Anglo-Chinese School (Barker Road)

PRELIMINARY EXAMINATION 2020

SECONDARY FOUR EXPRESS

BIOLOGY PAPER 1

6093/1

TIME: 1 HOUR

INSTRUCTIONS TO CANDIDATES:

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name and index number on the answer sheet in the spaces provided.

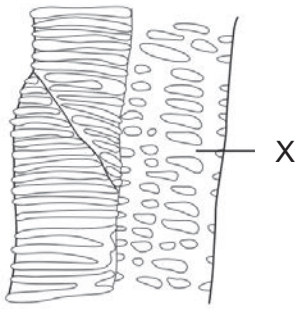
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

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

This question paper consists of **19** *printed pages.*

1 The diagram shows part of a xylem vessel.



What is the function of the spiral structure at X?

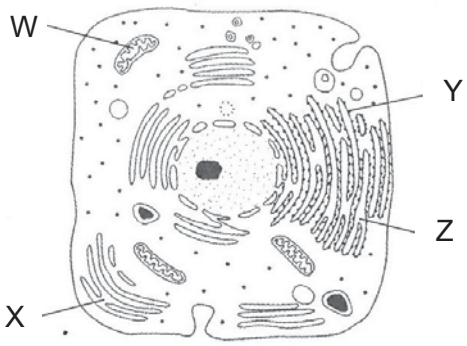
A absorption

B photosynthesis

C support

D transport

2 The diagram shows an animal cell.



Some processes that take place in the cell are listed.

1 aerobic respiration

2 formation of polypeptides

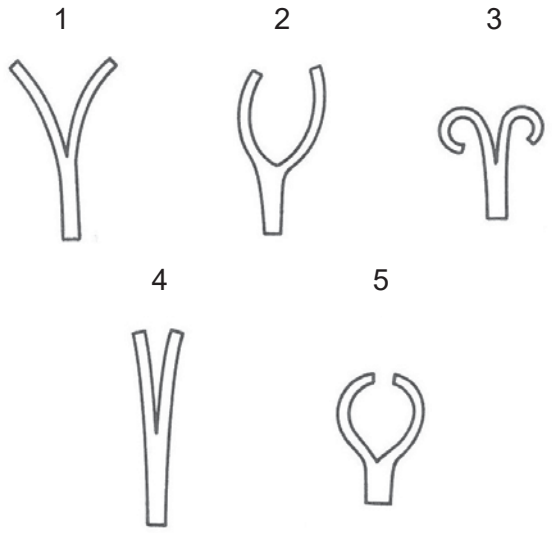
3 transport of proteins

4 synthesis of fats

Which row in the table gives the correct match between the labelled parts of the cell and its function?

	W	X	Y	Z
A	1	3	4	2
B	1	4	2	3
C	4	2	1	3
D	4	3	2	1

3 The diagram shows the appearance of some petioles that have been split longitudinally into two halves and immersed in different concentrations of sucrose solution. Petiole 1 represents the appearance of a freshly split petiole.



Which row shows the petioles in ascending order with respect to the concentration of the sucrose solution in which the petioles have been immersed?

A 3, 4, 2, 5

B 3, 5, 2, 4

C 5, 2, 4, 3

D 5, 3, 4, 2

4 Which row is correct for active transport?

	movement of substances	occurrence
A	high concentration to low concentration	dead cells
B	high concentration to low concentration	living cells
C	low concentration to high concentration	dead cells
D	low concentration to high concentration	living cells

5 Some statements about enzymes are listed.

1 The active site is on the enzyme.

2 They act as biological catalysts.

3 They are only used for the breaking down of complex organic compounds into simple and diffusible forms.

4 They are required in small quantities as they can be reused.

5 They are very stable to pH changes.

6 They lower the activation energy of a reaction by providing an additional source of energy.

Which statements about enzymes are incorrect?

A 1, 3, 6 only

B 1, 4, 5 only

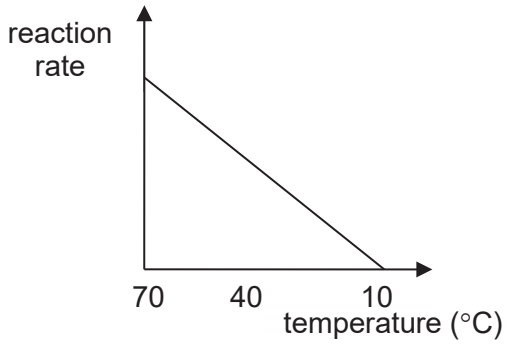
C 2, 4, 6 only

D 3, 5, 6 only

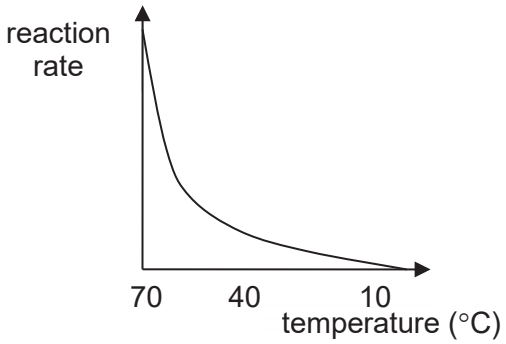
6 2 cm^3 of amylase solution is added to 5 cm^3 starch solution which is kept in a water bath maintained at 70 ºC. The mixture is then cooled down from 70 ºC to 10 ºC.

Which graph shows the change in the reaction rate of the enzyme in the mixture?

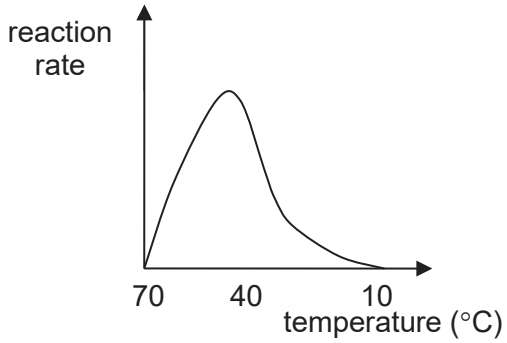
A



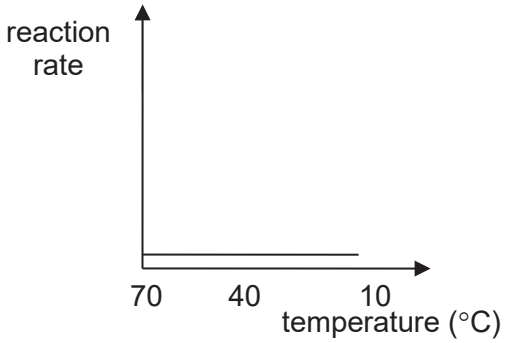
B



C



D



7 The table shows the results of tests carried out on a food item.

test	result
biuret test	purple colour
Benedict's solution	blue colour
emulsion test	white emulsion
iodine solution	blue-black colour

What was present in the food?

A fat and reducing sugar only

B fat, protein and starch only

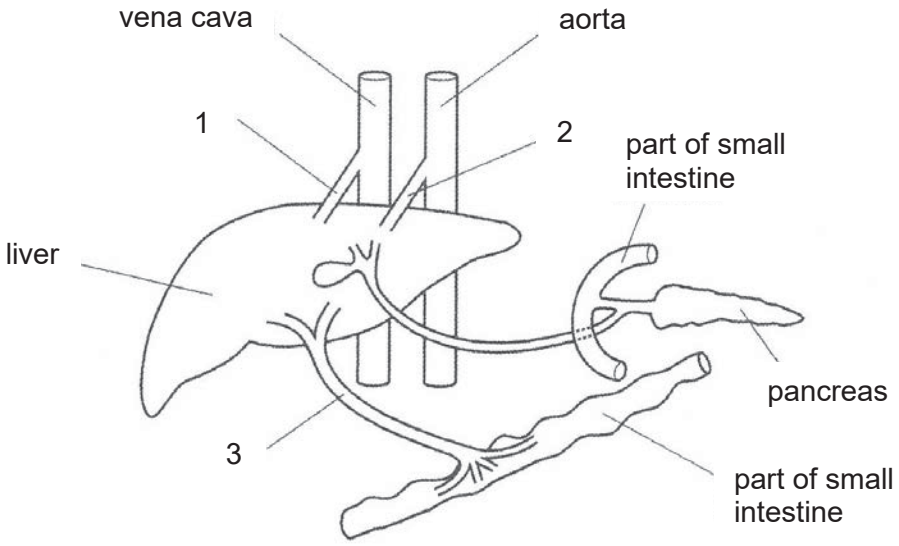
C fat, reducing sugar and starch only

D protein, reducing sugar and starch only

8 How will carbohydrates, fats and protein digestion be affected if a patient has his gall bladder removed?

	carbohydrate	fat	protein
A	normal	normal	normal
B	normal	slower	normal
C	slower	normal	normal
D	slower	slower	slower

