Geylang Methodist School (Secondary)
Preliminary Examination 2017

BIOLOGY
Paper 1

5158/01
Sec 4 Express

Additional materials: Optical Answer Sheet

1 hour

Setter: Mrs Cheryl Tang

29 Aug 2017

READ THESE INSTRUCTIONS FIRST

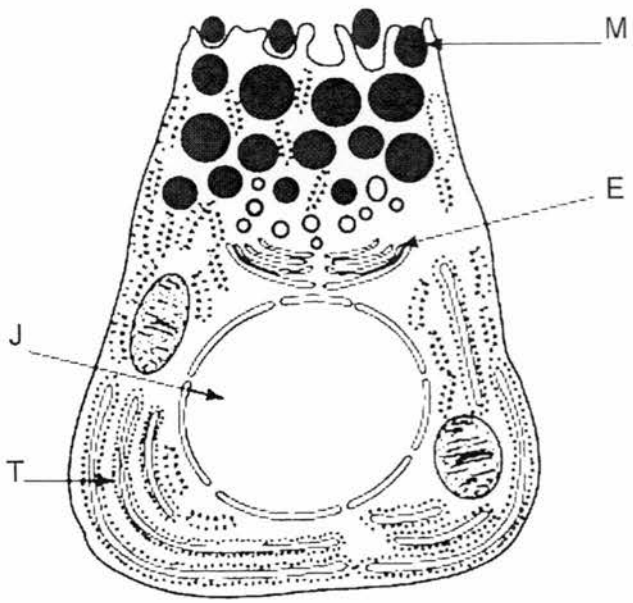
Write in soft pencil.
Do not use staples, papers clips, highlighters, glue or correction fluid on the Optical Answer Sheet.
Write your name, class and index number on the Optical Answer Sheet provided.

There are **forty** 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 booklet.

1 The diagram below shows a pancreatic cell.



The order in which the parts of the cell play a role in the production and secretion of enzymes is

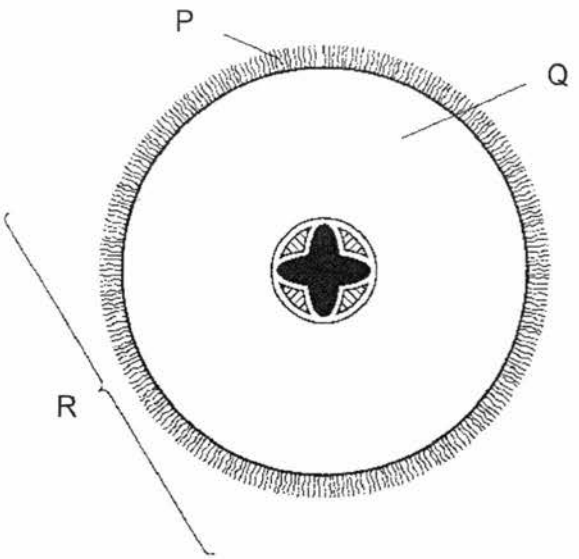
A M, E, J, T

B T, J, M, E

C J, T, E, M

D E, M, T, J

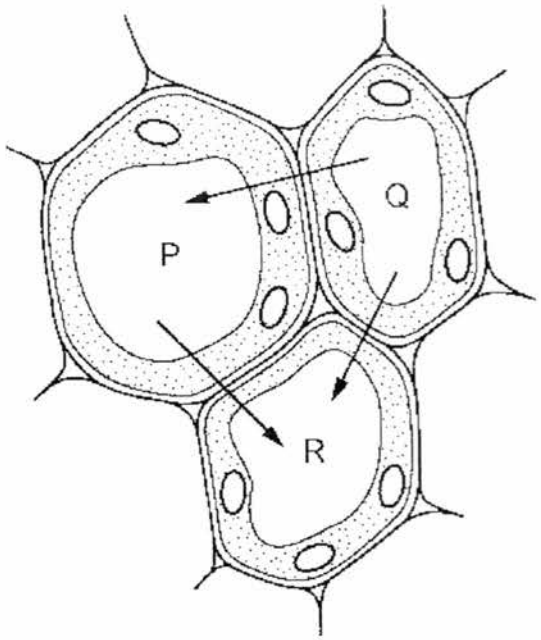
2 The diagram shows a section through a root.



What are the levels of organisation of the labelled structures?

	cell	organ	tissue
A	P	Q	R
B	P	R	Q
C	Q	R	P
D	R	Q	P

3 The diagram shows three plant cells labelled P, Q and R. The arrows show the direction of water movement by osmosis.



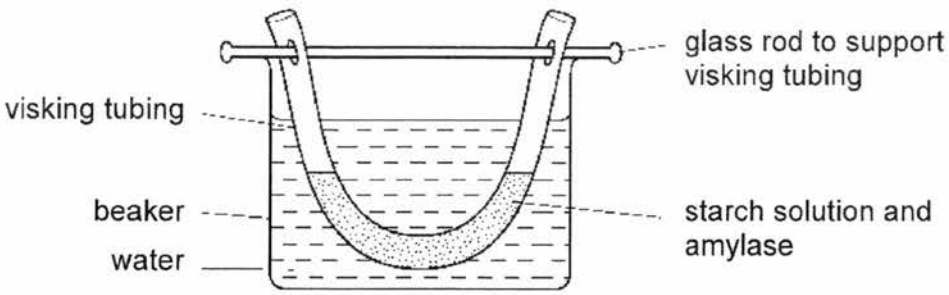
What is the correct order of water potential in the cells, from the highest to the lowest?

	highest	middle	lowest
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	R	P	Q

4 Which processes are responsible for the uptake of ions from the soil by a plant and the uptake of glucose into the villi of a human?

	uptake of ions by a plant	uptake of glucose into the villi
A	active transport	active transport
B	active transport	osmosis
C	diffusion	osmosis
D	osmosis	active transport

5 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.

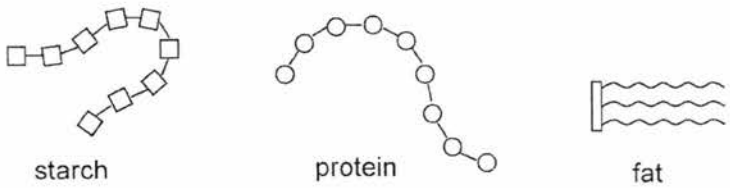


After one hour, samples of water in the beaker are tested with Benedict's solution and with iodine solution.

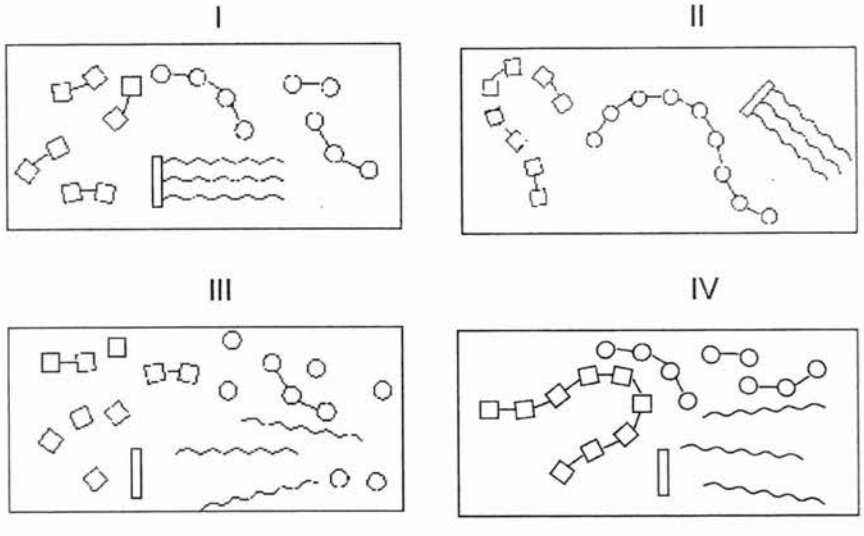
Which colours are obtained?

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

6 The diagrams below represent food molecules of starch, protein and fat.



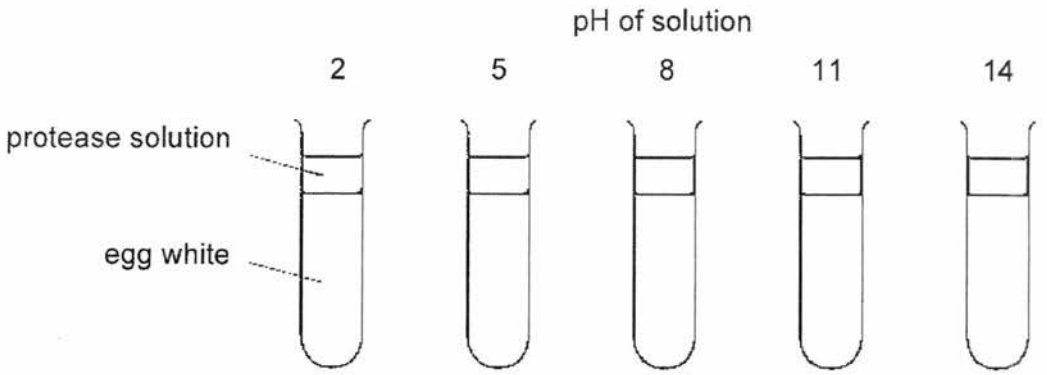
The following shows the mixtures of food taken from part of the human alimentary canal during digestion of the above food molecules.



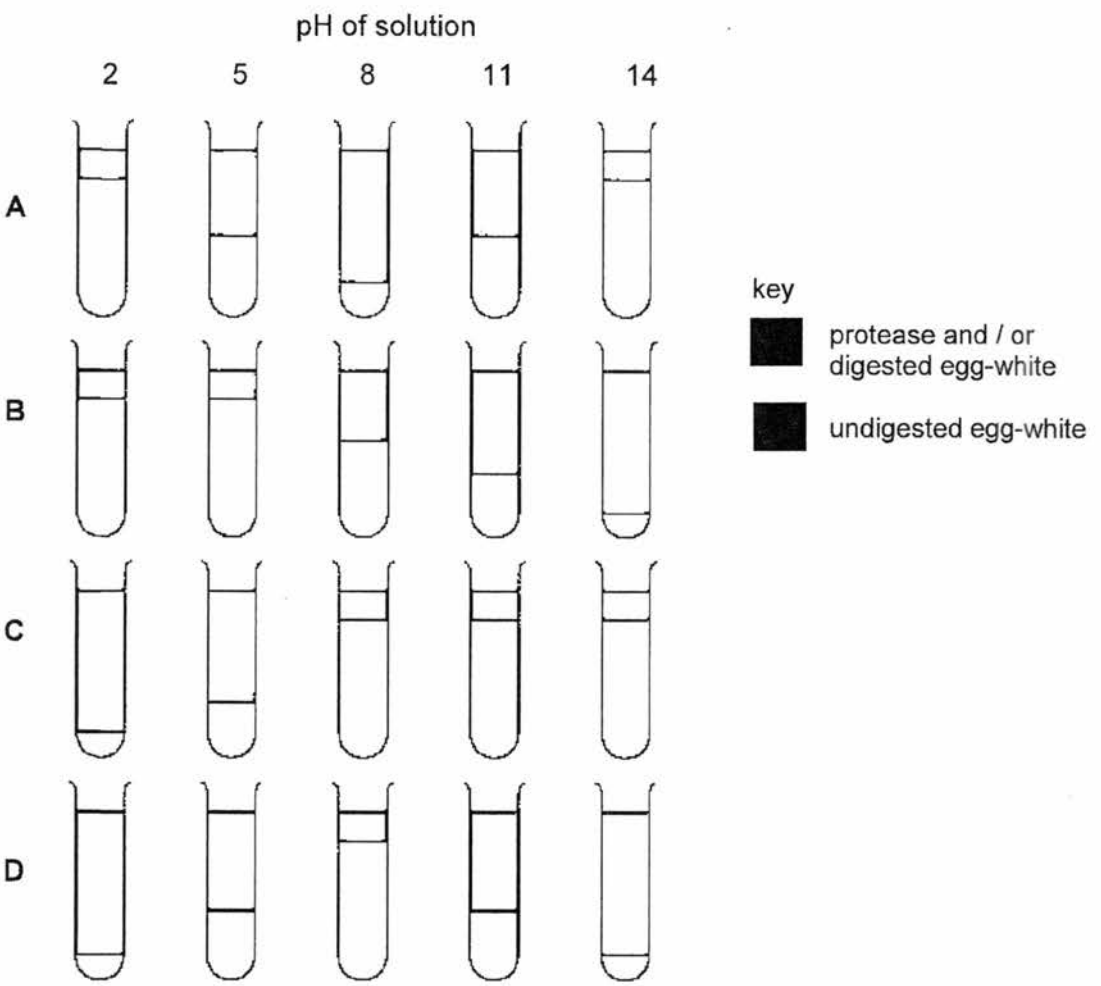
Which of the following gives a correct identification to the locations of the food molecules?

