Name: ..... Register/Index Number: ..... Class: .....

PRESBYTERIAN HIGH SCHOOL

BIOLOGY **6093/01**

Paper 1 Multiple Choice

31 August 2020 **Monday** **1 hour**

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2020 SECONDARY FOUR EXPRESS
PRELIMINARY EXAMINATION

INSTRUCTIONS TO CANDIDATES

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO

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

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.
The use of an approved scientific calculator is expected, where appropriate.

Setter: Mr Chandrasegaran P
Vetted by: Mrs Choy HP

This document consists of **18** printed pages.

[Turn over

1 Which pair of organelles has internal membranes?

A chloroplasts and mitochondria

B chloroplasts and nuclei

C mitochondria and ribosomes

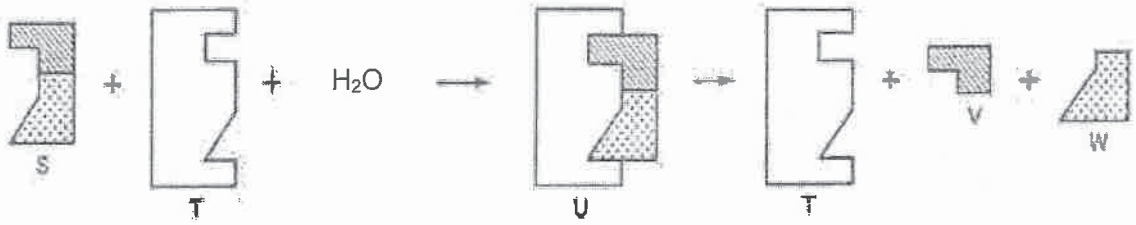
D nuclei and ribosomes

2 Pancreatic tissue from a freshly killed mouse was removed. It was placed in a warm isotonic saline and radioactively labelled amino acids were added. Samples of the tissue were later removed, sections cut and the sites of radioactivity determined at regular intervals.

Which of the following represents the order in which radioactivity appeared in the organelles?

	first → last		
A	cytoplasm	rough endoplasmic reticulum	Golgi apparatus
B	cytoplasm	Golgi apparatus	rough endoplasmic reticulum
C	Golgi apparatus	smooth endoplasmic reticulum	cytoplasm
D	rough endoplasmic reticulum	smooth endoplasmic reticulum	cytoplasm

For questions **3** and **4**, refer to the diagram, which represents the lock and key hypothesis in an enzyme catalysed reaction.



3 Identify from the diagram which letter represents the lock and which the key.

	lock	key
A	T	S
B	T	U
C	S	T
D	S	U

4 If the amount of substance S is in excess, which of the following is true?

A More V and W will be formed.

B T will hydrolyse into a simple molecule.

C More V and W will combine to form a larger molecule.

D The excessive amount of S will slow down the rate of the reaction.

5 When investigating the rate of reaction of the enzyme lipase on the hydrolysis of fats, the pH must be maintained at an optimum to prevent the lipase denaturing.

What is the reason for this?

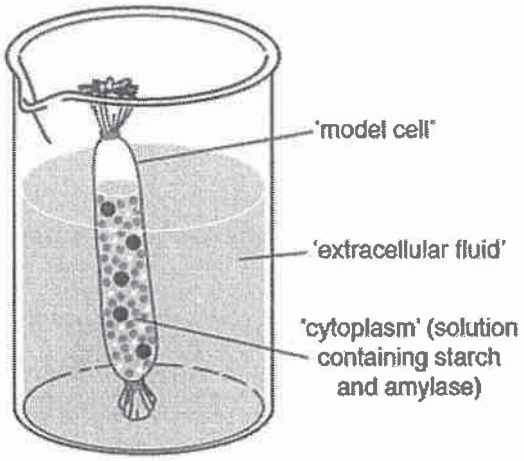
A The addition of water molecules produced by hydrolysis increases the pH.

B The products of hydrolysis decrease the pH.

C The products of hydrolysis increase the pH.

D The removal of water molecules used in hydrolysis decreases the pH.

6 A small group of students were investigating the diffusion of molecules across membranes using a 'model cell', as shown below.



Biochemical tests were used to identify the types of molecules present.

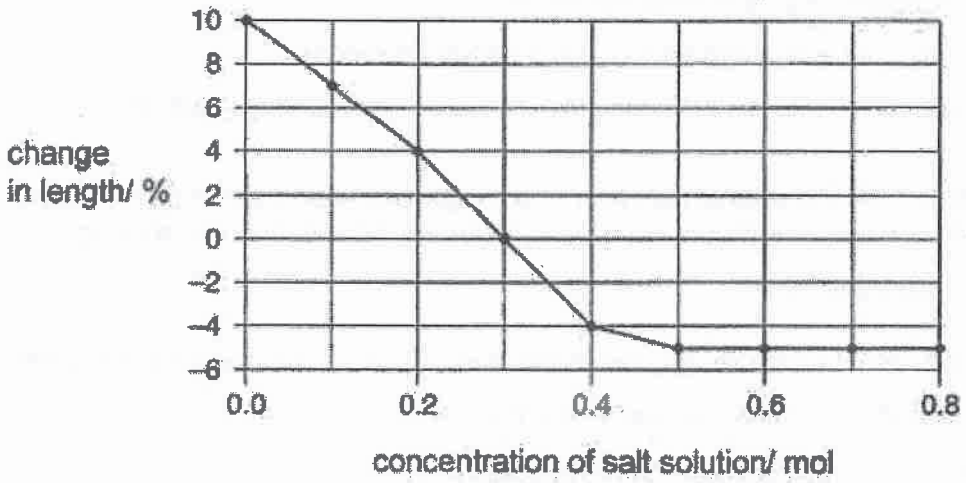
A tick (√) represents a positive result.

Which of the rows, A to D, shows the correct results for the 'cytoplasm' at the beginning of the experiment and the 'extracellular fluid' at the end of the experiment?

	Benedict's test		Biuret test		Iodine test	
	'cytoplasm'	'extracellular fluid'	'cytoplasm'	'extracellular fluid'	'cytoplasm'	'extracellular fluid'
A	√		√		√	
B		√	√	√	√	
C	√	√			√	√
D		√	√		√	

7 Cylinders of potato tissue were placed in different concentrations of a sugar solution.

The graph below shows the percentage change in length of the tissues over a fixed period of time



Assuming that the water potential of red blood cells is similar to that of potato cells, which of the following statements is correct?

A red blood cells placed in 0.3 M sugar solution will burst.

B red blood cells placed in 0.6 M sugar solution will burst.

C red blood cells placed in 0.1 M sugar solution will be crenated.

D red blood cells placed in 0.6 M sugar solution will be crenated.

8 Which process is an example of assimilation?

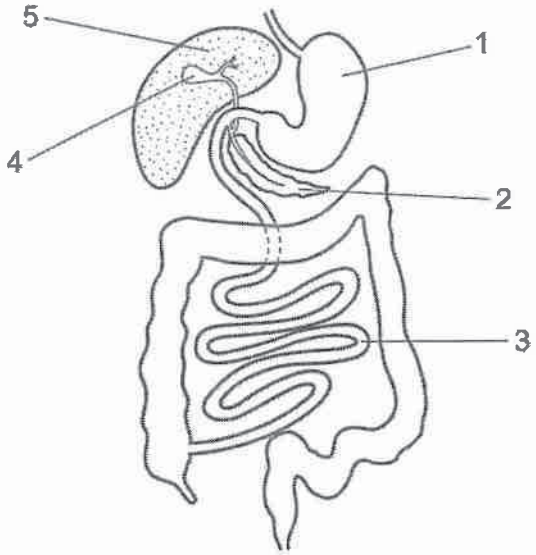
A formation of carbon dioxide from glucose

B formation of cell membranes using lipids

C formation of sweat from blood plasma

D formation of urea from amino acids

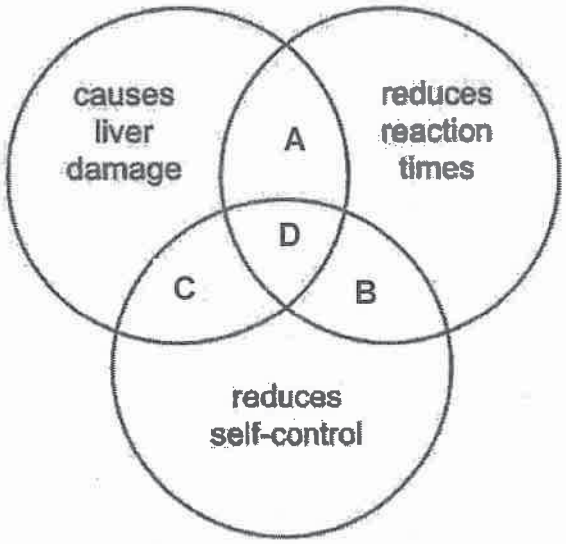
9 The diagram shows part of the alimentary canal and associated organs.



