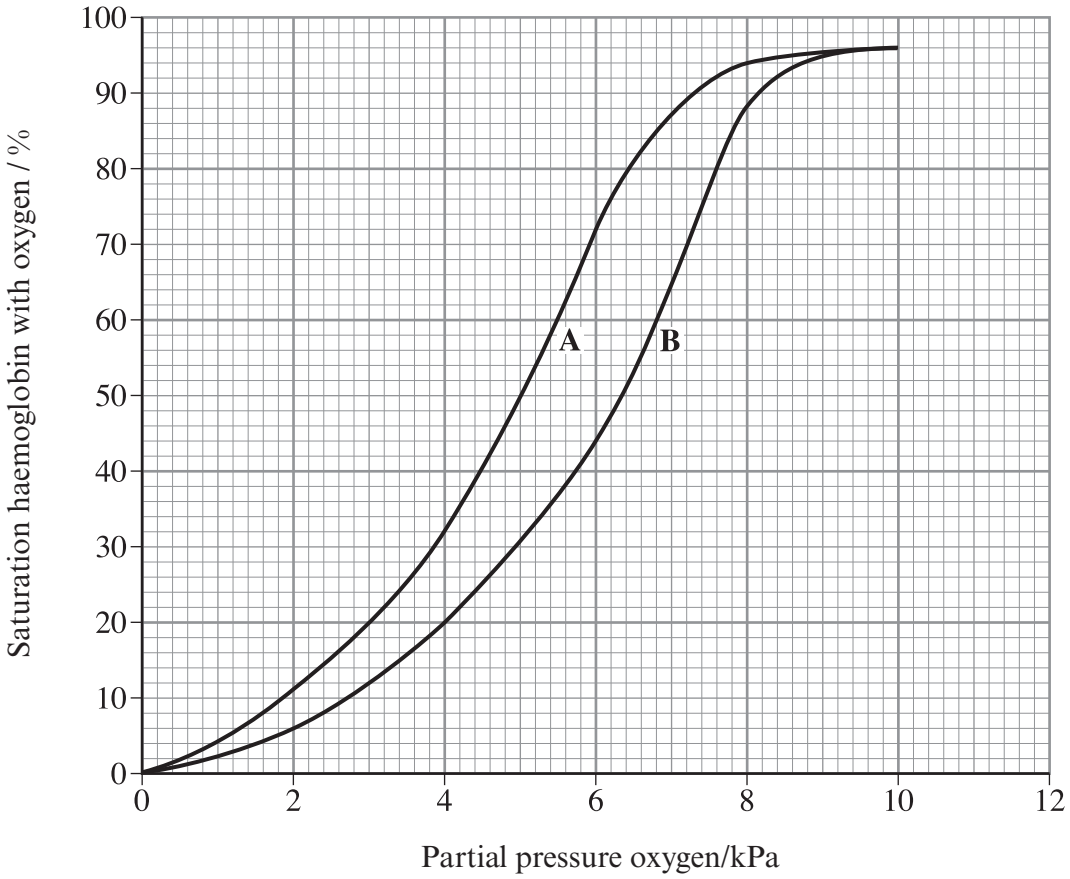
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(ii) What is the advantage of this feature of red blood cells? [1]

.....

.....

The diagrams below show oxygen dissociation curves prepared using human blood.



(b) Use the dissociation curves to determine the percentage saturation of haemoglobin and complete the following table: [1]

	Haemoglobin Saturation (%)	
Oxygen partial pressure (kPa)	Curve A	Curve B
10	96	.....
4	32	.....

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(c) (i) What environmental factor could account for the displacement of the curve from A to B? [1]

.....

(ii) Name this displacement of the curve. [1]

.....

(iii) What is the significance of this effect? [1]

.....

.....

(d) (i) Draw another curve on the diagram to show the relative position of the haemoglobin dissociation curve for the blood of llamas which live in the high Andes of South America. [1]

(ii) Explain the significance of the relative position of the curve you have drawn. [2]

.....

.....

.....

.....

(iii) Suggest **one** change which could be observed in the blood of an athlete who had been training at high altitude? [1]

.....

(Total 10 marks)

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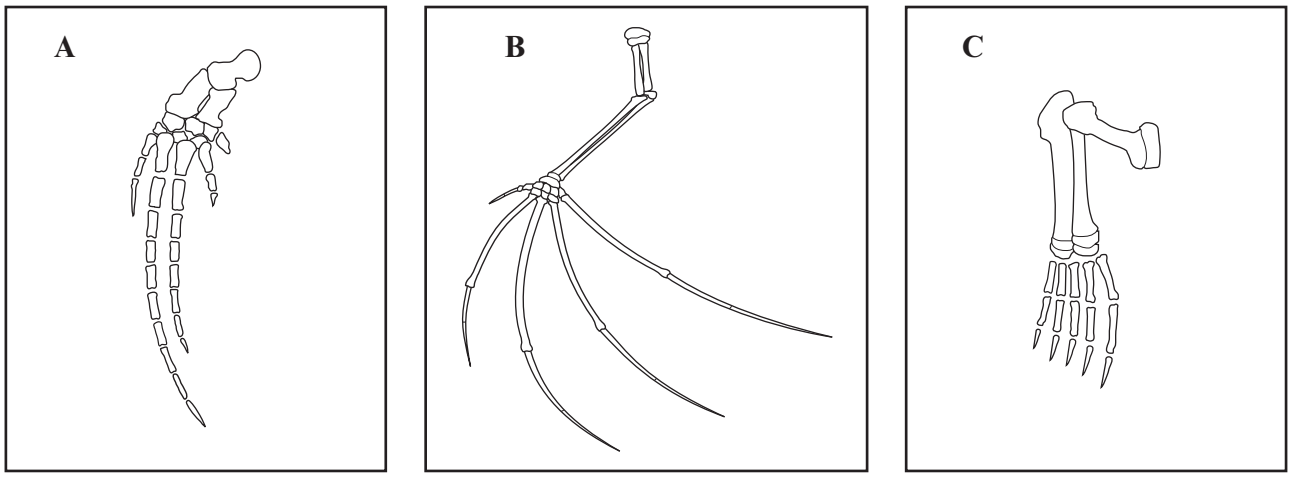
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4. *(a)* To which phylum do mammals belong? [1]

.....

(b) The drawings below show the bones in the limbs of three different mammals.

[not to scale]



Balaenoptera acutorostrata *Macroderma gigas* *Phoca vitulina*

(i) What name is given to limbs with the pattern of bones shown in the drawings? [1]

.....

(ii) Suggest which of limbs **A**, **B** or **C** is best adapted for flight. [1]

.....

(iii) Give the genus of the mammal with limb **C**. [1]

.....

(c) (i) The limbs of these mammals are similar in structure but serve quite different functions. What term is used to describe such structures? [1]

.....

(ii) How are such structures used as evidence for evolution? [1]

.....

.....

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(d) The sequence of amino acids in the haemoglobin molecules of the three species has been used to determine their evolutionary relationships. The results below show the same sections of the haemoglobin molecules of the three mammals, each letter represents one amino acid.

M. gigas	….G E E K A A V T G L W G K V N V E…. D S…. S
P. vitulina	….G E E K S A V T A L W G K V N V D…. D S….. S
B. acutorostrata	….A E E K S A V T A L W A K V N V E….. E A…. T

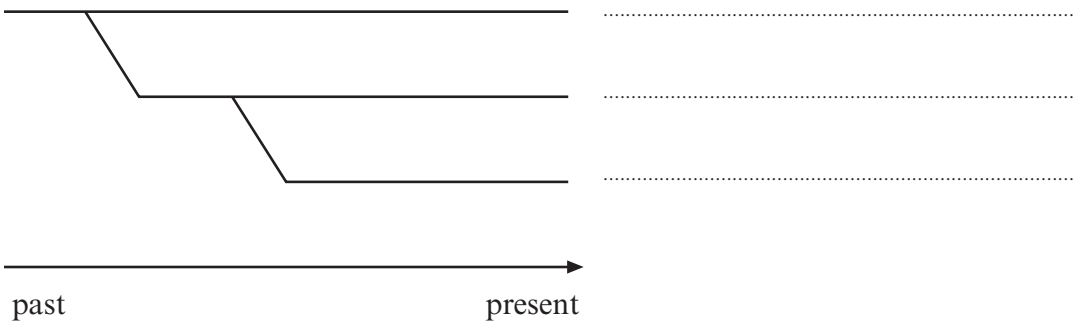
(i) There are 7 differences between *B. acutorostrata* and *M. gigas*.
There are 3 differences between *P. vitulina* and *M. gigas*.
How many differences are there between *P. vitulina* and *B. acutorostrata*? [1]

.....

(ii) Which species is more closely related to *Phoca vitulina*? [1]

.....

