BP-365

Name | Reg. No | Class

MAYFLOWER SECONDARY SCHOOL

4EX

BIOLOGY	6093/02
Paper 2 [80 Marks]	
	PRELIMINARY EXAMINATION
Additional Materials Approved Calculator	August 2024
	1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Do not start reading the questions until you are told to do so.

Write your name, class, and index number on all the work you hand in.

Write in dark blue or black pen.

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

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

This paper consists of **Section A** and **Section B**.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

Section B

Question **10** is in the **Either** or **Or** format.

Write your answers in the spaces provided on the Question Paper.

FOR EXAMINER'S USE	
Paper	**Marks**
A Total	/ 70
B Total	/ 10
Paper 2 Total	/ 80

INFORMATION FOR CANDIDATES

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

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show all their working in a clear and orderly manner.

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

This question paper consists of **16** printed pages.

[Turn over

Section A (70 marks)
Answer **all** the questions in the spaces provided.

1 Pneumococcal diseases are one of the major causes of death worldwide. It is caused by a bacteria called *streptococcus pneumoniae*.

(a) Define the term pathogen.

.....

..... [1]

(b) Antibiotics are drugs that can treat pneumococcal diseases. Complete the table below to list any three of the structures present in a bacterial *streptococcus pneumoniae* cell. Explain how the antibiotics acts on each of them to destroy this bacterium. [3]

Structure	How the antibiotic acts on this structure

(c) "Superbugs" can develop when bacteria become resistance to antibiotics. Discuss two ways how antibiotic resistance can be reduced.

.....

.....

.....

..... [2]

2 In the Artic, food is scarce. The reindeer depends on limited resources like grasses for food.

(a) The reindeer is in turn eaten by brown bears.

Brown bears are very adaptable like human. They consume a wide range of foods, including ground squirrels and grasses.

Ground squirrels are mostly herbivorous and feed on grasses.

Construct a food web to show the flow of energy between organisms in this ecosystem. [3]

(b) Explain in detail why the food chains found in the above food web consist not more than three organisms.

.....

.....

.....

.....

.....

..... [3]

(c) During some time of the year, grasses are not available. The reindeer has to turn to alternative food source. This alternative source of food contains a carbohydrate called lichenan.

Reindeer are the only animals that can feed on lichenan.

(i) List the three elements present in lichenan.

.....

..... [1]

(ii) Explain why reindeers are the only animals that can feed on lichenan.

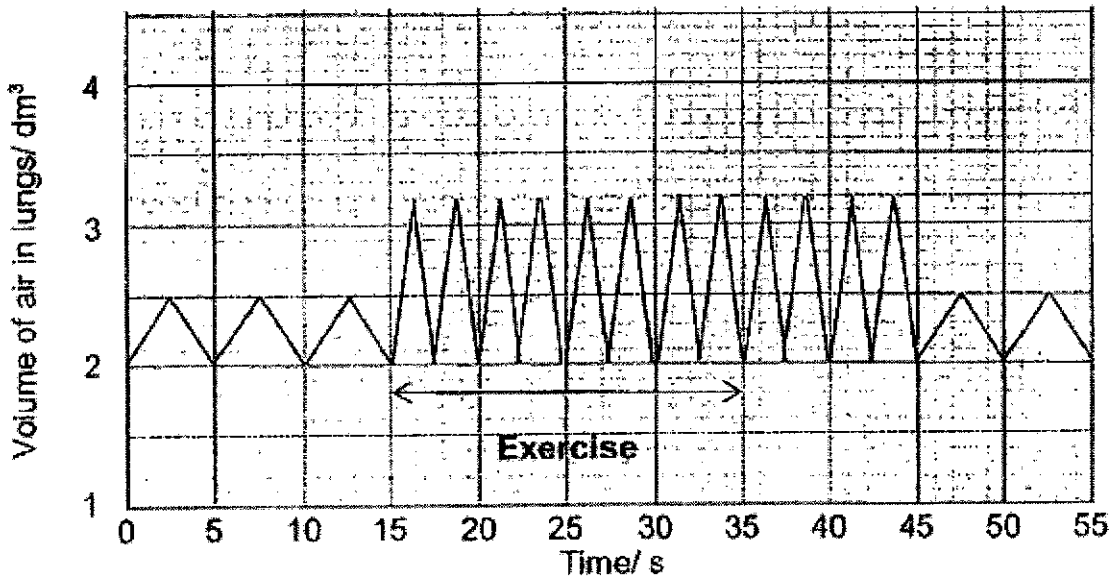
.....

