TANJONG KATONG GIRLS' SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME

CLASS 4

INDEX NUMBER

BIOLOGY

Paper 1 Multiple Choice

6093/01
22 August 2024
1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Write your name, index number on the Answer Sheet.

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

Read the instructions on the Answer Sheet very carefully.

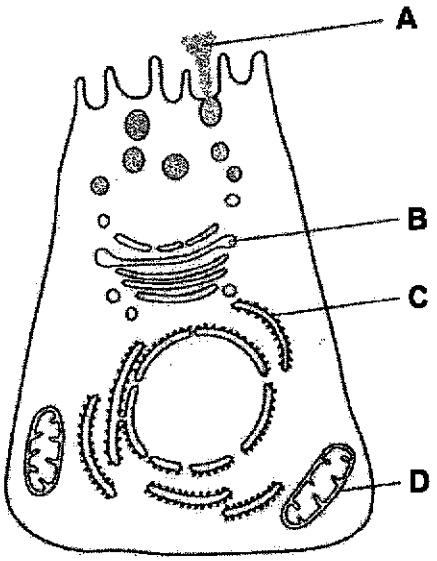
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **20** printed pages.

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1 The diagram shows a cell viewed under an electron microscope.

Which structure is responsible for the modification and packaging of substances for secretion out of the cell?



2 A unicellular organism containing sodium ions at a concentration of 0.1 mM lives in a pond of sodium concentration 0.01mM.

How does the organism absorb sodium ions?

A osmosis

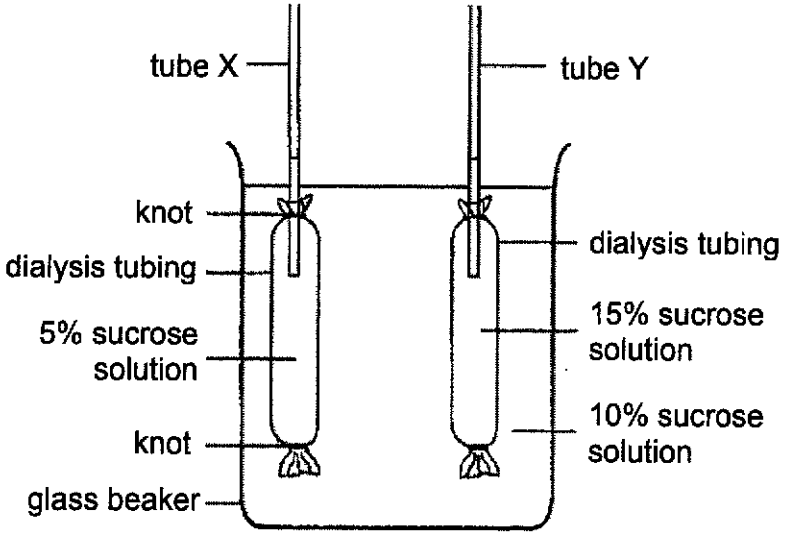
B diffusion

C ingestion

D active transport

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3 The diagram shows an experiment setup to investigate osmosis.



What will happen to the liquid levels in tube X and tube Y after 30 minutes?

	tube X	tube Y
A	rise	fall
B	fall	rise
C	rise	rise
D	fall	fall

4 During deamination, which element is **significantly** removed from an amino acid molecule?

A carbon

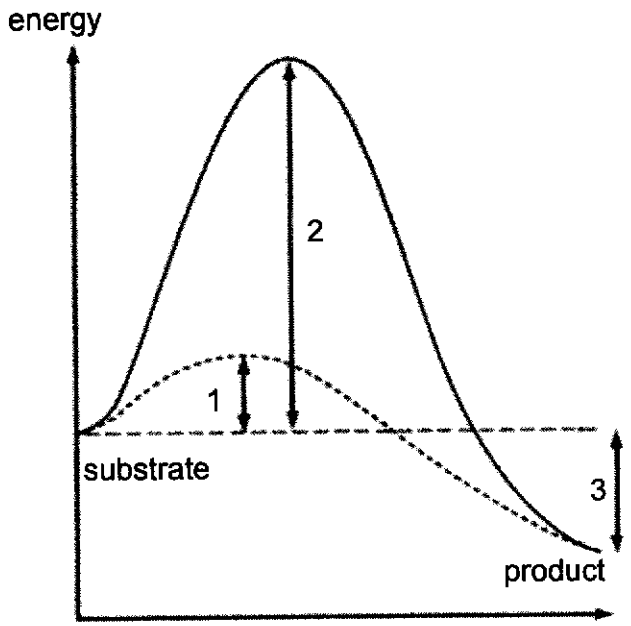
B oxygen

C nitrogen

D hydrogen

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5 The graph shows two possible energy changes of an enzyme-controlled reaction.