(e) Use your answers to part *(d)* to complete the following (phylogenic) evolutionary tree. [1]



(Total 9 marks)

1072 01 07

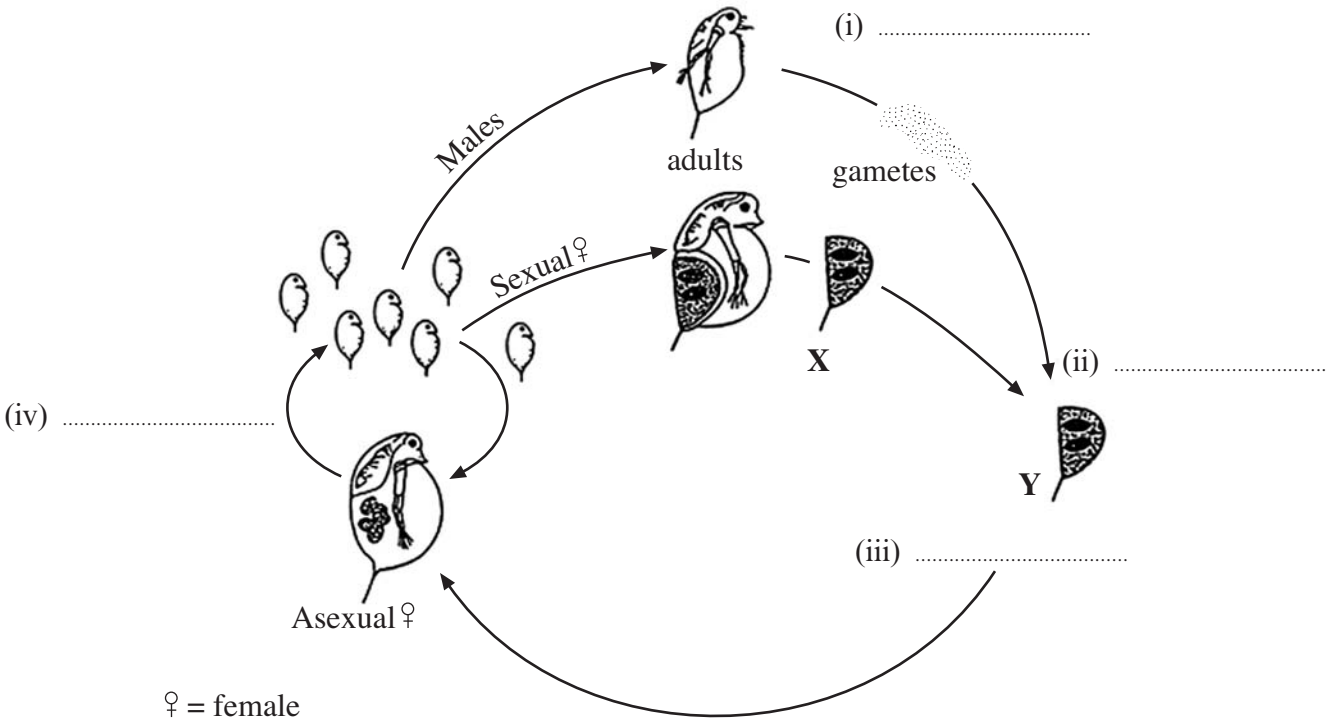
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5. Some organisms combine cycles of asexual reproduction with periods when they reproduce sexually. The sexual phase is induced when environmental conditions become unfavourable. The diagram shows the life cycle of the water flea, *Daphnia pulex*.

(a) Use the following words to complete the labelling of the diagram: [2]

zygote, fertilisation, mitosis, meiosis.



(b) State whether structures **X** and **Y** are haploid or diploid. [1]

X ..... , **Y** .....

(c) (i) Give **one** potential advantage of reproducing asexually. [1]

.....

.....

(ii) Suggest why organisms such as *Daphnia* are stimulated by certain environmental conditions (eg. crowding, food shortage, temperature) to enter a sexual phase of reproduction. [2]

.....

.....

.....

.....

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(d) (i) Explain what is meant by the term *internal* fertilisation. [1]

.....

.....

(ii) Give **three** advantages of internal fertilisation and development to terrestrial animals. [3]

.....

.....

.....

.....

.....

.....

.....

.....

(Total 10 marks)

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6. The drawings show the skulls of two mammals.



P



Q

(a) (i) Identify the mode of nutrition for each animal. [1]

P ..... **Q** .....

(ii) For each animal, describe **one** adaptation of its dentition to its diet. [2]

P .....

.....

.....

Q .....

.....

.....

(b) The table below compares the gut of animal **P** with that of animal **Q**.

Gut Region	*Animal* **P**	*Animal* **Q**
Stomach	Very large, divided into four chambers	Smaller than in **P**, but quite large compared to the volume of the rest of the gut.
Small intestine	Long	Short
Caecum	Short	Apparently absent
Colon	Medium length	Very short

(i) Explain the significance of relative lengths of the gut in the two animals. [1]

.....

.....

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(ii) Describe how the stomach of **P** is adapted to its diet. [4]

.....

.....

.....

.....

.....

.....

.....

.....

(iii) Suggest why **Q** has a large stomach, even though the rest of its gut is reduced in length. [1]

.....

.....

.....

(iv) What evidence is there in the table to suggest that animal **P** is more able to absorb water than animal **Q**? [1]

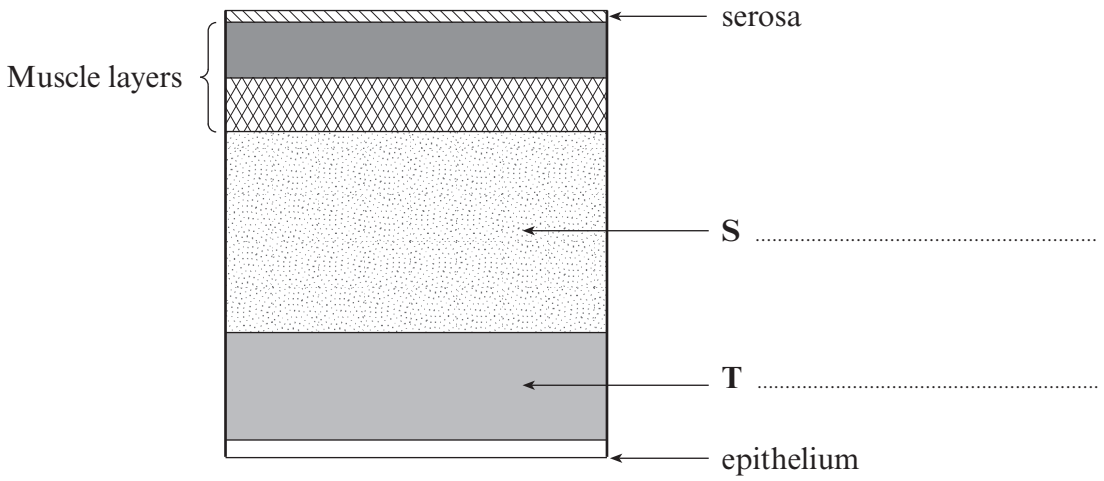
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(c) The diagram below shows the arrangement of layers in a gut wall.



(i) How does the arrangement of fibres differ in the two muscle layers? [1]

.....

.....

(ii) What term is used for the process by which the muscle layers push food along the gut? [1]

.....

(iii) Label layers **S** and **T**. [1]

(iv) Name **two** structures found in layer **S** and give their functions in nutrition. [4]

Structure	*Function*
.....	....
.....	....

(Total 17 marks)

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7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Describe how the structure of the leaves of flowering plants is adapted for gaseous exchange and photosynthesis. [10]

Or *(b)* Plants have two distinct transport systems. Describe how the structure of each is adapted to its function. [10]

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(Total 10 marks)

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Question				Mark Scheme
1	(a)	(i)	Species.	1
		(ii)	Ventilation.	1
		(iii)	Hydrophytes.	1
			(not: aquatic / hygrophytes)	
	(b)		[For 'distinguish' must refer to both terms]. Apoplast is pathway (for water) via cell walls, symplast via living protoplast / cytoplasm / plasmodesmata / cell membrane 1 mark each pathway, no mark if only 1 mentioned (not: ref. gaps between cell walls) allow: between cell walls	2
				5 MARKS
2	(a)	(i)	Drawing showing 2 guard cells curved and pore open AND drawing showing guard cells inner edge straighter and pore closed (1); Wall adjacent to pores thicker (1). Touching top + bottom	2
		(ii)	Chloroplasts. (right + wrong = 0)	1
	(b)		Stomata will be open to allow carbon dioxide in / gas exchange for photosynthesis.	1
			closed at night to avoid water loss. / transpiration reduced	1
	(c)	1.	K^+ / Potassium <u>ions</u> pumped into <u>guard cell</u> (by active transport) (not: diffused)	
		2.	Starch to malate.	
		3.	Solute/ water potential in the (guard cells) lowered. (not: WP)	
		4.	Water moves in by <u>osmosis</u> / down a water potential gradient	
		5.	(Turgor increases) as cells expand they curve/bend (because inner walls are thicker than outer walls)	
			[4/5]	4
				9 MARKS