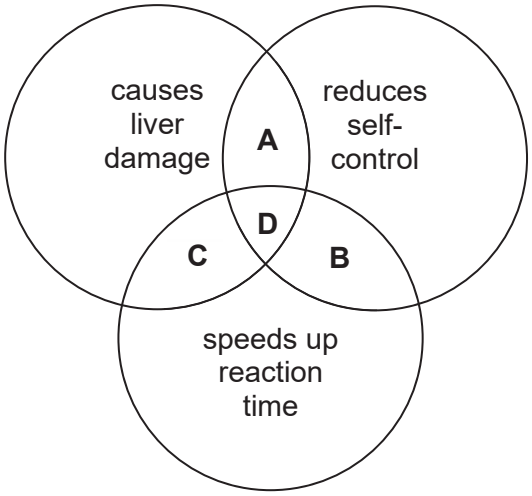
9 The diagram shows the liver and some associated structures.



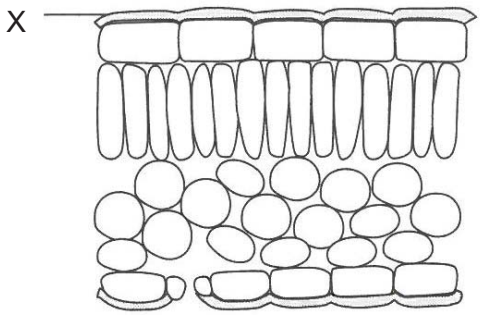
Which row shows the relative concentration of carbon dioxide and glucose?

	carbon dioxide	glucose
A	1 > 2 > 3	2 > 3 > 1
B	1 > 2 > 3	3 > 1 > 2
C	1 > 3 > 2	1 > 3 > 2
D	1 > 3 > 2	3 > 1 > 2

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



11 The diagram shows the transverse section of a leaf.



Which of the following is **not** a function of structure X?

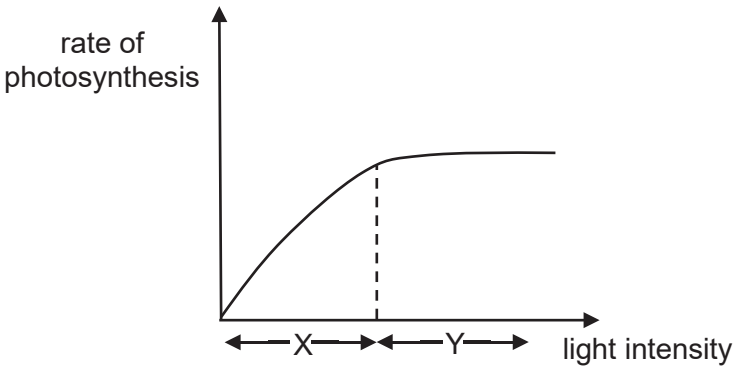
A It confines water loss to limited openings on the leaf surface.

B It gives rise to new epidermal cells when the old ones die out.

C It minimises the entry of bacteria and fungi.

D It protects the inner cells from drying out.

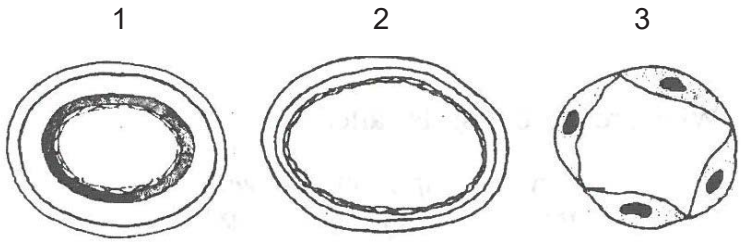
12 The diagram shows the effects of light intensity on the rate of photosynthesis.



What are the limiting factors at X and Y respectively?

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

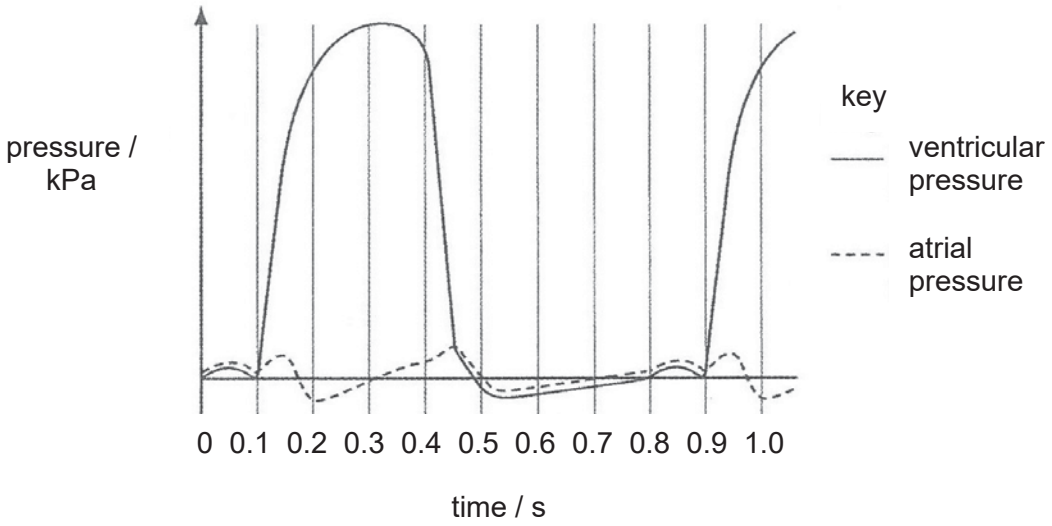
13 The diagram shows three types of blood vessels (not drawn to scale).



Which row describes features of each vessel?

	fluid can pass through wall	fluid under high pressure	least resistance to flow of fluid
A	1	2	3
B	2	1	3
C	3	1	2
D	3	2	1

14 The diagram shows the pressure changes in the left side of the heart.



What is the ratio of the duration of atrial systole to atrial diastole?

A 0.1 : 0.3

B 0.1 : 0.7

C 0.1 : 0.8

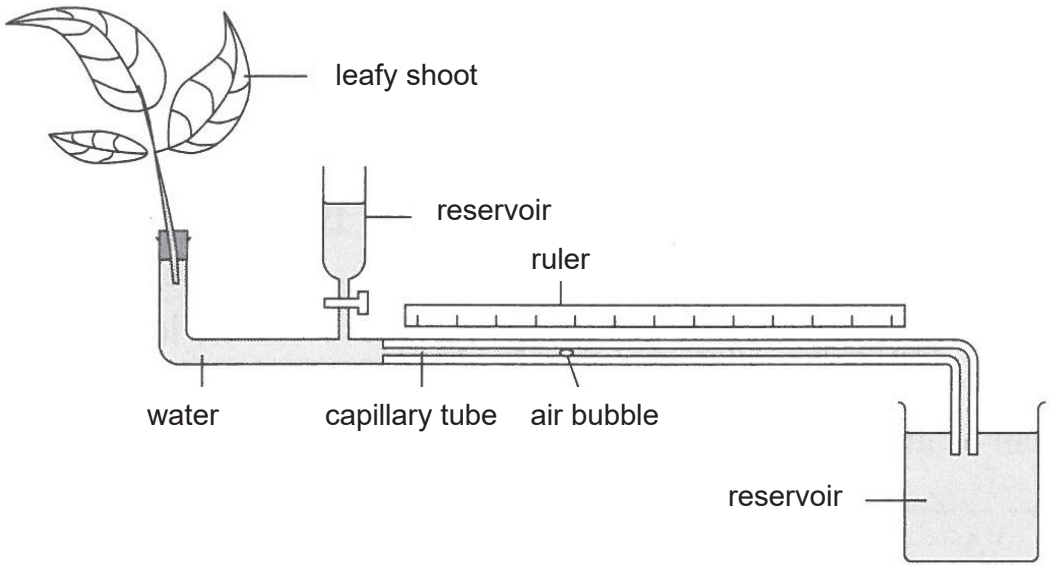
D 0.7 : 0.1

15 Several plant roots were soaked for 24 hours in a metabolic poison that is known to affect the activity of mitochondria.