	mouth	stomach
A	I	III
B	II	I
C	II	III
D	IV	III

7 Five tubes containing cooked egg-white are set up as shown. Protease solutions of different pH are added to each tube.

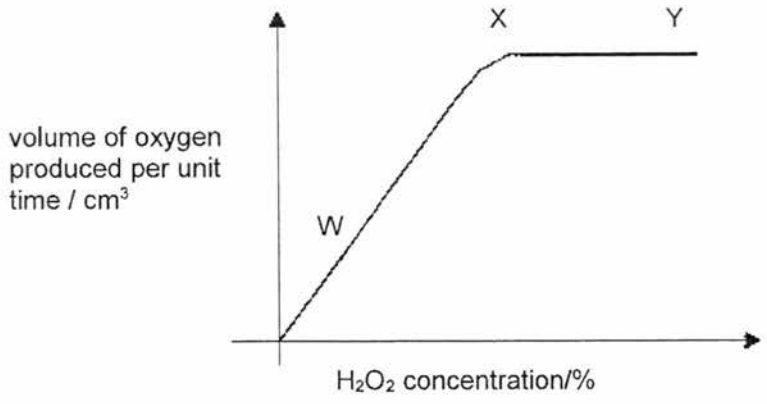


Which diagram shows the results of this experiment for a protease from the stomach?



8 Hydrogen peroxide (H_2O_2) decomposes naturally into oxygen and water. The rate of this reaction can be increased by the addition of the enzyme, catalase.

A student investigated the effect of hydrogen peroxide concentration on the rate of catalase activity and the graph below was obtained.



Which statement about the graph is incorrect?

A Between X and Y, the number of catalase molecules is limiting.

B Between X and Y, the number of H_2O_2 molecules is limiting.

C Between W and X, the number of H_2O_2 molecules is limiting.

D Between X and Y, the concentration of oxygen remains the same.

9 The liver of a mouse was removed surgically and the hepatic portal vein was connected to the hepatic vein. Measurements of amino acids and urea concentration in the blood were carried out.

Which one of the following would be expected during the next 24 hours?

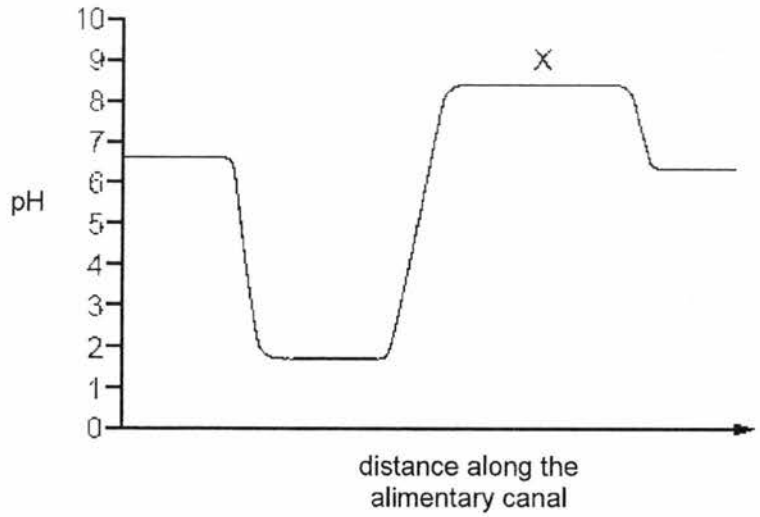
A a decrease in both the amino acid and urea concentrations

B a decrease in the amino acid concentration and an increase in the urea concentration

C a decrease in the urea concentration and an increase in the amino acid concentration

D an increase in both the amino acid and urea concentration

10 The graph shows how the pH changes along the alimentary canal.



What is the region labelled X?

A large intestine **B** oesophagus

C small intestine **D** stomach

11 If a green plant was fed with water containing radioactive oxygen (^{18}O), radioactivity would finally be located in

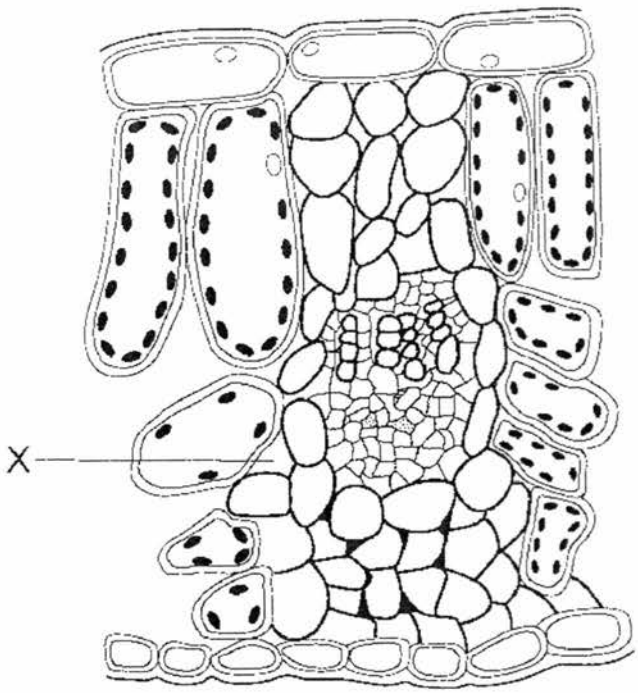
A the carbon dioxide formed in respiration.

B the cellulose cell walls.

C the oxygen formed by photosynthesis.

D the starch granules in a leaf.

12 The diagram represents a cross section of part of a leaf.

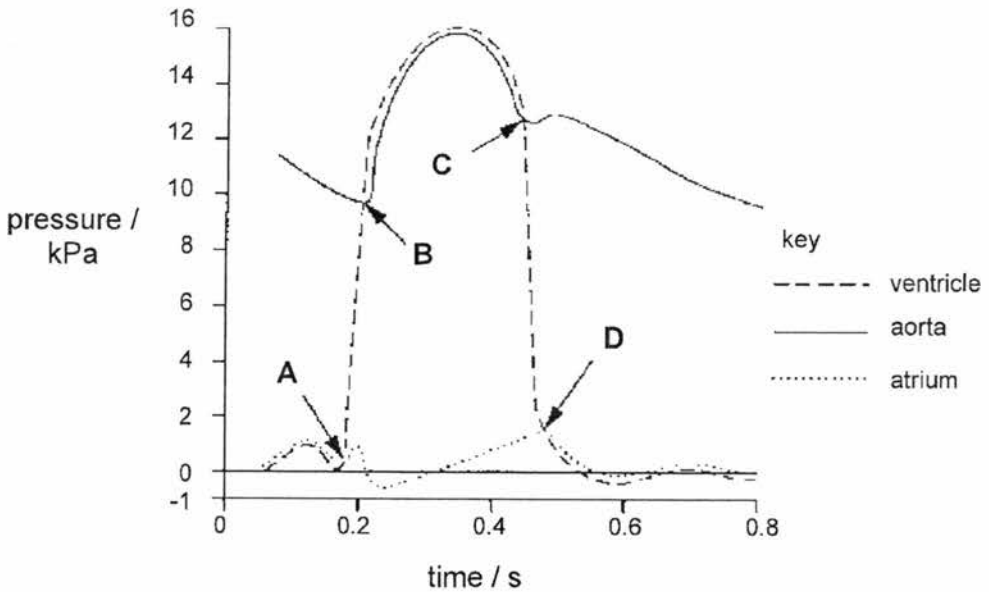


How does the oxygen content of the air at X compare to normal atmospheric air, when the leaf is in the light and when it is in the dark?

	in the light	in the dark
A	lower	the same
B	lower	higher
C	higher	the same
D	higher	lower

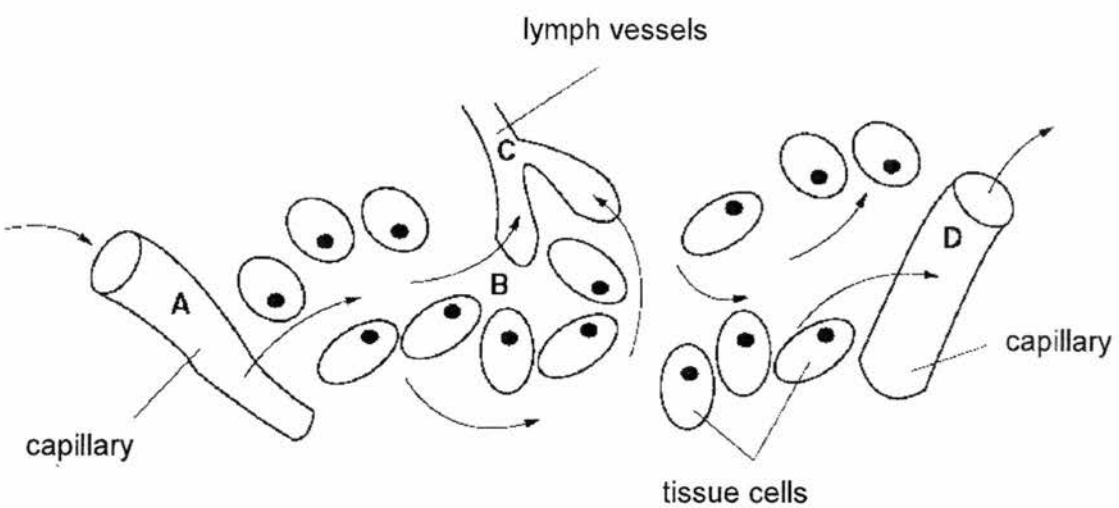
13 The diagram shows pressure changes in the left side of the heart during part of the human cardiac cycle.

At which point do the atrioventricular valves close?