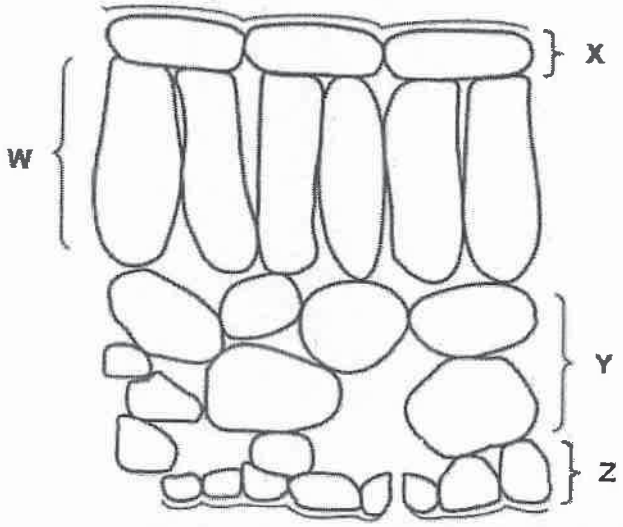
Which row correctly describes the functions of the parts shown in the diagram?

	structure	function	structure	function
A	1	digestion of protein	3	absorption of the products of digestion
B	2	emulsifying	3	absorption of amino acids and glucose
C	4	production of bile	5	making digestive enzymes
D	4	storing digestive enzymes	2	making digestive enzymes

10 Which section of the diagram represents the effects of excessive alcohol consumption on the body?



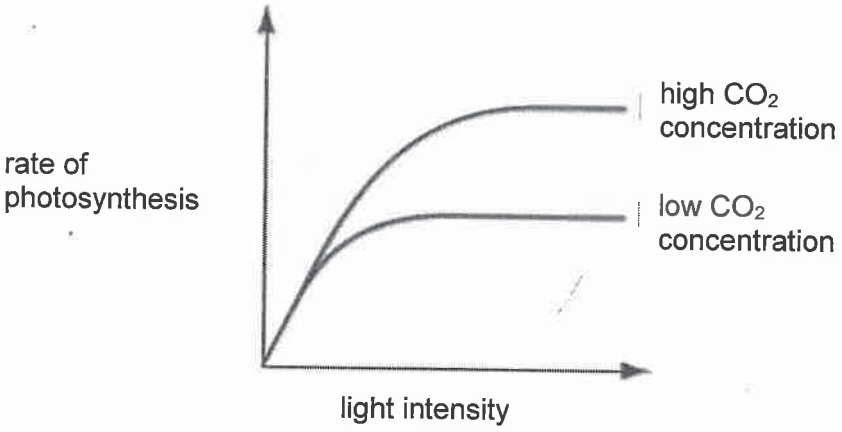
11 Similar number of cells from regions **W** to **Z** were isolated from a leaf and then placed in 0.5% $NaHCO_3$ solution under the same light intensity. The volume of gas released by each group of cells in thirty minutes was measured and tested.



Which of the following is correct?

	oxygen gas	carbon dioxide gas
A	only released by **W**	only released by **X**
B	only released by **W** and **Y**	not released by **Y**
C	released by **W**, **Y** and **Z**	not released by **W**, **X**, **Y** and **Z**
D	released by **W**, **Y** and **Z**	released by **W**, **X**, **Y** and **Z**

12 The graph shows the effects of carbon dioxide and light intensity on the rate of photosynthesis.



Which statement is supported only by evidence from the graph?

A At low light intensities, light intensity has no effect on photosynthesis.

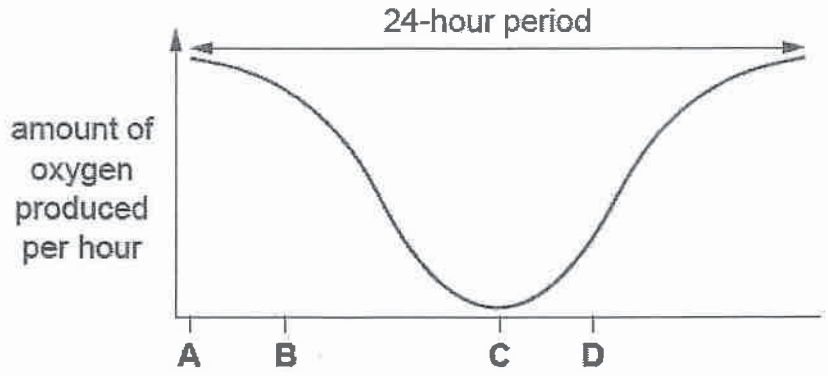
B Carbon dioxide limits the rate of photosynthesis at low light intensities.

C Light intensity and carbon dioxide both limit the rate of photosynthesis.

D The rate of photosynthesis is proportional to light intensity.

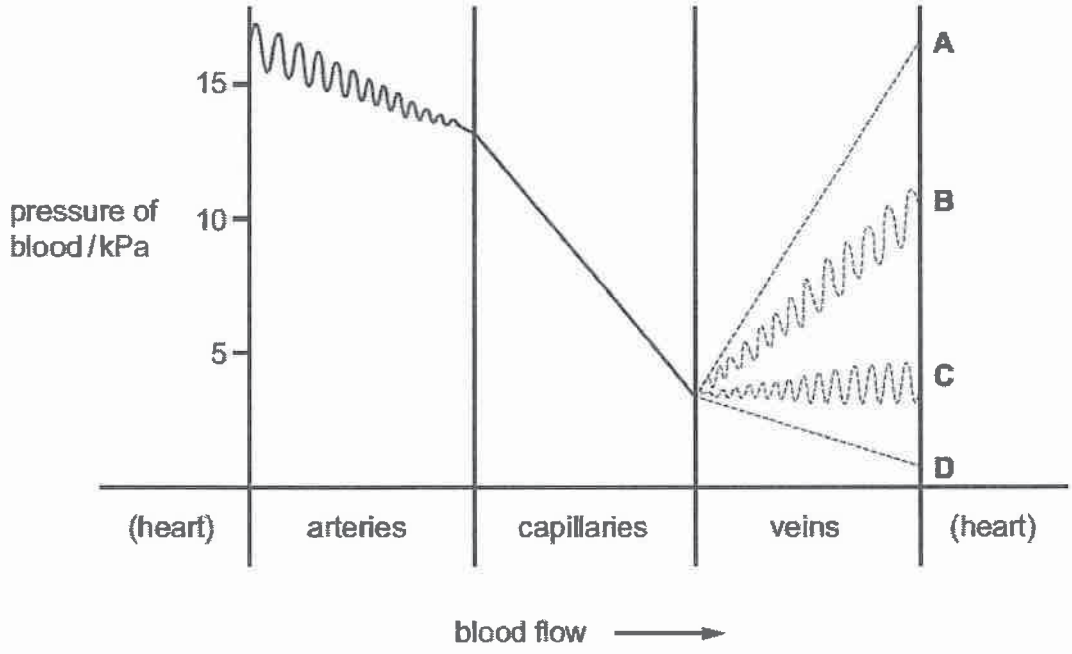
13 The graph shows the amount of oxygen produced by a green plant, growing outdoors, during a 24-hour period.

Which letter represents midday?



14 The diagram shows the blood pressure of a person at rest as the blood leaves the heart and passes through arteries and then capillaries.

Which line shows the pressure of blood as it flows through veins before returning to the heart?



15 Transfusion of donor red blood cells to a recipient can result in an agglutination reaction, which can lead to adverse effects in the recipient.

Options **A**, **B**, **C** and **D** each describe two different red blood cell transfusions.

Which option will result in agglutination reactions for **both** of the described transfusions?

A A person with blood group A:

- donates blood to a person with blood group AB
- receives blood from a person with blood group O.

B A person with blood group AB:

- donates blood to a person with blood group O
- receives blood from a person with blood group A.

C A person with blood group B:

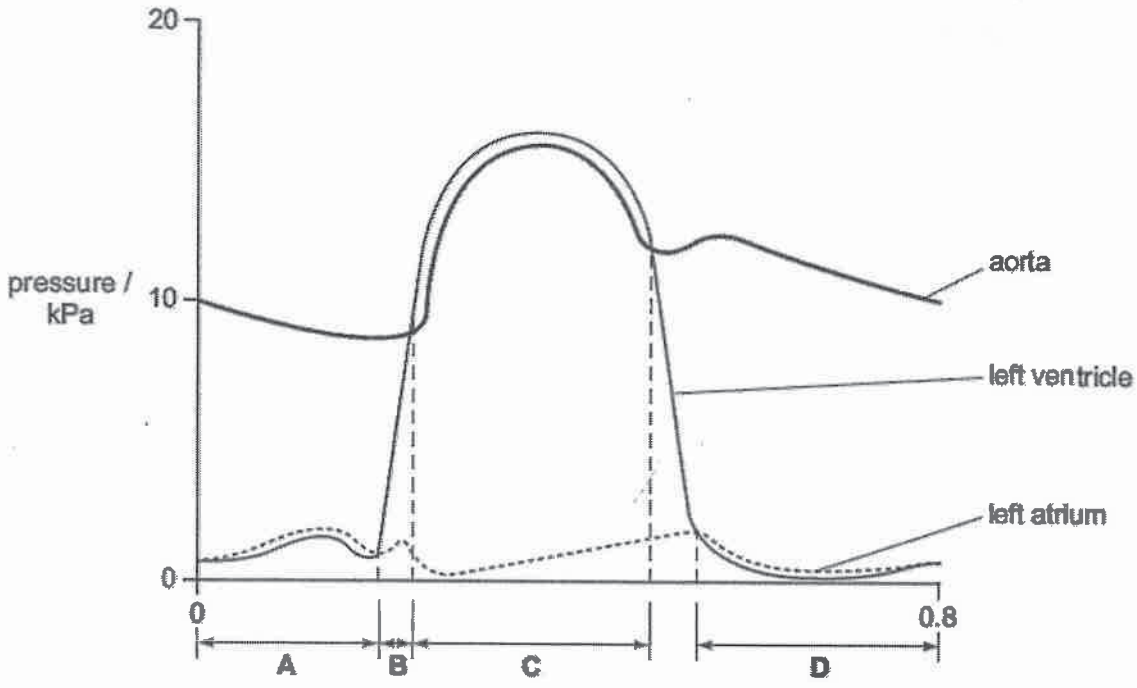
- donates blood to a person with blood group O
- receives blood from a person with blood group AB.

D A person with blood group O:

- donates blood to a person with blood group B
- receives blood from a person with blood group B.

16 The diagram shows the pressures in the left side of the heart during one heartbeat.

At which time in the cycle of one heartbeat are all four valves in the heart closed?



17 Some functions of the blood are listed.

1 antibody formation

2 clotting

3 distribution of hormones

4 phagocytosis

Which two functions are responsible for tissue rejection following a transplant operation?