What is the expected impact on the absorption of mineral salts and water in the roots?

	absorption of mineral salts	absorption of water
A	becomes slower	becomes slower
B	becomes slower	no impact
C	no impact	becomes slower
D	no impact	no impact

16 The diagram shows a potometer.



What is expected to occur after the leafy shoot is exposed to hot, windy conditions for one hour?

A The air bubble in the capillary tube increases in size.

B The air bubble in the capillary tube moves away from the leafy shoot.

C The air bubble in the capillary tube moves towards the leafy shoot.

D The volume of water in the reservoirs falls.

17 In which order would a molecule of carbon dioxide pass through these structures as it left the body?

A alveolus → bronchiole → bronchus → larynx → trachea

B alveolus → bronchiole → bronchus → trachea → larynx

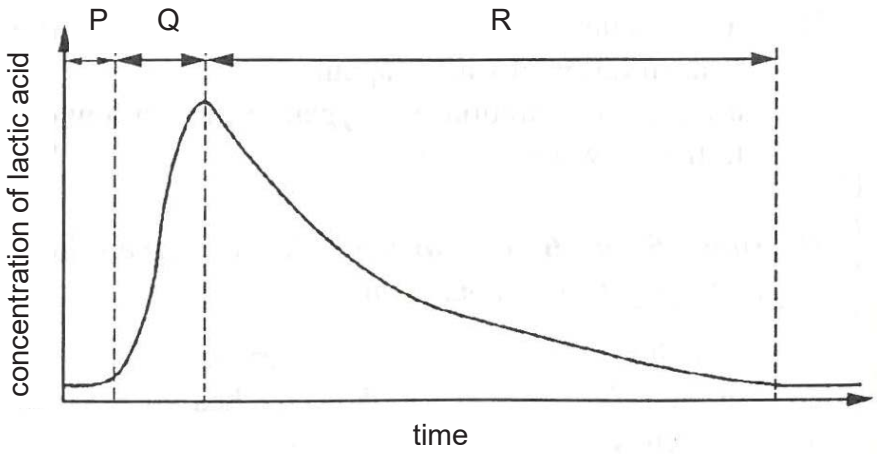
C larynx → trachea → bronchus → bronchiole → alveolus

D trachea → larynx → bronchus → bronchiole → alveolus

18 Which row is correct regarding effects of chemical in tobacco smoke on human health?

	chemical	causes	increased risk of
A	nicotine	makes blood clot easily	emphysema
B	nicotine	paralyses cilia lining	chronic bronchitis
C	tar	makes blood clot easily	chronic bronchitis
D	tar	paralyses cilia lining	emphysema

19 The graph shows the concentration of lactic acid in the blood of an athlete.



During which period of time was the athlete exercising?

A period P

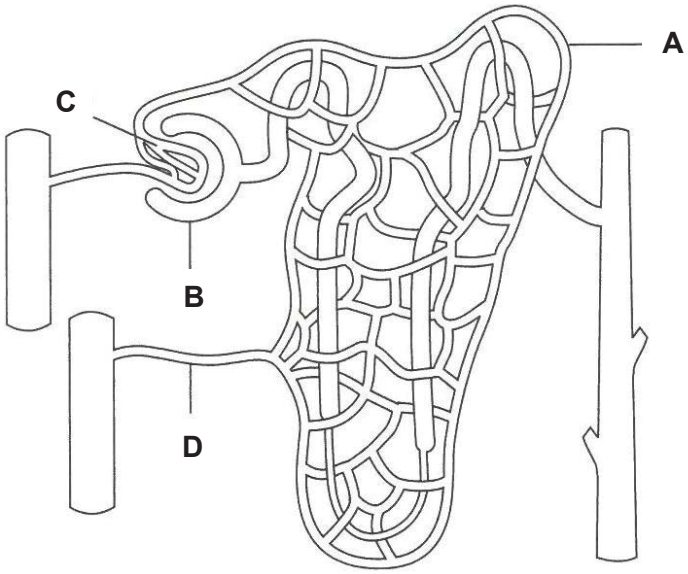
B period Q

C period R

D period P & Q

20 The diagram shows a nephron and its associated blood vessels.

Which vessel will have the highest blood pressure?



21 A drug has been found to inhibit the effects of anti-diuretic hormone (ADH).

What would be the consequence of administering this drug to a healthy person?

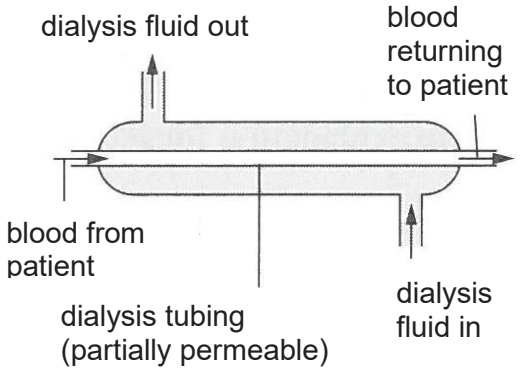
A A smaller volume of urine would be produced.

B More proteins would be present in the urine.

C The person will become dehydrated.

D The urine produced will be more concentrated.

22 An engineer has been tasked to improve the efficiency of the dialysis machine shown in the diagram.



He has made the following list of recommendations:

1 increase length of the dialysis tubing by coiling it

2 increase rate at which dialysis fluid is replaced

3 increase thickness of the dialysis tubing

Which recommendation(s) will improve the process of dialysis?

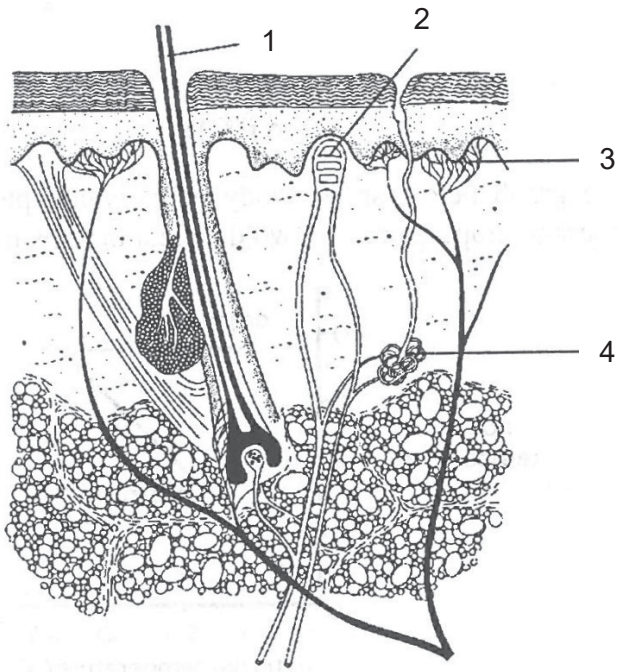
A 1 and 2 only

B 1, 2 and 3

C 2 and 3 only

D 3 only

23 The diagram shows a section through human skin.



Which structures detect changes in skin temperature and secrete a dilute solution of sodium chloride and urea?

	detects changes in skin temperature	secretes a dilute solution of sodium chloride and urea
A	2	1
B	2	4
C	3	1
D	3	4

24 The dorsal root ganglion of a spinal nerve contains

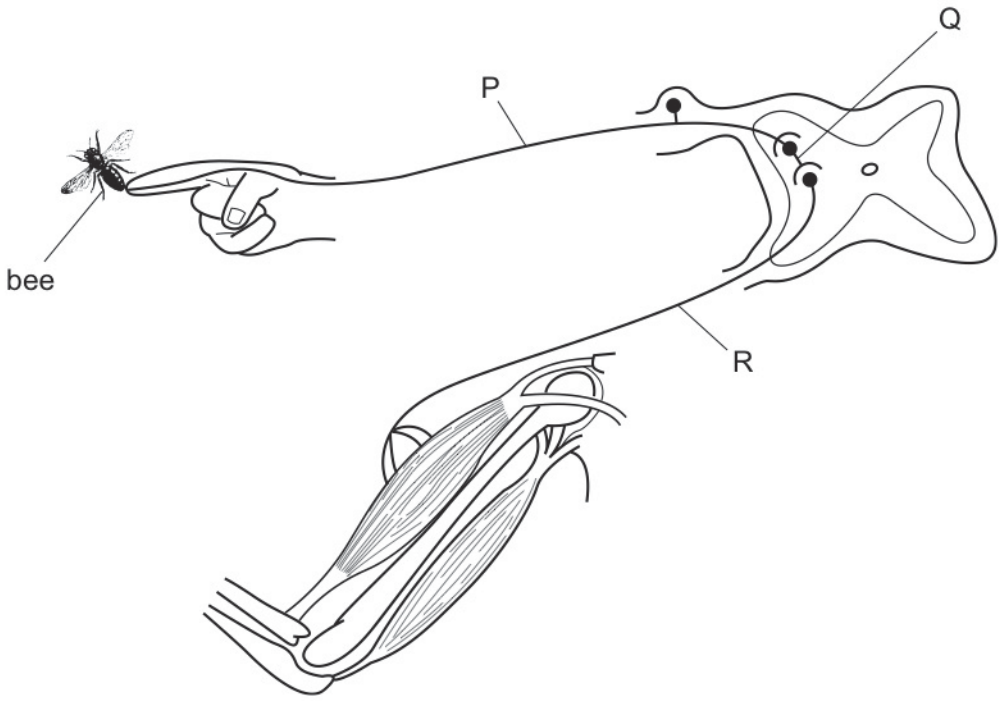
A both sensory neurones and motor neurones.

