JUNYUAN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2021
SECONDARY FOUR EXPRESS

CANDIDATE NAME

CLASS | 4 | E | 1 |

INDEX NUMBER

BIOLOGY

6093 / 1

1 SEP 2021

1 h

1100 – 1200

Candidates answer on the Multiple Choice Answer Sheet (MCAS) provided.
Additional materials - MCAS

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.
The use of an approved scientific calculator is expected, where appropriate.

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.

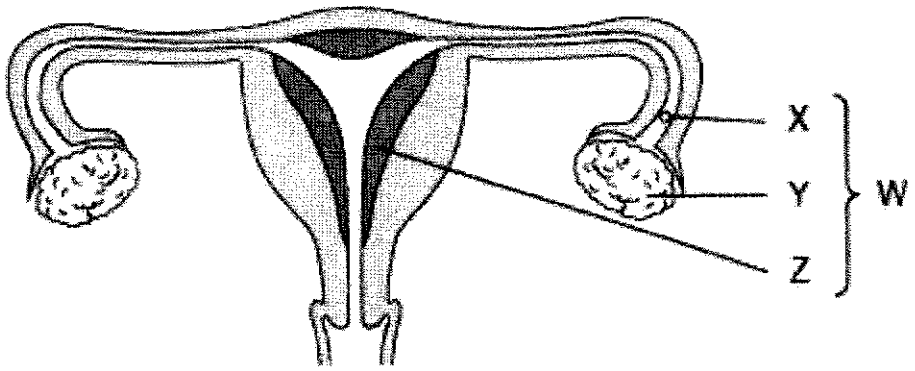
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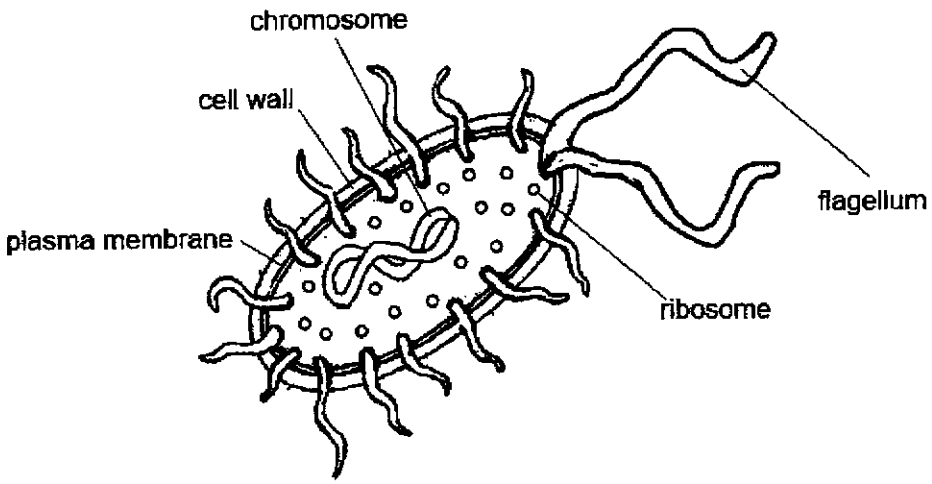
1 The diagram shows a female reproductive system.



Which correctly identifies the labelled parts?

	cell	tissue	organ	organ system
A	W	Y	X	Z
B	X	Z	Y	W
C	X	Y	W	Z
D	Z	W	Y	X

2 The diagram shows a bacteria cell.



Which statement is true?

A Both bacteria and root hair cells do not have nuclear membrane surrounding the nucleus.

B Both bacteria and root hair cells do not have nucleus.

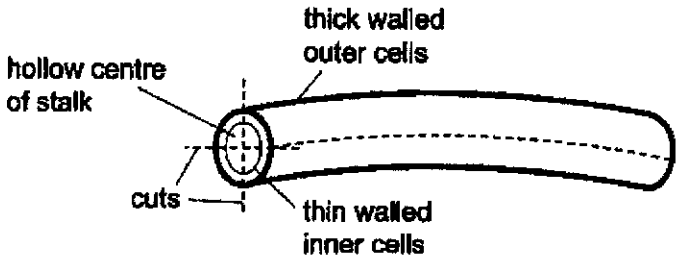
C Root hair cell contains golgi apparatus but bacteria cell does not.

D Root hair cell contains chloroplasts but bacteria cell does not.

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3 The stalk of a water spinach (*Ipomoea aquatica*) has a hollow centre. Four pieces of the stalk are cut and placed in four sucrose solutions of different water potential for one hour.

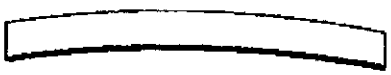


Which diagram shows the piece that is placed in the sucrose solution with higher water potential than cell sap?

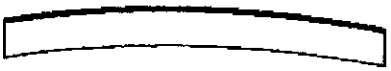
A



B



C

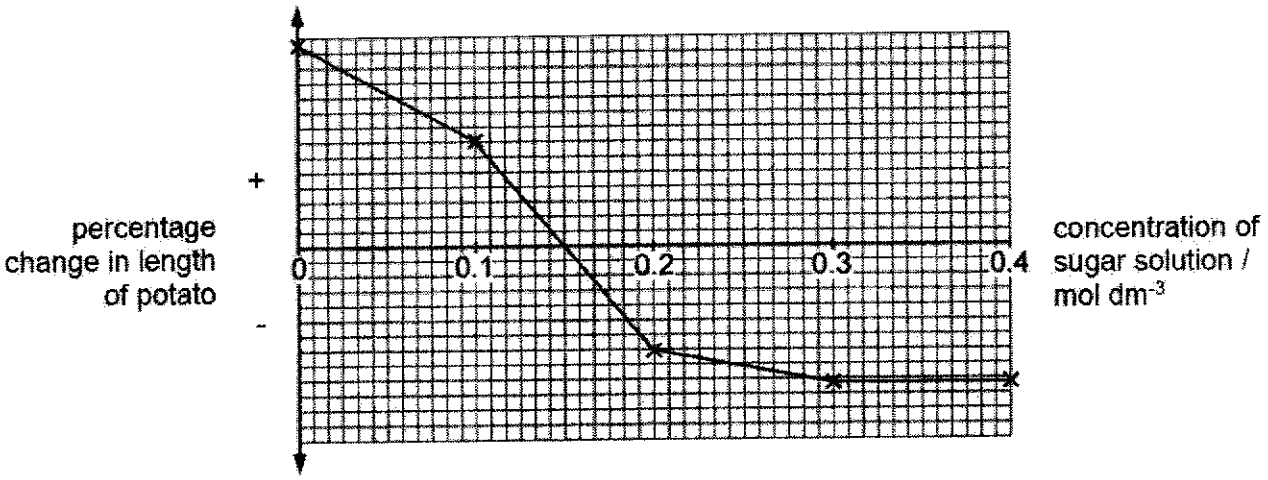


D



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4 Five pieces of potatoes were placed in sucrose solutions of different concentrations. The change in the length of each potato strip was measured and recorded. The results are shown in the graph.



Which statement is true?

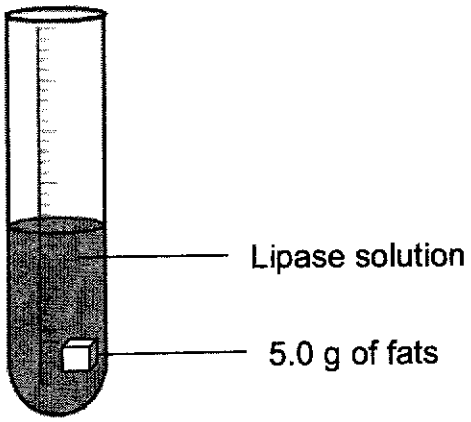
A The concentration of the potato cell sap is 0.15 mol/dm^3.

B There is no movement of water molecules into and out of the potato cells at 0.15 mol/dm^3.

C The potato cells are always losing water to the sucrose solution.

D Two of the potato strips cells had a higher water potential than the sucrose solution.

5 The diagram shows an experiment to investigate the action of lipase on 5.0 g of fats. After 30 minutes at a water bath of 20°C, half of the fats were digested. The test tube was then placed in a water bath at 80°C for another 30 minutes.



How much fats would be left in the test tube?

A 0.0 g

B 2.0 g

C 2.5 g

D 5.0 g

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6 Some statements about the active site are listed.

1 It accounts for the specificity of the enzyme.
2 It can be used a few times only.
3 It is altered irreversibly when exposed to high temperature beyond its optimum.
4 It helps to lower the activation energy needed in a chemical reaction.

Which statements are correct?

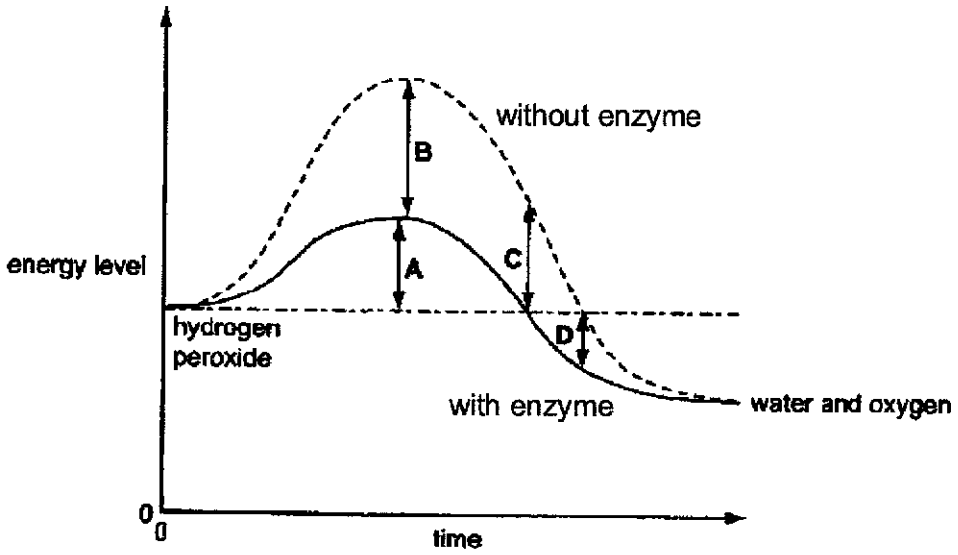
A 1 and 3 only

B 2 and 4 only

C 1, 3 and 4

D 2, 3 and 4

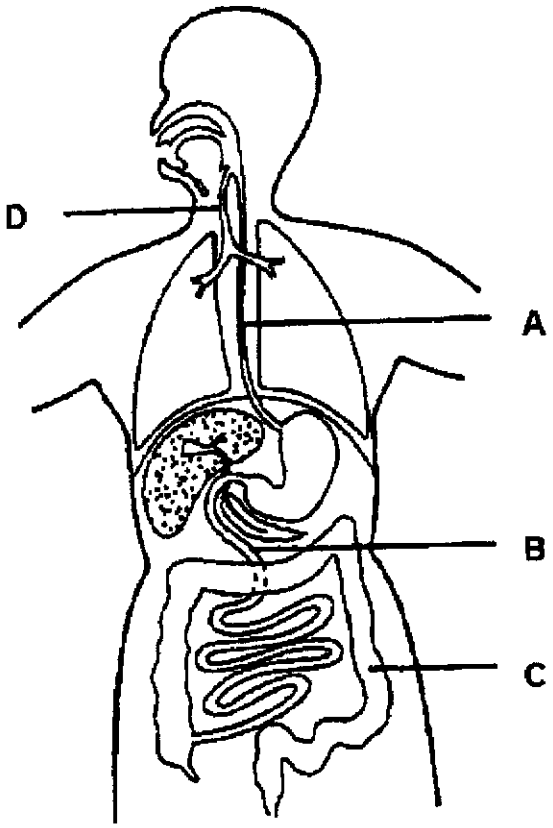
7 The graph shows the energy level during the breakdown of hydrogen peroxide into water and oxygen, in the presence and absence of catalase enzyme.



