ZHONGHUA SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
SECONDARY 4E

Candidate's Name	Class	Register Number
	4E4	

BIOLOGY **6093 /01**

20 September 2019
1 hour

Additional Materials: OTAS

READ THESE INSTRUCTIONS FIRST

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

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

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.

Total	/ 40

Setter: Ms Rozianna
Vetter: Mr Goh Tze Mian

This document consists of **20** printed pages, including this cover page.

More papers at www.testpapersfree.com

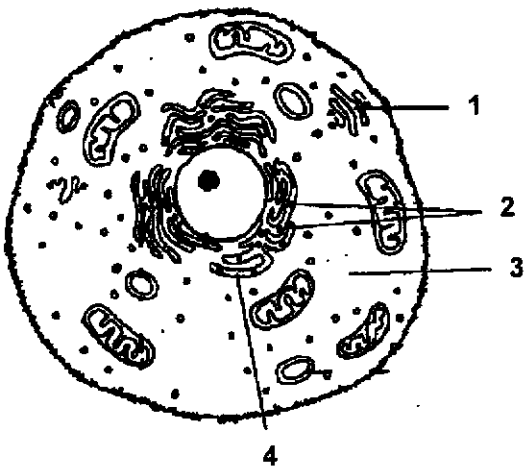
Downloaded from SingaKids.com

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

Section A
Answer **all** questions in the OTAS.

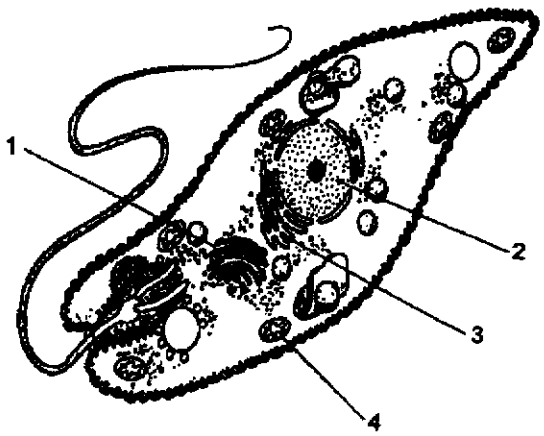
1 The diagram shows a typical animal cell with cell components involved in the synthesis and secretions of an enzyme.



Which is the correct route taken by an amino acid molecule during enzyme production?

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

2 The diagram shows a freshwater single-celled organism.



Which of the statements correctly identifies structures 1 to 4 and its function?

1 smooth endoplasmic reticulum synthesises fats and steroids
2 chromosomes control polypeptide synthesis
3 Golgi body synthesizes proteins
4 chloroplast captures light energy for photosynthesis

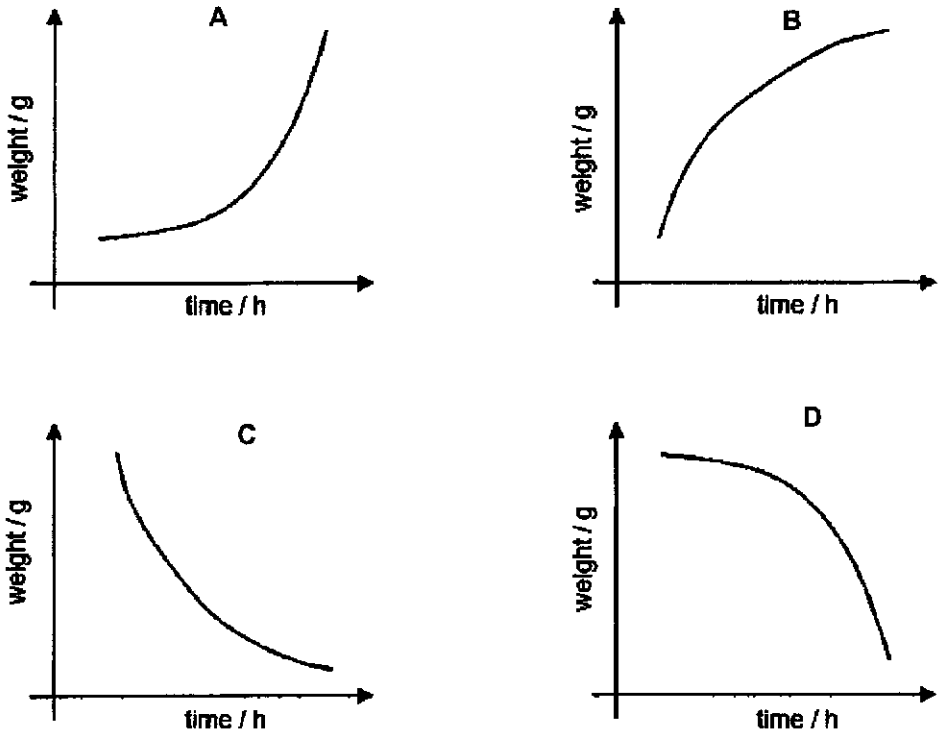
A 1, 2, 3 and 4
B 1, 3 and 4
C 2 only
D 2 and 3

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

3 Concentrated starch solution is added into a cow's urinary bladder until it is half full. The bladder is tied, weighed and then placed in a dilute starch solution. The weight of the urinary bladder is taken every hour.

Which graph best reflects these results?



4 The diagram shows a xerophytic leaf in different conditions, **P** and **Q**.



condition **P** condition **Q**

Which statements about the cells of the leaf in conditions **P** and **Q** are correct?

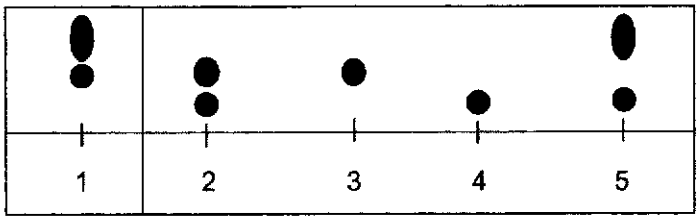
1 water potential in condition **P** is higher than in condition **Q**
2 cells may be turgid in condition **P** and plasmolysed in condition **Q**
3 turgidity of cells in condition **P** is lesser than in condition **Q**
4 no net diffusion of water into cells in layer **X** in either condition **P** or **Q**

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

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

5 Five disaccharides were each hydrolysed with dilute acid and the purified products were separated by chromatography. The results are shown below.



The spots from 1 represent the products obtained from the hydrolysis of sucrose.

Which represents the results obtained from the hydrolysis of lactose and maltose?

	lactose	maltose
A	2	3
B	2	4
C	5	2
D	5	3

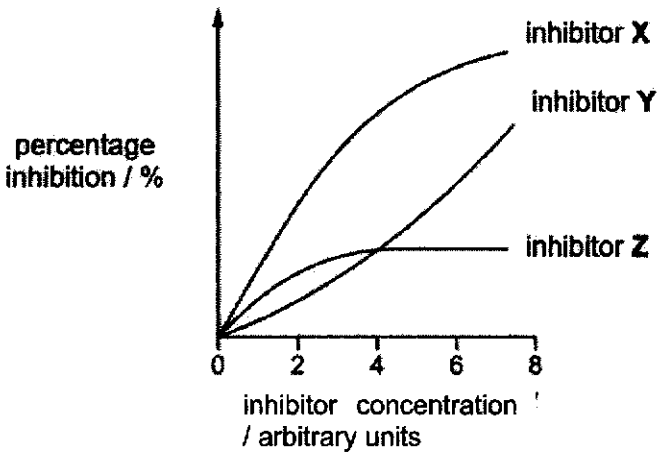
6 Lipase catalyses the conversion of fats into fatty acids and glycerol.

$$\text{fats} \xrightarrow{\text{lipase}} \text{fatty acids} + \text{glycerol}$$

Three different enzyme inhibitors of lipase **X**, **Y** and **Z**, which prevent the above reaction from occurring, were investigated.

The percentage inhibition of lipase was measured at different concentrations of inhibitor.

The graph shows the results of the investigation.



More papers at www.testpapersfree.com

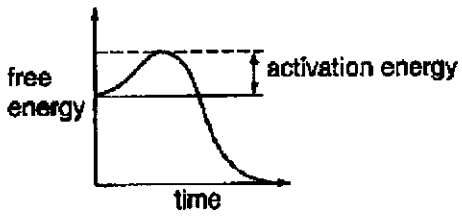
Downloaded from SingaKids.com

Which is/are valid conclusion(s) from these results?

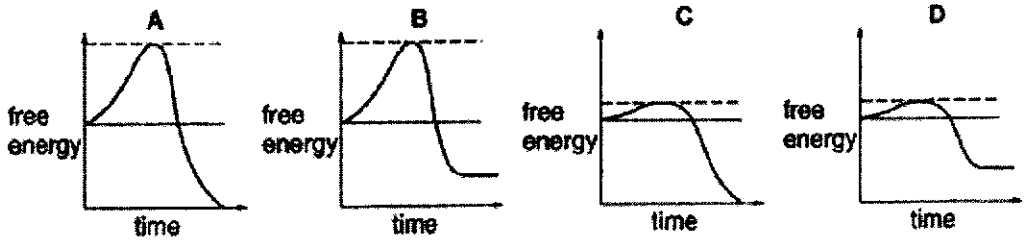
1 The higher the concentration of inhibitor **X**, the lesser the amount of fats is broken down.
2 The production of fatty acids and glycerol using inhibitor **Y** is higher than when inhibitor **Z** is used.
3 The production of fatty acids and glycerol at an inhibitor concentration of 2 arbitrary units is lower than at an inhibitor concentration of 4 arbitrary units, for all inhibitors.

