


CLASS	INDEX NUMBER	CANDIDATE NAME
 <b>PEI HWA SECONDARY SCHOOL</b> <b>END OF YEAR EXAMINATIONS 2016</b> <b>Secondary Three Express</b>		
<b>BIOLOGY</b> Paper 1		<b>5158/01</b> 7 October 2016 30 minutes
Additional Materials : Multiple Choice Answer Sheet		

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.  
 Do not use staples, paper clips, highlighters, glue, or correction fluid.  
 Write your name, class, and index number on the Answer Sheet in the spaces provided.  
 Shade your index number on the Answer Sheet in the boxes provided.

There are **twenty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C and D**.  
 Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.  
 Any rough working should be done in this Question Paper.  
 The use of an approved scientific calculator is expected, where appropriate.

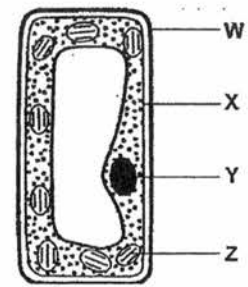
**Hand in the Answer Sheet separately from the Question Paper.**

This question paper consists of **11** printed pages, inclusive of this cover page.

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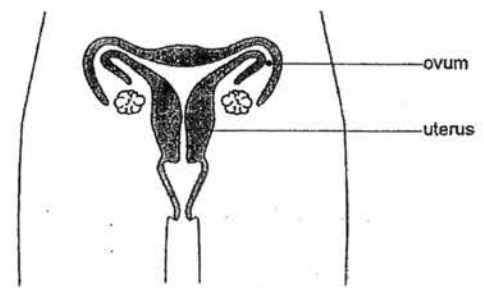
2

1 Which two parts of the plant cell shown are also found in liver cells?



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

2 The diagram shows the female reproductive system.

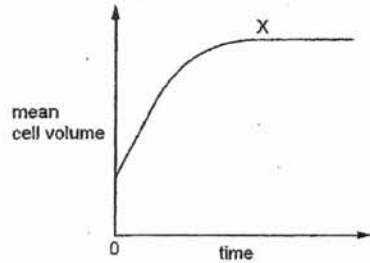


At which level of organisation are the ovum and the uterus?

	ovum	uterus
A	cell	organ
B	cell	tissue
C	organ	tissue
D	tissue	organ

3

- 3 A tissue composed of plasmolysed plant cells was put into distilled water. The graph shows how the mean cell volume changes with time.

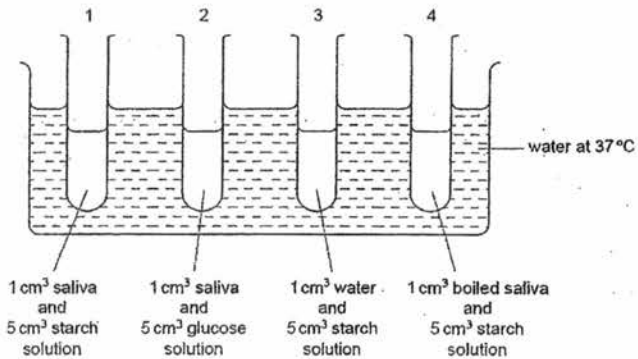


What is the cause of the plateau at X?

- 1 water potential in the plant cell has become more negative
- 2 cells have become fully turgid
- 3 no net movement of water into cells

- A 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

- 4 The diagram shows an experiment to investigate the action of salivary amylase. The contents of the tubes were tested with iodine solution after one hour.

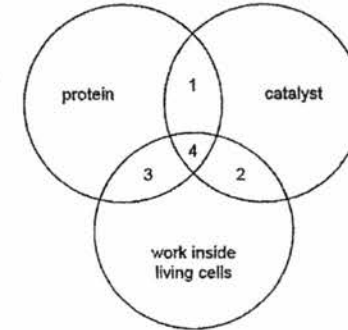


The contents of which tubes will show a brown colour as a result of this test?

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 3 and 4

4

- 5 The diagram shows three properties of substances in living organisms.



Which numbered areas represent most enzymes?

- A 1 and 2
- B 1 and 4
- C 2 and 3
- D 3 and 4

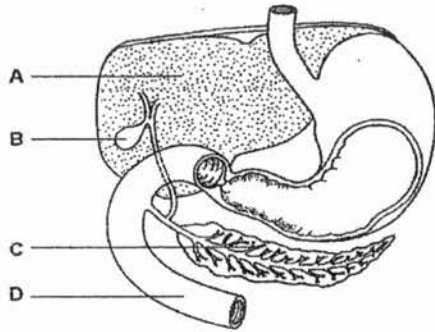
- 6 A student carried out four tests for biological molecules on a solution. The observations are shown in the table.

test for biological molecules	observation
iodine solution added	yellow
biuret reagent added	purple
Benedict's test done	orange
dropped on filter paper and dried	translucent mark (light spot)

Which molecules may be present in this solution?

- A glucose, starch, protein
- B lipid, protein, glucose
- C protein, lipid, sucrose
- D starch, protein, lipid

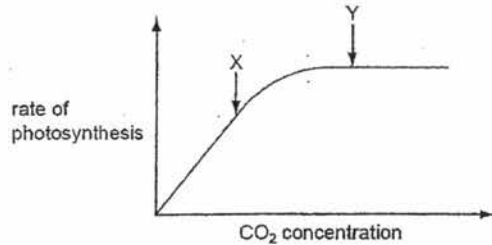
7 The diagram shows a part of the digestive system. In which structure is amylase made?



8 Which process does not require energy?

- A focussing of eye
- B growth of hair
- C secretion of sweat
- D tissue respiration

9 The graph shows the effect of carbon dioxide (CO<sub>2</sub>) concentration on the rate of photosynthesis.



What could be limiting the rate of photosynthesis at points X and Y?

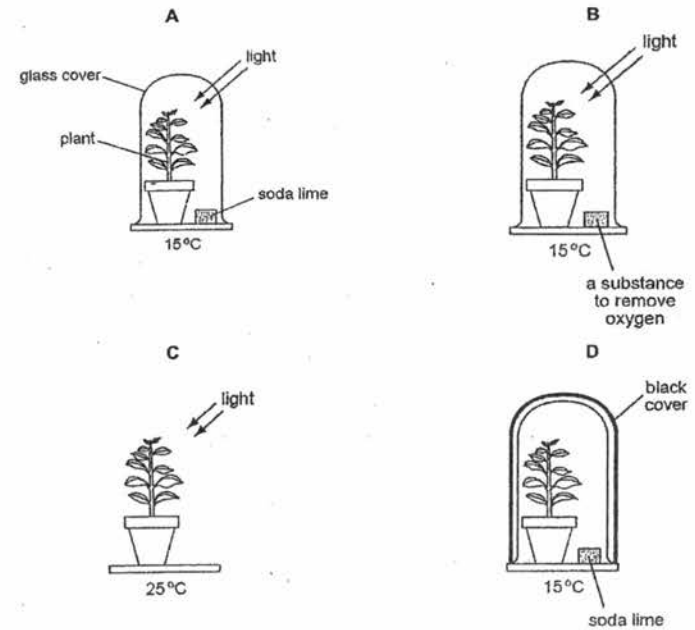
	X	Y
A	carbon dioxide concentration	carbon dioxide concentration
B	carbon dioxide concentration	light intensity
C	light intensity	carbon dioxide concentration
D	light intensity	light intensity

216

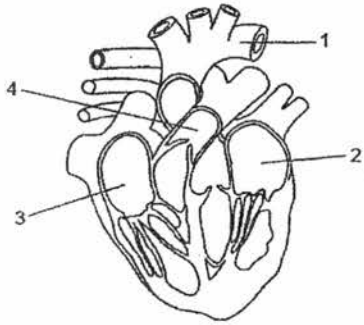
10 The diagram shows a green shoot photosynthesizing under a glass jar. This was used as a control experiment in a laboratory investigation.