.....

.....

..... [2]

3 The figure below shows the changes in the lung volume of an athlete before, during and after his exercise.



(a) **(i)** Calculate the differences in the number of breaths per minute that the athlete took when at rest and when exercise.

Differences in the number of breathes per minute: ..... [3]

(ii) Explain why there is a difference in the number of breaths per minutes taken at rest and while exercising.

.....

.....

.....

..... [2]

(b) Explain why the volume of air in the lungs remains high in the next ten minutes following the end of exercise.

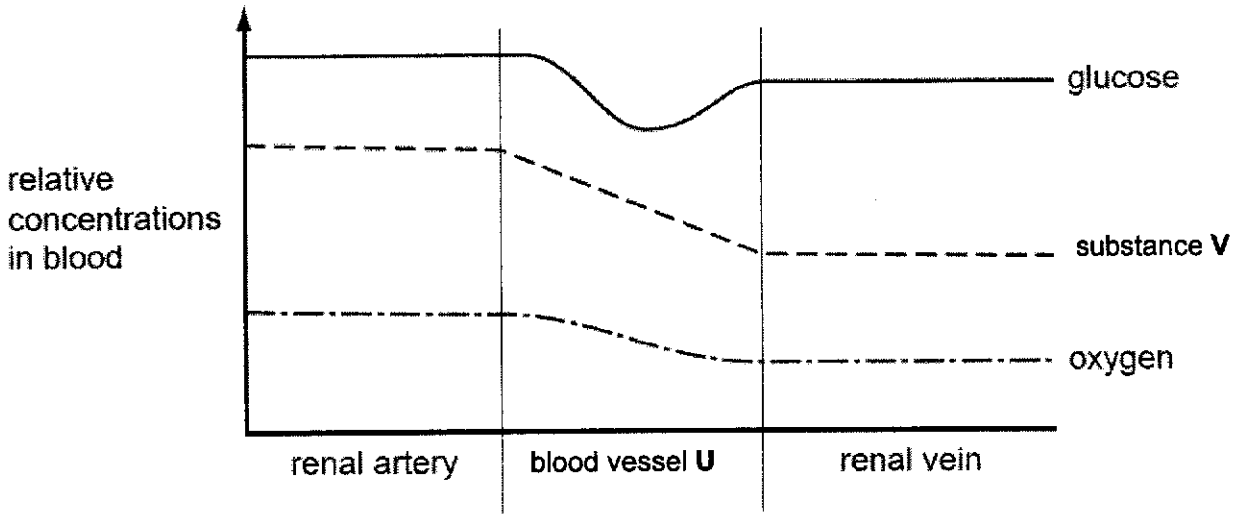
.....

.....

.....

..... [2]

4 The figure below shows the changes in the relative concentrations of three substances in the blood plasma of a healthy person. These changes happen when the blood flows through the renal artery, an unknown blood vessel **U** and the renal vein.



(a) Suggest the identity of blood vessel **U** and substance **V**.

blood vessel **U**: .....

substance **V**: ..... [2]

(b) Describe and explain the differences in the relative concentration of the glucose in blood plasma between the renal artery and renal vein.

.....

.....

.....

