

2016 Preliminary Examination 2
Secondary 4 Express

NAME

CLASS

INDEX NUMBER

<input type="text"/>	<input type="text"/>
----------------------	----------------------

Biology

5158 / 01

Paper 1 Multiple Choice

13 September 2016

Additional Materials: Multiple Choice Answer Sheet

1 hour

Setter: Mrs. Dorothy Goh

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write in soft pencil.

Do not use staples, paper clips, highlighters and glue or correction fluid.

Write your class, name and index number on the answer sheet in the spaces provided.

There are **forty** questions in this section. 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.

Parent's Signature	<input type="text"/>
For Examiner's Use	
Total	<input type="text"/>

This document consists of **23** printed pages, including the cover page.

[Turn over

- 1 The diagram shows four specialized cells.



Which feature is **not** common to all of these cells?

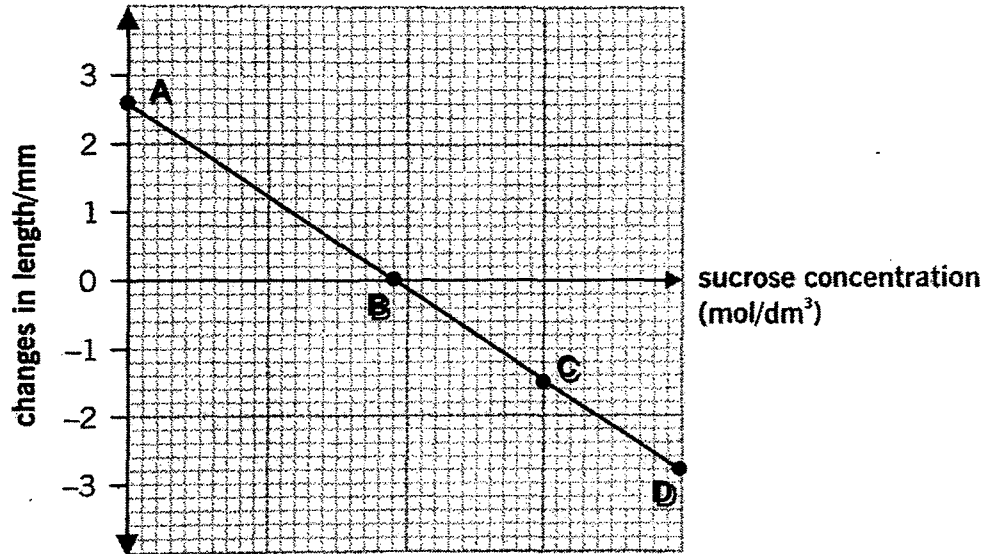
- A cell membrane
 - B cytoplasm
 - C diploid number of chromosomes
 - D nucleus
- 2 Which is a tissue and which is an organ?

	tissue	organ
A	brain	xylem
B	epidermis	root
C	liver cell	neurone
D	sperms	liver

- 3 Which of the following is **not** a function of a cell nucleus?

- A protection of genetic material
- B regulation of protein synthesis
- C replication of genetic material
- D synthesis of enzymes

- 4 The graph shows changes in the length of a potato strip when immersed in different concentrations of sucrose solution. At which point, **A**, **B**, **C** or **D**, would there be largest net movement of water molecules between the potato strips and sucrose solution at the beginning of the experiment?

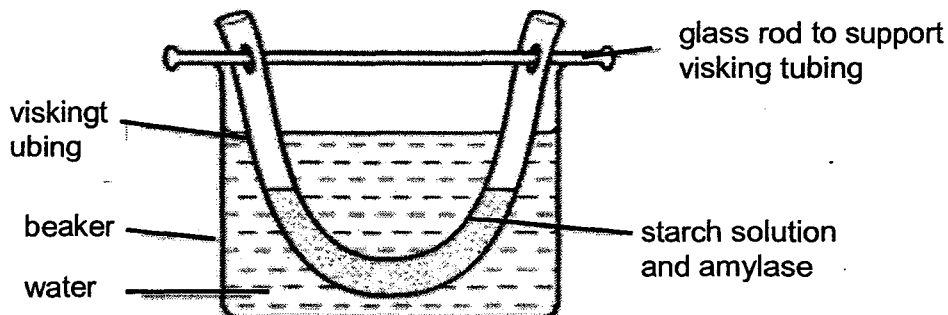


- 5 Which of the following fluids from a healthy man would produce a positive result with Biuret test?

- (i) plasma
- (ii) saliva
- (iii) sweat
- (iv) urine

- A** (i) and (ii) only
- B** (ii) and (iii) only
- C** (i), (ii) and (iii) only
- D** (i), (iii) and (iv) only

- 6 An investigation is carried out on digestion and absorption in the alimentary canal. The diagram shows the apparatus used. The visking tubing is permeable to small molecules such as glucose but not to large molecules such as starch.



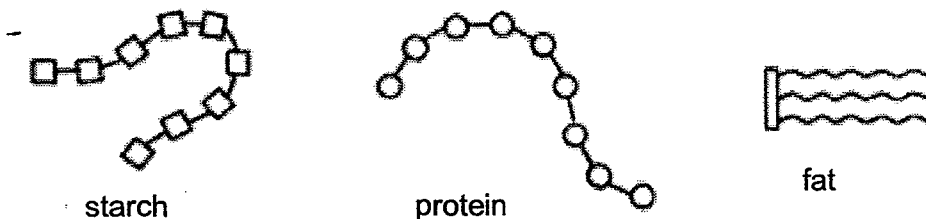
After one hour, samples of water in the beaker are tested with Benedict's solution and iodine solution.

Which colours are obtained?

	colour obtained after heating with Benedict's solution	colour obtained after adding iodine solution
A	blue	blue-black
B	blue	yellow-brown
C	red	blue-black
D	red	yellow-brown

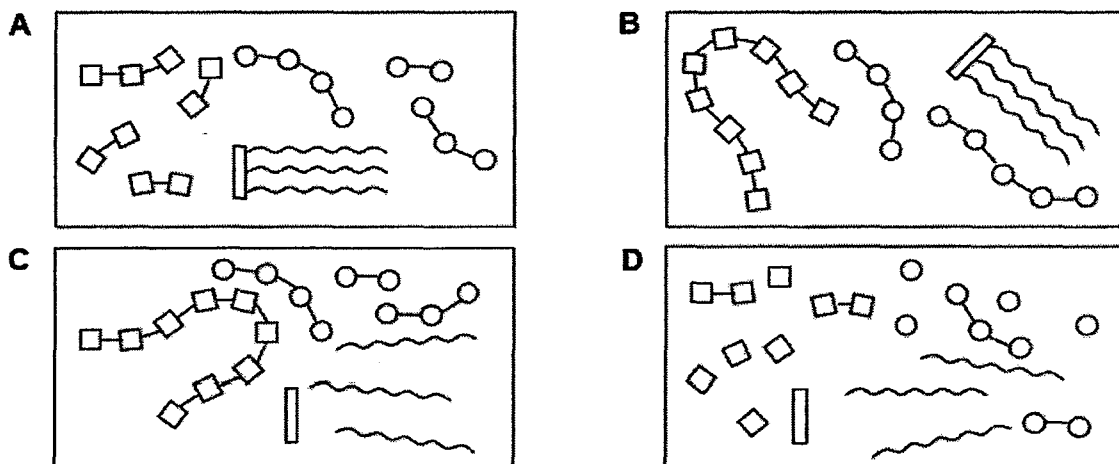
- 7 Which of the following correctly describes the harmful effect of alcohol?
- A** It can reduce the absorption of digested food in the small intestines.
 - B** It can reduce the efficiency of red blood cells to transport oxygen.
 - C** It stimulates over-secretion of mucus that can block the transport of oxygen.
 - D** It stimulates over-secretion of stomach acid that can cause gastric ulcers.

8 The diagrams represent molecules of starch, protein and fat at the beginning of the human alimentary canal.

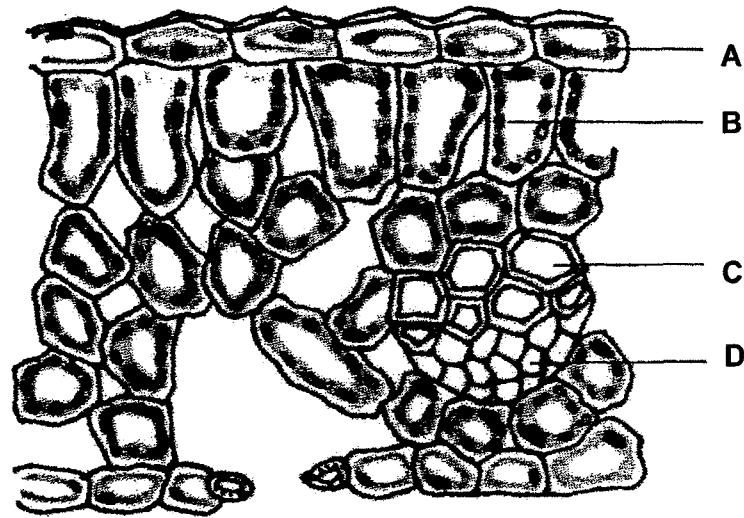


A sample of food that has been in a person's stomach for 3 hours was removed and mixed with bile. The mixture was left to stand for an hour.

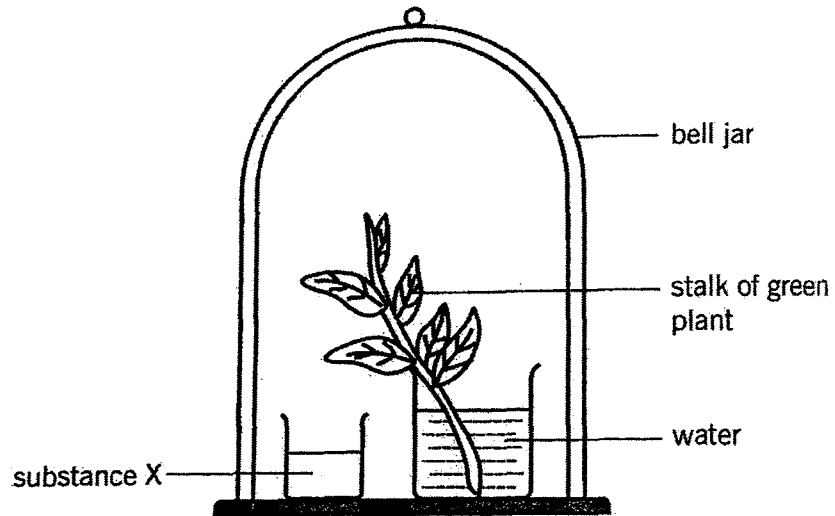
Which diagram correctly represents the final products of this procedure?



- 9 The diagram shows a section of a leaf. Which region contains cells that transport sucrose from the leaf cells to the rest of the plant?



- 10 The diagram shows an experimental setup to investigate the rate of photosynthesis.



A beaker containing substance X is placed in the bell jar to increase the percentage of carbon dioxide in the bell jar. What could substance X be?

- A potassium hydroxide solution
- B potassium sulfate solution
- C soda lime pellets
- D sodium hydrogen carbonate solution

- 11 A student studied the influence of temperature and light intensity upon carbon dioxide exchange of plants in a greenhouse. During the experiment, cellular respiration using glucose was completely aerobic and was not influenced by light intensity.

At each temperature, carbon dioxide uptake was measured during light exposure and loss of carbon dioxide was measured during dark period. The light intensity was constant during the light period and was not a limiting factor for photosynthesis. The data collected is represented in the table.