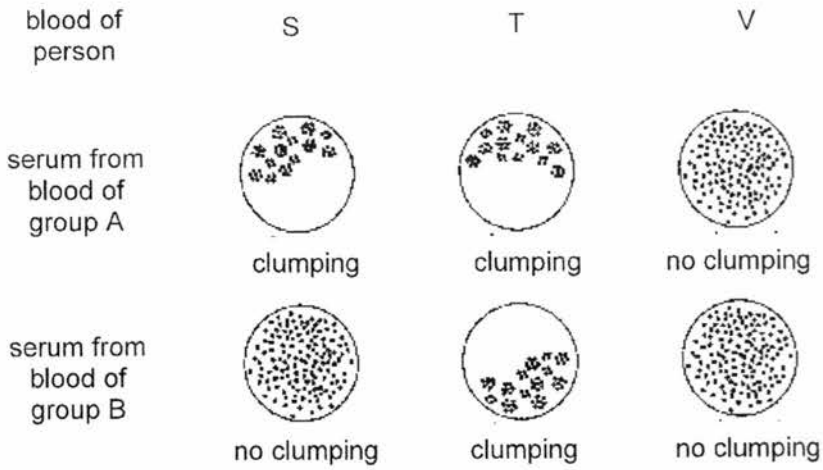


14 The diagram shows part of a tissue. The arrows show movement of fluids.

At which point is the pressure highest?



15 The blood of three people S, T and V were tested to determine their blood groups. The results are shown below.



Which of the following shows the correct blood types of people S, T and V?

	S	T	V
A	A	AB	O
B	B	AB	O
C	A	O	AB
D	B	O	AB

16 Four similar leafy shoots are exposed to different conditions. The rates of water uptake and the rates of water loss are measured.

The results are shown in the table.

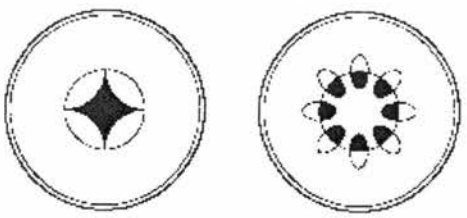
Which shoot is most likely to wilt?

	water uptake / mm^3 per min	water loss / mm^3 per min
A	14	13
B	10	12
C	5	5
D	4	2

17 A plant was placed in water containing black dye. After 24 hours, the plant was removed and sections were taken from the root and the stem.

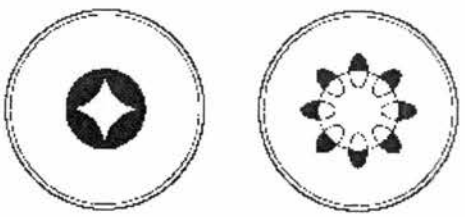
Which diagram shows the results?

A



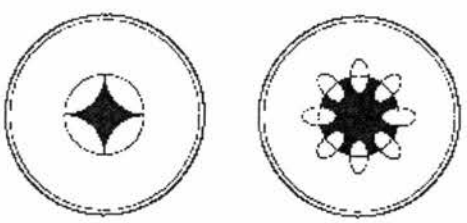
root stem

B



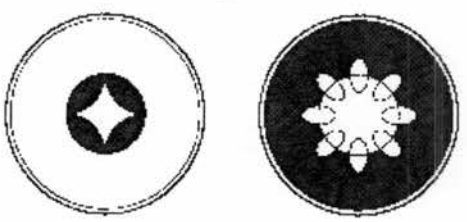
root stem

C



root stem

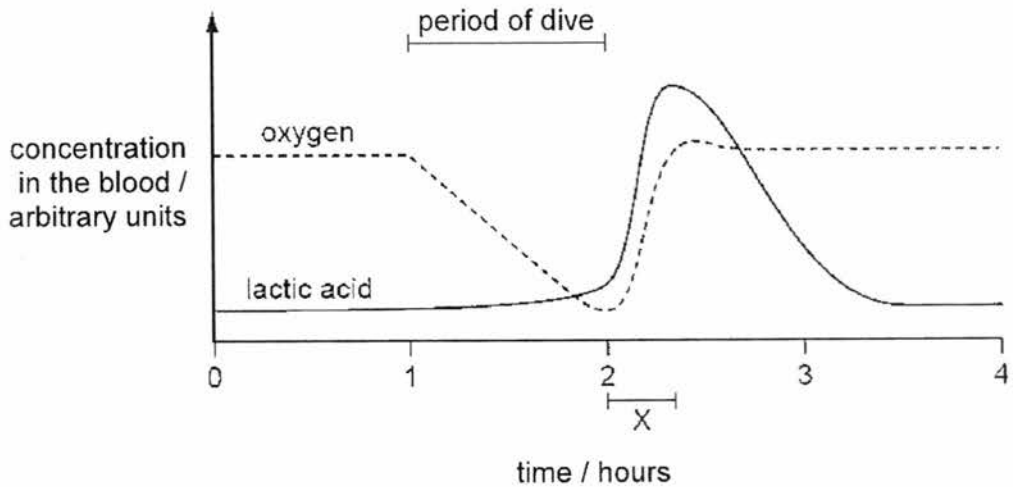
D



root stem

18 Seals are marine mammals. When they dive under water, they are capable of respiring anaerobically for long periods. During this time, blood flow to the muscles is greatly reduced but the muscles are able to tolerate high concentrations of lactic acid.

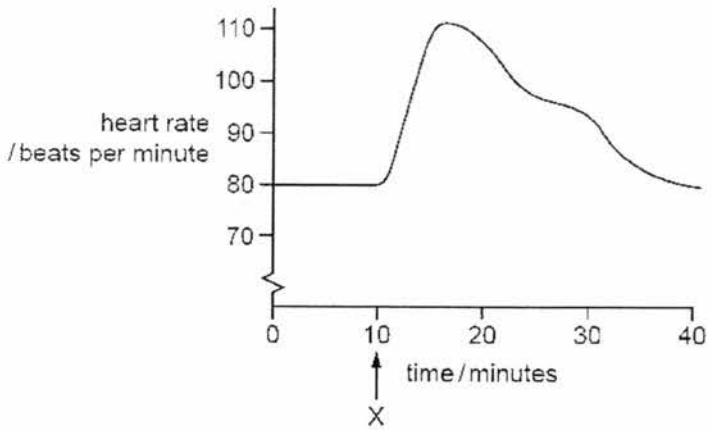
The graph shows the concentrations of lactic acid and oxygen in the blood of a seal before, during and after a dive.



What explains the change in lactic acid concentration during time X?

A increased lactic acid production
B increased blood flow to the muscles
C increased rate of aerobic respiration
D reduced rate of anaerobic respiration

19 A person begins to smoke a cigarette at time X. The graph shows how their heart rate changes.

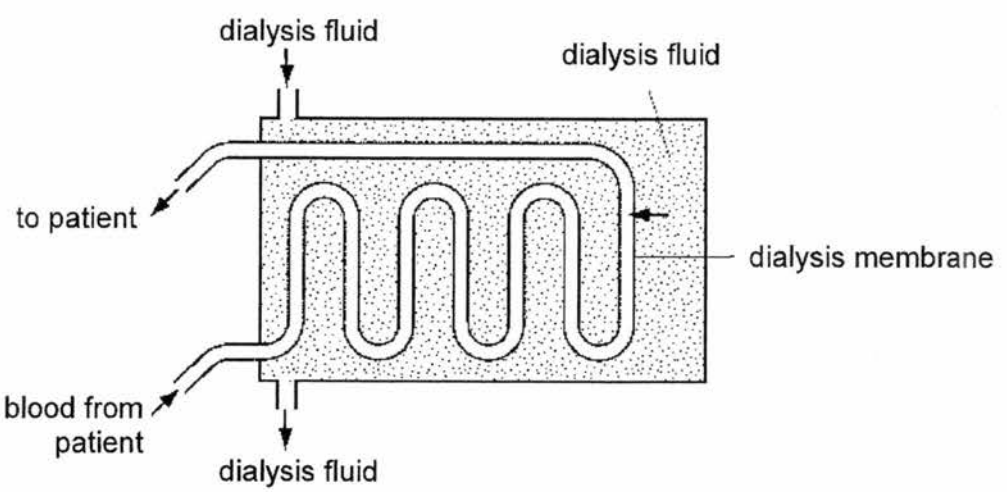


Which substance in cigarette smoke is the main cause of the change in heart rate between 10 and 18 minutes?

A carbon monoxide **B** nicotine

C smoke particles **D** tar

20 The diagram shows the flow of blood and dialysis fluid through a kidney machine.

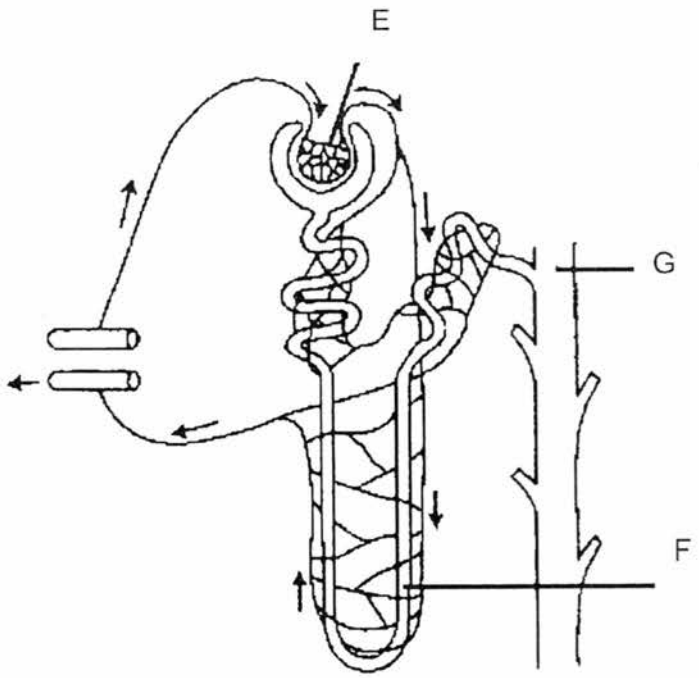


Which substance cannot diffuse through the dialysis membrane?

A glucose **B** insulin

C sodium **D** urea

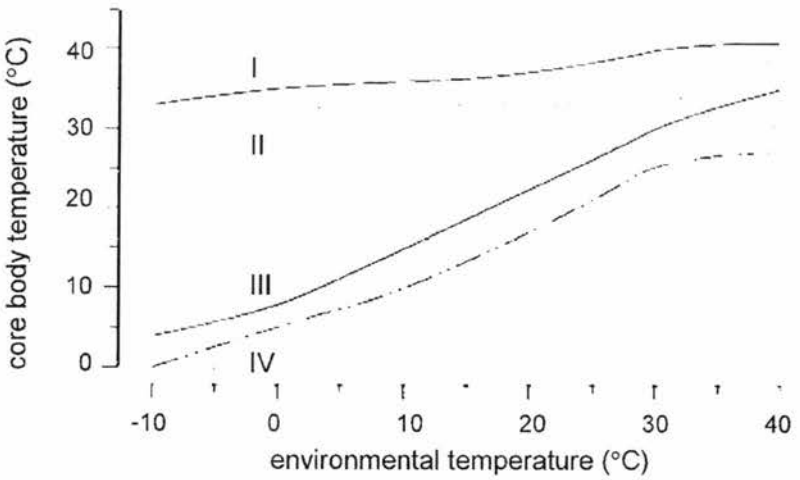
21 The following shows the kidney nephrons and its associated features.