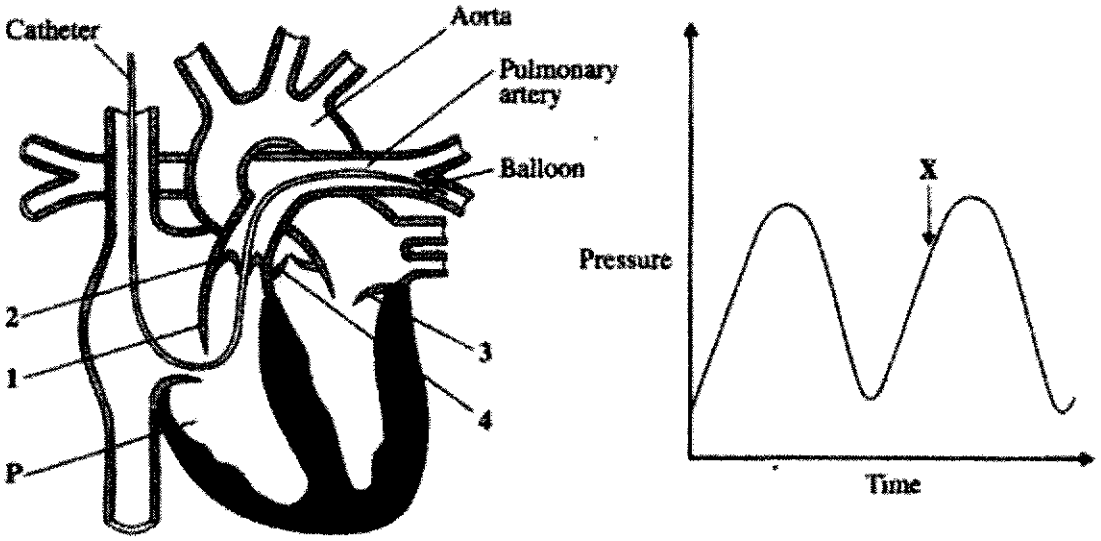
.....

.....

..... [3]

5 A small tube called a catheter can be inserted into the blood system through a vein. It can be threaded through the vein and into and through the heart until its tip is in the pulmonary artery. A tiny balloon at the tip can then be used to measure the pressure changes in the pulmonary artery.

The figure below shows a section through the heart with the catheter in place.
The graph shows the pressure changes recorded in the pulmonary artery.



(a) Name the parts labeled **3** and **P**.

3: .....

P: ..... [2]

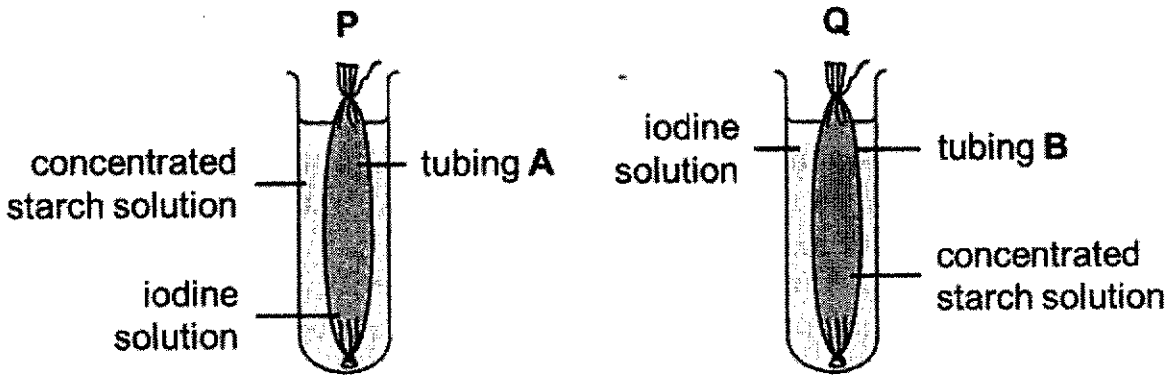
(b) Complete the table to show whether the valves 1 to 4 in the figure above are open or closed at time X shown in the graph.

Valve	**1**	**2**	**3**	**4**
Open / Closed				

[2]

(c) Sketch an additional curve on the graph above to show the pressure changes that would be measured in the aorta at the same time. [2]

6 The below shows two experimental set-ups containing a Visking tubing each. Both set-ups were left to stand for 25 minutes.



(a) Predict what would be seen in the following after 25 minutes.

(i) Visking tubing **A**

.....

..... [1]

(ii) Visking tubing **B**

.....

..... [1]

(b) Explain your prediction for **(a)(ii)**.

.....

.....

.....

.....

.....

..... [3]

(c) Suggest and explain which part of the alimentary canal does this set up represents.

.....

.....

.....

.....

.....

..... [3]

7 Geranium species are cultivated for horticultural use and for pharmaceutical products. Geranium plants produce a unique chemical compound in its petals to defend itself from Japanese beetles. Within 30 minutes of ingestion, the chemical paralyses the Japanese beetles.

The picture below shows a flower of one of the Geranium species.

(a) Suggest the agent of pollination and list two observable features to support your answer.

.....

.....

..... [3]

(b) Suggest the advantages and disadvantages of using the type of pollination stated in **(a)**.

