Name: _____( ) Class:_____

CHIJ KATONG CONVENT
PRELIMINARY EXAMINATIONS 2019
Secondary Four Express

BIOLOGY **6093/01**
Paper 1 Duration: 1 hour

Classes: 405 and 406

Additional Materials: Optical Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid/ tape.
Write your name, registration number and class on all the work you hand in.

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 Optical Answer Sheet.

Read the instructions on the Optical 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 on the question paper.
The use of an approved scientific calculator is expected, where appropriate.

At the end of the examination, hand in:
(a) Optical Answer Sheet; and
(b) Question paper **separately**.

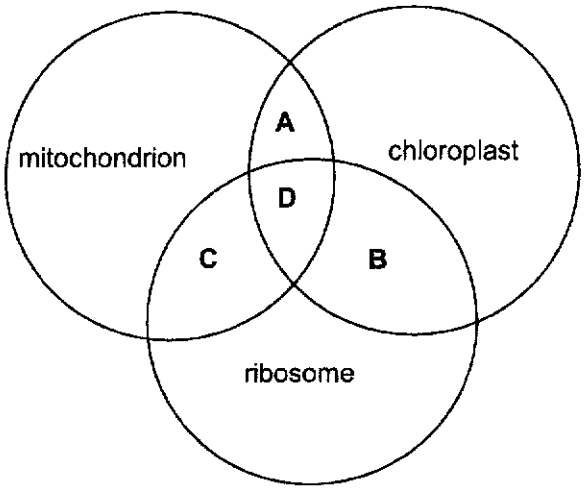
This question paper consists of **17** printed pages.

[Turn over

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1 Which section of the diagram represents the structures that are typically found in both plant and animal cells?



2 Which structures are found in a human male gamete?

	diploid nucleus	enzymes	mitochondria	nuclear membrane
A	✓	✗	✓	✓
B	✗	✗	✓	✓
C	✗	✓	✓	✓
D	✗	✓	✗	✗

3 Which chemical element is present in fats but **not** in water?

A carbon
B hydrogen
C nitrogen
D oxygen

4 A student conducted an investigation to determine the type of nutrients in a food sample.

food sample	Benedict's test	biuret test	ethanol emulsion test
Y	blue	purple	white emulsion
Z	brick-red	blue	clear

Which row shows the nutrients present in each food sample?

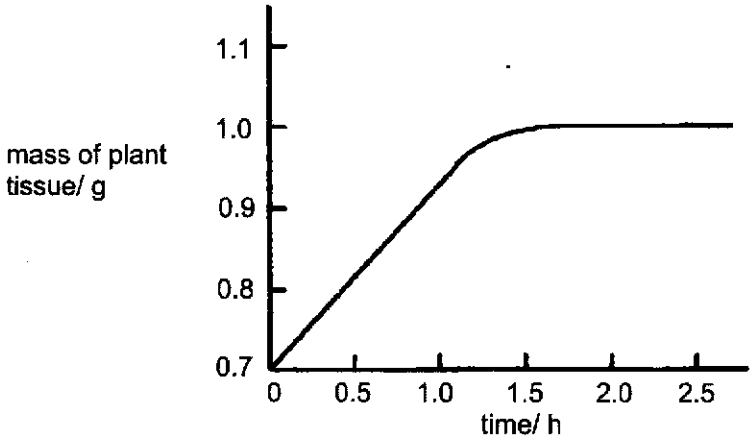
	Y	Z
A	proteins	fats and glucose
B	fats and proteins	maltose
C	fats and sucrose	proteins
D	proteins and sucrose	maltose

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5 The graph shows the changes in the mass of a piece of plant tissue in distilled water at 30 °C.



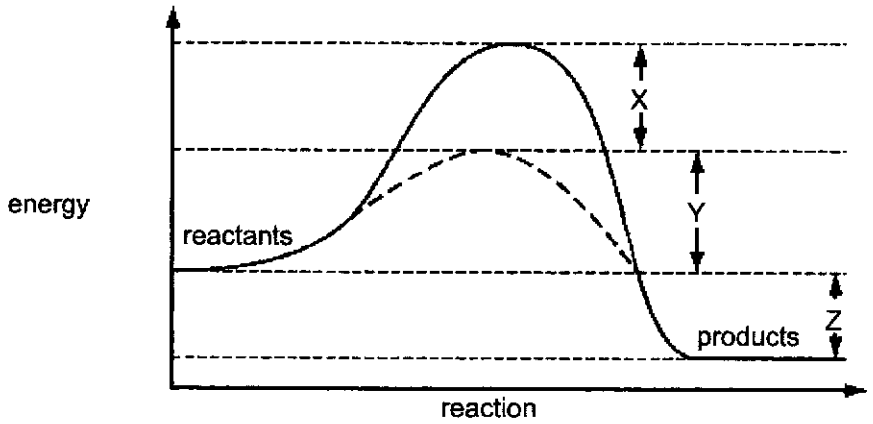
The following conclusions were made:

1 The plant cells are plasmolysed between 1.5 hrs to 2.5 hrs.
2 The plant cells are fully turgid between 1.5 hrs to 2.5 hrs.
3 The rate of osmosis is highest from 1.5 hrs to 2.5 hrs.
4 There was no movement of water molecules from 1.5 hrs to 2.5 hrs.

Which conclusion(s) is/ are correct?

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

6 The graph shows the activation energy of an enzyme-catalysed reaction and the same reaction without a catalyst.



Which working shows the activation energy of the uncatalysed reaction?

A X + Y - Z
B X + Z - Y
C X + Y
D Y + Z

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7 Cubes of hard-boiled egg white are placed in test-tubes containing different combinations of chemicals are added to 7 tubes.

tube	chemical(s) added	results of test for amino acids
1	pepsin	absent
2	pepsin + alkali	absent
3	none	absent
4	pepsin + acid	large amounts
5	boiled pepsin + acid	traces
6	acid	traces
7	alkali	absent

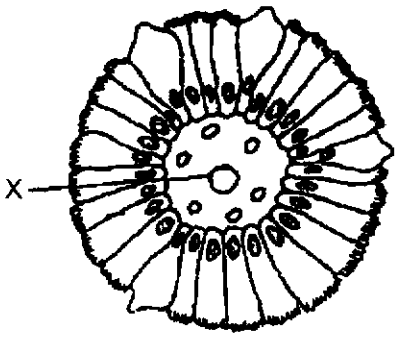
Which tubes show that pepsin is an enzyme?

A 1 and 6
B 2 and 7
C 4 and 5
D 5 and 6

8 Which blood vessel contains the highest concentration of glucose after a period of fasting?

A hepatic artery
B hepatic vein
C hepatic portal vein
D inferior vena cava

9 The diagram shows a transverse section of an intestinal villus.



Which food substance is absorbed by structure X?

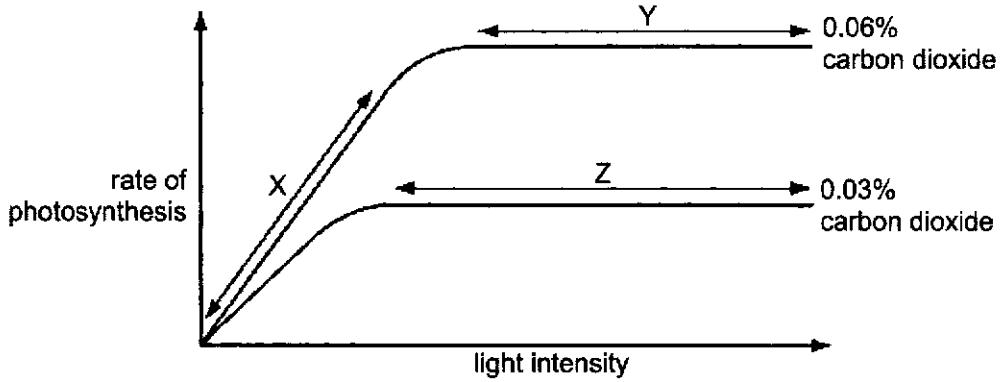
A amino acids
B fatty acids
C glycogen
D lipids

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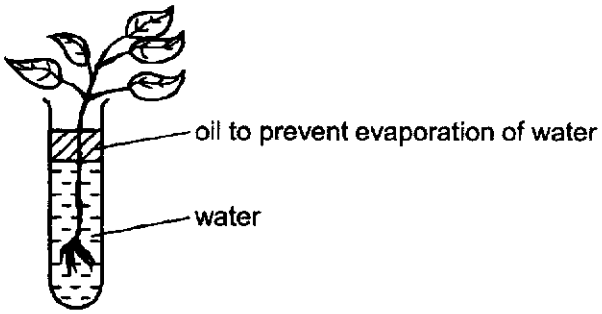
10 The graph shows the rate of photosynthesis of a plant at increasing light intensities at two carbon dioxide (CO_2) concentrations. The temperature is kept constant.



What may be limiting the rate of photosynthesis at X, Y and Z?

	X	Y	Z
A	CO_2 concentration	light intensity	CO_2 concentration
B	CO_2 concentration	light intensity	light intensity
C	light intensity	CO_2 concentration	CO_2 concentration
D	light intensity	CO_2 concentration	light intensity

11 In an investigation into rate of transpiration, 5 of the following set-ups were used.



Some of the plants had all their leaves coated with grease to reduce transpiration. Each plant is weighed in its own test-tube at the start of the experiment and after 2 days.