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

7 The graph shows energy changes during an enzyme-catalysed chemical reaction.



Which graph shows the energy changes for the same reaction when the enzyme is absent?



8 The diagram shows some chemical reactions that occur in plants.



Which stage/s depend/s on the use of nitrate ions as a raw material?

A 1 only

B 2 only

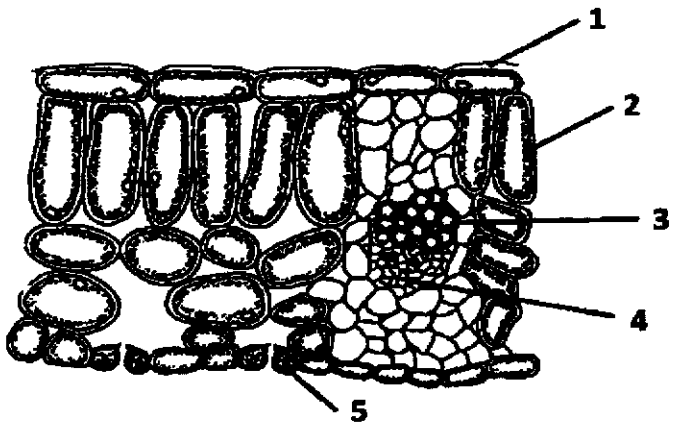
C 1 and 3

D 2 and 3

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

Refer to the diagram of a dicotyledonous leaf to answer questions **9** and **10**.



9 A drop of concentrated salt solution was placed on the surface of the leaf at 1.

Which statement describes the movement of water molecules between the salt solution and the plant cells in the leaf?

A There is no movement of water molecules between the salt solution and the plant cells.

B There is no net movement of water molecules between the salt solution and the plant cells.

C Water molecules move from the plant cells into the salt solution by osmosis.

D Water molecules move from the salt solution into the plant cells by osmosis.

10 The plant was placed in a glass jar containing radioactive carbon dioxide and then exposed to sunlight.

In which order would radioactivity be detected in the leaf?

A 1, 5, 2

B 1, 5, 4

C 5, 2, 4

D 5, 4, 3

11 Which process is an example of assimilation?

A formation of carbon dioxide from glucose

B formation of cell membranes using lipids

C formation of sweat from blood plasma

D formation of urea from amino acids

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

12 In patients with cystic fibrosis, thick mucus blocks the pancreatic duct.

Which are possible effects of this blockage?

1 egesting oily stool
2 weight loss
3 malnourishment
4 hyperglycemia (high blood glucose)

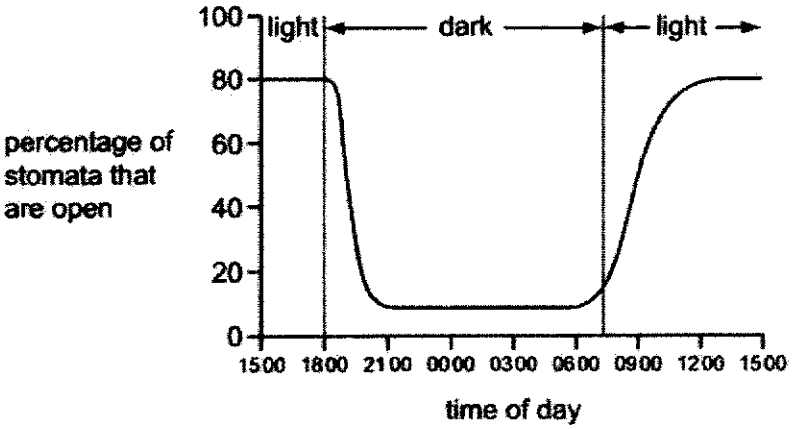
A 1 and 3

B 1, 2 and 3

C 1, 3 and 4

D 2 and 3

13 The graph shows stomatal opening and closing in leaves during a 24-hour period.



What can be concluded from the graph?

A Gaseous exchange occurs when stomata are open.

B Stomata open as light intensity increases.

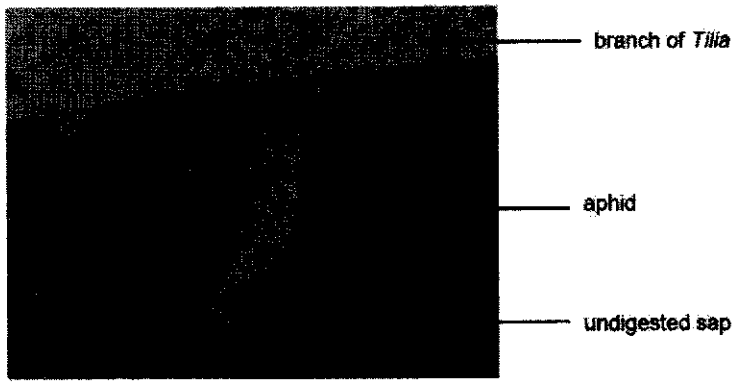
C Gaseous exchange does not occur in the dark.

D Transpiration does not occur in the dark.

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

14 The photomicrograph shows an aphid feeding on a branch of a woody tree, *Tilia*. The fluid extracted by the aphid consists of sieve element sap. The high turgor pressure in the sieve element forces the cell contents through the food canal of the aphid. Once every 30 minutes, a droplet of undigested sap exits from the aphid. Plants exhibiting extensive aphid damage can display a variety of symptoms, such as decreased growth rates, stunted growth, low yields and death.



Which pair of observation and explanation is correct?

	observation	explanation
A	sieve element sap	rich in solutes, especially sucrose and amino acids
B	high turgor pressure in sieve element	numerous mitochondria in sieve tubes to carry out active transport
C	undigested sap	product of defecation and not excretion
D	variety of symptoms	due to low levels of manufactured food substances left for *Tilia* plant

15 Blood samples from three veins in the body were tested for the concentration of oxygen, carbon dioxide and urea. The results, in arbitrary units, are shown in the table.

vein	oxygen concentration	carbon dioxide concentration	urea concentration
1	40	48	1.3
2	40	48	7.5
3	90	40	3.9

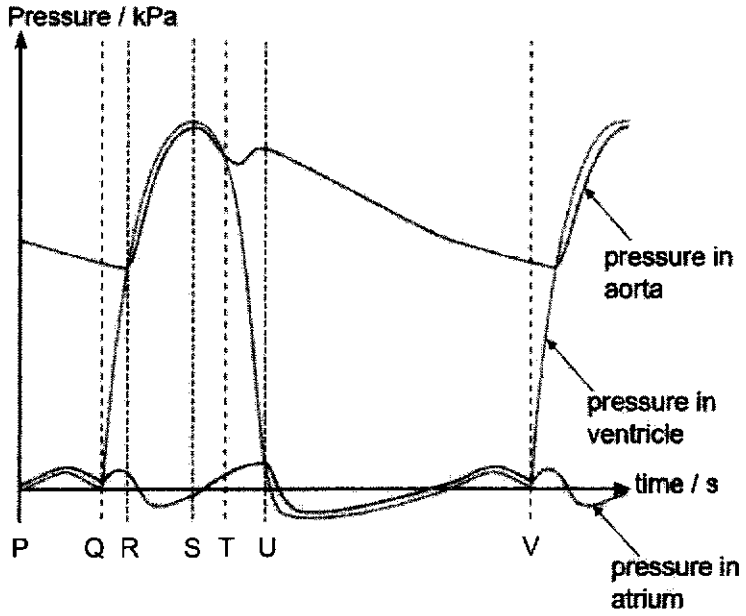
What are the identities of the three veins?

	hepatic vein	pulmonary vein	renal vein
A	1	3	2
B	2	3	1
C	3	1	2
D	3	2	1

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

16 The graph below shows the pressure changes in the left side of the heart. The letters P, Q, R, S, T, U and V represent time in seconds.



At which time frame does ventricular systole take place?

A between Q and S
B between Q and T
C between Q and U
D between P and Q

17 The table shows the results of a blood test of three volunteers, P, Q and R for blood transfusion.

		donor		
		P	Q	R
recipient	P		agglutination	no agglutination
	Q	no agglutination		no agglutination
	R	agglutination	agglutination	

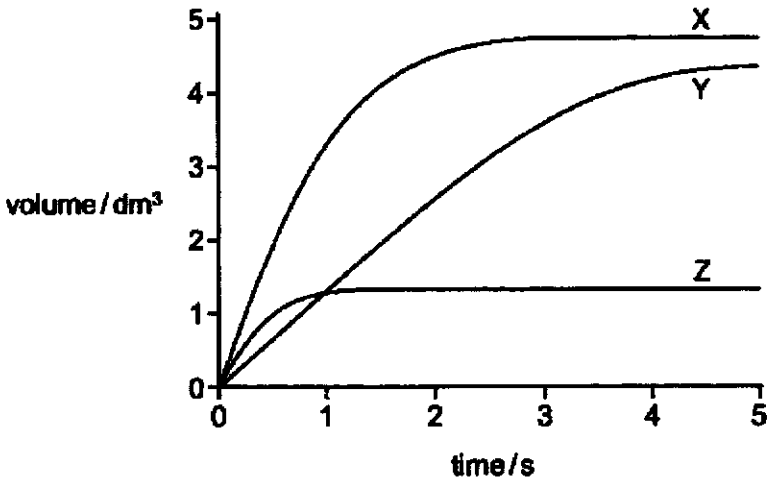
Which of the following may be the blood types of volunteers P and Q?