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Question				Mark Scheme
3	(a) linked marks	(i)	Biconcave (discs)/no nucleus. (allow: no organelles / labelled diag) allow: full description (not: diagram alone)	1
		(ii)	Biconcave (discs) - increase SA:vol/flexibility/no nucleus-room to pack in haemoglobin.	1
	(b)			1

	A	B
		96
		20

(c)	(i)	Increased carbon dioxide/increased acidity/lower pH (not: ref. oxygen/temperature)	1
	(ii)	Bohr shift/effect.	1
	(iii)	Makes more oxygen available (during increased activity)/dissociates more easily/owtte/lowers affinity for oxygen (not: ref speed/taking up O_2)	1
(d)	(i)	Curve drawn to left of A. (start + end at same point as A + B)	1
	(ii)	At low levels of oxygen/low partial pressures;	1
		Hb has greater affinity/will become fully saturated/Hb will be able to absorb more oxygen from environment. (not: lower amount/ref. llamas having affinity)	1
	(iii)	More red blood cells/higher Hb concentration/more Hb (Not: ref. affinity/viscous)	1

10 MARKS

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Question				Mark Scheme
5	(a)	(i)	Meiosis (correct spelling).	
		(ii)	Fertilisation.	
		(iii)	Zygote. (allow: mitosis)	
		(iv)	Mitosis. (correct spelling)	
			[4 correct = 2, 3 correct = 1]	2
	(b)		X - haploid, Y - diploid. Colonise area quickly/reduce parasite transmission	1
	(c)	(i)	Rapid increase in numbers/energy for mating is saved/where environment is stable/ useful features maintained. (not: its quicker/one parent needed/clones)	1
		(ii)	Variation/variety in offspring needed to adapt to new conditions or example/survival advantage; (sexual reproduction) leads to variation.	1 1
	(d)	(i)	Joining together gametes/fusing of sperm and eggs (sperms introduced) inside (female's) body/reference to intromittent organ. (not: zygote formation)	1
		(ii)	Reduced number of gametes produced/more chance of gametes meeting/fertilisation/less chance of gametes being wasted; allows (male) gamete to become independent of water ref. prevent dehydration; embryo/zygote can be better protected; (not: it/offspring/baby) resistant stage in life cycle/ref. shelled egg. (any 3)	3
		(iii)	Embryo can receive nutrition during development.	1
				10 MARKS

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Question				Mark Scheme
6	(a)	(i)	P - herbivore, Q - carnivore. [Both for 1]	1
		(ii)	P <u>incisors</u> in lower jaw only (with horny pad) for cutting plants/interlocking (W-M) <u>molars</u> for <u>grinding</u> (tough fibrous material) /enamel ridges/tooth continues to grow/diastema/bolus formation/ tongue action/AVP (not: large molars)	1
			Q - sharp incisors to grip and tear flesh from bone/large canines for seizing or killing prey/tearing flesh/carnassials for shearing flesh/ slicing/crushing bones	1
	(b)	(i)	Short gut in carnivore reflects ease with which <u>protein</u> is digested compared with <u>cellulose</u>. (or reverse argument). (not: meat/plant material)	1
		(ii)	(cud mixed with) cellulose digesting bacteria/cellulase produced by bacteria; (allows cud to be) regurgitated and (chewed again); allows water to be <u>re</u>-absorbed; correct use of term rumen; i.e. presence of bacteria/first chamber some absorption e.g. of fatty acids/keratinised lining [Any 4]	4
		(iii)	Carnivores catch prey only periodically and can use stomach to store catch until next time they make a kill/diet mainly protein and stomach is where protein is digested/can take in large quantities in one go. (not: ref. chewing)	1
		(iv)	P has a longer colon. (allow: ref. large intestine) (not: small intestine)	1
	(c)	(i)	One layer (has fibres) arranged <u>longitudinally</u>, one has <u>circular</u> fibres.	1
		(ii)	Peristalsis.	1
		(iii)	S - sub-mucosa, T - mucosa. [Both for 1]	1

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4

(iv)

Structure	Function
Blood vessels/capillaries.	Carry/transport dissolved, products of digestion (to liver) or specific example
Lymph vessels/lymphatics.	Transport lipids.
Nerves.	Co-ordinate muscular Control secretion contractions in peristalsis.
Glands/gastric/brunners	Secretion of enzymes or named/alkali/acid secrete mucus/gastic juice/intestinal juice

[Any 2, 1 for each structure and 1 for each corresponding correct function] **17 MARKS**

(not: lacteals/goblet cells/crypts of lieberkuhn/elastic fibres/absorption

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Question				Mark Scheme
7	(a)	A	Leaves (are flat) and have large surface area to <u>absorb</u> maximum light/CO_2/gas exchange	1
		B	Leaves can grow towards/orientate with light/sun to expose maximum area.	1
		C	Leaves thin to allow light to penetrate to lower layers.	1
		D	Cuticle and/or epidermis are transparent to allow light to penetrate to mesophyll.	1
		E	Palisade cells elongated to reduce number of cross walls to absorb light.	1
		F	Palisade cells packed with chloroplasts to increase photosynthetic capacity/light absorption.	1
		G	Chloroplasts can move/circulate inside cells to gain best positions for absorbing light.	1
		H	Spongy mesophyll cells are moist/wet surface or have large surface area for gas exchange/absorption of gases.	1
		I	Xylem to supply water and/or phloem to remove sugar.	1
		J	Leaves thin (i.e. overall thickness) to reduce distance for diffusion.	1
		K	Air spaces in spongy mesophyll allow circulation of gases/ cut down distance for diffusion into cells/gradient for uptake.	1
		L	Stomatal pores permit entry and exit of gases/sub stomatal/intercellular spaces in spongy mesophyll allow supply of carbon dioxide and removal of oxygen/gas exchange between outside and inside leaf.	1
		M	Waxy cuticle on upper surface reduces water loss (by evaporation) or waterproofs the leaf.	1
		N	Stomatal pores in <u>lower</u> epidermis reduce water loss (by evaporation).	1
		O	Guard cells can close stomatal pores/control opening to reduce water loss.	1
		(allow: ecf for ref. 'traps' light or 'stops/prevents' water loss)		**10 MAX**

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Question				Mark Scheme
7	(b)	A	Xylem transports water (and mineral salts) (from the roots to leaves).	1
		B	Phloem transports the soluble products/sucrose/sugars/organic molecules/amino acids/source to sink of photosynthesis from leaves to other parts of the plant. (not: glucose)	1
		C	Xylem is made of vessels and tracheids.	1
		D	Xylem vessels form continuous tubes/ lose end walls (to carry water throughout the plant).	1
		E	Their (secondary) wall is lignified to waterproof and/or strengthen/or support them/stop them (collapsing under suction/tension).	1
		F	Mature Xylem vessels are dead and cytoplasm has gone so there is nothing to impede flow.	1
		G	Tracheids have tapered ends that fit together and/or pits to allow transfer of water between cells.	1
		H	Phloem is made of sieve tubes and companion cells.	1
		I	Sieve tube cells lose most of their organelles/are still alive when mature.	1
		J	Sieve tube cells have perforated sieve/end plates that allow solutes/sugar to pass through.	1
		K	(Sugar solution) flows in both directions.	1
		L	Companion cells have all the organelles/communicate by plasmodesmata/are responsible for keeping sieve tube cells alive/provide ATP	1
		M	Any reference to fibres or parenchyma in either.	1
		N	Cohesion-tension/capillarity/adhesion in xylem. Correct use of terms with ref. water molecules.	1
		O	Correct use of terms in correct context: Reference to mass flow/cytoplasmic streaming/protein filaments in phloem.	1
				10 MAX

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Candidate Name	Centre Number	Candidate Number
		2

GCE AS/A level

1072/01

BIOLOGY/HUMAN BIOLOGY – BY2

P.M. TUESDAY, 19 January 2010

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**6**	
3	**12**	
4	**9**	
5	**11**	
6	**17**	
7	**10**	
Total	**70**	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

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The quality of written communication will affect the awarding of marks.

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1. The table below lists five organisms, together with the five kingdoms. Tick (✓) a box to place each organism in the kingdom to which it belongs. [5]

	Plantae	*Animalia*	*Protoctista*	*Fungi*	*Prokaryotae*
Jellyfish					
Yeast					
Amoeba					
Moss					
Bacterium					

(Total 5 marks)

2. *(a)* Which one of the following features, found in two different animals, indicates a common ancestor? [1]
(Tick (✓) your choice.)

Fins of sharks and dolphins. ☐

Wings of birds and bats. ☐

(b) (i) The Galapagos finches illustrate the evolution of different birds from one ancestral form. What name is given to this evolutionary spread of new forms? [1]

.....

(ii) If a foreign finch was introduced into Britain now, it would be extremely unlikely for it to give rise to a similar variety of descendants to those on the Galapagos. What was different about the situation when the first finches arrived on those islands? [2]

.....

