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ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2024

BIOLOGY
6093 / 01

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LEVEL:	Sec 4 Express	**DATE:**	27 August 2024
CLASS:	Sec 4/1	**DURATION:**	1 hour

Additional Materials provided: 1 sheet of OAS paper

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME and INDEX NUMBER at the top of this page and on the OAS paper.
Shade your index number on the OAS paper.

PAPER 1 (40 marks)
MULTIPLE CHOICE QUESTIONS
There are 40 questions in this paper. Answer **all** questions.
For each question, there are four possible answers **A**, **B**, **C** and **D**.

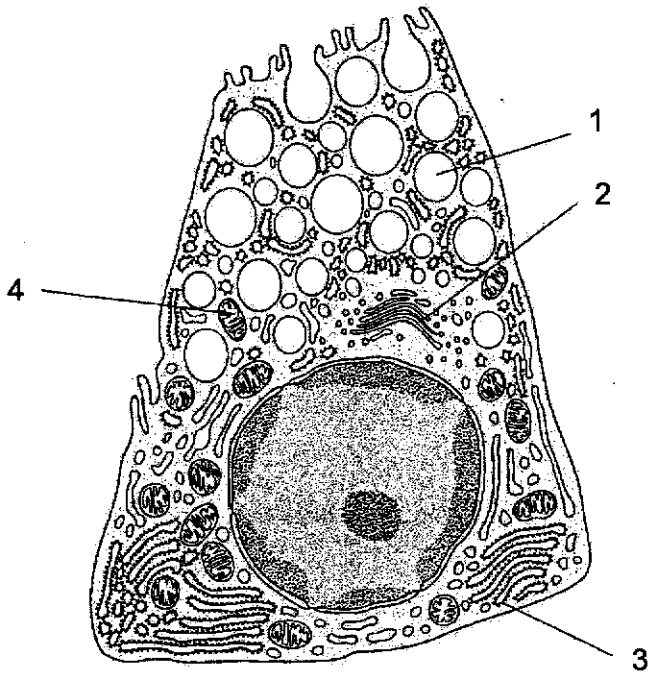
At the end of the examination, hand in your OAS paper and question booklet separately.

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MULTIPLE-CHOICE QUESTIONS [40 marks]

For each question, **there are four** possible answers **A, B, C** and **D**.
Choose the one you consider correct and record your choice in the OAS paper provided.

1 The diagram shows an electron micrograph of an animal cell.
Which row shows the correct identity of 1, 2, 3 and 4?



	1	2	3	4
A	ribosome	smooth endoplasmic reticulum	rough endoplasmic reticulum	chloroplast
B	chloroplast	smooth endoplasmic reticulum	Golgi apparatus	mitochondrion
C	vacuole	Golgi apparatus	rough endoplasmic reticulum	mitochondrion
D	vacuole	rough endoplasmic reticulum	smooth endoplasmic reticulum	chloroplast

2 Which cells contain DNA?

1 guard cell

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2 palisade mesophyll cell

3 sieve tube cell

4 xylem cell

A 1 and 2

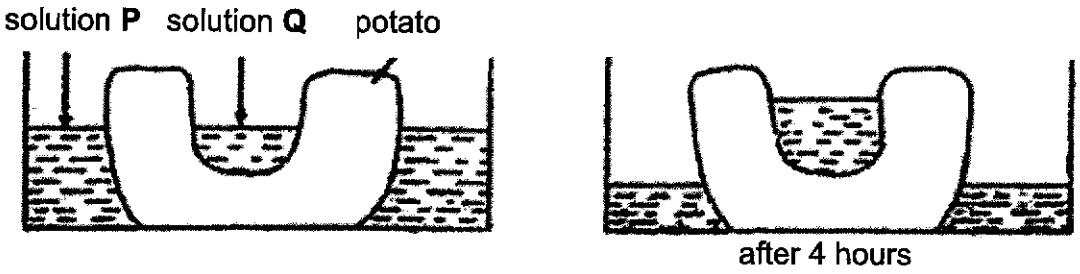
B 1 and 3

C 2 and 4 only

D 2, 3 and 4

3 A peeled potato shaped into a cup was placed in a container. Salt solutions of varying concentrations were poured into the centre of the potato and the rest of the container.

The water potential of the potato flesh was determined to be similar to that of a salt solution with a concentration of 0.4 mol/dm^3.



Which row shows the possible concentrations of solutions **P** and **Q**?

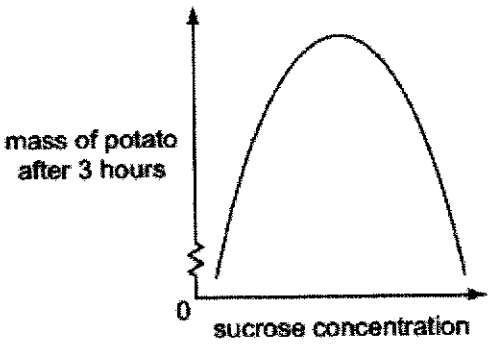
	solution **P**	solution **Q**
A	0.1 mol/dm^3	0.3 mol/dm^3
B	0.2 mol/dm^3	0.6 mol/dm^3
C	0.4 mol/dm^3	0.8 mol/dm^3
D	0.8 mol/dm^3	0.2 mol/dm^3

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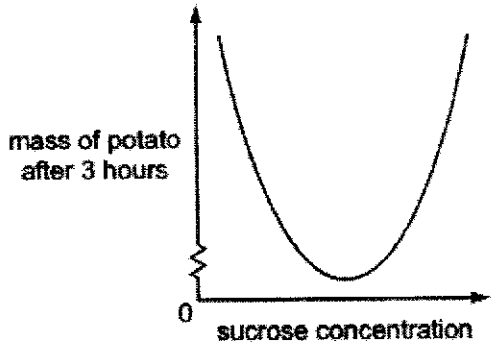
4 Identical potato strips were placed in sucrose solutions of varying concentrations. After three hours, the mass of each potato strip was measured.