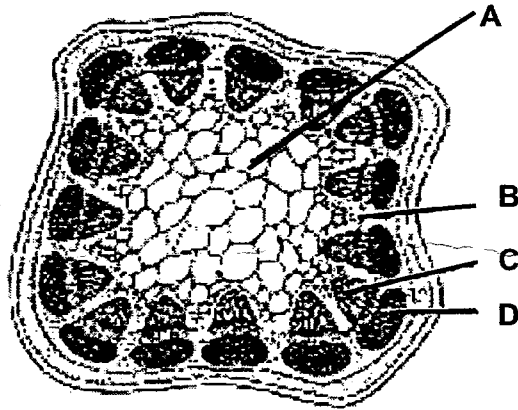
temperature ($^{\circ}\text{C}$)	carbon dioxide uptake in light (mg per gram dried weight per hour)	loss of carbon dioxide in dark (mg per gram dried weight per hour)
5	0.5	0.2
10	0.7	0.5
15	1.2	0.9
20	1.9	1.5
25	2.3	2.6
30	2.0	3.9
35	1.5	3.3

At which temperatures does the plant release oxygen gas when exposed to light?

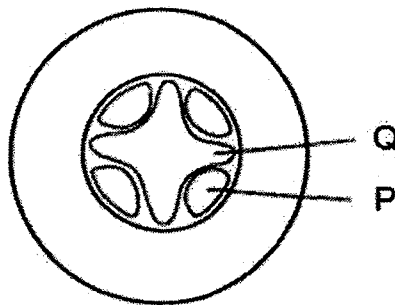
- A At all temperatures.
- B Only at temperatures above 25°C .
- C Only in the range of temperatures between 5°C to 20°C
- D Only in the range of temperatures between 20°C to 25°C

- 12 A plant was placed in a bell jar which contained radioactive carbon dioxide. After an hour, thin slices were cut from the stem and placed on X-ray film which becomes black when exposed to radioactivity.

Which of the labelled regions will become black when placed on the film?



- 13 A herbaceous plant, growing in a nutrient solution, is placed in a well-lit experimental chamber through which humid air is being passed slowly. The diagram shows a section through a part of a plant.

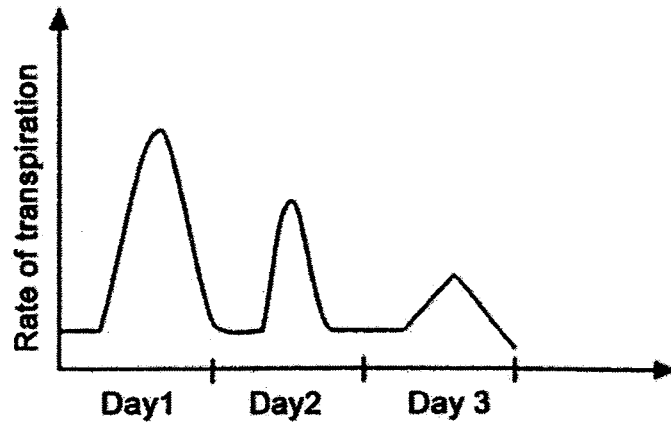


The speeds of movement of the fluids in tissues P and Q are measured. The humid air is then replaced by dry air and the speeds of movement of the fluids change.

What are these changes?

	tissue P	tissue Q
A	greatly increased upward movement	greatly increased downward movement
B	greatly increased downward movement	little change
C	little change	greatly increased downward movement
D	little change	greatly increased upward movement

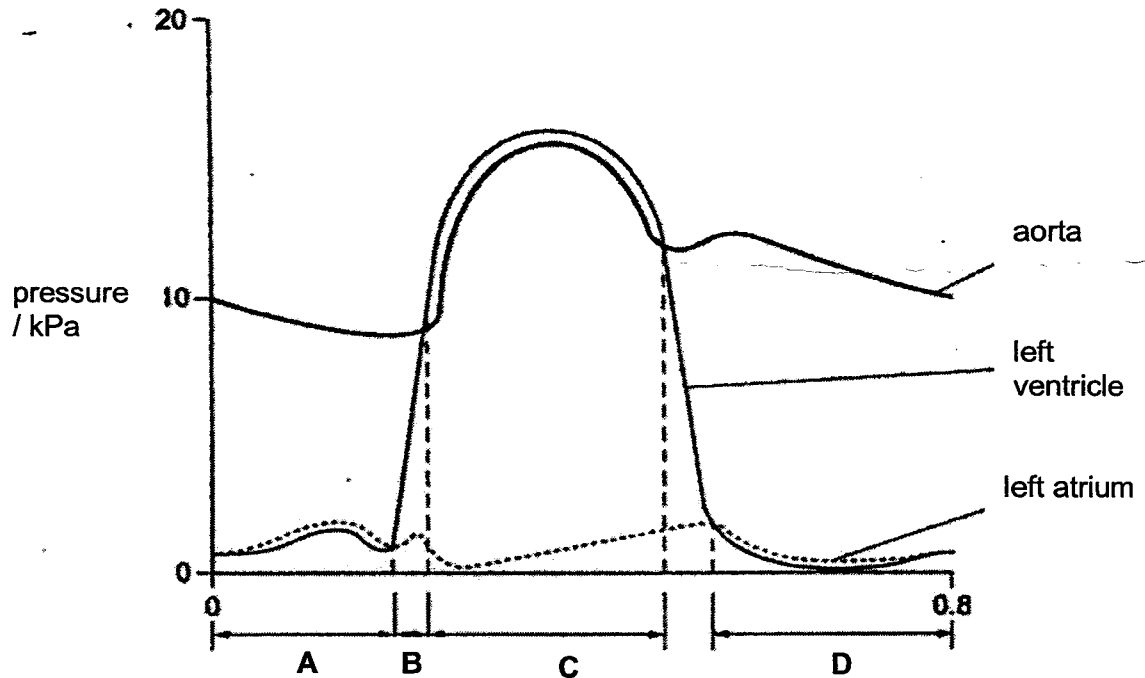
- 14 The graph shows the rate of transpiration of a potted plant left without any attention over three days. Which statement describes the graph and gives the most likely explanation for it?



- A A decreasing rate of transpiration due to a decrease in the relative humidity over the three days.
- B A decreasing rate of transpiration due to the soil becoming progressively drier.
- C An increasing rate of transpiration due to a decrease in the rate of water absorption by the roots.
- D An increasing rate of transpiration due to increase in temperature over the three days.
- 15 Which of the following is an enzyme in the clotting process?

- A fibrin
- B fibrinogen
- C prothrombin
- D thrombokinase

- 16 The diagram shows the pressure of the left side of the human heart during one cardiac cycle. At which interval of the cardiac cycle are all four heart valves closed?



- 17 Which of the following substances can release energy directly when it is oxidised directly in the liver?

- (i) ethanol
- (ii) glucose
- (iii) glycogen
- (iv) lactic acid

- A (i) and (ii)
- B (i) and (iii)
- C (i), (ii) and (iii)
- D (ii) and (iv)

- 18 The table shows the results of blood transfusion between four individuals P, Q, R and S.

		receipients			
		P	Q	R	S
donors	P		√	√	√
	Q	x		√	√
	R	x	x		x
	S	x	√	√	

√	successful transfusion
x	unsuccessful transfusion

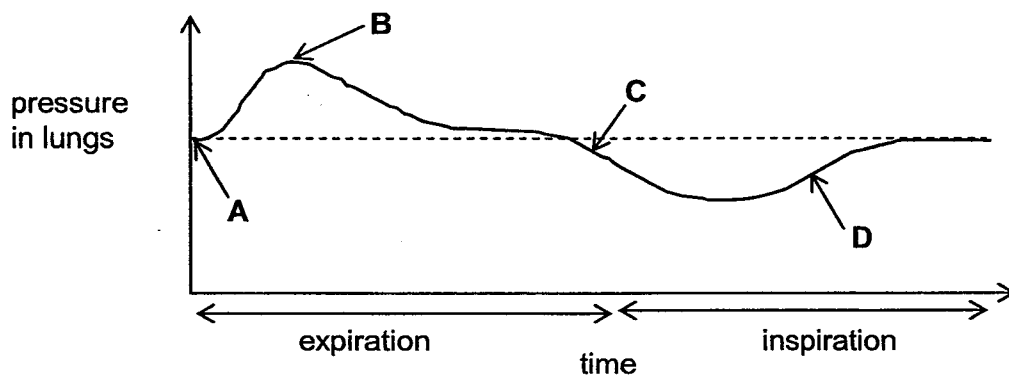
What is the blood group of the four individuals, P, Q, R and S respectively?

	P	Q	R	S
A	AB	A or B	O	A or B
B	AB	A	O	B
C	O	A or B	AB	A or B
D	O	B	AB	A

19 The active ingredient in brand X pesticide inhibits the synthesis of the plasma protein prothrombin in the liver. This pesticide most likely kills pests like rodents by

- A causing the accumulation of amino acids in the blood.
- B preventing the clotting process when bleeding.
- C preventing the maintenance of the glucose level in the blood.
- D stimulating the breakdown of red blood cells.

20 The following graph shows the pressure in the lungs in a complete breathing cycle.



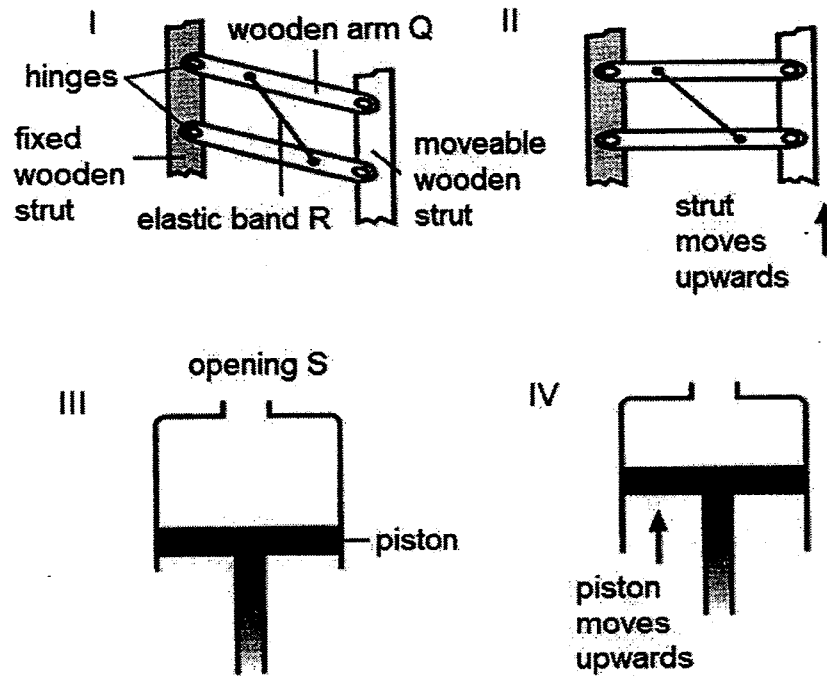
At which point does the muscles in the diaphragm start to contract?

21 Chemicals in tobacco smoke lead to the breakdown of the elastic tissue in the walls of the alveoli.

What is the name of this condition?

- A arteriosclerosis
- B chronic bronchitis
- C emphysema
- D lung cancer

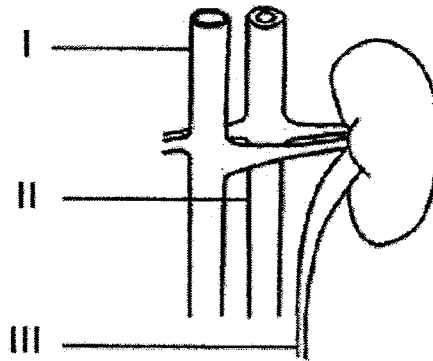
- 22 The figure shows models used to demonstrate the actions of two different sets of muscles used during breathing in a mammal.



Which two diagrams represent the thorax during inspiration?