A 1 and 2

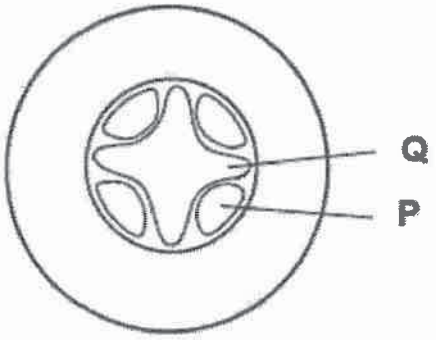
B 1 and 4

C 2 and 3

D 3 and 4

18 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 the plant.



The speeds of movement of the fluids in tissues **P** and **Q** are measured.

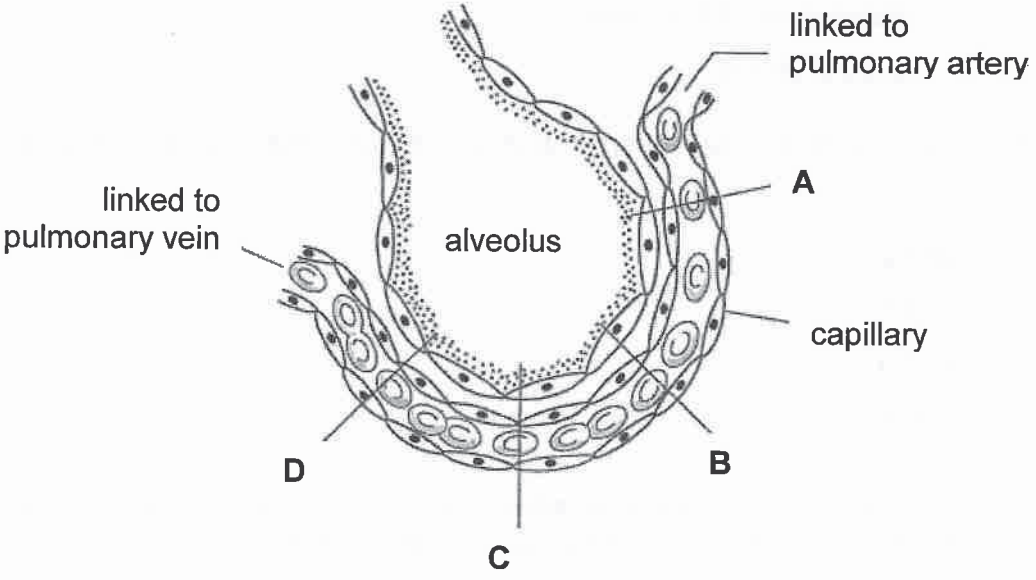
The humid air is then replaced by dry air and the speeds of movement of the fluids change.

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

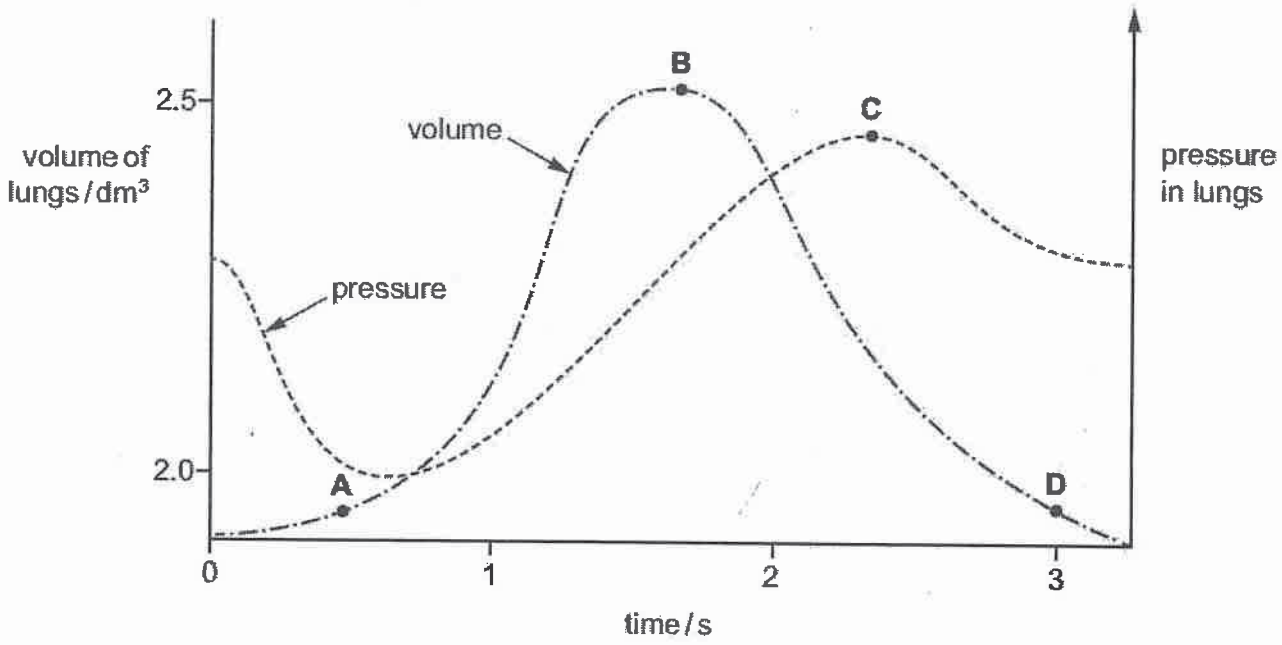
19 The diagram shows an alveolus and an associated blood capillary.

At which point will the greatest rate of diffusion of carbon dioxide occur?

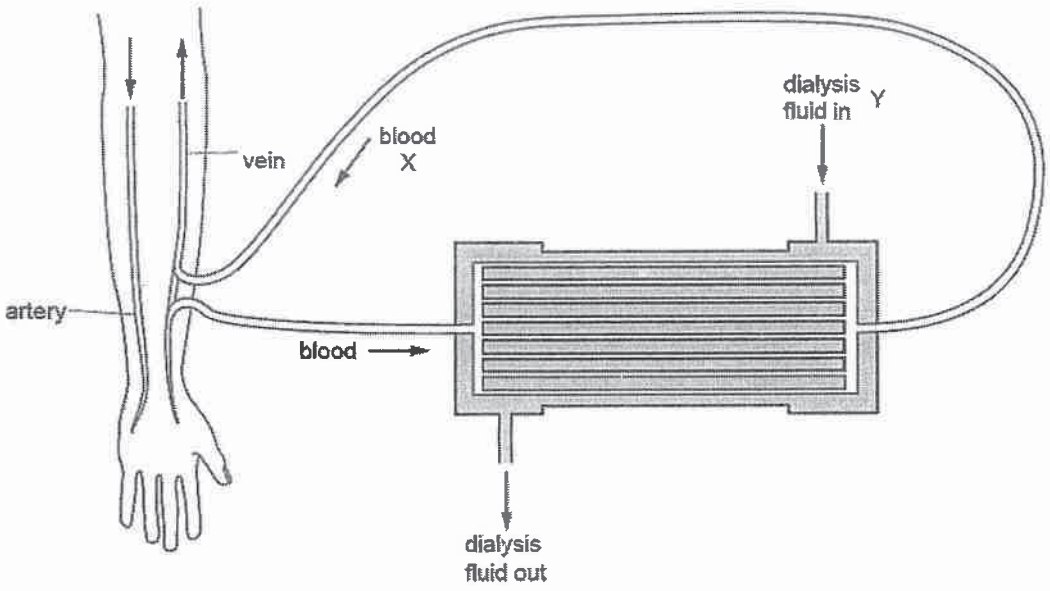


20 The graph shows how the pressure and volume inside the lungs change during one complete breath.

At which point are the muscles of the diaphragm starting to relax?



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



Which of the following statements about X and Y is true?

A X contains mineral salts but Y does not.

B X contains a higher concentration of amino acids than Y.

C X and Y have the same concentration of glucose.

D X and Y do not contain any urea.