Which graph shows the result of the experiment?

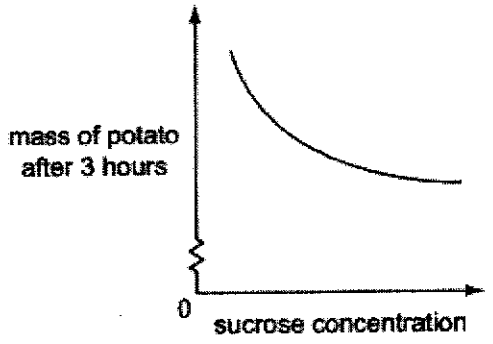
A



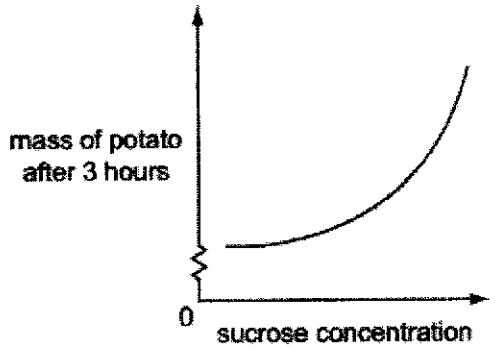
B



C



D



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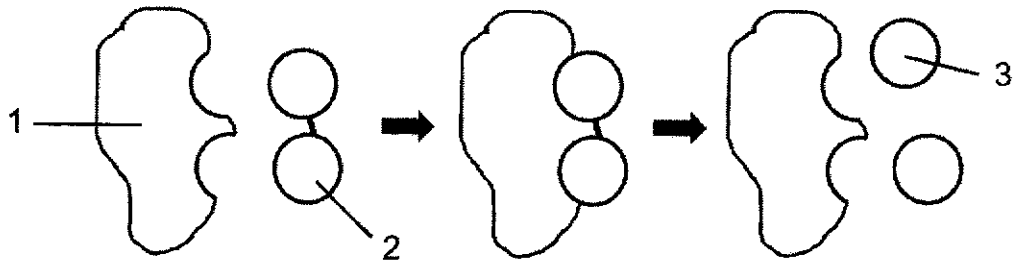
5 A student carried out tests on a food sample. The results are shown in the table.

test	observation of sample
biuret test	violet
ethanol emulsion test	colourless
Benedict's test	orange ppt

What did the sample contain?

	protein	reducing sugar	fat
A	✓	✓	X
B	✓	X	✓
C	X	✓	✓
D	X	X	X

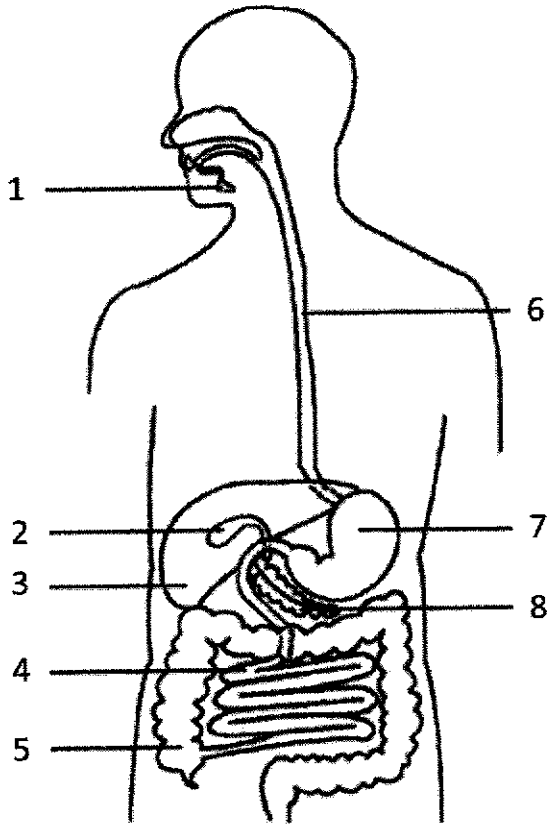
6 Using the 'lock-and-key' hypothesis, which row shows the correct identity of the structures in the diagram?



	1	2	3
A	enzyme	key	substrate
B	key	enzyme	substrate
C	lock	substrate	key
D	lock	substrate	product

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Refer to the diagram of the human digestive system for questions **7** and **8**.



7 Which option shows the organs that produce enzymes involved in the digestion of proteins?

A 1, 3 and 4

B 1, 3 and 8

C 4 and 7 only

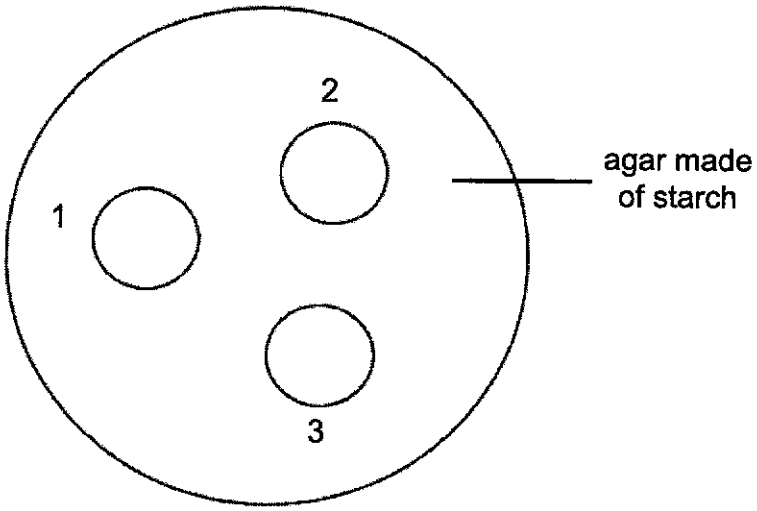
D 4, 7 and 8

8 Which row **does not** correctly show the structure matched to its function?

	structure	function
A	2	production of lipase
B	5	absorption of water
C	6	transport of food to the stomach
D	8	production of amylase