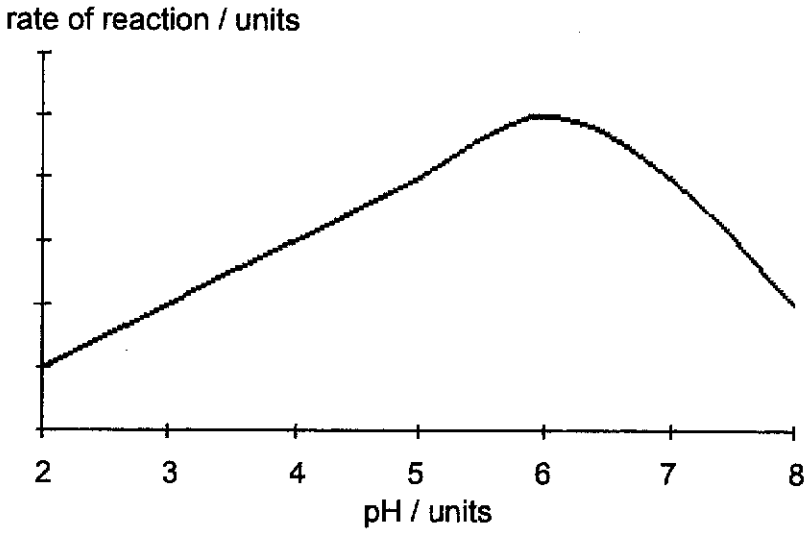


Which represents the activation energy of the reaction with and without the enzyme?

	with enzyme	without enzyme
A	1 + 2	1
B	1	2
C	1 + 3	2 + 3
D	1	2 – 1

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6 The graph shows the rate of reaction of an enzyme under different pH.



Which statement is correct?

A The enzyme is inactive at pH 2.

B The time taken for the reaction to complete is highest around pH 6.

C The rate of enzyme-substrate complexes formed is highest at pH 6.

D The collision of enzyme and substrate molecules is highest at pH 5.

7 A student mixes 2 cm^3 of starch to 1 cm^3 of salivary amylase in a test tube. He leaves the test tube standing for 30 minutes.

What are the colour observations if the student perform iodine and Biuret tests on the contents in the test tube?

A yellowish brown and blue colourations

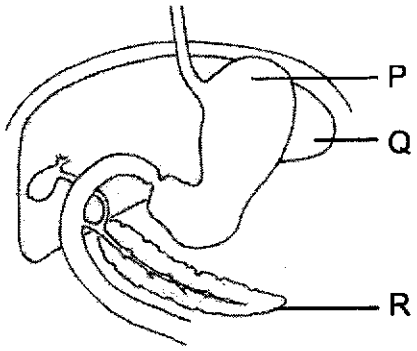
B yellowish brown and violet colourations

C blue-black and blue colourations

D blue-black and violet colourations

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8 The diagram shows a section of the alimentary canal.



What processes are occurring at P, Q and R?

	P	Q	R
A	assimilation	detoxification	storage
B	digestion	storage	absorption
C	digestion	detoxification	secretion
D	egestion	absorption	digestion