The results are shown in the table.

	mass of plant/ g				
	plant 1	plant 2	plant 3	plant 4	plant 5
t = 0	105	121	107	111	119
t = 2 days	103	97	84	110	93

Which plants had their leaves coated with grease?

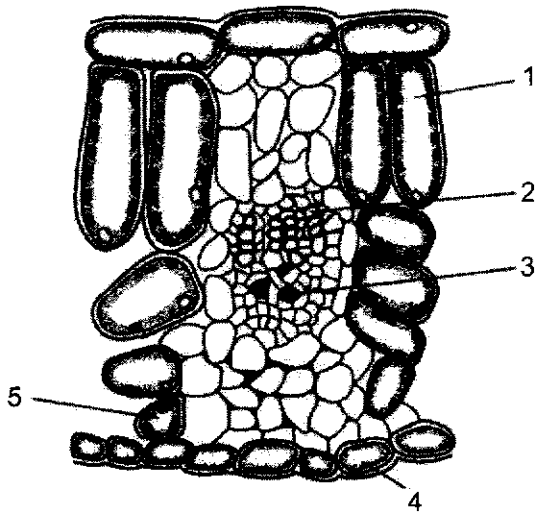
A 1 and 2
B 1 and 4
C 2 and 5
D 2, 3 and 5

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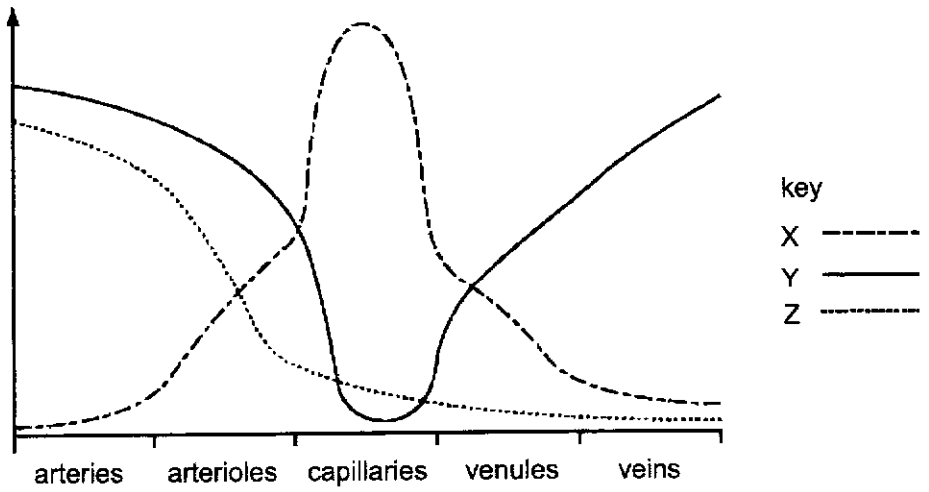
12 The diagram shows a section through a leaf.



Which option matches the cells to their respective functions?

	photosynthesis	transport
A	1 and 5	2 and 3
B	2 and 4	1 and 4
C	3 and 4	2 and 5
D	4 and 5	3 and 4

13 The graph represents data on blood vessels and blood flow.



Which row correctly identifies the curves?

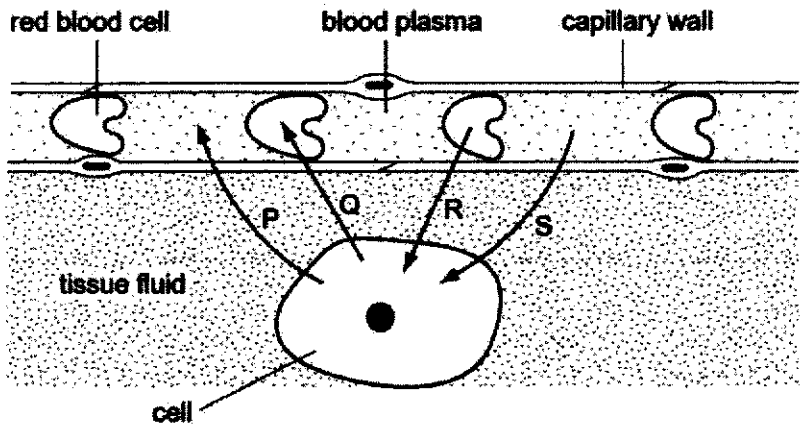
	pressure of blood	total cross sectional area	velocity of blood flow
A	Y	Z	X
B	Z	Y	X
C	Z	X	Y
D	X	Y	Z

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14 The diagram represents a blood capillary with an adjacent cell. The arrows represent the directions of movement of substances between the capillary and the cell.

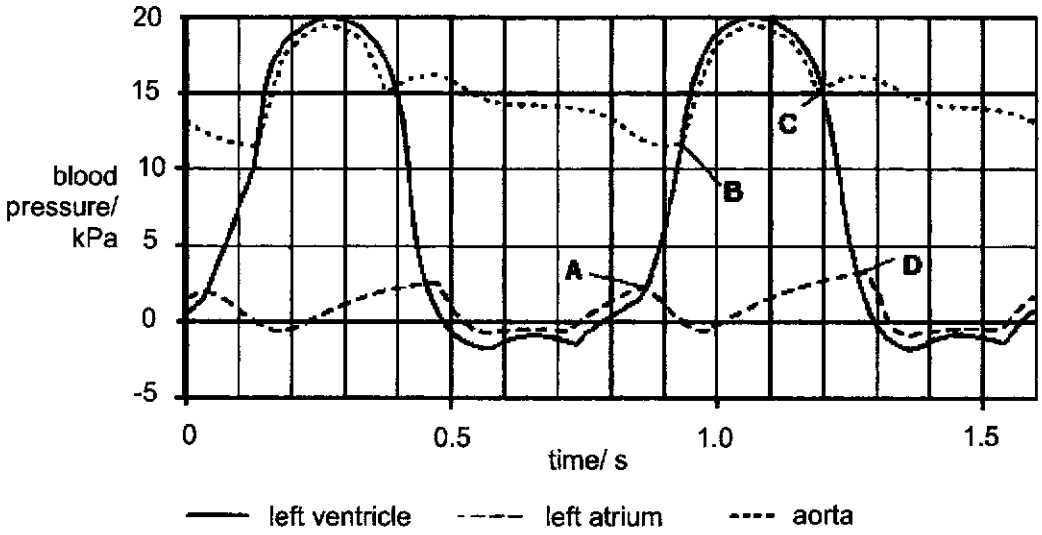


Which arrows represent glucose, carbon dioxide and oxygen?

	glucose	carbon dioxide	oxygen
A	P	R	Q
B	Q	S	P
C	R	Q	S
D	S	P	R

15 The graph shows pressure changes in the left ventricle, left atrium and aorta.

At which point, **A**, **B**, **C** or **D** is the aortic valve open?

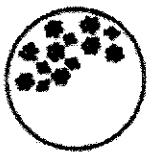
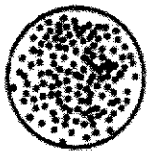
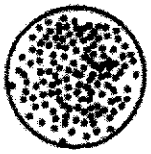
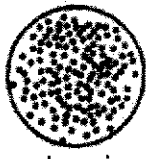


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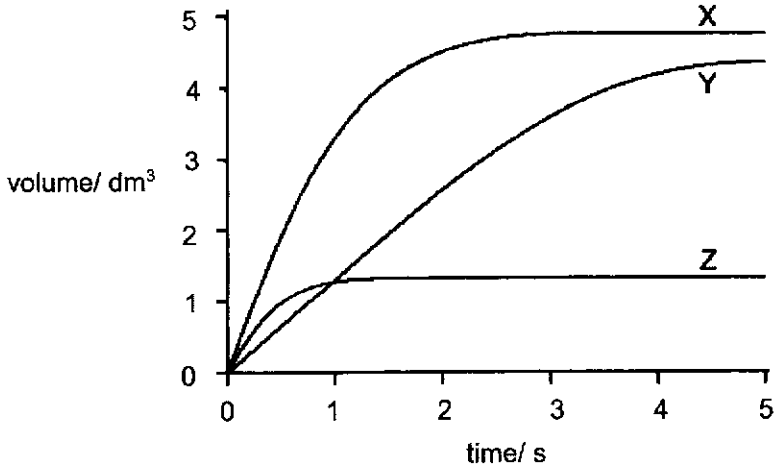
16 The diagram shows the results of blood group testing of three people.

blood extracted from person	X	Y	Z
serum from blood group A	 clumps	 clumps	 no clumping
serum from blood group B	 no clumping	 clumps	 no clumping

Which blood group does X, Y and Z belong to?

	X	Y	Z
A	A	AB	O
B	B	AB	O
C	AB	A	B
D	O	AB	A

17 The graph shows the volume of air breathed out quickly and with force, following a deep breath in, for three different people, X, Y and Z.



What is an explanation for the differences shown?