What is the difference in activation energy of the reaction when the enzyme catalase is present as compared to when it is absent?

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8 The diagram shows the organs associated with the digestive system.



Which structure does not move its contents by peristalsis?

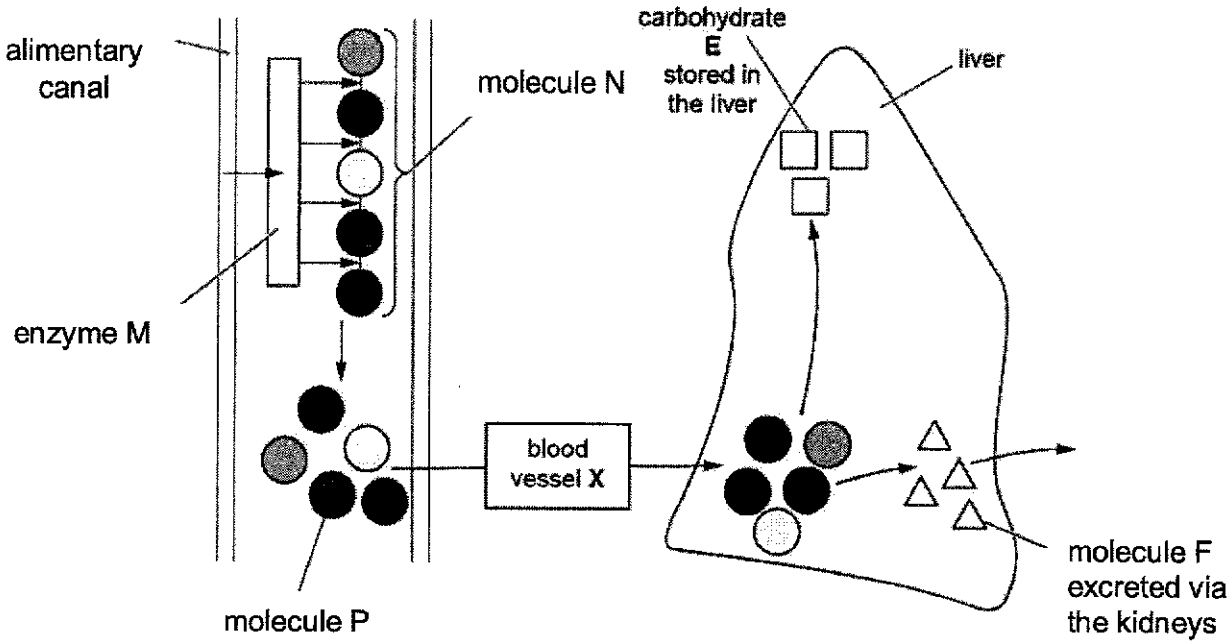
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7

Refer to the diagram below for question **9** and **10**.

The diagram shows the digestion, absorption and assimilation of molecule N. It also shows the formation of its waste product, molecule F.



9 Which correctly identifies the labelled parts?

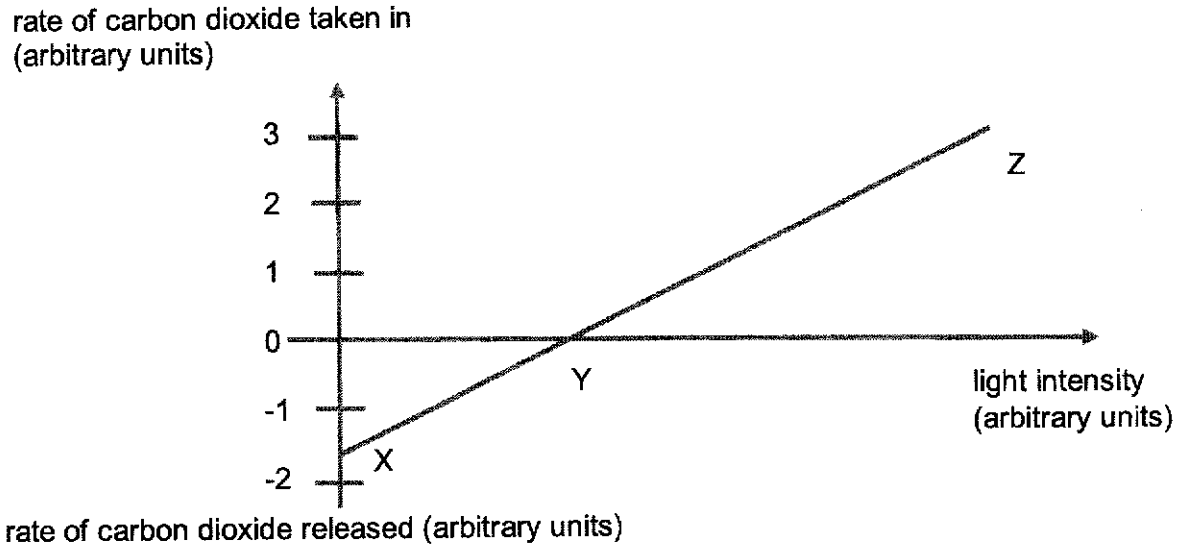
	M	N	P
A	amylase	starch	glucose
B	amylase	maltose	sucrose
C	pepsin	protein	amino acids
D	protease	polypeptide	amino acids

10 Which correctly identifies the labelled parts?

	E	F	X
A	glucose	urea	hepatic portal vein
B	glycogen	urea	hepatic portal vein
C	glycogen	urea	hepatic vein
D	glucagon	Mineral salts	hepatic vein

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11 The graph shows the effect of changing light intensity on the rate of carbon dioxide absorbed or released by green plants.



Which statement(s) is / are incorrect?

I Between X and Y, the rate of respiration is higher than the rate of photosynthesis.
II Between Y and Z, the rate of photosynthesis is higher than the rate of respiration.
III There is no respiration taking place at Y.

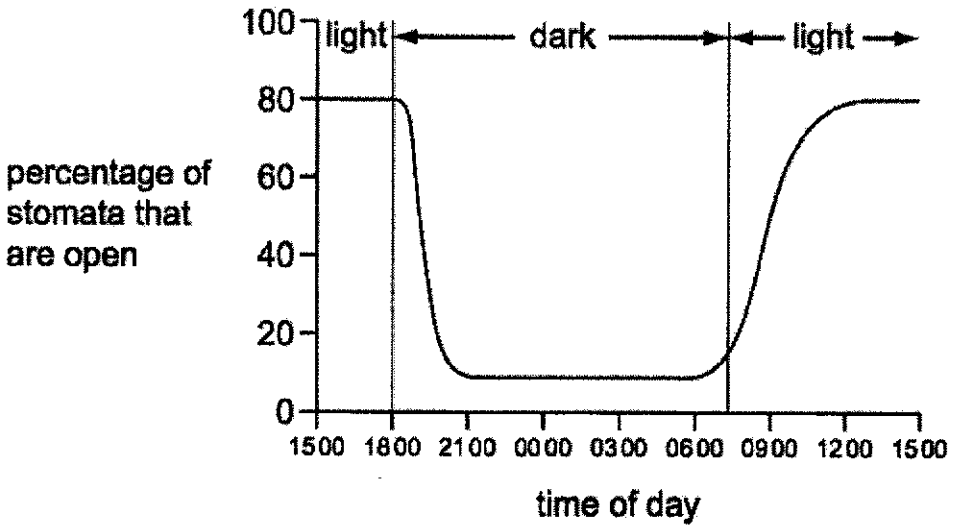
A I only
B III only
C I and II only
D I and III only

12 Which statement best explains why transpiration occurs?

A Carbon dioxide can enter a leaf only if the stomata are open, so water vapour diffuses out and is lost.
B Photosynthesis only uses water produced by respiration, so all the water supplied by the roots is lost through the stomata.
C So that the plant can transport amino acids and mineral salts.
D So that the water produced from chemical reactions can be excreted.

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13 The graph shows stomatal opening in the leaves of a Teak plant over a 24-hour period.



What can be concluded from the graph?

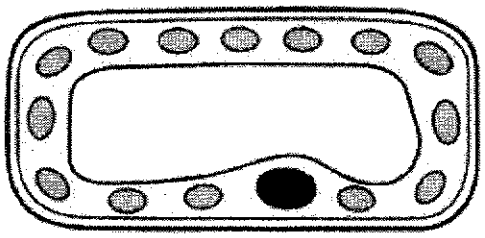
A Gaseous exchange occurs only when stomata are open.

B Rate of transpiration is much higher during the dark period.

C The percentage of stomata that are open increases as the light intensity increases.

D The percentage of stomata that are open increases as temperature increases.

14 The diagram shows a cell extracted from part of a plant.



Which feature shows that this is a palisade cell?

A a large vacuole to store more cell sap

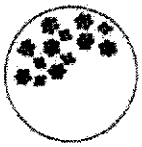
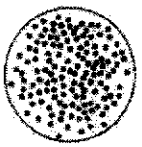
B numerous chloroplasts to absorb more sunlight

C numerous ribosomes to synthesize more proteins to make more chlorophyll

D thickened cell wall to protect against the strong sunlight

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15 A sample of blood is taken from a patient and a few drops of the blood are placed onto a petri dish. The drops of blood are then tested with serum containing antibodies a and b. The results of the test are shown below.

	serum with antibodies **a**	serum with antibodies **b**
blood samples		

Which of the following is a correct conclusion on the blood type of the patient?

A His blood type is AB.

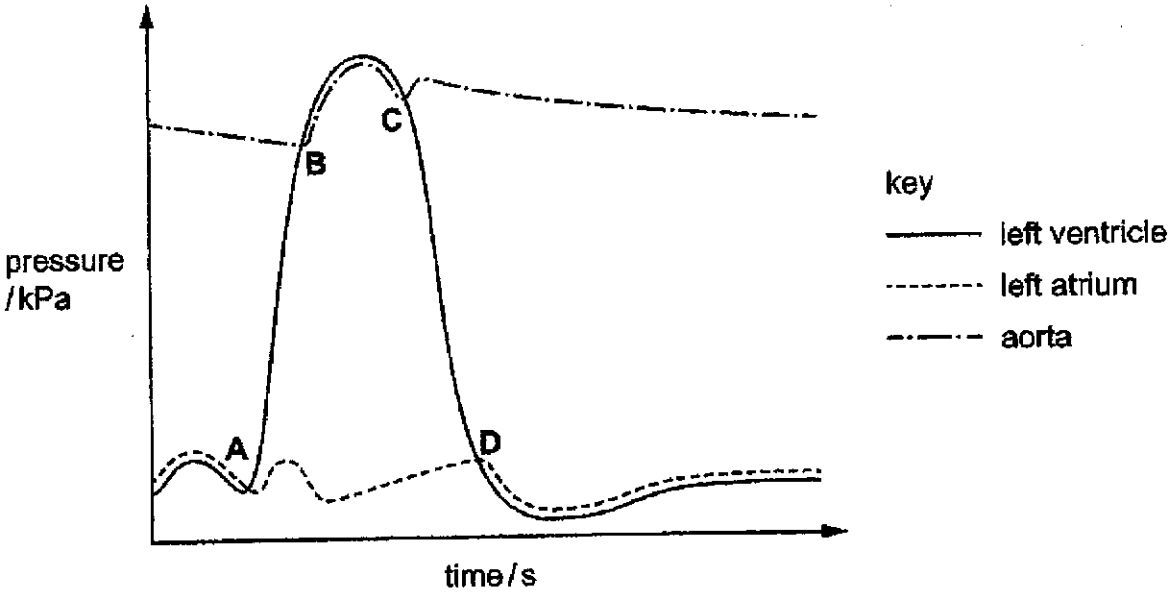
B He can donate blood to another person who has blood type AB.

C His red blood cells contain antigen B.

D His red blood cells do not have any antigens.