9 The diagram shows a tissue found in the small intestine.

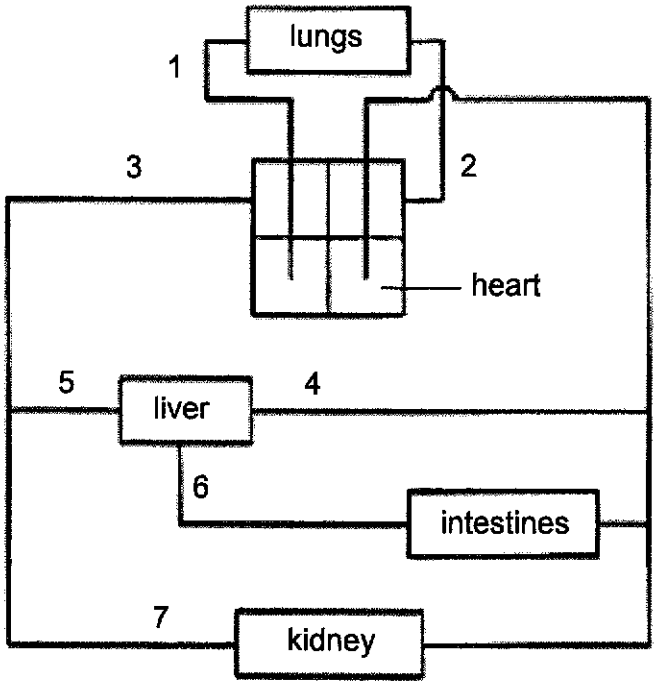


Which adaptation is **not** true to the description made of the tissue?

	description	adaptation
A	thin epithelium	absorbs protein more efficiently
B	dense network of blood capillaries	transports glucose
C	presence of microvilli	absorbs nutrients more efficiently
D	highly folded	more surface area to volume ratio for more absorption

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10 The diagram shows part of the circulatory system.



Which row shows the correct blood vessels?

	hepatic portal vein	hepatic vein	renal vein
A	2	5	1
B	5	6	7
C	6	4	3
D	6	5	7

11 Which is a correct property of a blood capillary?

A The blood capillary is one-cell thick.

B The wall of the blood capillary is partially permeable.

C The blood capillary can vasodilate due to muscle cells in its walls.

D The blood pressure in the blood capillary is the lowest compared to the artery and the vein.

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12 A person who is blood group A can _____.

A donate blood to blood group O

B donate blood to blood group AB

C receive blood from blood group B

D receive blood from blood group AB

13 The Heimlich maneuver is a first-aid method administered to a person who is experiencing choking. It involves thrusting in the abdominal area of the person to force the object that causes the individual to choke out of the body.



With respect to pressure and volume in the thoracic cavity, what is the best explanation for this?

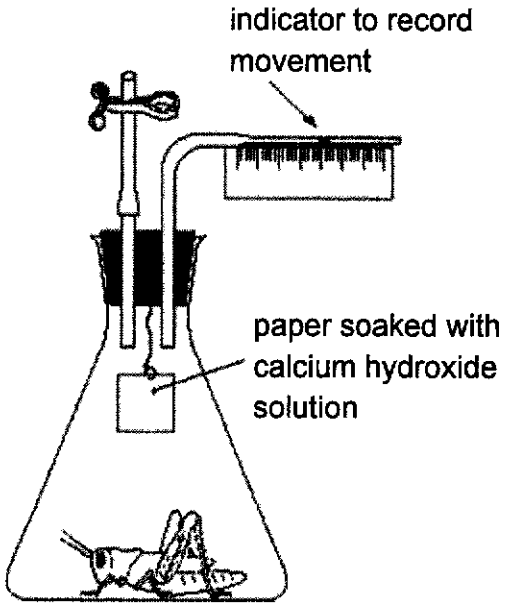
	thoracic cavity	
	volume	pressure
A	decrease	decrease
B	increase	decrease
C	decrease	increase
D	increase	increase

14 What changes will have occured to cause muscle fatigue?

	glycogen	lactic acid	pH
A	decreased	increased	decreased
B	decreased	decreased	increased
C	increased	increased	decreased
D	increased	decreased	increased

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15 The diagram shows an experiment setup to investigate respiration in an insect.



What does the experiment measure and what is the purpose of calcium hydroxide solution?

	experiment measures	calcium hydroxide
A	amount of oxygen absorbed	absorb oxygen
B	amount of oxygen absorbed	absorb carbon dioxide
C	amount of carbon dioxide released	release oxygen
D	amount of carbon dioxide released	release carbon dioxide

16 What is the significance in the directions of flow of the dialysis fluid and blood in kidney dialysis?

A Speed up the flow of blood in the kidney dialysis machine.

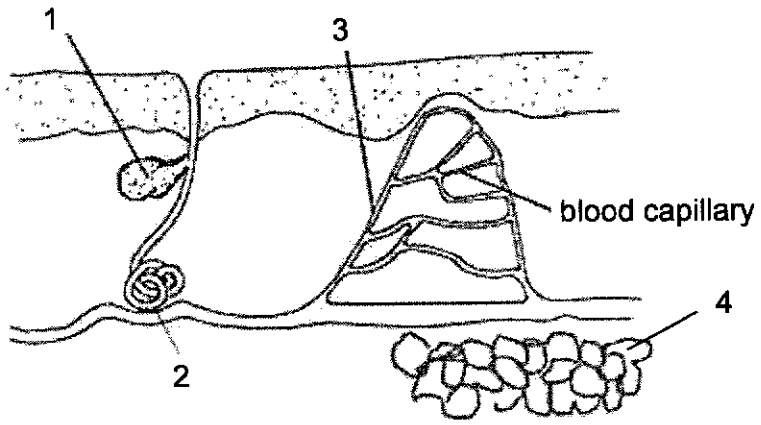
B Slow down the transfer of waste products in the dialysis machine.