	P	Q
A	A	AB
B	A	O
C	B	B
D	O	AB

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

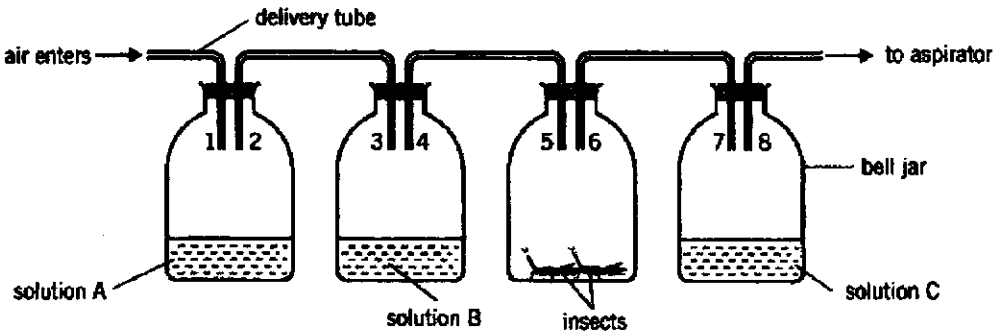
18 The graph shows the volume of air deeply inhaled by three different people, X, Y and Z immediately after breathing out quickly and with force.



What is an explanation for the differences?

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

For questions **19** and **20**, refer to the experimental set-up below. The set-up investigates respiration using living insects. Positions 1 to 8 indicate the end part of the delivery tube.



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

19 Which is the best suggestion to rectify the mistake in the experimental set-up?

A Air should enter from tube 8 instead of tube 1.

B The insects should be replaced with freshwater fish as it is a more effective organism to study respiration.

C The end part of delivery tubes at 2 and 4 should be dipped into the solution to let the air flow through solutions A, B and C.

D The end part of delivery tubes at 1, 3 and 7 should be dipped into the solution to let the air flow through solutions A, B and C.

20 Assuming that the experimental setup has been rectified, which correctly identifies solution A and its purpose?

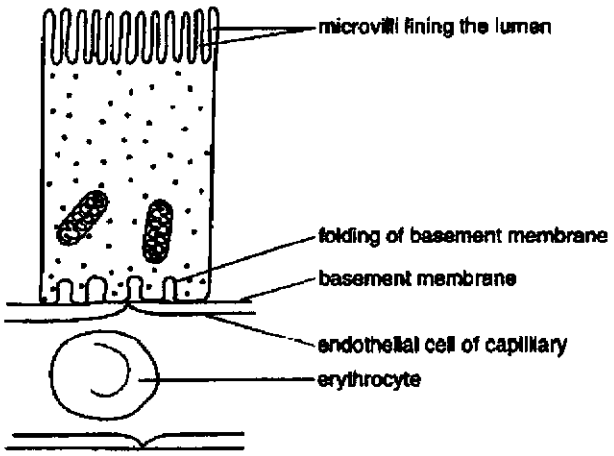
A Bicarbonate solution. To detect carbon dioxide released by living organism during respiration.

B Sodium hydroxide solution. To remove atmospheric carbon dioxide.

C Potassium hydroxide solution. To detect carbon dioxide released by living organism during respiration.

D Bicarbonate solution. To remove atmospheric carbon dioxide.

21 The diagram shows the ultrastructure of a nephron with part of an adjacent blood capillary.



Which part of the nephron was this taken from?

A afferent arteriole

B Bowman's capsule

C glomerulus

D proximal convoluted tubule

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

22 Which statement correctly describes control by negative feedback?

A An injury to body tissue activates platelets in the blood and these activated platelets release chemicals which activate more platelets.

B During a menstrual cycle, luteinising hormone stimulates the release of oestrogen which in turn stimulates the release of more luteinising hormone.

C The onset of contractions during childbirth causes the release of a hormone, which stimulates further contractions.

D When blood pressure is high, nerve impulses from the brain cause the blood vessels to dilate and blood pressure is reduced.

23 Caleb injured his hand in a car accident. Shortly after that, he could feel the objects he touched with his hand but was unable to move his hand away from them.

What could have caused this?

A Receptors in his hand were damaged.

B Relay neurones in his hand could no longer function.

C The nerve connection was cut only between the receptors in his hand and his central nervous system.

D The nerve connection was cut only between his central nervous system and the effectors in his arm.

24 Our eyes feel strained when we read small prints for a long period of time.

Which of the following is the correct explanation for the incident described above?

A The suspensory ligaments become stretched.

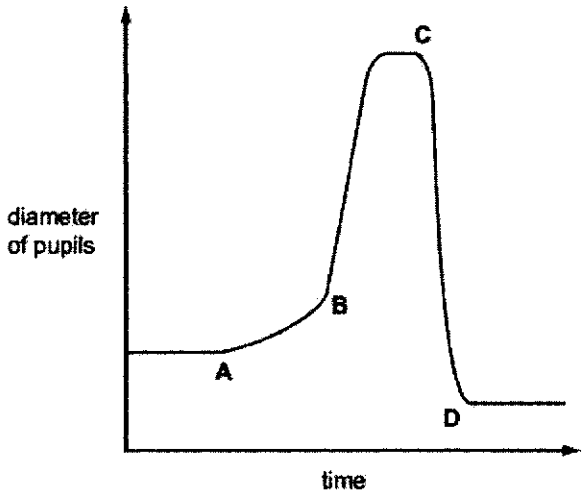
B The retina will no longer record clear images.

C The optic nerve will no longer transmit impulses to the brain.

D The ciliary muscles become fatigued.

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

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



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

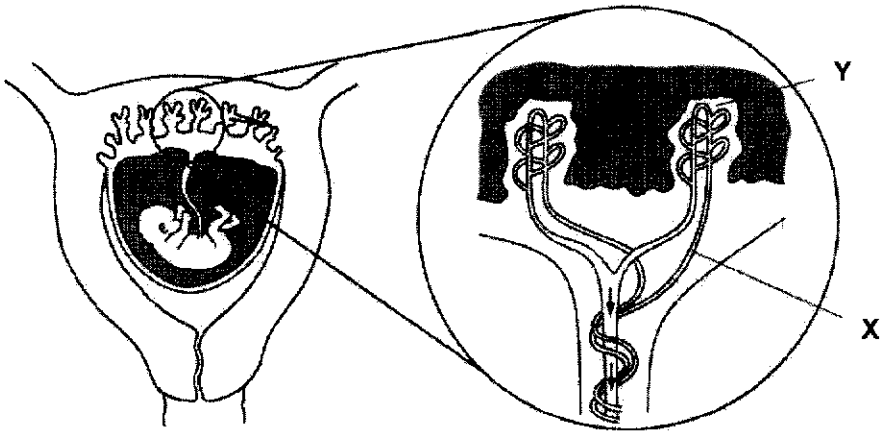
26 Insulin is injected into a diabetic patient rather than taken orally. This is because insulin

1 can be broken down by the digestive enzymes.
2 will be destroyed by the body immune system.
3 cannot be absorbed in the small intestine.
4 can travel faster through the blood stream than through the lymphatic network.

Which statement(s) are correct?

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

27 The diagram shows a fetus in the uterus.



Which substance will be at a lower concentration at **X** than at **Y**?

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

28 Which precautions should be taken to prevent the spread of HIV?

1 avoidance of any direct skin contact with another person
2 medical staff wearing gloves when treating patients
3 not sharing soap used by another person
4 prevent exchange of body fluids being in direct contact
5 treatment of blood products to destroy the virus

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

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

29 The table shows information about flowers of three different plants.

flower characteristics	plant X	plant Y	plant Z
petal colour	white	purple	bright yellow
aroma	none	pungent smell	sweet smell
petal size	0.4 cm	10.2 cm	3.9 cm
nectar volume	none	medium amount	large amount

Which inference is valid about the method of pollination for plants X, Y and Z?

A All three plants are wind pollinated.

B All three plants are insect pollinated.

C Plant X is wind pollinated but plants Y and Z are insect pollinated.

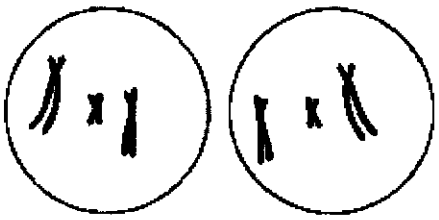
D Plants X and Y are insect pollinated but plant Z is wind pollinated.

30 The diagram shows the chromosomes in a cell.

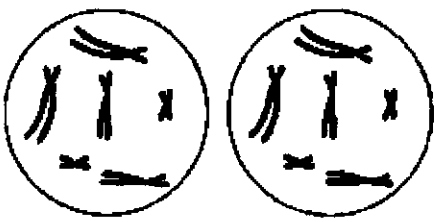


Which diagram shows the product of **one** division of the cell by mitosis?