Which of the following states correctly some of the component(s) found in the fluids inside E, F and G in a healthy person at any time of the day?

	E	F	G
A	amino acids, salts	white blood cells, urea	amino acids, water
B	amino acids, urea	glucose, salts	platelets, water
C	white blood cells, proteins	water, salts	salts, water, urea
D	red blood cells, amino acids	proteins , salts	urea, glucose

22 Four different animals were maintained in a laboratory in habitats similar to that of their natural environment. The core body temperature of the animals was measured in response to changes in the temperature of the laboratory environment and plotted in the graph shown below.



Which of the following conclusions can be drawn from the graph?

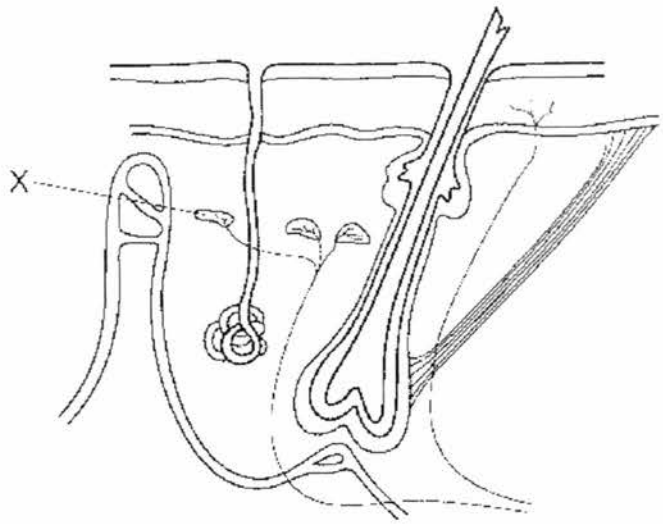
A Animals I and II are most likely mammals.

B Animal I maintains its core body temperature relatively constant by making its sweat glands less active when environmental temperature falls below 37°C.

C Animal III becomes warm blooded as environmental temperature increases.

D Animal IV is most likely a marine mammal.

23 The diagram shows some of the structures seen in a section through human skin.



What is the function of structure X?

A to cause capillaries to constrict

B to detect changes in temperature

C to receive impulses from the central nervous system

D to stimulate sweat glands to release sweat

24 Which of the following results from increased secretion of adrenaline?

1 dilated air passages
2 decreased blood flow to skeletal muscles
3 increased heart rate
4 increased insulin production
5 increased glucagon production

A 2 and 3 only

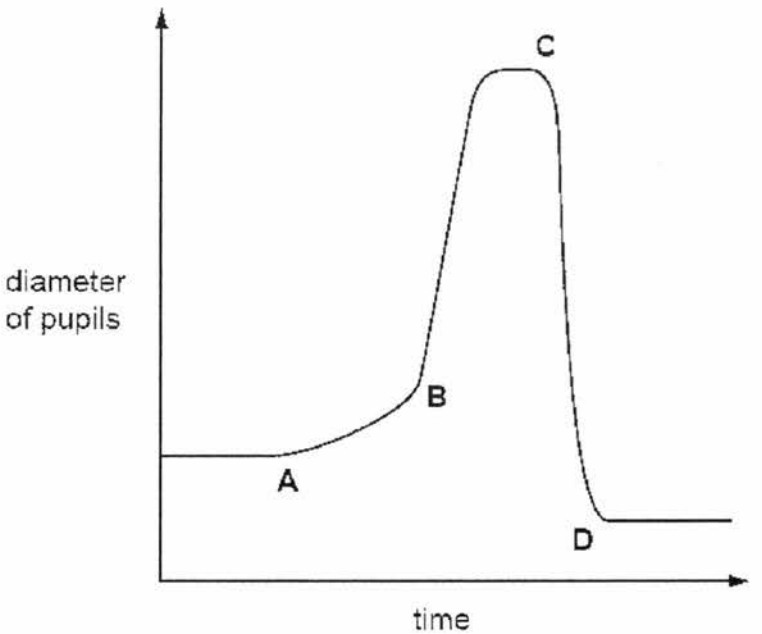
B 2 and 4 only

C 1, 3 and 5 only

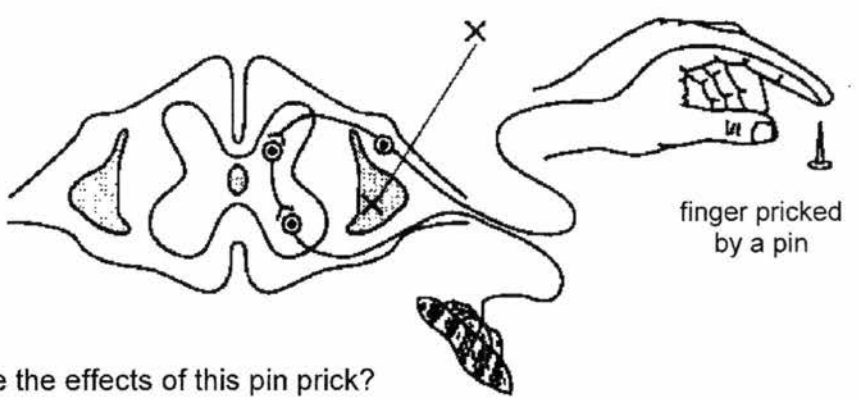
D 1, 4 and 5 only

25 The graph shows changes in the diameter of a person's pupils while outdoors on a sunny day.

At which time did the person take off a pair of sunglasses?



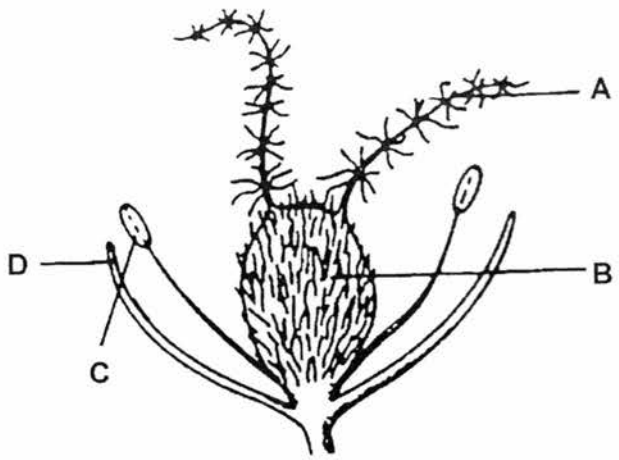
26 The diagram shows part of the nervous system, including a reflex arc. It has been cut along the line XX. The finger is accidentally pricked by a pin, as shown.



What are the effects of this pin prick?

	pain felt	arm moved
A	no	no
B	no	yes
C	yes	no
D	yes	yes

27 The diagram shows a longitudinal section of a flower.



In which of the labelled structures do pollen tubes start to develop?

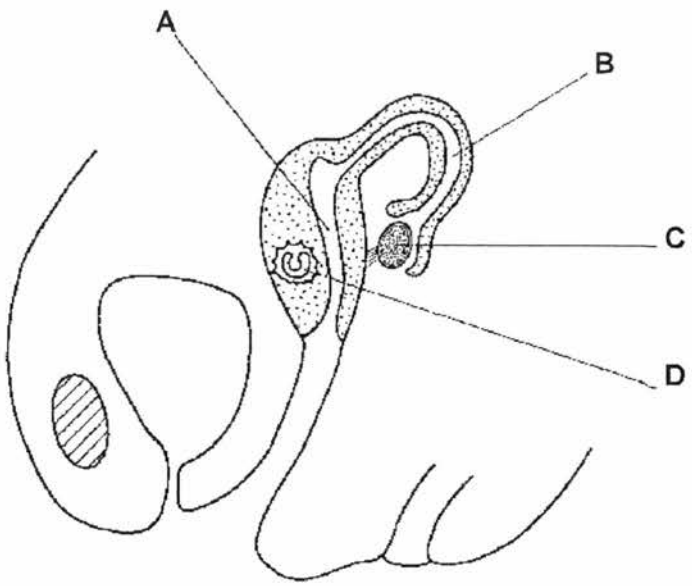
28 An experiment was set up using four groups of insect-pollinated flowers in a field. In each group, different parts of the flowers were removed, as shown in the table below, and insects were allowed to visit all the flowers freely.

Which group of flowers would produce the most seeds?

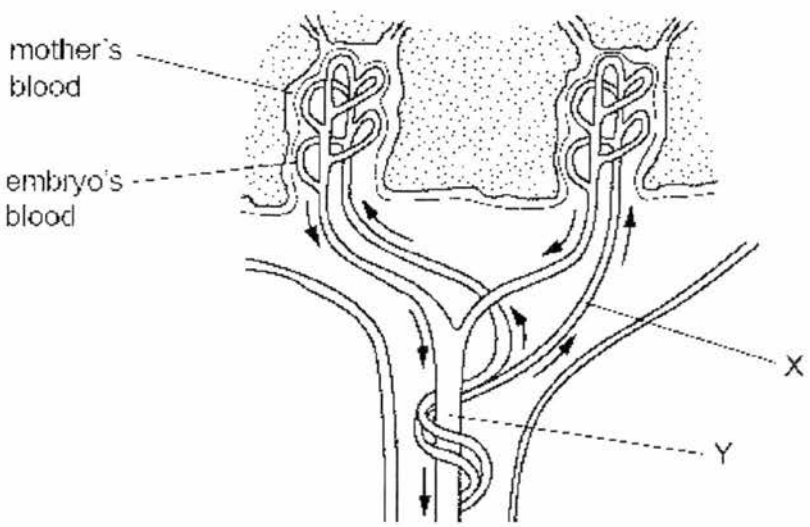
group of flowers	stigma	anthers	petals
A	left	removed	left
B	left	left	removed
C	removed	left	removed
D	removed	removed	left

29 The diagram shows a side view of the female reproductive system with a developing embryo.

In which part is fertilisation likely to have taken place?



30 The diagram shows how the blood of a human embryo flows close to the mother's blood in the placenta.



Which substances are present at X in higher concentrations than at Y?