.....

.....

.....

.....

.....

..... [3]

(c) Suggest how Geranium plants evolved to become pest-resistant.

.....

.....

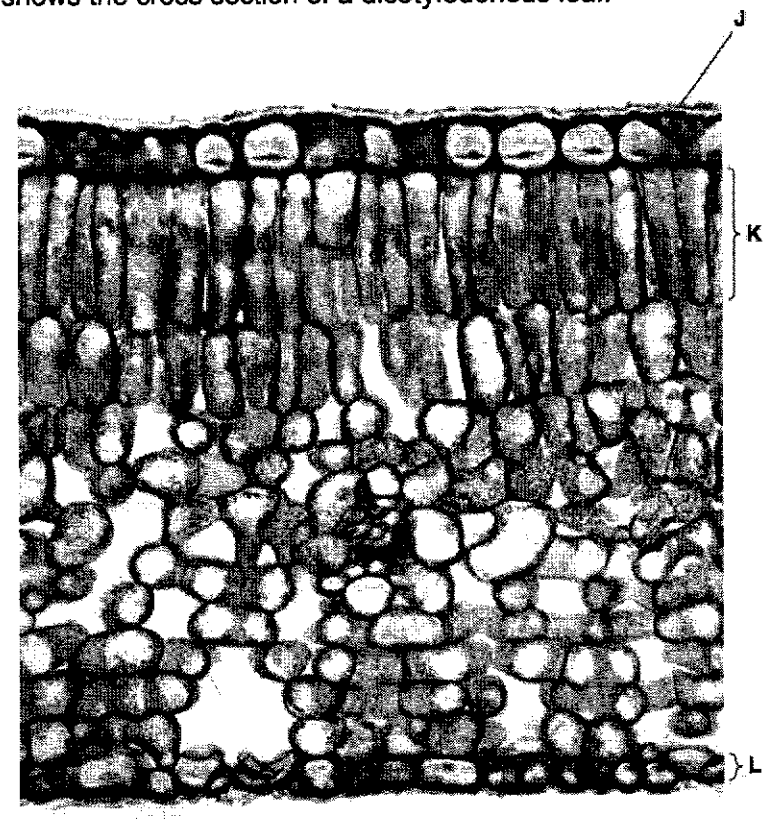
.....

.....

.....

..... [3]

8 The figure below shows the cross section of a dicotyledonous leaf.



(a) Identify structures **J**, **K** and **L** and explain the importance of each in the process of photosynthesis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

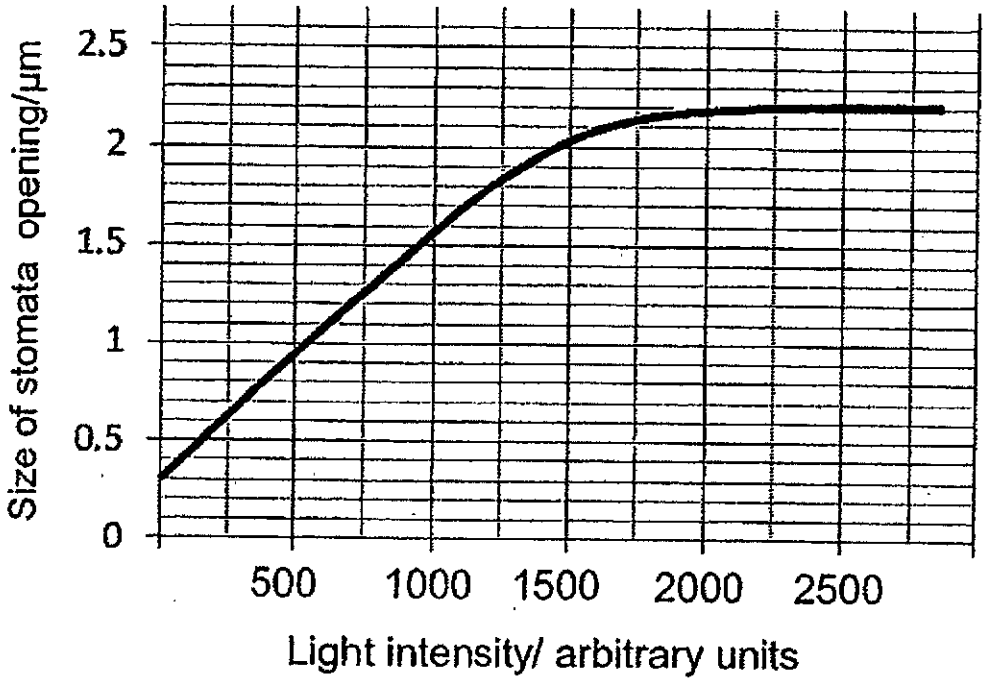
.....

