Name: …… ( ) Class: Sec ……

St. Gabriel's Secondary School

2024 'O' Preliminary Examination

Subject	**:**	**Biology**
Paper	**:**	**6093 / 1**
Level/Stream	**:**	**Sec 4 Express**
Duration	**:**	**1 hour**
Date	**:**	**28 August 2024**
Setter	**:**	

Additional material: *Multiple Choice Answer Sheet*

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, index number and class on the Multiple Choice Answer Sheet.

There are **forty** questions in this question 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 Multiple Choice Answer Sheet.

Read the instructions on the Multiple Choice 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.

1 Which of the following structures has both cytoplasm and cell wall?

A root hair cell

B xylem vessel

C red blood cell

D platelet

2 Which structures listed below are found in both a typical animal cell and a typical plant cell?

1 centrioles

2 chloroplast

3 Golgi apparatus

4 mitochondria

5 ribosome

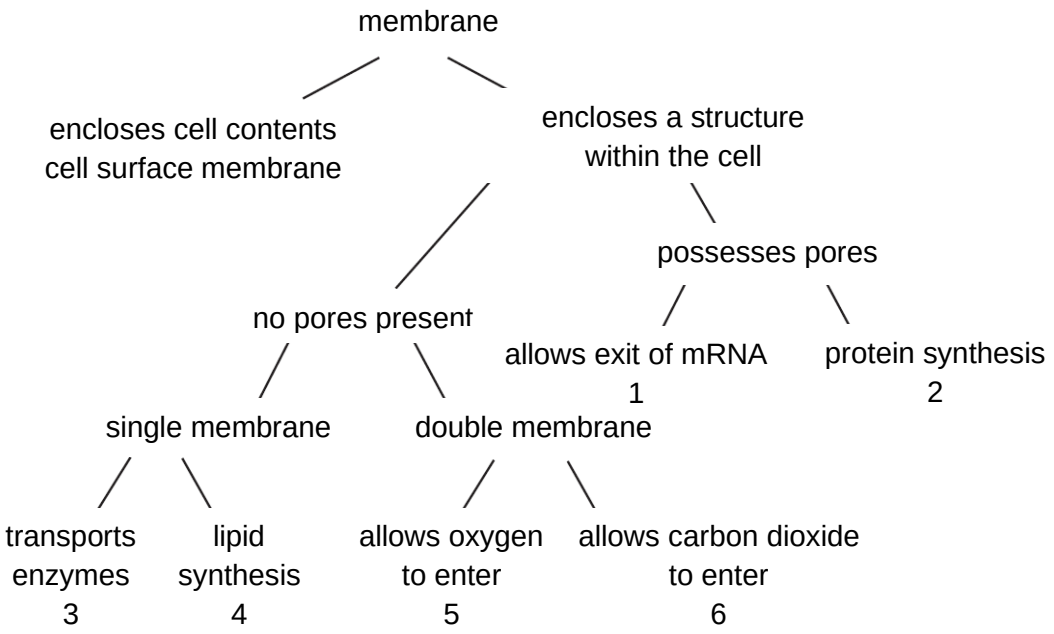
A 3 and 5

B 1, 2 and 3

C 2, 3 and 4

D 3, 4 and 5

3 Membranes within and at the surface of cells have different roles.



Which of the outcomes correctly identifies the organelles that possess the membrane and function concerned?

	outcome 1	outcome 3	outcome 4	outcome 6
A	chloroplast	smooth ER	rough ER	mitochondrion
B	nucleolus	vesicle	smooth ER	mitochondrion
C	nucleus	vesicle	smooth ER	chloroplast
D	nucleus	mitochondrion	rough ER	chloroplast

4 The table below shows the outcome of an investigation on the uptake of bromide ions by a plant.

Time from the start of experiment / min	Amount of bromide ions taken up by plant tissue under the following conditions / arbitrary units		
	Sugar absent, oxygen present	Sugar present, oxygen absent	Sugar and oxygen present
0	0	0	0
30	0	30	100
60	0	50	150
90	0	70	180
120	0	70	200

Which conclusion can be made from the investigation?

A The uptake of bromide ions is via active transport only.

B The uptake of bromide ions is via diffusion only.

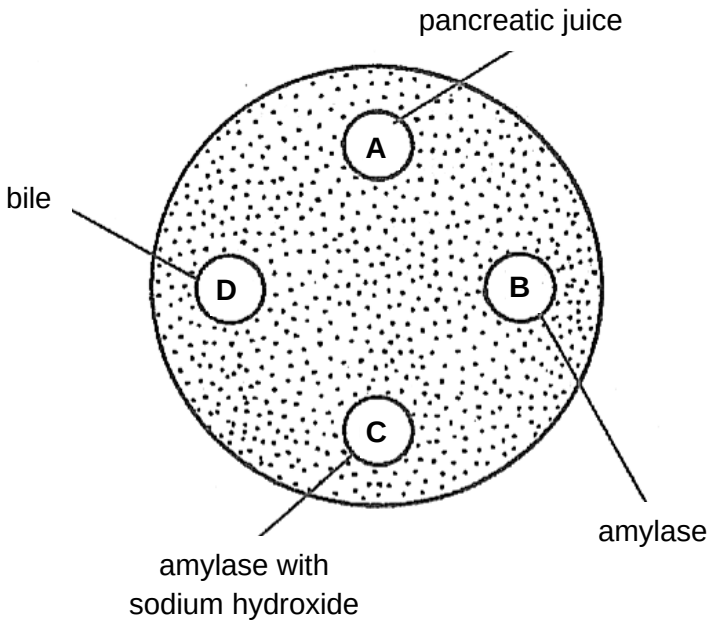
C The uptake of bromide ions occurs during aerobic respiration only.