B cell bodies of the sensory neurones.

C cerebrospinal fluid.

D synapses between neurones.

25 The diagram shows the cross section of the spinal cord and the nervous supply to the arm of a man. Cuts are made at P, Q and/or R. He is able to feel the bee sting but is unable to move his hand away.



Which row describes the state of P, Q and R?

	P	Q	R
A	cut	cut	cut
B	cut	not cut	not cut
C	not cut	cut	cut
D	not cut	not cut	not cut

26 Which row describes the ciliary muscle, suspensory ligament and lens when a person looks at a distant object?

	condition of ciliary muscle	tension in suspensory ligament	convexity of the lens
A	contracts	decreases	more convex
B	contracts	increases	less convex
C	relaxes	decreases	more convex
D	relaxes	increases	less convex

27 Adrenal gland produces a hormone which is

A discharged through ducts to the target organs.

B released into the alimentary canal.

C transported along the nerve fibres throughout the body.

D transported by blood vessels throughout the body.

28 What is the route taken by a pollen tube upon successful pollination of a flower?

A anther → stigma → ovary

B stigma → anther → ovule

C stigma → style → ovary

D style → stigma → ovule

29 A plant was enclosed within a plastic bag for two week. At the end of the two weeks, fruits were still able to develop from the flowers on the plant.

Which statement would **not** explain the observation?

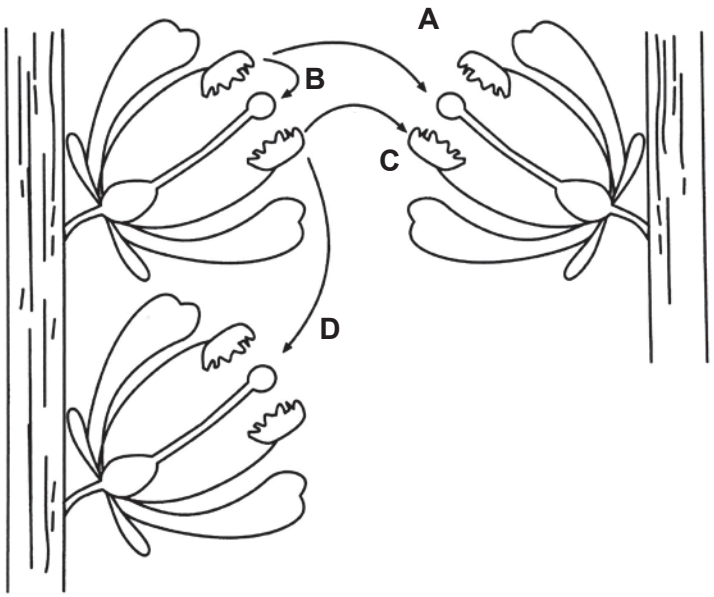
A The anthers and stigmas of the flowers on this plant mature at different times.

B The flowers were already pollinated before the plant was enclosed in the plastic bag.

C The flowers were bisexual.

D There are separate male and female flowers on the plant.

30 The diagram shows two plants of the same species.

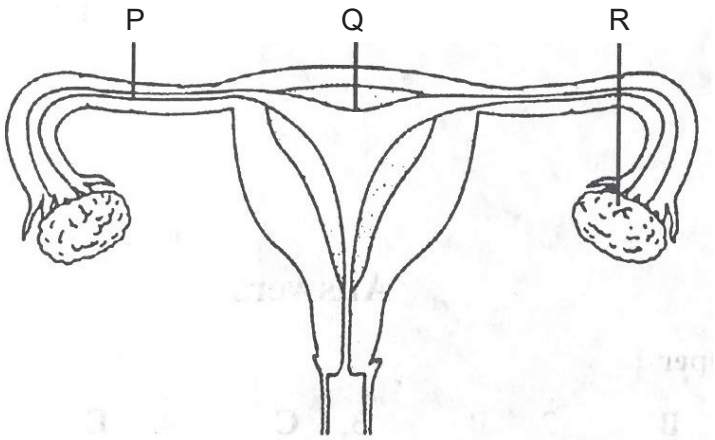


Which arrow represents a type of pollination that would result in greater adaptability of this particular species to potential environmental changes?

31 During the fertile period of a menstrual cycle, which changes are occurring to the uterus wall and to the concentration of estrogen and progesterone in the blood?

	uterus wall	concentration of estrogen	concentration of progesterone
A	breaking down	falling	falling
B	breaking down	rising	rising
C	thickening	falling	rising
D	thickening	rising	falling

32 The diagram represents part of the female reproductive system.



Where do fertilisation, implantation and ovulation occur?

	fertilisation	implantation	ovulation
A	P	Q	R
B	P	R	Q
C	Q	R	Q
D	R	Q	R

33 Some statements about cell division is listed.

1 A furrow begins to form in the middle of the cell.

2 The chromosomes begin to separate the centromeres of all the chromosomes.

3 The chromosomes line up along the middle of the spindle fibres.

4 The separated chromosomes are slowly pulled towards opposite poles with the centromere leading the way.

Which statements regarding anaphase are true?

A 1 and 2 only

B 1 and 3 only

C 2 and 4 only

D 3 and 4 only

34 Some statements about mitosis is listed.

1 Each cell of a multicellular organism has exactly the same kinds of chromosomes as those in every other cell.

2 It ensures that each daughter cell will receive exactly the same number of chromosomes as the parent cell.

3 It proceeds without any control system to guide it.

Which statements describe the significance of mitosis?

A 1 and 2 only

B 1, 2 and 3

C 1 and 3 only

D 2 and 3 only

35 Which statement regarding the structure of DNA is not true?

A A DNA molecule has a sugar-phosphate backbone.

B A DNA molecule is made up of nucleotides.

C DNA consists of two polynucleotide chains coiled around each other.

D DNA has 4 bases, which are adenine, guanine, cytosine and uracil.

36 Which of the following does **not** describe a gene?

A a sequence of nucleotides that controls the formation of a single polypeptide

B a small segment of DNA that controls a particularly characteristic in an organism

C a small segment of DNA that produces enzymes and hormones

D it is a unit of inheritance and consists of a pair of alleles

37 Some possible descriptions of a transgenic plant is listed.

1 It is a plant with cells containing genes from another plant of a different species.

2 It is a plant with cells containing genes from another plant of the same species.

3 It is a plant with tissues grafted from another plant of a different species.

4 It is a plant with tissues grafted from another plant of the same species.

Which statements are correct?

A 1 and 2 only

B 1 and 3 only

C 2 and 4 only

D 3 and 4 only

38 A couple has two children where one has blood group A and the other blood group O.

If the mother's blood group is B, what is the blood group genotype of the father?

A I^AI^B

B I^AI^O

C I^BI^O

D I^OI^O

39 Which of the following regarding natural selection is incorrect?

A It occurs when breeders mate different breeds of animals.

B Organisms that survive will pass down their genes over generations.

C Selection occurs when natural environmental conditions changes.

D Variations are caused by mutations.

40 Which statement is incorrect regarding the variation of height among students in a class?

A Different combination of alleles causes changes in height among the students.

B Environmental factors can influence the height of the students.

C The height of students is continuous variation.

D The variation is caused by genetic factors only.