Which diagram shows the other experiment that should be done to investigate the need for carbon dioxide in photosynthesis?



- 11 The diagram shows a section through the heart and the associated blood vessels. What is correct for the flow of blood through the heart?

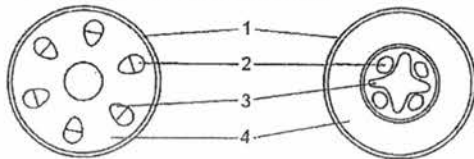


- A 1 → 2 → 3 → 4  
 B 2 → 1 → 3 → 4  
 C 3 → 4 → 1 → 2  
 D 4 → 3 → 2 → 1

- 12 The table shows the composition of blood as it leaves some organs of the body. Which row in the table represents blood leaving the liver?

	carbon dioxide concentration	Oxygen concentration	Urea concentration
A	low	high	high
B	high	low	low
C	high	low	high
D	low	high	low

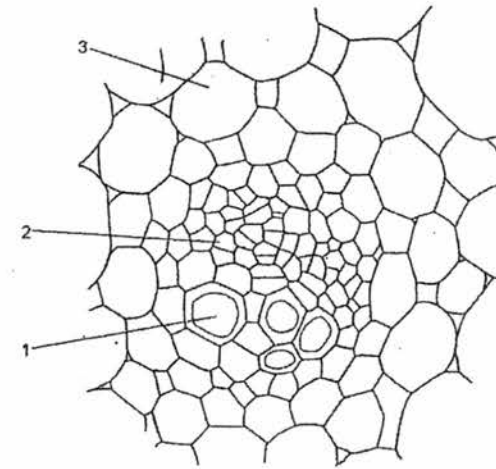
- 13 The diagram shows transverse sections of two plant structures.



Which row shows the correct labels?

	1	2	3	4
A	cuticle	phloem	xylem	pith
B	cuticle	xylem	phloem	cortex
C	epidermis	phloem	xylem	cortex
D	epidermis	xylem	phloem	pith

- 14 The diagram shows a vascular bundle from the stem of a plant.



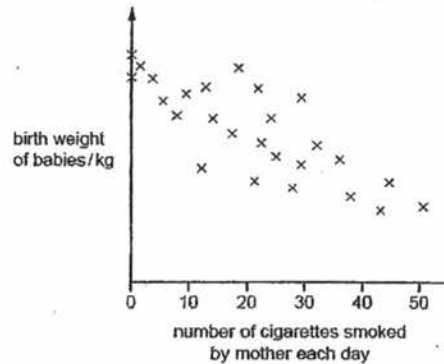
Which row describes the functions of the labelled cells?

	transports sucrose	transports ions	stores starch
A	1	2	3
B	2	1	3
C	2	3	1
D	3	1	2

- 15 What changes cause inspiration (breathing in) to take place?

	diaphragm muscle	volume of thorax	pressure in thorax
A	contracts	decreases	increases
B	contracts	increases	decreases
C	relaxes	decreases	increases
D	relaxes	increases	decreases

- 16 The graph shows the results of a study to determine whether there is a link between the number of cigarettes smoked by a mother and the birth weight of her baby.

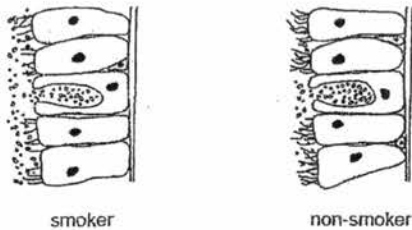


Which conclusions can be drawn from this graph?

- 1 As the number of cigarettes smoked increases, the weight of the baby always decreases.
- 2 Factors, other than smoking, affect the birth weight of a baby.
- 3 Nicotine, tar and carbon monoxide slow the growth of an unborn baby.
- 4 The majority of all smokers smoke between 10 and 35 cigarettes per day.

- A 1, 2 and 3  
 B 2, 3 and 4  
 C 2 only  
 D 3 only

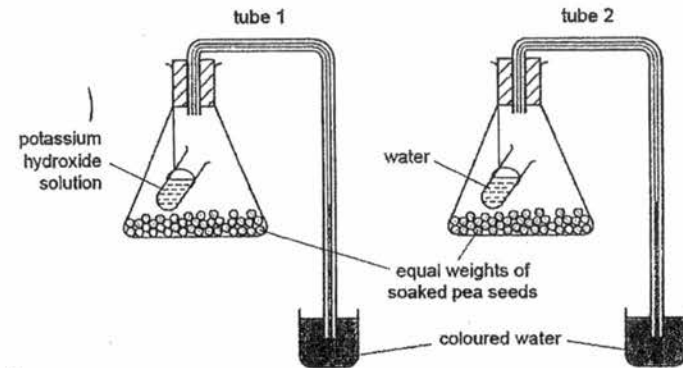
- 17 The diagrams show the epithelium lining a bronchiole of a smoker and of a non-smoker.



Why does mucus drain down into the smoker's lungs?

- A a non-smoker has more active mucus secretion  
 B a smoker has fewer cilia on the epithelial cells  
 C epithelial cells divide more in a non-smoker  
 D the cells burst in the bronchiole of a smoker

- 18 An experiment is set up as shown.



After four hours, the coloured water will

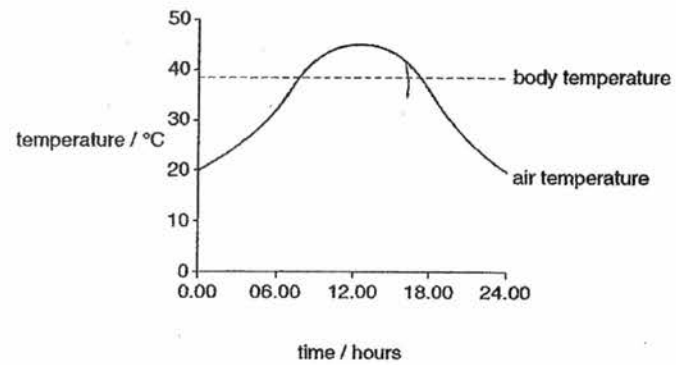
- A have gone down by the same amount in both tubes.  
 B be higher in tube 1 than in tube 2.  
 C be higher in tube 2 than in tube 1.  
 D have gone up by the same amount in both tubes.

- 19 The table below shows substances which may be found in urine. Which shows only the substances that are present in the urine of a healthy person?

	protein	salt	glucose	urea
A	✓	✓	X	X
B	✓	X	✓	✓
C	X	✓	✓	✓
D	X	✓	X	✓

✓ = present  
 X = absent


- 20 The graph shows the air temperature and body temperature during a 24-hour period.