.....

.....

.....

(c) Why are the Galapagos finches now recognised as separate species, rather than simply varieties of the same species? [1]

.....

.....

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(d) State the best technique for working out the relationships between the descendants of the orignal finch. [1]

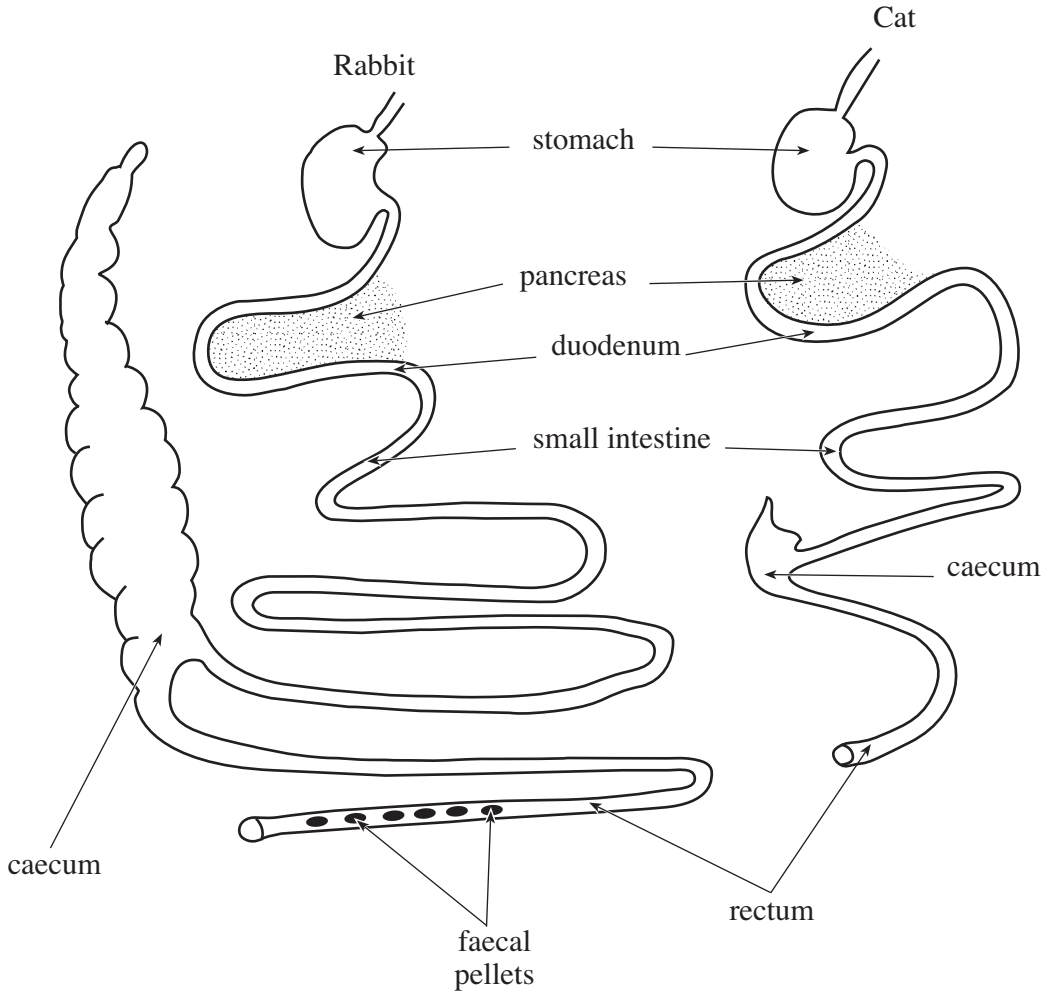
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(Total 6 marks)

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3. The two diagrams below show a comparison of the gut structure in a rabbit and a cat.



(a) (i) State **two** structural differences between the cat and the rabbit gut that you can see in the diagram. [2]

1. .....

.....

2. .....

.....

(ii) In a similar diagram of a human gut these features would be intermediate between those shown. Give a reason for this. [1]

.....

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(b) State **three** differences that can be seen when comparing the dentition of the cat and the rabbit. [3]

.....

.....

.....

.....

.....

(c) The caecum is packed with bacteria. Explain why this is necessary and its importance to the rabbit. [2]

.....

.....

.....

(d) The diagram shows that the faeces of rabbits form distinct pellets in the rectum. These are eaten in a process called refection.

(i) Suggest a reason for refection. [1]

.....

.....

(ii) Cows feed in a similar way to rabbits but do not show refection.
Explain this difference. [3]

.....

.....

.....

.....

.....

(Total 12 marks)

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4. *(a)* Name **three** structural features of fish gills which make them efficient gaseous exchange organs. [3]

1. .....

.....

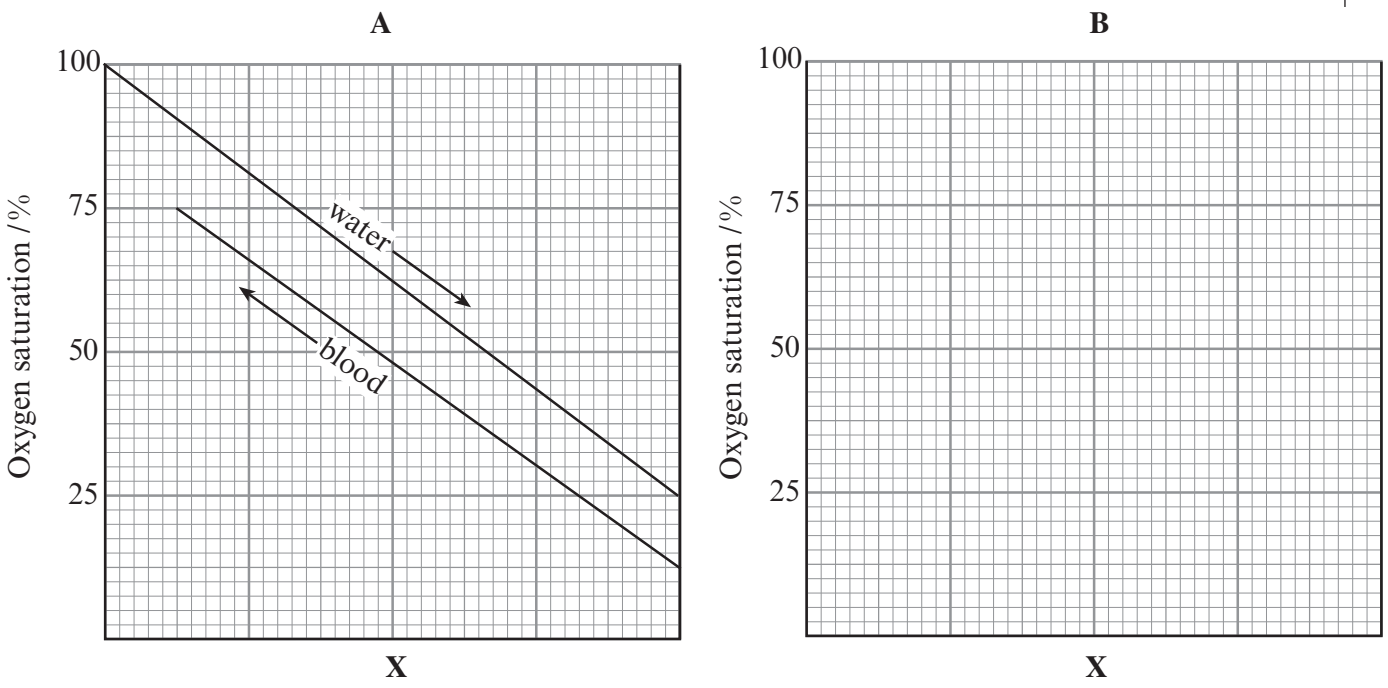
2. .....

.....

3. .....

.....

(b) Diagram **A** below illustrates counter current flow in a cod.



In shark gills there is a parallel flow system supplying oxygen.
On diagram **B** draw a graph to show oxygen uptake in the shark.
(Assume that the flow rates are the same in both cases.) [3]

(c) What is represented by the label **X** on the horizontal axis in the diagrams? [1]

.....

(d) Explain the advantages to the fish with flow **A** compared to a fish with flow **B**. [2]

.....

.....

.....

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5. Most of the carbon dioxide (85%) transported in the human blood stream is carried as bicarbonate ions.

(a) Describe the **two** *other* ways in which the remaining 15% is carried. [2]

.....

.....

(b) Carbon dioxide enters a red blood cell (erythrocyte) and is converted into carbonic acid by an enzyme.

(i) Name this enzyme. [1]

.....

(ii) Since carbon dioxide dissolves in water to form carbonic acid anyway, explain why the enzyme is necessary. [1]

.....

(c) The carbonic acid in the red blood cell is ionised into hydrogen ions and bicarbonate ions.

(i) Describe what then happens to the bicarbonate ions. [1]

.....