Index Number	
Name	
Class	

Anglo-Chinese School (Barker Road)

PRELIMINARY EXAMINATION 2020

SECONDARY FOUR EXPRESS

BIOLOGY PAPER 2

6093/2

TIME: 1 Hour 45 Minutes

READ THESE INSTRUCTIONS FIRST

Write your index number on all the work you hand in.
Write in dark blue or black pen.
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 answer in the spaces provided on the Question Paper.

Section B
Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

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.

*This question paper consists of **17** printed pages.*

SECTION A

Answer **all** questions.

Write your answers in the spaces provided.

1 Fig. 1.1 shows some mature human and plant cells.

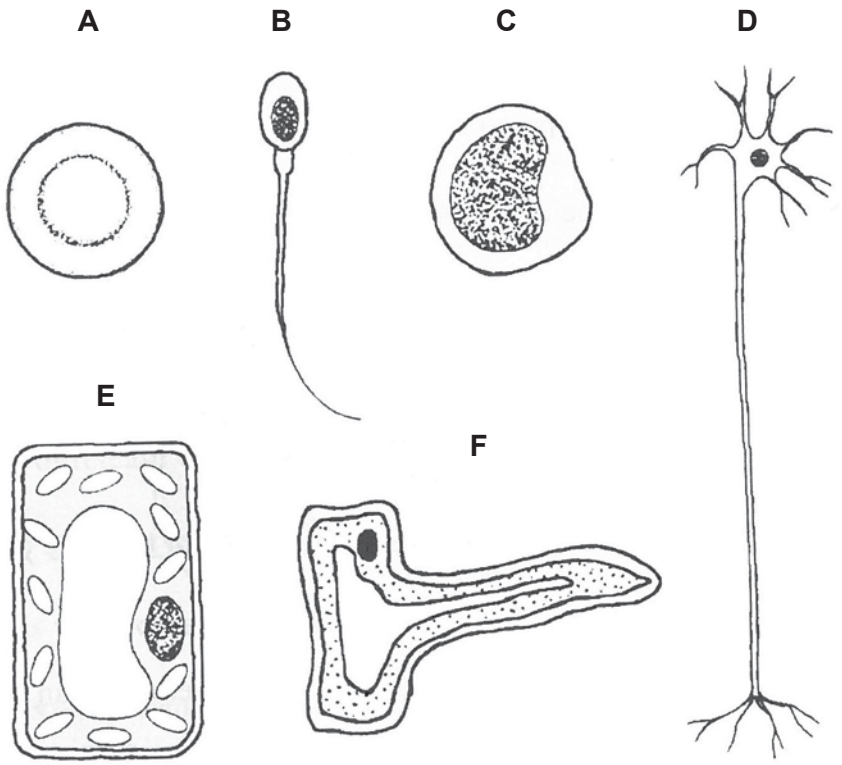


Fig. 1.1

(a) State **two** ways in which the structures of cell **C** differ from cell **E**.

1 ……

……

2 ……

……

[2]

(b) Explain how cell **A** is adapted to its function.

……

……

……

[2]

(c) Both cell **D** and cell **F** possess cellular extensions.

Explain how these cellular extensions are adapted to the function of each cell.

……...

……...

……...

[2]

(d) If cell **C** has 46 chromosomes, state the number of chromosomes in each of the following cells.

cell **A** ……..

cell **B** ……..

cell **D** ……..

[3]

[Total: 9]

2 A green plant had been kept in darkness for two days. Five leaves labelled **A** to **E** were removed from the plant.

The five leaves were treated in darkness for another two days. Fig. 2.1 shows the treatment of these five leaves.

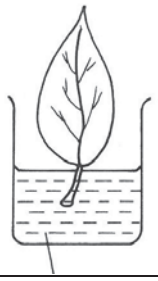
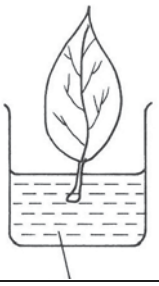
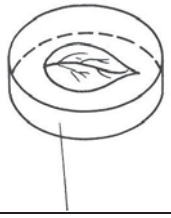
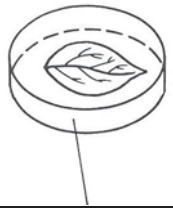
leaf **A**	leaf **B**	leaf **C**	leaf **D**	leaf **E**
				in vacuum 
no treatment	distilled water	5% sucrose solution	under surface in contact with 5% sucrose solution (petiole removed)	under surface in contact with 5% sucrose solution (petiole removed)

Fig. 2.1

After two days these leaves are tested with iodine solution. Fig. 2.2 shows the results of the test with iodine solution for these five leaves.

leaf **A**	leaf **B**	leaf **C**	leaf **D**	leaf **E**
brown 	brown 	brown  blue black	blue black 	brown 

Fig. 2.2

(a) State and explain the purpose of leaf **A** in this experiment.

……...

……...
[1]

(b) State and explain the conclusions that can be drawn by comparing the results of leaves **B** and **C**.

……...

……...

……...

……...

[3]

(c) If leaf **D** was allowed to float with its upper surface instead of under surface in contact with the 5% sucrose solution, predict and explain the result expected.

……...

……...

……...

[2]

(d) With reference to Fig. 2.1 and Fig. 2.2, state and explain the conclusion that can be made by comparing leaves **D** and **E**.

……...

……...

……...

[2]

[Total: 8]

3 Fig. 3.1 shows a human heart in which the coronary arteries are partially blocked. It is remedied by a coronary by-pass operation. This involves grafting sections of vein from the patient's leg to the heart.

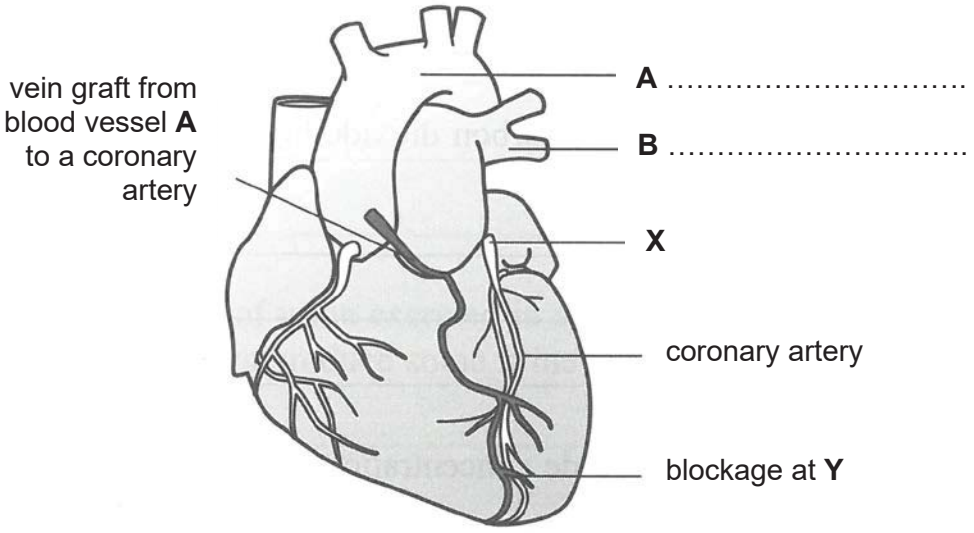


Fig. 3.1

(a) Name **A** and **B** on the diagram. [2]

(b) Explain how blockages in coronary arteries affect the heart's ability to work.

……...

……...

……...
[2]

(c) Suggest why a blockage at **X** will have more serious consequences than one occurring at **Y**.

……...

……...
[1]

(d) Suggest why a coronary by-pass is preferable to a heart transplant operation.

……...

……...
[1]

(e) State **one** habit which might account for an increased risk of heart attack.

……...

……...
[1]

[Total: 7]

4 Fig. 4.1 shows a flower and the female reproductive system of humans.

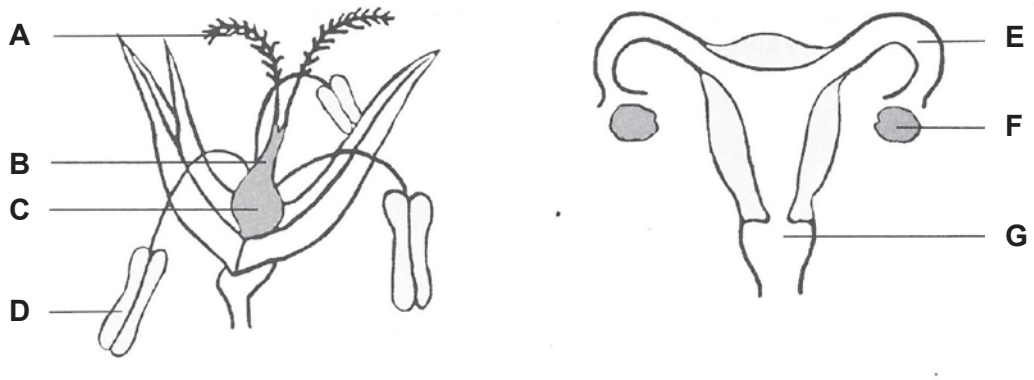


Fig. 4.1

(a) State and explain how the flower in Fig. 4.1 is pollinated.