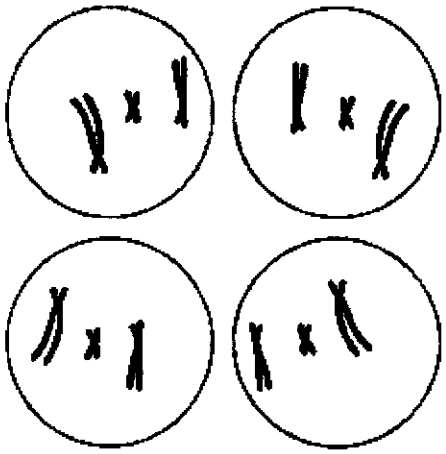
A



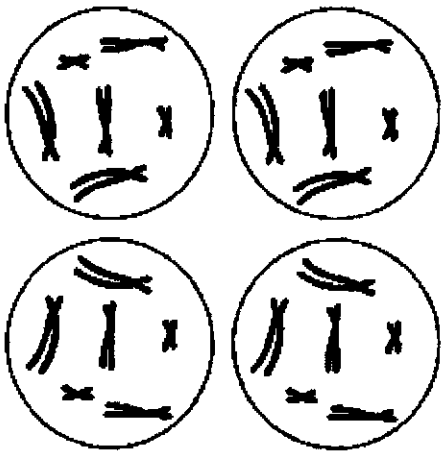
B



C



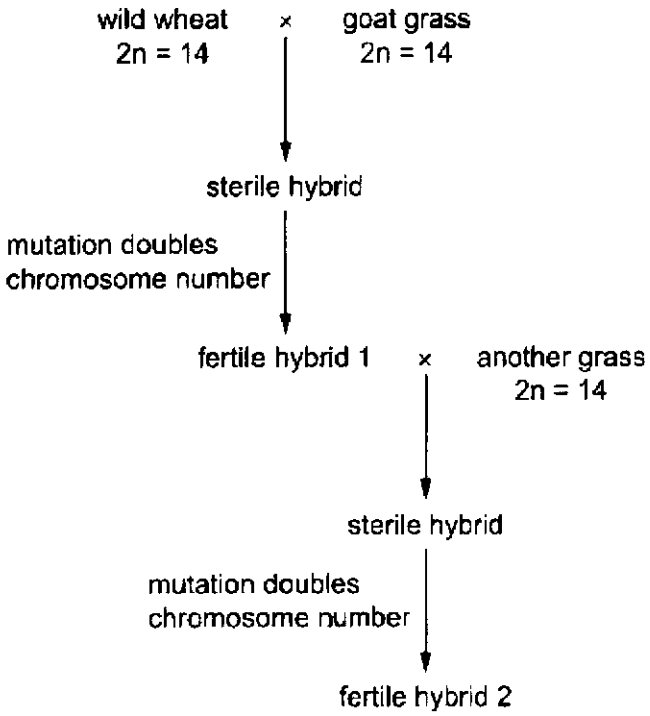
D



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

31 The diagram shows crosses between wild wheat and two types of grass.

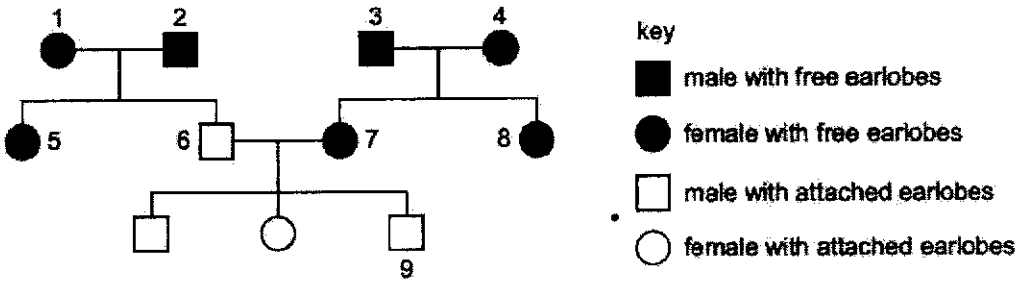


What is the chromosome number of fertile hybrid 2?

A 28 **B** 42 **C** 56 **D** 140

32 Earlobes can either be attached to the cheek or 'free' (unattached). This characteristic is controlled by a single gene.The allele for attached earlobes is recessive.

The diagram shows the inheritance of earlobe attachment in one family.



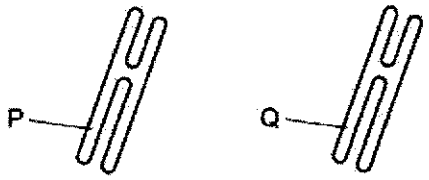
Which two individuals must be heterozygous for earlobe attachment?

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

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

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



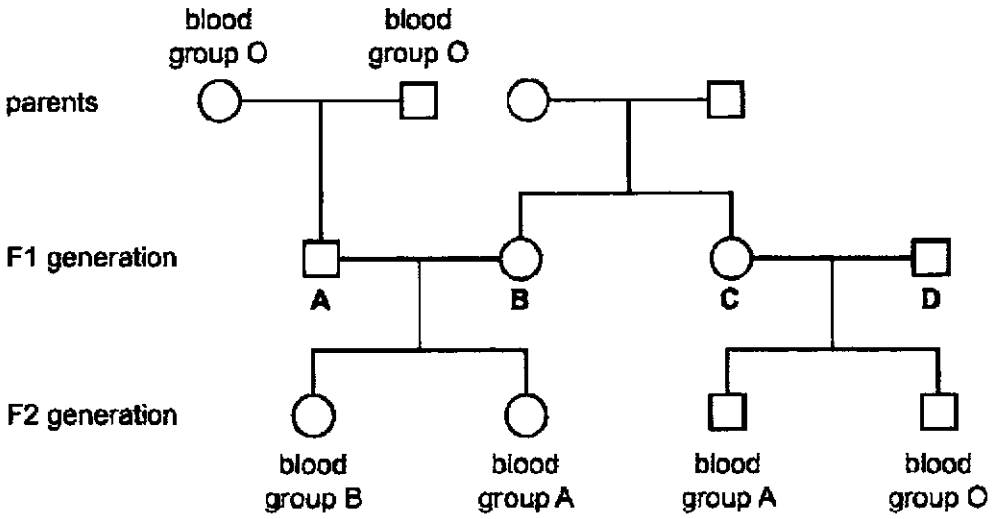
A gene is found at the point labelled P.

In a heterozygous individual, what can be found at the position labelled Q?

A a different allele of a different gene
B a different allele of the same gene
C a different gene of the same allele
D the same gene of the same allele

34 The diagram shows the blood group phenotypes of some members of a family.

Which member of the F1 generation must be heterozygous, with the codominant alleles?



35 In fruit flies, the allele for an ebony-coloured body is recessive to the allele for a grey-coloured body. In an investigation, an ebony-bodied fly is crossed with a grey-bodied fly.

What will be the body colour of the offspring if the grey-bodied fly is heterozygous?

A all ebony
B all grey
C half ebony and half grey
D three-quarters grey and one-quarter ebony

More papers at www.testpapersfree.com

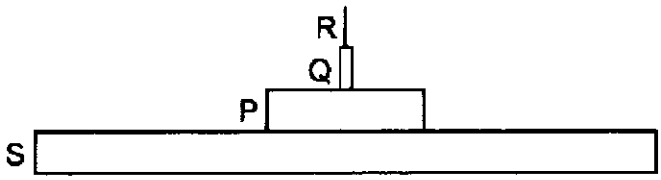
Downloaded from SingaKids.com

36 The table shows the results of a field study of four species in a food chain in an area of woodland.

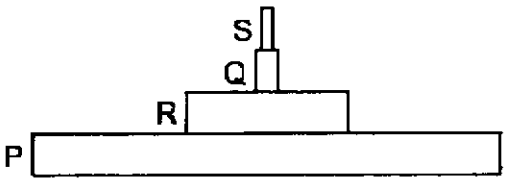
species	number of individuals	biomass of one individual / arbitrary units	energy value per unit mass / arbitrary units
P	10 000	0.100	1.0
Q	5	10.000	2.0
R	500	0.002	1.8
S	3	300 000.000	0.5

Which is the correct pyramid of energy from these data?

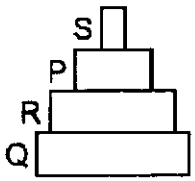
A



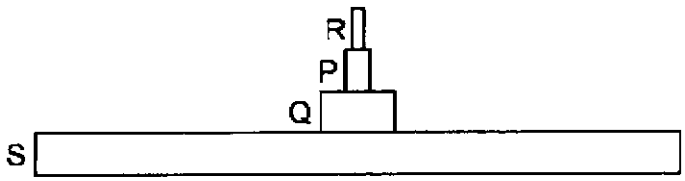
B



C



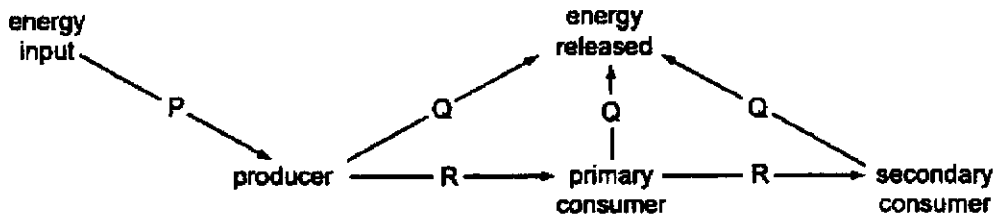
D



More papers at www.testpapersfree.com

Downloaded from SingaKids.com

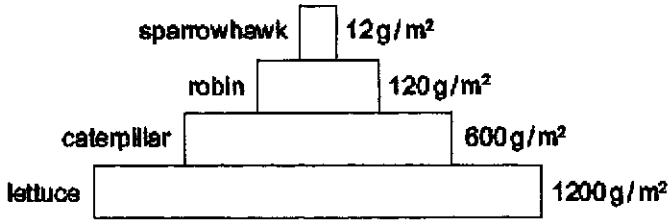
37 The diagram shows the flow of energy in a food chain.