C Ensure that waste products will continuously enter the dialysis fluid.

D Ensure that the difference in the concentrations of waste products in blood and dialysis fluid is small.

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17 The diagram shows a section through a skin of a man.



Which parts will be activated when the man moves from a hot kitchen into an air-conditioned room?

A 1 and 2 only

B 2 and 3 only

C 3 and 4 only

D 2, 3 and 4 only

18 Which statements on the endocrine gland are correct?

1 secretes substances through ducts

2 substances are produced by the brain

3 production of substances is involuntary

4 substances secreted are transported by blood

A 1 and 2 only

B 3 and 4 only

C 1, 2 and 3 only

D 1, 3 and 4 only

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19 How does the injection of insulin into a diabetic patient lead to a lowering of blood glucose concentration?

A increase excretion of glucose

B stimulates the production of glucagon

C decrease permeability of cells to glucose

D increase the formation of polysaccharides

20 What happens when a person is sweating excessively?

	blood water potential	ADH	reabsorption of water
A	increase	increase	increase
B	increase	decrease	decrease
C	decrease	increase	increase
D	decrease	decrease	no change

21 Sometimes a physical injury to the eye may result in a section of the retina being detached from the choroid.

What happens to the individual when such an injury happens?

A The person can still see normally as the retina is still in the eye.

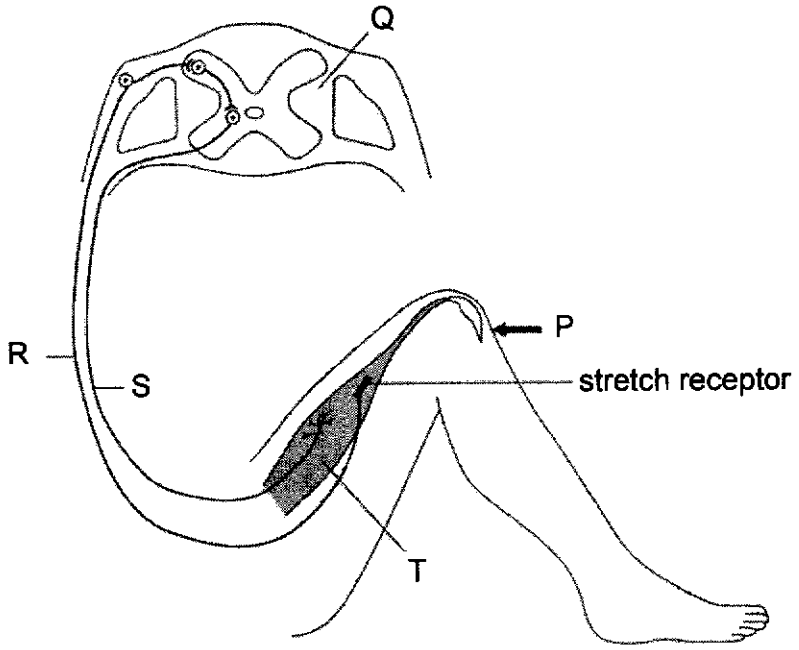
B The person's vision will be sharp as the retina is not obstructing the choroid.

C The person becomes partially blind due to the overstimulation of receptors in the choroid.

D The person becomes partially blind because the cells of the retina are unable to receive nutrients from the choroid.

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22 The diagram shows the nervous pathway for a knee-jerk reflex. When the person is hit at P, the lower leg will be raised involuntarily.



Which are the motor neurone and effector?

	motor neurone	effector
A	S	Q
B	S	T
C	R	Q
D	R	T

23 Which muscles in the eye help in accommodation?

1 radial muscles
2 rectus muscles
3 ciliary muscles
4 suspensory ligaments

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

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24 Which statement about AIDS is true?

A AIDS can be treated with antibiotics.