16 The graph shows the pressure changes in the left atrium, left ventricle and in the aorta in one complete cardiac cycle.

At which point does the aortic valve close?

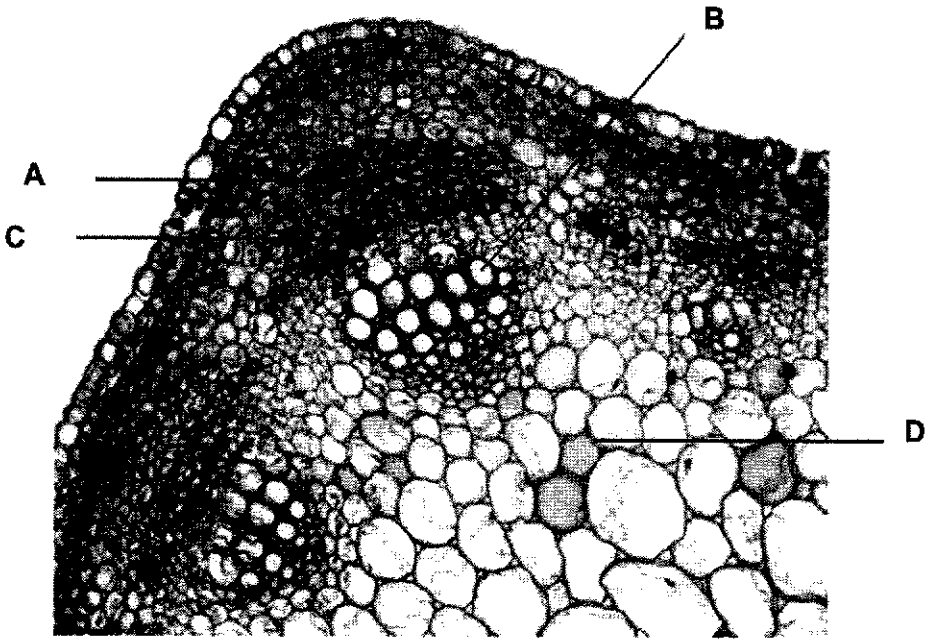


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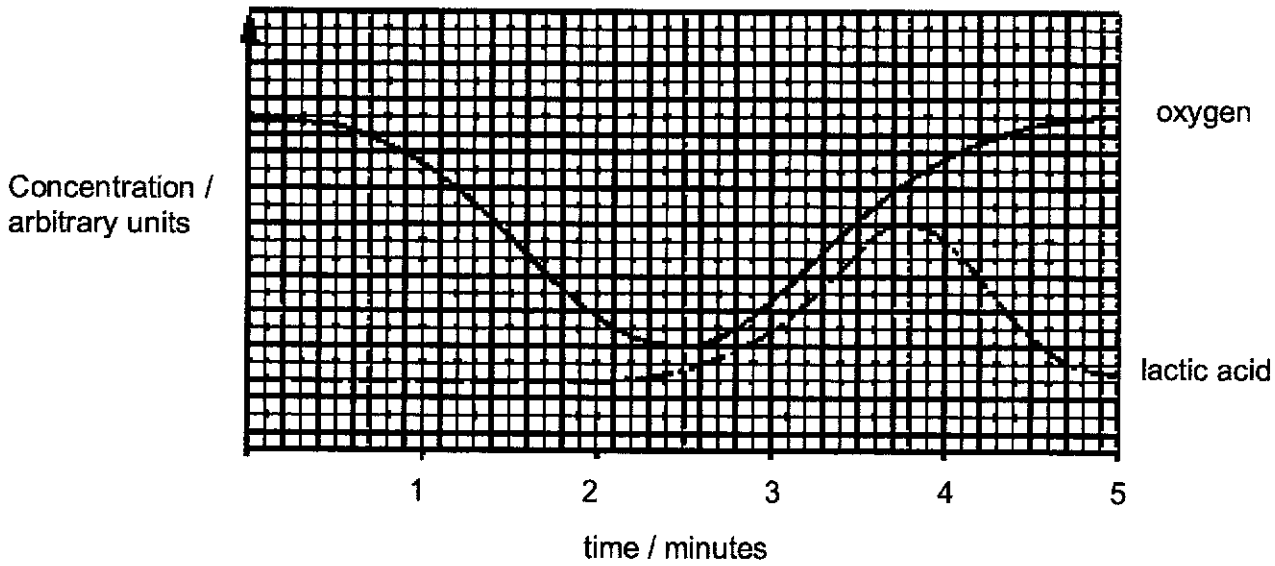
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17 The photomicrograph shows part of a cross section of a plant stem.

What structure contains companion cells?



18 The graph shows the changes in the concentration of oxygen and lactic acid in the blood of the person as he exercises.



Which statement can you conclude from the graph?

A The person exercised for only 2.3 minutes.

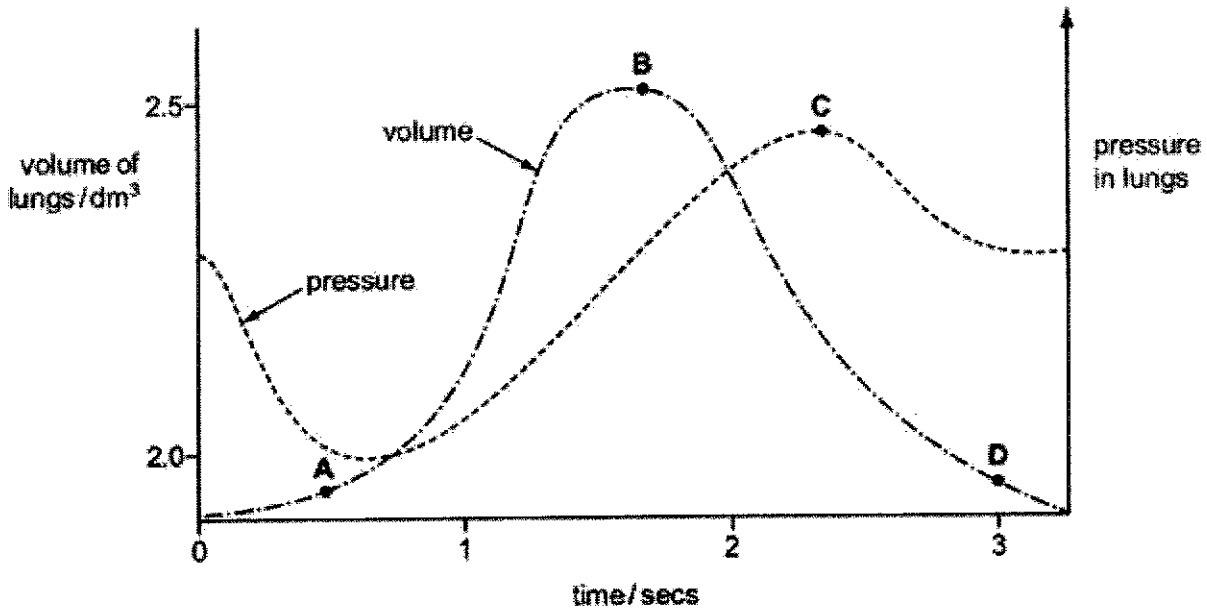
B The person starts exercising at 2.5 minutes.

C The person undergoes only anaerobic respiration from 2.2 minutes onwards.

D The stimulus for breathing is carbon dioxide.

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19 The graph shows how the pressure and volume in the lungs change during one complete breath. At which point are the muscles of the diaphragm starting to relax?



20 What causes emphysema?

A blockage of the bronchioles

B destruction of the alveolar walls

C inflammation of the walls of the alveoli

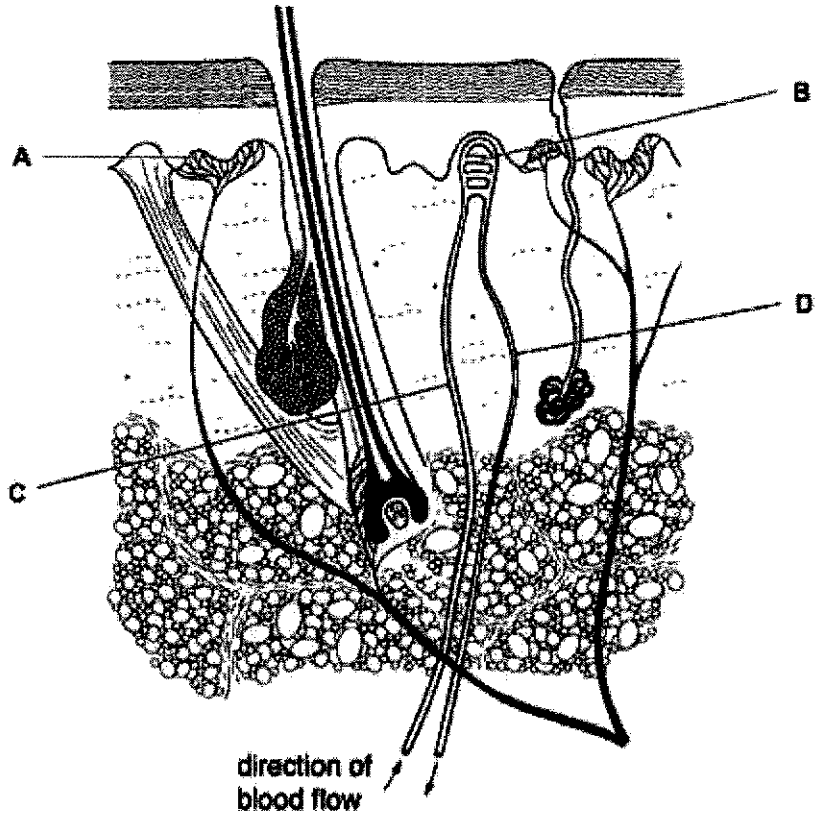
D overproduction of mucus

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21 The diagram shows a section through the skin.

Which structure of the skin has the highest temperature on a cold day?



22 Which statement is not true?

A During focusing, the thickness of the lens is adjusted so that objects at different distances can be seen clearly.

B Images formed on the retina are upside down, laterally inverted and diminished.

C The iris contract as a result of changes in light intensity.

D To focus on a near object, the ciliary muscles contract and suspensory ligaments slacken.

23 General anaesthesia works by interrupting nerve signals in your brain and body. It blocks nerve transmission to the central nervous system.

Which statement explains why a patient does not feel pain when anaesthesia is administered?

A Motor neurone is unable to send the impulse to the muscles for contraction.

B Relay neurones can only send the nerve signals to either the brain or the body.

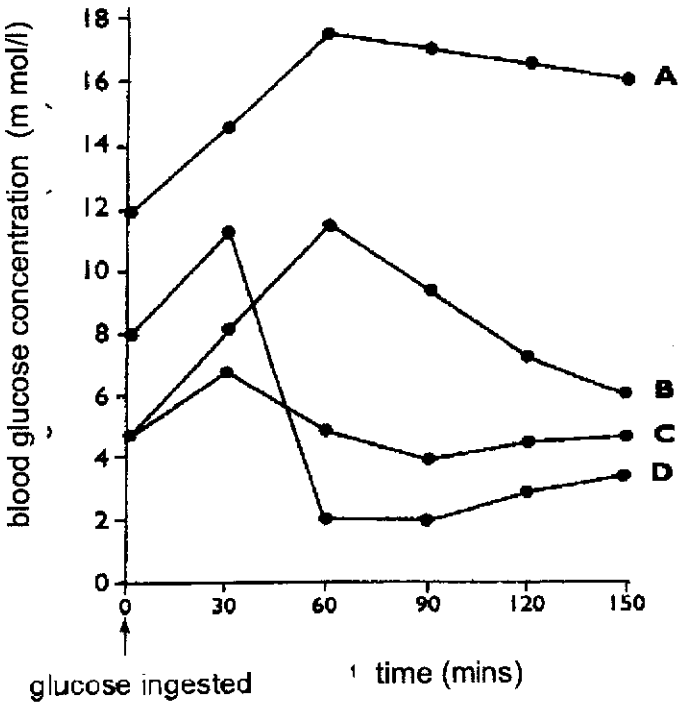
C Sensory neurones are unable to detect the stimulus.