What are the forms of energy P, Q and R?

	P	Q	R
A	chemical	light	heat
B	heat	chemical	light
C	light	chemical	heat
D	light	heat	chemical

38 The diagram shows a pyramid of biomass.



Which percentage of biomass is passed from the primary consumer to the secondary consumer?

A 1%

B 10%

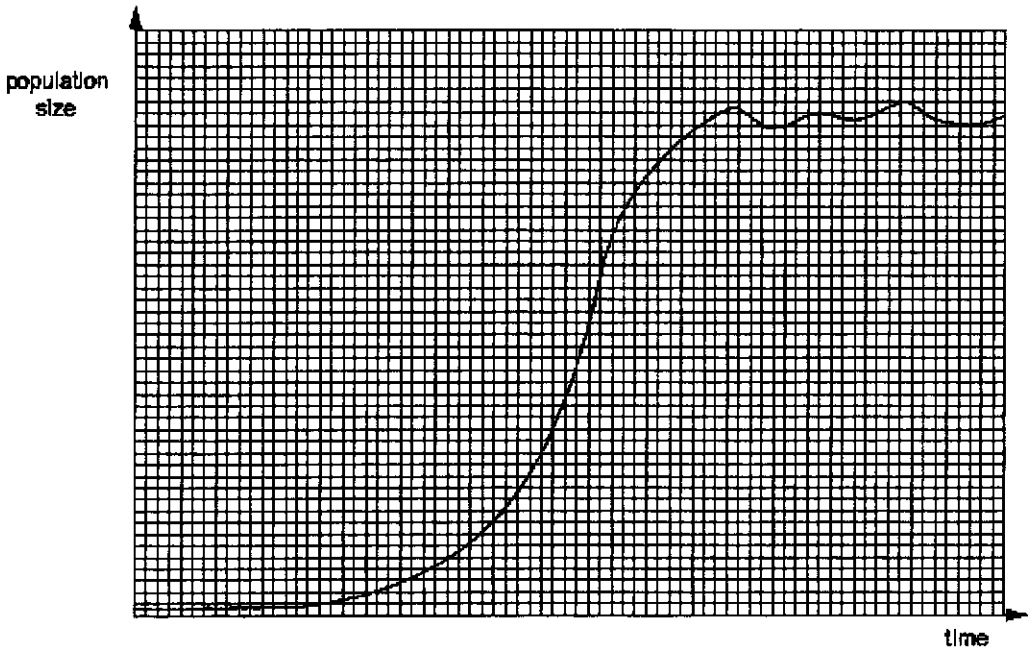
C 20%

D 90%

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

39 Some rabbits colonised an island for the first time. The graph shows how their population size changed over the next few years.



What explains the way the size of the rabbit population changed during the exponential (rapidly increasing) phase?

A limiting factors begin to take effect

B increase in the number of predators

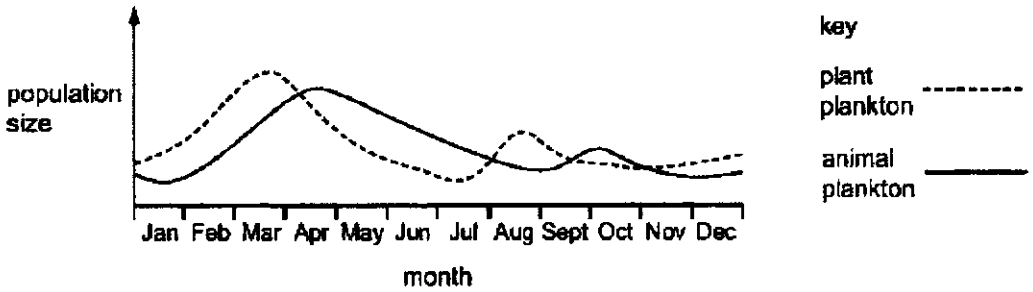
C birth rate and death rate in equilibrium

D increasing number of rabbits able to reproduce

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

40 The graph shows changes in the populations of plant and animal plankton in a lake.



Consider the following statement in relation to the data provided by the graph.

'Population changes in animal plankton lag behind similar changes in plant plankton because the animals feed on the plants.'

Into which category does the statement fall?

A It is a reasonable interpretation of the data.

B It is a restatement of the data, not an interpretation.

C It is contradicted or not supported by the data.

D More data are required in order for this interpretation to be made.

END OF PAPER

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

ZHONGHUA SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
SECONDARY 4E

Candidate's Name	Class	Register Number
	4E4	

BIOLOGY **6093 /02**

19 September 2019
1 hour 45 minutes

Additional Materials:

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces at the top of this page and on all separate answer paper used.

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper

Section B

Answer all **three** questions, the last question is in the form either/or.

Write your answers in the spaces provided on the question paper.

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

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

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

All essential working must be shown clearly.

For Examiner's Use	
Section A	50
B8	10
B9	10
B10	10
Total	80

Setter: Ms Rozianna
Vetter: Mr Goh Tze Mian

This document consists of **18** printed pages, including this cover page.

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

Section A

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

1 Large trees produce sun leaves on the outside of the canopy and shade leaves inside the canopy.

Fig. 1.1 shows the rate of carbon dioxide uptake or production of a sun leaf and a shade leaf when exposed to increasing light intensity.

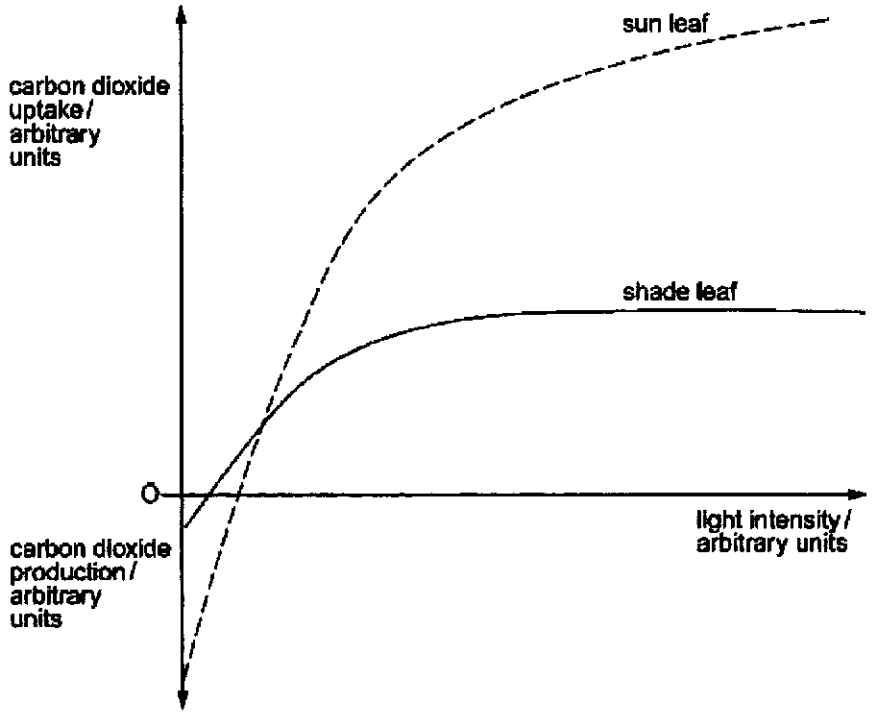


Fig. 1.1

(a) Draw a line and letter X to label the light intensity at which the rate of respiration is equal to the rate of photosynthesis in the shade leaf on Fig. 1.1. [1]

(b) With reference to Fig. 1.1, describe two ways in which the sun and shade leaf differ in their response to increasing light intensity.

1 _____

_____

2 _____

_____ [2]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(c) Fig. 1.1 shows the results taken at a temperature of 20°C.

Describe the effect on the sun leaf if the temperature was increased to 25°C.

[3]

(d) Outline an experimental plan to investigate the effect of carbon dioxide concentration on rate of photosynthesis.

[3]

[Total: 9]

2 Fig.2.1 shows the series of events in a cardiac cycle of a man.

The outer ring of the circle (**A** to **H**) represents the sequence of events in the ventricles, while the inner ring (**a** to **h**) represents events in the atria.

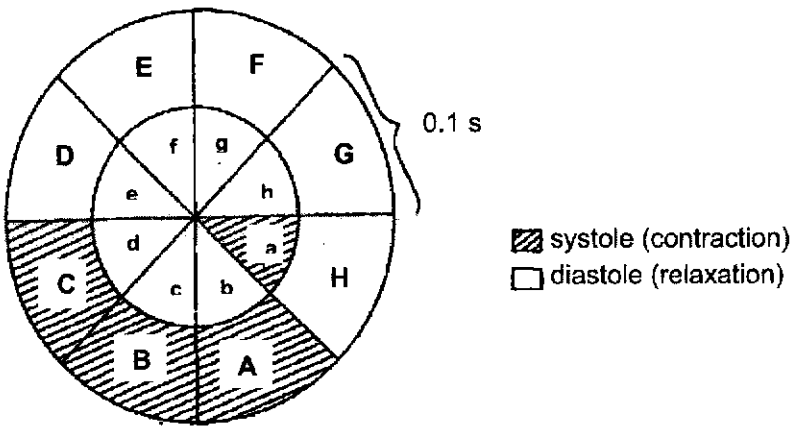


Fig. 2.1

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(a) Calculate the heart rate of the man in beats per minute. Show your working.