……

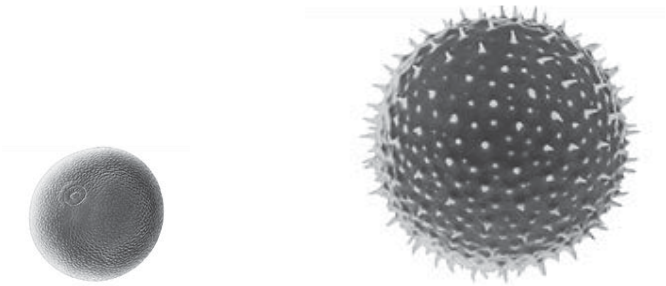
……

……

……

[3]

Fig. 4.2 shows two types of pollen grain taken at the same magnification.



pollen grain **P** pollen grain **Q**

Fig. 4.2

(b) State and explain which type of pollen grain, **P** or **Q**, is more likely to belong to the flower in Fig. 4.1.

……

……

……

[2]

(c) Using the letters in Fig. 4.1, for each of the following parts of the female reproductive system, state the corresponding part in the flower, and state their common function in reproduction.

E

corresponding part in the flower……

function ……

……...

F

corresponding part in the flower ……

function ……

……...

[4]

(d) Name one contraceptive method which can be used outside **G**.

Explain how this method works.

……...

……...

……...

[2]

[Total: 11]

5 Fig. 5.1 shows the different stages of cell division in the human ovary labelled **A** to **G**.

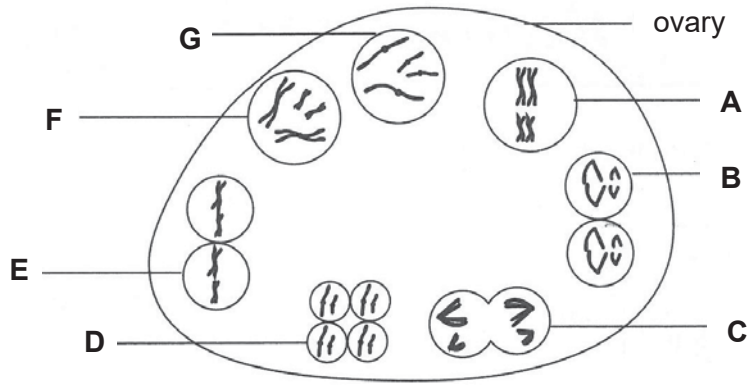


Fig. 5.1

(a) Using the letters in Fig. 5.1, arrange the stages of cell division in their correct sequence.

……...

[1]

(b) **(i)** Name the type of cell division illustrated in Fig. 5.1.

……

[1]

(ii) With reference to Fig. 5.1 only, give **two** reasons to support your answer in **(b)(i)**.

……

……

……

[2]

(c) Name the biological term used to describe the state of the cells in stages **D** and **G** with respect to the number of chromosomes in their nucleus.

D ……

G ……

[1]

(d) Account for the difference in appearance between the chromosomes in stages **G** and **F**.

……...

……...

[1]

[Total: 6]

6 Fig. 6.1 shows a family pedigree tree for the inherited condition hypercholesterolaemia caused by a mutation. Children who inherit the dominant mutant allele from both parents rarely survive beyond puberty.

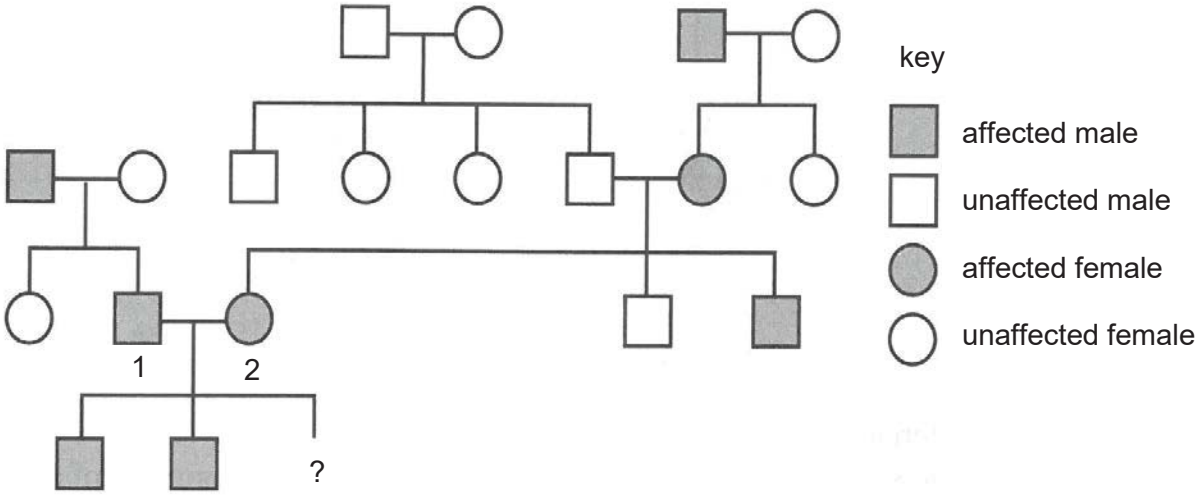


Fig. 6.1

(a) **(i)** State the probability that Individual **1** and Individual **2** will have a son who is unaffected by hypercholesterolaemia.

……
[1]

(ii) Explain why Individual **1** and Individual **2** survive beyond puberty even though they are affected.

……

……
[1]

(iii) State the probability that Individual **1**'s and Individual **2**'s first child will survive beyond puberty. Show your genetic diagram in the space provided below.

probability ……..
[3]

(b) Fig. 6.2 shows the chromosomes of a person.

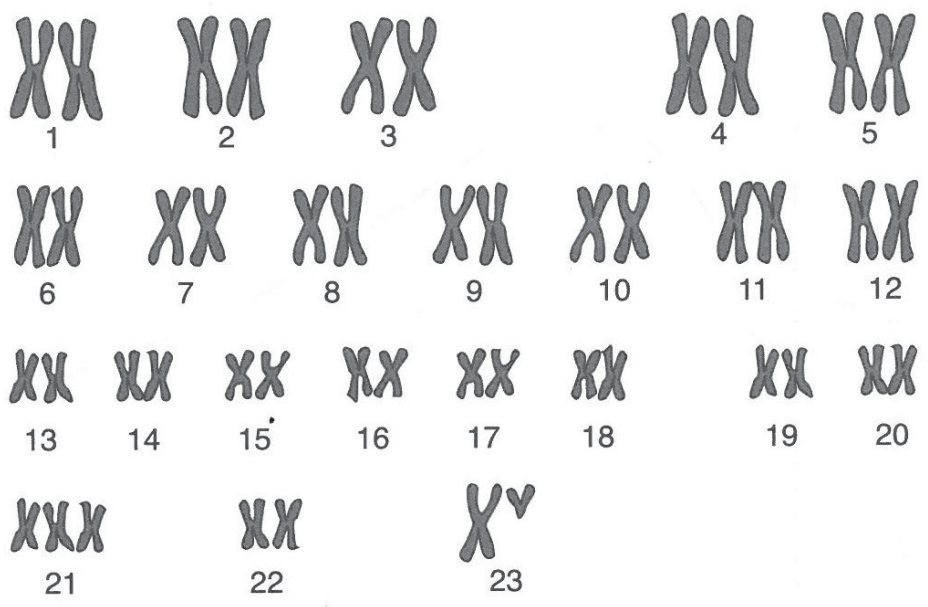


Fig. 6.2

(i) State and explain the gender of the person from whom these chromosomes were taken.

……

……

[1]

(ii) This person suffers from a disease due to chromosomal mutation.

State what is unusual about the chromosomes.

……

……

[1]

(iii) State two factors thought to increase the chances of such a mutation taking place.

……

……

[2]

[Total: 9]

SECTION B

Answer **all** questions.