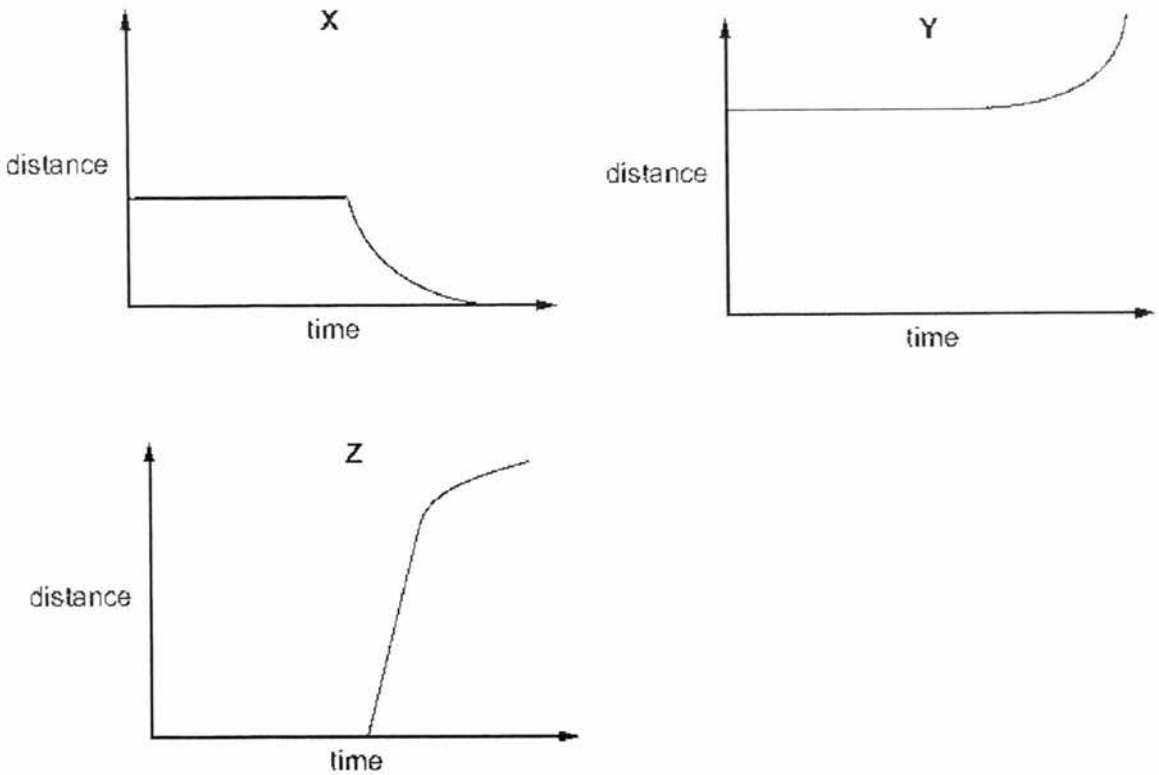
A carbon dioxide and glucose

B carbon dioxide and urea

C glucose and oxygen

D glucose and urea

31 The graphs show various measurements taken from metaphase of mitosis onwards. The graphs are to scale when compared to one another.

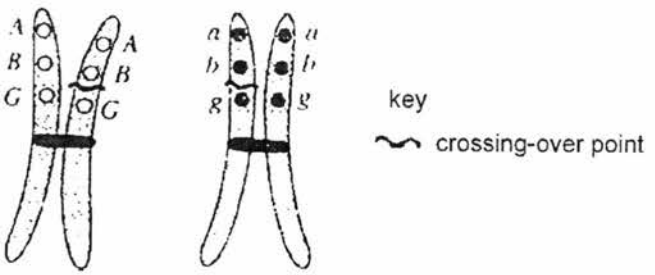


Which row correctly identifies each graph?

	X	Y	Z
A	distance between poles of spindles	distance between sister chromatids	distance of centromere from pole of spindle
B	distance between poles of spindles	distance of centromere from pole of spindle	distance between sister chromatids
C	distance of centromere from pole of spindle	distance between poles of spindles	distance between sister chromatids
D	distance of centromere from pole of spindle	distance between sister chromatids	distance between poles of spindles

32 The diagram below represents one pair of homologous chromosomes during meiosis.

Crossing over occurs and random segregation takes place.



What are the genotypes of the resulting gametes?

A ABG, abG, ABg, abg

B ABG, aBg, AbG, abg

C ABG, ABG, abg, abg

D ABG, aBG, Abg, abg

33 A person with Down's syndrome is born with 47 chromosomes in each cell, instead of 46.

What could cause this?

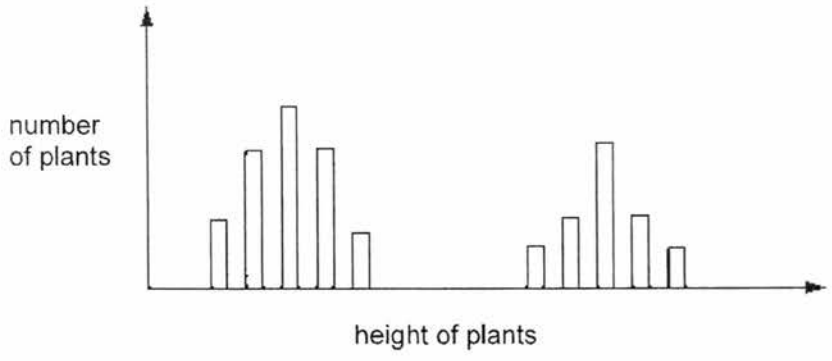
A A mutation happened during the production of the egg cell.

B More than one sperm fused with the egg at fertilisation.

C Radiation caused a change in structure of a gene in the father's sperm.

D The mother was exposed to harmful chemicals while she was pregnant.

34 The bar chart shows the height of pea plants grown from 1000 seeds.



What variation do the plants show?

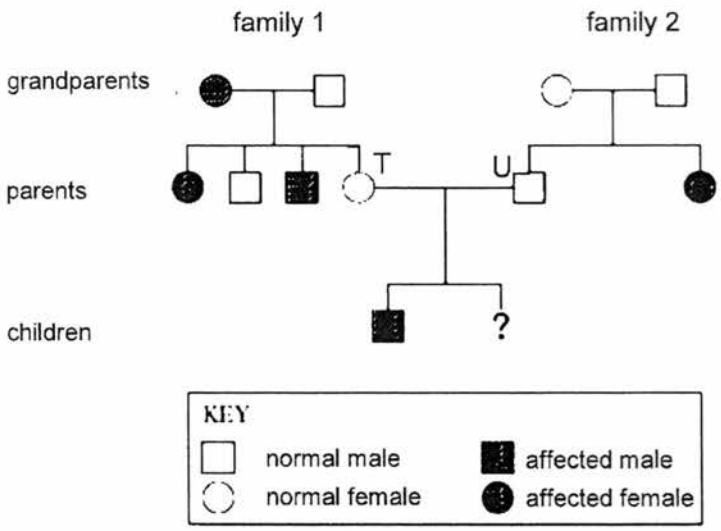
A continuous variation only

B discontinuous variation only

C both continuous variation and discontinuous variation

D neither continuous variation nor discontinuous variation

35 The diagram shows the inheritance of a particular genetic characteristic.



What is the probability that a daughter of T and U would be affected?

A 0%

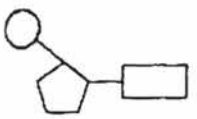
B 25%

C 50%

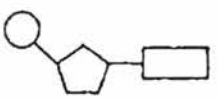
D 100%

36 What is the correct arrangement for the components in a nucleotide?

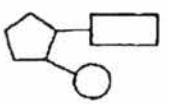
A



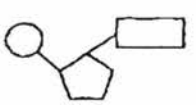
B

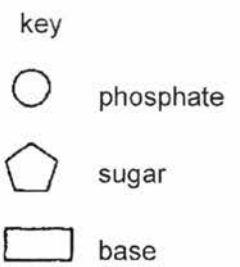


C



D





37 If 30% of the bases in DNA extracted from an organism is cytosine, what percentage of its bases would be adenine?

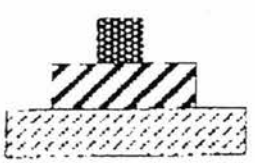
A 10% **B** 20%

C 30% **D** 40%

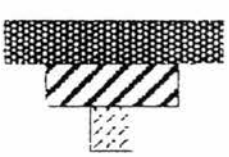
38 Which pyramid of numbers represents the following food chain:

grass → cows → ticks

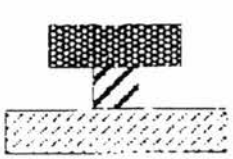
A



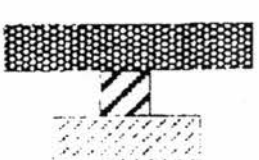
B



C

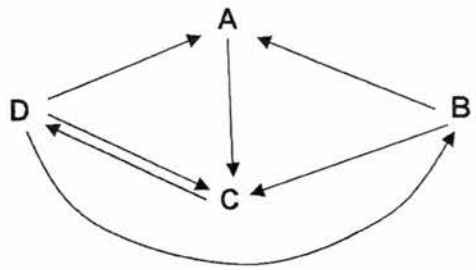


D



39 In the diagram below, arrows represent the movements of carbon compounds in the carbon cycle. **A**, **B**, **C** and **D** represent carbon compounds in animals, decomposers, plants and the atmosphere.

Which represents the producer?



40 Inorganic fertiliser is applied each year to fields bordering a lake. The fertiliser runs off into the lake and causes six changes which together make the fish die.

1 Aerobic bacteria feed on dead plants.
2 Algae reproduce faster.
3 Light cannot penetrate the water.
4 Oxygen levels fall.
5 Water becomes green.
6 Underwater plants die.

In which order do the changes take place?

A 2 → 5 → 1 → 6 → 4 → 3

B 2 → 5 → 3 → 6 → 1 → 4

C 3 → 6 → 1 → 4 → 2 → 5

D 4 → 6 → 1 → 2 → 5 → 3

End of Paper

Geylang Methodist School (Secondary)
Preliminary Examination 2017

Candidate Name			
Class		Index Number	

BIOLOGY **5158/02**

Paper 2 **Sec 4 Express**

Additional materials: Nil **1 hour 45 minutes**

Setter: Mrs Cheryl Tang **29 Aug 2017**

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen in both sides of the paper.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions in the spaces provided on the question paper.

Section B

Answer **all** the questions.

Write your answers in the spaces provided on the Question 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 for Section B.

At the end of the examination, hand in Section A and Section B **separately**.
The number of marks is given in brackets [ ] at the end of each question or part question.

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

Section A (50 marks)

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

1 Fig. 1.1 below shows two experiments to investigate the partial permeability of Visking tubing.

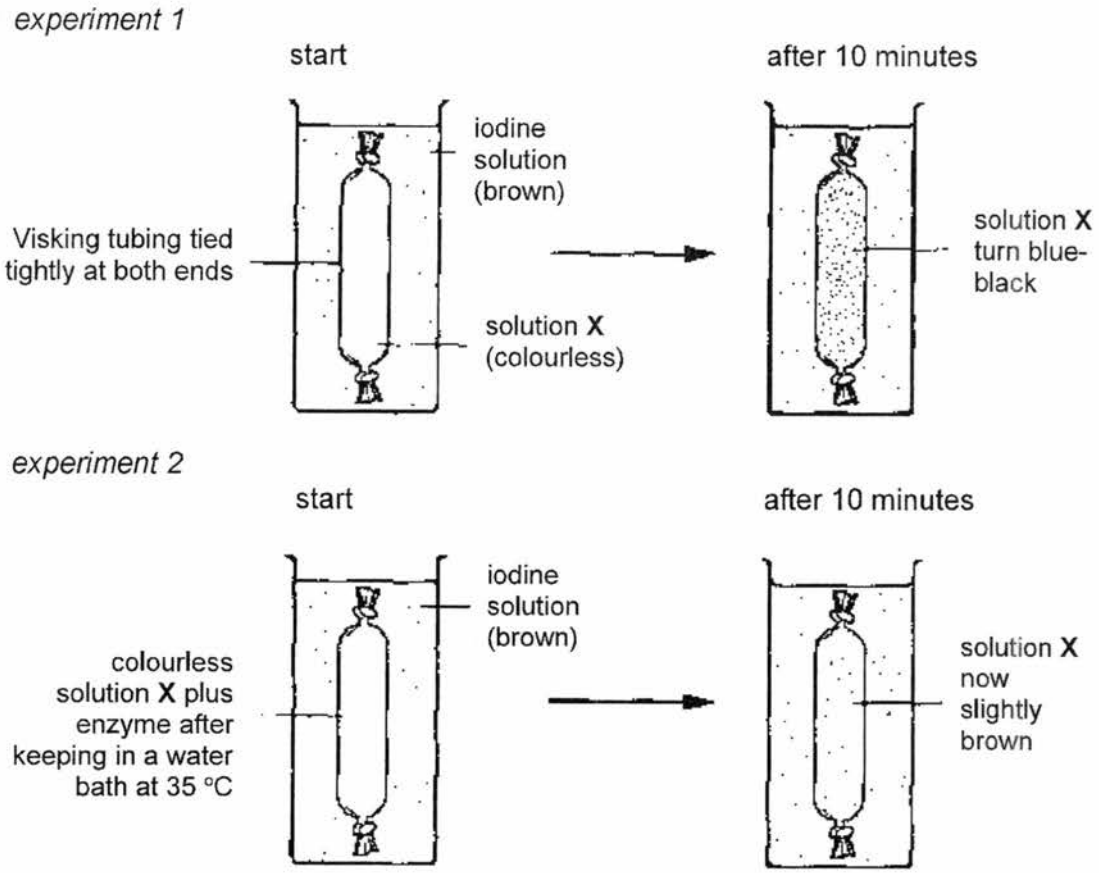


Fig. 1.1

(a) Suggest what solution **X** was likely to have been.