D The uptake of bromide ions is highest during aerobic respiration.

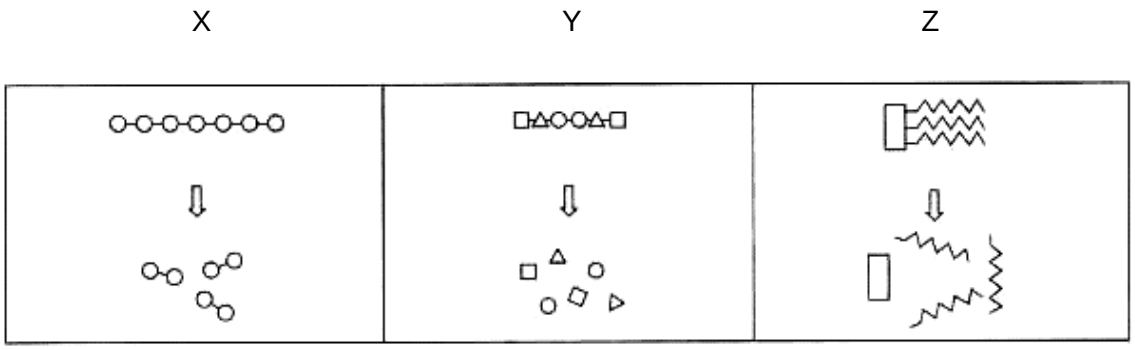
5 Bromothymol blue is a blue indicator that turns yellow when pH decreases below pH 6.

A dish was filled with agar jelly containing adipose tissue extracts. Four holes were cut in the jelly and each hole was filled with the substances shown in the diagram. After 30 minutes, bromothymol blue was poured over the jelly.

Which hole would be surrounded by the largest yellow region?



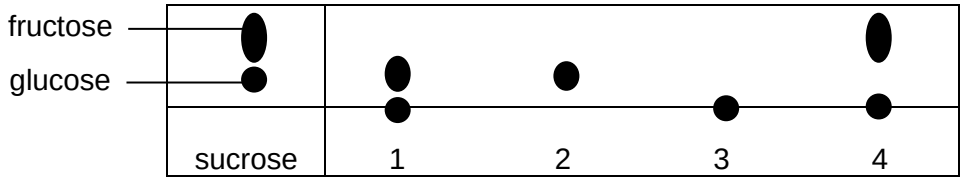
6 The diagram below shows the breakdown of three types of organic molecules, X, Y and Z.



What are the identities of X, Y and Z?

	X	Y	Z
A	carbohydrate	fat	protein
B	carbohydrate	protein	fat
C	protein	carbohydrate	fat
D	protein	fat	carbohydrate

7 Five disaccharides were each hydrolysed with dilute acid and the purified products were separated by chromatography. Substances of the same identity will travel equal distances from the start line. The results are shown in the diagram.



Which result represents the hydrolysis of maltose?

	result
A	1
B	2
C	3
D	4

8 The following fluids were obtained from a healthy individual.

1 blood plasma
2 saliva
3 sweat
4 urine

Which fluid(s) will produce a positive result with the biuret test?

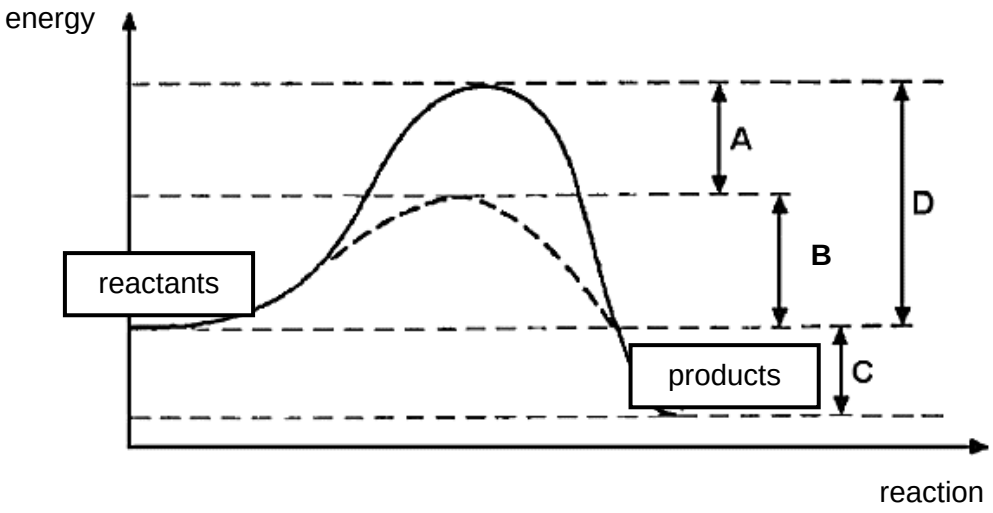
A 1 only

B 1 and 2

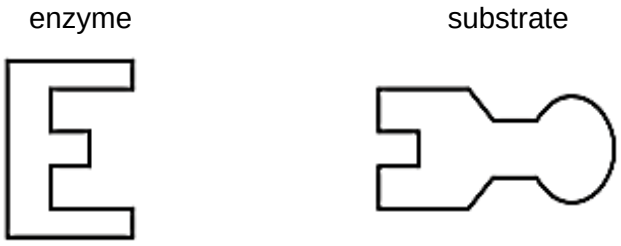
C 2 and 3

D 3 and 4

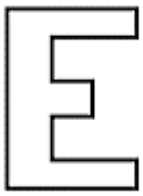
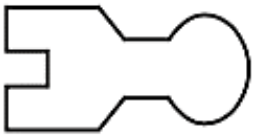
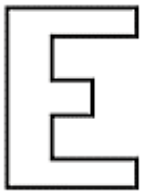
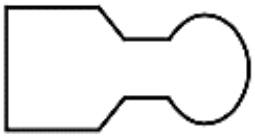
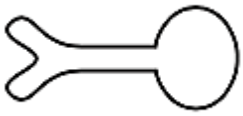
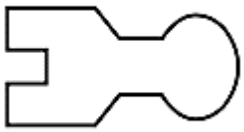
9 The graph shows the energy changes in a chemical reaction, with and without an enzyme. Which interval, **A**, **B**, **C** or **D**, represents the activation energy of the enzyme-catalysed reaction?