_____ [1]

(b) Identify the period (**A** to **H**), at which

(i) blood flows from the atria into the ventricles _____ [1]

(ii) the semi-lunar valves close _____ [1]

(c) Describe the events that occur in the heart during the period **A** to **C**.

_____

_____

_____

_____

_____

_____ [3]

(d) An atrial septal defect is a condition where there is a small hole found in the wall of the heart between the left and right atria.

Suggest why doctors advise patients with atrial septal defect to avoid vigorous sports.

_____

_____

_____ [1]

[Total: 7]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

3 Table 3 shows the clearance time of some substances for a patient undergoing kidney dialysis.

Table 3

substance in blood	concentration in blood / mg/l		
	time = 0 h	time = 0.5 h	time = 6 h
urea	176	144	126
creatinine	3.4	2.7	2.5
glucose	134	128	138
potassium	4.3	4.1	4.1
sodium	143	137	135
chloride	108		107

(a) Complete Table 3 to show the estimated concentration of chloride at time = 0.5 h. [1]

(b) Calculate the average hourly rate at which urea is removed from the blood of the kidney dialysis patient.

Show your working.

[2]

(c) Explain the results when t = 6 h for potassium.

_____

_____

_____ [1]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(d) The table did not show the concentration of proteins in blood. Predict how the trend of proteins would look like between t = 0 h to t = 6 h. Give a reason for your answer

_____

_____

_____

_____ [2]

(e) During each treatment, a patient has to undergo dialysis for a few hours. Suggest one way the time can be shortened.

_____

_____ [1]

[Total: 7]

4 Fig. 4.1 shows the tissues of a mother and her fetus in a human placenta. The maternal blood and fetal blood remain separate.

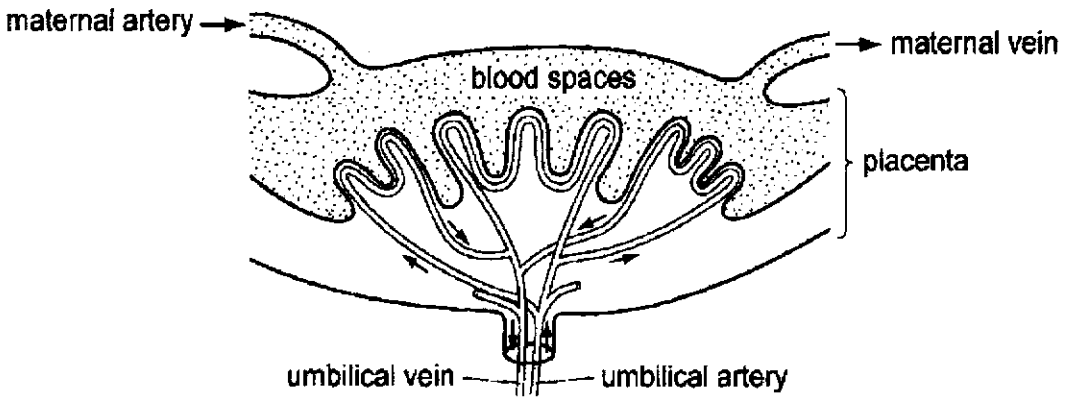


Fig. 4.1

(a) State a reason why there must be no mixing of fetal and maternal blood.

_____

_____ [1]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(b) The placenta is often described as "a small intestine, a lung and a kidney". Explain how the placenta functions like the abovementioned organs.

small intestine _____

_____

lung _____

_____

kidney _____

_____ [3]

(c) Suggest two ways in which a pregnant mother could help in the healthy development of her fetus.

_____

_____

_____

_____ [2]

[Total: 6]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

5 Scientists are able to treat people with some types of brain damage. They may do this by injecting a patient with cells taken from another person (donor). These cells then migrate to the brain where they divide and specialise to become groups of fully functioning brain cells.

(a) State the type of cell division that takes place when the injected cells reach the patient's brain.

_____ [1]

(b) State the term used to describe a group of cells that are specialised to perform a specific function.

_____ [1]

(c) Female patients were injected with cells from male donors. After a period of time, the scientists examined brain cells from these patients and looked for groups of brain cells containing the Y chromosome.

Explain why finding groups of brain cells containing the Y chromosome would suggest to the scientists that the treatment may have been successful.

_____

_____

_____

_____

_____

_____ [3]

[Total: 5]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

6 In the inheritance of the colour of cat fur, the allele for yellow fur (**A**) is dominant to the allele for grey fur (**a**).

(a) Two heterozygous yellow-coloured cats produced offspring. Use a fully labelled genetic diagram to show how the colour of cat fur is inherited by the offspring.

State the expected ratios of genotypes and phenotypes in the offspring.

[5]

A particular combination of these alleles is known as a 'lethal' combination. Young that inherit this combination die in the uterus during the very early stages of development. This results in a 2:1 ratio of fur colour in the surviving offspring.

(b) Identify the lethal combination of alleles and explain how you reached this answer.

lethal combination _____

explanation _____

_____

_____ [3]

[Total: 8]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

7 Fig. 7.1 shows some of the interactions that take place in an aquatic ecosystem.

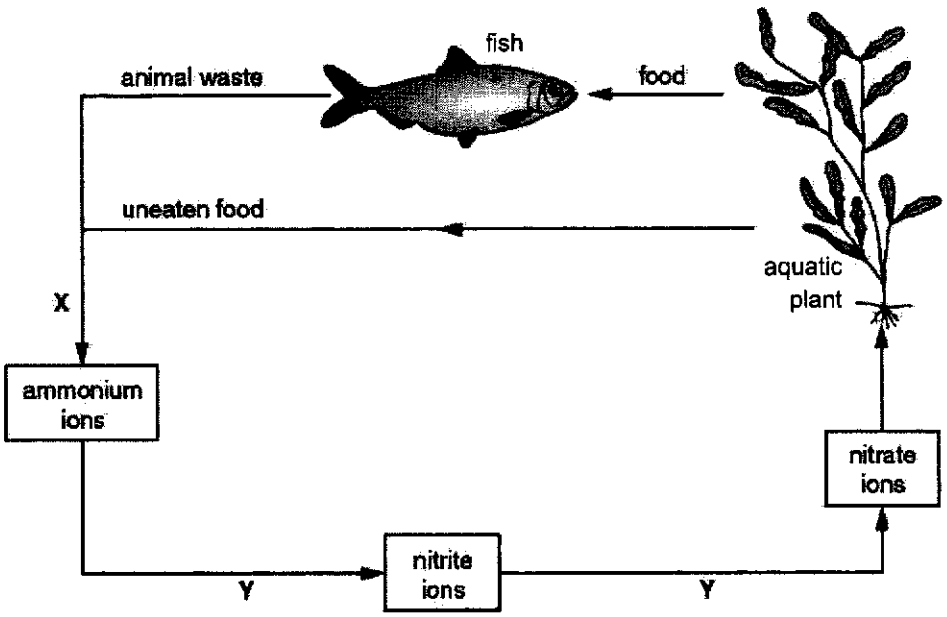


Fig. 7.1

(a) Use the information in Fig. 7.1 to state the

trophic level of aquatic plant _____

trophic level of fish _____ [2]

(b) Explain one way, other than for food, that the fish may depend on the aquatic plant.

_____

_____

_____ [2]

(c) **Y** represents the nitrification process responsible for the conversion of nitrogenous compounds into nitrate ions.

State the name of process **X** and suggest the type of microorganism which carries out both processes **X** and **Y**.

process **X** _____

type of microorganism _____ [1]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(d) Describe the pollution effect that nitrogen-containing fertilizers might have on this ecosystem.