(ii) Describe the function of the hydrogen ions produced in the red blood cell and explain its importance in muscle tissue. [2]

.....

.....

(iii) Name **one** *other* ion involved in carbon dioxide transport and describe its function. [2]

.....

.....

(d) The solubility of carbon dioxide in water is a concern for ecologists as a consequence of increasing carbon dioxide levels in the atmosphere. Suggest a reason for this concern with an example of a problem that might arise. [2]

.....

.....

(Total 11 marks)

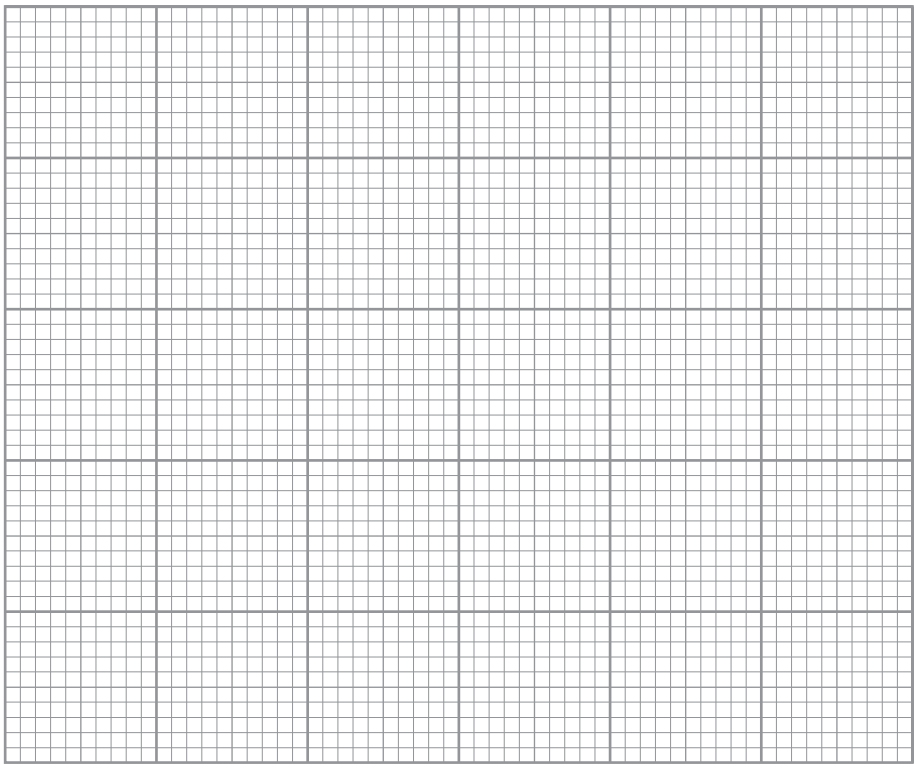
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6. The table shows the transpiration rate of a plant, measured at regular intervals over a 20hr period.

Time (hrs)	04.00	08.00	12.00	16.00	20.00	24.00
Rate (gh^{-1})	0.25	1.50	4.00	7.50	3.25	0.75

(a) Plot these data on the graph paper provided. [4]



(b) Describe and explain the difference in the transpiration rate at 0800hrs compared with 1600hrs. [4]

.....

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(c) Under experimental conditions, give **two** ways in which the peak value could be increased. [2]

1. .....

2. .....

(d) The cohesion-tension theory explains the movement of water up the xylem of a plant.

(i) Explain what is meant by *cohesion*. [1]

.....

(ii) Explain how *tension* is generated. [2]

.....

.....

.....

(iii) What additional force helps to support the water molecules in the xylem against the force of gravity? [1]

.....

(e) The values plotted on the graph never fall to zero. This suggests that throughout the 24 hour period a constant additional small force is influencing the upward movement of water.

(i) Name this force. [1]

.....

(ii) Explain how this force is generated. [2]

.....

.....

.....

(Total 17 marks)

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7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Describe the way in which normal heart beat is initiated and controlled. [10]

Or *(b)* Using fish and mammals as examples, explain how the reproductive strategies of animals have changed as a result of the evolution of life on land. Comment on the advantages of the mammalian strategies. [10]

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(Total 10 marks)

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BY2

1. One mark for each line:-

Animalia: Fungi: Protoctista: Plantae: Prokaryotae. [5]
(no mark if extra ticks present)

[Total 5 marks]

2. (a) Wings of birds and bats. [1]

(b) (i) Adaptive radiation (**Allow** Speciation / Natural Selection) [1]

(ii) No competition from other birds / vacant niches / subsequent intraspecific competition (Any two) [2]

(c) Unable to interbreed and produce fertile offspring [1]
(allow: breed together. Not: unable to breed)

(d) DNA profiling/hybridisation (comparing DNA or equivalent e.g. fingerprinting)
(not: looking at DNA/electrophoresis unqualified) [1]

[Total 6 marks]

3. (a) (i) Larger caecum in rabbit. [1]

Longer intestine in rabbit [1]
(allow: longer rectum in rabbit. Not: ref. pancreas)

(ii) Human is omnivorous / mixture of meat and plant food [1]

(b) Rabbit – premolars and molars with large cusps or for grinding / no carnassials / large incisors / no canines (not: ref. continuous growth)
Cat – carnassials / loss of back molars / shape of incisors / large canines.

(Three comparisons) [3]

(c) Mammals are unable to digest cellulose / do not possess a cellulase. [1]

Bacteria can break down the (very high proportion of) cellulose in the rabbit diet. [1]

(d) (i) Effectively doubles the exposure to cellulose digestion. Gives more time to absorb nutrients. [1]

(ii) Cows have (four) more than one stomach(s). [1]

Food is regurgitated for further grinding/chew the cud. [1]

Additional stomachs for <u>bacterial</u> fermentation. [1]

[Total 12 marks]

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4. (a) Large surface area / thin or short diffusion pathway / permeable / good blood supply
(moist neutral; wrong answer negates right answer; not: ref. contraflow)
(Any three) [3]

(b) On diagram B label water (upper plot) and blood (lower plot) with arrows pointing left to right on both [1]

Water plot starts high on Y axis (90-100%) and blood starts low (20%) [1]

Convergence point is at 50%. [1]

(c) X = distance along lamella / gill plate (not gill). [1]

(d) Blood saturation reaches higher level. [1]

Uptake continues (water concentration higher than blood) throughout/ concentration gradient maintained. [1]

[Total 9 marks]

5 (a) In combination with haemoglobin /as carbamino-haemoglobin. [1]

Dissolved/in solution in the plasma. [1]

(b) (i) Carbonic anhydrase. [1]

(ii) speeds up the reaction. [1]

(c) (i) They pass (out of the corpuscle) into the plasma. (not: blood) [1]

(ii) They dissociate oxyhaemoglobin to release oxygen [1]

To be used in respiration by the muscle. [1]

(iii) Chloride/Cl^- (not: chlorine) [1]

Enters the corpuscle to replace bicarbonate/ in order to preserve electrical neutrality. [1]

(d) Causes acidification in fresh and seawater. [1]

Extinction of fish in lakes / death of coral reefs / failure of shell formation in shellfish / any sensible suggestion based on aquatic fauna or flora. [1]
(not: affects organisms in the water)

[Total 11 marks]

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6. (a) Choice of suitable scale with axes the right way round [1]

Correct units on axes (hrs, gh^{-1}, or g/h) [1]

Accurate plotting of points (+/- half small square). [1]

Quality of line, no extrapolation. [1]

(b) Quantitative comparison e.g. actual values at the two times or value at 1600 is 5 times the value at 0800 [1]
Mention of difference in light intensity at the two times. [1]

Relate this to photosynthesis of K^+ pump. [1]

Causing opening of stomata / movement apart of guard cells. [1]

(c) Increasing the temperature / lowering the humidity / air movement.
(not: heat) *(ignore light – conference)*
(Any two) [2]

(d) (i) Cohesion is the strong attraction that water molecules exert on one another. (not: stickiness) [1]

(ii) Water molecules evaporating through the stomata/transpiration at the top of the column are replaced from below [1]

and because of cohesion this creates an upward force (tension) throughout the whole column. [1]

(iii) Adhesion between the water molecules and the xylem wall. [1]
(allow: ref. cellulose/lignin. Not: friction/capillarity)

(e) (i) Root Pressure. [1]

(ii) Active transport of ions into the root xylem. [1]

Creates an osmotic (wp) gradient / water is drawn in by osmosis at the foot of the xylem. [1]

[Total 17 marks]

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7. (a)