.....

..... [5]

(b) This plant was exposed to carbon dioxide concentration of 0.03%. The size of the stomata opening on the plant is measure at different light intensity.

The results were plotted as follows.



(i) With reference to the graph above, describe the relationship between light intensity and size of stomata opening.

.....

.....

.....

..... [2]

(ii) Describe and explain how light intensity affects transpiration rate.

.....

.....

.....

.....

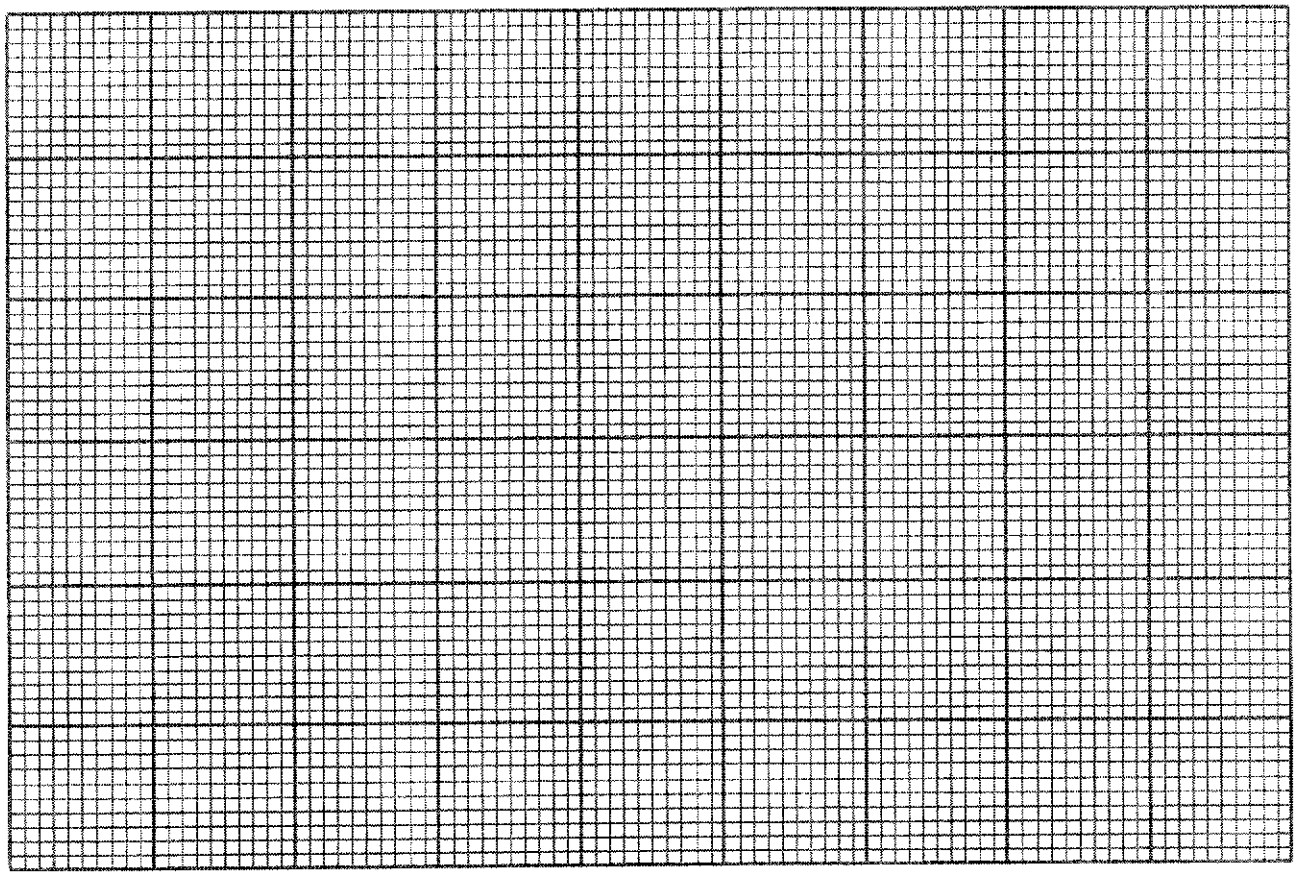
.....