_____

_____

_____

_____

_____

_____ [3]

[Total: 8]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

Section B

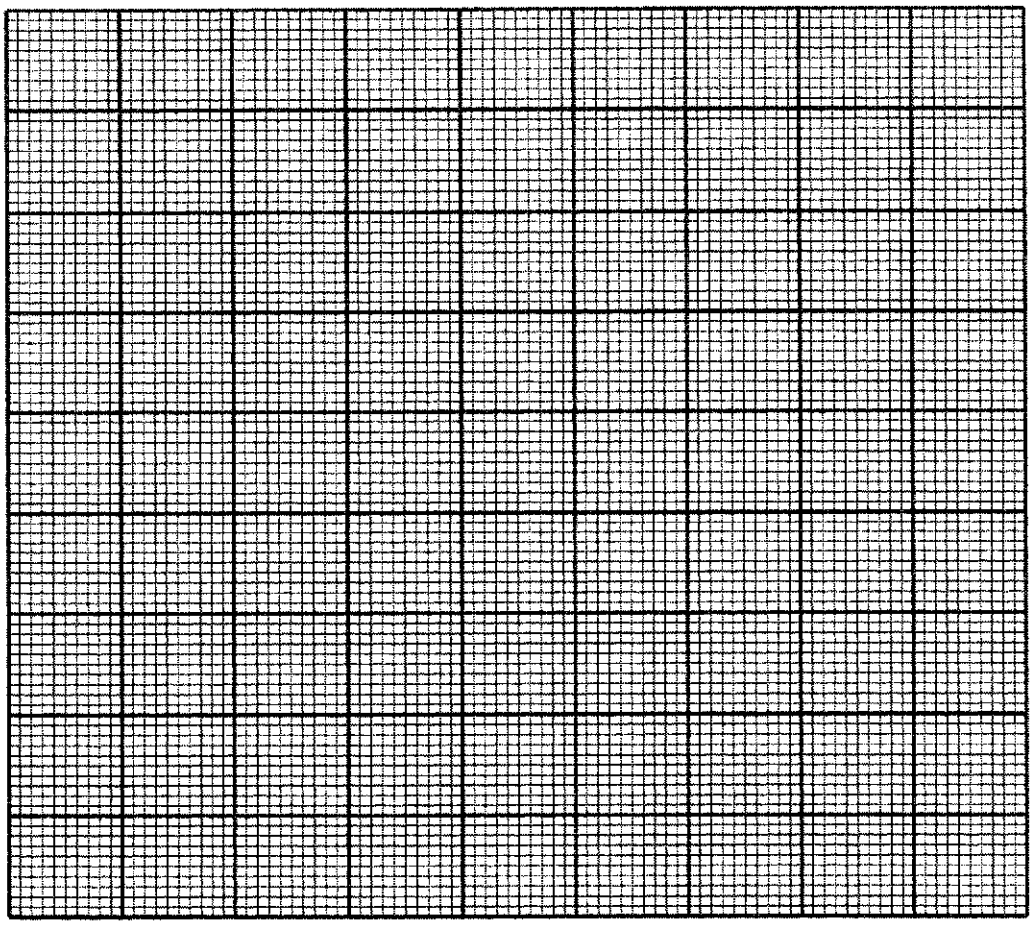
Answer all **three** questions, the last question is in the form **EITHER / OR**.
Write your answers in the spaces provided.

8 Table 8.1 shows the results obtained in an investigation to compare the rate of transpiration with the rate of water absorption of a plant taken at four hour intervals on a summer day.

Table 8.1

time / h	rate of water absorption / g/h	rate of transpiration / g/h	light intensity / %
04 00	1.5	0.25	0
08 00	1.5	2.0	70
12 00	3.5	5.0	100
16 00	5.5	7.25	100
20 00	3.25	2.5	10
24 00	2.0	0.75	0

(a) Using the data in Table 8.1, plot a graph to show how the rate of water absorption and the rate of transpiration changes with time. Join the points using straight lines.



[4]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(b) Based on the results, what is the time of the maximum water absorption and maximum transpiration? Explain your answer.

[4]

(c) With reference to Table 8.1, suggest whether the plant can live indefinitely under the conditions of the experiment.

[2]

[Total: 10]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

9 Fig. 9.1 shows the stages in the process of genetic engineering to produce the hormone insulin.

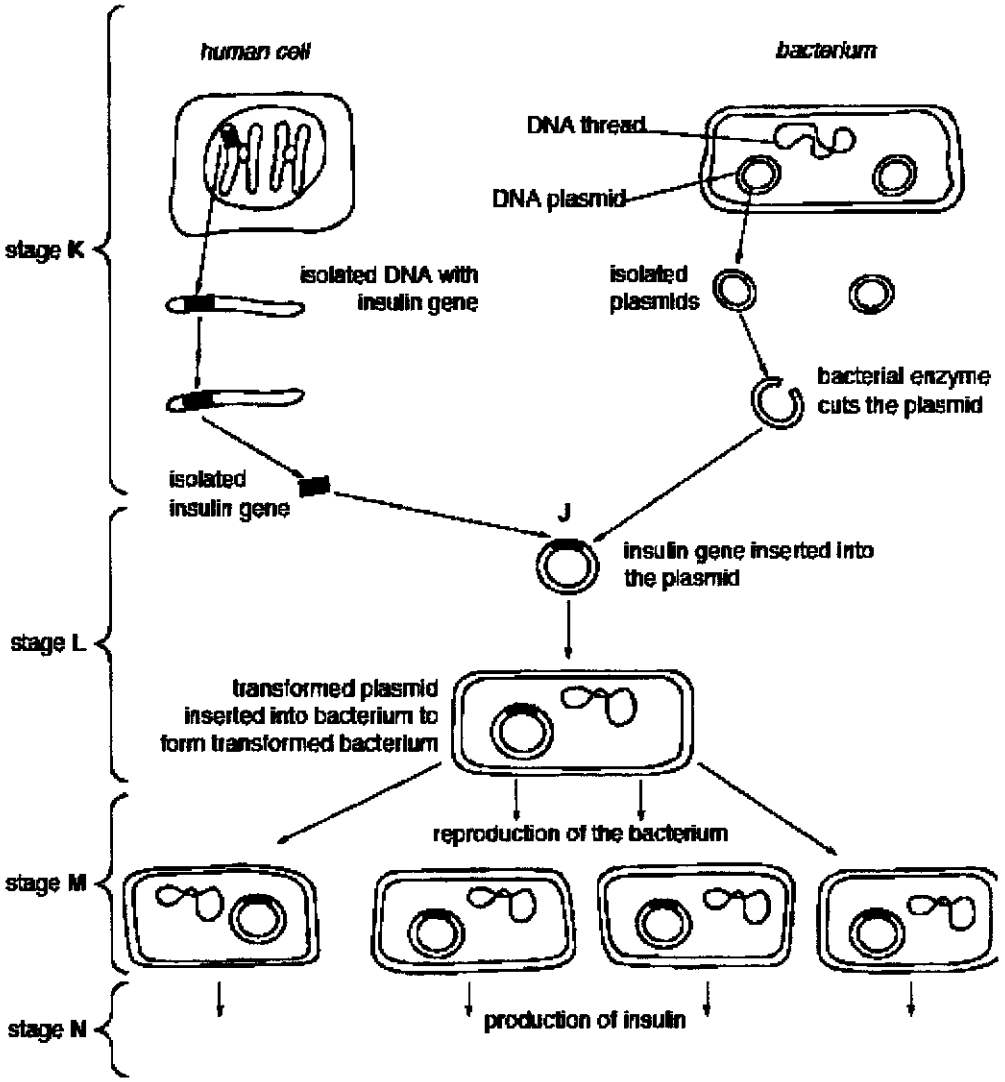


Fig. 9.1

(a) **(i)** Describe how the location and organization of genetic material in the human cell shown in stage **K** of Fig. 9.1 is different from that in the bacterium shown.

_____

_____

_____

_____ [2]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(ii) Describe how the events in stage **K** led to the production of **J**.

[3]

(iii) Stage **N** of Fig. 9.1 takes place in a container similar to that used in the large-scale production of antibiotics.

State the name of this type of container.

[1]

(b) Genetic engineering can also be used to produce crop plants for humans to eat.

Discuss the potential advantages and dangers of using genetic engineering to produce crop plants for humans to eat.

advantages

[2]

dangers

[2]

[Total: 10]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

EITHER

10 (a) A parasitic insect known as red scale affects mainly citrus trees. Fig. 10.1 shows the distribution of red scales and their predators before treatment with an insecticide, shortly after treatment and long after treatment.

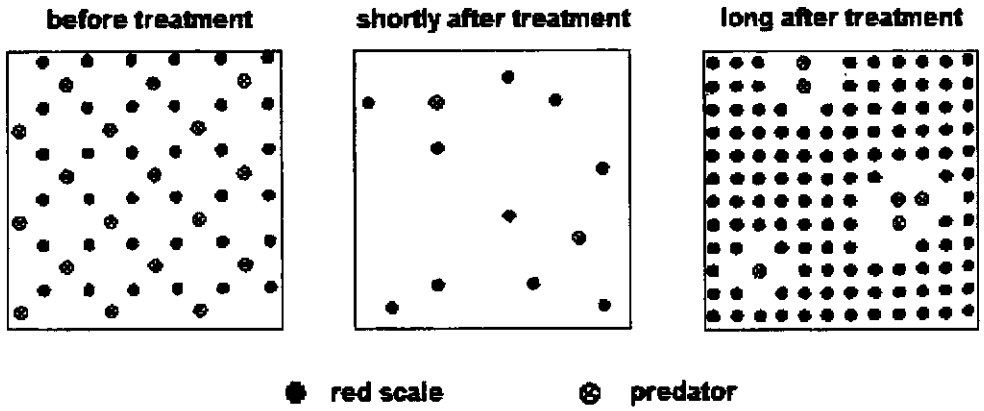


Fig. 10.1

With reference to Fig. 10.1, explain why the use of insecticides is not the best way of destroying the red scales.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

(b) Fig. 10.2 shows a sewage treatment plant.