A. Heart muscle is myogenic. [1]
(allow: heart is myogenic, conference only)

B. It can contract without any nerve stimulation. [1]

C. The stimulus to contract originates in the sinoatrial node (SAN). [1]

D. Which controls the rate of beating / acts as pacemaker. [1]

E. It is situated in the wall of the right auricle / atrium. [1]

F. Electrical impulse from the SAN causes the two auricles / atria to contract. [1]

G. Thin layer of connective tissue prevents the stimulus spreading to the ventricles. [1]

H. At the bottom of the wall separating the two auricles / atria is the atrioventricular node AVN. [1]

I. This delays the impulse (about 0.1 sec) before passing it on to the ventricles. [1]

J. The impulse is sent to the tip/apex of the ventricles [1]

K. Along bundle branches (Bundle of His); [1]

L. And is conveyed upwards along the branching Purkinje fibres [1]

M. Causing a wave of ventricular contraction starting from the lowermost part of the ventricle; [1]

N The SAN may be stimulated by various factors to change its pacing [1]

O. One example – hormones (adrenalin), exercise, body temperature, etc. (allow: ref. autonomic nervous system) [1]

[Ten marks can be awarded from the fifteen available]

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7. (b)

A. Gametes are shed in water [1]

B. and fertilisation is external. [1]

C. Heavy waste of gametes which fail to fuse. [1]

D. Embryo is entirely dependent on yolk supply for its development. [1]

E. Many hazards – predation etc, - large waste of embryos. [1]

F. Finding suitable conditions for development is a completely random process. [1]

G. Terrestrial mammals have internal fertilisation. [1]

H. Placing of gametes/female gametes not shed. [1]

I. Greater certainty of fertilisation. [1]

J. Number of eggs has been much reduced. [1]

K. Internally developing embryo not dependent solely on yolk / importance of placenta. [1]

L. High level of protection from external hazards during development. [1]

M. In general more time / energy / resources devoted to fewer offspring. [1]

N. Contact between parent and offspring; parental care [1]

O. e.g. provision of dens/burrows/herding/ protection from predation etc. [1]

[Ten marks can be awarded from the fifteen available]

Candidate Name	Centre Number	Candidate Number
		2

WJEC CBAC

GCE AS/A level

1072/01 **New AS**

BIOLOGY/HUMAN BIOLOGY – BY2

P.M. MONDAY, 1 June 2009

1½ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**10**	
2	**11**	
3	**13**	
4	**17**	
5	**9**	
6	**10**	
Total	**70**	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

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1. *(a)* Complete the following table, which shows the classification of some organisms, including **two** features only of the phylum where applicable. [9]

Kingdom	*Phylum*	*Features of phylum*	*Class*	*Example*
Animalia	Annelida	1. 2.	Polychaeta	Lugworm *Arenicola marina*
Animalia		Soft moist skin; External fertilisation; Aquatic larvae with gills; Adults simple lungs.		Common frog *Rana temporaria*
Animalia		1. 2.		Desert locust *Schistocerca gregaria*
	Basidiomycota	Hyphae; Cell wall of chitin; Reproduce using spores; No flagella;	Basidiomycetes	Field mushroom *Agaricus campestris*

(b) What is the name of the genus of the Desert locust? [1]

.....

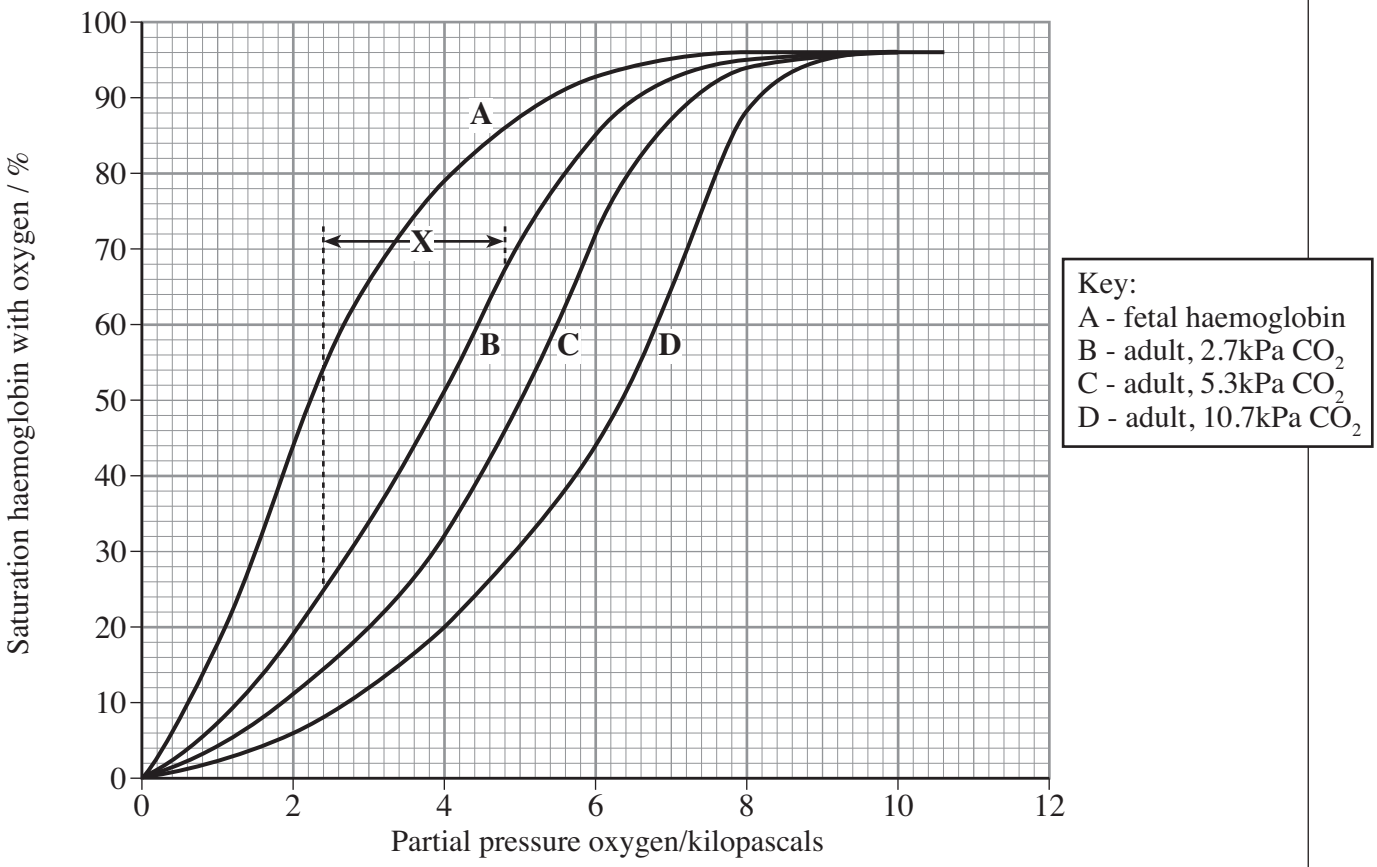
(Total 10 marks)

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2. The oxygen dissociation curves below, show the relationship between the partial pressure of oxygen and the percentage oxygen saturation of two respiratory pigments. Curve A shows the response of fetal haemoglobin and curves B, C and D the response of adult haemoglobin in the blood at three different partial pressures of carbon dioxide.



(a) (i) How many **molecules** of oxygen can one molecule of haemoglobin carry when it is fully saturated ? [1]

.....

(ii) What percentage of the oxygen binding sites in the haemoglobin in curve **B** are empty in the capillaries of the human lung? [1]

.....

(b) The curve is steepest in the region marked **X** on the graph. Explain how the steepness of the curve in region **X** helps the tissues in a mammal function more efficiently. [2]

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(c) (i) Suggest a tissue in the body of a mammal where the partial pressure of carbon dioxide is likely to be as high as in curve **D**. [1]

.....

(ii) What is the advantage of an increasing partial pressure of carbon dioxide in a muscle? [2]

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.....

(d) (i) Explain the importance of the position of the dissociation curve of fetal haemoglobin. [2]

.....

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.....