22 The following events take place after a large glass of water is drunk. What is the correct sequence of events?

1 A larger volume of urine is formed.

2 The hypothalamus produces less ADH.

3 The water potential of the blood increases.

4 The permeability of the kidney tubules decreases.

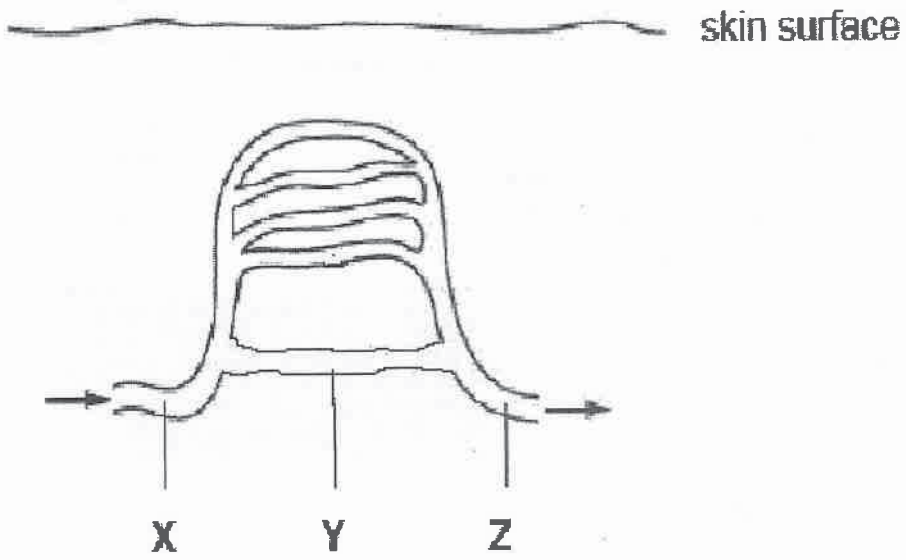
A 1, 4, 2, 3

B 2, 4, 3, 1

C 3, 2, 4, 1

D 3, 4, 1, 2

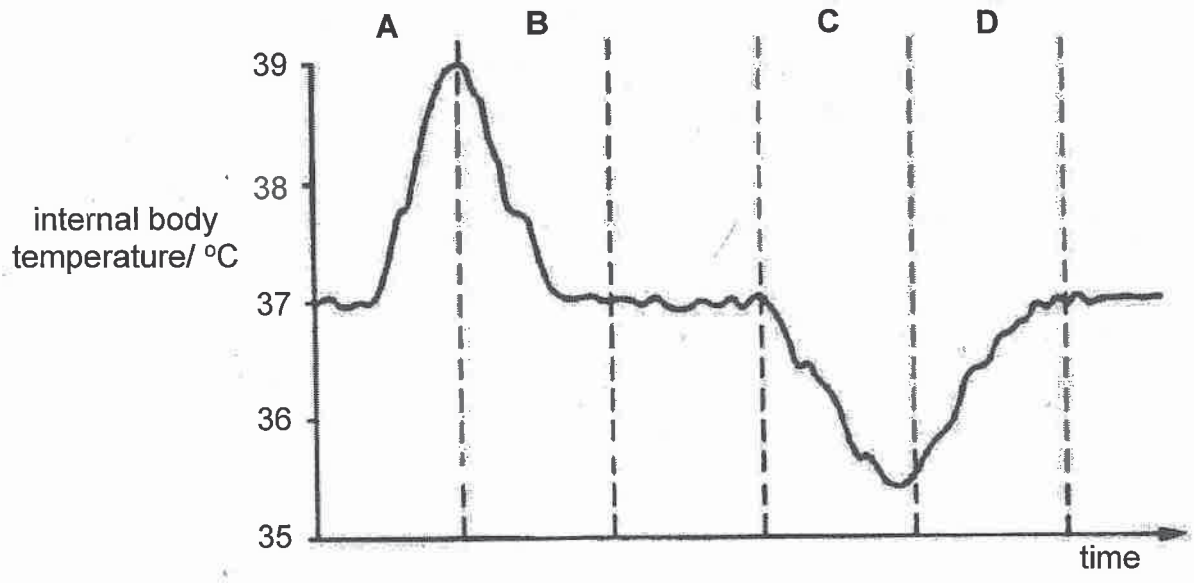
23 The diagram shows some blood vessels near the surface of the skin.



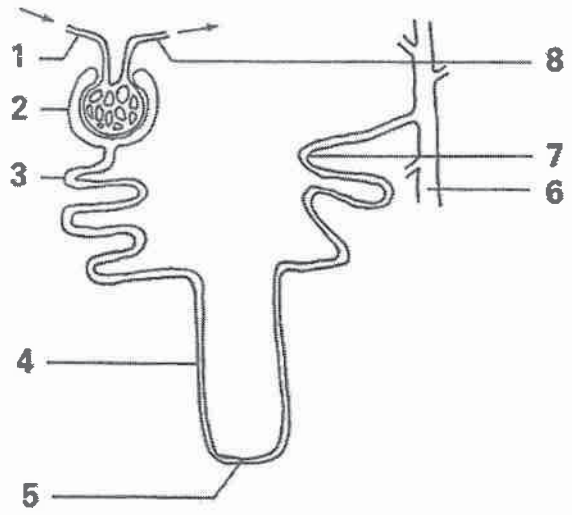
Which of the following correctly shows the changes when temperature rises?

	X	Y	Z
A	dilates	contracts	remains unchanged
B	constricts	dilates	dilates
C	dilates	constricts	remains unchanged
D	dilates	dilates	dilates

24 The graph shows changes in a person's internal temperature over a period of time.
During which period would the arterioles first become constricted?



Questions **25** and **26** refer to the diagram which illustrates the structures found within the kidney that are involved in urine production.



I Concentration of blood protein in structure **1** is less than that in structure **8**.

II Concentration of urea in structure **1** is more than that in structure **8**.

III Red blood cells are present in structure **1** but absent in structure **8**.

25 Which statements are correct?

A I only

B II only

C I and II only

D I, II and III

26 Which substances are normally found in both structures **5** and **7**?

A Protein and water

B Glucose and water

C Urea and glucose

D Salt and urea

27 After a student touches a hot kettle, he immediately withdraws his hand.

Which of the following best explains the role of the relay neurone in this process?

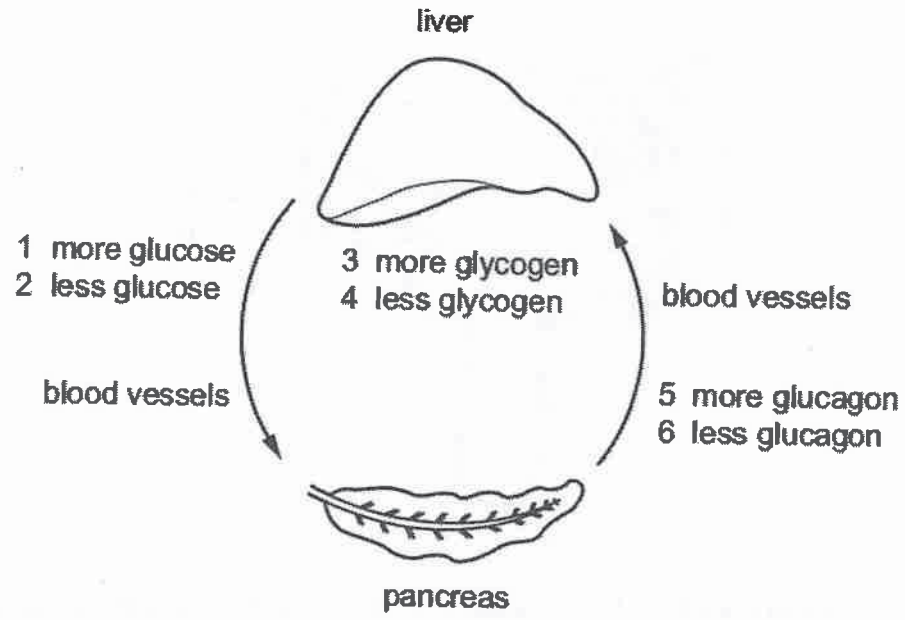
A It releases neurotransmitters to transmit the nerve impulses.

B It stimulates the muscles in the arm to contract so that it moves away.

C It transmits nerve impulses from the sensory neurone to the motor neurone.

D It transmits nerve impulses to the brain so that the withdrawal of the arm can be initiated.

28 The diagram shows part of the mechanism that controls blood sugar concentration.



A person does one hour of exercise.

Starting with the pancreas, what is the sequence of events in which the hormone glucagon is involved?

A 5 → 3 → 2 **B** 5 → 4 → 1 **C** 6 → 3 → 1 **D** 6 → 4 → 2

29 A number of new plants are growing from pieces of a plant that have become detached and have rooted in soil.

Which statement is correct about these new plants when they mature?

A The fruit they produce will all ripen at the same time.

B They will all produce the same number of fruits.

C They will all grow to the same size.

D They will all have the same flower colour.

30 HIV is transmitted by body fluids during sexual contact. HIV affects the immune system.

Which statement best describes the effect of HIV?

A The body has increased immunity.

B The body produces fewer antibodies.

C The body produces more antibodies.

D The number of lymphocytes increases.

31 Which row shows the effects of estrogen and progesterone?

	high level needed for ovulation	high level needed to stop development of more ova	maintains the uterine lining	repairs the uterus lining
A	estrogen	progesterone	estrogen	progesterone
B	estrogen	progesterone	progesterone	estrogen
C	progesterone	estrogen	estrogen	progesterone
D	progesterone	estrogen	progesterone	estrogen

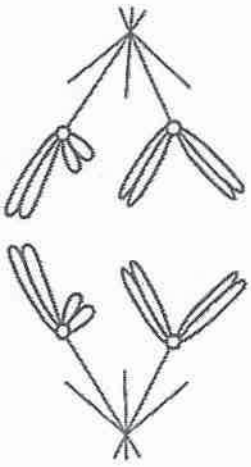
32 Which statements about DNA are correct?

1 An allele carries molecules of DNA.
2 A chromosome includes a molecule of DNA.
3 A molecule of DNA is divided into genes.

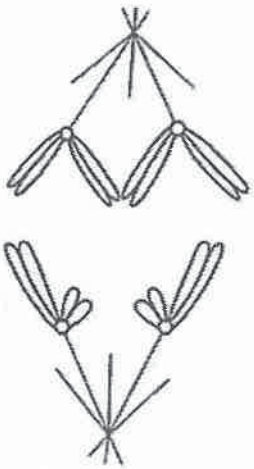
A 1, 2 and 3
B 1 and 2 only
C 1 and 3 only
D 2 and 3 only

33 Which diagram shows early anaphase of the first division of meiosis (anaphase I) of a nucleus containing two pairs of homologous chromosomes?

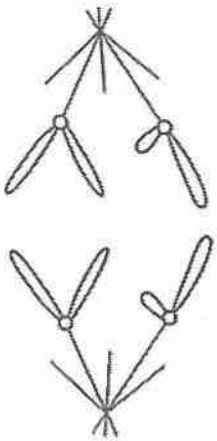
A



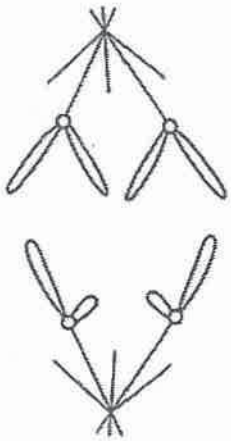
B



C



D



34 Which statement about a pair of homologous chromosomes is correct?

A They always have identical alleles.

B They contain bases in the same sequence.

C They contain the same genes in the same position.

D They form pairs in mitosis and meiosis.

35 A person with Down's syndrome is born with 47 chromosomes in each of his/her cells, instead of 46.

What could cause this?

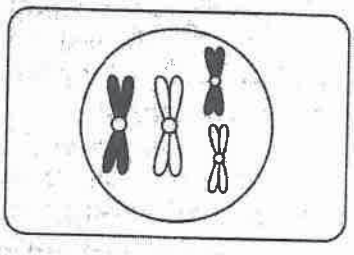
A A mutation happened during the production of the egg cell.

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.