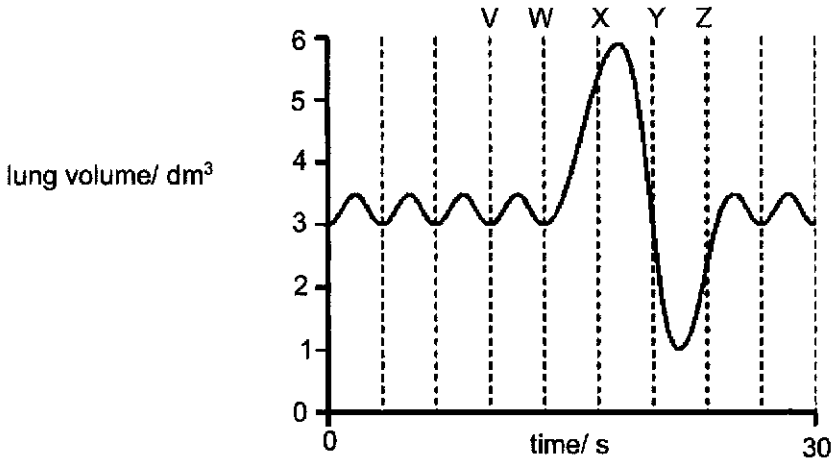
	chronic bronchitis	emphysema	healthy lung function
A	X	Y	Z
B	X	Z	Y
C	Y	Z	X
D	Z	Y	X

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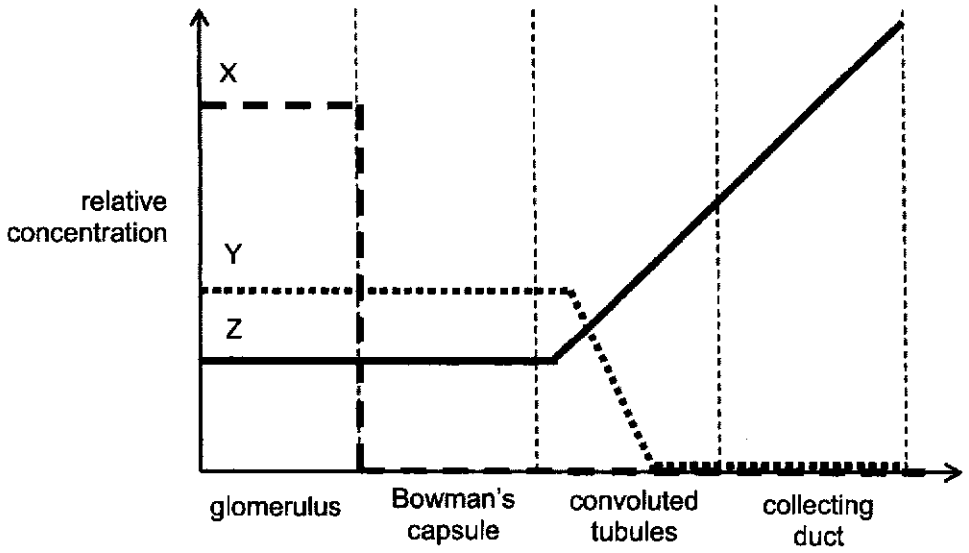
18 The graph shows changes in the amount of air in a person's lungs over a period of 30 seconds.



During which period is the rate of breathing the highest?

A V to W
B W to X
C X to Y
D Y to Z

19 The line graphs show the relative concentration of glucose, protein and urea in the fluids obtained from various parts of the mammalian kidney.



Which option correctly matches the three line graphs?

	X	Y	Z
A	glucose	urea	protein
B	glucose	protein	urea
C	protein	urea	glucose
D	protein	glucose	urea

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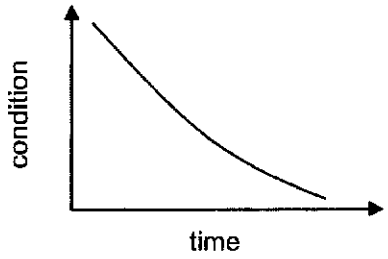
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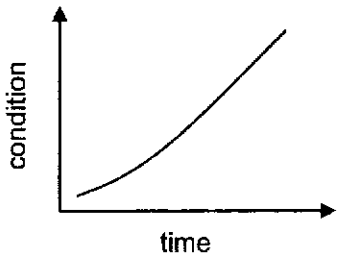
20 The graphs show how four different conditions in the body may change with time.

In which graph is the condition being controlled by negative feedback?

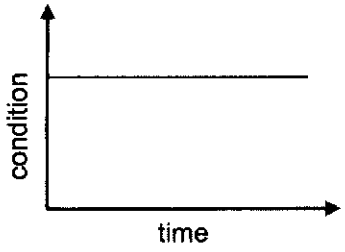
A



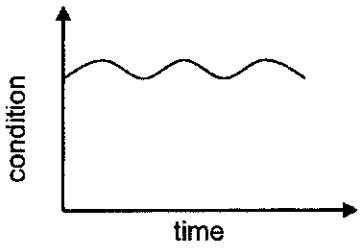
B



C



D



21 The table gives information about endocrine glands.

Which row shows the correct information?

	gland	hormone produced	target organ	effect
A	adrenal	adrenaline	liver	decreases blood glucose concentration
B	ovaries	progesterone	uterus	ovulation occurs
C	pancreas	insulin	liver	conversion of excess glucose to glycogen
D	testes	testosterone	penis	erection occurs for sexual intercourse

22 Which statement describes a role of the anti-diuretic hormone?

A It controls the rate of water secretion in the sweat.
B It is antagonistic to insulin.
C It regulates osmotic concentration of body fluids.
D Its absence causes diabetes mellitus.

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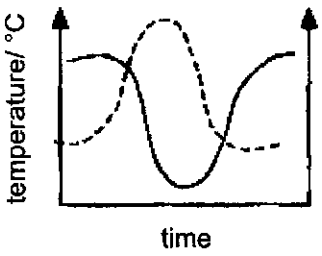
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23 A man is placed in a room where the temperature is controlled at 40 °C. Measurements of his skin temperature and rate of sweating are recorded over a period of time.

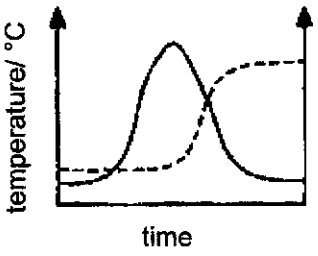
Which graph would most accurately represent the above situation?

Key —— skin temperature ---- rate of sweating

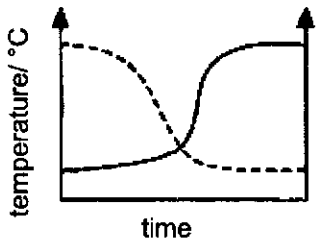
A



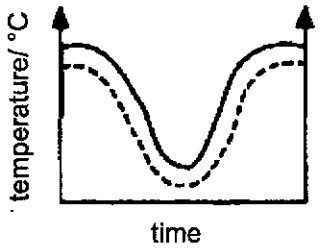
B



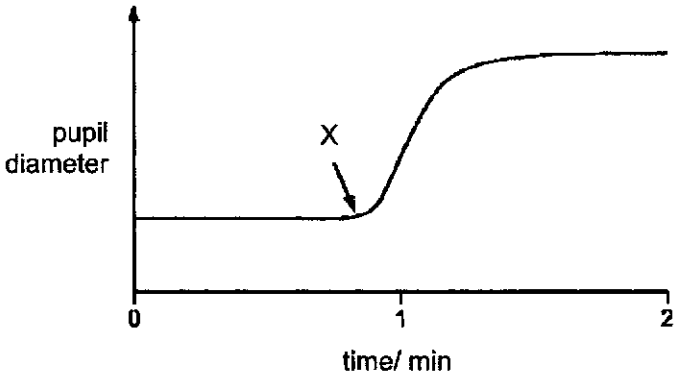
C



D



24 The graph shows how the diameter of a pupil of the human eye changed during the period of two minutes.



What happens to the light intensity at X, and which muscles begin to contract?

	light intensity	iris muscles
A	decrease	circular
B	decrease	radial
C	increase	circular
D	increase	radial

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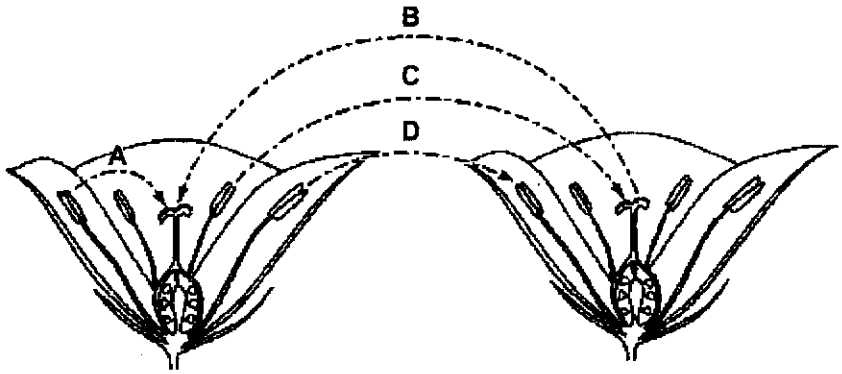
25 An experiment was set up using four groups of insect pollinated flowers, all of the same species, in a field. In each group, different parts of the flowers were removed and insects were allowed to visit all the flowers freely.