Which mechanism may help to maintain the body temperature between 18.00 hours and 24.00 hours?

- A a decrease in metabolic rate
- B capillaries move away from skin surface
- C evaporation of sweat
- D vasoconstriction of arterioles to skin-surface capillaries

~~~~~ END OF PAPER ~~~~~

|                                                                                                                                                                                             |              |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------|
| CLASS                                                                                                                                                                                       | INDEX NUMBER | CANDIDATE NAME           |
|  <b>PEI HWA SECONDARY SCHOOL</b><br><b>END OF YEAR EXAMINATIONS 2016</b><br><b>Secondary Three Express</b> |              |                          |
| <b>BIOLOGY</b>                                                                                                                                                                              |              | <b>5158/02</b>           |
| Paper 2                                                                                                                                                                                     |              | 11 October 2016          |
| No Additional Materials                                                                                                                                                                     |              | <b>1 hour 45 minutes</b> |

**READ THESE INSTRUCTIONS FIRST**

Write your class, index number and name on all the work you hand in.  
 Write in dark blue or black pen on both sides of the paper.  
 You may use a pencil for any diagrams, graphs or rough working.  
 Do not use staples, paper clips, glue, or correction fluid.

**Section A**

Answer **all** questions in the spaces provided.

**Section B**

Answer all **three** questions in this section.  
 Write your answers in the spaces provided.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.  
 You are advised to spend no longer than 45 minutes on Section A and no longer than 30 minutes on Section B.

At the end of the examination, fasten all your work securely together.

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

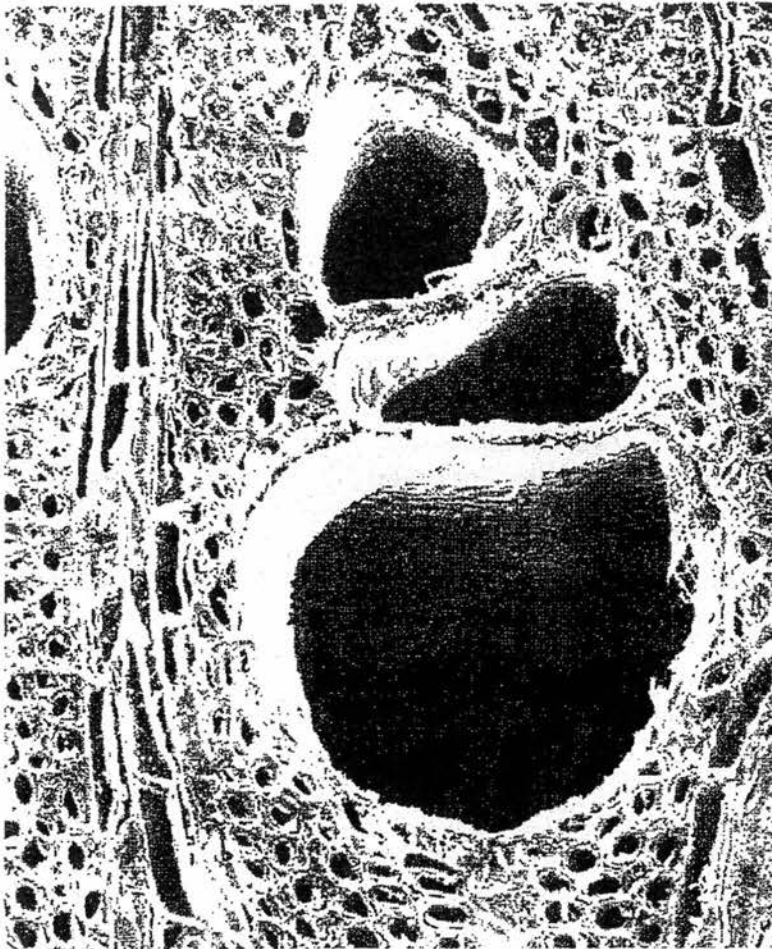
| Section      | Mark |
|--------------|------|
| P1           | 20   |
| P2 Section A | 50   |
| P2 Section B | 30   |
| Total        | 100  |

This document consists of 18 printed pages, inclusive of this cover page.

**Section A (50 marks)**  
Answer all questions.

Write your answers in the spaces provided.

- 1 Fig. 1.1 is a scanning electron micrograph of a type of vascular tissue found in plants.



**Fig. 1.1**

- (a) Name the vascular tissue.

.....

[1]

- (b) With reference to Fig. 1.1, describe two ways that these vascular tissues, are adapted to their functions.

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[2]

Total: [3]



- 2 Fig. 2.1 shows two chips that were cut from the same yam. They were blotted dry and weighed. They both had the same mass of 60 g.

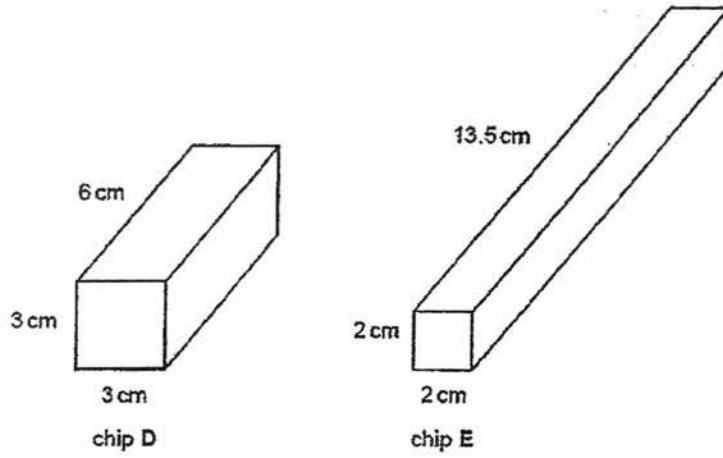


Fig. 2.1

Both chips were placed in distilled water for ten minutes. They were then taken out of the water, blotted dry and re-weighed. The results are shown in Table 2.1.

| chip | original mass / g | mass after ten minutes in distilled water / g |
|------|-------------------|-----------------------------------------------|
| D    | 60                | 70                                            |
| E    | 60                | 72                                            |

- (a) Explain why the mass of both chips increased.

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[3]

- (b) Explain why chip E gained more mass than chip D during the ten minutes.

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[2]

- (c) Fig. 2.2 shows a photograph of some red blood cells immersed in plasma as seen with a microscope.

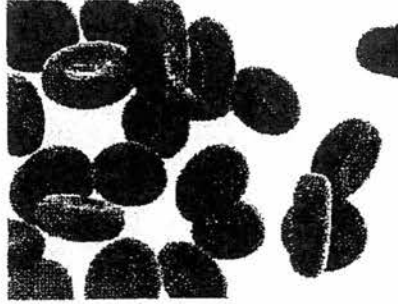


Fig. 2.2

Name the chemical that gives the cells their red colour.

[1]

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- (d) A student extracted some of these cells and placed them on a slide in distilled water. After three minutes the student looked at the slide using a microscope. No cells were visible, but the surrounding liquid was coloured pink.

- (i) Deduce what had occurred to the cells during the three-minute period;

.....  
 .....

[1]

- (ii) Explain how the human body is able to prevent such an occurrence.

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[2]

Total: [9]

- 3 A student carried out an experiment on the fat content of two different samples of cow's milk, H and I. Fig. 3.1 shows a sequence of steps in the experiment. The pH indicator used is colourless when the pH is 7 or less, and purple when it is over 7.

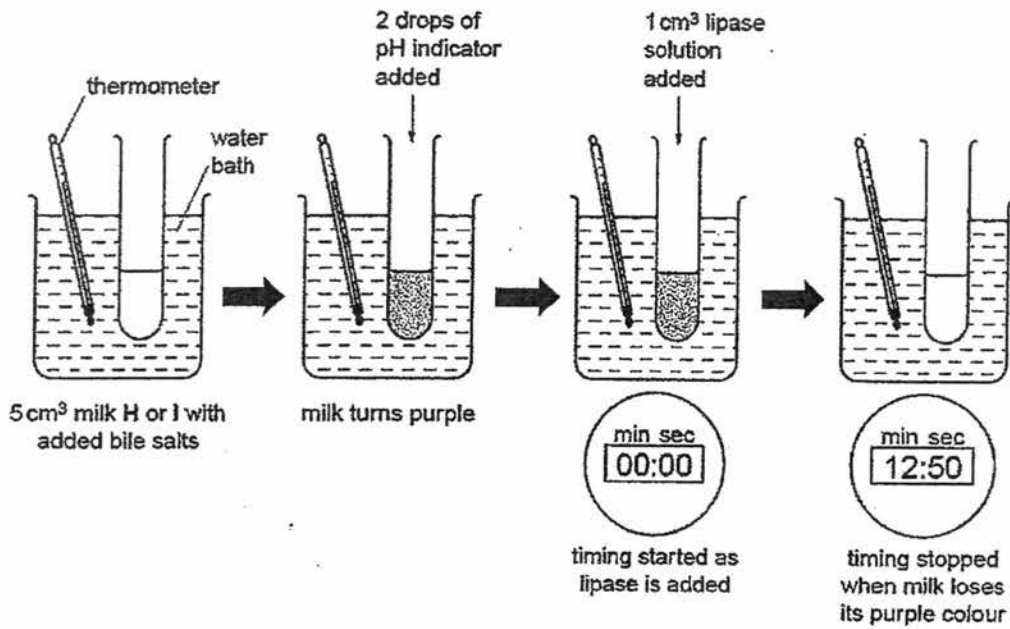


Fig. 3.1

The experiment was carried out at different temperatures. The times taken for the pH indicator to change from purple to colourless are shown in Fig. 3.2.

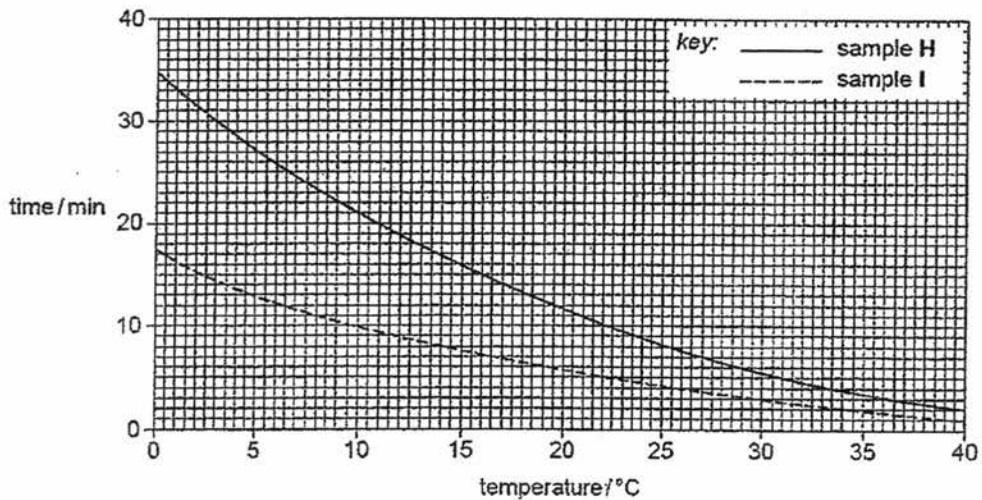


Fig. 3.2

- (a) State one reason why bile salts were added to the milk.

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[1]

- (b) Explain how the action of lipase caused the indicator to change from purple to colourless.

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..... [2]

Table 3.3 shows the time taken for the indicator to change from purple to colourless when a sample of goat's milk, J, was used.

Table 3.3

| temperature / °C | time taken for indicator to change from purple to colourless / min |
|------------------|--------------------------------------------------------------------|
| 8                | 17                                                                 |
| 22               | 7                                                                  |
| 31               | 4                                                                  |

- (c) Using the information in Fig. 3.2 and Table 3.3, place the three milk samples, H, I and J, in order of their fat content, starting with the lowest.

1. .... 2. .... 3. .... [1]

- (d) Explain your answer to (c).

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..... [1]

Total: [5]

- 4 Fig. 4.1 shows a section through a leaf with only some of the cells drawn.

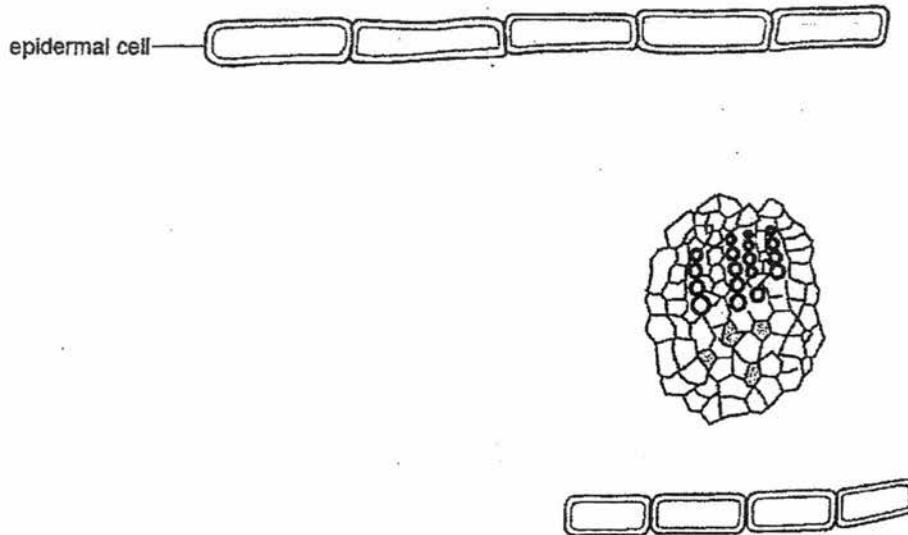


Fig. 4.1