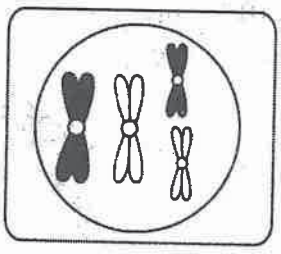
D The mother was exposed to harmful chemicals while she was pregnant.

36 The diagram shows cell X during prophase of mitosis.

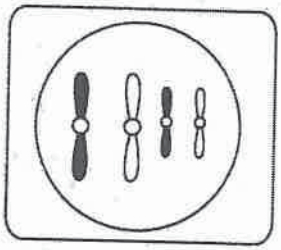


Which of the following diagrams shows a possible daughter cell when cell X has completed mitosis?

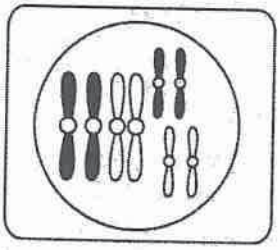
A



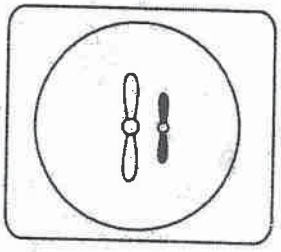
B



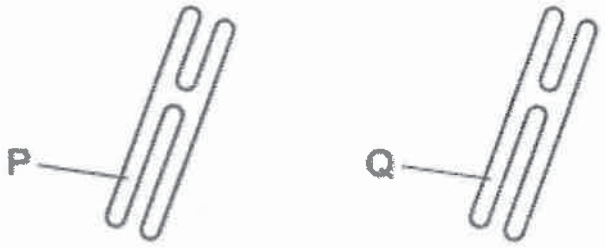
C



D



37 The diagram shows a pair of chromosomes from the same cell.



A gene is found at the point labelled **P**.

In a heterozygous individual, what will be found at the equivalent position labelled **Q**?

A a different allele of a different gene

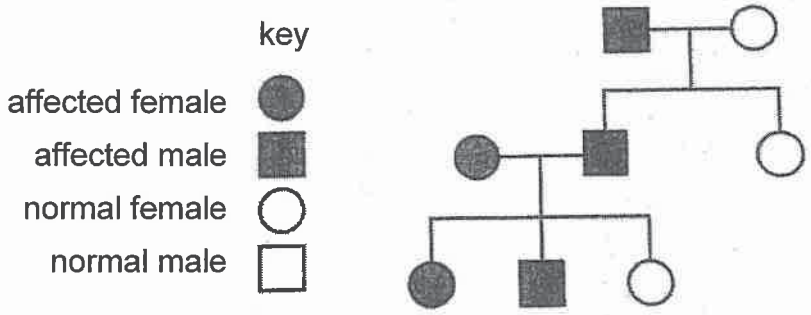
B a different allele of the same gene

C a different gene of the same allele

D the same gene of the same allele

38 Tuberous sclerosis is an uncommon genetic disorder caused by a mutation. The condition causes noncancerous (benign) tumors to develop in many parts of the body.

The diagram shows how this condition is inherited in a family



What does the family tree show about the mutated allele?

A It is co-dominant.

B It could be dominant or recessive.

C It is dominant.

D It is recessive.

39 Which statement describes an example of artificial selection?

A It has been found that some strains of bacteria produce antibiotics.

B It is common practice to mate bulls with cows that produce the most milk.

C It is possible to control caterpillars on food crops by releasing small wasps which lay their eggs in caterpillars and kill them.

D Mosquitoes have developed strains that are resistant to insecticides.

40 Which statement describes the relationship between evolution and natural selection?

A A change in the adaptive features of a population over time causes evolution, resulting in natural selection.

B Evolution causes a change in the adaptive features of a population over time, resulting in natural selection.

C Evolution causes natural selection, resulting in a change in the adaptive features of a population over time.

D Evolution is the change in the adaptive features of a population over time as a result of natural selection.

END OF PAPER

Name: ..... Register/Index Number: ..... Class: .....

PRESBYTERIAN HIGH SCHOOL

BIOLOGY **6093/2**

Paper 2

27 August 2020 **Thursday** **1 hour 45 minutes**

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2020 SECONDARY FOUR EXPRESS PRELIMINARY EXAMINATION

INSTRUCTIONS TO CANDIDATES

Write your class, register number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use correction fluid.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

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

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

At the end of the examination, submit Section A and Section B separately.

For Examiner's Use	
Section A	
Section B	
Total	

Setter: Mr Chandrasegaran P
Vetted by: Mrs Choy HP

This document consists of **15** printed pages and **2** blank pages.

[Turn over

Section A

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

1 Fig. 1.1 shows the effect exercise has on the amount of oxygen taken in by the body.

It also shows how the amount of another chemical in blood, called substance **X**, changes.

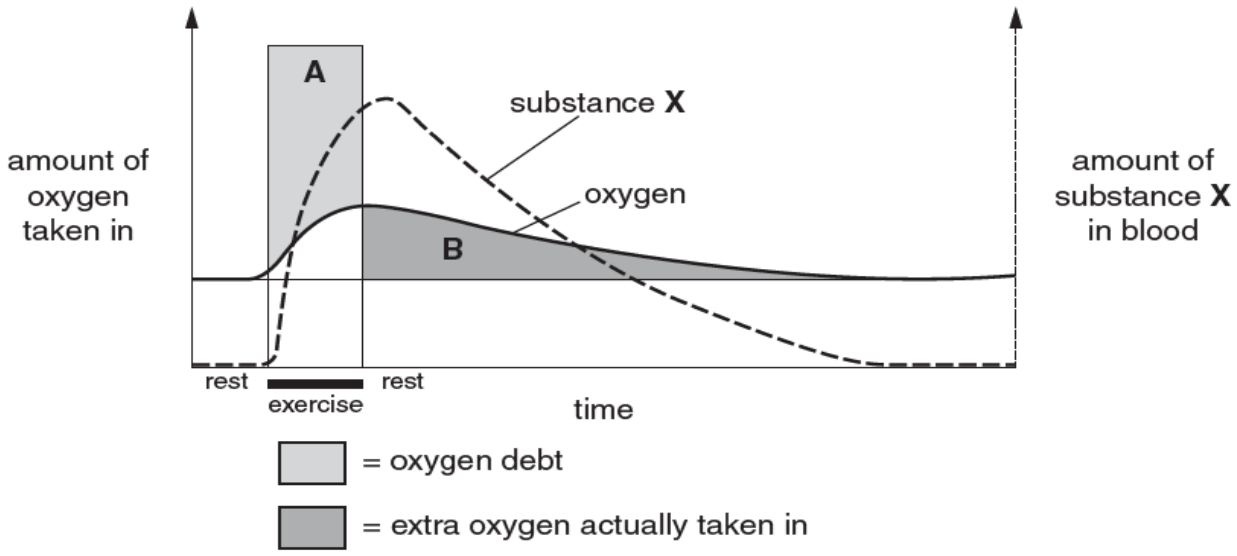

Fig. 1.1

(a) Identify what is substance **X**.

…….. [1]

(b) Area **A** on Fig. 1.1 represents the oxygen debt.

State what you understand by oxygen debt.

……

……[1]

(c) Explain why Area **B** is equal in size to area **A**.

……

……[1]

(d) On Fig. 1.1, draw a curve for substance **X** of a smoker suffering from emphysema and suggest why it is different.

……

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……[3]

[Total: 6]

2 An investigation was carried out to determine the rate at which the contents of the stomach are emptied into the duodenum in response to two types of food:

- a sucrose solution
- pieces of meat.

Fig. 2.1 shows the results of this investigation.

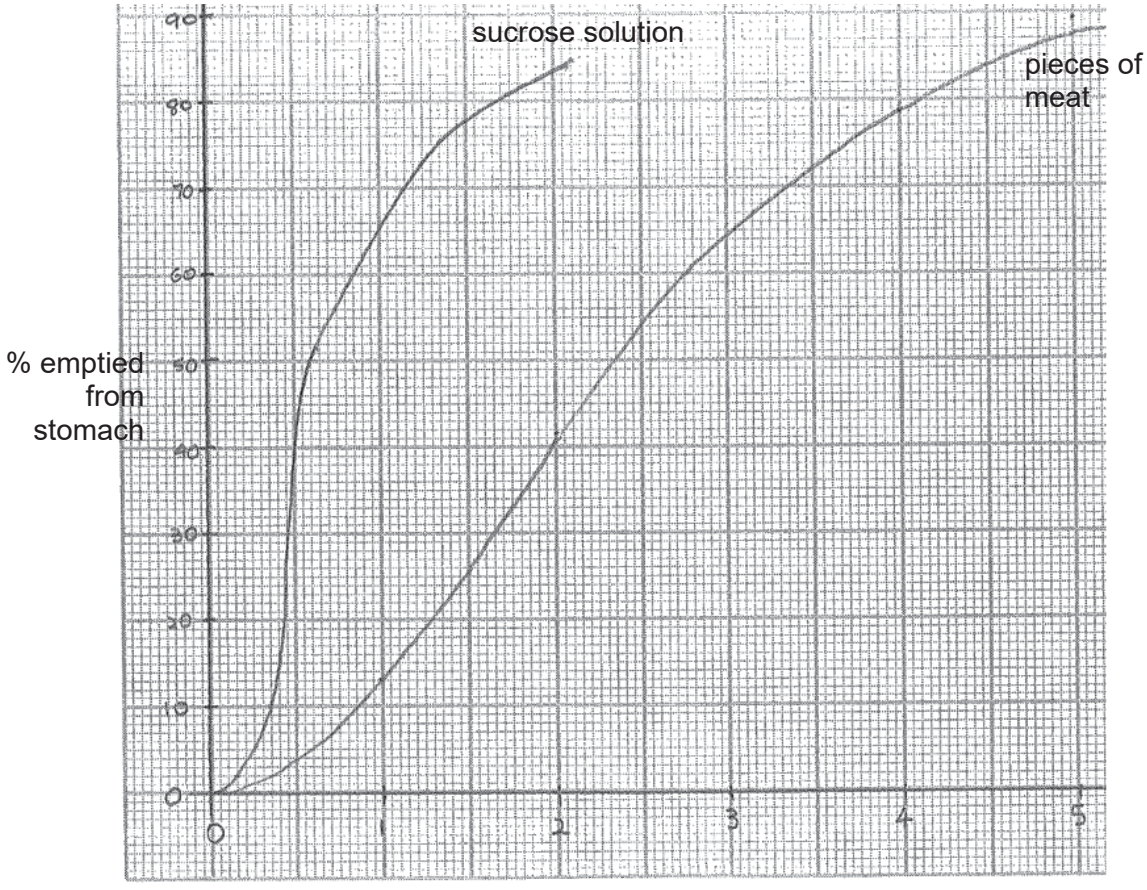

Fig. 2.1

(a) How long does it take for 50% of each food to be emptied from the stomach?

sucrose solution ……

pieces of meat …… [2]

[Turn over

(b) Explain the advantages of pieces of meat remaining longer in the stomach than sucrose solution.