D The brain is unable to process the pain.

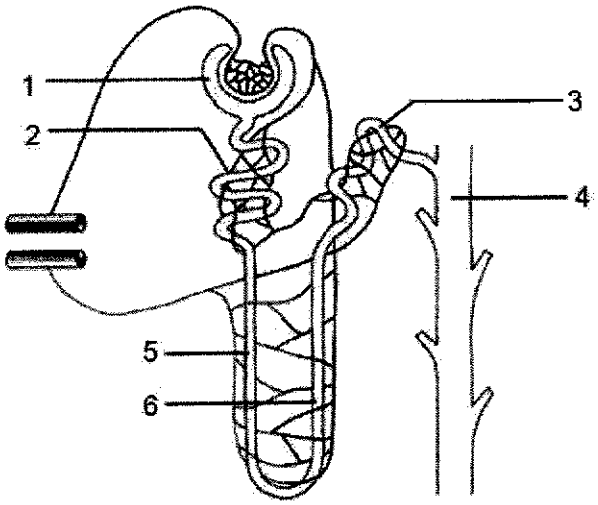
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24 The graph shows the blood glucose concentration in four individuals after the ingestion of glucose.

Which of the glucose tolerance curves represents someone who is suffering from diabetes?



25 The diagram shows a section of the nephron in the kidney.



Which region would you find cells with the largest number of mitochondria?

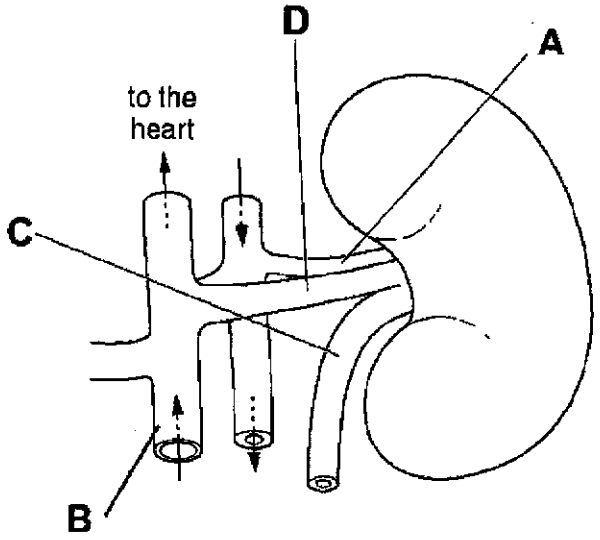
- ☐ 1 and 2
- ☐ 2 and 3
- ☐ 3 and 4
- ☐ 4 and 5

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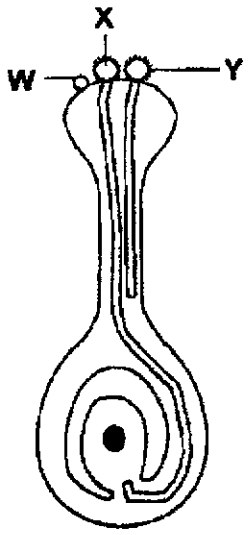
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26 The diagram shows a kidney and its associated structures. The arrows show the direction of flow of fluids into these structures. A kidney disease, renal artery stenosis is the narrowing of one or more arteries that carry blood to the kidney. Narrowing of the arteries prevents normal amounts of oxygen-rich blood from reaching the kidneys.

Which blood vessel will be most affected?



27 The diagram shows the cross section of an insect-pollinated flower.

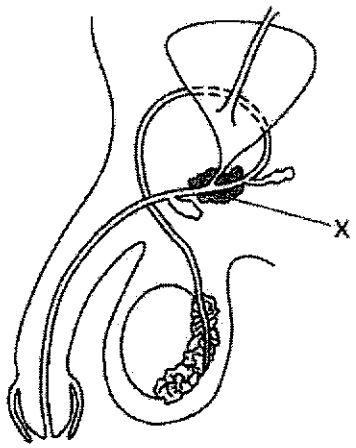


Pollen W was unable to germinate. What could be the possible reason?

- ☐ Only a maximum of 2 pollen grains can germinate each time.
- ☐ Pollen grains X and Y were bigger in size as compared to W.
- ☐ Pollen grain W came from a flower of a different species.
- ☐ Pollen grain W was unable to stick to the stigma properly.

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28 The diagram shows a section through the male reproductive system.



What will happen if X is removed?

- ☐ Fewer sperms are formed.
- ☐ Fewer sperms can be stored.
- ☐ Lesser testosterone produced.
- ☐ Sperms may swim less actively.

29 A DNA strand contains 7500 nucleotides. How many thymine bases are present in a double helix DNA molecule if 20% of the base molecules are guanine?

- ☐ 750
- ☐ 1500
- ☐ 2250
- ☐ 4500

30 Fruit flies are 61 percent genetically identical as humans. They share common genes with humans for many biological processes involved with growth and development.

Which statement best explains why fruit flies still differ greatly in their physical characteristics as compared to humans?

- ☐ Fruit flies are very small as compared to humans.
- ☐ Fruit flies and humans follow different base pairing rules in their DNA strands.
- ☐ Fruit flies need to be at least 95 percent genetically identical as humans to look more like us.
- ☐ The difference in 39 percent genes could have coded for the physical characteristics.

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31 Which of the following statements correctly describes an advantage that genetic engineering has over artificial selection?

A It is a faster process because only one species is required for beneficial traits to be passed down to the offspring.

B It always creates organisms that are naturally adapted to their environment.

C Genetically modified food is always more nutritious and safe for all consumers.

D There is a higher chance of an offspring receiving the beneficial trait from the genetically engineered parent compared to using artificial selection.

32 Which statement(s) about evolution is / are correct?

1 Phenotypic variation must be present for evolution to take place.
2 Natural selection will always lead to formation of new species.
3 Natural selection is one mechanism that can lead to evolution.
4 Natural selection may not lead to evolution if the trait under selection is not heritable.

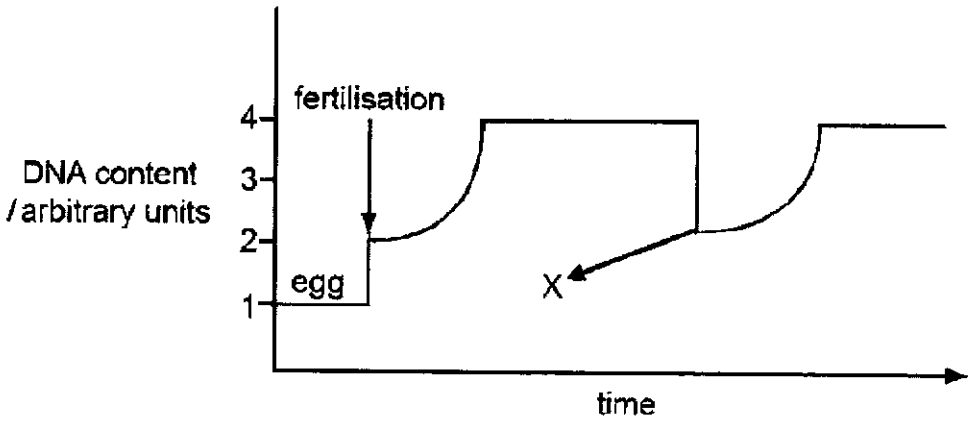
A 1 only

B 2 and 3

C 1, 3 and 4

D 2, 3 and 4

33 The graph represents the changes in the DNA content present in a nucleus at different stages of the life cycle of a mammal.



Which stage does X represents?

☐ interphase

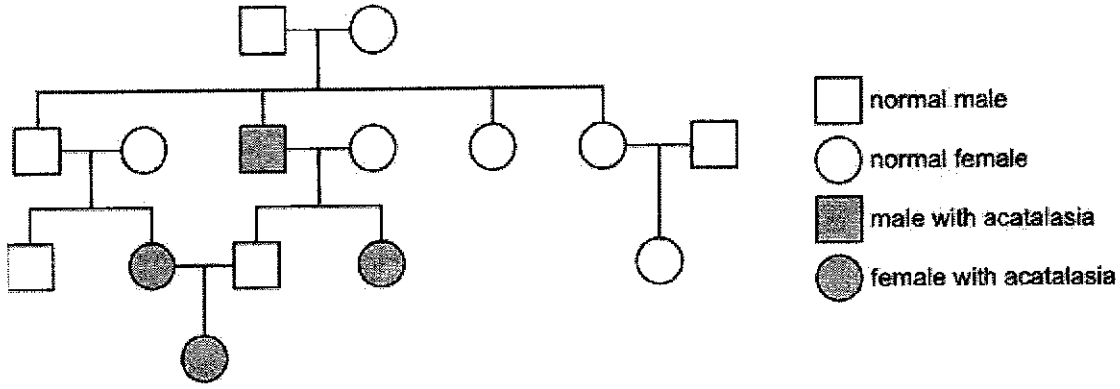
☐ prophase

☐ metaphase

☐ telophase

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34 The diagram shows the inheritance of acatalasia disease in a family. The disease is a rare genetic disorder associated with a very low catalase activity.



What does the family tree show about the mutated allele?

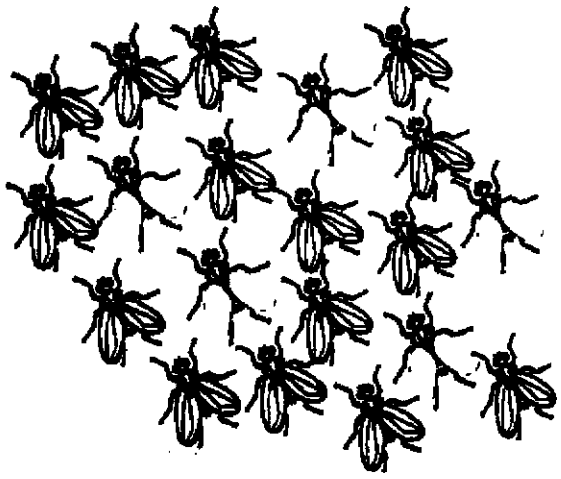
A It is co-dominant.

B It could be dominant or recessive.

C It is dominant.

D It is recessive.

35 The diagram shows two different types of fruit flies in a genetic crossing experiment.
Legend: Let E represent the dominant allele and e represent the recessive allele.



Which crosses would produce the offspring as shown?

A EE x EE

B EE x ee

C Ee x Ee

D Ee x ee

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36 What defines a gene?

A the sequence of amino acids found in the DNA that codes for a polypeptide

B the sequence of amino acids found in a polypeptide

C the sequence of nucleotides found in a polypeptide

D the sequence of nucleotides found in the DNA that codes for a polypeptide

37 Which row gives the chromosome number in the nuclei of different cells during the life cycle of a monkey?

	gametes	cells from which gametes develop	cells of the embryo
A	diploid	diploid	haploid
B	haploid	diploid	diploid
C	diploid	haploid	haploid
D	haploid	haploid	diploid

38 The table shows how energy from the grass ingested is used by a goat.

	ingestion of grass	heat radiated from body	growth and repair	exhalation	products of egestion
Energy / joules	100	12	6	24	58

What percentage of energy is available to both consumers and decomposers?