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9 Digestive juices were collected from three different parts of the human alimentary canal. The samples were each dropped into a well made in an agar plate of starch.



After 24 hours, iodine solution was added to each well.
The results are as follows:

well	1	2	3
colour	blue-black	brown	blue-black

Which row shows the possible identities of the digestive juices placed in each well?

	1	2	3
A	pancreatic juice	saliva	stomach juice
B	saliva	stomach juice	pancreatic juice
C	stomach juice	intestinal juice	pancreatic juice
D	stomach juice	pancreatic juice	intestinal juice

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10 A patient, with blood group B, required a blood transfusion. His friends offered to donate blood to him.

Donor X and Y's donations were accepted, but donor Z's donation was rejected.

Which option shows the possible blood groups of the three donors?

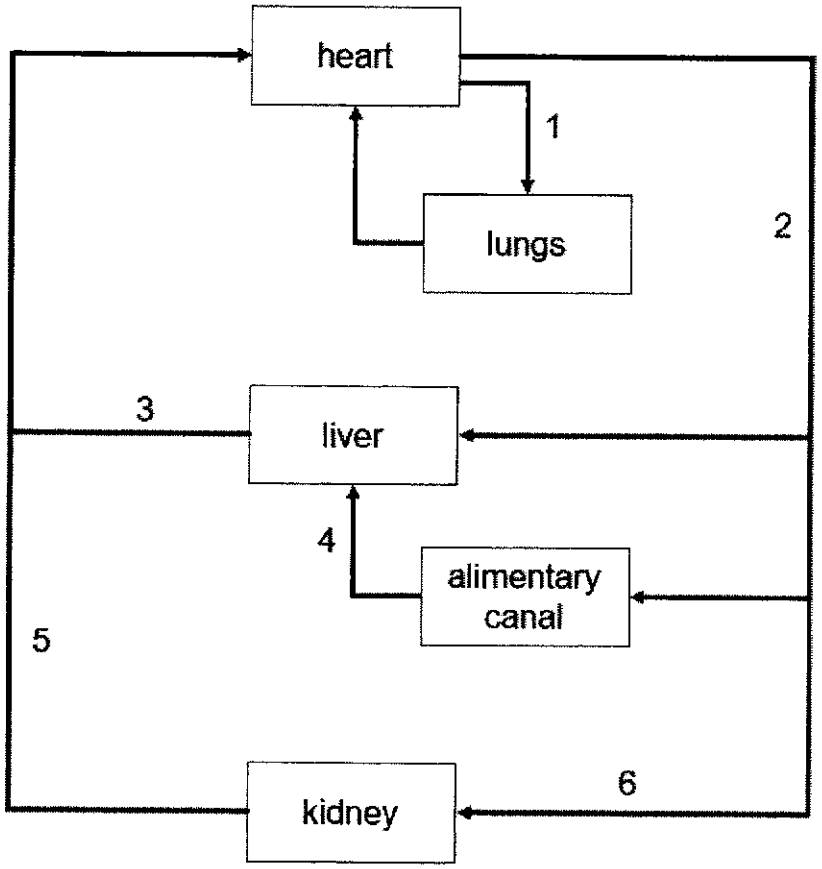
	donor X	donor Y	donor Z
A	AB	B	A
B	AB	B	O
C	B	O	AB
D	O	A	B

11 Which row correctly shows the presence of valves in blood vessels?

	veins	arteries	capillaries
A	✓	✓	✓
B	✓	✗	✓
C	✓	✗	✗
D	✗	✗	✗

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12 The diagram represents part of the human circulatory system.



Which statement is true?

A 2 contains more carbon dioxide than 1.

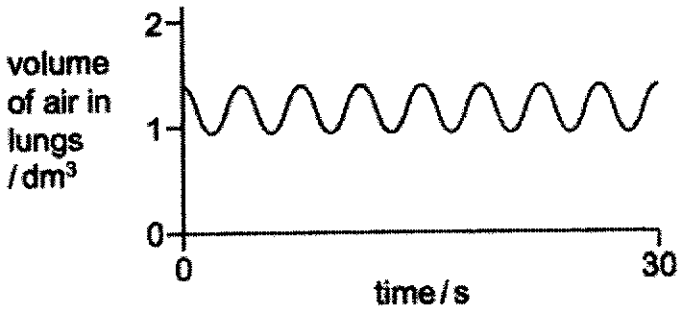
B 3 contains more oxygen than 2.

C 4 contains less glucose than 3.

D 5 contains less urea than 6.

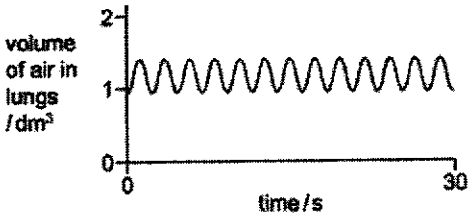
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13 The graph shows the changes in volume of air in a person's lungs at rest for a period of 30 s.