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……[3]

[Total: 5]

3 Fig. 3.1 illustrates part of the reproductive system of a woman about to give birth.

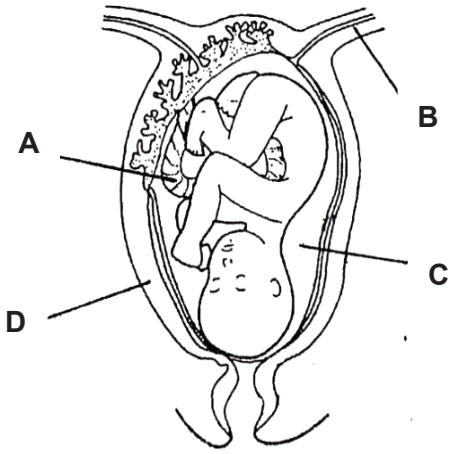

Fig. 3.1

(a) Name the parts labelled **A** to **D**.

A: …… **B**: ……..

C: …… **D**: …….. [2]

(b) On Fig. 3.1, label 'H' the part which produces hormone. [1]

(c) State two features of the placenta and how it is adapted for its role.

1……...

……

……

2……..

……

……[2]

(d) Fig. 3.2 shows the probability of a woman becoming pregnant after sexual intercourse, during a menstrual cycle.

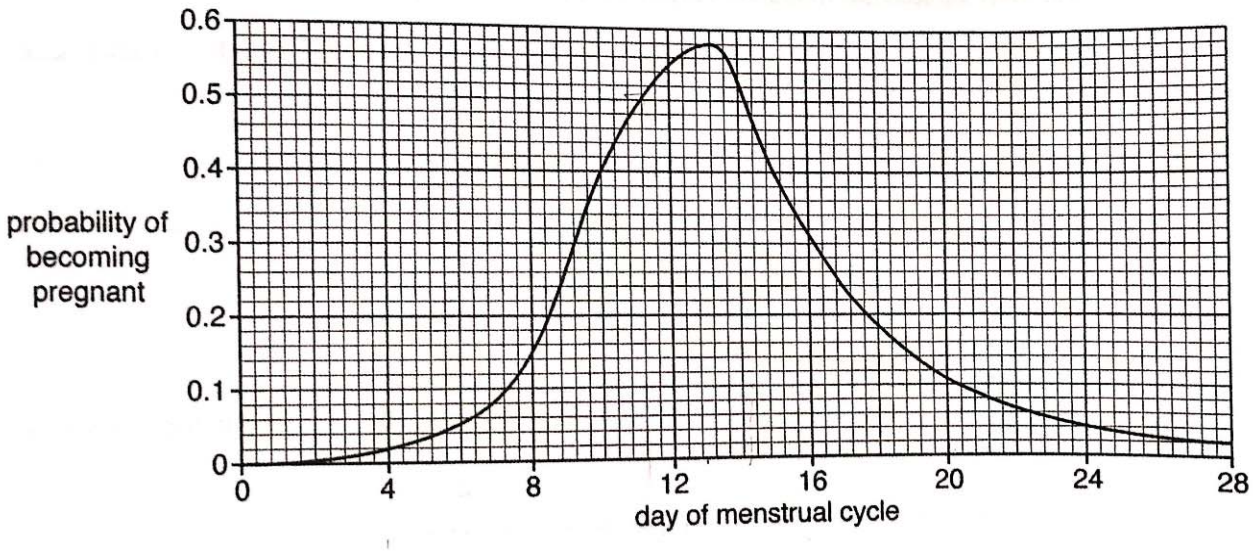

Fig. 3.2

Use your knowledge of the release and fertilization of an ovum to explain the shape of this graph.

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……[3]

[Total: 8]

4 Fig. 4.1 shows changes in the volume of blood in the left ventricle.

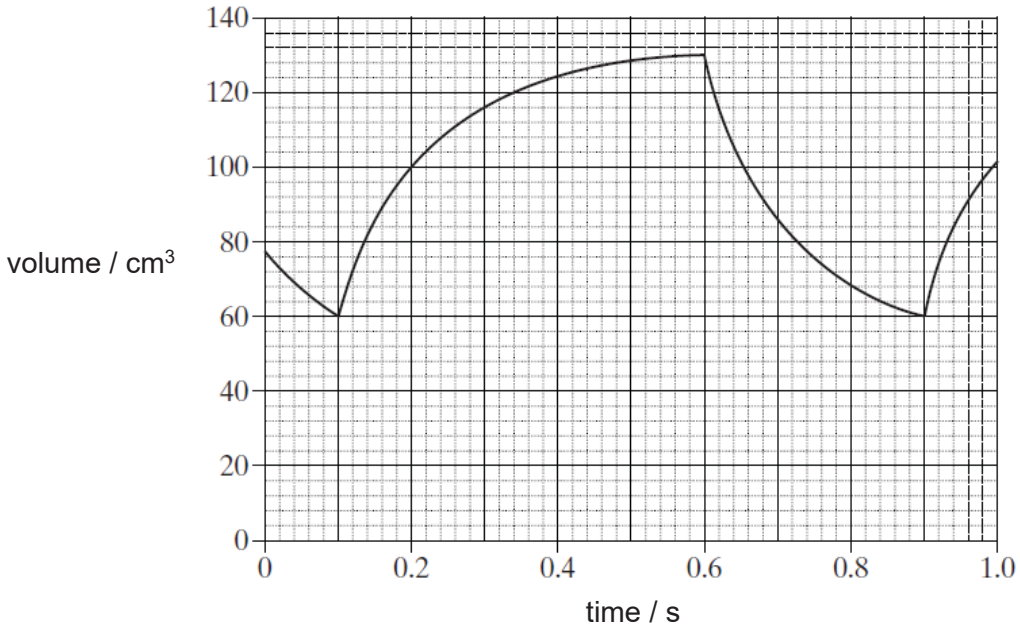

Fig. 4.1

(a) Between which times is the muscles of left atrium contracting?

.....[1]

(b) Use the graph to calculate the heart rate per minute. Show your working clearly. [1]

(c) On the graph in Fig. 4.1, sketch a line to show changes in the volume of blood in the left ventricle during a vigorous exercise. [1]

(d) Fig. 4.2a and Fig. 4.2b show the relative proportions of blood flow to various parts of the body at rest and during a period of vigorous exercise.

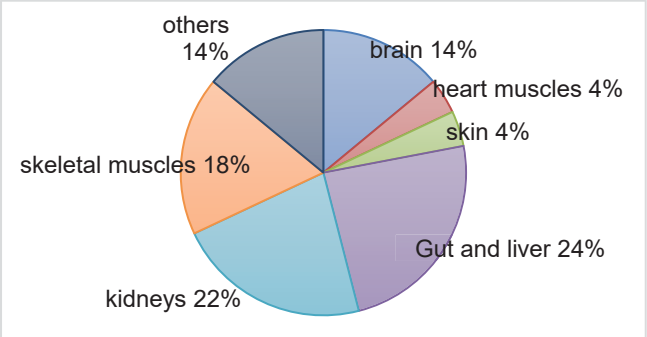

Fig. 4.2a : Total blood flow = 5 dm^3 per min.

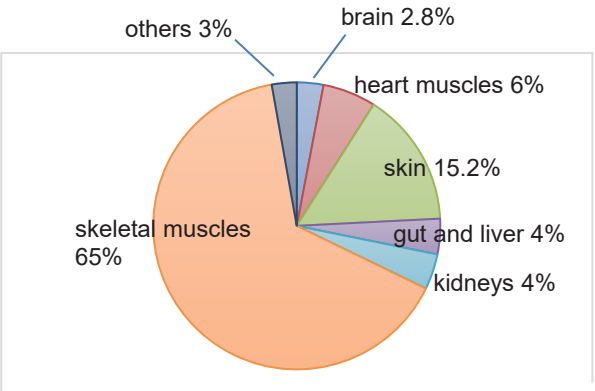

Fig. 4.2b : Total blood flow = 25 dm^3 per min.

[Turn over

(i) Use Fig. 4.2a and Fig. 4.2b to explain the rate of blood flow to the brain at rest with that during vigorous exercise.

……

……

……..…..[2]

(ii) Explain the change in the rate of blood flow to the skin and state why this is important.

……...

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……....

……..[4]

[Total: 9]

5 **(a)** Briefly describe how an image of a distant object is focused onto the retina in a normal human eye.

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……...

…… [3]

Macular degeneration is a disease resulting in the loss of light-sensitive cells in the yellow spot of elderly people. Almost all patients with age-related macular degeneration may see fairly well enough to take care of themselves.

(b) Suggest how the vision of a patient with macular degeneration differs from normal vision.

……...

…… [1]

(c) The vision of patients with macular degeneration may be helped by bionic eyes.

Fig. 5.1 shows a bionic eye which consists of a camera mounted on a pair of glasses worn by a patient. Signals from the camera are sent wirelessly to a device implanted behind the retina of the eye of the patient as shown in Fig. 5.2.