(ii) Curve **A** is similar to a curve obtained when investigating the oxygen carrying capacity of the respiratory pigment of a lugworm which burrows in mud. Explain how this curve indicates the worm's adaptation to its environment. [2]

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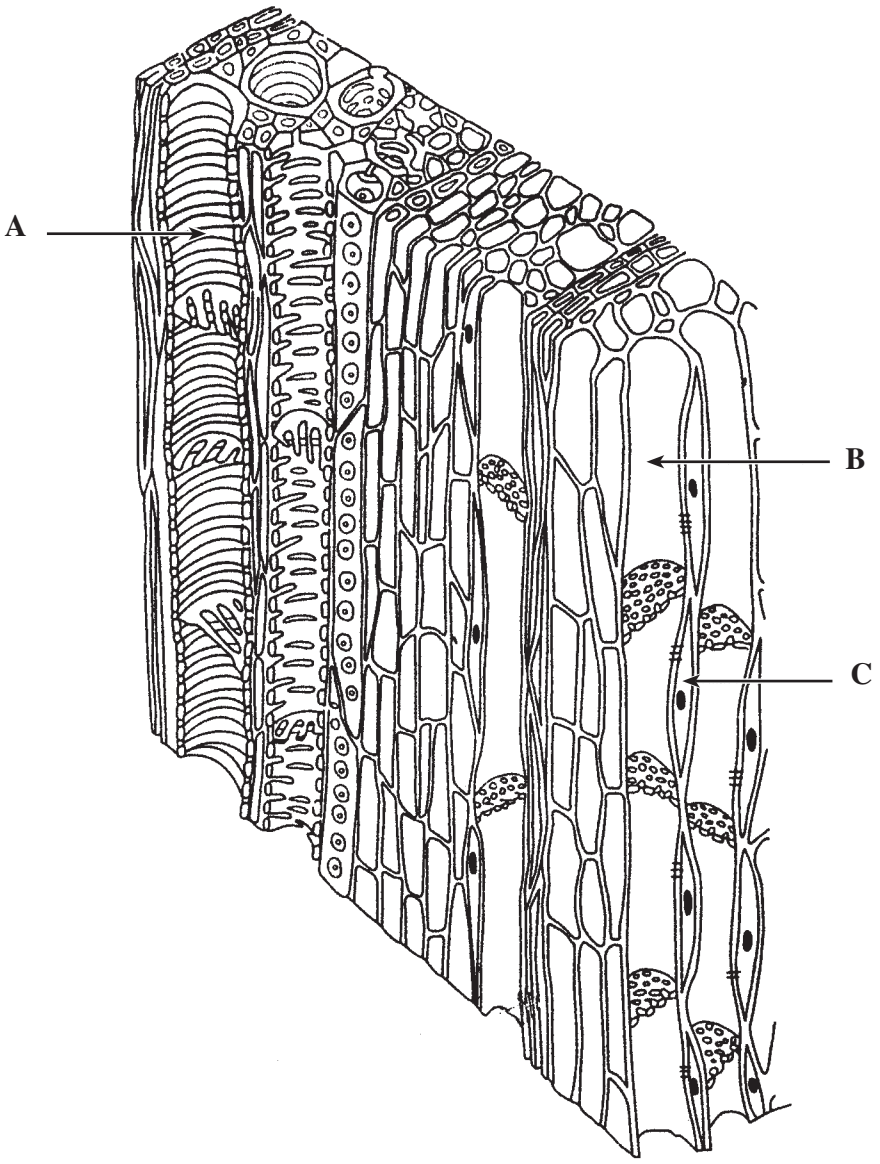
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(Total 11 marks)

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Examiner only

3. The diagram below is a three-dimensional drawing of part of a stem.



(a) Identify the cells **A**, **B** and **C** and give a function for each. [6]

A .....

Function .....

.....

B .....

Function .....

.....

C .....

Function .....

.....

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(b) Cell **A** has a secondary cell wall which contains the substance lignin. Explain the function of this material in the cell wall. [2]

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(c) Complete the following passage, using **one** of the following, in **each** of the spaces provided. [5]

adhesive, cohesive, casparian strip, apoplast, symplast, hydrophilic, hydrophobic, vacuolar pathway, capillarity.

Water is absorbed into the root mainly through the root hairs. Its movement through the apoplast is prevented by the ..... in the endodermis. Movement through the ..... is aided by the plasmodesmata. The water is pulled upwards by the transpiration pull and this is possible by large ..... forces between the water molecules and ..... forces between the water molecules and the ..... lining of the cells.

(Total 13 marks)

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4. *(a)* All living organisms exchange gases with the environment. Respiratory surfaces in all organisms have a very large surface area. Give **three** *other* properties of respiratory surfaces common to **all** organisms. [3]

1 .....

.....

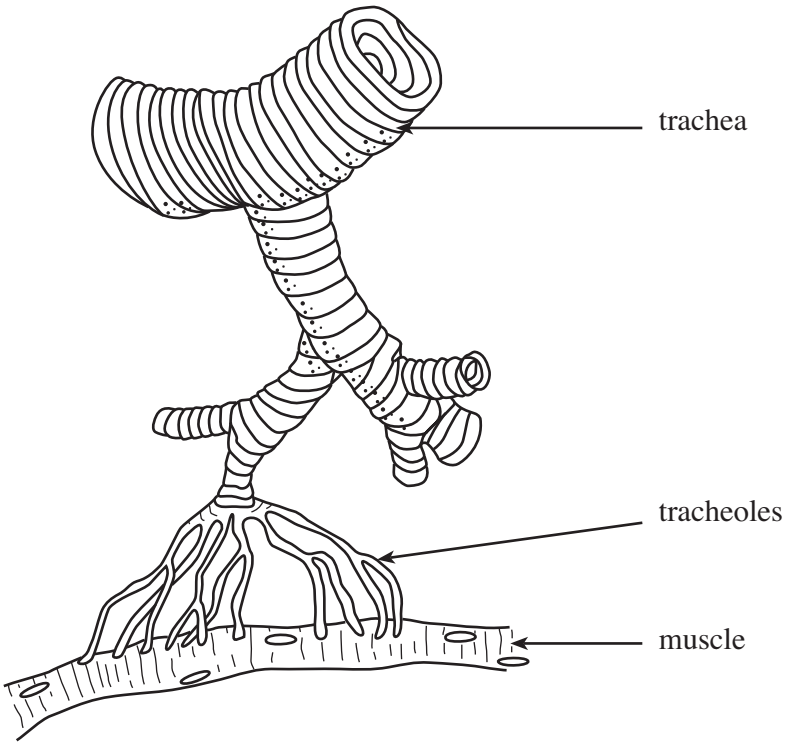
2 .....

.....

3 .....

.....

(b) Insects use a tracheal system for gas exchange, as shown below.



(i) On the diagram use a line **labelled R** to show the respiratory surface. [1]

(ii) State **two** advantages of using a tracheal system for gas exchange. [2]

1 .....

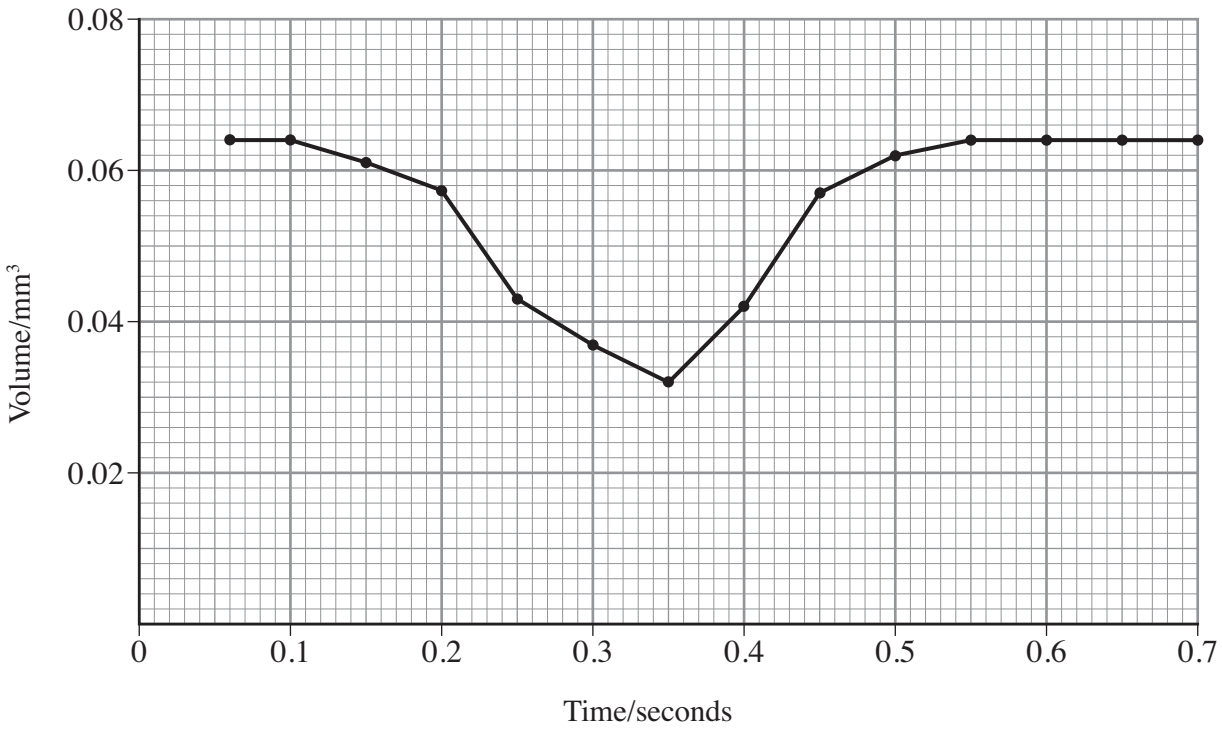
.....

2 .....

.....

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(iii) The graph shows the volume change in the main trachea in the anterior thorax and head of a beetle.



Calculate the percentage (%) volume change. Show your working. [2]

Answer .....

(c) Describe and explain the process of inspiration in a mammal. [4]

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(d) Gas exchange in fish takes place across a special surface, the gill.