7 Despite the extremely low temperatures of the Antarctic sea, several species of seals are well adapted to living in such a harsh environment.

(a) Data was collected on some physical features of seals and compared with equivalent data from humans.

The data is given in Table 7.1.

Table 7.1

feature	human	seal
average mass / kg	70	70
average body temperature / °C	37	37
average O_2 consumption / kg/h	0.20	0.75
average body fat / %	22	55

From the data provided, explain how seals are better adapted to live in extremely low temperatures than humans.

……...

……...

……...

……...

……...

[3]

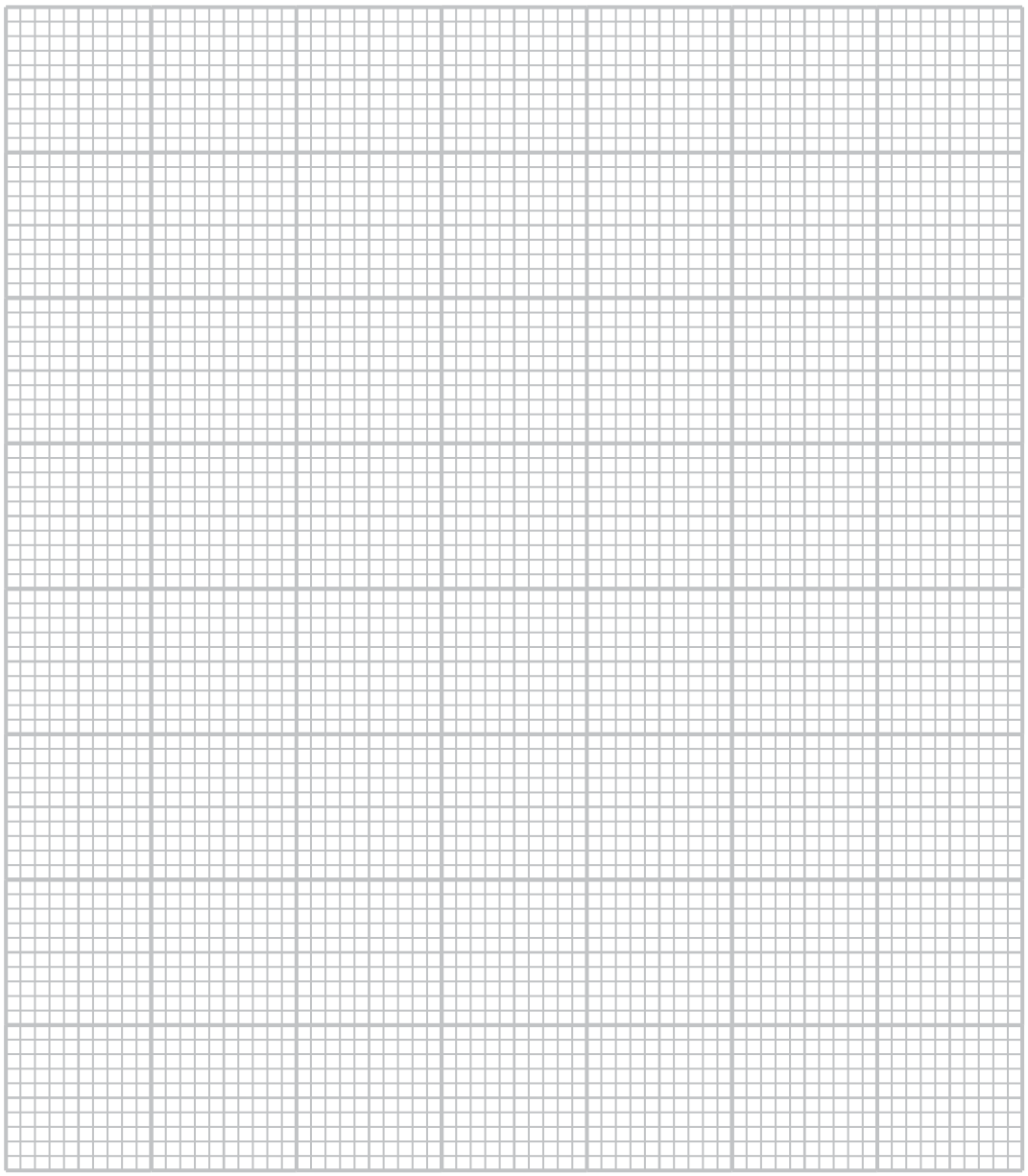
(b) Temperature readings were taken at a number of locations at the surface and inside the body of a seal in water at 0 °C.

Table 7.2 shows the results of the temperature reading.

Table 7.2

distance from skin surface / mm	0	5	10	15	20	25	30
body temperature / °C	2	3	6	10	14	18	22

On the grid on the next page, plot a graph of body temperature against distance from skin surface.



[4]

(c) Use your graph to estimate the temperature of cells found at 8 mm from the skin surface of the seal in water at 0 °C. Show how you obtained your answer.

……

[1]

(d) Explain the advantage low skin temperature provides when the seal is in near-freezing waters.

……

……

……

……

[2]

(e) Seals spend part of the day lying in the sun. In this situation, a seal faces a potential problem of overheating. Fig. 7.1 shows the arrangement of blood vessels in the body of a seal.

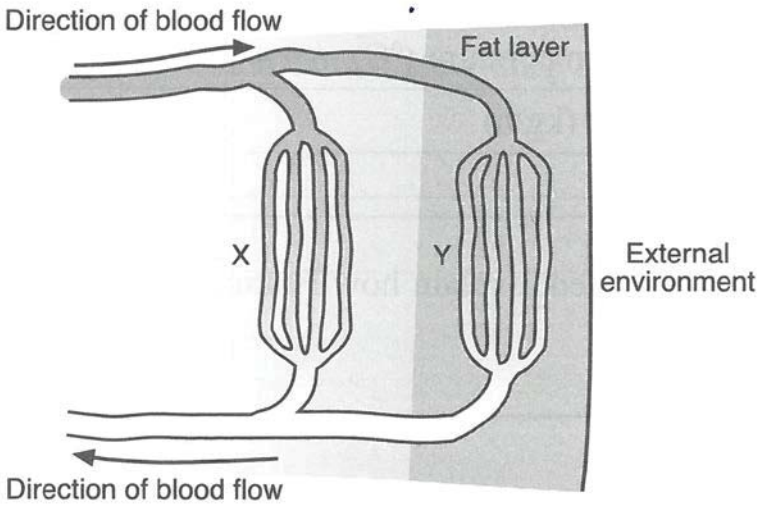


Fig. 7.1

Describe and explain how blood would flow through capillary network **X** and capillary network **Y** when the seal is in the sun to minimise the risk of overheating.

……...

……...

……...
[2]

[Total: 12]

8 (a) Describe the pupil reflex in response to bright light.

……...

……...

……...

……...

……...

……...

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[4]

(b) Describe how high blood glucose concentration is brought back to normal levels.

……...

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……...

……...

……...

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……...

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……...

……...

……...

[4]

[Total: 8]

9 (a) Describe the structure of a villus and its role in absorption of digested food substances.

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[5]

(b) Describe how carbon dioxide is transported from the tissues to the lungs.

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……...

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……...

……...

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……...

……...

[5]

[Total: 10]

Answers BIO2020-EOY-4

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

1a	• C: absence of cell wall; E: presence of cell wall • C: no central vacuole; E: presence of central vacuole • C: absence of chloroplast; E: presence of chloroplasts • C: no fixed shape; E: fixed shape (Any 2 AND must have comparisons)	
1b	• No nucleus; more space to hold haemoglobin • Biconcave in shape; increase surface area to volume ratio for gaseous diffusion / oxygen uptake	Reject: more space to hold oxygen Some students incorrectly identified the RBC as egg cell
1c	• D: long axon / numerous dendrons facilitate nerve impulse transmission • F: root hair extension provides a large surface area to volume ratio to facilitate absorption of water (and mineral salts)	Reject: passing of signals
1d	• cell A: 0 • cell B: 23 • cell D: 46	Many students answered 46 for cell A, failing to draw connection with their answer of absence of nucleus in the RBC in 1(b).
2a	• Acts as a control to ensure that no starch is present/plant has been destarched at the beginning of the experiment.	Some students gave vague answers like to show the independent variable affecting the dependent variable. Other students simply stated as control without explain the purpose.