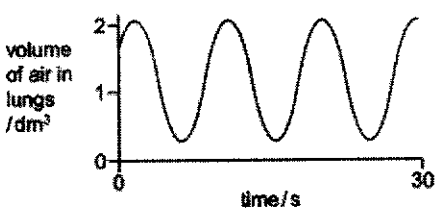


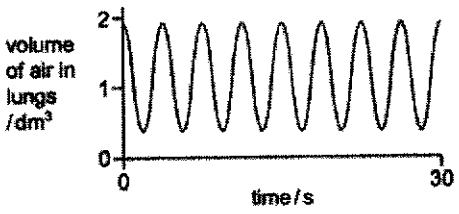
Which option shows the change in volume of air in the person's lungs after he has played an intense game of badminton?

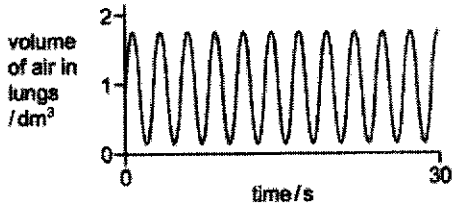
A



B





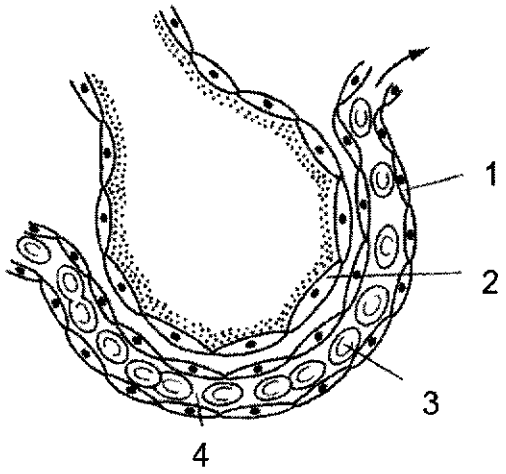


14 Which row is true regarding the effects of the components of tobacco smoke?

	carbon monoxide	tar
A	combines permanently with haemoglobin	paralyses cilia
B	makes blood clot easily	higher risk of emphysema
C	more fatty deposits on walls of coronary arteries	reduced ability of blood to carry oxygen
D	uncontrolled cell division	higher risk of lung cancer

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15 The diagram shows an alveolus and the adjacent blood vessels.



Which statement is **not** true?

A 1 and 2 are one-cell thick to reduce distance for diffusion of gases.

B 2 is coated with a film of moisture to allow carbon dioxide to diffuse in it before diffusing into the bloodstream.

C 3 does not contain a nucleus to transport more oxygen.

D 4 contains glucose.

16 Which option shows the body's response towards dehydration?

1 decreased permeability of collecting duct wall

2 less water excreted

3 more dilute urine

4 more water reabsorbed into bloodstream

A 1, 2 and 4

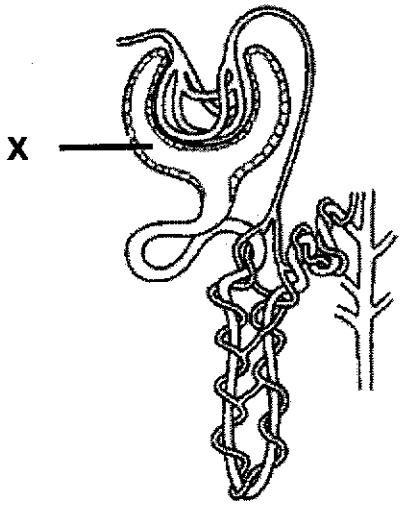
B 2 and 3 only

C 2 and 4 only

D 2, 3 and 4

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17 The diagram shows a kidney tubule.



Which option shows the substances present in **X**?

1 glucose
2 protein
3 salts
4 urea

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

18 Which row shows the body's response to hot weather?

	arterioles in skin	sweat glands	metabolic rate
A	constrict	less sweat	increases
B	constrict	more sweat	decreases
C	dilate	less sweat	increases
D	dilate	more sweat	decreases

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19 During dental surgery, the dentist applies local anaesthetic to the patient's mouth. This affects the transmission of nerve impulses through the trigeminal nerve, which causes the patient to not feel any pain and not be able to smile properly. A few hours after the procedure, the patient will be able to regain normal sensation and function of the area.

Which statements are true?

1 Motor neurones are connected to the trigeminal nerve.

2 Sensory neurones are not connected to the trigeminal nerve.

3 The anaesthetic affects transmission of impulses to the effectors.

4 The anaesthetic destroys the receptors in the mouth.

A 1 and 3

B 1, 2 and 4

C 2 and 3 only

D 2 and 4

20 Which statement is true regarding voluntary and reflex actions?

A Both actions involve transmission of nerve impulses to the brain.

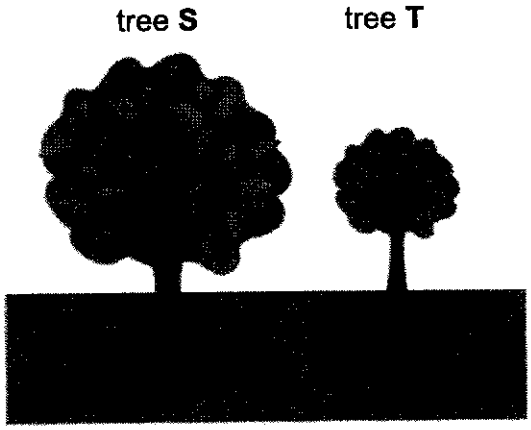
B Reflex actions are usually quicker than voluntary actions.