- (a) On Fig. 4.1, draw and label in their correct positions:
- (i) a palisade mesophyll cell;
  - (ii) a spongy mesophyll cell;
  - (iii) a pair of guard cells;
- (b) On Fig. 4.1, label the tissue that transports manufactured food out of the leaf.
- (c) Suggest one reason why epidermal cells are important to a leaf.

[3]

[1]

[1]

Total: [5]

- 5 Fig. 5.1 shows the masses of water transpired and the masses of water absorbed by loblolly pine, *Pinus taeda*, and prickly pear cactus, *Opuntia ficus-indica*, over a 24 hour period.

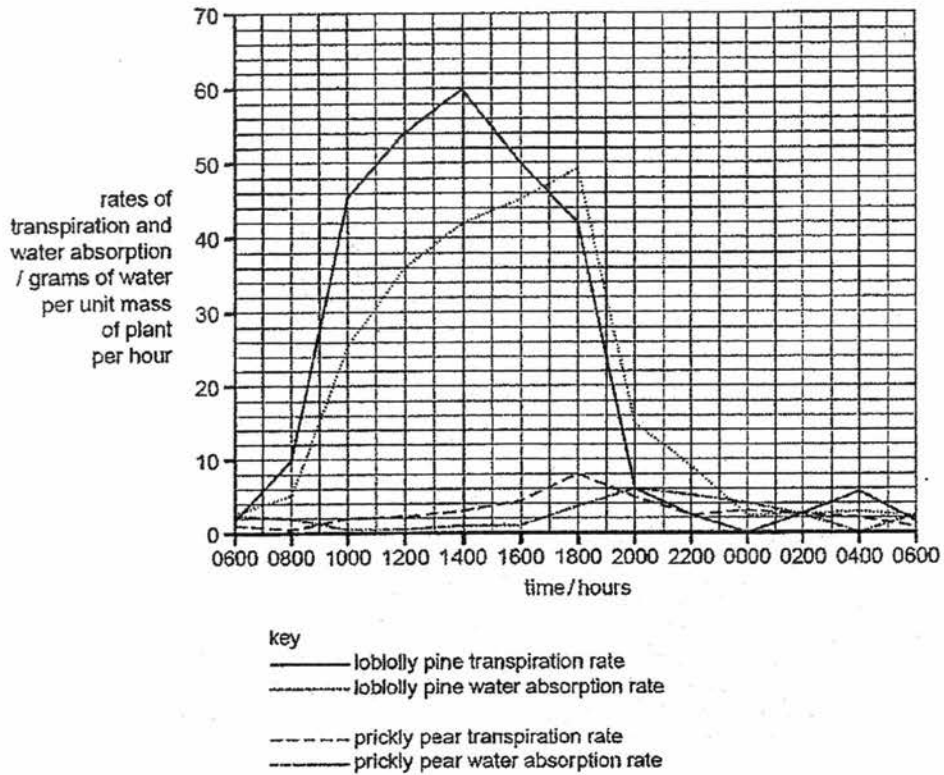


Fig 5.1

- (a) Describe and explain the patterns of transpiration and water absorption in loblolly pine.

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[3]

- (b) Suggest and explain how an increase in atmospheric humidity would affect the process of transpiration for the loblolly pine.

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[2]

- (c) Suggest why the patterns of transpiration and water absorption for prickly pear are not the same as for loblolly pine.

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[2]

Total: [7]

6 Fig 6.1 shows a structure found in the body of a mammal.

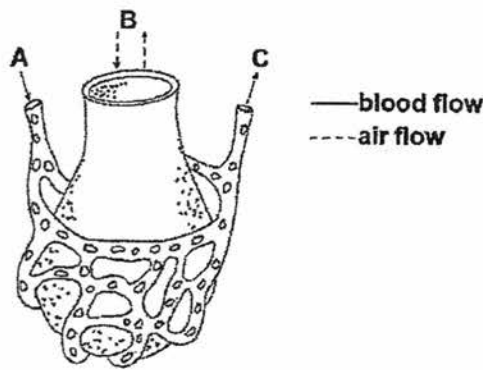


Fig 6.1

- (a) What is the name of this structure?

.....

[1]

- (b) Which blood gas normally moves from the lung into the blood stream and would the blood have the higher concentration of this gas at A or C?

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[1]

- (c) Describe two characteristics of the above structure that make it very efficient in carrying out its specialised task?

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[2]

- (d) Explain how an increase in the red blood cell count of an athlete could result in the athlete's aerobic performance improving.

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[2]

Total: [6]

7 Fig. 7.1 shows a view of a human heart cut across two of its chambers.

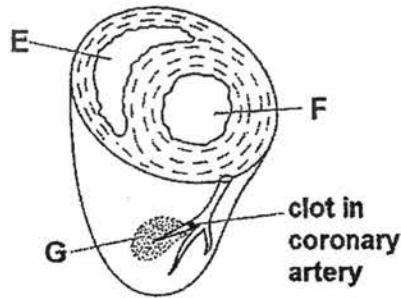


Fig 7.1

(a) Describe how the structure of the heart ensures that blood flows in one direction only through chamber F.

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[2]

(b) State two ways in which the composition of the blood inside chamber E differs from that inside chamber F. Explain the differences.

Difference 1: .....

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Explanation: .....

.....

Difference 2: .....

.....

Explanation: .....

.....

[4]

(c) Explain why the clot that has formed in a small branch of the coronary artery shown in Fig. 7.1 has caused cells in area G to die.

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[2]

Total: [8]



8 Fig. 8.1 shows a section through human skin.

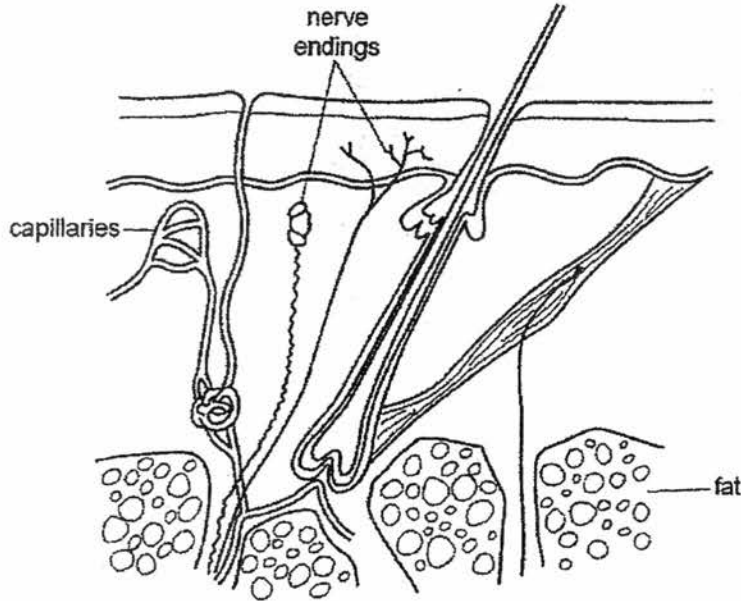


Fig. 8.1

(a) Suggest the possible functions of the nerve endings shown in Fig. 8.1.

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[1]

(b) Explain how the capillaries are involved in the loss of heat from the body during exercise.

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[2]

(c) Fig. 8.2 shows a yak. The yak is a large animal that lives at high altitudes (up to 5 500 m).



Fig. 8.2

Suggest why

(i) the sweat glands of this animal are largely non-functional;

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[2]

(ii) during those times of the year when food is plentiful, the yak stores a thick layer of fat beneath its skin;

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[1]

(iii) the yak has a compact body with small ears and short tail.

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[1]

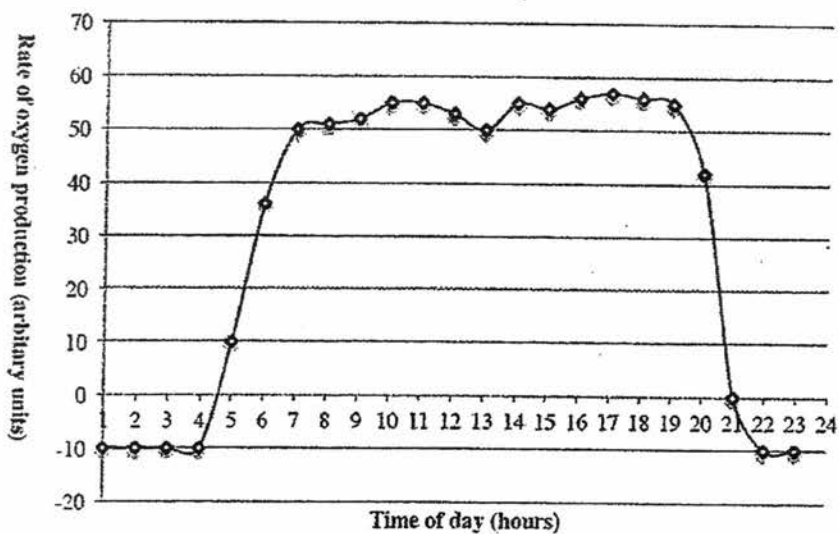
Total: [7]

**Section B (30 marks)**

Answer all questions.

Write your answers in the spaces provided.

- 9 The graph Fig. 10.1 below shows the rate of production of oxygen by a tomato plant growing in a greenhouse, measured over one day.



**Fig. 10.1**

- (a) What organelle is responsible for oxygen production in the tomato plants?

..... [1]

- (b) Explain fully why peak oxygen production occurs between 7 and 19 hours (7 am and 7 pm).

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 ..... [2]

- (c) Explain why the rate of oxygen production sometimes has a negative value

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26

[2]

(d) At 21 hours (9 pm) the plant is not growing. Explain why this is the case.

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[2]

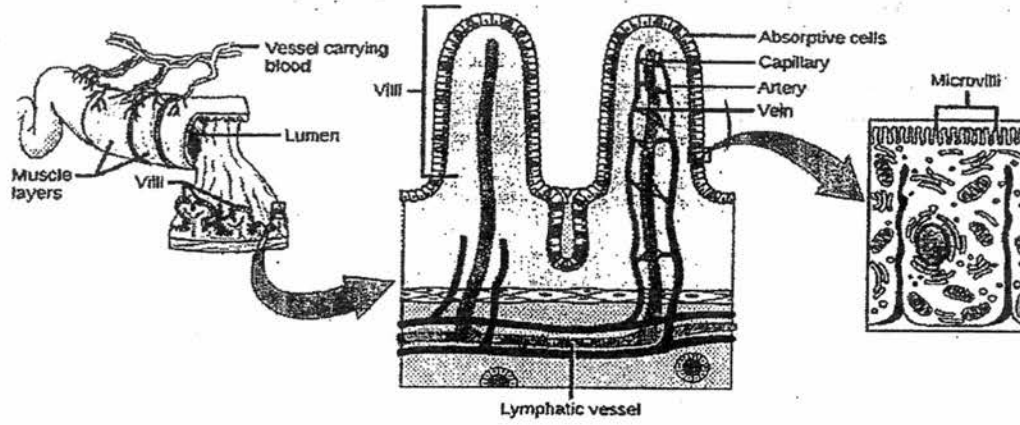
(e) Plant roots normally have access to oxygen from the small air spaces in between soil particles. After a flood, soils become waterlogged and it can be observed that plants survive for a short time and then die.  
Name the process that is taking place in the cells of the plant roots in waterlogged soil.  
Explain why it enables plants to survive only for a short time.

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[3]

Total: [10]

10 Fig.10.1 is a diagram of a section of the digestive system.



(a) Describe how the structures/features shown in the diagram relate to the function of the digestive system?

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207

- (b) The digestive system can become disrupted when bacteria is ingested with food, causing what is commonly known as 'food poisoning'. In some cases, this causes severe diarrhoea (watery stools).  
Which part of the digestive system has been affected? Explain your reasoning.

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[2]

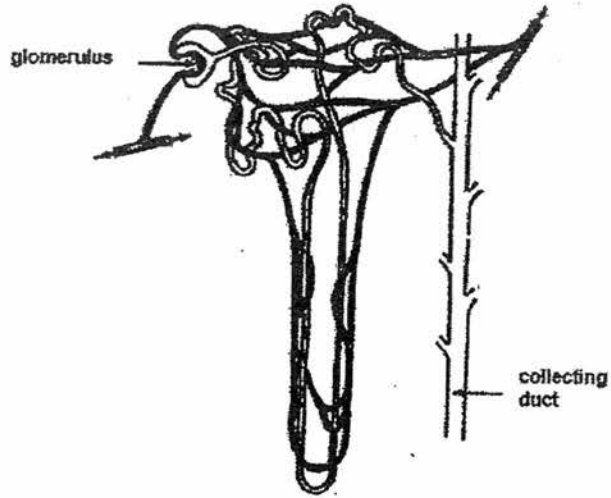
- (c) Suggest and explain the treatment for patients who suffer from food poisoning with severe diarrhoea (watery stools).

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[2]

Total: [10]

11 The diagram shows a kidney nephron.



(a) Give an account of what happens to both glucose and urea molecules in the blood entering a kidney nephron.

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[4]

- (b) If the kidney fails, the patient may be put on a kidney machine. Explain how a kidney machine works.

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[4]

- (c) Name an excretory product produced by the liver and state why it is considered a "product of excretion".

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[2]



END OF YEAR EXAMINATIONS 2016

Secondary Three Express

BIOLOGY (SPA)

Answer Key

PAPER 1

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1. C  | 2. A  | 3. D  | 4. A  | 5. D  |
| 6. B  | 7. C  | 8. D  | 9. B  | 10. A |
| 11. B | 12. C | 13. C | 14. B | 15. B |
| 16. C | 17. B | 18. B | 19. D | 20. D |