- A I and III
 - B I and IV
 - C II and III
 - D II and IV
- 23 What provides the force for ultrafiltration in the kidney tubule?
- A anti-diuretic hormone (ADH)
 - B breakdown of urea
 - C contraction of the left ventricle
 - D mitochondria in the cells of Bowman's capsule

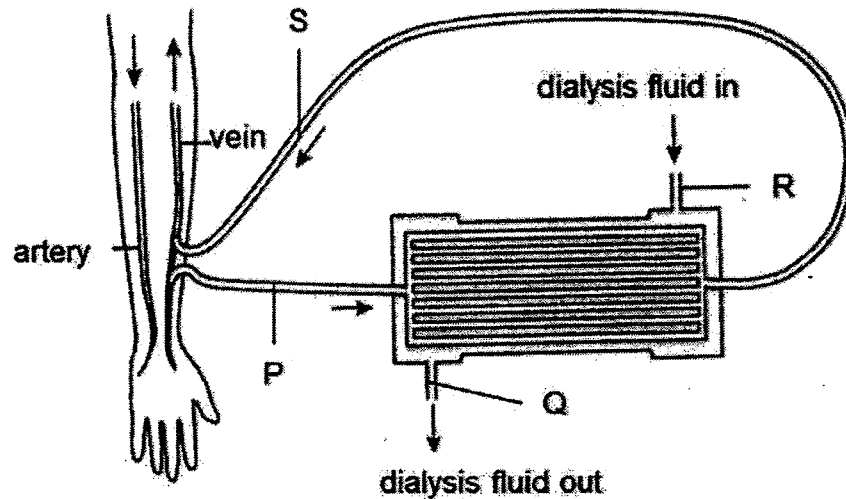
24 The diagram shows a kidney and some associated vessels.



Which of the following comparisons about the amount of substances in the associated vessels is correct?

	substances	concentration	
		higher	lower
A	concentration of oxygen	III	I
B	concentration of oxygen	I	II
C	concentration of urea	III	II
D	water content	III	I

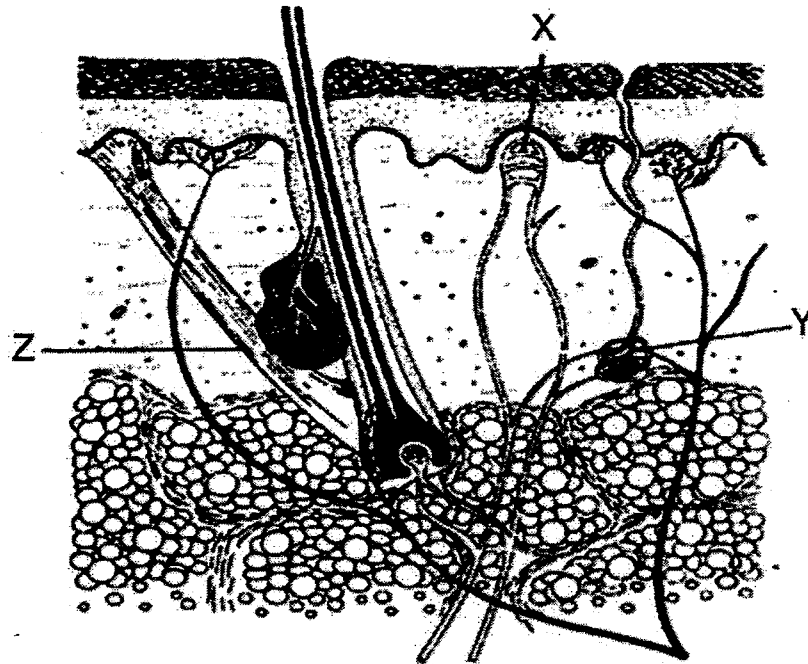
- 25 The diagram shows the flow of blood and dialysis fluid through a dialysis machine.



Arrange P, Q, R and S in increasing order of concentration of urea present in the fluids at different points.

- A R → S → P → Q
- B R → S → Q → P
- C S → Q → R → P
- D S → R → Q → P
- 26 Which process is **not** a result of negative feedback?
- A A decrease in the surrounding temperature leads to a decrease in blood flow through the skin surface.
- B A decrease in the surrounding temperature leads to a decrease in respiration rate.
- C A decrease in the surrounding temperature leads to a decrease in sweating.
- D A decrease in the surrounding temperature leads to shivering.

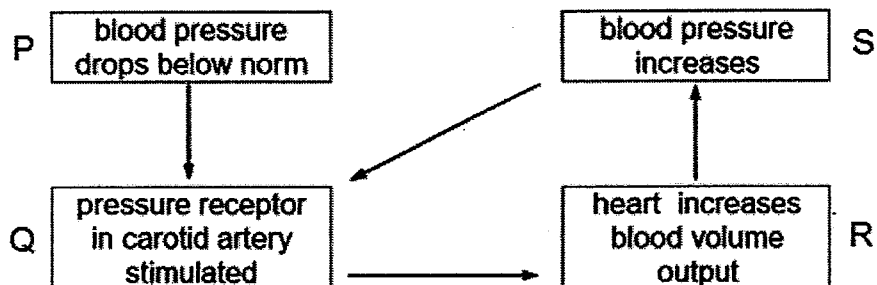
27 The diagram shows the vertical section through a human skin.



What happens to parts X, Y and Z in very cold conditions?

	X	Y	Z
A	constricts	active	contracts
B	constricts	active	relaxes
C	constricts	inactive	contracts
D	dilates	inactive	contracts

- 28 The regulation of blood pressure is an example of homeostasis. The diagram shows the homeostatic processes taking place when the blood pressure drops below the normal level.



Which of the following correctly describes the processes taking place in the regulation of blood pressure?

	stimulus	corrective mechanism	negative feedback
A	P	Q	R
B	P	R	Q
C	Q	R	S
D	S	Q	R

- 29 In myopia, or short-sightedness, distant objects appears blurred while near objects are clear. Which of the following are possible reasons for myopia?

- 1 ciliary muscles cannot contract sufficiently
- 2 circular muscles cannot relax sufficiently
- 3 lenses are unable to become thinner
- 4 suspensory ligaments cannot become taut

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

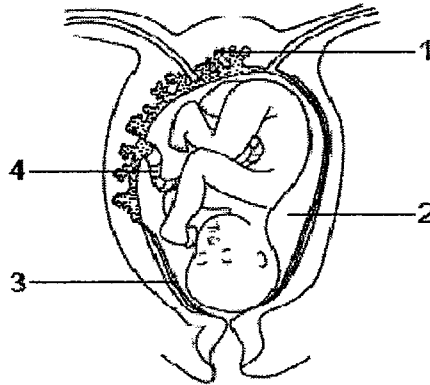
- 30 The trigeminal nerve in human connects the brain to the teeth and skin of the face.

When a dentist administers a local anaesthetic by injection, a person can no longer feel pain and cannot smile properly.

What can you conclude about trigeminal nerve?

- A It contains both motor and sensory neurones.
- B It contains mainly motor neurones.
- C It contains mainly sensory neurones.
- D It carries impulses from the brain to the teeth and back to the brain.

- 31 The diagram shows a fetus in the uterus.



Which statement is true?

- A 1 prevents nicotine and alcohol from diffusing to the fetus.
- B 2 spreads pressure evenly around the fetus.
- C 3 provides oxygen and nutrients for the fetus.
- D 4 holds the fetus in place in the uterus.

32 Which statements explain advantages of asexual reproduction?

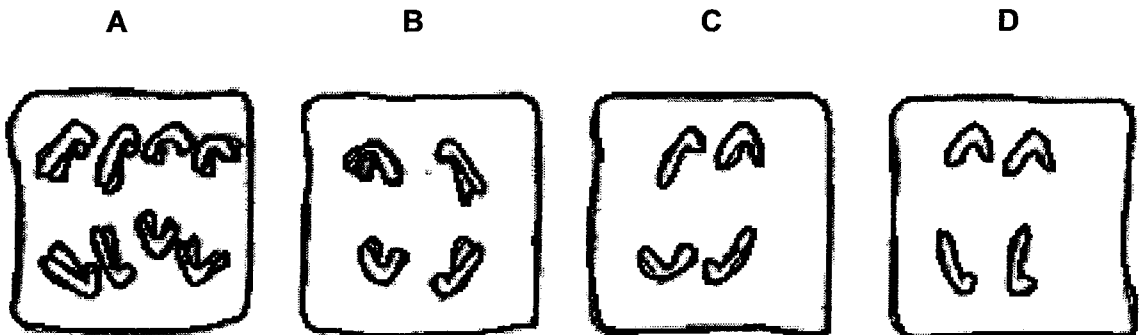
- 1 Any good trait from the parents will definitely be passed on to the offspring.
- 2 The offspring are already adapted to the parent's natural environment.
- 3 Only one parent is required.

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

33 The diagram shows a cell during a stage in mitosis.



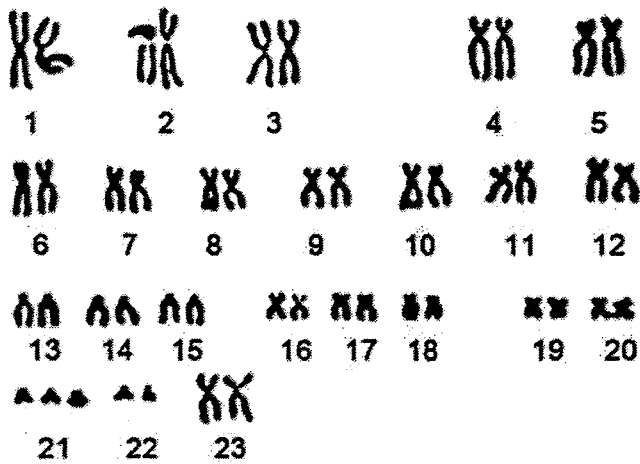
Which diagram shows a stage in meiosis I in the same organism?



34 Which of the following is a nucleotide found in DNA?

- A deoxyribose + phosphate group + thymine
- B deoxyribose + phosphate group + uracil
- C ribose + phosphate group + thymine
- D ribose + phosphate group + uracil

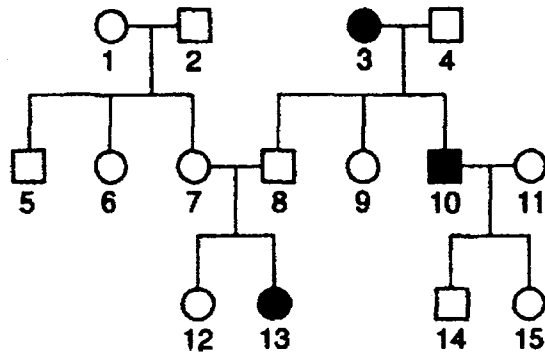
35 The diagram shows the result of examination of the chromosomes from a single cell of a woman's fetus.



Which conclusion can be made?

- A The cell is about to undergo meiosis.
- B The fetus has chromosomal mutation.
- C The fetus inherited all the beneficial qualities from the parents.
- D The fetus is a male.

36 The family tree shows the inheritance of a condition caused by the recessive allele, r .



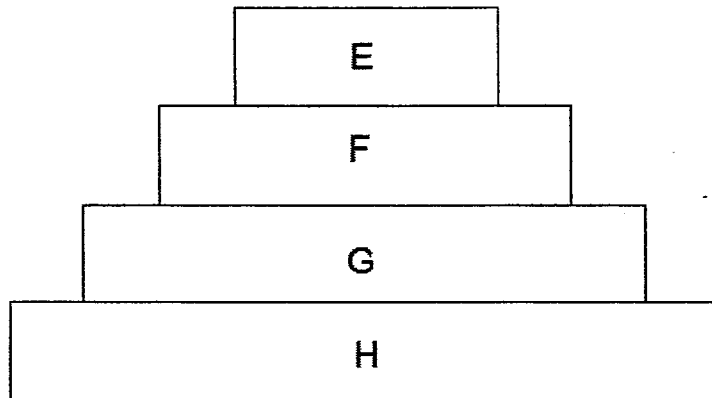
key

- normal female
- normal male
- affected female
- affected male

Which females are certain to have genotype Rr ?