Which group of flowers would produce the most number of seeds?

	stigma	anthers	petals
A	left	left	removed
B	left	removed	left
C	removed	left	removed
D	removed	removed	left

26 The diagram shows two different flowers from two different plants of the same species.

Which letter represents cross-pollination?



27 Which row shows the effects of estrogen and progesterone?

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

28 After sexual intercourse, sperms can survive up to 3 days in the uterus and oviducts. Ovulation can occur any time between day 13 and 15 of the menstrual cycle. An ovum can survive for 2 days after ovulation.

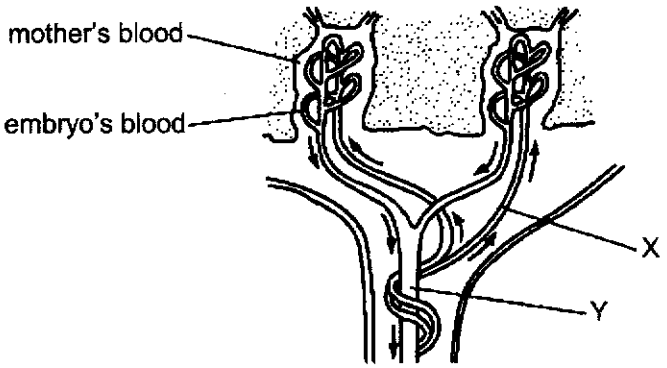
How long is the longest possible fertile period?

A 2 days
B 3 days
C 5 days
D 7 days

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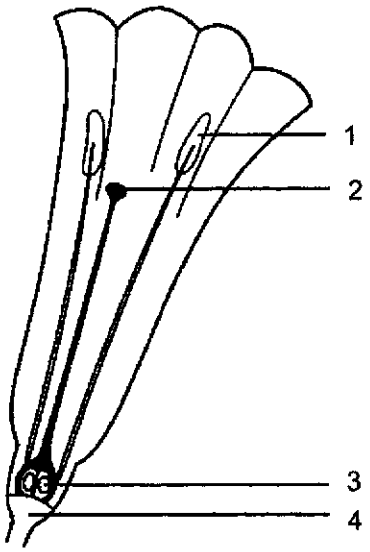
29 The diagram shows how the blood of a human embryo flows close to the mother's blood in the placenta.



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

A carbon dioxide and glucose
B carbon dioxide and urea
C glucose and oxygen
D glucose and urea

30 The diagram shows a section through a flower.



In which structures are haploid nuclei formed by reduction division?

A 1 and 3
B 1 and 4
C 2 and 3
D 2 and 4

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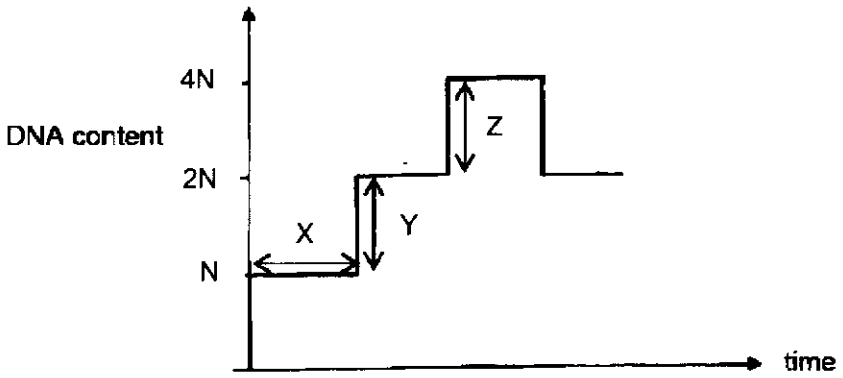
31 The list gives some of the stages involved in gamete and zygote formation.

1 prophase I of meiosis
2 prophase II of meiosis
3 metaphase I of meiosis
4 fertilisation

During which stages do events occur that increase genetic variation in the zygote?

A 1, 2 and 3
B 1, 2 and 4
C 1, 3 and 4
D 2, 3 and 4

32 The diagram shows changes in the amount of DNA content of a cell. The amount of DNA content in a normal body cell is 2N.



What is represented by X, Y and Z?

	X	Y	Z
A	telophase	gametes	fertilisation
B	fertilisation	interphase	gametes
C	gamete	fertilisation	interphase
D	anaphase I	metaphase I	gametes

33 Within a group of humans, which is an example of a continuous variation?

A blood group
B eye colour
C height
D tongue rolling

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34 Which statement about human blood group is correct?

A A person with the blood group A cannot have an I^O allele.
B A person with the blood group B may have either the genotype I^BI^B or I^BI^O.
C In a person with the blood group AB, the I^B allele is recessive to the I^A allele.
D The alleles I^B and I^O are co-dominant and have an equal effect on the phenotype.

35 Bacteria can be genetically modified to produce human insulin.

What is a possible risk of this procedure?

A Bacterial insulin is less effective in treating diabetes than animal insulin.
B The genetically modified bacteria may become insulin resistant.
C The genetically modified bacteria may produce too much insulin.
D The presence of a new gene in the bacteria may alter the way existing gene work.

36 Which statement about chromosomes is correct?

A Chromosomes are long DNA molecules called genes which are divided into sections.
B Chromosomes include a long molecule of DNA divided into sections called genes.
C Chromosomes include genes which are divided into sections called DNA molecules.
D Genes include long DNA molecules called chromosomes.

37 In maize, one allele of a particular gene allows chlorophyll production while the other allele prevents this, giving plants with cream-coloured leaves.

Half the seeds from a cross between two green-leaved plants were sown in trays kept in the dark. The other half was sown in similar conditions except that they received optimum light intensity.

The table shows the results obtained.

number of seedlings			
kept in the dark		kept in optimum light intensity	
green leaves	cream leaves	green leaves	cream leaves
X	400	320	110

What is the most possible number of green-leaved plants formed from seeds germinating in the dark?

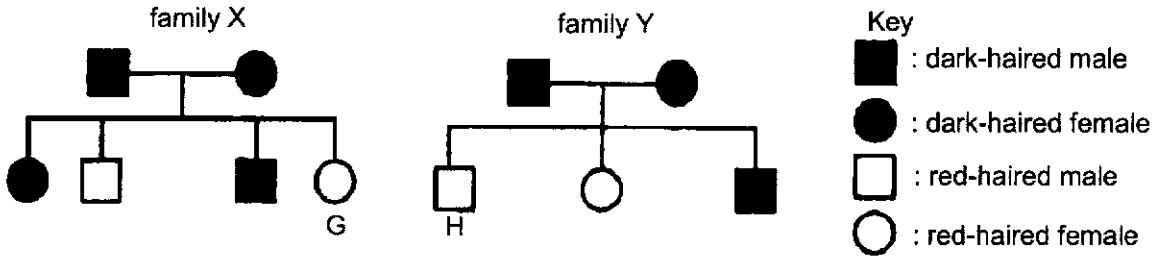
A 0
B 110
C 320
D 400

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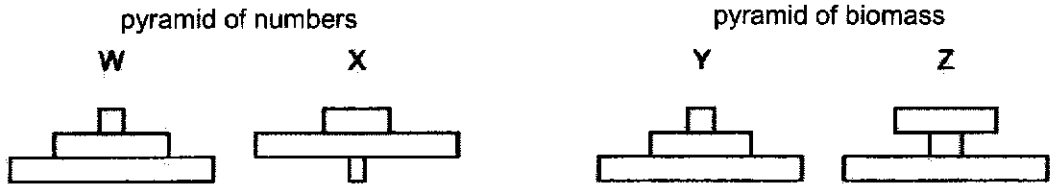
38 The diagram shows the pattern of inheritance of dark hair and red hair in two families.



If individuals G and H marry each other, what prediction can be made about the hair colour of their children?

A All their children will have red hair.
B Half of their children will have dark hair.
C Only the boys will have dark hair.
D 75% of their children will have dark hair.

39 A single plant provides food for many herbivores. The herbivores supply food for a few carnivores.



Which pyramids of numbers and biomass represent this information accurately?

	pyramid of numbers	pyramid of biomass
A	W	Y
B	W	Z
C	X	Y
D	X	Z

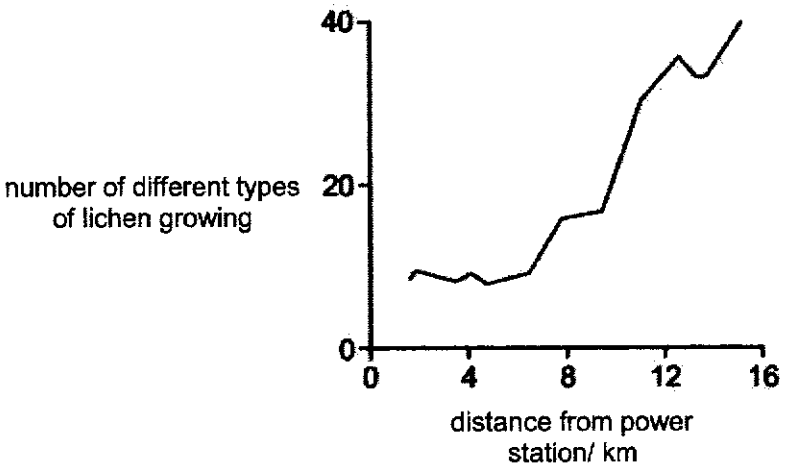
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40 Lichens are organisms which are very sensitive to air pollution.