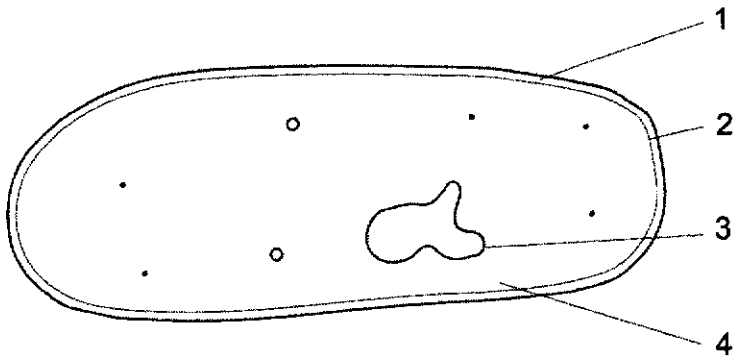
B AIDS is caused by the human immunodeficiency bacteria.

C AIDS can be transmitted through exchange of any bodily fluids.

D AIDS is a sexually transmitted infection that affects the immune system.

25 The diagram shows a bacterial cell with labelled features, 1 to 4.

1 cell wall
2 cell membrane
3 genetic material
4 cytoplasm



Which feature(s) is/are also found in a virus?

A 2 only

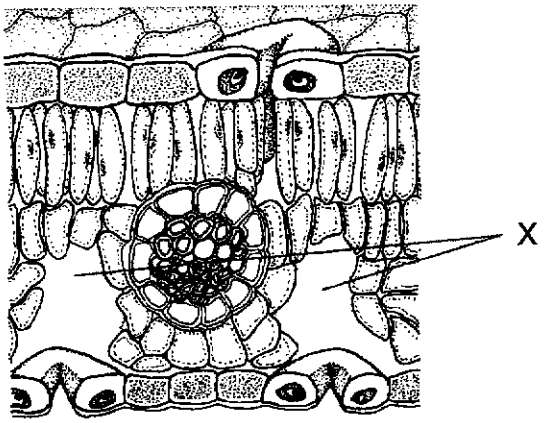
B 3 only

C 1 and 3 only

D 2 and 4 only

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26 The diagram shows a section of a leaf.



What is a function of X?

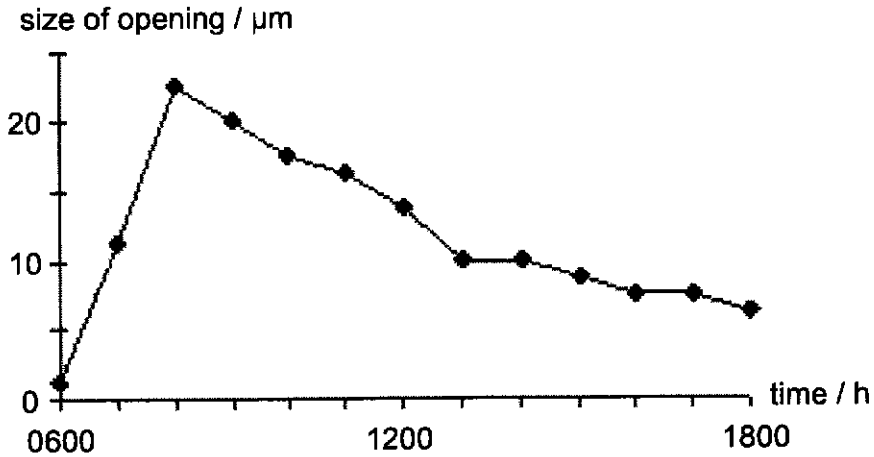
A Enables nutrients to move.

B Enables gases to exchange.

C Enables the leaf to retain water.

D Enables the leaf to lose excess liquids.

27 The graph shows how the size of stomatal openings varies throughout the day.



Which statement is correct?

A It is hottest at 0800h than at 1200h.

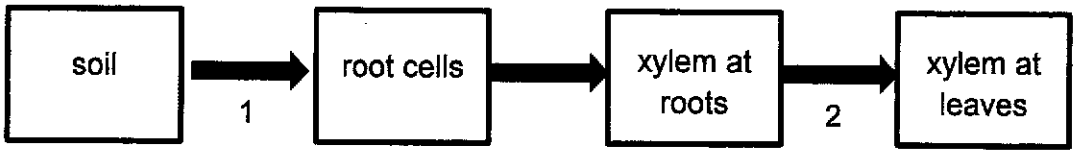
B More light is available at 0800h than at 1200h.