10 The diagram represents the 'lock and key' mechanism of an enzyme that works best at pH 7.

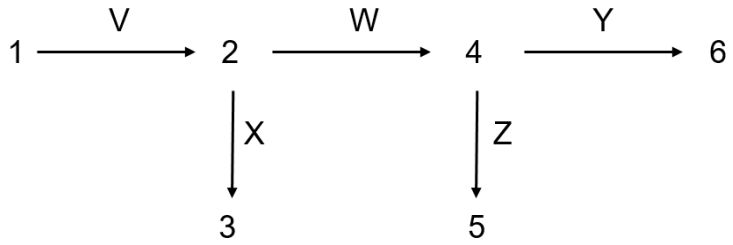


What of the following shows the enzyme and its substrate at pH 13?

	enzyme	substrate
A		
B		
C		
D		

11 The diagram below represents a sequence of reactions in a bacterium, where amino acids (1 to 6) essential for survival are produced by specific enzymes (V to Z).

The original strain of the bacterium required only amino acid 1 and could produce all the other amino acids using the enzymes. A mutant strain of this bacterium could not synthesise some enzymes. It could only survive when provided with amino acids 1, 2 and 5.



Which enzymes were missing in the mutant strain?

A X and X only

B V and Z only

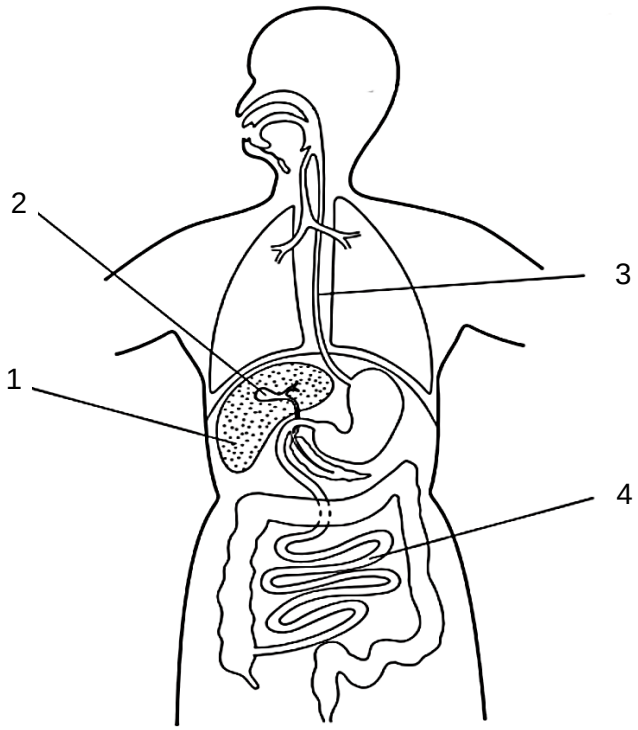
C V, X and Z

D V, W and Z

12 The alimentary canal is made of muscles.
How do the muscles, especially those in the walls of the oesophagus, act when pushing a bolus of food along?

	longitudinal muscles behind bolus	circular muscles behind bolus
A	contract	contract
B	contract	relax
C	relax	relax
D	relax	contract

13 The diagram shows the human alimentary canal.



If structure 1 is removed, which statement correctly describes the consequence?

A Fatty food cannot be digested.

B More fats can be absorbed.

C Oil cannot be emulsified.

D Release of bile cannot be regulated.

14 The diagram shows the label from a bottle of gin.

What will happen, during the next few hours, after a person drinks a large amount of gin?

A Their judgment of distance will improve.

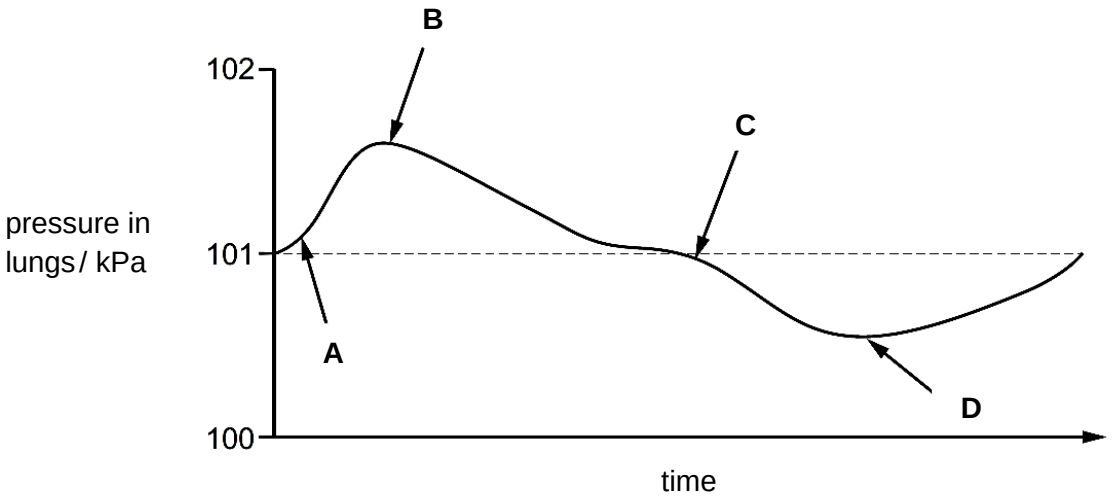
B Their muscle control will be reduced.