..... [3]

9 The table below shows the thickness of the uterine lining of a woman for a 40-day assessment period.

time / day of assessment	thickness of uterine lining / arbitrary unit
10	3
16	9
20	21
24	21
28	21
32	24
36	24
40	24

(a) Using the information above, plot a graph to show the thickness of the uterine lining of a woman for a 40-day assessment period.



[4]

(b) The woman's menstrual cycle lasts an average of 28 days. Using the data from the graph, state the day or the range of days during which the following key biological events would have taken place.

Describe the processes involved and how the level of hormones could have affected the thickness of the uterine lining.

(i) Ovulation

.....

.....

.....

..... [2]

(ii) Fertilization

.....

.....

.....

.....

.....

..... [3]

(c) A foetus in a woman's womb is suspended in amniotic fluid. State one function of amniotic fluid.

.....

..... [1]

Section B (10 marks)

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

10 Either

(a) The figure below shows a biological molecule.

Name this structure and describe the structure of this molecule.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

(b) Using a named example, explain how a transgenic organism can be produced.

.....

.....

.....

.....

.....

.....

.....

.....

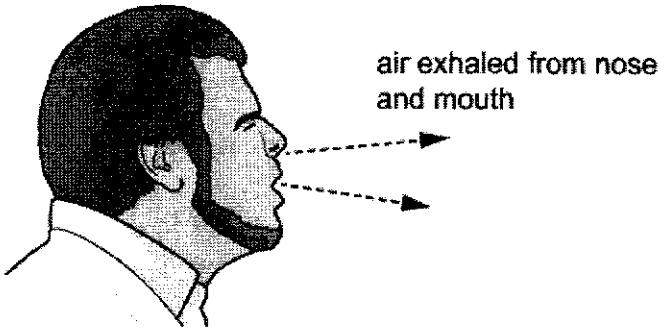
.....

.....

..... [5]

10 OR

A sneeze can be triggered by dust irritating receptor cells in the lining of the nose or throat. During a sneeze, air is exhaled from the lungs with some force and the eyelids close.



(a) Suggest how the closure of the eyelids during a sneeze is coordinated.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) A sudden increase in light intensity can trigger sneezing in some people. This is called photic sneezing. It is estimated that 18 – 35% of the human population can be triggered to sneeze by an increase in light intensity.

The genetic basis for photic sneezing is not fully understood but it is thought that this is caused by a dominant allele.

(i) Describe what is meant by the term *dominant allele*.

.....

.....

.....

..... [2]

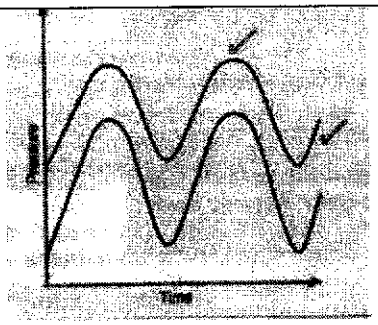
(ii) Using a genetic diagram, discuss the probability of an offspring inheriting the photic sneeze reflex if the mother does not have this condition and the father is heterozygous for the gene responsible for it.

[4]