The graph shows how the distance from a coal-fired power station affects the number of different types of lichen growing.



Which conclusion can be drawn from this information?

A Lichens grow faster near the power station.
B Lichens grow more slowly near the power station.
C Sulfur dioxide from the power station inhibits the growth of lichens.
D There are fewer different types of lichen growing near the power station.

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Name: _____( ) Class:_____

CHIJ KATONG CONVENT

PRELIMINARY EXAMINATIONS 2019

Secondary Four Express

BIOLOGY **6093/02**

Paper 2 Duration: 1 hour 45 minutes

Classes: 405 and 406

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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

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.

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 faster all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
Paper 1	/ 40
Paper 2	
Section A	/ 50
Section B	/ 30
TOTAL	/ 120

This question paper consists of **15** printed pages.

[Turn over

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Section A

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

1 The diagram shows an electron micrograph of a segment of a proximal convoluted tubule cell of a kidney.

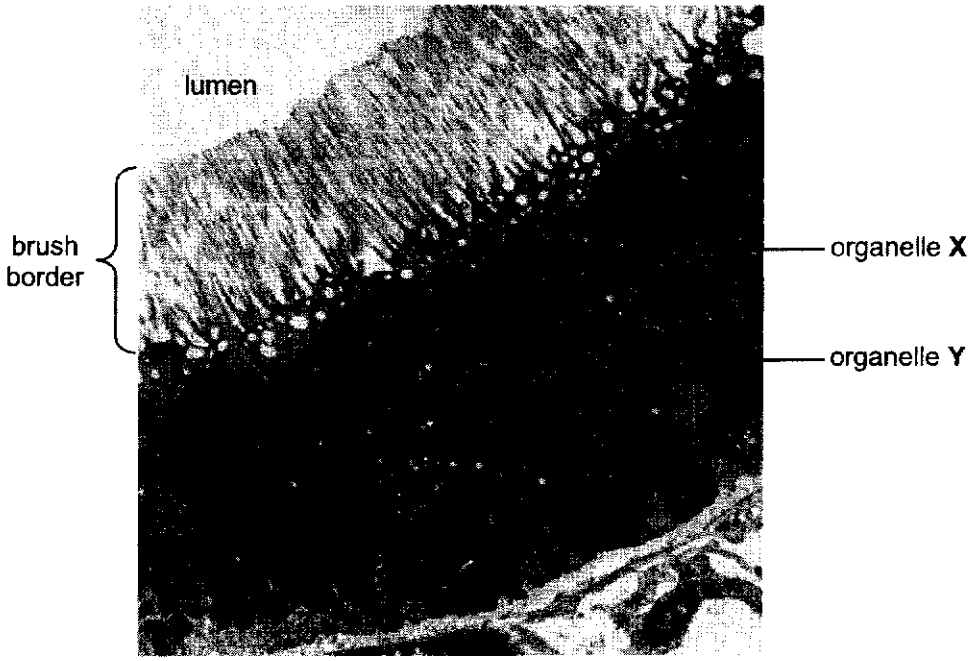


Fig. 1.1

(a) Identify organelles **X** and **Y**.

X ..... **Y** ..... [2]

(b) Suggest the importance of the numerous numbers of organelle **X** in the cell.

.....

.....

.....

.....[2]

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1 **(c)** Glomerular filtrate flows through the lumen of the proximal convoluted tubule which is surrounded by a tall brush border. The brush border is formed by the numerous folding of the cell membrane of the tubule cell.

Suggest and explain the importance of the brush border to the tubule cell.

.....

.....

.....

.....[2]

(d) Almost all humans have one functioning liver. In cases of liver transplantation, it is possible for a donor to donate a portion of his liver to a patient in need.

Suggest why it is possible for the donor to do so.

.....

.....[1]

[Total: 7]

2 Fig. 2.1 shows a human heart and its associated blood vessels.

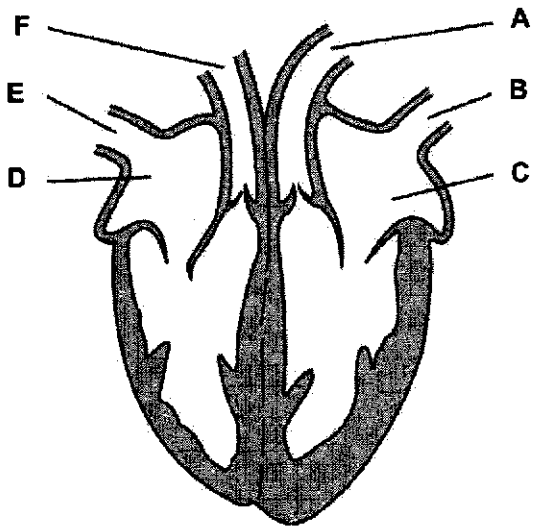


Fig. 2.1

(a) Complete the table below to show which structures **A** to **F** are involved in the circulation of blood to or from the lungs and body tissues.

blood to or from lungs	blood to or from body tissues

[2]

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2 **(b)** Compare the pressure of blood in the circulation to the body tissues and the pressure of blood in the circulation to the lungs.

.....

.....[1]

(c) Explain how the structure of the heart produces this difference in blood pressure.

.....

.....

.....

.....

.....

.....[3]

(d) In humans, there are three types of blood circulation:

1 Systemic circulation which circulates blood through various body tissues.
2 Pulmonary circulation which allows for oxygenation of blood in the lungs.
3 Portal circulation which is part of systemic circulation, with blood passing through two sets of capillaries before draining into a larger systemic vein.

Name one vein involved in portal circulation.

.....[1]

[Total: 7]

3 **(a)** Write the word equation for photosynthesis in the given space below.

.....

.....[2]

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3 **(b)** A young, green and leafy stem was placed in a clear glass beaker of water in bright light. Fig. 3.1 shows the stem 12 hours later.

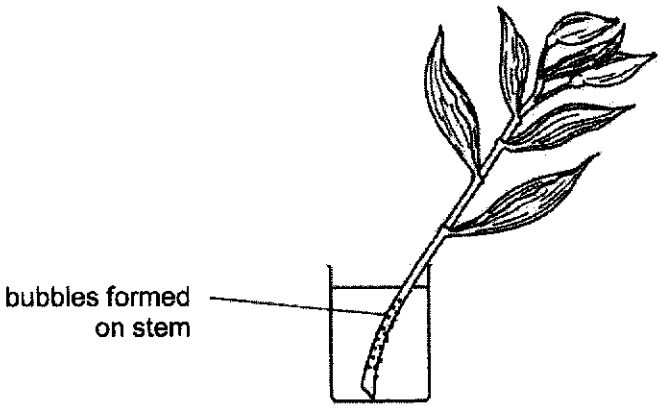


Fig. 3.1

Tests proved that the bubbles contain oxygen gas.

Explain how the bubbles of oxygen gas appeared on the sides of the green stem.

.....

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.....

.....[3]

(c) Explain the benefits to other aquatic organisms of having submerged water plants in the ecosystem.

.....

.....

.....

.....

.....

.....[3]

[Total: 8]

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4 Fig. 4.1 shows part of the flowering head of a small tree that grows in tropical rainforests.

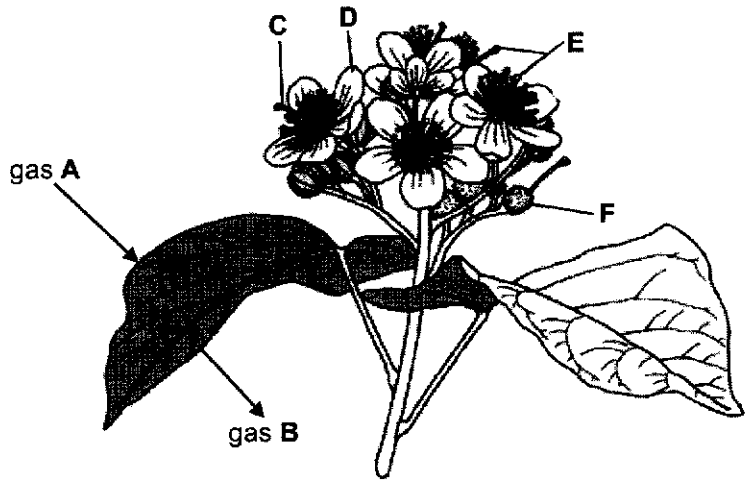


Fig. 4.1

(a) Identify structures **C**, **D** and **E**.

C .....

D .....

E ..... [3]

(b) Gases **A** and **B** represent gases that pass into and out of the leaves in the absence of light energy.

Write the equation to show the relationship between gas **A** and gas **B**.

.....

.....[1]

(c) Structure **F** is the fruit of this plant. It has low mass and density, and is covered with hair.

Suggest how this fruit can be dispersed to other parts of the tropical rainforests.

.....

.....[1]

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4 **(d)** Extracts from the tree have many uses in medicine. Some of the extracts are alkaline and have anti-bacterial properties.

Suggest why these tree extracts are sometimes used to treat medical conditions in the human stomach.

.....

.....

.....