C Reflex actions may or may not be consciously controlled.

D Voluntary actions are initiated by stimulation of receptors.

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21 Which row shows the changes in the eye as a person shifts their focus from tree **S** to tree **T**?



	ciliary muscles	suspensory ligaments	lens
A	contract	slacken	thinner
B	contract	tighten	thicker
C	relax	slacken	thicker
D	relax	tighten	thinner

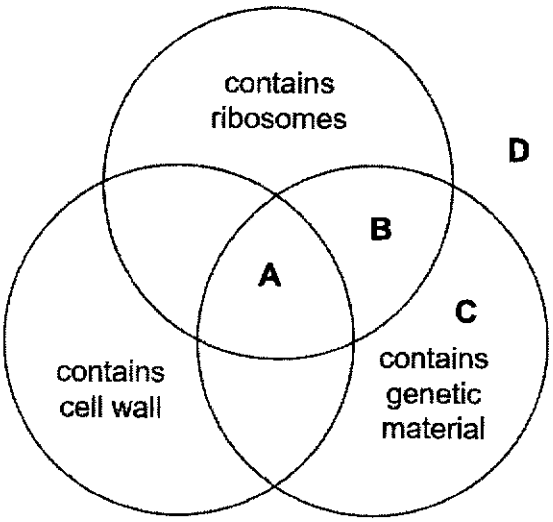
22 Which row shows the changes in the eye when a person switches on a light in a dark room?

	pupil	iris	
		circular muscles	radial muscles
A	constrict	contract	relax
B	constrict	relax	contract
C	dilate	contract	relax
D	dilate	relax	contract

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23 The venn diagram shows the presence of various structures in bacteria and viruses.

Which option shows where viruses will be placed?



24 Which row correctly identifies an infectious and a non-infectious disease?

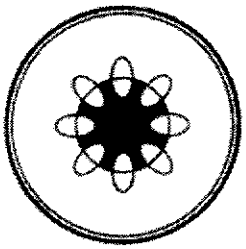
	infectious disease	non-infectious disease
A	coronary heart disease	influenza
B	COVID-19	pneumococcal disease
C	diabetes	sickle-cell anaemia
D	HIV	cancer

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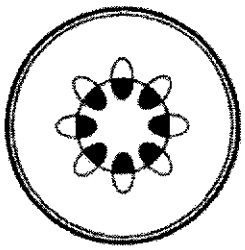
25 A plant has its roots chopped off, and is placed in a vase containing black food dye. After 2 hours, the stem of the plant is cut and observed under a microscope?

Which option shows the cross section of the stem?

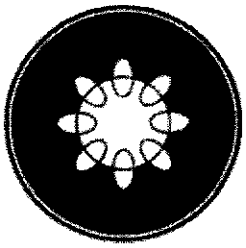
A



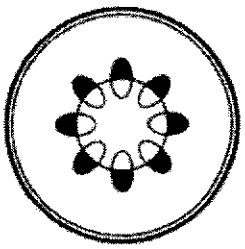
B



C



D

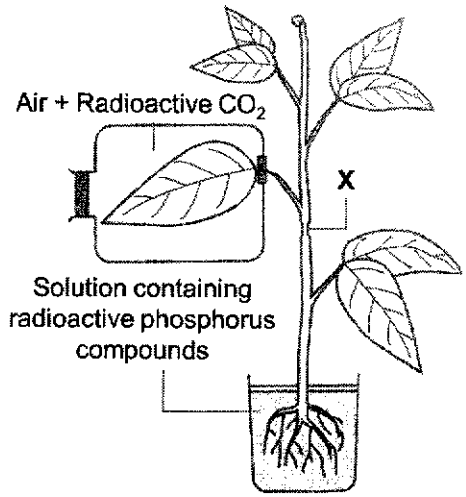


26 Which row shows the changes in the guard cells and stomata of a typical plant under various lighting conditions?

	guard cells	stomata	lighting conditions
A	flaccid	close	dark
B	flaccid	open	light
C	turgid	close	light
D	turgid	open	dark

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27 The diagram below shows a plant with the section **X** removed from the stem. After a few hours, the amounts of radioactive carbon and phosphorus in various parts of the plant were determined.



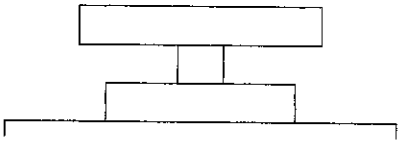
Which row shows the possible locations where radioactive carbon and phosphorus will be detected?

	radioactive carbon	radioactive phosphorus
A	leaves above **X**	leaves above **X**
B	leaves below **X**	leaves above **X**
C	roots	stem below **X**
D	stem below **X**	stem above **X**

28 Which diagram best represents the pyramid of biomass for this food chain?

grass → rabbit → wolf → flea

A



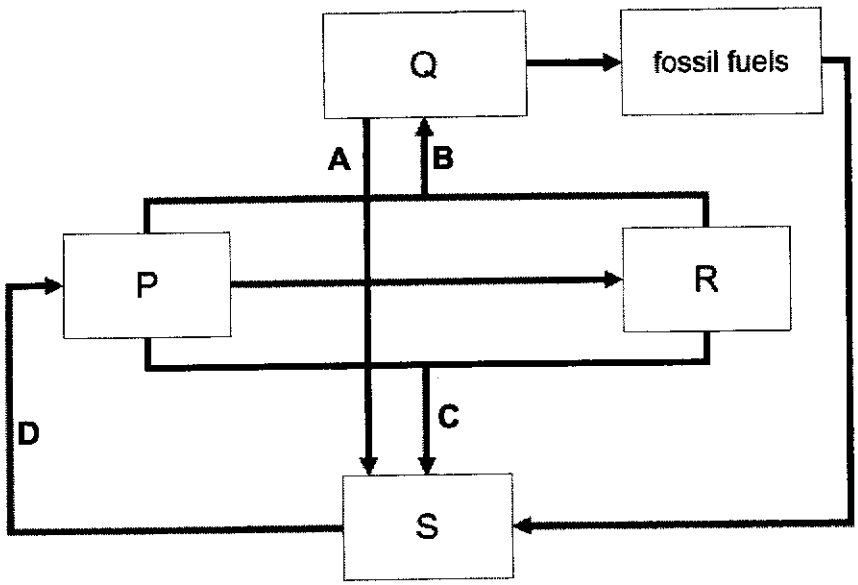
B



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29 The diagram shows the carbon cycle.