C Water availability is constant throughout the day.

D The carbon dioxide concentration is highest at 0800h and then decreases until 1800h.

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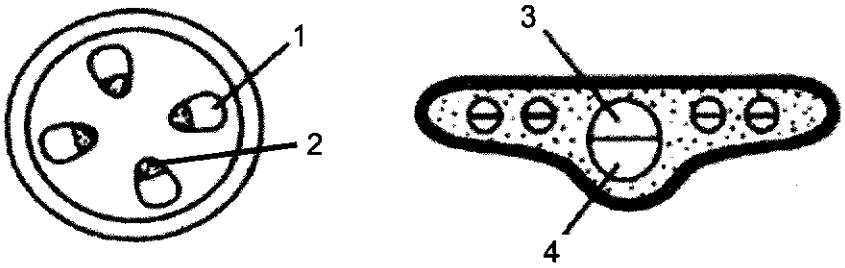
28 The diagram shows how water moves through the roots and stem of a plant.



What are processes 1 and 2?

	process 1	process 2
A	active transport	transpiration pull
B	active transport	osmosis
C	osmosis	transpiration pull
D	osmosis	osmosis

29 In a photosynthesis experiment, a plant was exposed to carbon dioxide containing radioactive carbon for 24 hours.



Which parts of the plant, 1 to 4, will contain the most amount of the radioactive carbon?

A 1 and 3

B 1 and 4

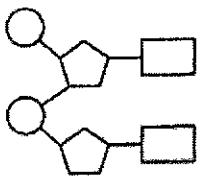
C 2 and 3

D 2 and 4

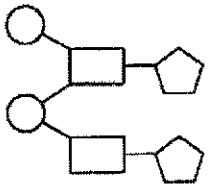
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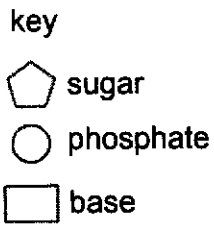
30 Which diagram shows the correct structure consisting of 2 nucleotides in DNA?

A

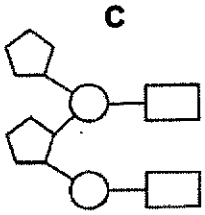


B

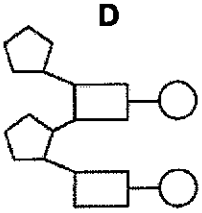




C



D



31 A farmer administers a non-biodegradable insecticide into a lake to kill a type of insect larvae. The larvae will grow into an adult insect which becomes a pest for the farmer's crops. The insecticide is administered once a year in small concentrations that are harmless to the other forms of life in the lake. After several years, it is observed that a large number of water birds that feed only on the fishes in the lake has died.

Which is the most **unlikely** explanation for the death of the water birds?

A The insecticide kills the fishes in the lake.

B The birds have died due to the eutrophication of the lake.

C The birds are at the top of the food chain involving the insect larvae.

D The concentration of insecticide in the water has increased over the years.

32 Which statement does **not** explain the need for conservation of mangrove?

A Mangrove ecosystems are good carbon sinks.

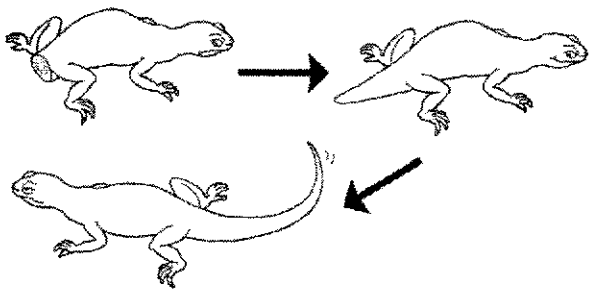
B Mangrove ecosystems provides a rich biodiversity.

C Conservation of mangrove ecosystems reduces soil erosion.

D Conservation of mangrove ecosystems reduces strong winds and waves.

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33 When lizards are faced with danger, they are able to remove their tail and escape. The tail will gradually grow back. The diagram shows the gradual growth of a tail of a lizard after it has been removed.



What process is responsible for the growth of their tail?

A mitosis

B meiosis

C fertilisation

D reproduction

34 A student cut open a fruit and observed that it contains many seeds.

Which statement best explains the observation?

A The flower contains many ovules.