- A 1, 6 and 7
- B 6, 7 and 11
- C 7, 9 and 15
- D 9, 11 and 12

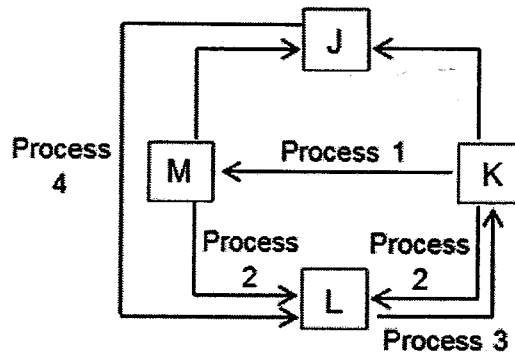
- 37 The diagram shows an ecological pyramid. Which statement about the pyramid is always **true**?



- A Cumulative poisons become more concentrated as we move downwards from E to H.
- B Energy flow is upwards from H to E.
- C Level E is occupied by a producer.
- D Number of organisms in level H exceeds those in level G.
- 38 Which microbes are used in the treatment of sewage?
- A aerobic bacteria only
- B aerobic bacteria and anaerobic bacteria only
- C aerobic bacteria, anaerobic bacteria and viruses
- D anaerobic bacteria, fungi and viruses

The carbon cycle can be illustrated using the following diagram. Processes 1, 2, 3 and 4 represent the processes involved in the flow of carbon compounds.

Refer to the diagram and answer questions 39 and 40.



39 Which row correctly shows what each letter (J, K, L and M) could represent?

	J	K	L	M
A	atmosphere	grass	decomposers	sheep
B	decomposers	grass	atmosphere	sheep
C	decomposers	sheep	atmosphere	grass
D	sheep	atmosphere	grass	decomposers

40 What is likely to occur if process 4 does not occur?

- A Carbon cycling would occur in the reverse direction.
- B Carbon dioxide levels in the atmosphere would decrease.
- C The population of the grass would increase.
- D The rate at which carbon dioxide is released would increase.

End of paper



2016 PRELIMINARY EXAMINATION 2
Secondary 4 Express

NAME

CLASS

INDEX NO

BIOLOGY

5158/02

Paper 2

24 August 2016

No Additional Materials are required

1 hour 45 minutes

Setter : Mrs. Dorothy Goh

READ THESE INSTRUCTIONS FIRST

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

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer **all** the questions.

Write your answers in the lined paper provided and, if necessary, continue on separate answer paper.

Write an E (for Either) or an O (for Or) next to the number **9** in the grid below to indicate which question you have answered.

You are advised to spend no longer than one hour on Section A and no longer than 45 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.

..... Parent's signature/ Date

For Examiner's Use	
Section A	
Section B	
7	
8	
9 ...	
Total	

Section A [50 marks]

Answer **all** the questions.

Write your answers in the spaces provided.

- 1 Fig. 1.1 shows the cross section of the human stomach and different types of cells found in the stomach epithelium.

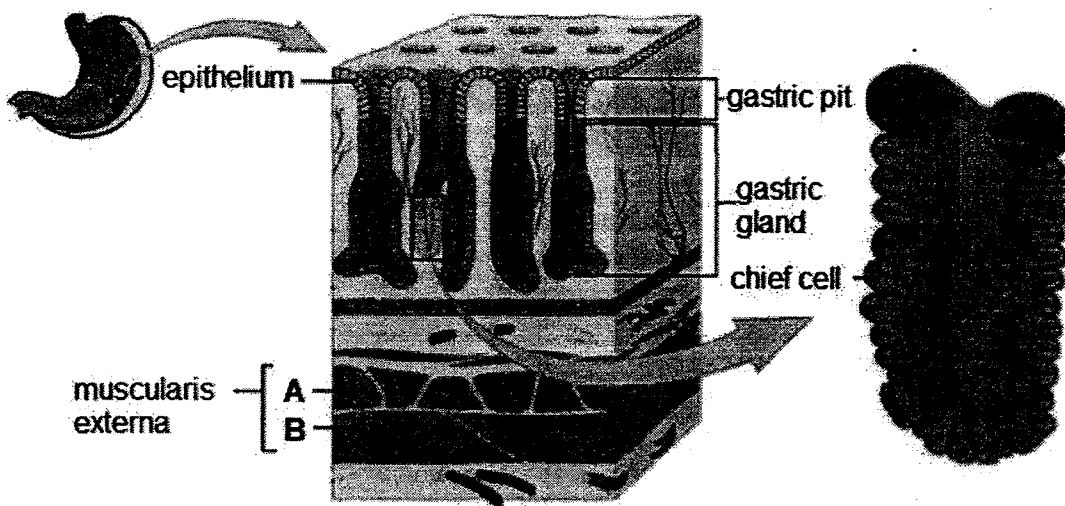


Fig. 1.1

- (a) (i) The muscularis externa layer in the stomach comprises a pair of antagonistic muscles. Identify muscles **A** and **B**.

A:

B: [2]

- (ii) Name and describe the process by which this muscle layer works in order for the stomach to produce chyme.

.....

..... [1]

- (b) The stomach lining is usually impermeable and only few substances are absorbed directly by the stomach. One such substance is alcohol.

- (i) State one short-term impact of excessive alcohol consumption.

.....

..... [1]

(ii) Alcohol is toxic if left to accumulate in the body. Describe how alcohol is removed from the body.

.....
.....
..... [2]

(c) Fig.1.2 shows the partial outline of a chief cell. Chief cells present in the epithelium secrete an inactive enzyme.

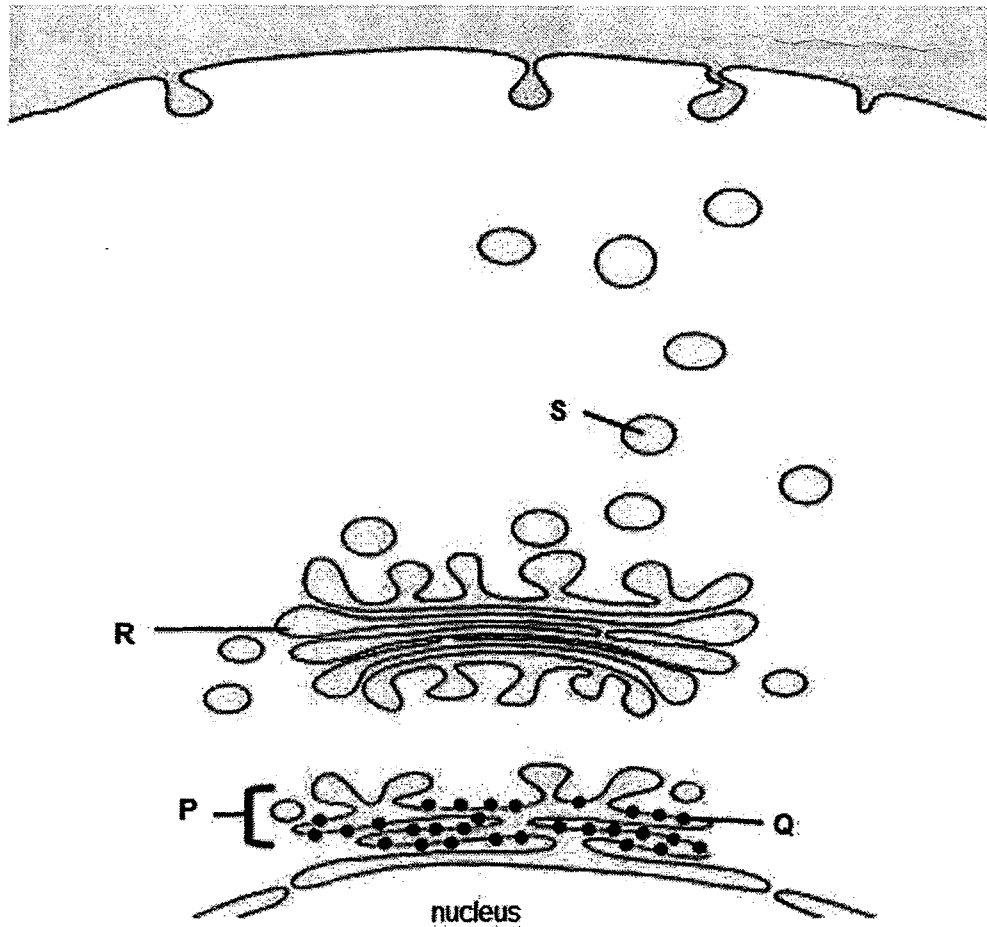


Fig. 1.2

With reference to letters **P – S** in Fig. 1.2, describe how the inactive enzyme is produced and eventually secreted out of the chief cell.

.....

.....

.....

.....

.....

[4]

[Total: 10]

2 Fig. 2.1 shows an experiment using germinating barley grains, three petri dishes were set up as shown in diagram 1 and left for 3 days.

A solution of iodine in potassium iodide was then added to the starch-agar substrate. The results are shown in diagram 2, in which the shaded areas are blue-black.

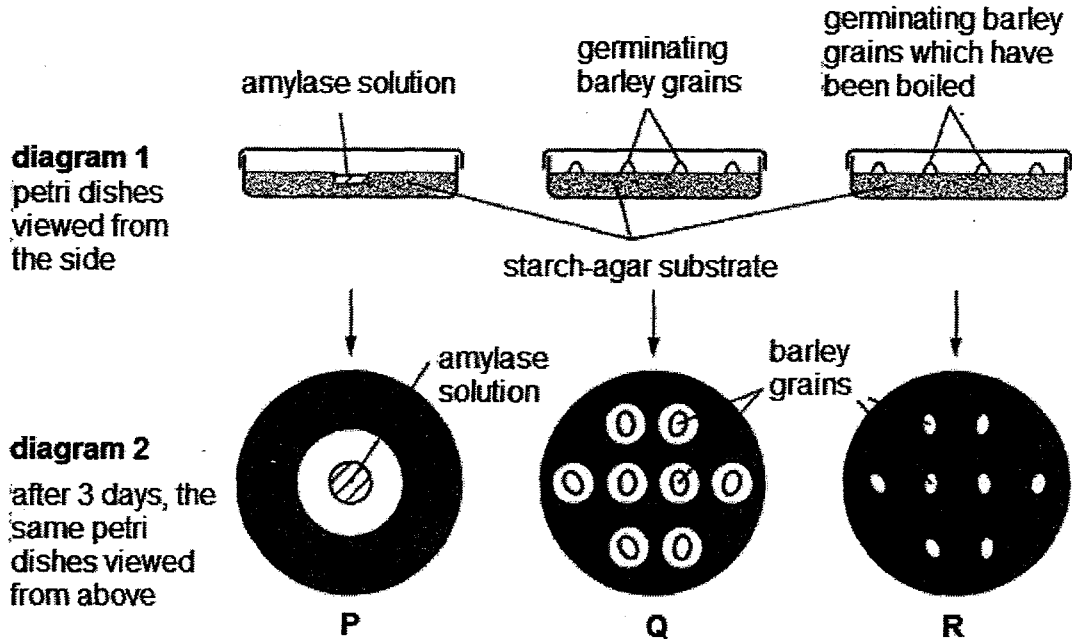


Fig. 2.1

(a) Suggest and explain the purpose of petri dish P.

.....
 [1]

(b) Explain the results for petri dish R.

.....

 [2]

- (c) Various concentrations of pepsin were added to egg white suspension and the time taken for the suspension to turn from cloudy to clear for each concentration is represented in Fig. 2.2.