Which arrow represents respiration?



30 A scientist found that 35% of the nucleotide bases in a cell are guanine.

What would be the expected percentage of bases which are thymine?

A 15%

B 35%

C 65%

D 70%

31 What is the purpose of heat shock in genetic engineering?

A to activate the gene of interest

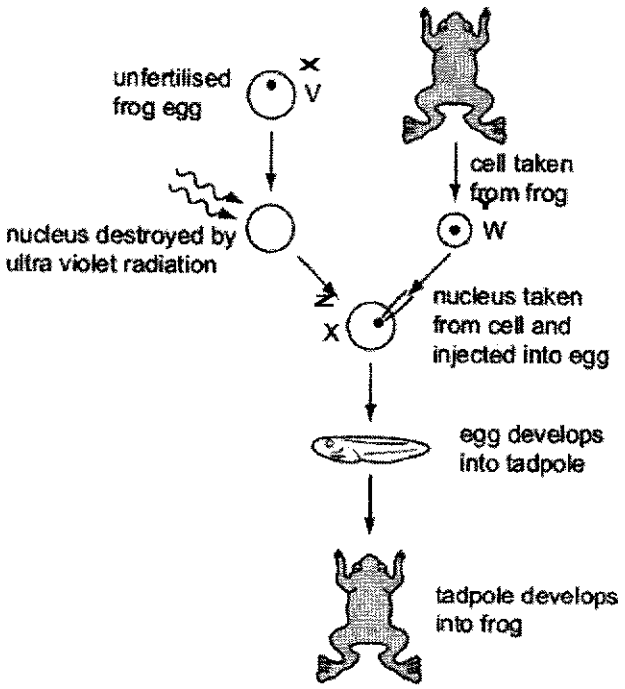
B to break bonds between DNA strands

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C to destroy the bacteria cell wall

D to open up pores in the bacteria cell membrane

32 The diagram shows how a genetically identical frog can be developed from an unfertilised egg. The diploid number (2n) of a frog is 26.



Which row shows the number of chromosomes at **X**, **Y**, and **Z**?

	X	Y	Z
A	13	13	26
B	13	26	13
C	13	26	26
D	26	13	13

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33 Which processes involve meiosis?

1 formation of zygote

2 production of pollen grains

3 production of red blood cells

4 production of sperm

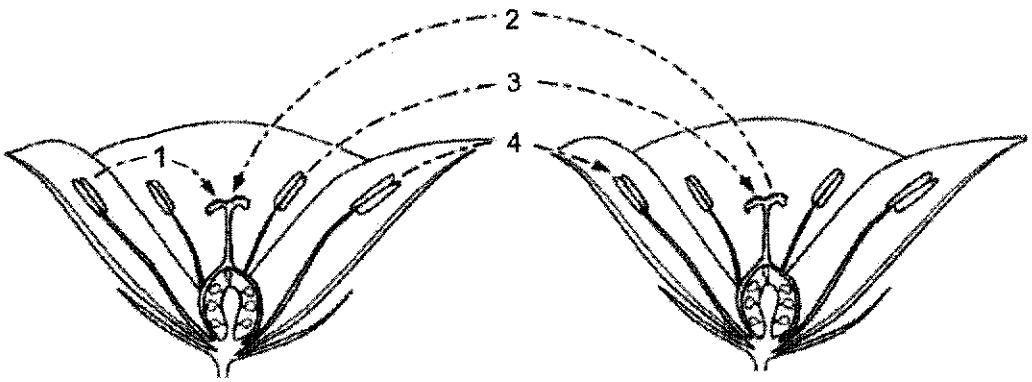
A 1 and 3

B 1, 2 and 4

C 2 and 4 only

D 2, 3 and 4

34 The diagram shows two flowers from two different plants of the same species.
Which arrow(s) show cross pollination?



A 1 and 2

B 2 and 3 only

C 2, 3 and 4

D 3 only

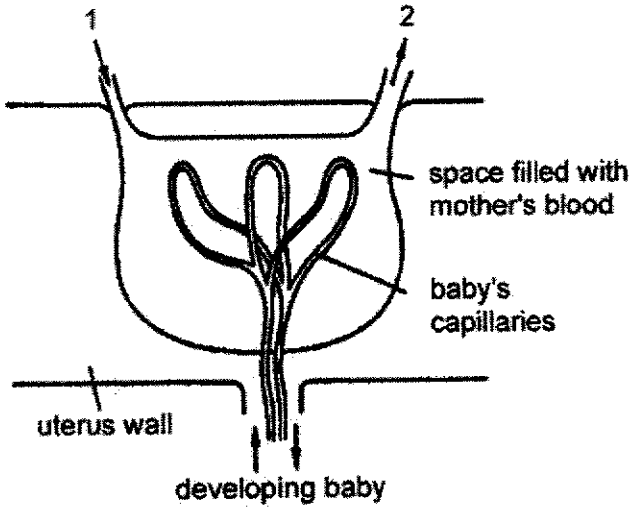
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35 Which row shows the characteristics of a typical insect-pollinated flower?

	colour	size of stigma	smell
A	bright	large	odourless
B	bright	small	strong
C	dull	small	odourless
D	dull	large	strong

36 The graph shows the structure of the placenta in the body of a pregnant woman.



Which statements are true?