C Their reaction time will decrease.

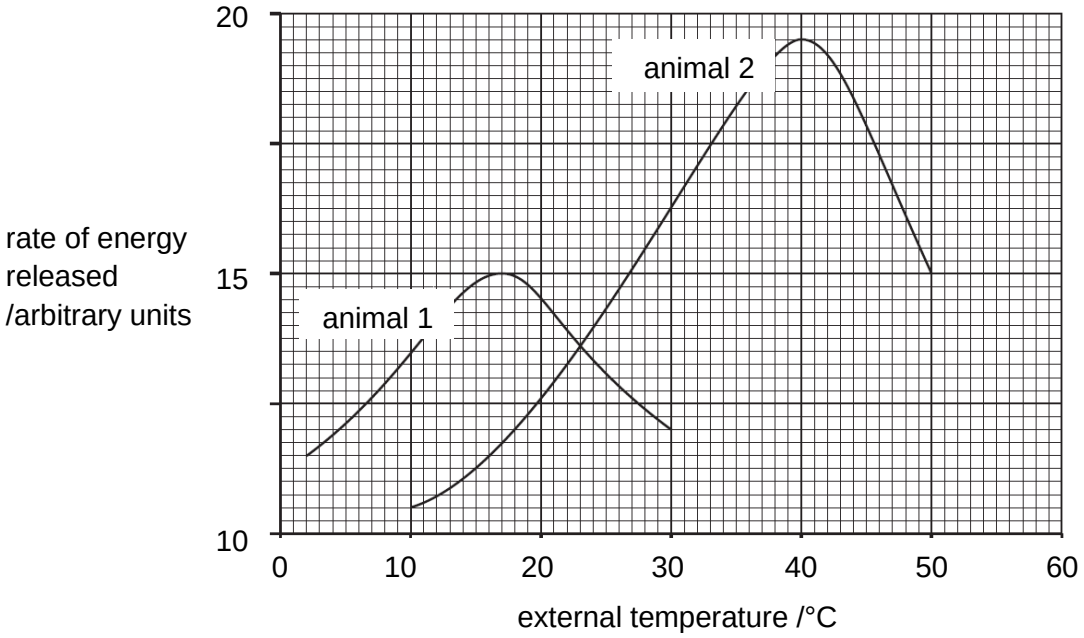
D Their urine output will decrease.

15 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 101 kPa.

At which point in the diagram are ribs going to be lowered?



16 The graph shows the energy released by two animals through respiration as the external temperature changes.



Which conclusion can be drawn from the graph?

A Animals 1 and 2 release the least energy at 23 °C.

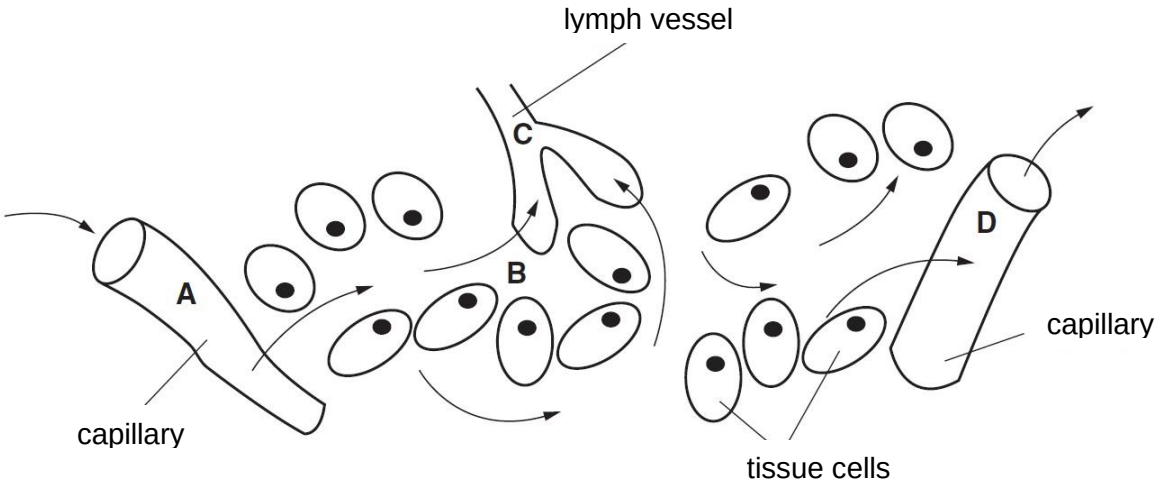
B Animal 2 always respires faster than animal 1.

C As the temperature rises, respiration always increases.