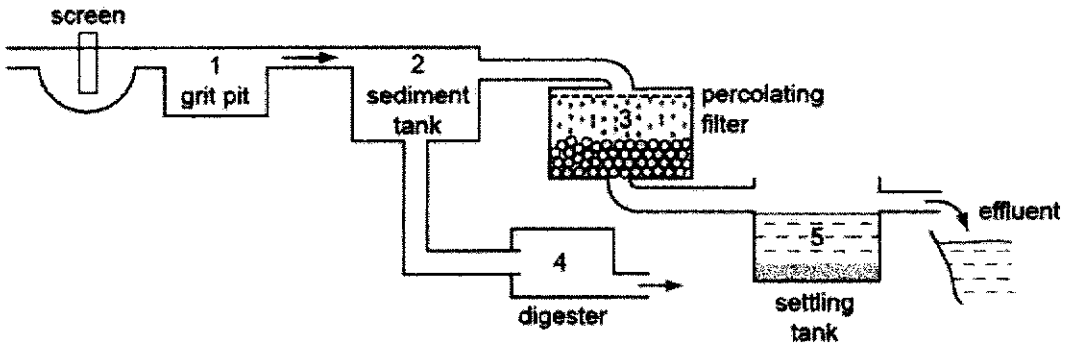


Fig. 10.2

With reference to Fig. 10.2, describe the role of microorganisms in the treatment of sewage.

[5]

[Total: 10]

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

OR

10 Some muscles in our body work as antagonistic pairs to create movement. 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 following actions.

(a) moving a bolus in the oesophagus after ingestion of food

[4]

(b) limiting the amount of light entering the eye in a brightly lit environment

[2]

(c) breathing in air from the atmosphere into our lungs

[4]

[Total: 10]

End of Paper

Total marks	

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

ZHONGHUA SECONDARY SCHOOL
2019 PRELIMINARY EXAMINATION
Secondary 4E Biology

PAPER 1
MULTIPLE-CHOICE QUESTIONS [40 MARKS]

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

PAPER 2 SECTION A
STRUCTURED QUESTIONS [50 MARKS]

Qn	Marking Point	Mark
1a	For an X at the point where graph for shade leaf **intersects x axis**	1
1b	The shade leaf did not produce or uptake CO_2 at a higher light intensity than the sun leaf OR Higher rate of photosynthesis / CO_2 uptake in the sun leaf than the shade leaf at higher light intensity The rate of photosynthesis increases more rapidly / (at a faster rate) in the sun leaf□ CO_2 uptake is greater in the shade leaf at low light intensity More respiration occurred in the sun leaf at lower light intensity CO_2 uptake levels off in the shade leaf	1 1 1 1 Any 2
1c	The increase in temperature increases the rate of enzyme- controlled reactions involved in photosynthesis / more successful collisions in the chloroplast so there is more chemical reaction taking place Increasing temperature will increase the rate of photosynthesis And carbon dioxide uptake increases	1 1 1
1d	Immerse aquatic plant in five different concentrations of sodium hydrogencarbonate solutions Fixed light intensity / similar plant size and type Count number of (oxygen) bubbles released by leaf in five minutes	1 1 1
2a	Heart rate = 60 / 0.8 = 75 bpm	1
2bi	H	1
2bii	D	1
2c	Muscles in ventricular wall contract at A leading to increased pressure in ventricles Causing semi-lunar valves to open Blood then rushes from ventricles to aorta / pulmonary artery	1 1 1
2d	Low oxygen content in blood due to mixing of oxygenated and deoxygenated blood	1

PartnerInLearning
567

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

ZHONGHUA SECONDARY SCHOOL
2019 PRELIMINARY EXAMINATION
Secondary 4E Biology

Qn	Marking Point	Mark
3a	Accept 1.06 to 1.08	1
3b	Rate = 50/6 = 8.33 Correct units = mg/dl h^{-1}	1 1
3c	The bath fluid contains the same concentration of mineral salts No net movement of these substances	1 1
3d	Trend should show a straight horizontal line/constant Proteins are too large to pass through selectively permeable tubing, hence no change in concentration	1
3e	Change to machine • Increase the number of coils of tubing • Increase length and decrease diameter of tubing Accept others • Decrease protein intake in diet → less urea to be removed	 1 1 1
4a	The mother and fetus can be of different blood groups which can cause blood clumping / agglutination **Reject coagulation / clotting** The high pressure of the mother's blood can kill the fetus.	1 1 Any 1
4b	• The placenta is like the small intestine as it allows the diffusion of digested food substances / digested nutrients such as glucose / amino acids / fats from the mother's blood to the fetal blood. • The placenta is like the lungs as it allows the transport of oxygen from the mother's blood to the fetal blood and carbon dioxide from the fetal blood to the mother's blood. • The placenta is like the kidney as it allows transport of urea / nitrogenous waste from the fetal blood to the mother's blood.	1 1 1
4c	A pregnant mother, • should not smoke • should not drink alcohol • should not take non-medicinal drugs • should have a well-balanced or healthy diet • should carry out regular / light exercise	 1 Any 2
5a	Mitosis	1
5b	Tissue	1
5c	Y chromosome is only in males / female is XX; injected cells have travelled to brain; Replication / cell division has occurred / tissue has formed; Cells present after time period	1 1 1 1 Any 3
6a	Parental Phenotype Yellow x Yellow Parental Genotype Aa × Aa (R if wrong symbols used) Gametes A a A a F1 Genotype AA Aa Aa aa F1 Phenotype 3 yellow : 1 grey	1 1 1 1 1
6b	AA (e.c.f. for use of incorrect symbols) ; With reference to 1 in 4 being AA ; When the offspring with lethal combi dies, it leaves ratio 2 yellow : 1 grey	1 1 1

PartnerInLearning
568

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

Qn	Marking Point	Mark
7a	producer / 1st / 1 ; (primary) consumer / herbivore / 2nd / 2	1 1
7b	plant releases oxygen ; fish uses this (oxygen) for (aerobic) respiration lay eggs on weed / provides cover / nesting ;	1 1 1 1
7c	Decomposition Bacteria	½ ½
7d	Eutrophication/algal bloom on water surface **blocks off sunlight, leading to death of submerged water plants** **increased decay** (of plants / waste products of fish) leading to increased numbers of bacteria **more oxygen used** by decomposers for respiration leading to death of fish / animals	1 1 1

PAPER 2 SECTION B
LONGER STRUCTURED QUESTIONS [30 MARKS]

8a	axes labelled with correct units suitable linear scales accurate plotting of points on a single set of axes for both graphs lines drawn	1 1 1 1
8b	1600 At 1600, light intensity is 100%, **stomata are widely open**, causing maximum water transpiration, Rate of water absorption also increases to the maximum to **replace the amount of water loss** At the same time at high light intensity, the rate of water absorption increases as the **photosynthetic rate of plant increases**.	1 1 1 1
8c	No Rate of transpiration is higher than rate of absorption, causing plant to wilt. [Quote data]: Over 24 hours, 71g (17.75 g/h per 4 hourly period) of water is lost through transpiration while only 17.25 g/h per 4 hourly period) of water is absorbed.	1 1
9ai	in nucleus (human) / within nuclear membrane ORA ; in cytoplasm (bacteria) ; thread-like + plasmid(s) (bacteria) ; genes / chromosomes paired (human)	1 1
9aii	Use of **same restriction enzyme** to isolate human insulin gene and to cut bacterial plasmid Formation of **complementary sticky ends** results in pairing between human insulin gene and plasmid Use of DNA ligase to seal bonds between insulin gene and plasmid to form recombinant DNA, **J**	1 1 1

PartnerInLearning
569

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

9aiii	Fermenter / bioreactor	1
9b	potential advantages (Any 2) increased yield / more profitable / grow quicker / reduce famine able to grow in environmental extremes / grow in new areas ; more predictable results than selective breeding / more certain able to transfer (beneficial) genes / features between species nutritionally improved / visually improved / desirable outcome e.g. uniform shape disease / pest resistance potential dangers (Any 2) risk of genetic spread to other species may be patented / costs too much possible risk to health of other species possible risk to genes of other species	 1 1 1 1 1 1 1 1 1 1
10a	population of red scale pest long after treatment is even greater than before treatment ; insecticide causes mutation + mutated red scale are immune to insecticide; insecticide kills non-resistant red scale, leaving naturally resistant red scale to reproduce + over time, population of resistant red scale increases; insecticide kills natural predators + less predation/ selection pressure on red scale, red scale population increases; ecological balance after treatment disrupted eg. reproduction rate of red scale higher than predator/ predators affected by effects of bioaccumulation;	1 1 1 1 1
10b	Use of aerobic and anaerobic bacteria and fungi **aerobic conditions** in percolating filter tank due to pumping of air bubbles **anaerobic conditions** in digester tank; **bacteria secretes enzymes** to decompose/ digest organic matter in wastes; useful / water-soluble matter absorbed and used by bacteria; treated effluent and sludge contains lower concentration of organic matter and harmful pathogens	1 1 1 1 1
O10a	Circular muscle **behind the bolus** contracts + longitudinal muscle relaxes oesophagus constricts; **Below the food bolus**, circular muscle relaxes + longitudinal muscle contracts – oesophagus widen; Squeezes and pushes the bolus downward; by peristalsis	1 1 1 1
O10b	Circular muscles of the iris contract + radial muscle relaxes; Pupil becomes smaller	1 1
O10c	**External intercostal muscles** of the rib cage **contract** + internal intercostal muscles relax; Raised the ribcage upwards and outwards; (Together with the help of a lowered diaphragm) **Volume** in thoracic (chest) cavity **increases + pressure lower than in lungs;** Lungs expand, causing pressure in lungs to be lower than the atmospheric pressure	1 1 1 1

PartnerInLearning
570

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

More papers at www.testpapersfree.com

Downloaded from SingaKids.com

More papers at www.testpapersfree.com

Downloaded from SingaKids.com