1 The glucose concentration in 1 is higher than 2.

2 The mother's and baby's blood groups are always identical.

3 1 has a higher concentration of carbon dioxide than 2.

4 2 contains more urea than 1.

A 1 and 4 only

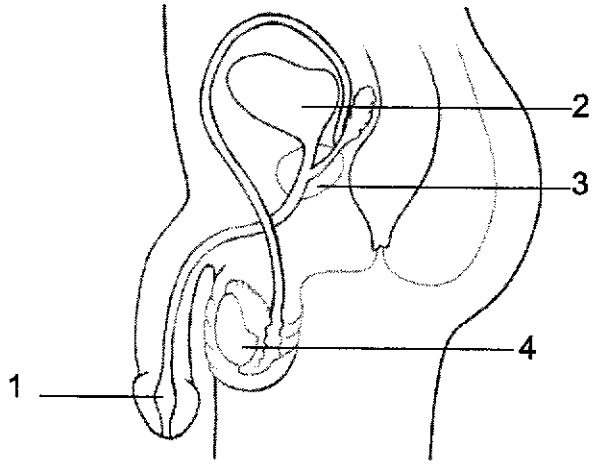
B 1, 3 and 4

C 2 and 3

D 2 and 4

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37 The diagram shows the male reproductive system.



Which structures are involved in semen production?

A 1 and 3 only

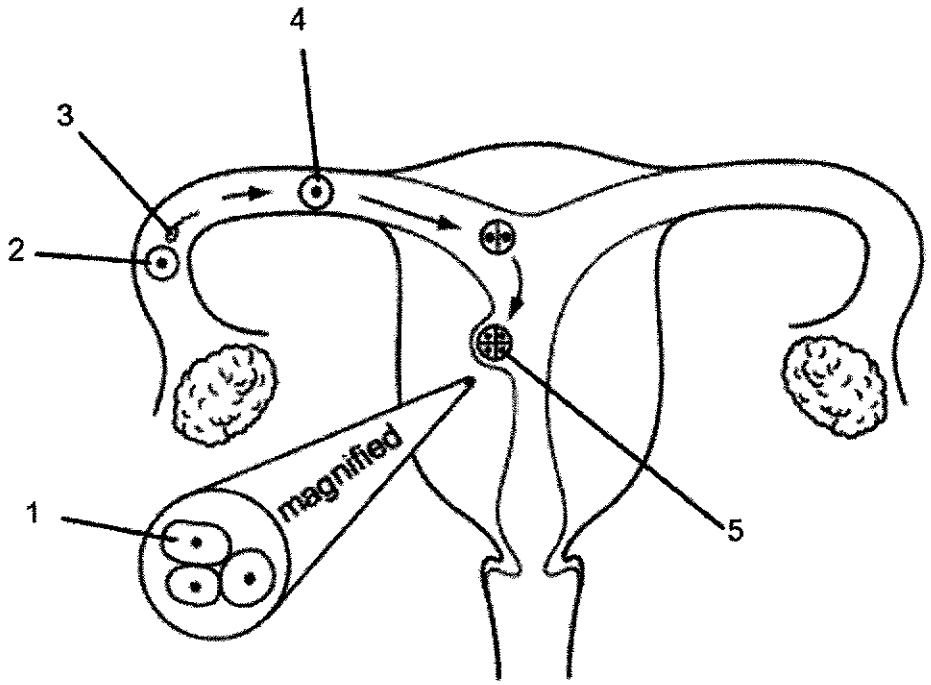
B 1, 2 and 3

C 1, 3 and 4

D 3 and 4 only

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38 The diagram shows the process of fertilisation and implantation in the female reproductive system.



Which cells are genetically identical?

A 1 and 2

B 1 and 5

C 2 and 3

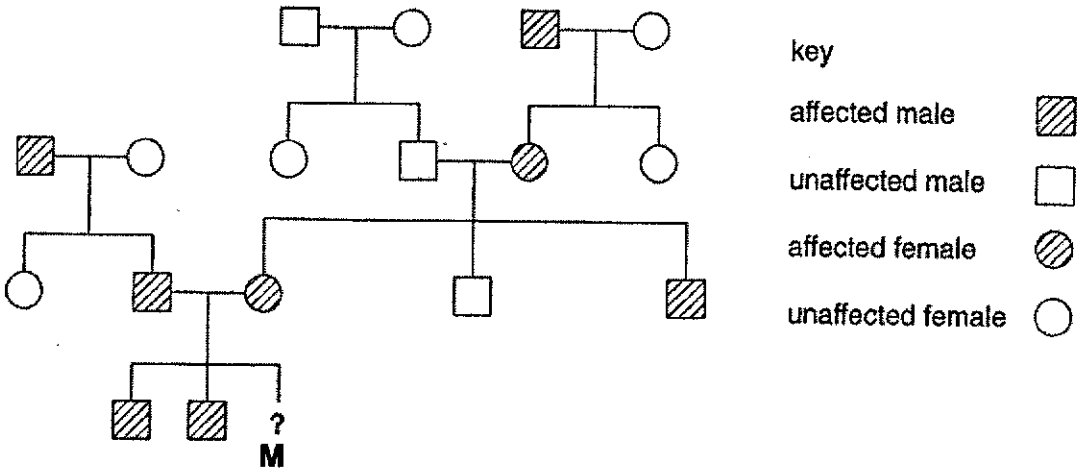
D 4 and 5

39 Which row correctly shows examples of continuous and discontinuous variation?

	continuous	discontinuous
A	blood groups	type of earlobes
B	height	ability to roll tongue
C	skin colour	foot size
D	type of earlobes	sickle-cell anaemia

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40 The family tree shows the individuals affected with a disease, which is a dominant condition.