.....[2]

[Total: 7]

5 Table 5.1 shows the concentration of glucose and hormone **A** in the blood over a period of 8 hours in a person.

Table 5.1

time/ h	blood glucose concentration/ x 10 mg/ dl	blood hormone A concentration/ µg/mg
0	5	4
1	5	4
2	7	20
3	15	19
4	16	15
5	13	8
6	9	5
7	6	4
8	5	4

(a) In the grid provided on the next page, plot the graphs of the concentration of glucose and hormone **A** in blood against time.

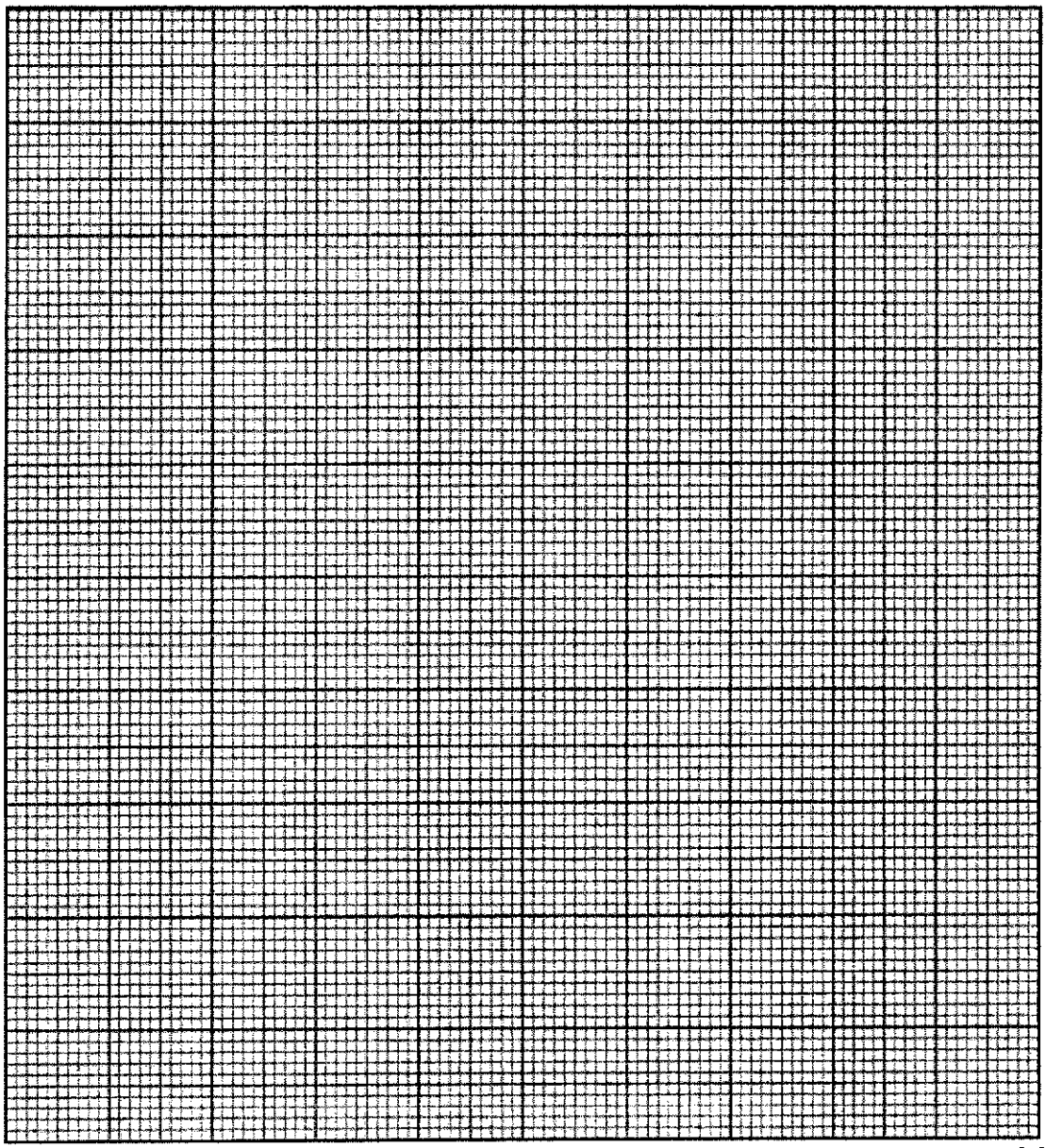
Both graphs must share the given space and you may have one y-axis on each side of the space.

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5 (a)



[5]

(b) Identify hormone **A**, and provide an explanation for your answer.

.....

.....

.....

.....[2]

[Total: 7]

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6 Fig. 6.1 shows an animal cell during cell division.

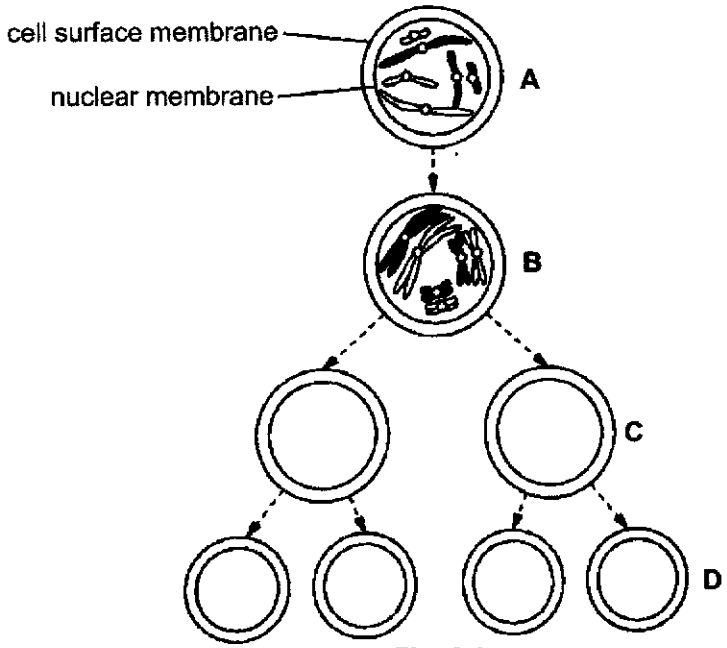


Fig. 6.1

(a) Identify the type of cell division shown.

.....[1]

(b) Complete the diagram on Fig. 6.1, for **C** and **D**. [2]

(c) Gene coding for Bt-toxin is found in soil bacterium *Bacillus thurengiensis*. Cabbage plants with in-built Bt-toxin gene against the diamondback moths can be produced by genetic engineering i.e. the farmer no longer has to eliminate the insects with insecticides.

Explain how these transgenic cabbage plants can be produced.

.....

.....

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.....

.....

.....

.....

.....[4]

[Total: 7]

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7 Fig. 7.1 shows the relationships between a number of organisms living together in a South American rainforest.

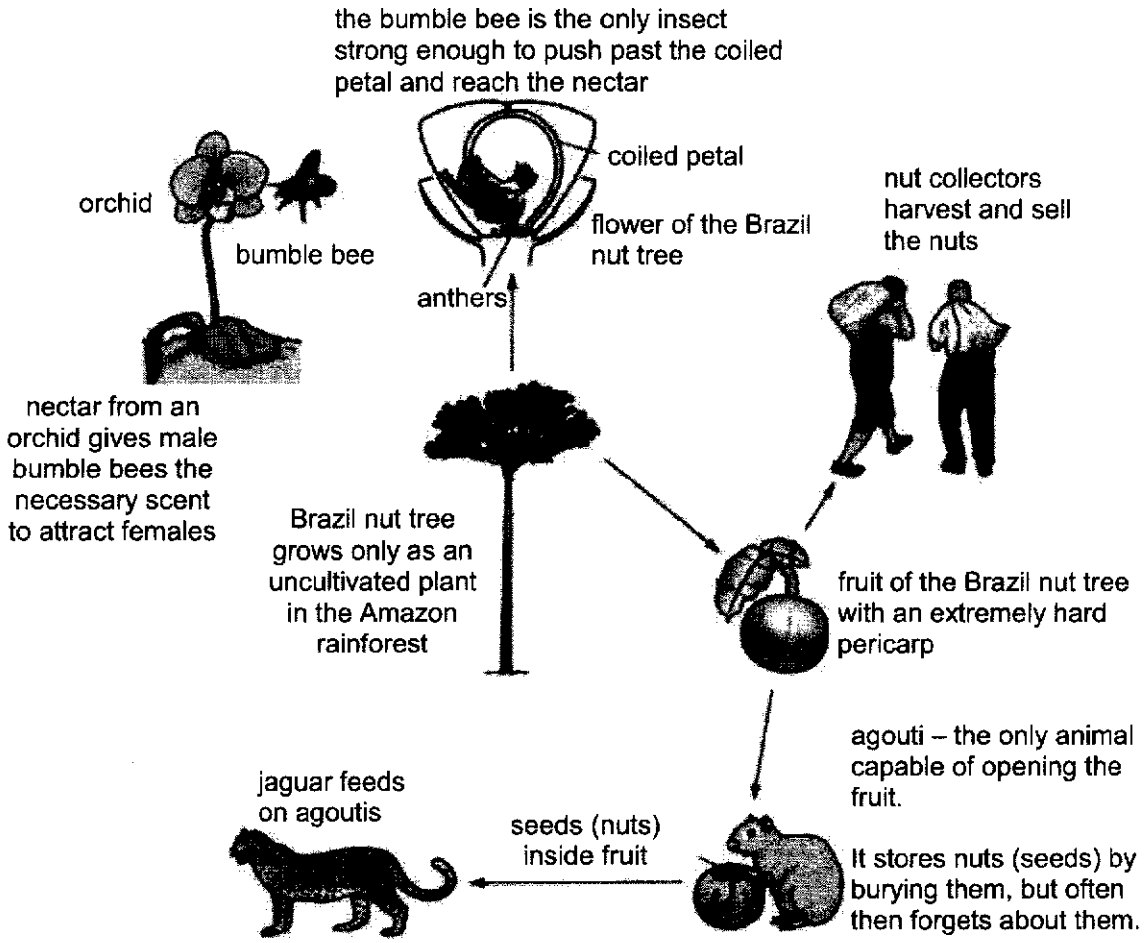


Fig. 7.1

(a) Complete Fig. 7.2 by:

- writing the name of an organism in each box,
- completing the arrows to show the flow of energy.