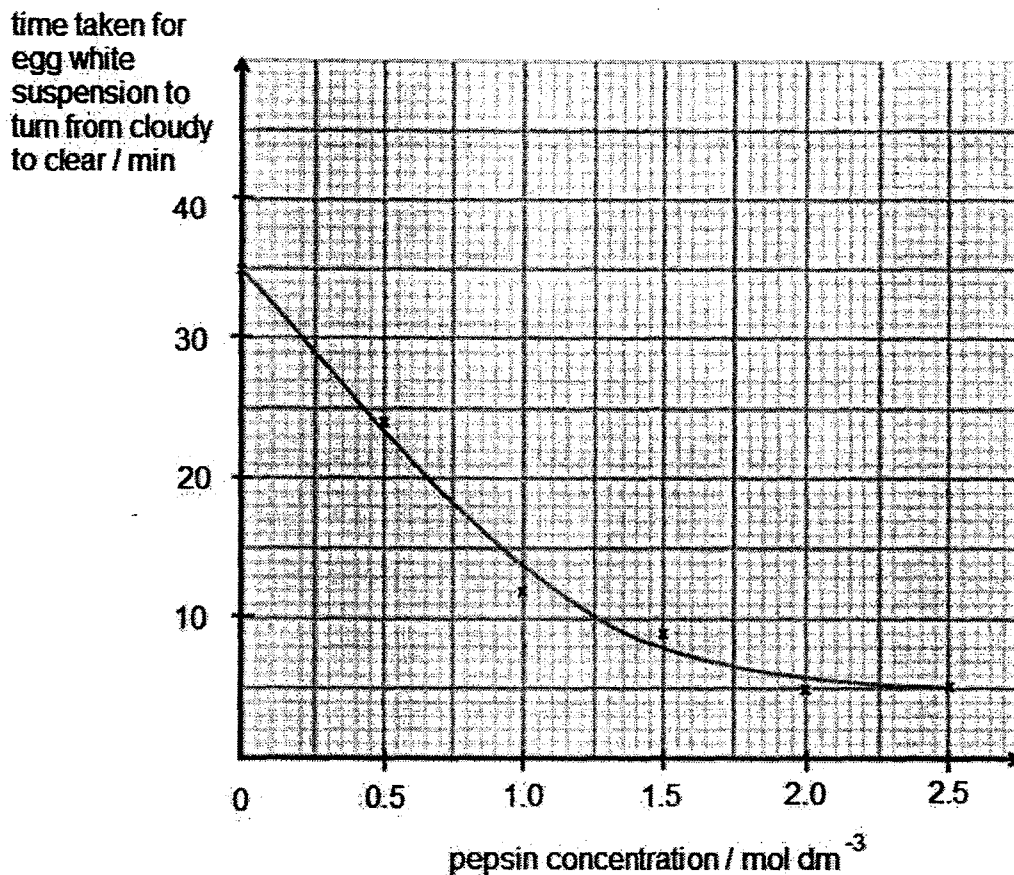


Fig. 2.2

- (i) With reference to Fig. 2.2, explain the shape of the graph when the pepsin concentration increases from 1.0 to 2.5 mol dm⁻³.

.....

 [2]

- (ii) State two factors that must be kept constant in this experiment.

.....

 [2]

- (d) Protein-digesting enzymes are synthesised inside cells as inactive 'proenzymes', which are then activated outside the cell.

Pepsinogen is a proenzyme and it is synthesised with an extra chain of 44 amino acids in the cell. Pepsinogen is secreted out of the cell and then converted to pepsin when this extra chain is cleaved off in the stomach. Pepsin is then able to digest proteins.

Fig.2.3 shows pepsinogen and pepsin.

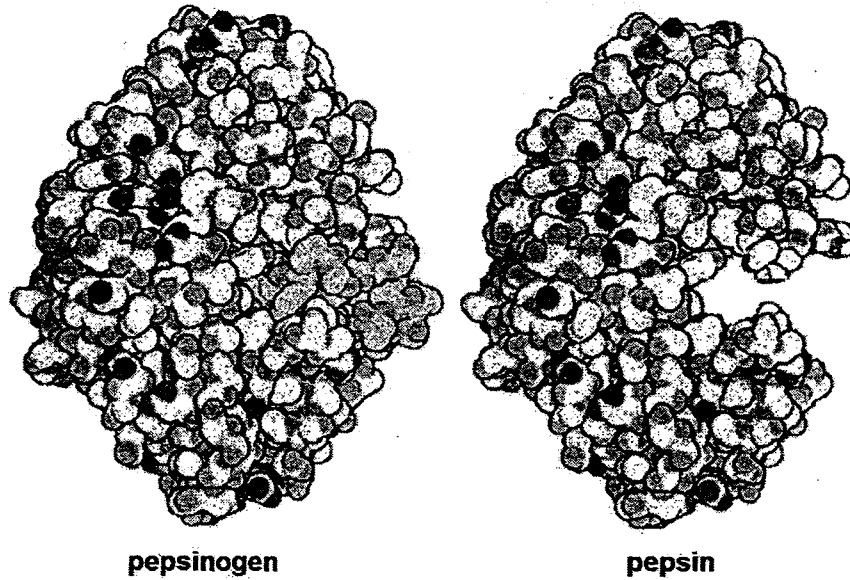


Fig. 2.3

Suggest how the extra 44 amino acids prevent pepsinogen from digesting proteins in the cell.

.....

.....

.....

..... [2]

[Total: 9]

- 3 A leaf from a balsam plant is exposed to radioactive isotope ^{14}C for a short period of time. The plant is frozen in liquid nitrogen to kill and fix it quickly. It is then placed onto a photographic film in the dark.

Fig. 3.1 shows the autoradiograph of the location of compounds containing ^{14}C isotope after the balsam plants are exposed to ^{14}C isotope for different time periods.

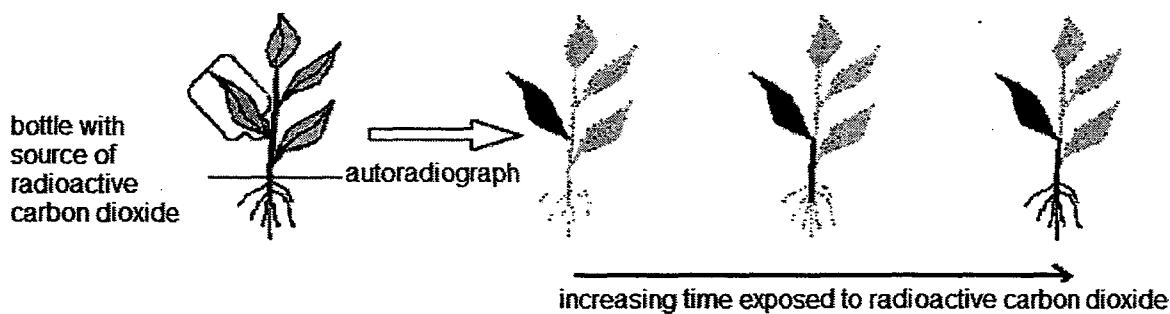


Fig. 3.1

- (a) Write down the balanced chemical equation for photosynthesis.

..... [2]

- (b) Explain the results observed in Fig. 3.1.

.....

 [2]

- (c) When fertilisers containing radioactive $^{15}\text{NO}_3^-$ (nitrates) was introduced to another balsam plant, radioactivity was detected in various parts of the plant as well. Explain this observation.

.....

 [2]

- (d) A capillary tube was inserted into the side of the plant stem and the liquid exuded was collected. State the expected observation when the exuded liquid is tested with different food tests.

food test procedure	observation
To the sample, sodium hydroxide solution was added. Copper (II) sulfate solution added drop wise to the mixture.	
To the sample, hydrochloric acid was added and mixture was heated. Benedict's solution was then added to the mixture and incubated in boiling water bath.	

[2]

[Total: 8]

- 4 Fig. 4.1 shows a piece of apparatus used to measure reaction time. As soon as the bulb lights up, the student being tested presses the switch. The reaction time, in seconds, is then displayed on the timer.

Ten students each have one attempt on the timer.

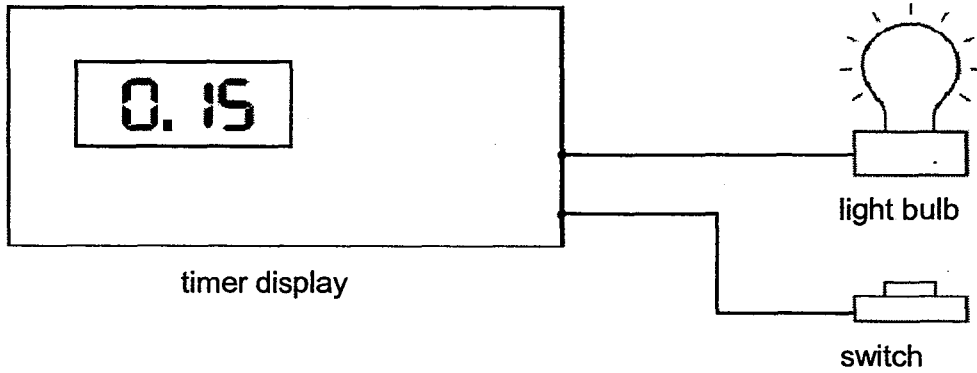


Fig. 4.1

The results of the investigation are shown in Fig. 4.2

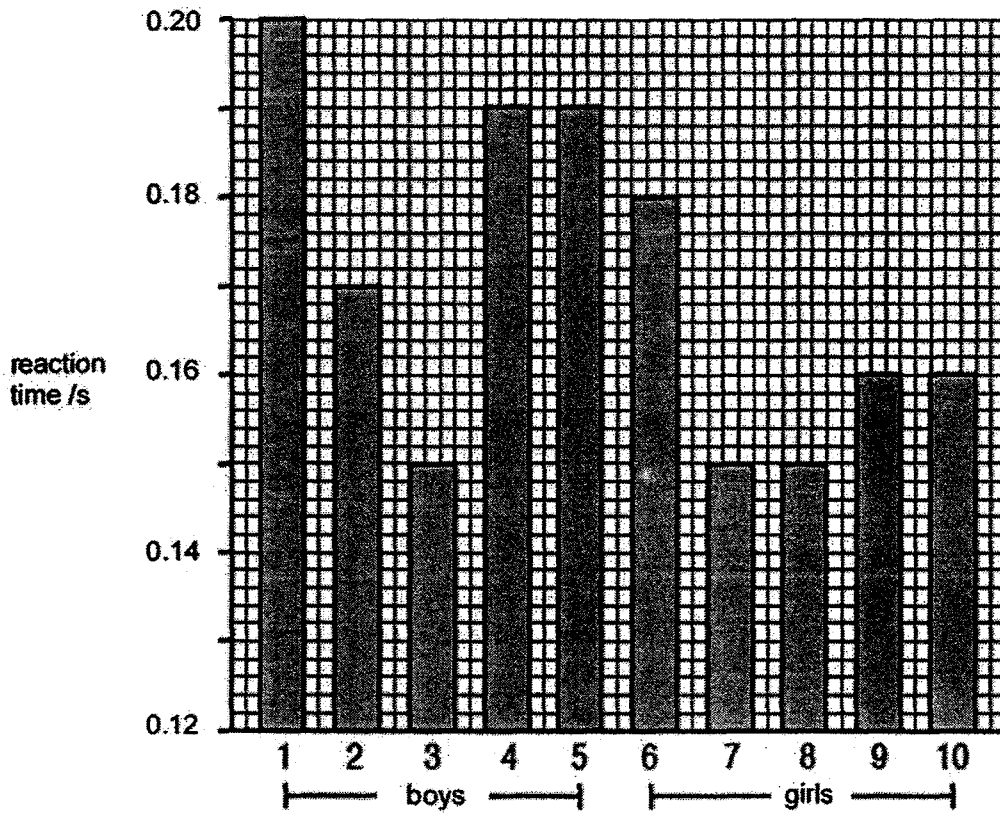


Fig. 4.2

- (a) Calculate the average reaction time for both boys and girls respectively. Show your working.

average reaction time for boys:s

average reaction time for girls:s [2]

- (b) Blinking is a reflex action. Fig. 4.3 shows what is happening as an eye blinks and then opens again.



Fig. 4.3

Suggest one reason why this reflex action is important to the body.

.....
..... [1]

- (c) Bobby once suffered an injury on a small portion of his spinal cord which resulted in the paralysis of his right leg. He is able to feel sensation on his right leg but is unable to move his right leg.