What is the probability of individual **M** being an unaffected female?

A 12.5%

B 25%

C 50%

D 75%

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PRELIMINARY EXAMINATION 2024

BIOLOGY
6093 / 02

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LEVEL: Sec 4 Express **DATE:** 27 August 2024

CLASS: Sec 4/1 **DURATION:** 1 hour 45 minutes

Additional Materials provided: NIL

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME and INDEX NUMBER at the top of this page.

SECTION A (70 marks)
STRUCTURED QUESTIONS
Answer **all** questions.
Write your answers in the spaces provided.

SECTION B (10 marks)
FREE RESPONSE QUESTIONS
Answer **one** question.
Write your answers in the spaces provided.

For Examiner's Use	
Paper 1	/40
Paper 2 Section A	/70
Paper 2 Section B	/10
Paper 3	/40
Total Marks	/160
Overall	/100

This Question Paper consists of 15 printed pages including this page.
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ASSUMPTION ENGLISH SCHOOL
Sec 4 Biology 6093 Marking Scheme
Preliminary Examination 2024

Paper 1 (40 m)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
C	A	B	C	A	D	D	A	D	C
Q11	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**	**Q18**	**Q19**	**Q20**
C	D	D	A	B	C	C	D	A	B
Q21	**Q22**	**Q23**	**Q24**	**Q25**	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**
D	A	C	D	B	A	A	D	C	A
Q31	**Q32**	**Q33**	**Q34**	**Q35**	**Q36**	**Q37**	**Q38**	**Q39**	**Q40**
D	C	C	D	B	A	D	D	B	A

Paper 2 Section A (70 m)

1	a	Potato strips placed in 8 au sucrose solution had a decrease in mass of 3 au; Water potential of sucrose solution is lower than that of potato strips; Net movement of water molecules from potato strips to sucrose solution; By osmosis 4 pts – 3m, 3 pts – 2m, 2 pts – 1m, 1 pt – 0m	3
	b	5 arbitrary units. When concentration of sucrose solution is 5 au, there is no change in mass of potato strips; There is no net movement of water molecules/osmosis between potato strips and sucrose solution	3
2	a	Duration of 1 heartbeat = 0.8 s Number of heartbeats per min = 60/0.8 = 75 Working – 1m, Ans – 1m 1m for deriving answer from 1 heartbeat = 0.85 s	2
	b	R S P 3 pts – 2m, 2 pts – 1m, 1 pt – 0m	2
	c	At Q, blood pressure of the left ventricle becomes higher than in the aorta. Semilunar/aortic valve opens Blood enters the aorta and blood pressure in the aorta increases. 3 pts – 2m, 2 pts – 1m, 1 pt – 0m Change in pressure	2
3	a	Microvilli Lacteal	2

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	b	X transports **fats**. *1m given for fatty acids and glycerol	1
	ci	W **increases surface area to volume ratio** of the epithelial cells to **increase rate of absorption** of nutrients.	1
	cii	Y is **one cell thick** to **reduce distance** for nutrients to pass through to enter the blood capillary/lacteal.	1
	ciii	Z **releases energy** for **absorption of nutrients** by **active transport**	1
4	a	X T	2
	b	Carbon dioxide **diffuses** into intercellular air spaces through stomata; Carbon dioxide **dissolves** into thin film of moisture; Dissolved carbon dioxide **diffuses** into spongy mesophyll cells. No mention of diffusion, dissolving = 0m	3
	c	Both have cell wall/nucleus/mitochondria etc. Cell X has chloroplasts, while root hair cells do not. Cell X has a regular shape, while root hair cells have long and narrow root hair protruding out. Minimum 1 similarity or 1 difference. 3 pts – 2m, 2 pts – 1m, 1 pt – 0m. All comparisons lumped together – Must fulfil above criteria, and max 1m	2
5	a	Big fish - Primary consumer, Secondary consumer Crocodile – Secondary consumer, Tertiary consumer Smooth-coated otter – Secondary consumer, Tertiary consumer Accept any other suitable answer. No mention of the word 'consumer' – 1m if all correct. 0m for any mistakes. Trophic level 1, 2, 3, 4 etc. – 0m	2
	b	At each trophic level, around 90% of energy is lost As heat through respiration, through metabolic processes, and as chemical energy through waste products (at least 2) Moving up each trophic level, there will be insufficient energy to support a long food chain more than 4 trophic levels.	3
	c	Fiddler crabs are also **decomposers** Fig 5.1 does not show the **transfer of energy from the other organisms** in the food web to the fiddler crabs upon their death. Alternative answers: The organisms in Fig 5.1 can get their energy from other food sources not shown in the diagram – 2m	2
6	a	Branch of the renal artery Distal convoluted tubule	2
	b	P does not have valves, Q has valves; P has thicker, more muscular walls than Q P has a smaller lumen than Q	2
	ci	The **partially permeable basement membrane** of glomerulus is damaged/pores become larger/more permeable; It allows **larger molecules** such as proteins **to pass through** into the glomerular filtrate. S is affected (stated in the question already) – 0m Prevent S from working (how?) – 0m	2

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