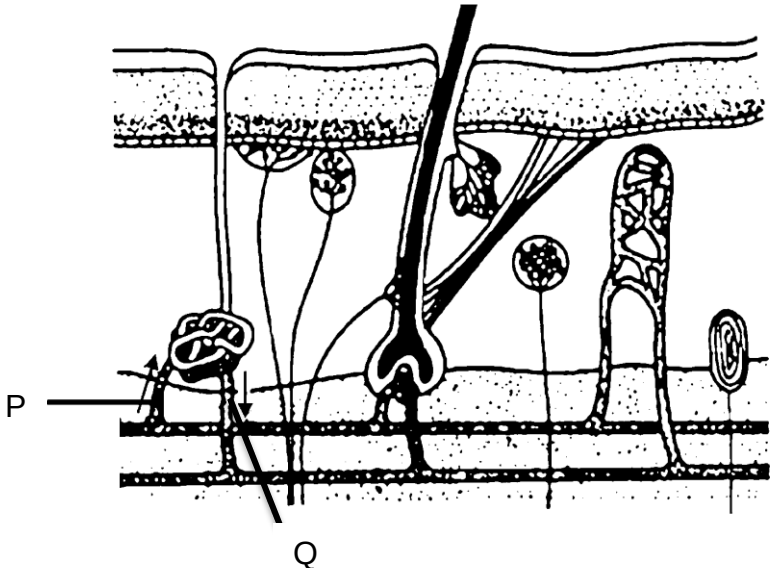
D The rate of respiration is the same for both animals at 23 °C.

17 The diagram shows part of a tissue. The arrows show movement of fluids.

At which point is the pressure highest?



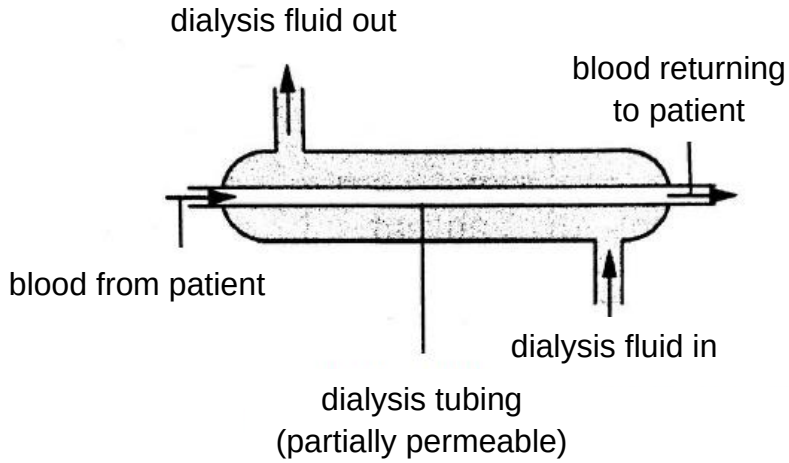
18 The diagram below shows a section through the human skin.



Which of the following changes in concentration of carbon dioxide, urea and salt occur as blood passes from P to Q?

	concentration of		
	carbon dioxide	urea	salt
A	decreases	decreases	decreases
B	decreases	increases	increases
C	increases	decreases	decreases
D	increases	increases	decreases

19 An engineer has been tasked to improve efficiency of the dialysis machine shown in the diagram below.



He has made the following recommendations:

1 reverse the direction of blood flow

2 increase the rate at which dialysis fluid is replaced

3 increase the length of the dialysis fluid by coiling it

4 increase the diameter of the lumen of the dialysis tubing while keeping the thickness of the tubing membrane the same

Which of his recommendations will improve the efficiency of the dialysis process of a patient?

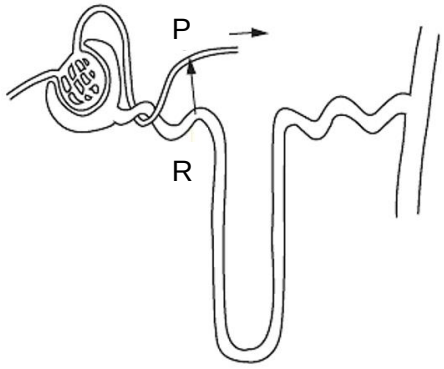
A 1 and 3

B 2 and 3

C 1, 2 and 3

D 2, 3 and 4

20 The diagram shows a kidney tubule and some of its associated blood vessels.



Which substance is entirely reabsorbed from the fluid at R to the blood at P?

A glucose
B salts
C urea
D water

21 Two organs secrete substances which affect the body.

organ 1 ⟶ product 1

organ 2 ⟶ product 2

How would negative feedback control of product 2 be achieved?

A product 1 counteracts product 2
B product 1 reinforces the effect of product 2
C product 2 inhibits organ 1 and product 1 stimulates organ 2
D product 2 stimulates organ 1 and product 1 stimulates organ 2

22 What is an example of excretion?

A release of adrenaline from the adrenal glands
B release of mucus from the goblet cells
C removal of carbon dioxide from the lungs
D removal of faeces from the alimentary canal