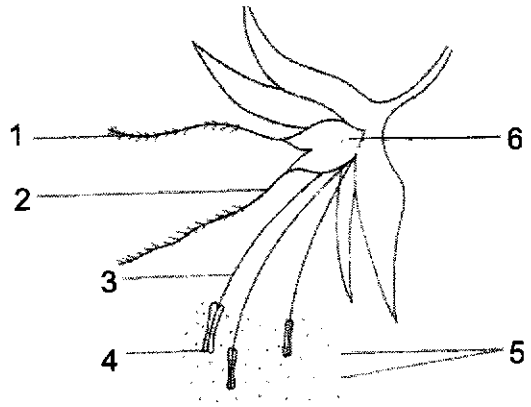
B The flower contains many ovaries.

C The ovum in the flower is fertilised by only one pollen grain.

D The stigma of the flower is feathery to trap a large number of pollen grains.

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35 The diagram shows a wind-pollinated flower.



Which features of the flower help to make wind pollination successful?

A 1, 2, 3 and 4 only

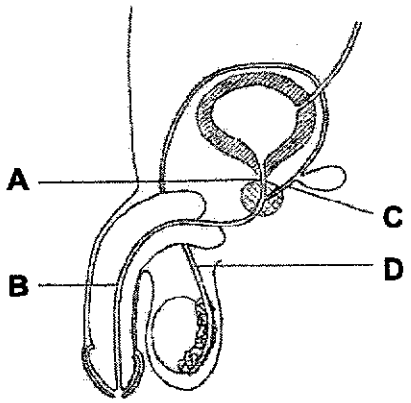
B 1, 2, 3 and 5 only

C 3, 4, 5 and 6 only

D 2, 3, 4, 5 and 6 only

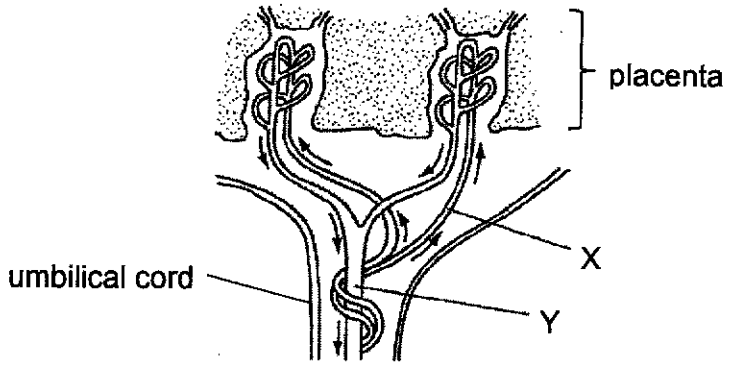
36 The diagram shows a section of the male reproductive system.

Which duct does **not** contain haploid cells?



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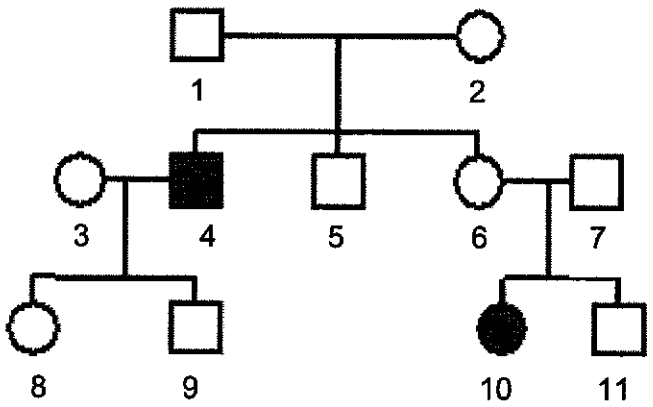
37 The diagram shows the blood vessels in human umbilical cord and placenta.



Which row is correct?

	vessel X	vessel Y	substances in X higher than Y
A	artery	vein	oxygen and glucose
B	artery	vein	urea and carbon dioxide
C	vein	artery	oxygen and glucose
D	vein	artery	urea and carbon dioxide

38 The diagram shows a family tree of individuals infected with a condition.



If Q represents the dominant allele for normal and q represents the recessive allele for the condition, what are the genotypes of individuals 4 and 6?

	individual 4	individual 6
A	QQ	QQ
B	Qq	Qq
C	qq	QQ
D	qq	Qq

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39 In codominance, when two heterozygotes are crossed with each other, what is the expected phenotypic ratio and genotypic ratio?