A 6

B 58

C 64

D 76

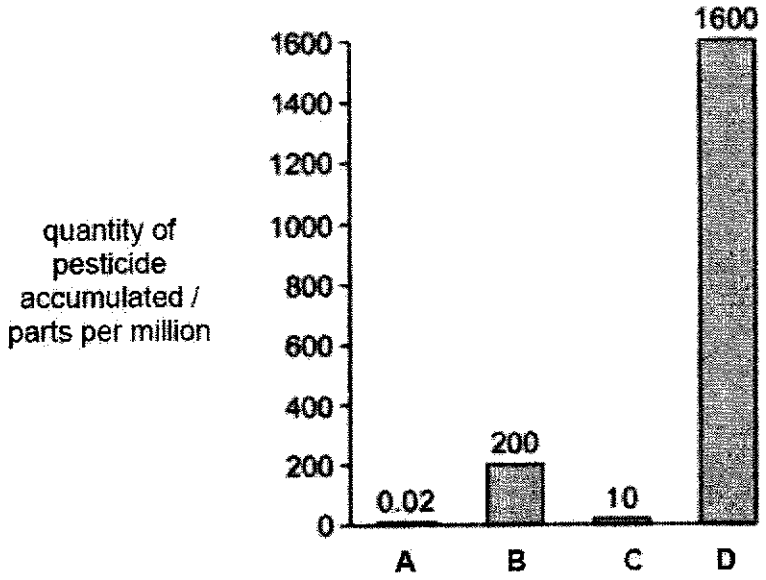
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39 The graph shows the quantity of pesticides accumulated in four different populations in a food chain.

Which population is most likely herbivores?



40 In sewage disposal, what are the results of processes that involve anaerobic processes?

A ammonia is removed

B methane is absorbed

C methane is produced

D urea is converted to nitrates

End of paper

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PRELIMINARY EXAMINATION 2021
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CANDIDATE NAME

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INDEX NUMBER

BIOLOGY

6093 / 2

25 Aug 2021

1h 45 min

0900 – 1045

Candidates answer on the Question Paper

No Additional materials are required

READ THESE INSTRUCTIONS FIRST

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

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

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

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

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Section A

Answer **all** questions.

Write your answers in the spaces provided.

1 Fig 1.1 shows a typical animal cell as seen through an electron microscope.

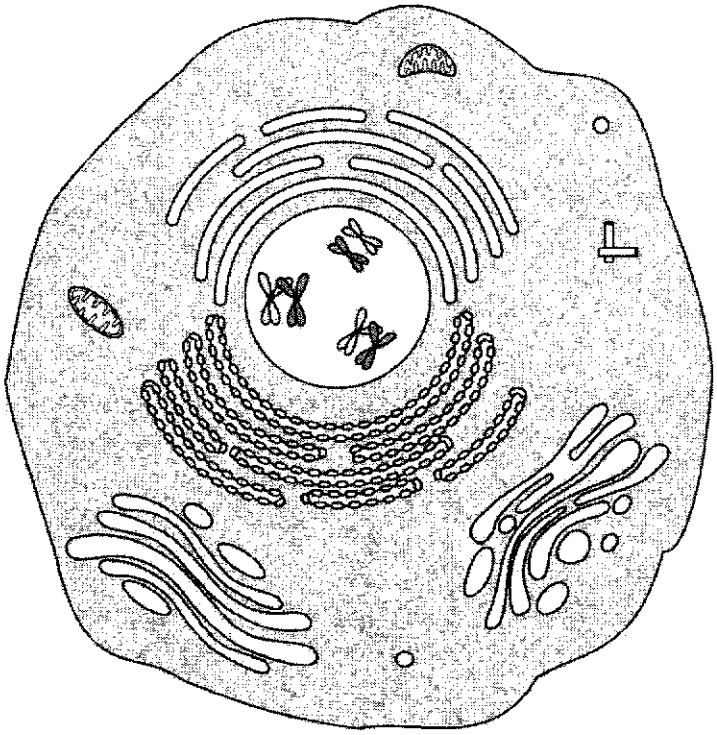


Fig 1.1

(a) Identify and label on the diagram, the organelles responsible for

(i) protein synthesis

(ii) energy release, and

(iii) controlling movement of molecules into and out of the cell. [3]

(b) Name and state the function of two other organelles, other than the ones above that are not visible under a light microscope.

1. .....

.....

2. .....

.....[2]

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(c) Observing the state of chromosome in Fig 1.1, identify the type and phase of cell division that the cell is undergoing. State a reason why you think it is so.

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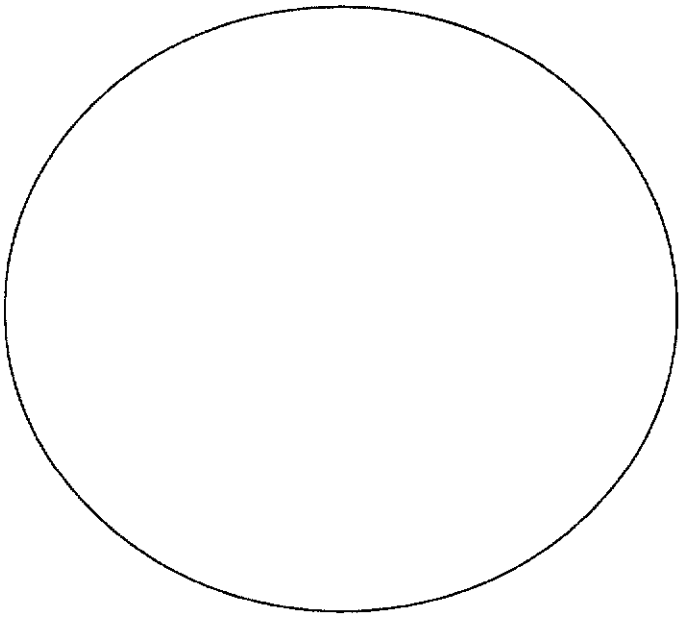
.....

.....

.....

.....[3]

(d) In the space below, draw how the nucleus of the cell would look like after the cell division is completed.



[1]

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(e) Fig 1.2 shows some chemical reactions occurring in the cell in which molecule X is translated.

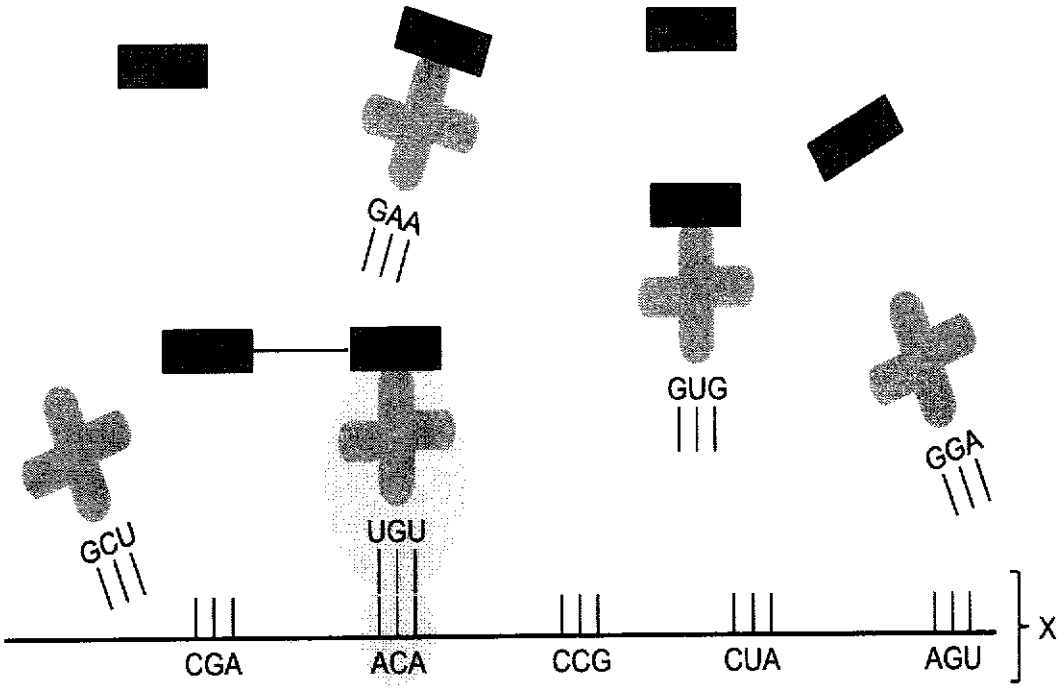


Fig 1.2

(i) Determine the base sequence of the gene coding for X.

.....[1]

(ii) Suggest what would happened if the base sequence is translated wrongly.

.....[1]

[Total: 11]

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2 Fig 2.1 shows the air temperature and the temperatures in the intercellular air spaces of the leaves for the same plant over 24 hours.

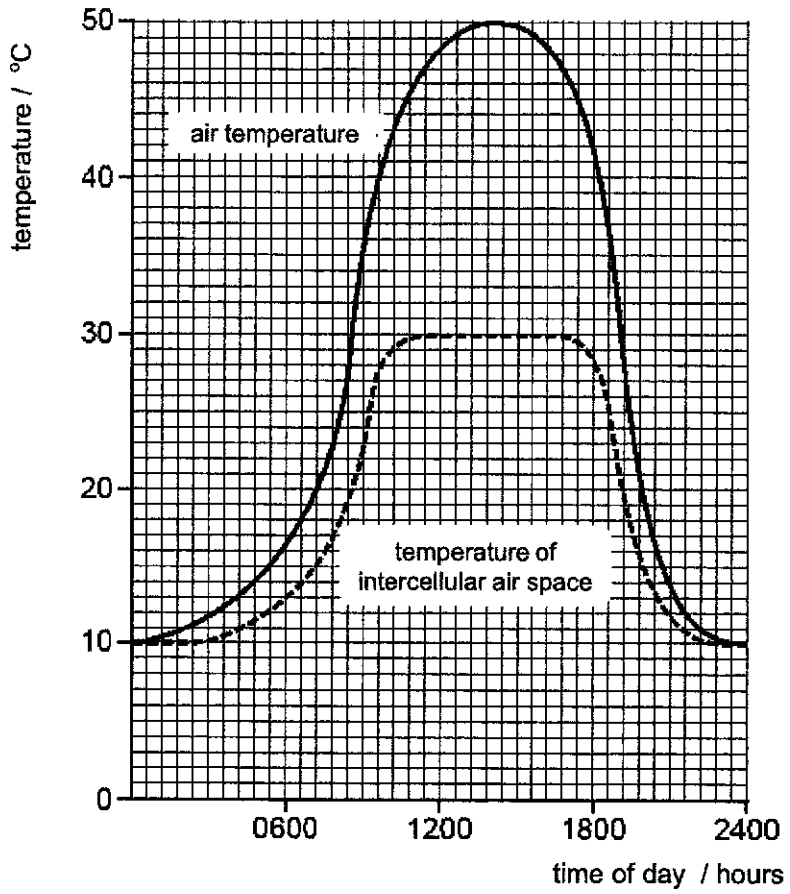


Fig. 2.1

Fig 2.2 shows stomata as they appear in the leaves at three different times during the day.

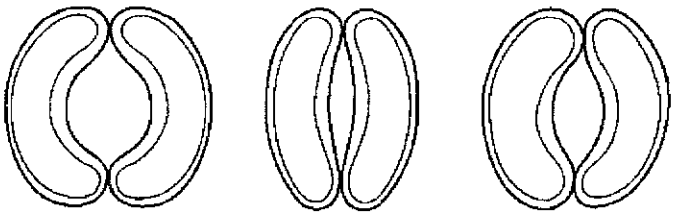


Fig. 2.2

(a) Using the information provided in Figs 2.1 and 2.2, state which of the stomata pores **M, N** or **O**, is representative of the stomata appearance at the following times of the day:

(i) 10.00 am .....

(ii) 6.00 pm ..... [2]

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(b) Based on your answer in **(a)**, explain how the time of the day at 10.00 am affects the stomata appearance.

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.....[5]

(c) Stomata appearance also affects the rate of transpiration in a plant over 24 hours. Suggest how transpiration can be an advantage to the plant as well as a disadvantage.

.....

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.....

.....