.....[1]

(b) In experiment 1, explain why

(i) solution **X** turned from colourless to blue-black;

.....

.....

.....

.....[2]

(ii) the iodine solution remained brown.

.....

.....[1]

In experiment 2, solution **X** and an enzyme were placed in a Visking tubing bag which was kept at 35°C for 30 minutes. After this time, the bag was placed in iodine solution. This experiment and the results are also shown in Fig. 1.1.

(c) In experiment 2, explain

(i) why the bag was first kept at 35°C for 30 minutes;

.....

.....

.....[1]

(ii) why solution **X** did not turn blue-black.

.....

.....

.....[1]

At the end of experiment 2, the student noticed a change in the condition of the Visking tubing bag after 24 hours.

(d) (i) What change might have been noticed?

.....[1]

(ii) Explain what caused this change.

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.....

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.....[2]

[Total: 9]

2 Fig. 2.1 shows the body temperature of a student over a 32-hour period.

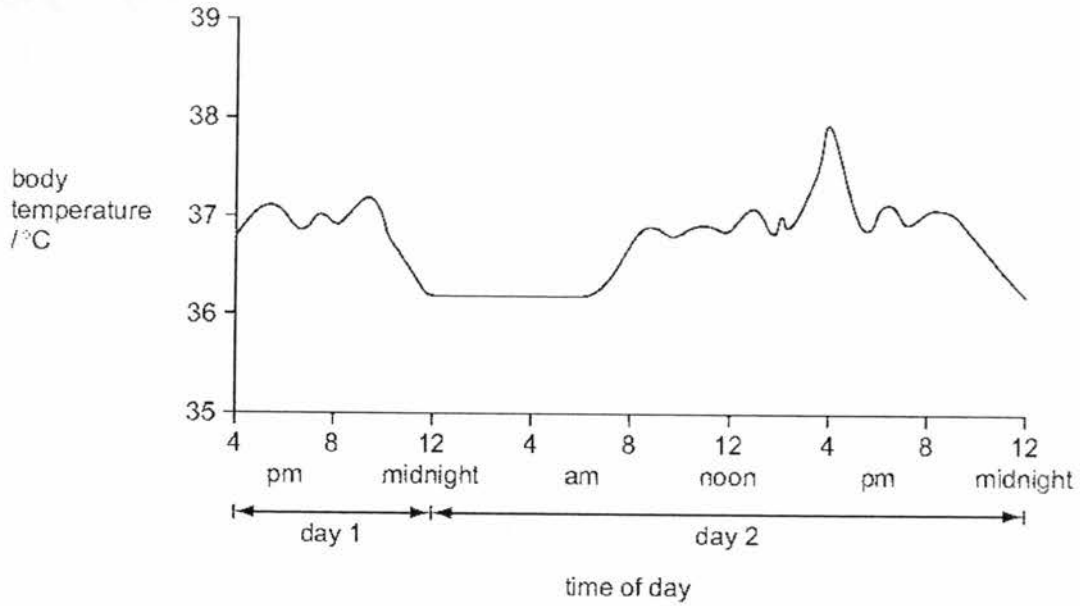

Fig. 2.1

(a) Between 2.30pm and 4.15pm on day 2 the student was involved in gymnastics training.

Explain why the body temperature increased during the training.

.....

.....

.....

.....[2]

(b) The student had a normal body temperature of 36.8 °C. If the body temperature rises above normal, homeostasis takes place.

(i) Define homeostasis.

.....

.....[1]

(ii) Explain how sweating can help to change body temperature.

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.....[3]

[Total: 6]

3 Fig. 3.1 shows an external view of the heart.

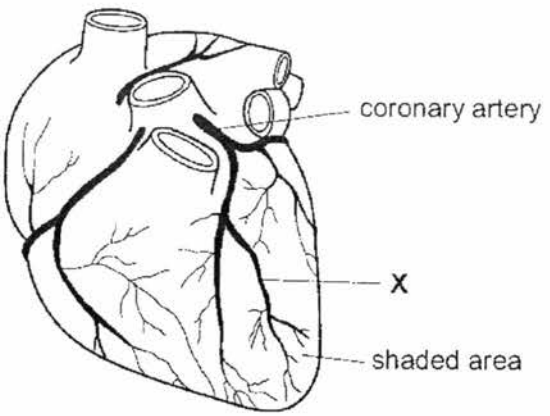

Fig. 3.1

(a) A blood clot is stuck at **X**. Explain what will happen to the heart muscle cells in the shaded area on Fig. 3.1.

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.....[4]

(b) List two actions people can take to reduce the risk of having a blood clot in the coronary arteries.

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.....[2]

(c) Fig. 3.2 shows one type of artificial heart.
Fig. 3.3 shows how this artificial heart is fitted inside the body.

Fig. 3.2

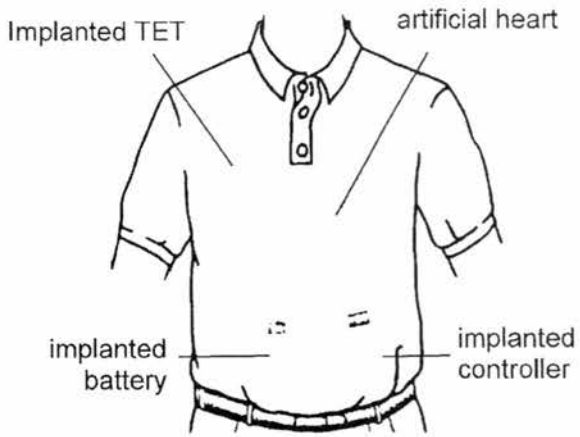

Fig. 3.3

Read the information about this artificial heart.

> The first patient to receive the heart lived for 151 days before dying from a stroke.
> The second patient was given less than a 20 % chance of surviving 30 days at the time of his surgery. He lived for 512 days after receiving the heart. He died because an internal membrane in the device wore out.

Suggest advantages and disadvantages of treating patients with this artificial heart.

Advantages:

.....

.....

.....

Disadvantages

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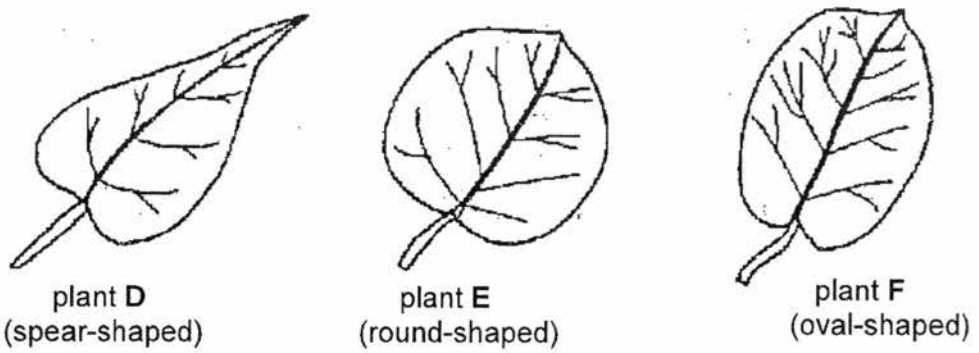
.....[5]

[Total: 11]

4 Fig. 4.1 shows leaves from three plants **D**, **E** and **F**, of the same species.



plant **D** (spear-shaped) | plant **E** (round-shaped) | plant **F** (oval-shaped)

Fig. 4.1

In this species of plant, leaf shape is controlled by two alleles, S^1 and S^2. Plants **D** and **E** are both homozygous for leaf shape and plant **F** is heterozygous.

(a) State the phenotype of the heterozygous plant.

.....[1]

(b) **(i)** In the space below, construct a genetic diagram to show how a particular cross will always result in **all** offspring having a different phenotype from both parents. [5]

(ii) Suggest an explanation for the offspring in your answer to **(b)(i)** always having leaves of a different shape from either of the parent plants.

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.....[2]

[Total: 8]

5 Fig. 5.1 shows a cell of a female fruit fly during a stage in mitosis.

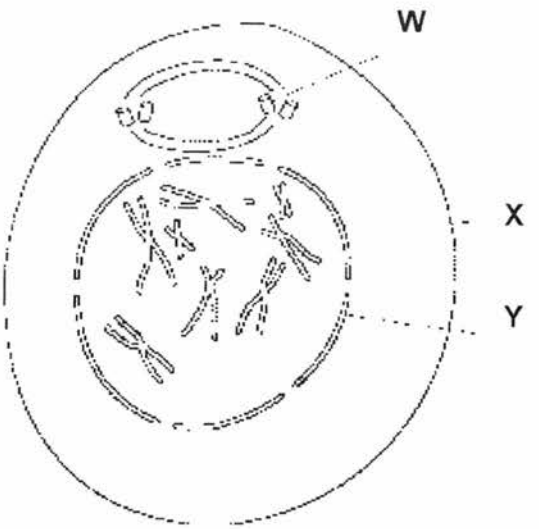

Fig. 5.1

(a) Name the parts labelled **W**, **X** and **Y**.

W .....[1]

X .....[1]

Y .....[1]

(b) **(i)** Name the stage of mitosis shown in Fig. 5.1.

.....[1]

(ii) On Fig. 5.1, circle a pair of homologous chromosomes. [1]

(c) **(i)** Predict the number of chromosomes found in the ovum of the fruit fly.

.....[1]

(ii) Predict the number of chromosomes found in a cell at prophase I of meiosis.

.....[1]

(d) Explain why mitosis is important in organisms.

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.....[3]

(e) State one difference between prophase at mitosis and prophase I at meiosis.