(i) State the difficulties aquatic organisms face, compared to terrestrial organisms, in obtaining oxygen from water. [2]

.....

.....

.....

.....

(ii) In cartilaginous fish, such as sharks, a parallel flow system operates in the gills and in bony fish such as Mackerel a counter current flow system is found.
Explain what is meant by the terms *parallel flow* and *counter current flow* and state why the counter current system is more efficient. [3]

Parallel flow

.....

.....

.....

Counter current flow

.....

.....

.....

Reason counter current flow is more efficient

.....

.....

.....

(Total 17 marks)

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5. *(a)* Many organisms can reproduce sexually and asexually. Give **two** advantages and **two** disadvantages of sexual reproduction. [4]

Advantages

1 .....

.....

2 .....

.....

Disadvantages

1 .....

.....

2 .....

.....

(b) Suggest **two** reasons why most terrestrial animals rely on internal fertilisation. [2]

1 .....

.....

2 .....

.....

(c) Suggest **three** reasons why the flowering plants have been so successful in the colonisation of the land. [3]

1 .....

.....

2 .....

.....

3 .....

.....

(Total 9 marks)

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6. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Describe the theory of evolution, as put forward by Charles Darwin, suggesting any evidence which supports his views. [10]

Or *(b)* (i) Compare the dentition of a carnivore and a grazing herbivore.
(ii) Describe how the gut region of a ruminant is adapted to its diet. [10]

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(Total 10 marks)

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Question		Answers/Explanatory Notes	Marks Available
1.	(a)	*Lugworm* segmented body; septa; fluid filled body cavity;	
		hydrostatic skeleton; primitive brain and nervous systems;	
		thin permeable skin; closed circulatory system; (not: coelom)	
		(Max 2)	[2]
		Frog Phylum Chordata / chordate, accept vertebrate;	[1]
		Class Amphibia;	[1]
		Locust Phylum Arthropoda / arthropod;	[1]
		class Insecta / insect;	[1]
		Features of phylum	
		a body divided into segments	
		a body further divided into head, thorax and abdomen/three sections	
		a well developed brain	
		a hard outer exoskeleton (made of chitin)	
		(paired) jointed legs (not: ref. 6)	
		an open circulatory system/haemocoel	
		a cavity which surrounds the body organs	
		(Max 2)	[2]
		Field mushroom Kingdom fungi;	[1]
	(b)	Schistocerca.	[1]
			[10 marks]

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Question		Answers/Explanatory Notes	Marks Available
2.	(a)	(i) 4	[1]
		(ii) 4 (%)	[1]
	(b)	small drop of partial pressure/concentration of oxygen (not: low pp); large amount of oxygen supplied/dissociates more easily; tissues can respire aerobically; aerobic respiration far more efficient than anaerobic / prevents lactic acid production. (Max 2)	[2]
	(c)	(i) (respiring) muscles / liver/heart/placenta (not: lung tissue);	[1]
		(ii) more oxygen released/affinity of haemoglobin for oxygen falls; at same partial pressure/concentration of oxygen; aerobic respiration; (Max 2)	[2]
	(d)	(i) Greater/higher affinity for oxygen; absorbs oxygen from mother; becomes (fully) saturated at low pp oxygen; (Max 2)	[2]
		(ii) Lives in an environment with low partial pressures/oxygen deficient; allows haemoglobin to become (fully) saturated at these low partial pressures/quoted figures; accept reverse argument; /Haemoglobin has high affinity for oxygen	[2]

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Question		Answers/Explanatory Notes	Marks Available
3.	(a)	A Xylem vessel (element / cell);	[1]
		Transport water / mineral ions or salts (allow: support); (not: nutrients)	[1]
		B Sieve tube (element / cell); (not: phloem)	[1]
		Transport of organic materials / sugars/ products of photosynthesis/ amino acids/sucrose (not: glucose)	[1]
		C Companion (cell);	[1]
		Makes proteins / ATP/ release energy (for sieve tube cell); (not: make/produce energy)	[1]
	(b)	Support/strengthen/ prevents vessel collapsing when water sucked along it;	
		waterproofing stops water entering or leaving;	
		adhesion of water/hydrophilic lining (not: impermeable unqual) aids movement of water upwards	
		2 linked marks	[2]
	(c)	Casparian strip; symplast; cohesion; adhesion; hydrophilic;	[5]

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Question			Answers/Explanatory Notes	Marks Available
4.	(a)		Thin/short diffusion pathway; permeable; moist; has a conc. gradient; (Max 3)(not: porous/ref capillary network/ ref flat shape)	[3]
	(b)	(i)	label line touching end of tracheole where they touch muscle (not: just letter);	[1]
		(ii)	Fast (oxygen 200,000 x faster than blood, carbon dioxide 10,000 x); No respiratory pigment/haemoglobin required;reduced water loss; oxygen supplied directly to tissues/no transport system needed: (Max 2) (not: large surface area unqual)	[2]
		(iii)	$\frac{\text{Difference}}{\text{Original}} \times 100$	[1]
			Answer 50(%);	[1]
	(c)		Intercostal muscles contract; ribs upwards and outward; diaphragm contracts/flattens; volume increases; pressure decreases; Below atmospheric pressure (Max 4)	[4]
	(d)	(i)	Water contains <u>less</u> oxygen than air; pp oxygen varies with temperature; diffusion rates much slower; Dense/viscous medium more difficult to pump/move; (Max 2)	[2]
		(ii)	*Parallel flow,* water and blood in gills flow in same direction;	[1]
			Counter current, water and blood flow in opposite directions;	[1]
			Concentration gradient maintained over entire distance travelled by water over gills*;*	[1]

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Question		Answers/Explanatory Notes	Marks Available
5.	(a)	***Advantages***	
		Variation/genetically different;	
		allows development of a resistant stage in life cycle;	
		seeds, spores, larvae allow dispersal	
		(Max 2)	[2]
		Disadvantages	
		Need two individuals/parents; a slow form of reproduction / asexual much faster;	
		some variations not as successful as parent type/mutations more common/inherit genetic disorder;	
		need to get gametes together; ref large numbers	
		(Max 2) (not: ref disease/complex/less successful unqual)	[2]
	(b)	Less gametes wasted/increased chance of fertilisation:	
		gametes become independent of water;	
		fertilised egg can be enclosed in a protective layer; allows fertilised egg to develop inside body of female (where it is nourished and protected);	
		gametes do not dehydrate;	
		(Max 2)	[2]
	(c)	Life cycle rapid; Food store in seed allows rapid growth of embryo; food store enables seed to survive for long periods of time/ref dormancy;	
		protection by testa/resistant outer layer;	
		leaf fall recycling of nutrients; no need for water for fertilisation; ref link with animals or wind for pollination; ref dispersal e.g. fruit; large numbers of seeds produced.	
		(Max 3) (not: ref reproduction asexual and sexual)	[3]

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Question	Answers/Explanatory Notes	Marks Available
6. (a)	*Darwin*	
	A. Darwin recognised that species did change/ put forward a theory as to how they changed;	
	B. mutation qualified;	
	C. Overproduction;	
	D. Numbers remain constant/high mortality rate/struggle for survival;	
	E. Variation e.g. beak size or shape/rats/moths;	
	F. competition (for limited food source);	
	G. Individuals with a beneficial variation survive / survival of fittest or converse;	
	H. pass on beneficial characteristic;	
	I. Repeats generation after generation; (not: over a long time)	
	J. details of beak adaptation, seed, insects, fruit etc;	
	K. Natural selection;	
	L. adaptive radiation qual;	
	M. morphologically similar and to mainland form/common ancestor;	
	N. similarities of proteins/enzymes;	
	O. similarities of DNA/genes;	
	P.+ Q AVP x2 e.g. Fossil evidence, living intermediate forms, pentadactyl limb;	
	(Any 10)	

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Question	Answers/Explanatory Notes	Marks Available

(b) *Adaptions to diet.*

A. Small flat top incisors / horny pad;

B. Canines absent / small indistinguishable front incisors;

C. Teeth continuously growing or reverse argument;

D. Carnivores, canines, large (and backward pointing, killing and holding prey);

E. Herbivore cheek teeth large surface area for grinding/ interlock, W M arrangement;

F. Carnassial qual;

G. Sharp cutting edges on teeth

H. Diastema qual, manipulation of food;

I. First three chambers in 'stomach' modified oesophagus/ 4 chambers; (not: 4 stomachs)

J. large volume/longer gut;

K. Symbiotic / commensal bacterial/mutualism;

L. Ref anaerobic conditions;

M. Ref reverse peristalsis/regurgitate / chewing cud, qual;

N. cellulose digestion/cellulose by bacteria;

O. + P AVP X2 e.g. ref jaw articulation Ref. urea in saliva to provide nitrogen, thick keratinized lining, ref protein digestion only in true stomach, bacteria used as food source.

(Any 10) (not: reverse arguments unless specified)

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