.....[3]

[Total: 10]

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3 Urine samples were obtained from three patients and each sample was tested for the presence of alcohol, glucose and proteins. Table 3.1 shows the results of the tests respectively.

patient	nicotine	glucose	protein
Tony	absent	absent	present
Steve	absent	present	absent
Nick	present	absent	absent

Table 3.1

(a) **(i)** Which patient is likely suffering from Type 1 diabetes?

.....[1]

(ii) Suggest the cause of his condition and explain what can be given to him to control it.

.....

.....

.....

.....

.....[3]

(b) **(i)** Which patient is likely suffering from kidney failure?

.....[1]

(ii) Explain your answer in **b(i)** and the cause of his condition.

.....

.....

.....

.....

.....[2]

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8

Fig 3.1 shows a dialysis machine used for treating people with kidney failure. The dialysate (dialysis fluid) is a solution of glucose, amino acids, water and mineral salts.

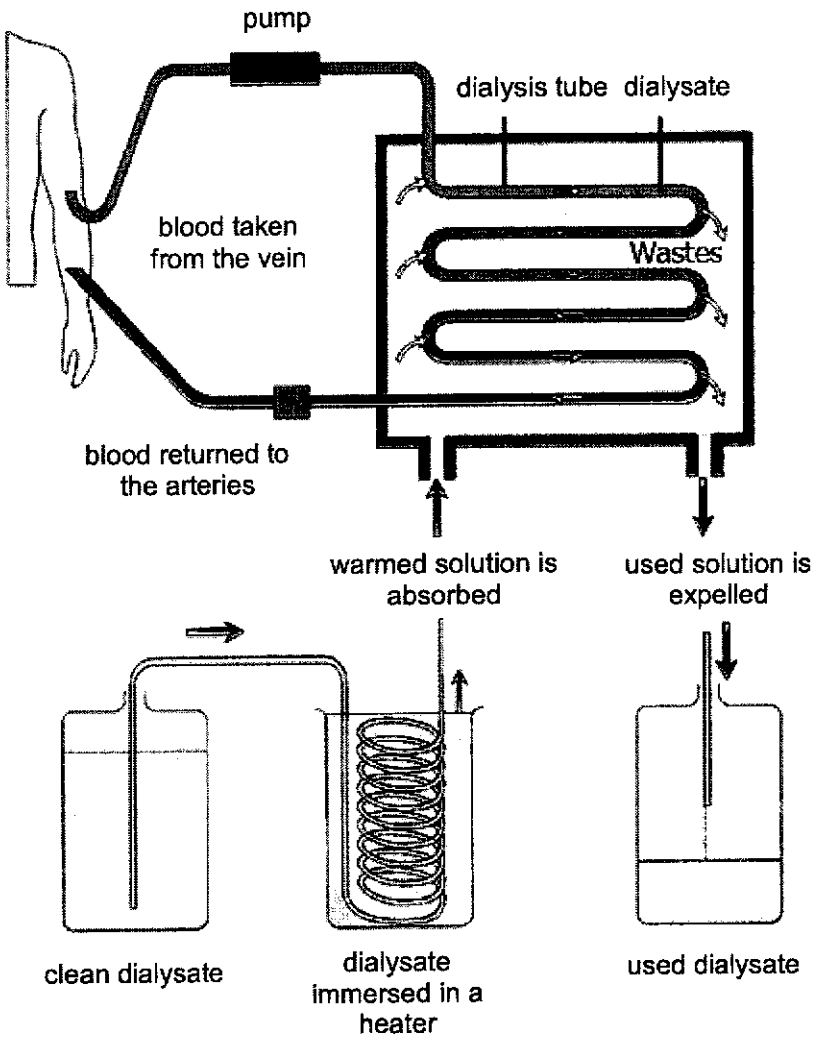


Fig 3.1

(c) Referring to Fig 3.1, state two features in an efficient dialysis machine. Provide your reasons.

.....

.....

.....

.....

.....[2]

[Total: 9]

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4 Fig 4.1 shows the changing levels of adrenaline found in the blood plasma and its effect on pupil size.

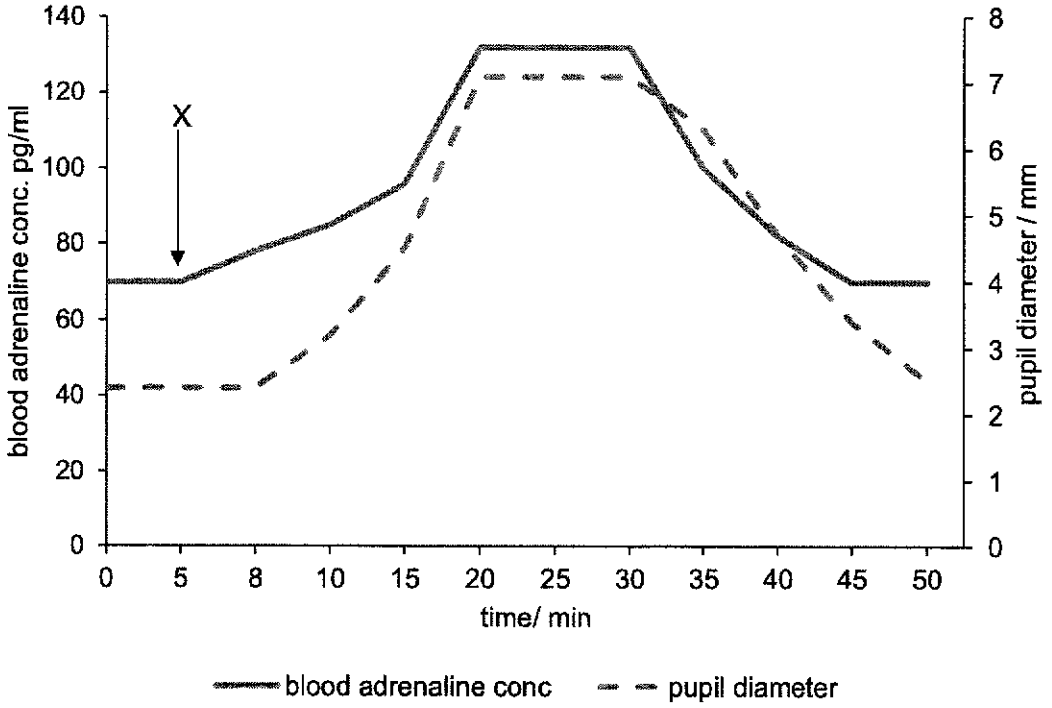


Fig. 4.1

(a) Describe the relationship between the blood adrenaline concentration and the pupil diameter from 0 to 50 minutes.

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.....

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.....[4]

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(b) Suggest a stimulus at point X on Fig 4.1 which affected the change in blood adrenaline concentration.

.....

.....[1]

(c) Define the term reflex action.

.....

.....[1]

(d) Explain the pathway of nerve impulses that lead to the change in pupil diameter from the 8th to 15th minute.

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.....[4]

[Total: 10]

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5 Food fish from sea aquaculture supplies about 10% of total fish consumption in Singapore. One of the major farmed species of fish is the Asian seabass.

Fig 5.1 shows an open net aquaculture system for the rearing of farmed seabass off the Singapore coast near Changi.

On an average harvest, 5 tons of fishmeal is used to produce 1 ton of seabass. Drugs and chemicals were added to prevent the spread of sea-lice, a parasite that lives in the gills of fishes.

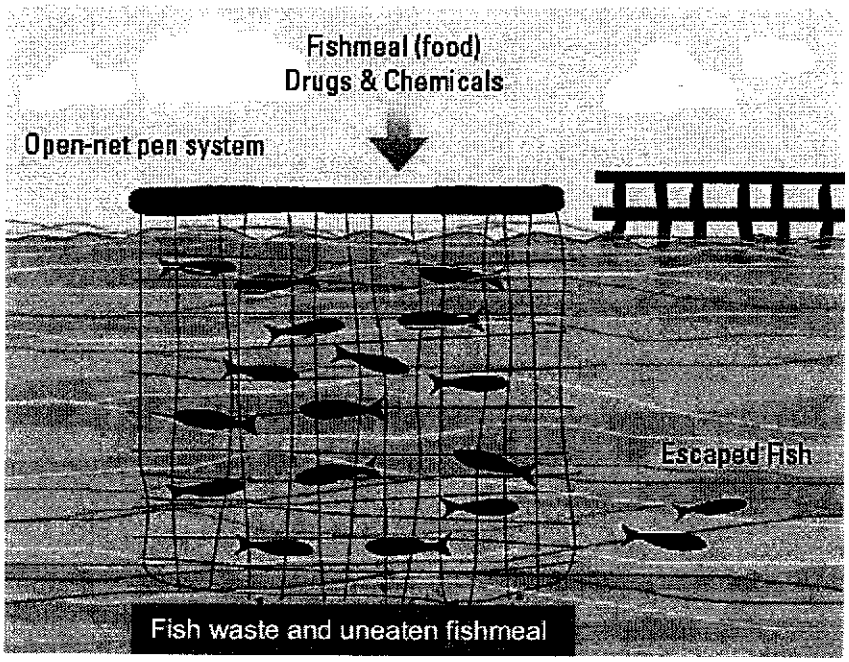


Fig. 5.1

Adapted from: http://www.eschooltoday.com/aquaculture/impact-of-aquaculture.html

(a) Discuss the impact of fish waste and uneaten fish meal in the water environment, if not properly managed.

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.....[3]

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(b) The NEA (National Environment Agency) has detected high levels of organochlorines (a chemical used in pesticides banned in Singapore) in tissue samples of dead Ospreys (a native predatory bird) found along Changi beach.

Suggest what could have caused this.

.....

.....

.....

.....[2]

(c) The farming transgenic seabass has become a reality to fish farmers when the technology of genetic engineering has found its way to Singapore.

(i) What is meant by a 'transgenic fish'?

.....

.....[1]

(ii) Compare the benefits of genetic engineering over the traditional selective breeding of farmed fishes in the past.

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.....[4]

[Total: 10]

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Section B

Answer **three** questions in this section.

Question 8 is in the form of an **Either/Or** question. Only one part should be answered.

Write your answers in the spaces provided.

6 Table 6.1 shows data collected from 20 random human volunteers at a coffee shop to observe common genetic traits present in the Singapore population.

volunteer	blood group	height/cm	hair type
1	A	136	curly
2	O	168	straight
3	A	159	straight
4	O	139	curly
5	O	174	straight
6	AB	167	straight
7	O	165	curly
8	A	164	curly
9	B	161	straight
0	O	169	curly
11	O	179	curly
12	A	170	straight
13	B	163	curly
14	B	166	curly
15	A	164	curly
16	B	165	curly
17	O	162	curly
18	AB	170	curly
19	A	165	curly
20	O	165	curly