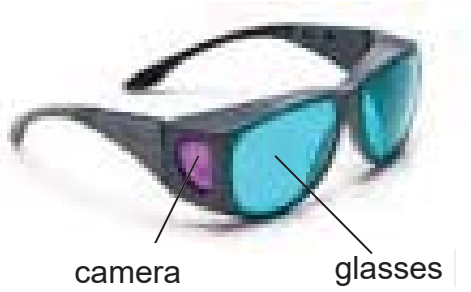
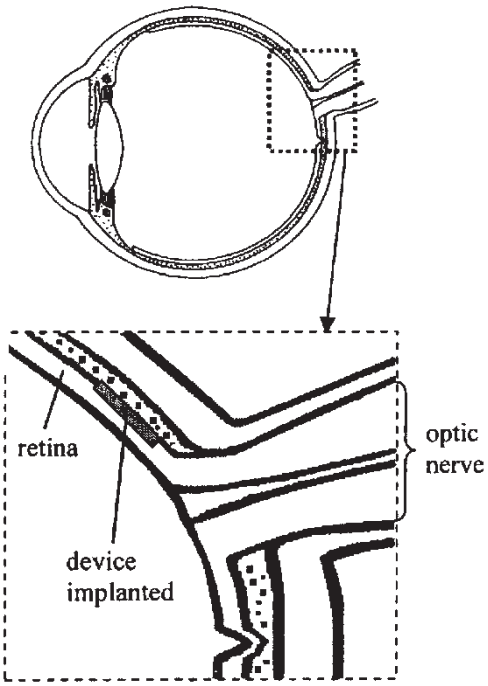


Fig. 5.1



The device generates electrical signals.

Fig. 5.2

(i) Why is the bionic eyes able to help the patients to see even when the lenses in their eyes become cloudy?

.....

.....[1]

(ii) Can the bionic eyes be used to help patients without any light-sensitive cells in their retina? Give a reason for your answer.

.....

.....

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.....[2]

[Total: 7]

6 **(a)** In an insect-pollinated flower, explain the importance of nectar and pollen.

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……[2]

(b) Fig. 6.1 shows the size of ovule in two flowers **P** and **Q** on the **same plant** over a period of 30 days.

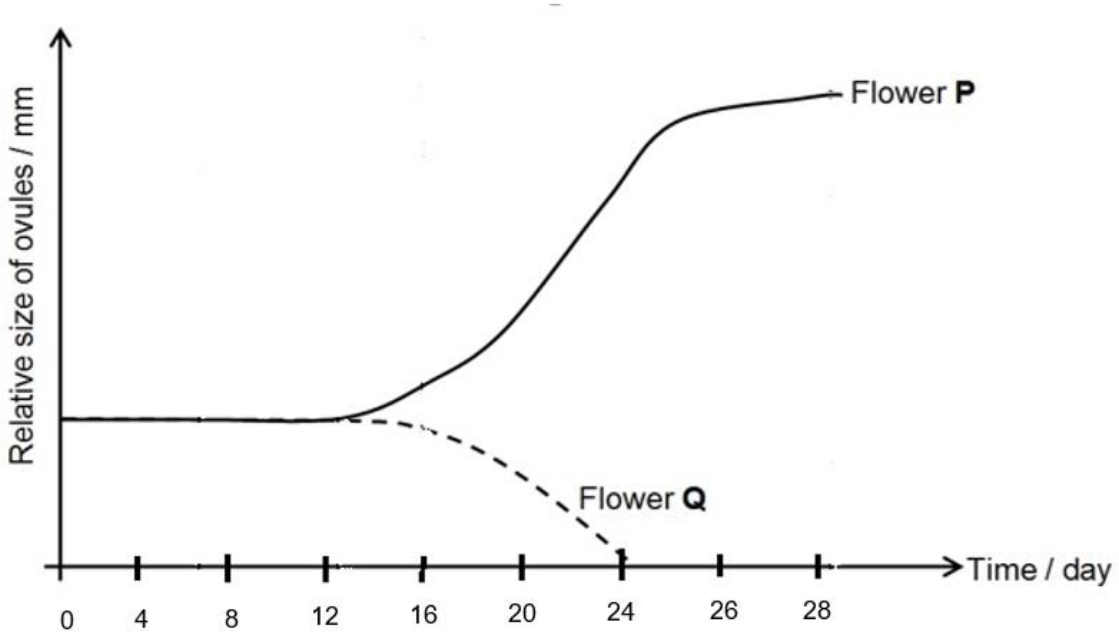

Fig. 6.1

(i) On Fig. 6.1, mark with a cross (X) to suggest when pollen was transferred to flowers **P** and **Q**. [1]

(ii) Explain why the relative size of the ovule of flower **P** increases only after day 13 and not at day X.

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……[3]

(c) State two advantages of self-pollination.

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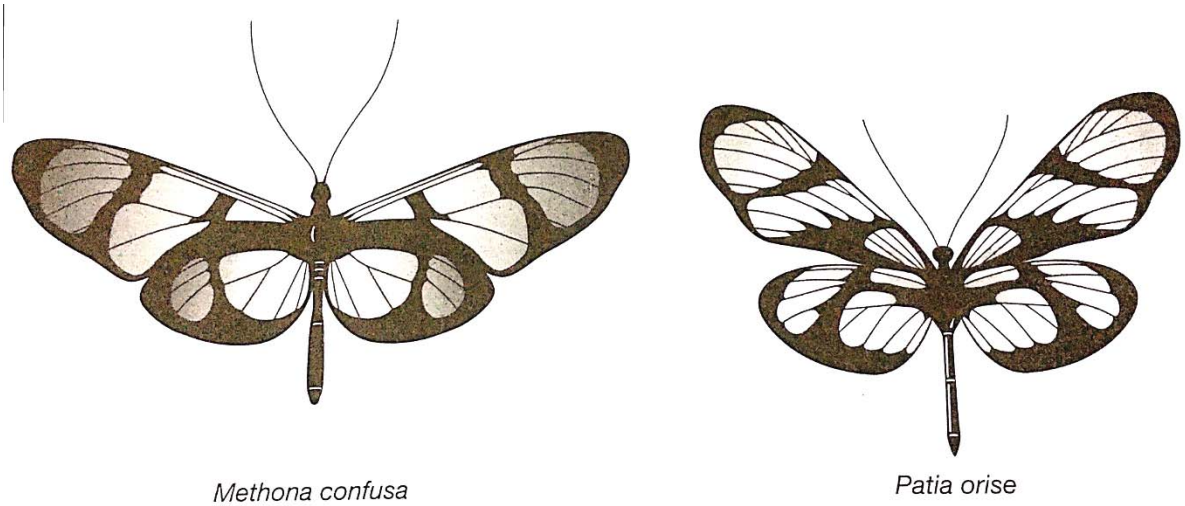
.....[2]

[Total: 8]

7 Fig. 7.1 shows two different species of butterflies found in the primary rainforest of South America.



Methona confusa

Patia orise

Fig. 7.1

Some information about the two butterfly species are given below:

- Both butterfly species are eaten by birds.
- *Methona confusa* contains toxins that are derived from its food sources. It makes the birds vomit.
- *Patia orise* is edible to birds but most birds do not prey on it. Its body does not contain toxins.

(a) State one difference, other than wing pattern, between the butterflies.

.....

.....[1]

(b) Deduce why most birds do not prey on *Patia orise*.

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.....[2]

(c) In the same population, the butterflies may show certain differences in wing pattern.

Explain **two** genetic causes that may lead to this differences among the butterflies.

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……[4]

[Total: 7]

BIOLOGY **PRELIMINARY EXAMINATION 2020 (SEC 4 EXP)**

Class	Index Number	Name

Section B

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

8 An experiment was conducted with four leaves of the same species and same area as shown in Fig. 8.1. Vaseline is a substance that is waterproof.

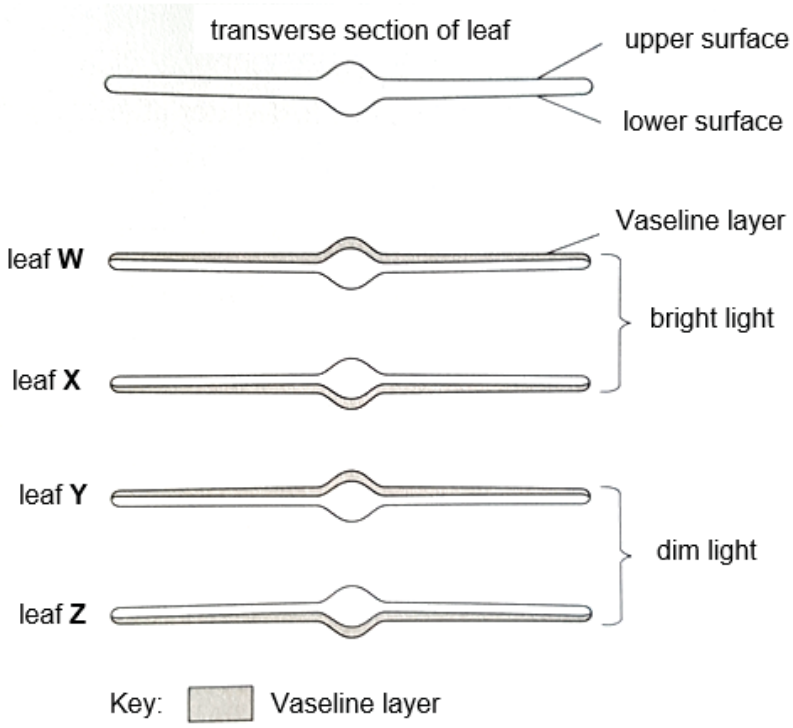

Fig. 8.1

The mass of each leaf was measured at the start and end of the experiment.

Table 8.1 shows the recorded masses.

Table 8.1

leaf	initial mass / g	final mass / g	change in mass / g
W	6.4	6.2	
X	6.2	5.5	
Y	6.3	6.2	
Z	6.4	6.2	

(a) Complete the table by calculating the change in mass of each leaf. [2]

(b) Draw a suitable graph of these data on the grid provided to show the change in mass under different conditions. [4]

(c) Suggest and explain the conclusion that can be drawn from the data?