PAPER 2

Section A

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1a            | xylem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1        |
| 1b            | award one mark for each feature plus its adaptation. Some features have the same adaptation.<br>Features - adaptations<br>1 wide / large cross sectional area / large diameter - transport large volume of water / low resistance to flow ;<br>2 lack of cross walls - continuous columns low resistance to flow / allows continuous flow of water ;<br>3 empty / no cytoplasm / AW low resistance to flow ;<br>4 thickening of (secondary) wall A lignification - provides mechanical support / strengthens wall to prevent collapse under tension ;<br>R strength unqualified / rigid R resisting positive pressure<br>5 annular / spiral, thickening allows xylem vessels to stretch during growth without collapsing ;<br>6 lignin in walls waterproofing wall (so water remains inside lumen) ;<br>[max 2] | 2        |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>3</b> |
| 2a            | water potential of distilled water is higher than the water potential of cell sap of chips ;<br>Movement of water through a partially permeable membrane ;<br>from region of high water potential to one of low water potential / down a water potential gradient ;<br>via osmosis ; (must match the explanation given)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3        |
| 2b            | chip E absorbed more water ;<br>chip E had larger surface area to volume ratio ;<br>larger area of membrane through which water could pass by osmosis ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2        |

|               |                                                                                                                                                                                                                                                                                                                                                                                                      |               |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|               | more osmosis / movement of water molecules occurred ;<br>in limited time ;<br>(ORA for chip D)<br>Max 2                                                                                                                                                                                                                                                                                              |               |
| 2c            | haemoglobin ; (accept Hb / oxyhaemoglobin)                                                                                                                                                                                                                                                                                                                                                           | 1             |
| 2d            | water potential of distilled water is higher than the water potential of red blood cell (cytoplasm)<br>osmosis occurred / water moved into / enters red blood cells ;<br>cell bursts / cell membrane ruptures ;<br>(because) no cell wall ;<br>haemoglobin released into water (staining it pink) ;<br>[max 3]                                                                                       | 3             |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                      | <b>9</b>      |
| 3a            | to emulsify fat / provide suitable pH / make alkaline ; [1]                                                                                                                                                                                                                                                                                                                                          | 1             |
| 3b            | fats changed to fatty acids ;<br>fatty acids lowered pH / indicator colourless when acidic ;                                                                                                                                                                                                                                                                                                         | 2             |
| 3c            | I, J, H (in this order)                                                                                                                                                                                                                                                                                                                                                                              | 1             |
| 3d            | enzyme produces more product when there is more substrate / AW ;                                                                                                                                                                                                                                                                                                                                     | 1             |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                      | <b>5</b>      |
| 4ai           | (palisade) 1 cell drawn, correct shape and position and labelled ;                                                                                                                                                                                                                                                                                                                                   | 1             |
| 4aii          | (spongy) 1 cell drawn, correct shape and position and labelled ;                                                                                                                                                                                                                                                                                                                                     | 1             |
| 4aiii         | 2 guard cells drawn in (lower) epidermis and labelled ;<br>(R label to stoma)                                                                                                                                                                                                                                                                                                                        | 1             |