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.....[1]

[Total: 11]

6 Fig. 6.1 below shows information about living things in a lake.

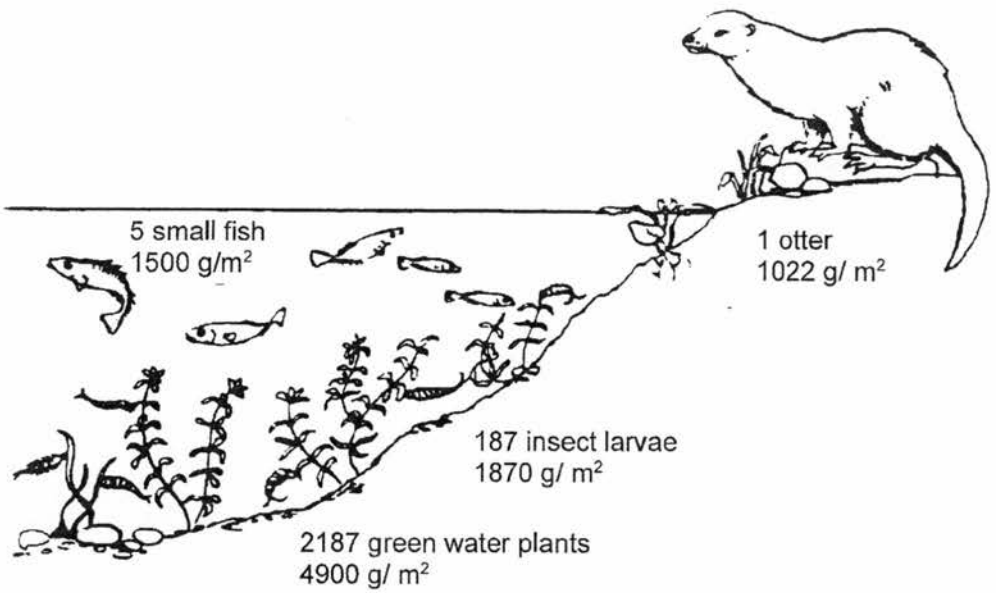

Fig. 6.1

(a) Use the information shown in Fig. 6.1 to answer the questions below.

(i) All the organisms shown in the diagram form a food chain. Draw and label a pyramid of biomass to represent this food chain.

[2]

(ii) Use your knowledge of energy transfer to explain the difference in biomass between the fish and their predators.

.....

.....

.....

.....[1]

(b) A biologist tested the lake and the living organisms for organochlorides, a compound found in insecticides and recorded his findings below.

	parts per million (ppm) of organochlorides
water	0.03
insect larvae	1.20
small fish	2.56
otter	1680.00

Suggest how the organochlorides may have entered the lake and explain the relationship between the content of the diet and the concentration of organochlorides found in the organisms.

.....

.....

.....

.....[2]

[Total: 5]

End of Section A

Section B (30 marks)

Answer **three** questions.
Question 9 is in the form of an **Either/Or** question.
Only one part should be answered.
Write your answers on the separate writing paper provided.

7 **(a)** A student looks at a clock at the far end of an examination room and then looks at a diagram on her examination paper.

Describe the changes that take place in her eyes so that she can focus on the diagram.

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.....[4]

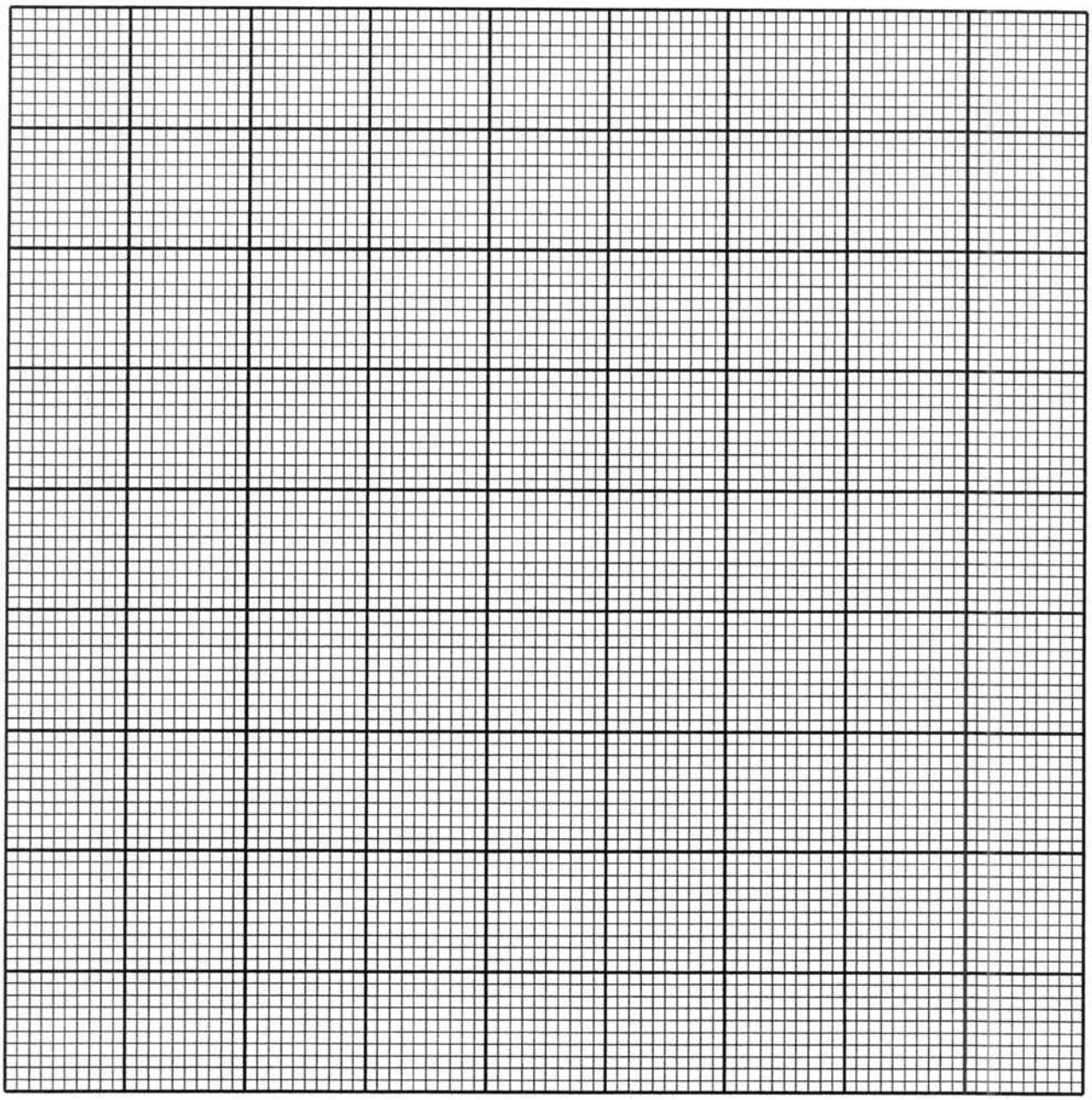
(b) The shortest distance from the eye at which a clear focus is possible is known as the near point. As a person gets older this distance changes.

Table 7.1 shows the near point for people of different ages who have normal vision.

age/ years	distance of near point / cm
10	7.0
15	8.5
20	10.0
25	12.5
40	22.0
50	40.0
60	80.0

Table 7.1

(i) Plot the data in Table 7.1 on the grid on the next page. [4]



(ii) Use the graph to estimate the distance of the near point for a 30-year-old person.

.....[1]

(iii) Use the graph to estimate the age of a person whose near point is 32.0 cm.

.....[1]

[Total: 10]

8 (a) Explain how the following are involved in the process of breathing:

(i) the diaphragm;

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.....[4]

(i) the intercostal muscles.

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.....[4]

(b) Describe the function of cilia in the trachea.

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.....[2]

[Total: 10]

9 **Either**

(a) Distinguish between self-pollination and cross-pollination.

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.....[4]

(b) With reference to its structural features, describe how pollination occurs in a named insect-pollinated flower.

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.....[6]

[Total: 10]

9 Or

(a) Explain with details how the transpiration rate of a plant is affected by

(i) decreasing humidity of the surrounding air and

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.....[4]

(ii) wind or air movement in the surrounding.

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.....[3]

(b) The same features of the leaf which help it to photosynthesize efficiently also facilitate a high rate of water loss through transpiration. Explain.

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.....

.....[3]

[Total: 10]

End of Paper

GEYLANG METHODIST SCHOOL (SEC)
PRELIMINARY EXAMINATIONS 2017
4EXP PURE BIOLOGY MARKING SCHEME

P1

1	2	3	4	5	6	7	8	9	10
C	B	C	A	D	B	C	B	C	C
11	12	13	14	15	16	17	18	19	20
C	D	A	A	B	B	A	B	B	B
21	22	23	24	25	26	27	28	29	30
C	A	B	C	C	B	A	A	B	B
31	32	33	34	35	36	37	38	39	40
C	A	A	C	B	B	B	C	D	B

P2

Section A

Qn No.	Answers
1 (a)	Starch [1m]
(b) (i)	There is a higher concentration of iodine molecules in the container than in the Visking tubing [1m]. Thus, iodine solution diffused [1m] into the tubing and reacts with starch solution to turn blue-black.
(ii)	Starch molecules are too large to diffuse out of the Visking tubing [1m]. Thus, iodine solution remained brown.
(c) (i)	This is to provide the enzyme to be at its optimal temperature for reacting with starch [1m].
(ii)	Starch in solution X was completely broken down by the enzyme to maltose [1m]. As there is no more starch, no blue-black colour was seen.
(d) (i)	The Visking tubing has become firmer and bigger [1m].
(ii)	There is a higher water potential in the container than in the visking tubing [1m]. Thus, water moves into the Visking tubing by osmosis [1m].
2 (a)	1. increased muscle activity; 2. increased / faster release of energy / heat; 3. from increased respiration; any two – 1 mark each
(b) (i)	It is the maintenance of a constant internal environment. [1m]

(ii)	1. sweat secreted (onto surface of skin / body); [1m] 2. evaporation of water requires heat energy which is obtained from latent heat of vaporization;[1m] 3. body temperature falls;[1m]
3 (a)	Blood is unable to reach the muscle cells in the shaded region [1]. Less oxygen and glucose reaches the muscle cells [1]. With less oxygen, respiration slows down and thus energy release is less [1]. Muscle cells die causing heart attack. [1]
(b)	i. exercise regularly; ii. reduce / stop smoking; iii. avoid stressful lifestyle; iv. reduce intake of fatty food. [any 2 – 2m]
(c)	<u>Advantages:</u> • useful where no other treatment available / patients near to death [1m] • extends lifespan [1m]. <u>Disadvantages</u> • low success rate [1] • device has limited lifespan [1] • battery will need charging [1] • discomfort from heart / battery / controller [1] • risk of infection [1] [any 5 – 5m; must have at least 2 advantages and disadvantages]

4 (a) Oval-shaped leaves[1m]

(b)(i) Let S^1 represents spear-shaped leaf allele and S^2 represents round shaped leaf allele.