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……[1]

(d) Explain how temperature of the surrounding affects transpiration?

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……[3]

[Total: 10]

[Turn over

9 **(a)** State the features of capillaries and explain how each of these helps with exchange of materials between the blood and tissue fluid.

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……[4]

(b) Describe the functions of white blood cells.

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……[4]

(c) Genes are also important in the clotting of blood. Blood will clot normally if a person possesses at least one dominant allele (**B**). This gene is carried only on the X chromosome.

Suggest why more males than females are likely to suffer from a disease in which blood does not clot normally.

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……[2]

[Total: 10]

10 **(a)** **(i)** Distinguish a hormone from an enzyme.

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(ii) Give an example of a situation in which there would be a rapid rise in the concentration of adrenaline in the blood.

What would be the effect of this rise?

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……[2]

(b) Describe the similarities and differences between a voluntary action and a reflex action.

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……[5]

END OF PAPER

PRESBYTERIAN HIGH SCHOOL
SCIENCE DEPARTMENT
SUGGESTED ANSWERS

Subject: BIOLOGY
Setter: Mr Chandra
Level: SEC 4 EXP

Exam: PRELIM
Year: 2020

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

PRESBYTERIAN HIGH SCHOOL
SCIENCE DEPARTMENT
MARKSCHEME

Subject: BIOLOGY Exam: PRELIM EXAM
Setter: Chandra Year: 2020
Level: SEC 4 EXP

SECTION A (50 marks)			
Qn	**Suggested Answer**	**Sub-total**	**Total**
1a	Lactic acid;	1	1
b	Difference between oxygen supply and demand for oxygen; Or Amount of oxygen needed if all the energy released was from aerobic respiration	1 1	1
c	Oxygen needed to break down lactic acid; Oxygen needed to repay debt;	1 1	1
d	Steeper rise + longer time to reach starting level; Emphysema -walls b/w alveoli broken, total surface area decreases; -less oxygen absorbed per unit time; -cannot meet oxygen demand; + anaerobic faster -more time needed to breakdown lactic acid	1 ½ ½ ½ ½	1 2
			6
2a	Sucrose: min Meat: min	1 1	2
b	sucrose is in solution; no sucrase/no carbohydrate digestion in stomach therefore sucrose passes straight, through stomach / into small intestine; protein digestion starts in the stomach ; enzyme need time to digest large molecules ; meat is solid, small surface area + takes longer to digest; solid requires more mechanical digestion e.g. ref to churning	½ ½ ½ ½ 1 1	 3
			5
3a	A: umblical cord B: oviduct C: amniotic fluid D: uterus wall	½ ea	2
b	Label H on placenta	1	1
c	Ref to numerous villi + increased surface area + for diffusion of material; Dense network of capillaries [R blood vessels] + continuous blood flow maintains diffusion gradient;	1 1 1	 2

	Thin membrane separates maternal and fetus blood + short distance for diffusion;		
d	Sperm and ovum must be present for fertilisation to occur; Uses data – more than 50% chance between day 11 and day 14; Ovulation is only 1 day, day 12, 13 or 14; Ref to lifespan of ovum n sperm; From day 8, uterine lining is ready to accept embryo so chances increases;	½ 1 1 1 1	3
			8
4a	0.1s to 0.6 s	1	1
b	Duration of 1 beat = 0.9 – 0.1 = 0.8s 60s = 60/0.8 = 75 beats	1	1
ci	Either 0.3 or 0.4s to reach maximum but same duration to empty	1	1
ii	At rest = 0.14 x 5 = 0.7 dm^3 Exercise = 0.028 x 25 = 0.7 dm^3 No change, blood flow remains the same to coordinate many activities;	½ ½ 1	2
iii	rate of respiration is very high to meet energy demand; heat energy is a by-product; arterioles dilate/vasodilation + more blood to capillaries in skin; excess heat + lost via convection, radiation; high body temperature causes enzyme to denature;	1 ½ 1 ½ 1	4
			9
5a	Light rays passes through cornea, iris and falls on lens; Ciliary muscles relax + exert pull on suspensory ligament; Edges of lens stretched, lens become thin and longer; Light rays bent less, focused on retina	1 1 1 ½	3
b	Centre of vision is blurred	1	1
ci	Light rays need not pass through the lens but camera.	1	1
ii	Yes. The device produces impulse; Carried by optic nerve to brain;	 1 1	2
			7
6a	Nectar contains sugar + Energy-giving food for insects; Pollen contains male gametes; Must be carried from anther to stigma for fertilisation;	1 ½ ½	2
bi	Day 8 – day 12	1	1
bii	Pollen germinates to form pollen tube, grows down through style carrying male gamete; Enters ovary, reaches ovule + release male gamete; Fertilisation occurs, zygote starts to divide to form new cells; All these needs time;	1 1 1	3

c	Only one parent plant is involved, so more likely to take place; Good qualities likely to be passed down; Its effective because not dependent on pollinating agents, especially in harsh environments; Its reliable if plants are widely scattered;	1 1 1 1	2
			8
7a	Patia has pointed abdomen/body	1	1
b	Birds have learnt not to prey on Methona by recognising wing pattern; Wing pattern of Patia resembles toxic Methona, do not prey on it as soon as they recognise wing pattern	1 1	2
c	Mutation Change in the genes controlling wing pattern; Independent assortment / crossing over of sister chromatids of homologous chromosomes during meiosis; Variety of gametes with different alleles for wing pattern; Random fertilisation Random combination of alleles for wing pattern in zygote	½ ½ ½ ½ ½ ½	Any Of 2 sets 4
			7
	Section B		
8a	-0.2 -0.7 -0.1 -0.2 no negative value = wrong value = no marks	0.5 0.5 0.5 0.5	2
b	Scale: even scale and graph able to fill up at least half the grid; Bars: drawn separately with correct labels (W, X, Y and Z); Axis: labelled with correct heading and unit: change in mass / g and leaf Plot: accurate values	1 1 1 1	4
c	More stomata found on upper surface; Water loss from upper surface is higher in both lighting condition	1	1
c	Warm condition increases transpiration; Film of moisture on mesophyll surfaces evaporate faster; Humidity of air in intercellular spaces increases; Greater concentration of water vapour molecules inside the leaf than outside atmosphere; Water vapour diffuses out through stomata; [reject water concentration]	1 ½ ½ ½ ½	3
			10

<table>
<tr><td>9a</td><td>
<table>
<tr><th>feature</th><th>explanation</th></tr>
<tr><td>Narrow/small diameter/microscopic</td><td>Contact with many cells/short diffusion distance between cells</td></tr>
<tr><td>Tiny gaps on wall</td><td>Allows fluids/nutrients out/ wbc;
Proteins cannot pass
[reject plasma]</td></tr>
<tr><td>Single cell layer/1 cell thick</td><td>Short distance for materials to diffuse through / rapid diffusion;</td></tr>
<tr><td>Smooth inner surface/endothelium;</td><td>Smooth blood flow</td></tr>
<tr><td>Large total surface area/reduces pressure</td><td>Slows flow for exchange / allows more exchange
[reject easier exchange]</td></tr>
</table>
</td><td>1
1
1
1
1</td><td>4</td></tr>
<tr><td>b</td><td>Phagocytes engulf + digest bacteria;
Lymphocytes release anti-bodies;
Causes agglutination + purpose;
Neutralise toxins;
Kills bacteria/virus
Antibodies remain + immune response</td><td>1
½
½
½
½
½</td><td>4</td></tr>
<tr><td>c</td><td>males have XY sex chromosomes;
female XX chromosomes ;
males require only one (b) recessive allele;
females require two recessive alleles;
greater chance that males will not have the dominant allele (B);</td><td>½
½
½
½</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td>10</td></tr>
<tr><td>10ai</td><td>
<table>
<tr><th>Enzymes</th><th>Hormones</th></tr>
<tr><td>all are proteins</td><td>either steroids (eg. oestrogen) or protein (eg, insulin)</td></tr>
<tr><td>carried in ducts to site of action</td><td>carried in bloodstream to target organs</td></tr>
<tr><td>high molecular weight, so non-diffusible through cell membrane</td><td>low molecular weight, diffusible through membrane</td></tr>
<tr><td>catalyse a particular reaction</td><td>stimulate target cells to perform the required reactions</td></tr>
<tr><td>catalyse reversible & irreversible reactions</td><td>hormone controlled reactions are not reversible</td></tr>
<tr><td>Released in large quantities</td><td>Released in very small quantities</td></tr>
</table>
</td><td>1
1
1
1
1
1</td><td>3</td></tr>
<tr><td>ii</td><td>Any reasonable state of emergency; [reject chased by tiger, etc]
Increased heart rate/breathing rate/Increased alertness/increased metabolic rate [any 2]</td><td>1
1</td><td>2</td></tr>
</table>

<table>
<tr><td>b</td><td>
<table>
<tr><th>Differences</th><th>Reflex action/involuntary</th><th>Voluntary action</th></tr>
<tr><td>behaviour</td><td>in-born behaviour, automatic</td><td>controlled behaviour, involves decision making</td></tr>
<tr><td>speed of response</td><td>response is rapid</td><td>response is slower</td></tr>
<tr><td></td><td>response to an external stimulus</td><td>response initiated from the brain under conscious control</td></tr>
<tr><td>nature of response</td><td>Same stimulus always results in the same response</td><td>response varies according to situation</td></tr>
<tr><td>CNS</td><td>brain or spinal cord involved</td><td>always forebrain involved</td></tr>
<tr><td>effectors</td><td>muscles and/or glands</td><td>muscles only</td></tr>
<tr><td>Similarities</td><td colspan="2">both involve transmission of impulse along motor neurone to effectors</td></tr>
</table>
</td><td>1
1
1
1
1
1
1</td><td>5</td></tr>
<tr><td></td><td></td><td></td><td>10</td></tr>
</table>