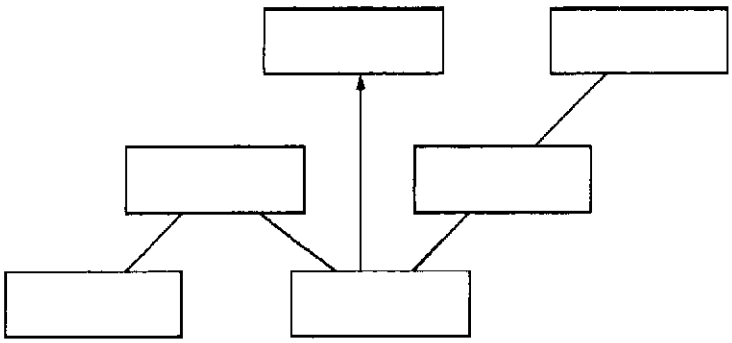


Fig. 7.2

[4]

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7 (b) Suggest the possible effects on the community in the rainforest if the orchids were killed by a disease.

.....

.....

.....

.....

.....

.....[3]

[Total: 7]

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Section B

Answer **three** questions.

Question **10** is in the form of an **Either/ Or** question. Only one part should be answered.

8 **(a)** Describe the structure of the DNA.

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.....

.....[4]

(b) Haemophilia is a genetic disorder where blood clotting does not occur, and the affected person may bleed to death from a minor cut. The gene for haemophilia is recessive, and is inherited only from the X-chromosome of the mother. This means that a son who inherits the recessive gene in the X-chromosome from the mother, and a healthy Y-chromosome from the dad, will inherit haemophilia.

A healthy man marries a woman who does not have the condition. They have a son who is haemophiliac. Explain with the aid of a genetic diagram how this is possible, and suggest the probability of this occurrence in the offspring.

You may use X^h for the recessive allele on X-chromosome.

[6]

[Total: 10]

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9 (a) Describe how a developing fetus in the uterus obtains and uses its metabolic requirements and gets rid of its waste products.

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.....[6]

9 (b) Describe how water and sugars are transported to a developing fruit.

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.....

.....[4]

[Total: 10]

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10 Either

(a) Describe three different ways substances move into and out of animal cells.

Use an example to illustrate each process.

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.....[6]

10 (b) Some muscles in our body work as antagonistic pairs. In these pairs of muscles, when one muscle contracts, the other muscle relaxes.

With reference to named muscles, describe how antagonistic pairs of muscles bring about the movement of food bolus in the esophagus after swallowing.

.....

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.....[4]

[Total: 10]

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10 Or

10 (a) Outline the processes following pollination and ending with fertilisation in a flower.

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.....[6]

10 (b) Describe the advantages and disadvantages of cross pollination compared to self-pollination in flowering plants.

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.....[4]

[Total: 10]

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ANSWERS

1	2	3	4	5	6	7	8	9	10
C	C	A	B	B	C	C	B	D	C

11	12	13	14	15	16	17	18	19	20
B	A	C	D	B	B	C	A	D	D

21	22	23	24	25	26	27	28	29	30
C	A	B	B	B	C	B	D	B	A

31	32	33	34	35	36	37	38	39	40
C	C	C	B	D	B	A	A	C	D

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Marking Scheme

1(a)	X: mitochondrion Y: nucleus	1 1
1(b)	The mitochondrion **releases energy** + for **active transport/ aerobic respiration**; of the **glucose** and **amino acids**; (from the lumen of the proximal convoluted tubule back into the bloodstream;) **Common errors:** • **not reading 'ORGANELLES' as requested in qn stem;** • **plural VS singular**	1 1
1(c)	- The brush border **increases the surface area to volume ratio** of the cell; - to increase rate of **selective reabsorption/ diffusion** of useful substances;	1 1
1(d)	The liver can regenerate itself/ the other portion is still functioning **Common errors:** • **not using ideas/ keywords close enough to 'regeneration' i.e. (*biology*) the process of growing again;** • **using "grow again quickly" + "grow again slowly". The rate of regeneration is relative, so why mention the speed? It actually takes about 30 days + this is relatively fast.** • **R: answers related to patients e.g. the donated portion of the liver can still carry out the functions; Cn is on donor**	1
		7
2(a)	<table><tr><th>blood to or from lungs</th><th>blood to or from body tissues</th></tr><tr><td>B, C, F</td><td>A, D, E</td></tr></table> 1 m for each correct side. No 0.5m **Common errors:** • **not practicing careful reading – the blood can be TO or FROM, not necessarily oxygenated or deoxygenated only**	2 m
(b)	higher to body tissues; OR lower to lungs	1
(c)	left ventricle; [correct identification of side] **has thicker muscular walls** ; greater + contraction / force (applied to blood) **AW** ; **Common errors:** - **the thicker muscular ventricular walls GENERATE higher blood pressure; not simply withstand** - **exert/generate high blood pressure *BUT* muscular contraction of thicker left ventricular walls exerts higher pressure on the blood → sentence phrasing/ C+E**	1 1 1

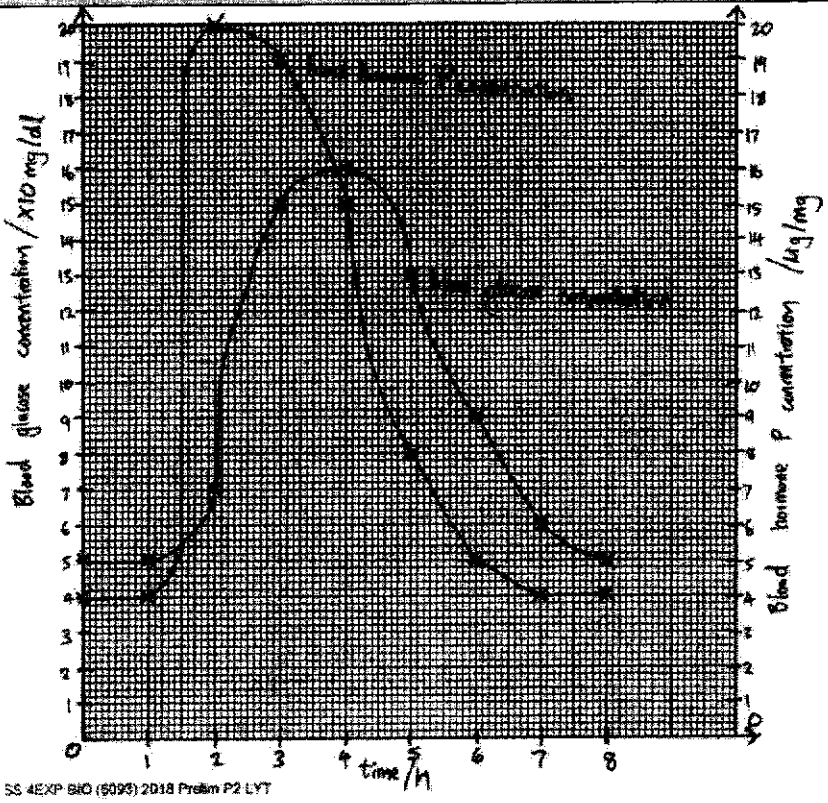
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	- **Students who explained double circulation are not awarded marks as NATQ + IRR.** - **Ventricles cannot contract; ventricular walls contract**	
(d)	hepatic portal vein/ renal portal vein	1
		7
3 (a)	light energy carbon dioxide + water → glucose + oxygen + water chlorophyll 1m for all conditions 1m for all correct reactants + products **Common errors:** - **Missing out water as product** - **Using 'sunlight' instead of 'light energy'**	2
(b)	- photosynthesis occurs - oxygen gas released via intercellular spaces - diffuses through opening/ spaces/ stomata/ lenticels	1 1 1
(c)	- increases oxygen concentration in water via photosynthesis - Oxygen is required for respiration - reduce competition for oxygen - use plants/ leaves of plants for food/ - use plants/ leaves of plants for home/ shelter from predators **Common errors:** - **Benefit to the water plants; qn requested benefits to other aquatic organisms**	max 3
		8
4(a)	C: style D: petal E: anthers **Common errors:** **not observing closely – E is anther, not stigma. Compare with the other anther structures.** **If F is fruit, thus C is the style, the stigma is found above C.** **E would be anthers, above the filament.** **NB marking points are strictly followed as this was a previous O level qn with the exact same diagram.**	1 1 1
(b)	glucose + oxygen (gas A) → carbon dioxide (gas B) + water + large amount of energy $C_6H_{12}O_6 + 6O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ + Energy/ ATP/ 38 ATP	
(c)	- wind dispersal OR - hooks onto insects **Common errors:** **R: dispersed by animals → how so?; water – assumption there's a body of water in the tropical rainforests**	1
(d)	- alkaline: to neutralise HCl - anti-bacteria: to kill/ destroy bacteria in stomach/ reduce chance of infections **Common errors:** - **Not answering the quality of 'anti-bacterial properties'** - **R: "extracts remove/ eliminate the bacteria" → remove/ eliminate, how?**	1 1