| 4b            | phloem correctly indicated on Fig. 4.1 ;                                                                                                                                                                                                                                                                                                                                                             | 1             |
| 4c            | protects photosynthesising or otherwise qualified cells ;                                                                                                                                                                                                                                                                                                                                            | 1             |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                      | <b>6</b>      |
| 5a            | loblolly pine<br>1 comparative descriptive comment ;<br>e.g. time delay between high rates of transpiration and water absorption<br>2 comparative data quote (transpiration and water absorption) ;<br>3 environmental conditions promote stomatal opening and loss of water vapour ;<br>4 idea that transpiration drives water absorption ;<br>5 transpiration sets up a water potential gradient ; | 1 ea<br>max 3 |
| 5b            | greater concentration in the atmosphere ;<br>water molecules ;<br>loss of gradient AW ;<br>slow(er)/less evaporation ;<br>slow(er)/less diffusion ; [max:3]                                                                                                                                                                                                                                          | 2             |
| 5c            | 1 prickly pear / Opuntia ficus indica, is a xerophyte ;<br>2 example of xeromorphic feature ;<br>3 very low rate of transpiration / data quote ;<br>4 rate of transpiration peaks at 1800 hrs, after hottest part of the day ;<br>5 stomata closed during the day / only open at night                                                                                                               | 2             |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                      | <b>7</b>      |
| 6a            | Alveolus                                                                                                                                                                                                                                                                                                                                                                                             | 1             |

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 6b            | Carbon dioxide and it has a higher concentration at A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1        |
| 6c            | Great numbers increase the surface area for gas exchange.<br>Wall made up of single layer of cells and so are the walls of the capillaries so diffusion distance is small allowing rapid gas exchange.<br>Covered by a dense network of capillaries which have low oxygen and high carbon dioxide concentrations. This allows oxygen to diffuse into the blood and carbon dioxide to diffuse out of the blood.<br>Some cells in the walls secrete fluid allowing gases to dissolve.<br>Fluid also prevents the sides of alveoli from sticking together. | 2        |
| 6d            | red blood cells to deliver oxygen and remove carbon dioxide from and athlete's exercising muscles.<br>More RBC increases the oxygen carrying capacity of the blood to deliver it to the muscles<br>(muscles) increased + supplies of glucose (to muscles);<br>increased + work-rate (person) / contraction (muscle);<br>faster + respiration (in muscle cells);<br>more + energy;<br>increased supply of O <sub>2</sub> ;                                                                                                                               | 2        |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>6</b> |
| 7a            | bicuspid / mitral + open;<br>aortic / semilunar valve + closed;<br>ref. valve action + contraction / relaxation / pressure change;                                                                                                                                                                                                                                                                                                                                                                                                                      | 2        |
| 7b            | any two from:<br>more carbon dioxide; blood returning from body cells that give out CO <sub>2</sub> AW / CO <sub>2</sub> lost in lungs;<br>or<br>less oxygen (A deoxygenated); oxygen used up in body cells/gained in lungs;<br>or<br>warmer; from body / cells at 37 °C / air in lungs usually cooler;<br>(accept reverse if ref. to tropical heat)<br>or<br>higher pH; dissolved CO <sub>2</sub> is acidic;                                                                                                                                           | Max 4    |
| 7c            | lack of oxygen;<br>lack of glucose;<br>cells cannot respire;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2        |
| <b>Total:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>8</b> |
| 8a            | mark the first, any 2 from:<br>detection of pressure, temperature, pain, touch;<br>(A for ONE mark max. a reference to the detection of stimuli)                                                                                                                                                                                                                                                                                                                                                                                                        | 1        |
| 8b            | more blood flow;<br>blood carries heat;<br>heat lost from + body surface/skin/named heat transfer method;<br>capillaries supply sweat glands;                                                                                                                                                                                                                                                                                                                                                                                                           | 2        |