Outline the pathway of electrical impulses that took place in Bobby when his right leg touches a hot object.

.....

.....

.....

.....

.....

..... [4]

[Total: 7]

5 Fig. 5.1 shows the front view of the male reproductive system of humans.

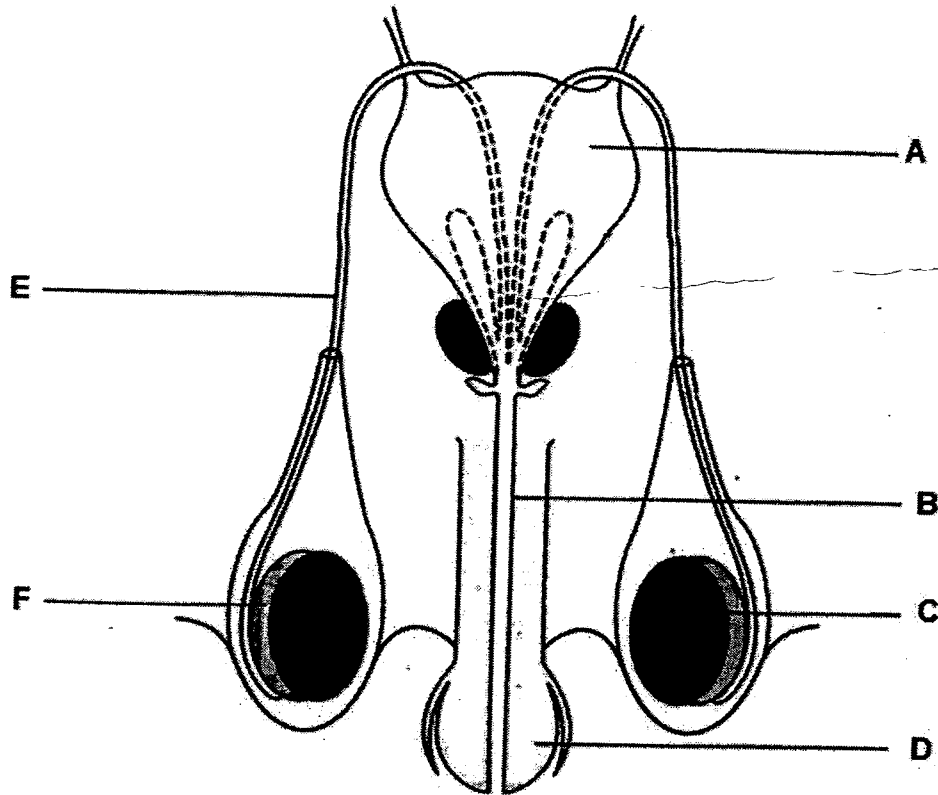


Fig. 5.1

(a) (i) State the letter and name the two labelled parts that will change their size significantly during certain physiological activities.

.....
 [2]

(ii) What structural features of the parts suggested in (a) (i) bring about their change in size. Explain your answer.

.....

 [4]

(b) Using letters in Fig. 5.1, indicate the pathway for the gametes produced by **C** to pass to the outside.

..... [1]

(c) A minor surgery to cut **E** on both sides was done on a 20-year old man. State one disadvantage of this method.

.....
..... [1]

[Total: 8]

6 Fig. 6.1 and Fig. 6.2 show the use of some scientific techniques in the process of reproduction. The animal used in this particular procedure was a sheep.

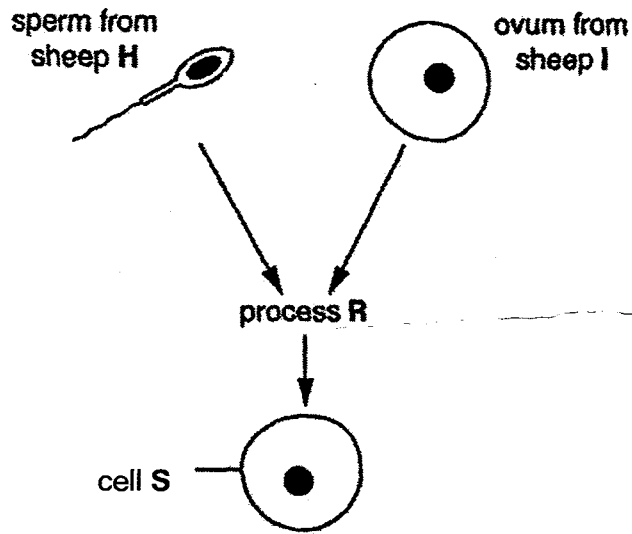


Fig. 6.1

(a) Describe the process R and explain the fate of cell S.

.....
.....
.....
.....
..... [3]

(b) The diploid number of chromosomes for a sheep is 54. State the number of chromosomes in

- (i) the sperm of sheep H
- (ii) cell S [1]

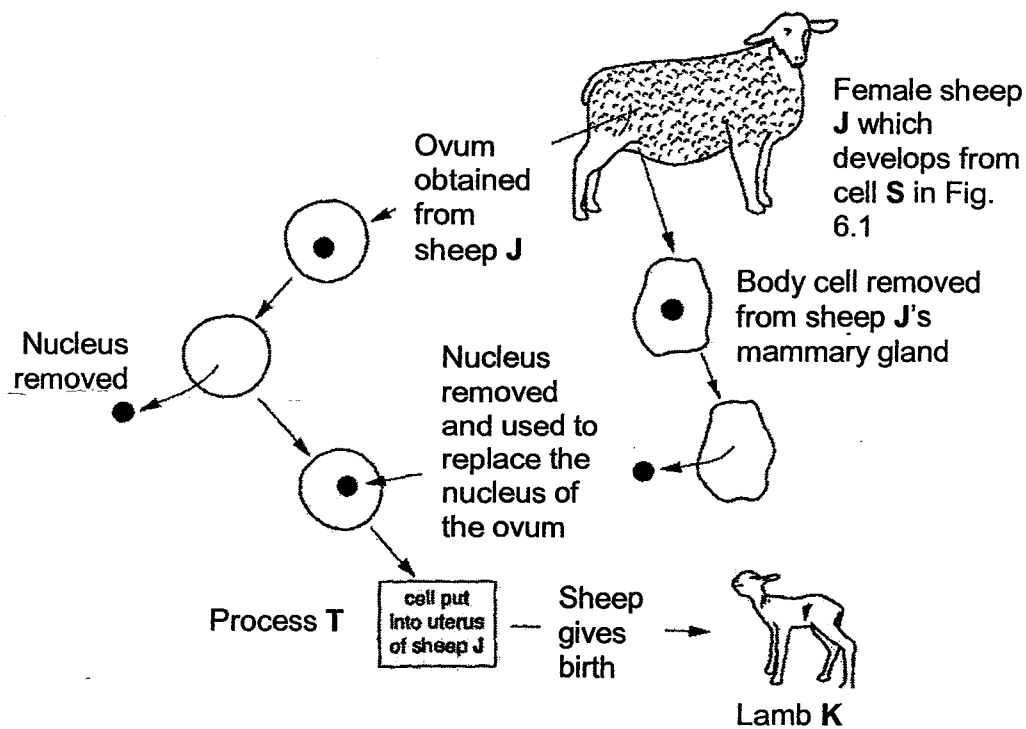


Fig. 6.2

- (c) Explain how the production of lamb K in Fig. 6.2 can be described as asexual reproduction.

.....

 [2]

- (d) Sex in sheep K is inherited in the same way as in humans. With reference to the sex chromosomes, suggest and explain the sex of the lamb K.

.....

 [2]

[Total: 8]

Section B

Answer **three** questions.

Question **9** is in the form of an **Either/Or** question.
Only one part should be answered.

7 Mammals have a double circulatory system. Blood flows between:

- 1- the heart and the lungs
- 2- the heart and the rest of the body (systemic circulation)

Fig. 7.1 shows a cross section of an artery.

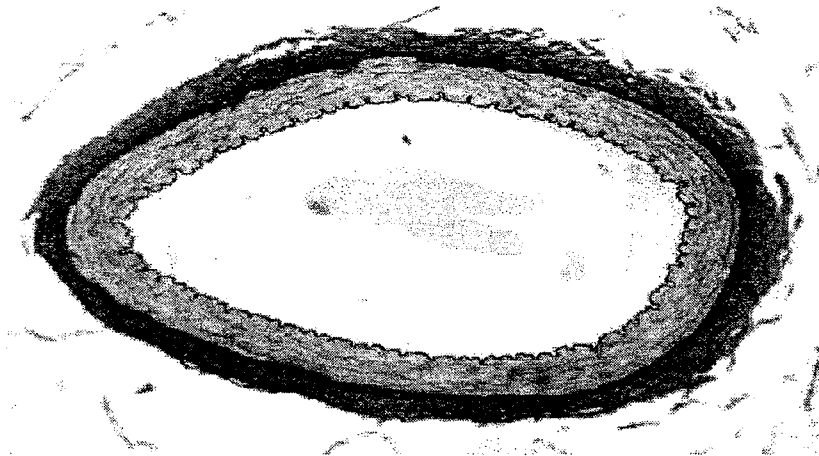


Fig. 7.1

(a) Explain the relationship between the function and the structure of the artery as shown in Fig. 7.1

.....

.....

.....

.....

.....

.....

.....

.....

[2]

- (b) Fig. 7.2 shows both the total cross sectional area of the blood vessels in the systemic circulation and the changes that occurs in blood pressure and the speed (velocity) of blood in different blood vessels.

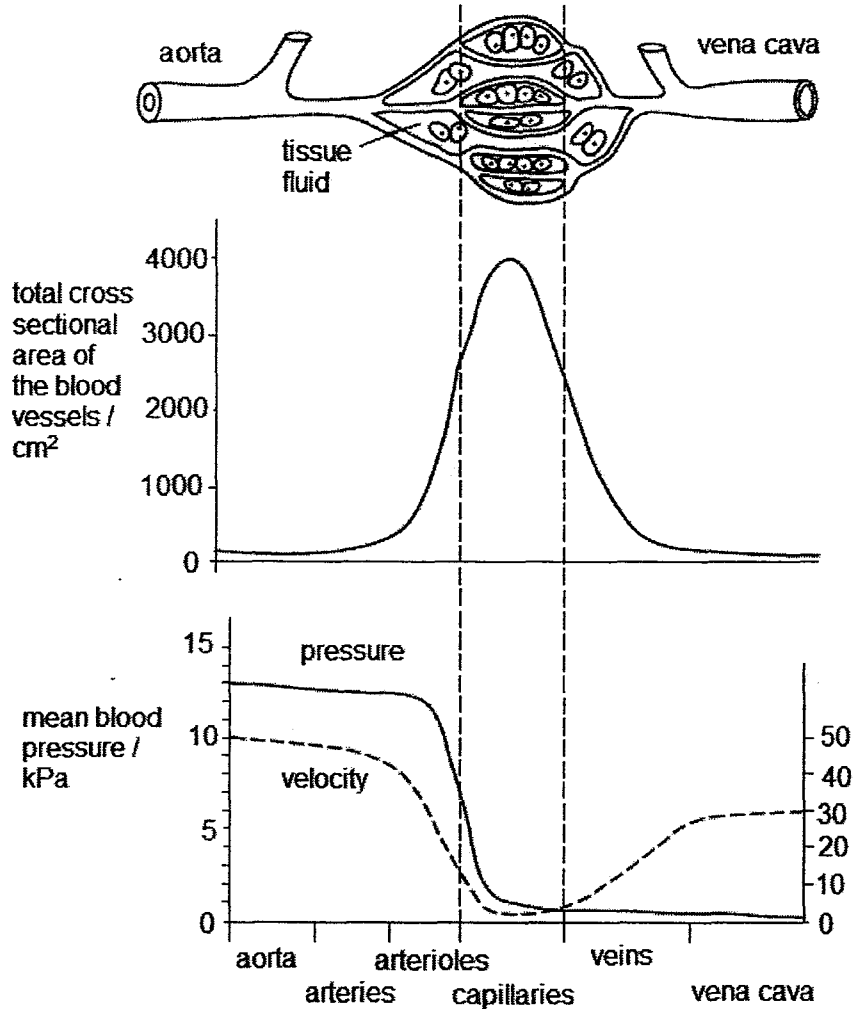


Fig. 7.2

- (i) State the maximum mean blood pressure in the aorta.