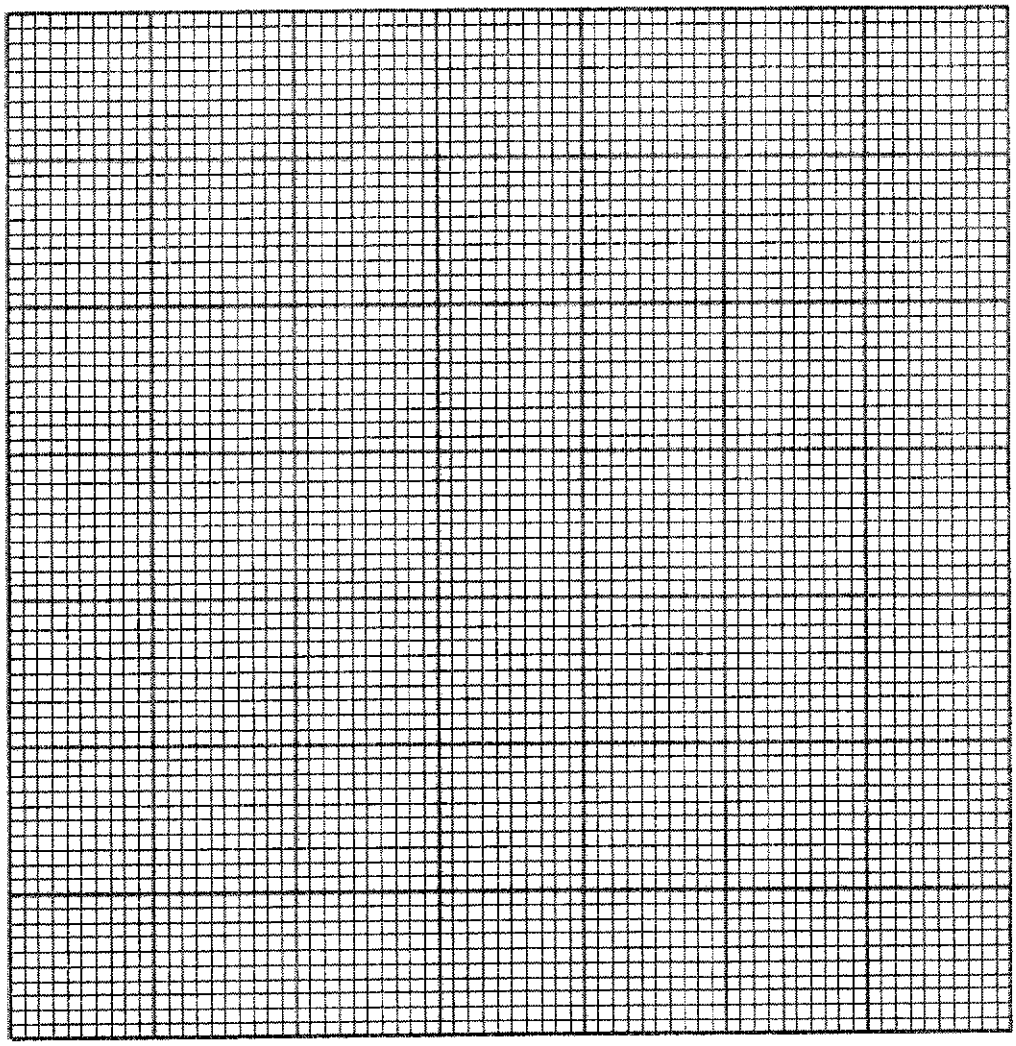
Table 6.1

(a) State the type of variation that exists in height of individuals.

.....[1]

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(b) Using the grid below, draw a bar chart to show the distribution of students with different blood groups. [3]



(c) In human, straight or curly hair type is determined by a pair of alleles. Individuals 1 and 2 are siblings. Both parents have curly hair. Deduce with reasons whether the allele for curly hair is dominant or recessive.

.....

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.....[4]

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(d) Individuals 19 and 20 are twins. Explain whether they are identical or fraternal.

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.....[2]

[Total: 10]

7 Fig. 7.1 shows three longitudinal sections of an individual daisy flower during pollination period.

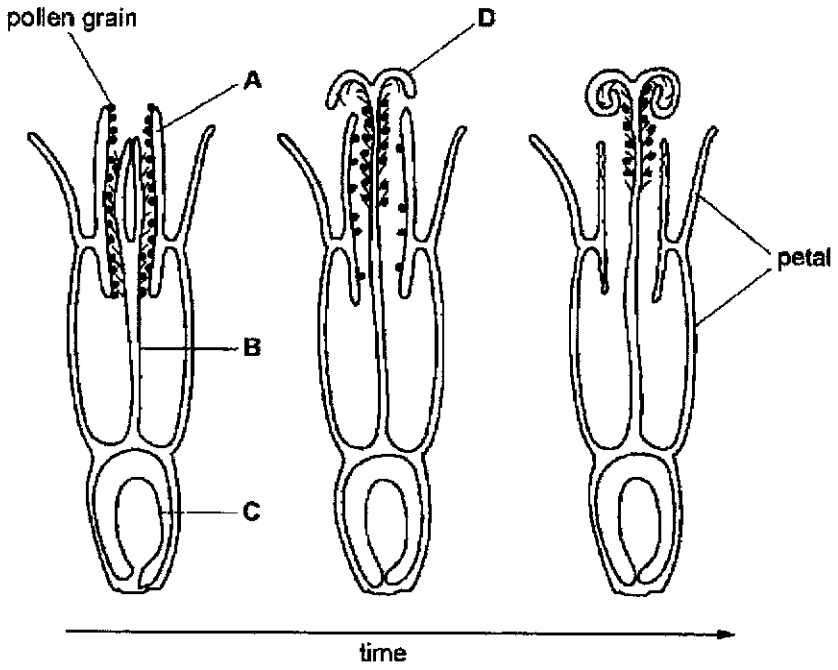


Fig. 7.1

(a) Identify the parts labelled A to D.

A ..... **C** .....

B ..... **D** ..... [2]

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(b) Daisy flowers attract insects. With reference to Fig 7.1, suggest with reasons, the type of pollination this flower employs and whether there is a possible advantage for this strategy.

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.....[4]

(c) Describe the events that will take place after pollination leading to the formation of the daisy fruit.

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.....[4]

[Total: 10]

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8 **Either**

Fig. 8.1 shows an experimental set up designed to simulate a chemical reaction occurring in the human body.

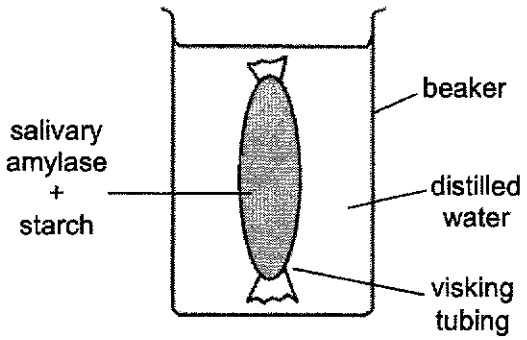


Fig. 8.1

At the start of the experiment, 1 cm^3 of the distilled water was removed from the beaker and left on the evaporating dish to evaporate. The mass of the solid residue collected after the evaporation was measured and recorded in table 8.1.

For the next 40 minutes, the same procedure repeats for every 10 minutes.

time / mins	mass / g
0	0.0
10	0.3
20	0.8
30	1.7
40	2.8

Table 8.1

(a) It was inferred that the solid residue is 'maltose'. Suggest how an experiment can be extended to determine this.

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.....[3]

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(b) Explain the increased mass of maltose present during the experiment.

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.....[3]

(c) A hypothesis suggests that 'increased temperature affects the rate of chemical reaction and ultimately the results in the experiment'. Do you agree?

Explain.

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.....[4]

[Total: 10]

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8 Or

(a) Fig 8.1 shows the tissues of a placenta.

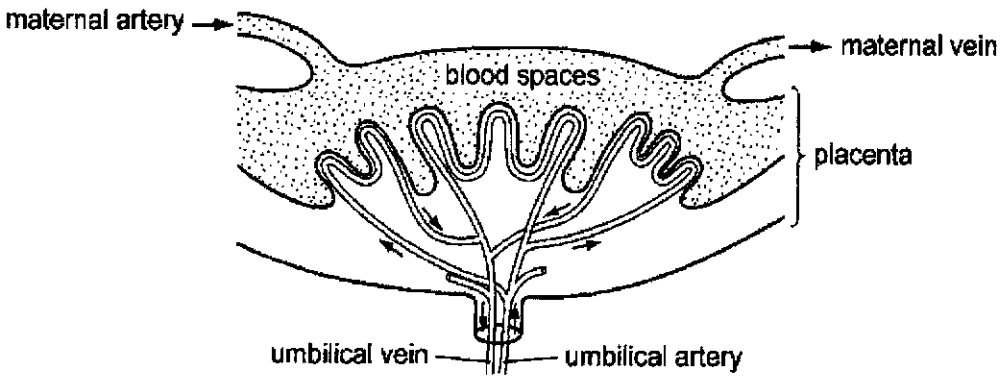


Fig. 8.1

Explain how the health of the mother and development of fetus will be affected if she smoked during her pregnancy.

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.....[6]

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(b) The placenta shares structural similarities to the small intestine, lung and kidney with respect to their functions. Discuss.

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.....[4]

[Total: 10]

End of Paper

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Junyuan Secondary School
Prelim Marking Scheme P1 2021

Sec 4E Pure Biology

PAPER 1

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

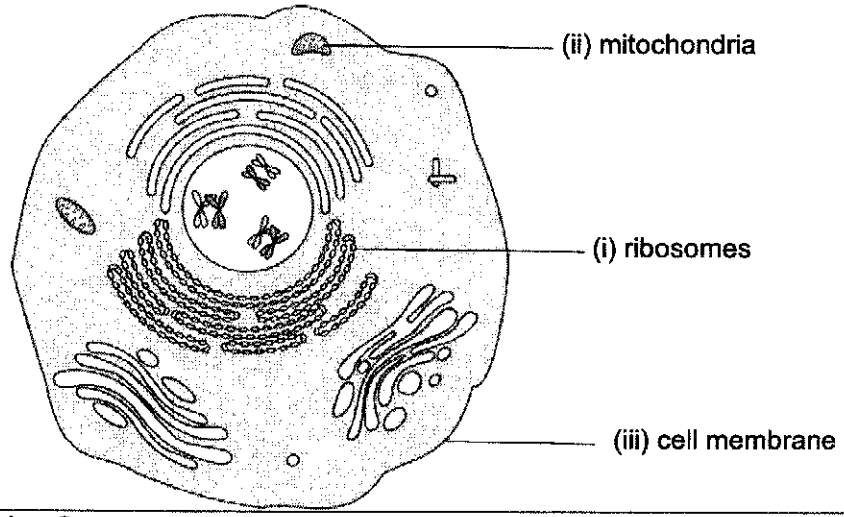
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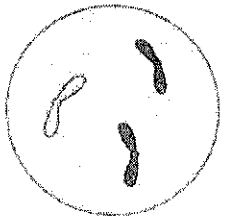
Suggested Mark Scheme

Purpose of Prelim

- Identify any more gaps of understanding by students
- Identify students interpreting questions and answering to the question.
- Knowing the key command words like 'define', explain, suggest, describe, state, identify, label, compare
-

Qn	Suggested Answers	Remarks	Markers' Comments
1(a)	Label rough ER or ribosomes on rER Label mitochondrion Label cell membrane  	1 1 1 (must identify and label correctly to get mark)	Students who do not label question number (eg. (i), (ii), (iii)) / name of organelle will get 1m deducted.
1(b)	Any 2: - centrioles: plays a role in **cell division** - chromosomes: stores **genetic information** - vacuoles: stores food and water temporarily - vesicles: contain secretory proteins - Smooth ER: lipid/fat/steroid synthesis, detoxifies harmful substances	 1 1 1 1 1 1 (max 2)	1m each for correctly identified organelle and corresponding function. -Reject "produce energy" in mitochondria

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	- Golgi Apparatus: chemically modifies, stores and packages substances made by ER in vesicles to secrete out of cells		
1(c)	Prophase Meiosis I A pair of homologous chromosomes / crossing over is seen.	1 1 1	Some students are unable to identify 'meiosis' to 'mitosis'
1(d)		1	A number of students drew 3 chromosomes with sister chromatids
1(e) (i)	GCT-TGT-GGC-GAT-TCA	1	A few could not identify that this is the DNA template. Mistaken to be the mRNA
1(e) (ii)	Phenotype / protein /polypeptide made will be different / mutation occurs	1	
2(a) (i)	M, O		
2(a) (ii)	N		
2(b)	During the day, **light** is present Guard cells **photosynthesise**, producing glucose **lowering** the water potential Water molecules **enters** the guard cells via **osmosis** via lower/neighbouring epidermal cells Making it **turgid** and **curved**, **Opening** the stomata	1 1 1 1 1	Many had forgotten how stomata opens as a result of guard cells photosynthesizing.
2(c)	Advantages of transpiration • Cools the plant • Creates transpiration pull of water and mineral salts up the plant Disadvantages of transpiration	1 [any one]	