23 Which symptoms are presented in both influenza and pneumococcus diseases?

A fever and cough

B sore throat and fever

C vomiting and sore throat

D cough and shortness of breath

24 Which method can reduce the transmission of pneumococcus diseases?

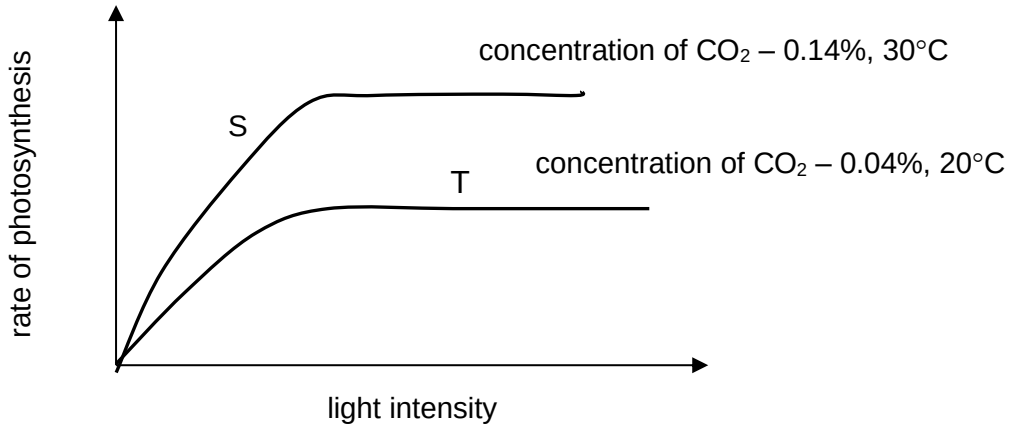
A drinking herbal tea frequently

B taking antiviral drugs

C huddling closely in groups

D taking antibiotics

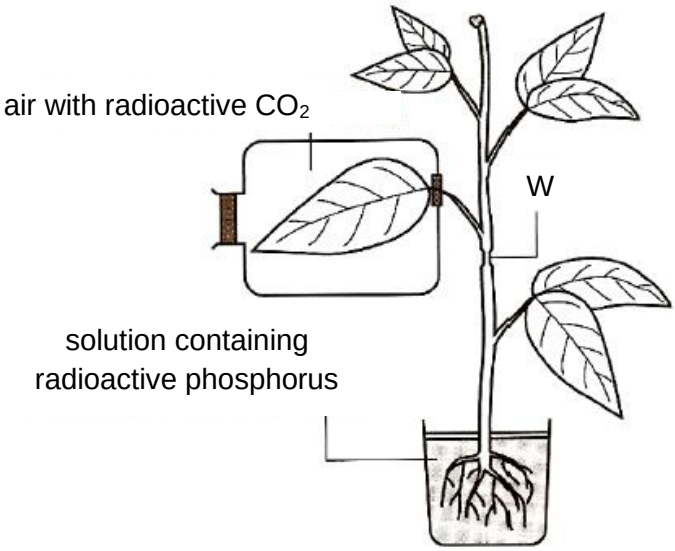
25 The graph below shows how the rate of photosynthesis in a plant varies with light intensity at two different carbon dioxide concentrations and temperatures.



From the information obtained from the graph, what are the limiting factors at S and T?

	S	T
A	concentration of CO_2	temperature
B	light intensity	concentration of CO_2
C	light intensity	chlorophyll availability
D	temperature	light intensity

26 An experiment was designed to study the movement of materials in a green plant with the phloem removed and the xylem intact at the level marked W. After several hours, the relative amounts of radioactive carbon and phosphorus compounds in different parts of the plant were determined.



Which of the following would be possible observations at the end of the experiment?

1 Radioactive carbon compounds were found in the leaves above W.
2 Radioactive phosphorus compounds were found in all leaves of the plant.
3 Transport of radioactive carbon compounds occurred in both directions of the stem, above and below W.
4 There was a small swelling containing radioactive carbon compounds located in the region below W.

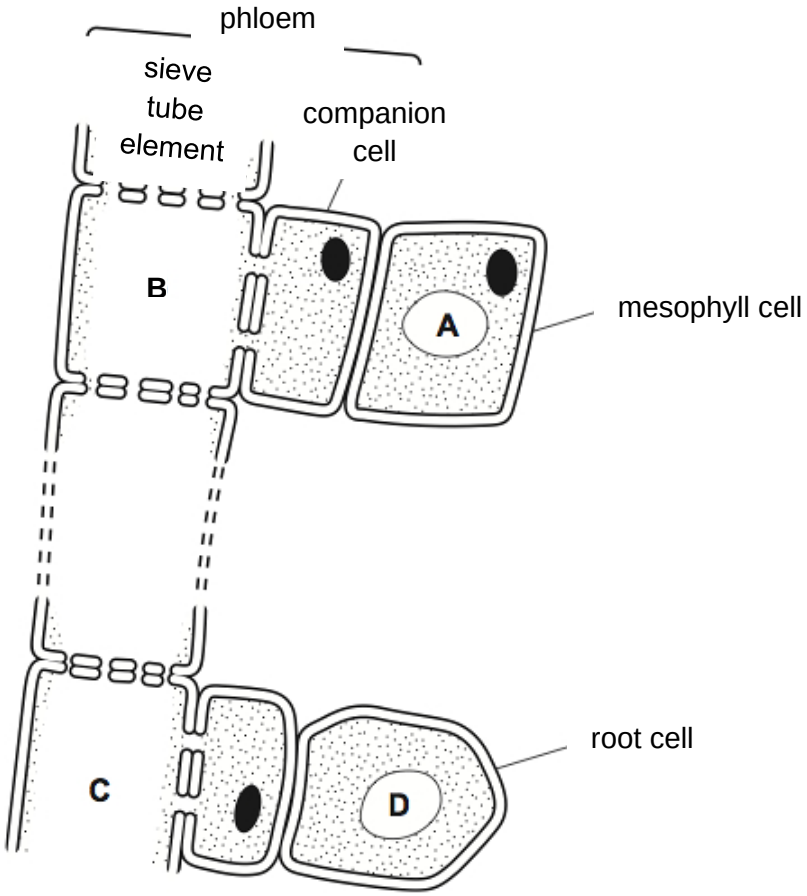
A 1 and 2

B 1 and 4

C 2 and 4

D 1, 2 and 3

27 The diagram shows the tissues involved in the transport of sucrose in a plant.
Where is the highest concentration of sucrose found during day time?



28 In an experiment with a potometer, a leafy shoot was subjected to four different environmental conditions. The table shows the distance travelled by the air bubbles and the time taken.

condition	distance travelled by the bubble / mm	time taken / min
P	8	1
Q	12	2
R	8	2
S	9	1.5

What can be concluded from the results?