| 8ci           | (A reverse argument) very little sweat lost;<br>no need to sweat/sweating would be detrimental AW;                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2        |

|               |                                                                                                                                                                                                                                                 |          |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|               | fur would inhibit evaporation;<br>less heat lost;<br>*ref. low external temperature;                                                                                                                                                            |          |
| 8cii          | stores energy;<br>supplies energy/heat;<br>insulates (against heat loss);<br>*ref. low external temperature;                                                                                                                                    | 2        |
| 8ciii         | (A reverse argument)<br>(for ears/tail) reduced surface/small surface area;<br>ref. small surface area to volume ratio for the whole animal<br>(Assume that 'it' = the yak);<br>from which heat can be lost;<br>*ref. low external temperature; |          |
| <b>Total:</b> |                                                                                                                                                                                                                                                 | <b>8</b> |

Section B

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 9a | chloroplasts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 |
| 9b | Oxygen is produced by photosynthesis (1)<br>which requires light and so occurs during the day/daylight hours.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2 |
| 9c | The plant only photosynthesises in the light but it is respiring all the time.<br>Negative oxygen production occurs at night when photosynthesis is not occurring. OR The plant is only respiring which involves the use/consumption/ uptake of oxygen which is registered on the graph as negative oxygen production.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2 |
| 9d | At 9 pm the rate of production of oxygen by photosynthesis is equal to the rate of uptake of oxygen by respiration ( this is the compensation point.) (1).<br>Therefore, the glucose product by the plant by photosynthesis will be all used in respiration and there is no excess glucose available for the production of new tissue (growth) (1).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2 |
| 9e | Plant roots will have limited access to oxygen and so will respire anaerobically (1).<br>Anaerobic respiration produces less ATP than anaerobic respiration (1).<br>This means that there will be less energy available to the root cells for metabolic processes such as active transport of ions (1).<br>Eventually resulting in the death of the whole plant.<br>OR<br>Anaerobic respiration produces less ATP from each molecule of glucose than aerobic respiration (1).<br>This results in a high use of the root's stores of glucose, rapidly depleting them (1)<br>At which point further respiration is not possible and the cells die.<br>OR<br>Anaerobic respiration produces alcohol/ethanol (1).<br>The root cells cannot use or remove this toxic substance, so it accumulates and eventually kills the cells (1).<br>Other feasible scenarios – | 3 |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|     | <p>e.g. waterlogging results in lower than normal concentrations of ions in the soil water, making it impossible for them to move into the root cells by diffusion.<br/>The cells may resort to active transport to obtain these ions, thereby depleting glucose reserves more rapidly than they can be restored by photosynthesis.</p> <p>Essentially:<br/>1 mark for identifying the process.<br/>1 mark for describing a feature of this process that limits the survival time (lack of ATP/energy; production of alcohol).<br/>1 mark for explaining how this feature results in plant death (preventing important metabolic processes, accumulation of toxins).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |
|     | <b>Total:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>10</b> |
| 10a | <p>A number of reasonable responses were accepted, including:<br/>The length of the small intestine (~ 6 m) increases the time for absorption. (1)<br/>The surface area is increased by the numerous folds in its inner wall for absorption of digestive products (1)<br/>Villi in the inner walls increase surface area for absorption of digestive products(1)<br/>Microvilli in the epithelium of villi increase surface area for absorption of digestive products. (1)<br/>- Muscle layers in the digestive tract help to move food along by peristaltic contractions (1)<br/>- Cells contain many mitochondria for the production of ATP (energy) to facilitate absorption (1)<br/>- Many capillaries are present in close contact with digestive surface to help carry away absorbed nutrients quickly allow for the products of digestion to be transported. (1)<br/>Single layer of cells of epithelium -small diffusion distance. (1) OR<br/>Maintenance of concentration gradient by removal of absorbed nutrients (1)<br/>mark for structure 1 mark for explaining how structure relates to function. Stating a structure without clearly indicating its relationship with the function yielded no marks.<br/>Any 6</p> | 6         |
| 10b | <p>The increase in water in the waste product (i.e. diarrhoea) indicates that water is not being absorbed into the bloodstream (1);<br/>Water reabsorption mainly occurs in the large intestine (1), so this must be the area most affected. (intestine, small intestine were also accepted however whilst this is true the majority of water is absorbed into the body via the colon for stools to be hard)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2         |

| 10c                                                           | <p>In the treatment of food poisoning, isotonic oral rehydration solutions (ORS) that contains water, glucose and salts are recommended for people vulnerable to the effects of dehydration. In a diarrheal illness, sodium-rich intestinal secretions are lost before they can be reabsorbed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                            | 2                                                 |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------|----------|--------------------------------------|---------------------------------------------------------------|-----------------------------------|------------------------------------|------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------|--------------------------------|------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------|-------------------------------------------|--|------------------------------------------------------|