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	• Too much loss of water vapour when transpiration rate higher than absorption, plant will wilt o Less surface area for photosynthesis o Guard cells flaccid, stomata close o Less gaseous exchange	 1 1 [any one]	
3(a)(i)	Steve	1	
3(a)(ii)	Islets of Langerhans in pancreas unable to secrete insulin. Give insulin injections Insulin will cause excess glucose to be converted to glycogen so less glucose present in blood plasma	1 1 1	Insulin from pancreas, not liver
3(b)(i)	Tony		
3(b)(ii)	Proteins are present in Tony's urine suggesting that the ultrafiltration mechanism did not prevent proteins from entering the glomerular filtrate.	1 1	Concept of ultrafiltration and selective reabsorption still weak to some Amino acids is NOT proteins
3(c)	[Any 2] Long, narrow and coiled dialysis tubing to increase surface area for exchange of waste materials Flow of dialysate is in opposite to the direction of flow of blood to maintain steep diffusion gradient Dialysate does not contain urea to set up a concentration gradient, Dialysate contains the same concentration of essential molecules such as glucose and amino acids to prevent these molecules from diffusing out. Dialysate warmed to human body temperature so as to maintain blood fluid integrity.	1 1 [any 2]	
4(a)	From 0 to 5 mins the adrenaline concentration in the blood is constant at 70pg/ml, likewise for the pupil diameter at 2.5mm. From 5 to 20 mins, the adrenaline levels increased sharply from 70pg/ml to 130pg/ml, the pupil diameter also increase from 2.5mm to 7.5mm.	1 1	

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	The adrenaline concentration and pupil diameter remain constant from 20 to 30 mins, at 130pg/ml and 7mm respectively. At 30mins, the adrenaline concentration decreased from 130pg/ml to 70pg/ml, this results in the decrease in the diameter of the pupil from 7.5mm to 2.5mm.	1 1	
4(b)	Start of exercise/ feeling nervous/ anxiety / scared/ fear /angry	1	
4(c)	A reflex action is an **immediate** response to a specific stimulus **without conscious control**.	1	
4(d)	Stimulus adrenaline is **detected** by **receptor** and **generated** a nerve impulse transmitted to the **Sensory neurone** to **relay neurone in CNS** and to the **motor neurone** causes the effector **radial muscles to contract and circular muscles in the** **iris to dilate, increasing the size** of the pupil from the 8th to 15th minute.	1 1 1 1	
5(a)	~~The fish waste and uneaten fish food would enrich the seabed resulting in rapid growth of bacteria.~~ ~~Depleted level of oxygen.~~ ~~The fishmeal fed to the salmon fishes may float away, enriching the nutrients in the water resulting in algae bloom in the sea.~~ ~~[Any possible answers]~~	1 1 1	
5(b)	~~Organochlorines are insoluble and non-biodegradable.~~ ~~are absorbed by the producers / phytoplankton~~ ~~Ingested by consumers and stored in their **fatty tissues** as they are transferred to the next trophic level, increasing in concentration through **bioaccumulation / bioamplification**.~~	1 1 1 1 1	

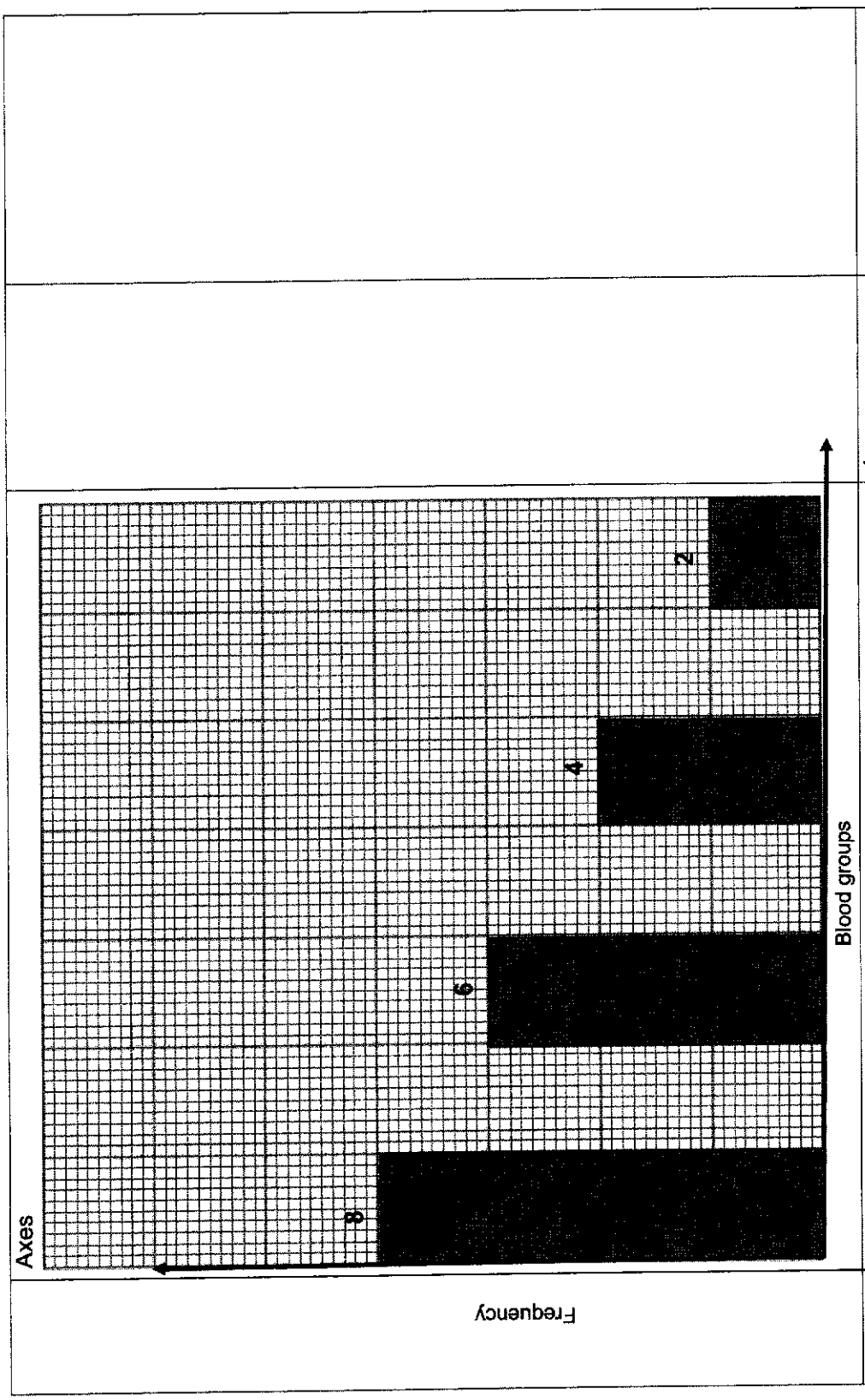
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<table>
<tr><td>5(c)(i)</td><td colspan="2">Transgenic fish is a fish that has acquired a <u>foreign gene from other species / artificially inserted</u> into their genome</td><td>1</td><td>Not just a 'genetically engineered' fish, need to unpack what it means</td></tr>
<tr><td>5(c)(ii)</td><td colspan="2"><table>
<tr><th>Genetic Engineering</th><th>Selective breeding</th></tr>
<tr><td>Genes from other non-related/different species can be inserted into farmed fishes</td><td>Farmed fish must be closely related or belong to the same species</td></tr>
<tr><td>Genes are carefully selected before transfer into farmed fishes to reduce risk of genetic defect passed to offsprings</td><td>Defective genes maybe transmitted along healthy genes to offsprings</td></tr>
<tr><td>GE uses individual cells reproduced rapidly in the laboratory in a small container</td><td>Selective breeding is a slow process. It involves breeding over several generations. Requires a large space.</td></tr>
<tr><td>More efficient eg transgenic salmon grow faster and requires less food than ordinary salmon.</td><td>Less efficient. Organisms grow slower and may require more food</td></tr>
</table></td><td>4

[Any 2 pairs of comparison]</td><td></td></tr>
<tr><td>6(a)</td><td colspan="2">Continuous variation</td><td>1</td><td></td></tr>
<tr><td>6 (b)</td><td colspan="2">Scale
Discrete grouping with labels (gaps between bars, bards equal in width)
Correct axes</td><td>1
1
1</td><td></td></tr>
</table>

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6(c)	 Curly hair is a dominant trait Both parents have curly hair but individual 2 has straight hair Both parents are heterozygous for the trait Both parents contributed to the one recessive allele for straight hair to individual 2	1 1 1

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6(d)	Fraternal twins Blood group is different / grow from 2 different embryos	1 1	
7(a)	A- Anther B- Style C- Ovule D- Stigma	1 mark for 2 correct answers	Majority still couldn't label properly
7(b)	Cross-fertilisation Pollen grains and stigma have different maturing times Insect collect pollens as it enters flower for nectar and pollinates the next flower Advantage: Greater variety/ viable seeds	1 1 1 1	Many wrote insect pollinated when this was actually written in the question – attracts insects.
7(c)	Pollen grain **germinates** into pollen tube in the presence of sugary fluid Pollen tube **grows/digest** into style Male nucleus moves inside the pollen tube Grow towards ovule / micropyle Pollen tube burst and male gamete released and **fused/fertilized** with female gamete/ovum in the ovule	1 1 1 1	Many have forgotten this
8 Either			
8(a)	Conduct **reducing sugar test with Benedicts solution** on the residue Add 2cm3 or equal volume of residue in water and Benedict's solution Shake to mix and heat in beaker of boiling water Brick red ppt observed If there is an **increase** in maltose concentration (colour ppt intensifies from green to orange to brick red ppt) Test for the presence of starch using iodine solution – should gradually **becomes brown** at the end of the experiment showing the absence of starch.	1 1 1	
8(b)	Amylase digest starch to maltose. Maltose molecules are small enough to **diffuse** through the in the Visking tubing. Maltose molecules will move from a **region of higher concentration, in the Visking tubing, to a region of lower concentration**, the distilled water in the boiling tube / **down the diffusion/concentration gradient.**	1 1 1	

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	Over time, **more maltose diffuse out** leading to an increase in the concentration of maltose during the experiment/absence of starch. [any 3]	1	
8(c)	Yes agree. An increase in temperature will **increase the kinetic energy**, hence **increasing the chances of collision** between amylase and starch and increase the rate of formation of enzyme-substrate complex that will increase the rate of reaction ; At the **optimum** temperature, the rate of reaction reaches the **maximum** ; An increase in temperature **above / beyond** the optimum will cause amylase to **denature/** change in the active site of, losing its complementary shape to the substrate/starch, causing a sharp decrease in the rate of chemical reaction;	1 1 1 1	Many did not explain the reason behind the increases of rate of reaction when temperature of enzyme increases
8 Or			
8(a)	Carbon Monoxide Combines permanently with haemoglobin to form carboxyhaemoglobin increases rate of fatty deposits on inner arterial wall Nicotine Clots blood easily Tar Paralyses cilia lining causing risk of emphysema All reduces oxygen carrying capacity of the maternal blood Less oxygen diffuse across placenta to the fetal blood circulation Increased heart beat and blood pressure caused by nicotine High blood pressure results in lesser time for materials to be exchanged in the placenta Less glucose/oxygen/energy for celluLar activity – slower development	1 1 1 1 1 1 1 1 [Any 6]	

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8(b)	- Eg: Villi in Small intestine - Alveoli in lung - Nephron in kidney	1 1 1		
	Small and numerous structures - To increase surface area to volume ratio	1		
	One-cell thick epithelium/wall – to reduce diffusion distance	1		
	Richly with blood capillaries - quickly transport molecules away to maintain steep diffusion gradient	1		
		[Any 4]		

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