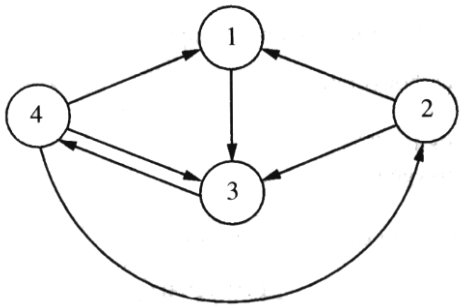
A Condition P is the brightest and condition R is the dimmest.

B The light intensity under condition Q and condition S is the same.

C The transpiration rates are the same under condition Q and condition S.

D The transpiration rate is the highest under condition Q.

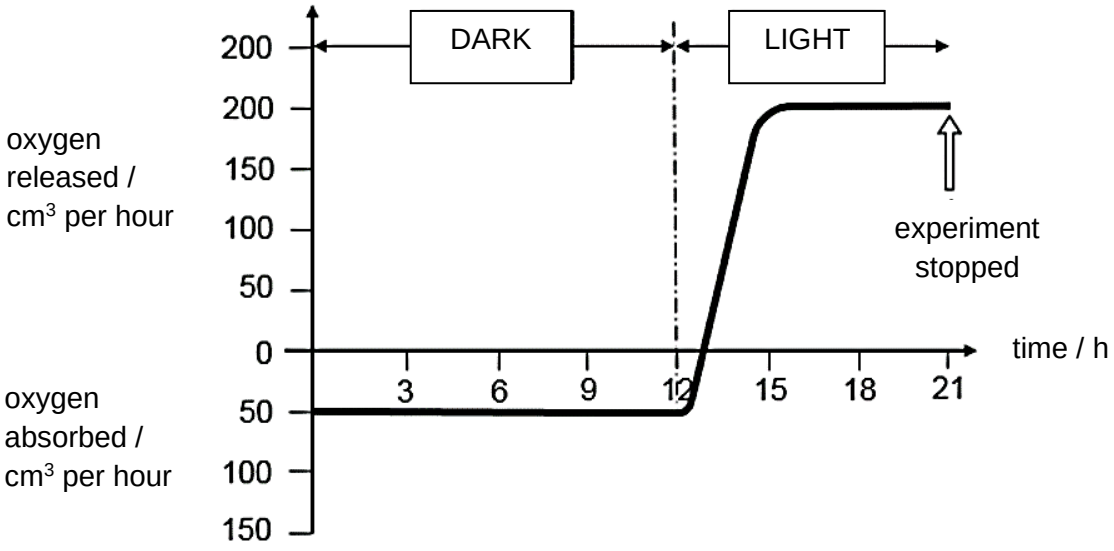
29 In the diagram below, arrows represent the movement of carbon compounds in the carbon cycle. The circles represent carbon compounds in animals, decomposers, plants and the atmosphere.



Which of the following options correctly identifies the four circles?

	1	2	3	4
A	animals	atmosphere	plants	decomposers
B	atmosphere	animals	decomposers	plants
C	decomposers	animals	atmosphere	plants
D	animals	decomposers	plants	atmosphere

30 The graph shows data obtained relating to the rates of oxygen release and uptake in plants. Temperature was constant throughout the period of the experiment.



What is the volume of oxygen used in respiration during this experiment?

A 600 cm^3

B 650 cm^3

C 750 cm^3

D 1050 cm^3

31 The following are steps needed to insert the insulin gene into a bacteria cell.

1 identify the insulin gene
2 ligate sticky ends to the plasmid
3 introduce the plasmid into bacteria
4 cut the plasmid using restriction enzyme
5 cut out the gene using restriction enzymes

Which is the correct sequence of the process?

A 5 → 1 → 3 → 2 → 4
B 4 → 3 → 5 → 2 → 1
C 3 → 2 → 4 → 1 → 5
D 1 → 4 → 5 → 2 → 3

32 A mutation involving the substitution of one nitrogenous base for another has altered the base sequence of a DNA molecule that codes for four amino acids is shown.

Normal	A-G-C-A-T-G-*G*-A-T-C-C-T
Mutant	A-G-C-A-T-G-*C*-A-T-C-C-T

The table shows six codons on the complementary strand of DNA and the corresponding amino acids into which each is translated.

codon on the complementary strand	amino acid
AAG	Lysine
CTA	Leucine
GGA	Glycine
GTA	Valine
TAC	Tyrosine
TCG	Serine

What is the change in the amino acid?

A leucine to valine
B lysine to glycine
C glycine to lysine
D valine to leucine

33 The table shows the results of mapping 100 nucleotides on a single strand of DNA.

nucleotide	quantity
adenine	22
cytosine	20
guanine	47
thymine	11

How many thymine nucleotides will there be on the strand of DNA that is complementary to this strand?

A 11

B 20

C 22

D 33

34 The mass of DNA in a normal body cell is Z.

How much DNA will be present in a cell after the completion of mitosis, after completion of meiosis and in an egg after completion of fertilisation?

	after completion of mitosis	after completion of meiosis	after completion of fertilisation
A	Z	$\frac{Z}{2}$	Z
B	Z	2Z	2Z
C	$\frac{Z}{2}$	2Z	2Z
D	2Z	$\frac{Z}{2}$	Z

35 Haemophilia is a condition in humans in which the blood will not clot. It is caused by a recessive allele inherited only on the X chromosome.

What causes haemophilia?