..... [1]

- (ii) Describe how the mean blood pressure and speed of blood change with cross-sectional area of blood vessels, as shown in Fig. 7.2

blood pressure:

.....

.....

.....

speed (velocity) of blood:

.....

.....

..... [2]

(c) Fig. 7.3 shows an enlarged part of the lungs of human.

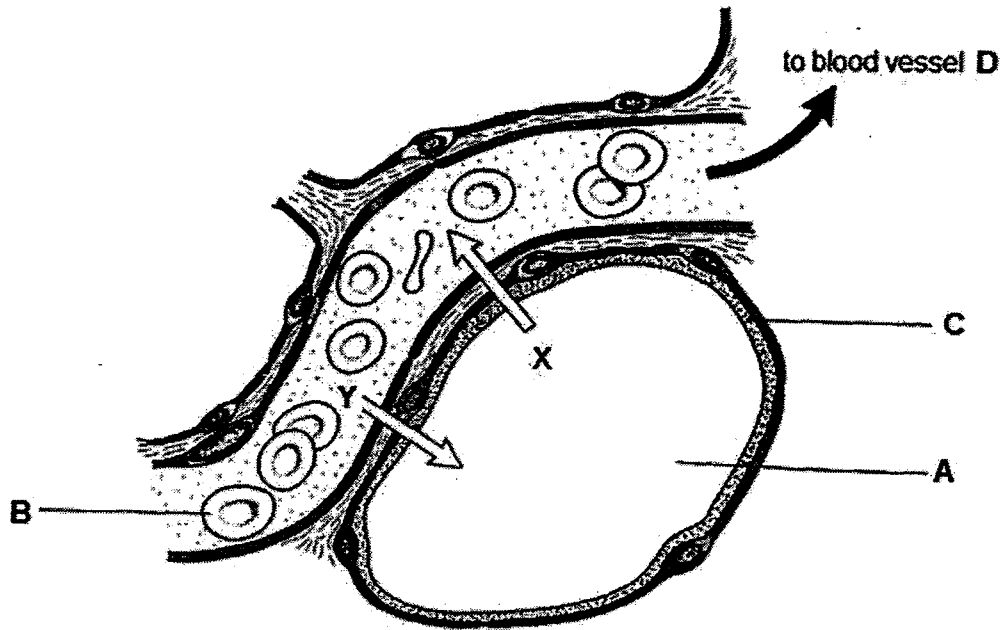


Fig. 7.3

(i) State the importance of C.

.....

..... [1]

(ii) Describe and explain what happens to gas X carried by B after reaching the body tissue.

.....

.....

.....

..... [2]

(iii) Explain why heavy cigarette smokers have more dust particles deposited in **A** than non-smokers.

.....

.....

.....

..... [2]

[Total:10]

(c) Explain how urine production in the person would vary on both days.

.....

.....

.....

..... [3]

[Total:10]

Either

9 Fig. 9.1 shows a longitudinal section of the jute flower.

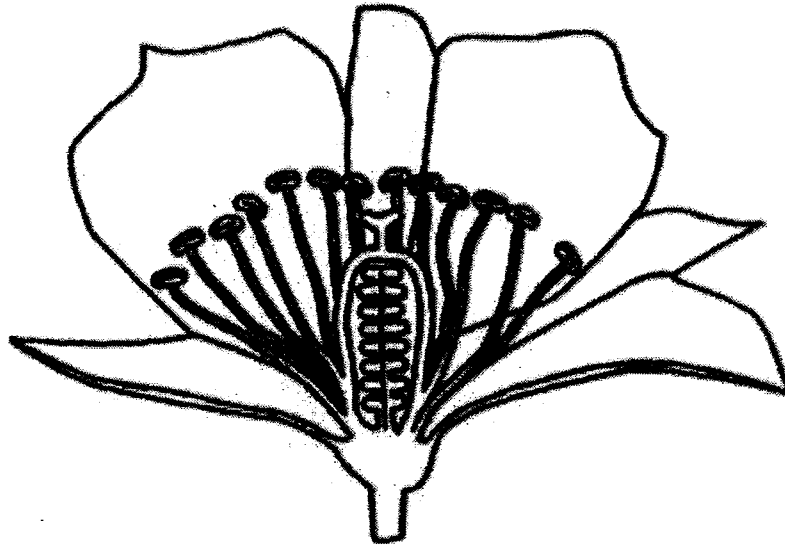


Fig. 9.1

(a) (i) Suggest the mostly likely method by which pollination is carried out in this flower.

..... [1]

(ii) State two features shown in Fig. 9.1 that supports your answer in (a)(i).

.....

 [2]

(b) (i) Samantha wanted to show that the jute flower could not produce fruit unless it is pollinated. She covered an unopened jute flower with a clear plastic bag and inspected the flower every day but was surprised to see a fruit appear two weeks later.

Explain how the flower could have been pollinated.

.....
 [1]

- (ii) Suggest an improvement to her experiment that she could have made to ensure that no pollination occurred.

.....
..... [1]

- (c) Fig. 9.2 represents the nucleus of the pollen grain obtained from the jute flower showing the early prophase of mitosis.

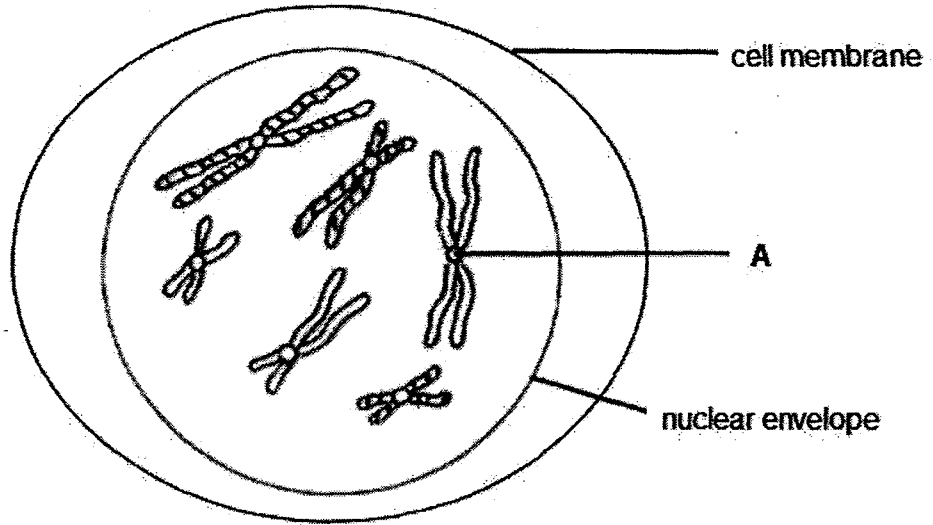


Fig. 9.2

- (i) Identify structure A.

..... [1]

- (ii) In the space below, draw an labelled diagram to indicate what happens in this cell during metaphase I.

[2]

(iii) Fig. 9.3 shows the change in the amount of DNA in the same cell at different stages of the cell cycle.

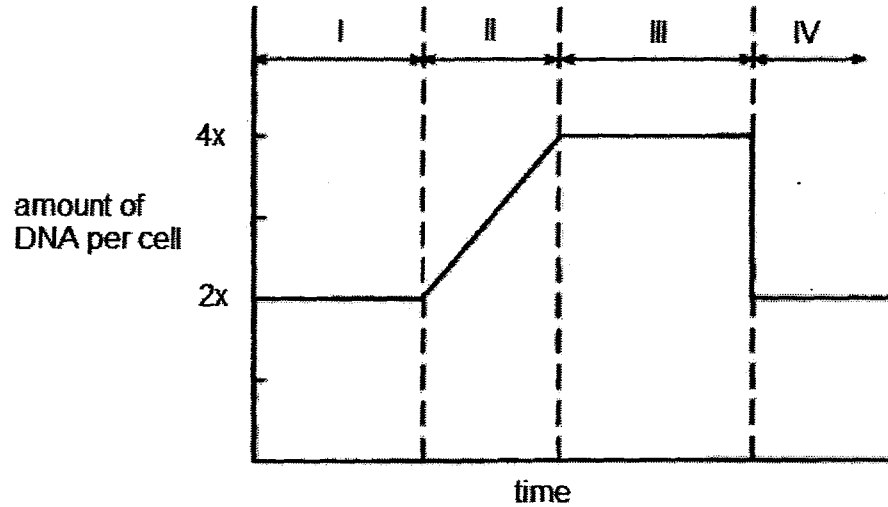


Fig.9.3

The amount of DNA per cell changed during both stages II and IV. Describe and explain why these changes occurred.

Stage II

Stage IV [2]

[Total:10]

Or

9 Fig. 9.1 shows changes in carbon emission from the burning of three fossil fuels between 1800 and 2000.

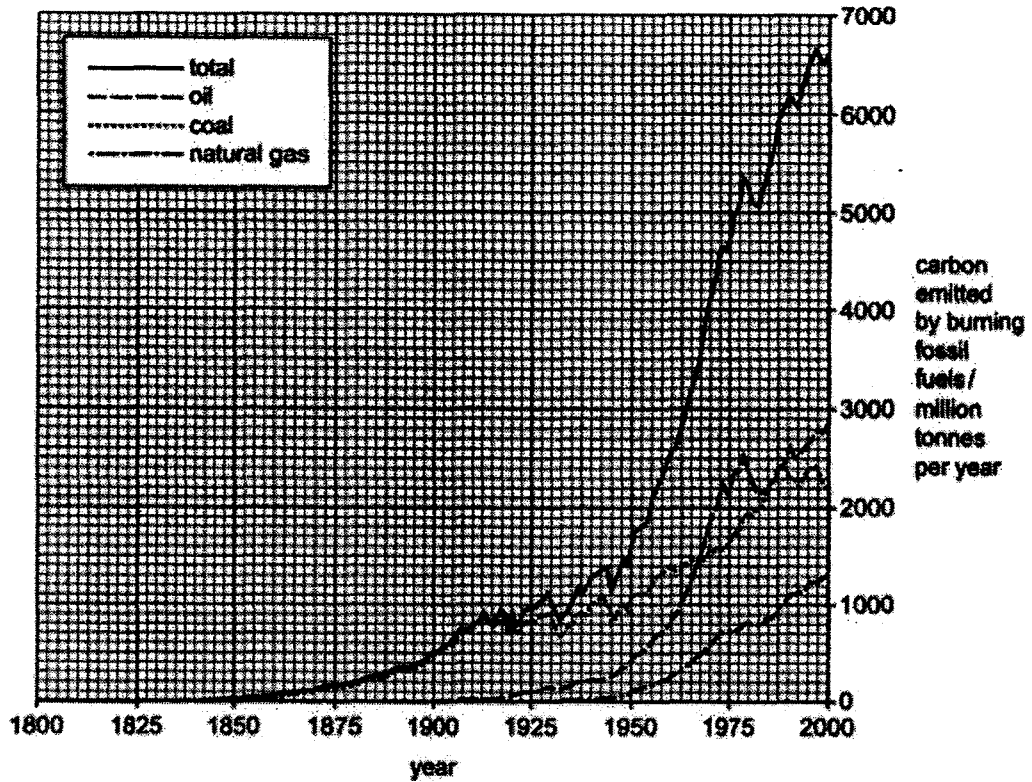


Fig. 9.1

(a) Use the information in Fig. 9.1 to describe the changes in carbon emissions from the burning of fossil fuels between 1800 to 2000.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[5]

(b) Deforestation often involves felling of trees and the burning of the unwanted remains.

(i) Name the process that is disrupted when trees are felled.