- End of Paper 2 -

Answers

Qnt	Answer	
1a	Organisms that spread diseases from one person to another ;	
1b	Cell wall – maintain the shape ; Cell membrane – control substances in and out of cell ; DNA/plasmid – contains genetic materials ; Cytoplasm – chemical reactions happens ; Reject nucleus, RER, SER	
1c	Complete dose of antibiotics ; Use antibiotics only when necessary ;	
2a	all four organisms in a diagram ; producer/s and consumer/s linked by lines to reindeer ; correct arrow/s from (grasses ferns and mosses) to ground squirrels ;	
2b	Only 10% of energy is pass to next trophic level : Energy is lost through uneaten body parts ; heat ; undigested food ; (any two for two marks)	
2ci	carbon / C + hydrogen / H + oxygen / O	
2cii	no enzyme to digest lichenan ; as there is no this enzyme gene ;	
3ai	Breathing rate at rest = 1 breath every 5 seconds = 12 breathes per minute; Breathing rate while exercising = 1 breath every 2.5 seconds = 24 breathes per minute; Differences = 24 – 12 = 12 breathes per minute	
3aii	During exercise, require more energy, through aerobic respiration; Body need to take in more oxygen as substrate for aerobic respiration;	
3b	body incurred an oxygen debt and accumulation of lactic acid, produced by anaerobic respiration; oxygen is needed to convert the lactic acid back to sugar/glucose in the liver;	
4a	U: Capillaries; reject glomerulus V: Urea;	
4b	fall in glucose concentration then concentration rises; Kidney filters all glucose but is selectively reabsorbed into blood at proximal convoluted tubule; however, final concentration lower than original as some is used in respiration for energy ;	
5	3: bicuspid valve ; P: right ventricle ;	
5b	**1**: Closed **2**: Open **3**: Closed **4**: Open for every 2 correct answers	

5c	 Graph higher than original ; Crests and troughs at similar time points as original ;	
6abi	The level of iodine solution in tubing **A** decreased ;	
6aii	The concentrated starch solution in tubing **B** turned blue-black ;	
6b	There is a higher concentration of iodine molecules in tubing **B** as compared to the surrounding concentrated starch solution ; Iodine molecules are small enough to diffuse through the pores of tubing **B** into the starch solution. react with starch, turning the starch solution blue-black ; Starch molecules are too large to pass through the pores of tubing **B**. ;	
6c	Ileum; Starch is too huge to pass through the walls of the ileum; Must be digested into small soluble glucose before it can be absorbed ;	
7a	Insect/ Bee/ Butterfly ; Nectar guides/ non-feathery stigma/ large petals/ non-pendulous stamens (**R**: colourful/ sweet smelling/ nectar present as these are not observable)	
7b	Disadvantage: Energy consuming as need to attrach insects ; Advantages: Use less pollen grain ; Pollinate flowers far away, increases genetic variation ;	
7c	Spontaneous mutation takes place, resulting in variation in the organisms; Natural selection occurs where best adapted organisms, with favourable traits, survive; These plants reproduce and pass on their favourable genes to their offspring;	
8a	(J) cuticle ; transparent / allows light through ; (K) palisade ; chloroplasts / chlorophyll + absorb light **AW** ; (L) lower epidermis ; guard cells / stomata for gaseous exchange ; correct identification 2 for 1 mark, 3 for 2 marks.	

8bi	As light intensity increases from 0 to 2000 arbitrary units the size increase from 0.3 to 2.2 micro m. As light intensity increase after 2000 arbitrary units, the stomata opening remains at 2.2 micro m.	
8bii	Light intensity increase, increase rate of photosynthesis; Guard cell will use the energy and cause the stomata to open wider; More water vapor will be lost and increase the rate of transpiration.	
9a	Correct scale Correct labelling of axes with unit Correct plot Best fit with no extrapolation	
9bi	Day 16 – 20 (accept day within this range); Developing follicle (ovary) secretes estrogen for the repair and thickening of uterine lining; Estrogen level at its peak will trigger ovulation.	
9bii	accept any 3 days plus minus answer in 6bi ; After fertilization, zygote undergoes repeated cell division to form embryo and moves from the oviduct to the uterus for implantation; Corpus luteum secretes progesterone to cause further thickening of the uterine lining for implantation of the embryo.	
9c	Provides protection for the developing foetus against shock and impact / surrounds the developing foetus and allows for foetal movement / lubricates the vagina during child birth. (Accepts any one reasonable function) (reject: Amniotic fluid contains nutrients and oxygen that diffuses into foetal blood and nourishes baby)	
Ea	DNA ; two / double strands, double helix ; made of nucleotides made of deoxyribose, phosphate group and nitrogenous base; strands held together by bonds between the bases ; complementary bases / A – T and C – G ;	
ORa	impulse in sensory neurone ; passes to CNS / brain ; relay neurone ; motor neurone to effector / muscle ; contraction of muscle closes eyelid ;	
ORbi	dominant: always expressed ; allele: alternative form of a gene / variation of a gene ;	
ORbii	Mother rr and father Rr; Gametes correct and circled; Correct cross ; Probability of 0.5	