A iron-deficient diet

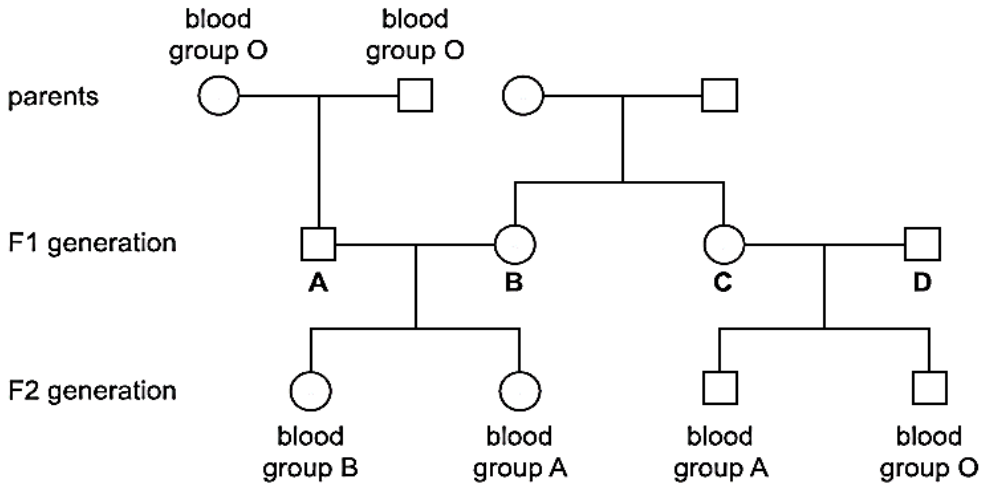
B loss of blood following an accident

C a change in chromosome number

D a change in the structure of a gene

36 The diagram shows the blood group phenotype of some members of a family.

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



37 The diagram shows a corn cob with purple and yellow fruits. Purple allele (P) is dominant over yellow allele (p).

What are the genotypes of the parents?

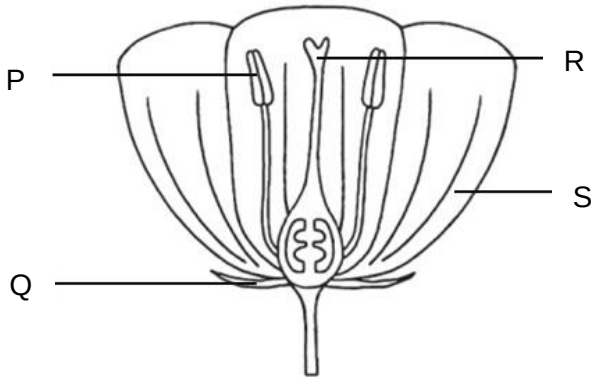
A PP x Pp

B PP x pp

C Pp x Pp

D Pp x pp

38 The following diagram shows part of a flower.

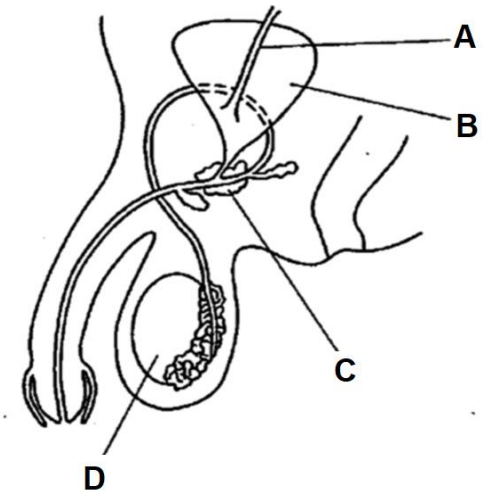


Which of the following matches the structures to the correct function?

	protects developing bud	production of gametes	receives pollen grains	attracts pollinators
A	Q	P	R	S
B	Q	R	P	S
C	S	R	P	Q
D	S	P	R	Q

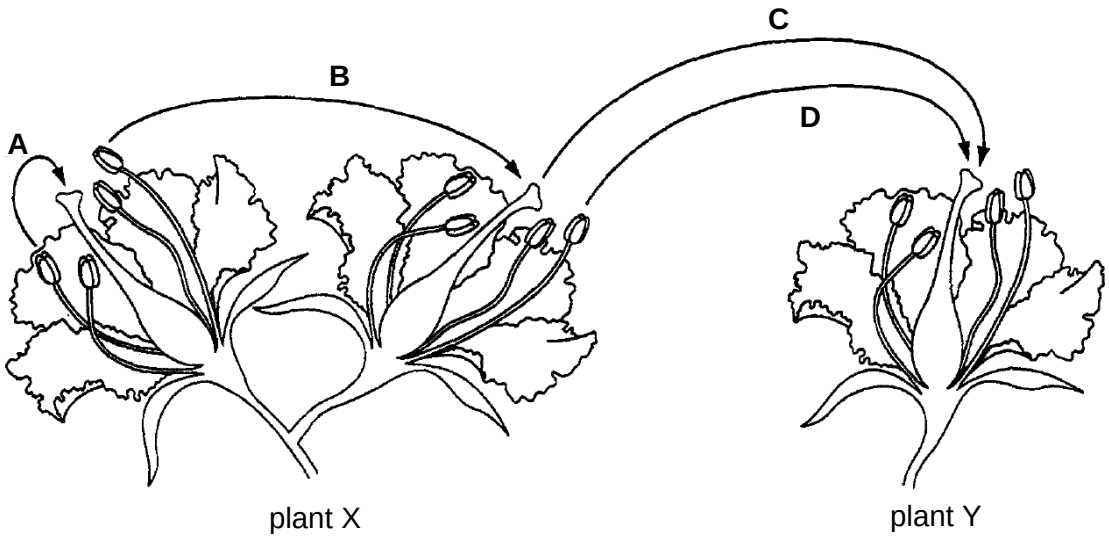
39 The diagram shows the male reproductive system.

Which structure is responsible for secreting nutrients and enzymes to active sperms?



40 The diagram shows two flowers on plant X and one flower on a different plant Y, of the same species.

Which transfer of pollen will bring about cross pollination?



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