..... [1]

(ii) Describe and explain how this process stated in **(b) (i)** affects the carbon cycle.

.....
.....
.....
.....
.....
.....
..... [2]

(c) Explain the term 'carbon sink' and using a named example other than forest, outline the role it plays to maintain the carbon cycle.

.....
.....
..... [2]

[Total:10]

End of paper

[Turn Over

PRELIMINARY EXAM 2 (2016)
SECONDARY 4 EXPRESS
PURE BIOLOGY
MARKING SCHEME

Paper 1 – Multiple Choice Questions (40 marks)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
C	B	D	D	A	D	D	A	D	D

Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
A	D	D	B	D	B	D	C	B	C

Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
C	C	C	C	A	B	D	B	C	A

Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
B	D	B	A	B	C	B	B	B	B

Paper 2 Section A – Structured Questions (50 marks)

1	a	(i)	A: circular muscles B: longitudinal muscles	1 1
		(ii)	Peristalsis; refers to the <u>wave-like, rhythmic contractions</u> of the muscles/ When circular muscle contracts, longitudinal muscles relax and vice versa	½ ½
	b	(i)	<i>*Any one answer</i> <ul style="list-style-type: none"> • Blurred vision, • slurred speech, • vomiting, • dizziness, • <u>longer / increased reaction time, slower reaction speed,</u> • <u>dehydration / reduced water potential of blood,</u> • <u>loss of balance / poor muscle coordination / unable to walk properly.</u> • <i>Reduced ability to make rational decisions</i> • <i>rash behavior / loss of self-inhibition / reduced self-control.</i> 	1

	(ii)	Alcohol is sent to liver; <i>At the liver...</i> ; and converted to acetaldehyde; in a reaction catalysed by enzyme alcohol dehydrogenase; acetaldehyde is further broken down into glucose/products used for respiration	½ ½ ½ ½
c		<ol style="list-style-type: none"> Ribosomes (Q) produce the inactive enzyme; which are then transported by RER (P) / <u>pinch off</u> from RER; and <u>secreted as vesicles</u>; The vesicles <u>fuse with</u> one end of the Golgi apparatus (R); and are stored, chemically modified and packaged; before they pinch off at other end of GA as vesicles (S) and fuses with the cell surface membrane to release inactive enzyme <p>Any 4</p>	1 1 1 1 1
Total			10

2	a	It acts as a <u>control</u> to test/show/prove that amylase is the enzyme (responsible for) that <u>breaks down</u> the <u>starch</u> in the agar.	1
	b	<ul style="list-style-type: none"> Barley grains were boiled, hence the <u>amylase /enzymes</u> in the grains were <u>denatured</u>. Active site is <u>no longer complementary</u> to the shape of starch / starch molecules <u>cannot fit into the active site</u> of amylase → Thus, starch is not broken down. 	1 1
	c (i)	<ul style="list-style-type: none"> From 1.0 to 2.5 mol dm⁻³, there is a <u>slow down in the decrease in time taken / the fall in the time taken become more and more gradual / gradient of curve becomes increasingly gentle (less steep)</u> as pepsin concentration increases This is because there is <u>maximum number of enzyme-substrate complex formed / pepsin concentration is no longer the limiting factor</u> hence any further increase in pepsin will not increase the rate of enzyme reaction. 	1 1
	c (ii)	<p>Any 2</p> <ul style="list-style-type: none"> <u>Temperature</u>; (of experiment / of XXX) <u>pH</u>; (of experiment / of XXX) <u>Amount / concentration / volume</u> of egg white suspension <u>Amount / volume</u> of pepsin solution; 	M ax 2
	d	<ol style="list-style-type: none"> The 44 amino acids <u>occupies / block / covers / binds to</u> the <u>active site</u>; This prevents proteins <u>from binding to / coming into contact with</u> 	1 1

	<i>/ fitting into the active site / active site is no longer complementary to the shape of the substrate proteins, thus preventing pepsinogen from digesting the proteins in the cell.</i>	
		Total 9

3	a	$6\text{CO}_2 + 12\text{H}_2\text{O} \rightarrow 6\text{O}_2 + 6\text{H}_2\text{O} + \text{C}_6\text{H}_{12}\text{O}_6$ (Conditions: chlorophyll and light energy)	1 1
	b	Radioactive $^{14}\text{CO}_2$ is taken in and used for photosynthesis, and is reduced to form glucose. Glucose is converted to sucrose and transported to roots by phloem. R: glucose transported to roots in the phloem R: sucrose diffuses to the roots	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	c	Radioactive nitrates moves into the <u>roots</u> via diffusion or active transport. Any of the following: <ul style="list-style-type: none"> The radioactive nitrates react with glucose produced to form amino acids and proteins, which is transported to all parts of the plant to build protoplasm/ for growth The radioactive nitrates are transported from roots to other parts of the plant through the xylem via transpiration pull 	1 1
	d	Food test 1: solution remained blue Food test 2: a brick-red precipitate is observed. (Accept: solution remained blue) R: no change is observed (vague)	1 1
Total			8

4	a	$0.20 + 0.17 + 0.15 + 0.19 + 0.19 / 5 = 0.18 \text{ s}$ $0.18 + 0.15 + 0.15 + 0.16 + 0.16 / 5 = 0.16 \text{ s}$	1 1
	b	Any of the following for [1]: <ul style="list-style-type: none"> It protects the <u>cornea</u> from dust / injury. It protects the <u>retina</u> from bright light. It keeps the eye surface moist with tears. Reject: allows body to react to danger or environment changes (vague)	max 1
	c	Heat is sensed by <u>thermo receptors</u> in the skin, and an electrical impulse is produced. The impulse is transmitted down the <u>sensory neurone</u> to the spinal	1 1

	<p>cord.</p> <p>At the spinal cord (grey matter), impulse is transmitted by the relay neurones up to the brain to produce the feeling of hotness.</p> <p>Relay neurones also transmit impulses to the motor neurones, but the motor neurons are damaged so no impulse is transmitted to muscles for muscles to contract.</p> <p>(Accept: relay neurones are unable to transmit impulses to motor neurones)</p>	<p>1</p> <p>1</p>
--	--	-------------------

5	ai	A is the urinary bladder. D is the penis.	1 1
	aii	The wall of A is composed of elastic fibres which enable it to enlarge when it is filled with urine. The wall of A is also composed of muscles which contract voluntarily to expel urine out of the body and reduce bladder size. D is composed of spongy / erectile tissues with many blood capillaries filled with blood to enlarge it during sexual arousal. After ejaculation of sperms the lowering of blood pressure causes D return to original smaller / limp form (Reject: erector muscle)	1 1 1 1
	b	C → F → E → B <i>no marks awarded for any wrong order or missing steps</i>	1
	c	The method is irreversible. Accept: The man will not be able to have children anymore / the man will be infertile forever. Reject: the man cannot <u>produce</u> sperms	1
Total			3

6	a	Process R, which is fertilisation, involves the fusion of the nuclei of two gametes (sperm and ovum) to produce cell S, zygote. Cell S will move to the uterus for implantation and development to become an embryo before further developing into a foetus. (Accept: ref to mitosis after fertilisation)	1
	bi	27	½
	bii	54	½
	c	As the nucleus removed from a mammary gland in sheep J is used to produce lamb K, <ul style="list-style-type: none"> • lamb K is <u>genetically identical</u> to sheep J. • lamb K is produced by one parent, sheep J, only. • no fusion of gametes is involved. 	1 1 1
d	Lamb K is a female. Any of the following: <ul style="list-style-type: none"> • Lamb K inherits two X chromosomes from Sheep J, a female sheep • Lamb K is genetically identical to sheep J, a female sheep • Sheep J can only [Accept any reasonable reason]	1 1	
Total			8

Section B - Free Response (30 marks)

7	a	<ul style="list-style-type: none"> • thick, wall; [Structure] withstands (blood) pressure; [function] • muscular tissue; [Structure] vasoconstriction/ vasodilation; [function] • elastic (tissue); [Structure] recoils to maintain (blood) pressure/ smoothes out blood flow; [function] • small lumen; [Structure] maintains (blood) pressure; [function] <p><i>(Any 2), (must be paired to get [1])</i></p>	Max of 2 pairs
	bi	13 kPa; (units must be present)	1
	bii	<ol style="list-style-type: none"> 1. blood pressure decreases as cross-sectional area increases to capillaries; 2. continues to decrease/remains constant, as cross-sectional area decreases in the veins; 3. speed of blood decreases as cross-sectional area increases in the capillaries; 4. increases as cross-sectional area decreases in, <u>veins / vena cava</u>; <p><i>(Any 2, the trend must be presented with data)</i></p>	1 1 1 1
	ci	C dissolves oxygen To enhance the diffusion of oxygen across the walls of the alveolus / air sac	$\frac{1}{2}$ $\frac{1}{2}$
	cii	The low oxygen concentration in tissue causes the oxyhaemoglobin in B to dissociate Oxygen will diffuse into the body cells for aerobic respiration by mitochondria to oxidise food to release energy	1 1
	ciii	Cigarettes smoke damages the cilia of the trachea. This reduces the filtering ability of the respiratory tract by preventing dust particles from being swept up Hence, the dust particles remains in the lungs.	1 1
Total			10

8	a	1. Excess heat in skin stimulates temperature receptors to send nerve impulse to hypothalamus of brain which then sends nerve impulses to relevant parts of the body.	1
		<u>Any 4 of the following</u>	1
		2. Shunt vessels constrict, arterioles under skin dilate / vasodilation	1
		3. Blood flow to skin increases, heat is lost through radiation, convection and, to some extent, conduction	1
		4. <u>Sweat glands actively produce sweat</u> , more water in sweat evaporates from skin surface	1
		5. To remove latent heat of vaporisation.	1
		6. Hair erector muscles relax to trap less heat on skin surface	
	b	Day 2 is more humid than day 1.	1
		Sweat produced cannot readily evaporate from skin surface to dissipate heat/ remove latent heat of vaporisation/ heat stroke may result/ more heat generated than released.	1
	c	Lower rate of sweat production on day 2 than on day 1 since the sweat produced is unable to evaporate off due to the high humidity.	1
		More urine is produced on day 2 than on day 1.	1
		More anti-diuretic hormone is produced on day 1 to reabsorb water,	1
Total			10

Most students answered this question

Either

9	ai	Insect pollinated	1
	aii	Large petals Enclosed carpel Non-feathery stigma Non-pendulous stamen (any two answers)	Max 2
	bi	Pollen grains from the anthers could have fallen on the stigma, allowing self-pollination to occur.	1

		Rej: quoting self pollination without explanation	
	bii	Remove the anthers or stigma OR Cover the anthers or stigma with a bag before covering the flower with another bag	1
	ci	centromere	1
	cii	Shows 6 homologous chromosomes paired up along the equator Spindle fibres attached to the centromere Shows crossing over has occurred Absence of nuclear membrane	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	ciii	Stage II: DNA replication has occurred to double the amount of DNA Stage IV: Cytokinesis occurred so that the amount of DNA is divided equally between 2 daughter cells	1 1
		Total	10

OR

9	a	Phase 1 1800-1850 : Little / very little increase	1
		Phase 2 1850 - 1950 : all have increases ; coal started from 1850, petroleum from 1920, gas shows a steady increase from late 1940 to 2000	1 1
		Phase 3 1990s : coal reached a peak and showing slight decline	1
		1950-1970s : steep increase in use of oil before it shows that the use of oil decreased in 1975s	1
	bi	Photosynthesis	1
	bii	<ol style="list-style-type: none"> 1. When the trees are removed, the rate of photosynthesis reduces 2. Hence carbon dioxide will not be removed from the surrounding 3. The level of carbon dioxide will increase 4. Heat is trapped and thus leading to global warming 	1 1
	c	Carbon sink is anything that adsorbs more carbon than it releases Ocean plays a critical role in soaking up some of the greenhouse gas emissions thus maintaining a balance in the atmosphere.	1 1
			10

END OF MARKER'S REPORT