2b	• No starch is formed in leaf B, but starch is formed in leaf C (particularly along the veins) • Sucrose passes into the leaf lamina through the petiole • Sucrose is converted to/stored as starch	Conceptual error – sucrose turning starch blue-black. Careless mistake – photosynthesis occurring (experiment was carried out in darkness). A number gave incomplete answers, either not stating that the sucrose diffused into the leaf through the petiole, or stating that the phloem transported the sucrose (petiole or in the leaf?)
2c	• Only patches of blue black colour on the leaf OR only patches of the leaf have starch • Upper epidermis have fewer stomata, hence less sucrose take up by the leaf OR fewer places can take up sucrose (to convert it to starch)	Student errors include no stomata on the upper epidermis, hence cuticle would have prevented diffusion of substances.
2d	• Without air/oxygen, the leaf cannot change sucrose into starch in darkness • Conversion of sucrose into starch requires energy, which is released from the aerobic respiration of the leaf.	Conceptual error – in the absence of air, diffusion cannot occur. Careless mistake – photosynthesis cannot occur in the absence of carbon dioxide
3a	• A: aorta • B: pulmonary artery	A number of students thought that B referred to the pulmonary vein
3b	• Coronary arteries bring oxygen and glucose to the cardiac muscles for respiration to provide energy for contraction • Hence heart pumps blood less powerfully around the body.	Conceptual error – less blood to heart vs less blood to heart muscles/cells Some students just answered effect as heart attack without offering an explanation why the muscles would stop working.
3c	• A larger area of the heart will be deprived of oxygen and glucose and thus will not be able to contract/function	Conceptual error – incorrectly identified as coronary vein; and thus coronary artery carries oxygenated blood, while coronary vein carries deoxygenated blood; one is connected to the atria, the other to the ventricle, hence blood cannot be pumped out
3d	• No problem with tissue rejection OR operation is simpler/easier/less risky than heart transplant	
3e	• Having a high fat diet OR smoking cigarettes	There were some vague answers like fast food or unhealthy food, i.e., did not account for the high fat diet.

4a	• Wind pollinated • Anthers hanging out / pendulous – allow pollen grains to be blown away • Feathery stigma – provides greater surface are for pollen grains to land	A number of students did not account for structure to function. Reject: hairy stigma
4b	• Pollen Type P • Small so that it can be blown away by wind to long distances	Reject: rough to attach to stigma
4c	• E: C • Function: site of fertilisation • F: C • Function: site of egg/ovum production	Students named the parts instead of using letters. Students also did not recognise the demand of the question – common function. Hence many just stated that it is a passage way only. Incorrect would also be that it contains (rather than produce) the egg. (To fertilise the egg vs For fertilisation)
4d	• Condom / diaphragm (Accepted spermicide, though effectiveness is only 70%) • Stops the entry of sperm into G.	Examples of contraceptive methods like cervical cap, IUD, vasectomy that were not applied outside G were listed.
5a	• G – F – A – C – E – B – D	
5bi	• Meiosis	
5bii	• Four new daughters cells from one parent cell • Each daughter cells have half the number of chromosomes as in parent cells • There are two cell divisions • Formation of bivalent or homologous pairings (Any 2)	Reject: forming 4 haploid daughter cells alone (did not account for diploid parent) Reject: presence of homologous chromosomes An example of an incomplete answer include citing specific stages, like there were 2 anaphase, without accounting for the reason why there were 2 such phases.
5c	• D: haploid G: diploid (both correct to score 1 m)	
5d	• DNA replication OR Chromosomes duplicated (to produce a replica of itself)	Reject: doubled
6ai	• 12.5%	A number of students did not recognise the 'double' condition.
6aii	• Both are heterozygous with only one dominant allele. Only homozygous dominant individuals die young.	Many did not account for why having only 1 dominant allele allows better survival.

6aiii	• Correct genetic diagram (1HH:2Hh:1hh) • Correct labels (parents, gametes, offspring genotypes & phenotypes) • 75% will survive beyond puberty because they are Hh or hh	Labels were missing in some of the students' answers. Some were confused by the term 'affected' while question asked for 'survived'.
6bi	• Male – the sex chromosomes (pair 23) are different in length	Many students identified the presence of X & Y chromosomes without explaining why one is an X chromosome while the other is a Y chromosome.
6bii	• 3 copies of chromosome 21 instead of the usual 2	Some students listed '3 pairs of chromosome 21'.
6biii	• Radiation / X-ray / UV light • Mutagens / mustard gas / formaldehyde • Older women giving birth	Incorrect answers include LSD, inbreeding, eating GM food, giving birth when old.
7a	• Higher rate of oxygen consumption means higher rate of aerobic respiration • Releasing more heat energy to counter heat loss to the environment/maintain body temperature • Higher percentage of body fat acts as an insulating layer, reducing heat lost to the environment	Some students listed higher metabolism instead of aerobic respiration, thus releasing heat. Metabolism does not account for the increase consumption of oxygen.
7b	• Scale – at least half the page + user friendly + main grids labelled • Line of Best Fit • Axes – correct headers and units (X: distance from skin surface/ mm; Y: body temperature/ °C • Plots – 7 points plotted correctly (allow for 1 error)	Some students plotted their graphs with a scale of 4.
7c	• To read from graph (Must show working on graph for both values)	Many students still did not show the full working on the graph.
7d	• Heat loss from skin to water is low • As temperature difference between skin and water is small	A number of students did not account for the lack of a gradient, and thus the explanation of less heat loss was insufficient.
7e	• More blood flows through Y • More blood flows near skin surface so that more heat can be lost (through conduction, convection and radiation)	Conceptual error: basking in the sun to gain heat. Conceptual error: Loss of latent heat. Reject: use of vasodilation/ vasoconstriction without explaining what happens

8a	• The stimulus (change in light intensity) is detected by the receptors in the retina • Impulse is sent by the sensory neurone in the optic nerve to the brain, then to the effector (iris) via the motor neurone. • The circular muscles of the iris contract AND the radial muscles of the iris relax • Pupil becomes smaller, this reduces the amount of light going into the eye • In addition, the eye might squint OR a hand may be brought up to shield the eye from the bright light	Reject: receptor as eye – too vague A number of students also indicated that the impulse is sent to the spinal cord, not recognising that the eyes are in the head.
8b	• The islets of Langerhans in the pancreas increases the secretion of the hormone insulin • Increasing the permeability of cell membranes to glucose thus increasing the rate of glucose uptake by cells • Stimulating the liver and muscle cells to convert glucose into glycogen for storage • Increasing oxidation of glucose during tissue respiration	Some students answered that glucose is converted to glucagon (instead of glycogen) The increase in tissue respiration was often missed out by students.
9a	• The epithelial cells of the villus has numerous microvilli to increase surface area to volume ratio for absorption. • The villus has thin walls or membranes / epithelium is only one cell thick to allow for faster rate of absorption. • In each villus, there is a lacteal / lymphatic capillary, surrounded by blood capillaries. • Carbohydrates and proteins are digested into glucose and amino acids. These diffuses (+ active transport) into the villus and is transported away by the blood capillaries away from the intestine. • Fat is broken down into fatty acids and glycerol and diffuse into the epithelium. These recombine to form minute fat globules which enter the lymphatic capillaries which transports fat away from the intestine. • Presence of many mitochondria for active transport of digested food substances	A number of students mentioned that many villi increases SA/VR for absorption, without recognising the question is about one villus. Conceptual error: villus is one cell thick vs epithelium of villus is one cell thick Conceptual error: fatty acids and glycerol moves into the lacteal and reforms as fat

9b	• At the tissues, carbon dioxide diffuses out of the cells into the capillaries, into the blood, and into the red blood cells. • Carbon dioxide reacts with water in the red blood cells to form carbonic acid. This reaction is catalysed by the enzyme carbonic anhydrase. • The carbonic acid is then converted into hydrogencarbonate ions which diffuses out of the red blood cells. (Most of the carbon dioxide is carried as hydrogencarbonate ions in the blood plasma.) • A small amount of carbon dioxide is also carried and dissolved in the red blood cells. • In the lungs, hydrogencarbonate ions diffuse back into the red blood cells and are converted into carbonic acid, and then into water and carbon dioxide. This is also catalysed by the enzyme carbonic anhydrase. • The carbon dioxide then diffuses out of the blood capillary walls, across the epithelium of the lungs, and into the alveoli (max of 5)	Many students incorrectly explained at length how blood is transported from the tissue to the lungs without recognising the question is about carbon dioxide transport. The remaining students often did not cite the role of carbonic anhydrase in the lungs.