	phenotypic ratio	genotypic ratio
A	1:1	1:1
B	3:1	1:2:1
C	1:2:1	3:1
D	1:2:1	1:2:1

40 A DNA test on the amniotic fluid of a 16-week pregnant woman revealed the following observations:

1 21st pair of chromosomes has an extra chromosome

2 23rd pair of chromosome is non-homologous

What is the condition and the sex of the unborn fetus?

	condition	sex
A	Down's syndrome	male
B	sickle-cell anaemia	male
C	Down's syndrome	female
D	sickle-cell anaemia	female

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Tanjong Katong Girls' School
Secondary 4 Preliminary Examinations 2024
Answer Key

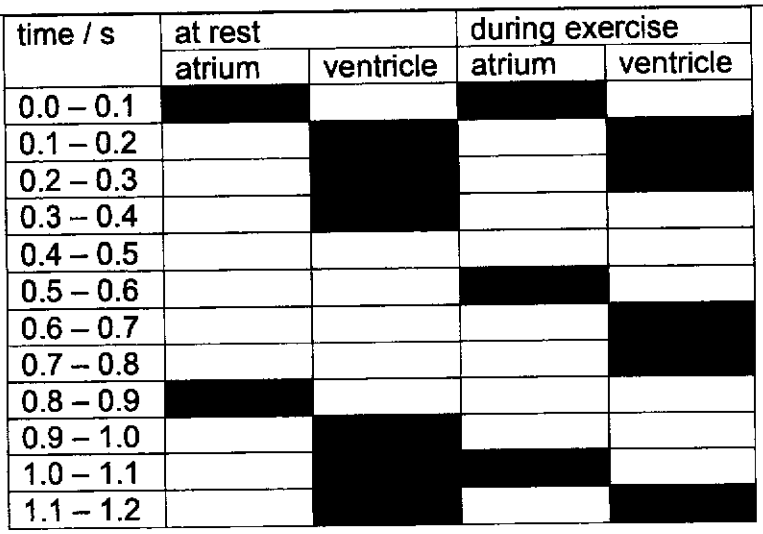
Biology 6093/01

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

Biology 6093/02

Question		Answer	Marks
1	**(a)**	One-cell thick wall + decrease diffusion distance, increase rate of diffusion of gases; Close proximity to a blood capillary + decrease diffusion distance, increase rate of diffusion of gases;	Max 1m
	(b)	Microvilli;	1m
	(c)	Lacteal;	1m
	(d)	Oxygen; Glucose / amino acids / water / vitamins / minerals;	2m
2	**(a)**	B is thicker, more elastic, more muscular than A; (*vice versa*)	1m
	(b)	*Arrows must show the following to get 1m:* *1. right atrium to right ventricle* *2. right ventricle to pulmonary artery* *3. left atrium to left ventricle* *4. left ventricle to aorta*	1m
	(c)	Tricuspid valve; Closes during ventricular systole + prevent blood from entering right atrium;	2m
	(d)(i)	(60 / 0.8) = 75;	1m

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	(d)(ii)	 *Ventricle contraction – 1 or 2 rectangles, as long as lesser than 3* *All chambers relaxation – 1 or 2 or 3 rectangles, as long as lesser than 4* *Must shade until the end*	1m
3	**(a)(i)**	A – glomerulus; B – collecting duct;	2m
	(a)(ii)	Afferent arteriole's lumen is bigger than efferent arteriole's; Creates a high hydrostatic/blood pressure in the glomerulus to force small substances out;	2m
	(b)	Maintain a steep concentration gradient between fluid and blood; (*must write properly*) Allows waste products to diffuse out of blood into fluid; (*reject: "if" answers e.g. if the fluid is not changed…*)	2m
4	**(a)**	$6CO_2 + 6O_2 \rightarrow C_6H_{12}O_6 + 6O_2$; (*light energy and chlorophyll written on the arrow*);	2m
	(b)	Carbon, hydrogen, oxygen;	1m
	(c)	Proteins in water flea is digested into amino acids; Amino acids is used for growth and repair of cells;	2m
5	**(a)**	Rate of transpiration is higher in environment A than B + 9.8 gh^{-1} vs 4.7 gh^{-1}; Or Rate of transpiration in environment A is higher than B by 5.1 gh^{-1}; Increase in humidity lowers rate of transpiration; Gentler / lower concentration gradient between water vapour of air spaces of leaves and environment; (*must write properly*)	3m
	(b)	Did not take into account light intensity;	1m

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