1m Parents phenotype: spear-shaped leaf X round-shaped leaf

1m Parents genotype: $S^1 S^1$ X $S^2 S^2$

1m Gametes: (S^1) (S^1) (S^2) (S^2)

	S^1	S^1
S^2	S^1S^2 (oval-shaped)	S^1S^2 (oval-shaped)
S^2	S^1S^2 (oval-shaped)	S^1S^2 (oval-shaped)

1m F1 generation genotype } as shown above

1m F1 generation phenotype }

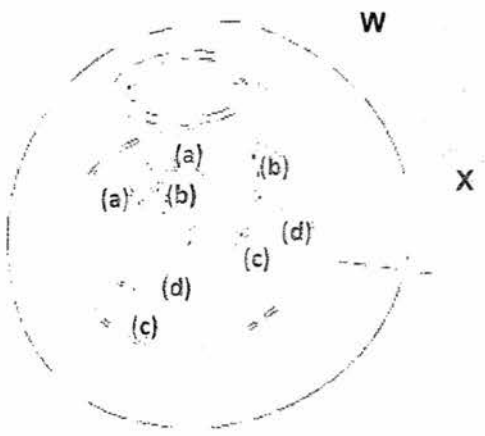
All offspring are oval-shaped and have different genotype from its parents [1m].

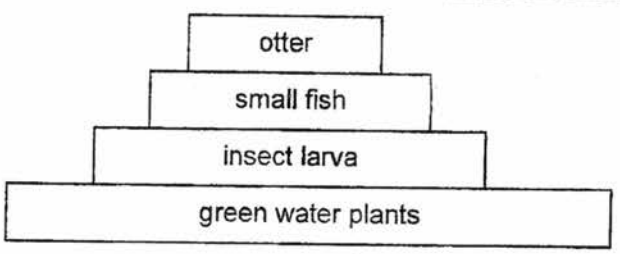
(b)(ii) The allele for leaf shape is co-dominant / incomplete dominance [1m]. Allele for round- and spear-shaped leaf is neither dominant over each other [1m]. This results in the offspring having a different shape from the parent plants.

5 (a) W centriole [1m]
X cell/plasma membrane [1m]
Y nuclear membrane/envelope [1m]

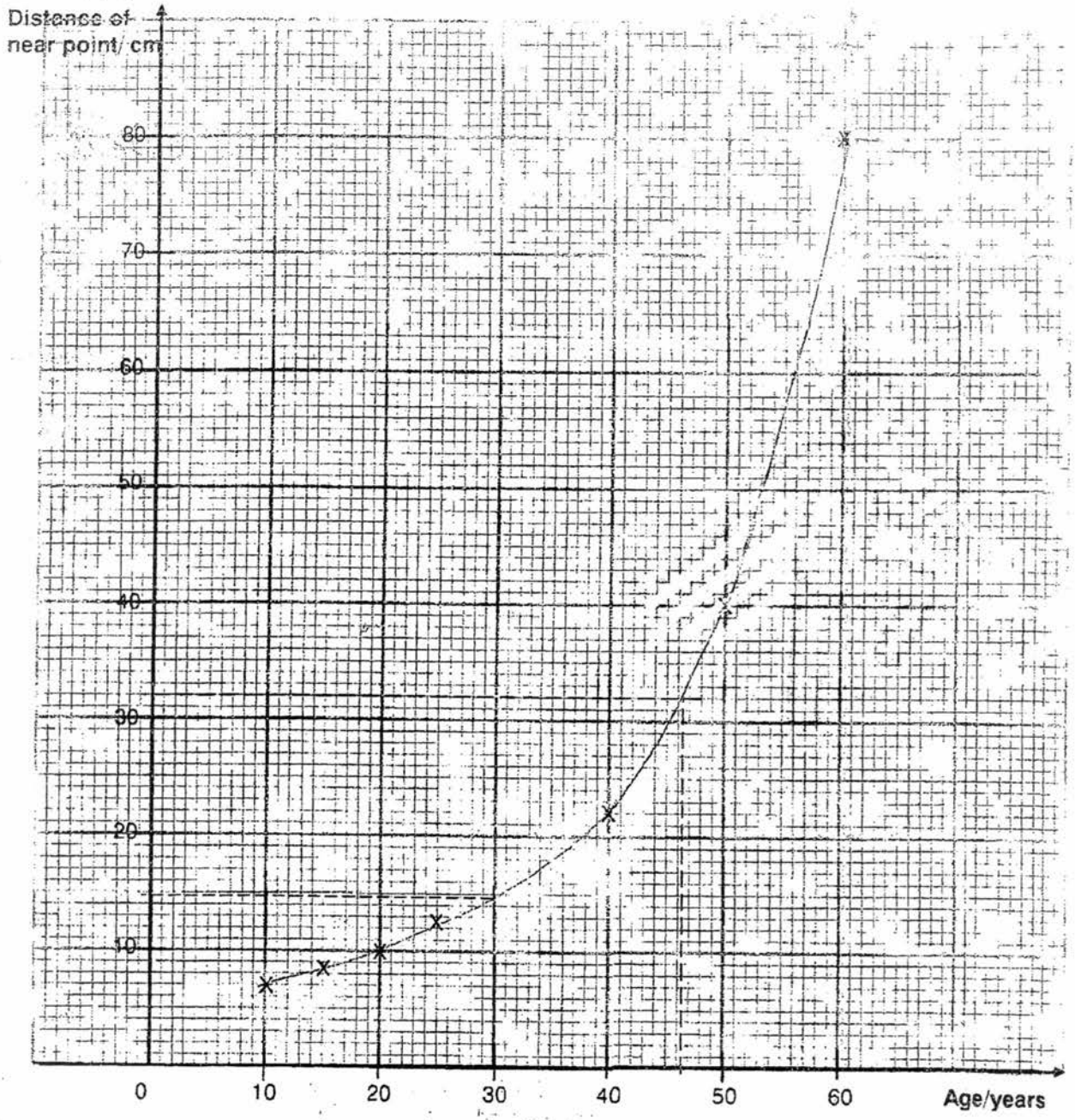
(b)(i) Prophase [1m]

(ii) shade a pair of homologous chromosomes: pairs (a), (b) (c) & (d) (must be of the same length and centromere position); [1m]



(c)(i)	4 chromosomes [1m]
(ii)	8 chromosomes [1m]
(d)	– Mitosis occurs during growth and development of a multicellular organism [1m]; – Mitosis occurs during the replacement of worn-out parts of the body [1m]; – Mitosis is the basis of asexual reproduction, which results in a colony of identical individuals, i.e. clones [1m].
(e)	Chromatids of homologous chromosomes cross over at prophase I of meiosis but there is no crossing over of chromatids at prophase at mitosis [1m] OR pairing up of homologous chromosomes at prophase I of meiosis(synapsis) but not in prophase of mitosis [1m].
6 (a) (i)	 *Pyramid of similar shape [1m]* *Correct labelling of organism for each trophic level [1m]*
(ii)	Only 10% of energy is transferred from fish to their predator (as 90% is lost through processes such as respiration and excretion). Thus, biomass of fish must be greater to be able to sustain the next trophic level [1m]
(b)	Organochlorides may have run-off from nearby farms that use insecticides [1m]. As the organochlorides do not break down/non-biodegradable and are passed along from one organism to the next in the food chain, it will accumulate and will be present in the highest concentration in the top most consumer, the otter [1m]
<u>Section B</u>	
7 (a)	1. ciliary muscles contract relaxing the pull on the suspensory ligaments [1]. 2. suspensory ligaments slacken, relaxing their pull on the lens [1]. 3. lens becomes more convex / curved to decrease the focal length [1]. 4. light rays from near object/ diagram are sharply focused on to the retina / fovea;

(b) (i)



(ii)	14.5 cm / read value from graph [1m]
(iii)	46.3 years / To read value from graph [1m]

8 (a) (i)	When the diaphragm contracts, the diaphragm flatten downwards [1m]. The flattening of diaphragm helps to increase the volume of the thoracic cavity and thus lungs expands [1m] causing the pressure in the lungs to decrease [1m]. Atmospheric pressure is higher than the pressure within the lungs. Thus, air enters the lungs through the nose, trachea and the bronchi [1m]. OR Use expiration to answer. When the diaphragm relaxes, the diaphragm arches upwards [1m]. The arching of diaphragm decreases the volume of the thoracic cavity and thus lungs are compressed [1m], causing the pressure in the lungs to increase [1m]. The pressure within the lungs is higher than atmospheric pressure. Thus, air is forced out of the lungs to the exterior [1m].
(ii)	The external and internal intercostal muscles are found in between the ribs help to raise or lower the ribs [1m]. During inhalation, the external intercostal muscles contract and the internal intercostal muscles relax [1m]. Thus, the ribs is raised upwards and outwards. The sternum moves upwards and forward, thus increasing the volume of the thorax and decreasing the pressure in the lungs [1m]. Thus, atmospheric air enters the lungs [1m]. OR Use expiration to answer The external and internal intercostal muscles are found in between the ribs help to raise or lower the ribs [1m]. During exhalation, the external intercostal muscles relax and internal intercostal muscles contract [1m]. The ribs moved downwards and inwards, bringing the sternum inwards. The volume of the thorax is reduced and the pressure in the lungs increase [1m]. Thus, air is forced out of the lungs to the exterior environment [1m].
(b)	The gland cells in the epithelium of trachea secrete mucus to trap dust particles and bacteria [1m]. Cilia sweep the dust-trapped mucus up the trachea to the pharynx [1m].

9 E (a)	Self-pollination is the transfer of pollen from the anther to the stigma [1m] of the same flower or another flower of the same plant [1m]. Cross-pollination is the transfer of pollen from the anther [1m] of one flower to the stigma of another flower of another plant of the same species [1m].
(b)	Clitoria is an insect-pollinated flower [1m] and is generally pollinated by bees. When the bee visits the deep blue coloured flower, it lands on the standard petal [1m]. The insect follows the nectar guide into the flower to the nectary [1m]. The insect forces the keel petals upwards to expose the enclosed stigma and the anthers [1m]. The stigma and anther brushes again the hairy back/ abdomen and legs of the insect. When this happens, some pollen grains stick to the hairy back/ abdomen and legs [1m]. At the same time, some pollen grains from the hairy back/ abdome and legs (from another flower which the insect visited earlier) are transferred to th sticky stigma [1m]. When the insect leaves the flower, the keel petal springs back to its original position to enclose the stamens and the stigma again.
9O (a) (i)	Transpiration is the loss of water vapour from a plant, mainly through the stomata of the leaves [1m]. The intercellular air spaces in the leaves are normally saturated with water vapour [1m]. There is water vapour concentration gradient between the leaf and the atmosphere [1m]. The drier or less humid the air outside the leaf, the steeper the concentration gradient is, thus the rate of transpiration will increase [1m].
(ii)	Wind blows away the water vapour that accumulates outside the stomata [1m]. This maintains the water vapour concentration gradient between the leaf and the surrounding air [1m]. Thus, the stronger the wind, the higher the rate of transpiration [1m].
(b)	• Mesophyll cells with thin film of moisture lining allow carbon dioxide to diffuse into the leaf easily for photosynthesis. But due to this feature, water from thin lining of moisture is lost easily into the intercellular air space and out through stomata during transpiration. • Also large intercellular and sub-stomatal air spaces in the leaf that allow carbon dioxide to diffuse easily also allow water to be lost easily by transpiration. • The greater the number of stomata, the greater is the rate of water loss through transpiration. • The greater the size of stomatal opening, the greater is the rate of water loss through transpiration. [any 3 – 3m]