|                                                               | <b>Total:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                            | <b>10</b>                                         |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| 11a                                                           | <p>a. Entering the glomerulus, glucose molecule is filtered out through ultrafiltration into the renal capsule.<br/>b. The high pressure is caused by the difference between the larger diameter of the afferent arteriole and the smaller efferent arteriole.<br/>c. The glucose is then selectively reabsorbed back from the kidney tubules to the blood capillaries through diffusion and active transport.<br/>d. Urea molecules also got filtered out from the glomerulus into the renal capsule.<br/>e. Because urea molecules becomes toxic when accumulated / an excretory product, it does not get reabsorbed and move along the kidney tubule into the collecting duct<br/>f. There the urea is carried to the urinary bladder via the ureter to be excreted as urine</p>                                                                                        |                                                            | 1 marks each<br><br><br><br><br><br>[max 4 marks] |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| 11b                                                           | <table border="1"> <thead> <tr> <th>Structure</th> <th>Properties</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Tubing walls are partially permeable</td> <td>Diffusion of selected substances from blood to dialysis fluid</td> <td>Remove nitrogenous waste eg. urea</td> </tr> <tr> <td>Tubing is narrow, long highly coil</td> <td>To increase surface area to volume ratio</td> <td>Increase efficiency of diffusion/removal of waste products</td> </tr> <tr> <td>Blood is flowing the opposite direction to the dialysis fluid</td> <td>To maintain diffusion gradient</td> <td>Increase efficiency of diffusion/removal of waste products</td> </tr> <tr> <td>Dialysis fluid contain essential salts for the body</td> <td>To maintain osmotic potential/ water potential</td> <td>Ensure salts do not diffuse out the blood</td> </tr> </tbody> </table> | Structure                                                  | Properties                                        | Function | Tubing walls are partially permeable | Diffusion of selected substances from blood to dialysis fluid | Remove nitrogenous waste eg. urea | Tubing is narrow, long highly coil | To increase surface area to volume ratio | Increase efficiency of diffusion/removal of waste products | Blood is flowing the opposite direction to the dialysis fluid | To maintain diffusion gradient | Increase efficiency of diffusion/removal of waste products | Dialysis fluid contain essential salts for the body | To maintain osmotic potential/ water potential | Ensure salts do not diffuse out the blood |  | 1 mark per property<br><br><br><br><br><br>[4 marks] |
| Structure                                                     | Properties                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Function                                                   |                                                   |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| Tubing walls are partially permeable                          | Diffusion of selected substances from blood to dialysis fluid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Remove nitrogenous waste eg. urea                          |                                                   |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| Tubing is narrow, long highly coil                            | To increase surface area to volume ratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Increase efficiency of diffusion/removal of waste products |                                                   |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| Blood is flowing the opposite direction to the dialysis fluid | To maintain diffusion gradient                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Increase efficiency of diffusion/removal of waste products |                                                   |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| Dialysis fluid contain essential salts for the body           | To maintain osmotic potential/ water potential                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Ensure salts do not diffuse out the blood                  |                                                   |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
| 11c                                                           | <ul style="list-style-type: none"> <li>• Bile pigments</li> <li>• Produced by the liver where haemoglobin is broken down</li> <li>• Considered an excretory product because it is a by-product from a metabolic reaction,</li> <li>• Not needed by the body</li> </ul> <p>A urea product from deamination of amino acids</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                            | 0.5 mark each<br>[2 marks]                        |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |
|                                                               | <b>Total:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                            | <b>10</b>                                         |          |                                      |                                                               |                                   |                                    |                                          |                                                            |                                                               |                                |                                                            |                                                     |                                                |                                           |  |                                                      |