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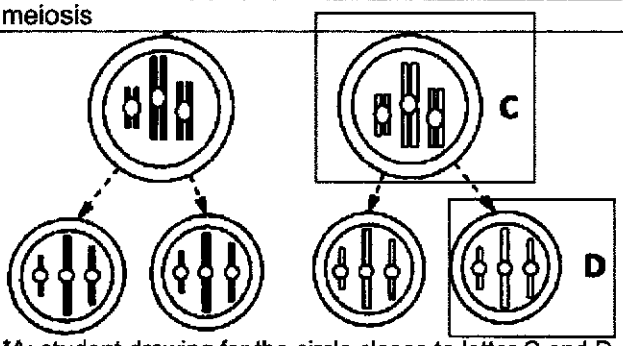
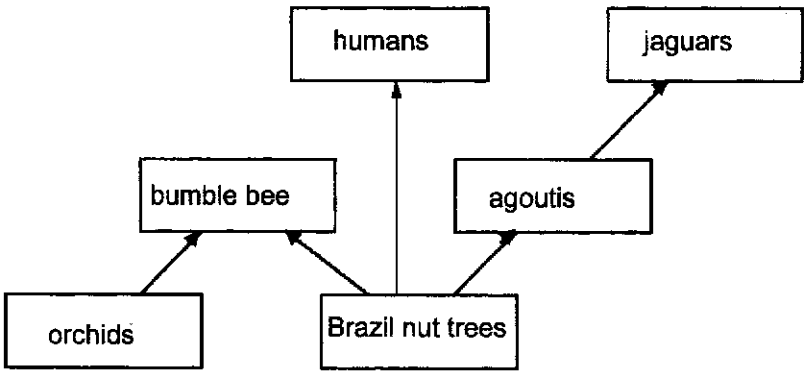
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		7
5(a)		
	1. Scale 2. Points 3. Line for hormone A 4. Line for BGC 5. Axes – blood glucose and hormone A; both must be the same scale due to relationship between the 2 smooth curve, not straight line + differentiated/ different plot symbols simply labelling **won't suffice** as there is a cross/ overlap of lines **Common errors:** straight line + relationship between hormone concentration in blood + time is usually a curve Use "SPLAT" as a reminder – even if the markers' points are different, these SPLAT points would help you cover all grounds! Write it down as a reminder to yourself!	1 1 1 1 1
(b)	Adrenalin. The increase in hormone causes increase in BGC + with no prior decrease. A: Although glucagon increases in blood glucose level, there is no trigger/stimulus eg drop in blood glucose level which causes release of glucagon/ sudden increase in concentration of hormone A which usually happens when a person faces/ suffers from a shock. **Common errors:** not differentiation why it is caused by adrenaline as opposed to glucagon	1 1

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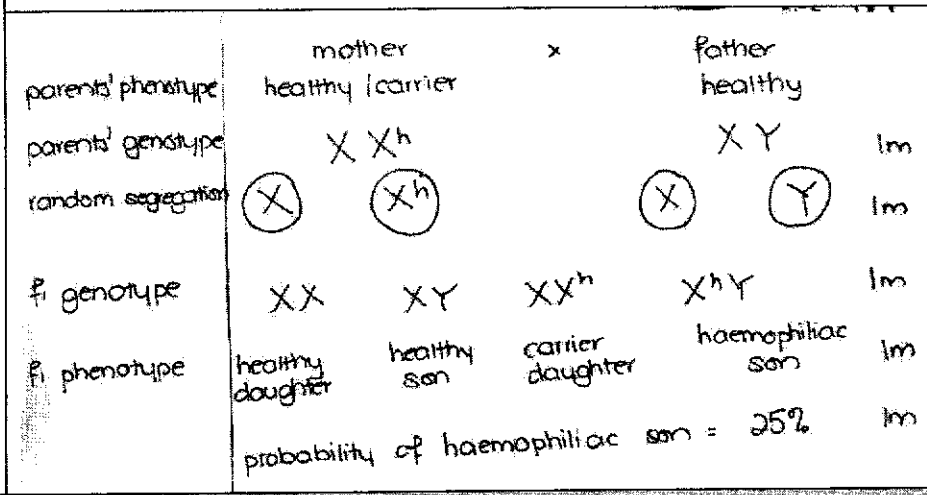
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6(a)	meiosis	1
(b)	 *A: student drawing for the circle closes to letter C and D.	1 1
(c)	1. The **Bt-toxin gene** is **cut** from the **DNA** of the soil bacterium, **Bacillus thuringiensis** using **restriction enzymes**. Using the same restriction enzyme, bacterial plasmid is cut. 2. **Bt-toxin gene** is inserted into **plasmid** to form a **recombinant plasmid** using **ligase.** 3. **Recombinant plasmid** then **introduced** into **bacterial cells** using **heat / electric shock**. Bacterial cells are **cloned.** 4. **Cabbage plant cells infected** with **bacteria**, thus **introducing the recombinant plasmid** into the cabbage plant cells. **Common errors:** poorly done, - not using keywords or understanding process.	max 4
7(a)	 3 m: all 6 correct boxes, 2m: 4 correct boxes, 1m: 2 correct boxes// no 0.5 m awarded 1m: all correct arrow heads. **Common errors:** not understanding the sequence. the fruit, the flower, belongs to the same brazil nut tree → we do not differentiate them into different trophic level. It is one trophic level i.e. brazil nut tree.	4
(b)	1 less nectar ; 2 male bees + lack scent ; 3 female bees + not attracted ; 4 less reproduction of bees ; 5 less pollination + of trees ;	any 3

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	6 less trees ; 7 less nut / fruit production ; 8 loss of jobs (for humans) / negative economic impact AW ; 9 less food for agoutis ; 10 death / reduced population + of agoutis OR agoutis seek other food ; 11 less food for jaguars ; 12 death / reduced population + of jaguars OR jaguars seek other food ; Common errors: hyperbolic assumptions reduced/ decreased ≠ 0 less ≠ lesser decreased rate ≠ cannot	
8a	- Nucleotides: 1 deoxyribose sugar + phosphate group + nitrogenous base - 4 bases: adenine, thymine, guanine, cytosine - 2 strands of DNA joined together by complementary base pairing; double helix + complementary base pairing - Anti-parallel strands	1 1 1 1
8b	- This is possible as the mother is a carrier of the recessive gene, and the father is a healthy male.	1
		5
		10
9(a)	exchange of substances at the placenta; oxygen and nutrients diffuse from maternal blood space into fetal blood; waste products e.g urea and carbon dioxide diffuse out of fetal blood into maternal blood space; umbilical cord transports the dissolved substances in the blood to and fro fetus and mother; oxygen and glucose are used for cellular respiration to release energy for cell growth; amino acids and fatty acids used for bulding new protoplasm, new cells for the fetus;	1 1 1 1 1 1

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9(b)	water transported via **osmosis** in xylem vessels from roots to stem to the transport tissues in the developing fruit; water move up through transpiration pull; glucose produced in the leaves are converted to sucrose; transported as sucrose in the phloem to the developing fruit;	1 1 1 1
		10
Either 10(a)	diffusion + describing the process; diffusion example; osmosis + describing the process; osmosis example; active transport + describing the process; active transport example; R: any explanation wrt plant cells	1 1 1 1 1 1
10(b)	- Circular muscles relax + Longitudinal muscles contract - Widening the lumen, allowing entrance/ to pass through - Circular muscles contract + longitudinal muscles relax - Constricting the lumen behind the bolus, pushing it through	1 1 1 1
		10
Or 10(a)	- Pollen grain germinates / pollen tube develops upon stimulation by sugary sticky fluid + secreted by the stigma - Growth of pollen tube by secreting enzymes to digest tissues of style - transports the male gamete - The tip of pollen tube enters the ovule via the micropyle - The tip of pollen tube absorbs sap and swell/burst - Releasing the male gamete into the ovule + fertilise/ fuse with the female gamete	1 1 1 1 1 1
10(b)	Advantages of cross pollination to self-pollination: - Greater genetic variation in the offspring compared to the parents + more adapted to changes in the environment - Beneficial genes/traits of both parents may be passed to the offspring / less possibility for recessive alleles to offspring R: if answers stop at "greater genetic variation" – so what? How does this benefit the offspring? Disadvantages of cross pollination to self-pollination: - Dependent on external agent of pollination + may not always be available - requires two parents + they may not be always available - More abundant pollen grains need to be produced compared to self pollination process as there is greater risk of loss during the transfer between two plants / more energy loss/ - Not all beneficial traits / genes of a plant may be passed down to the offspring	 1 1 1 1
		10

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