Name	Class				Index Number		

BROADRICK SECONDARY SCHOOL
SECONDARY 4 EXPRESS
PRELIMINARY EXAMINATION 2019

BIOLOGY 6093/01

Paper 1 Multiple Choice Sep 2019

Additional Materials: Multiple Choice Answer Sheet 1 hour

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 OTAS 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 OTAS answer sheet.

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.

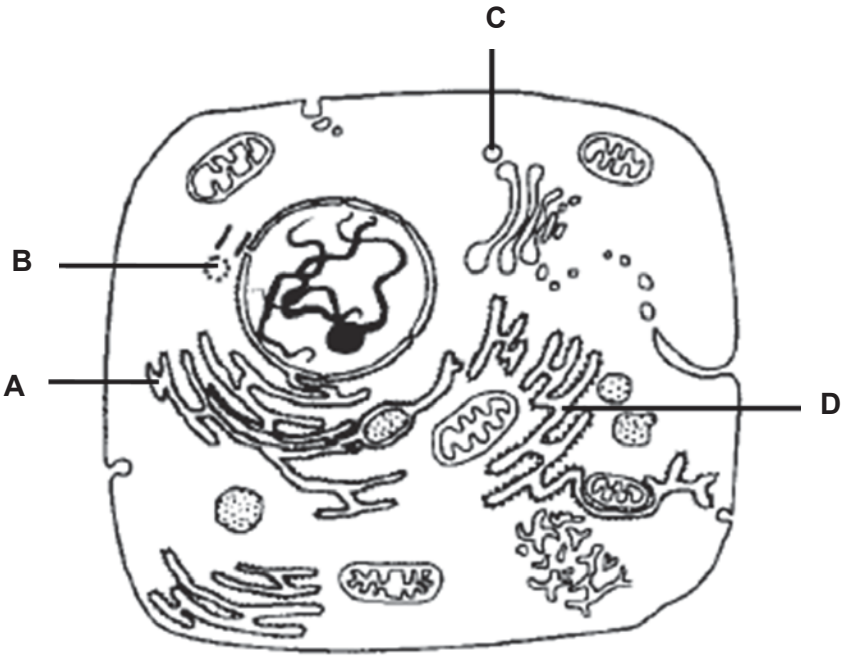
This question paper consists of **20** printed pages including this page.

[Turn over

1. Which of the following is found in all living cells?

A centrioles and nucleus
B chloroplast and protoplasm
C golgi apparatus and cell membrane
D vacuole and cell wall

2. The diagram below shows a general animal cell.
Which of the structures would be involved in the final secretion of digestive enzymes from this cell?



3. A few leaves of purple cabbage were placed in a beaker of water for 10 minutes. The water remained colourless after the 10 minutes.
The beaker was then heated to 100°C for 5 minutes. After boiling, the water turned purple.

Which of the following best explains this observation?

A The pigments gained more kinetic energy upon heating and were able to diffuse out of the leaves quickly, hence the coloured water in just 5 minutes.

B The cell walls were denatured upon heating, allowing the pigment to diffuse into the water.

C During the boiling, the cell membranes were damaged, hence allowing the pigment to diffuse into the water.

D Heating increases the solubility of the pigment, thus colouring the water purple.

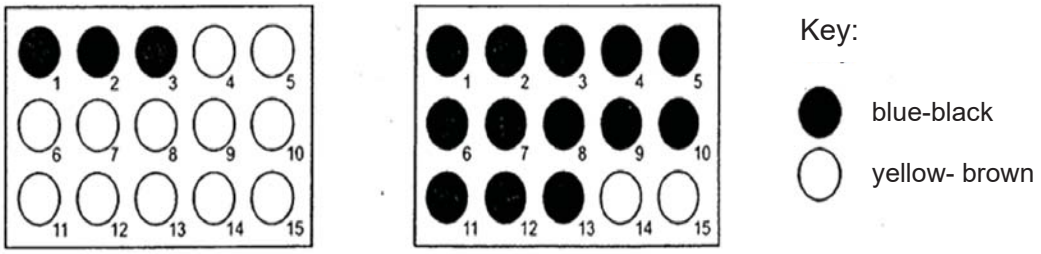
4. Which of these processes require energy from respiration?

	Diffusion	Osmosis
A	✓	✓
B	✓	×
C	×	✓
D	×	×

Key:
✓ energy required
× energy not required

5. An experiment was carried out to investigate the digestion of starch using amylase at two different temperatures, 10^0C and 40^0C. A sample is taken every 15 seconds and placed into each well as shown below.

Each well contains 2 drops of iodine solution and 15 samples were taken from each temperature condition.
The results are shown below.

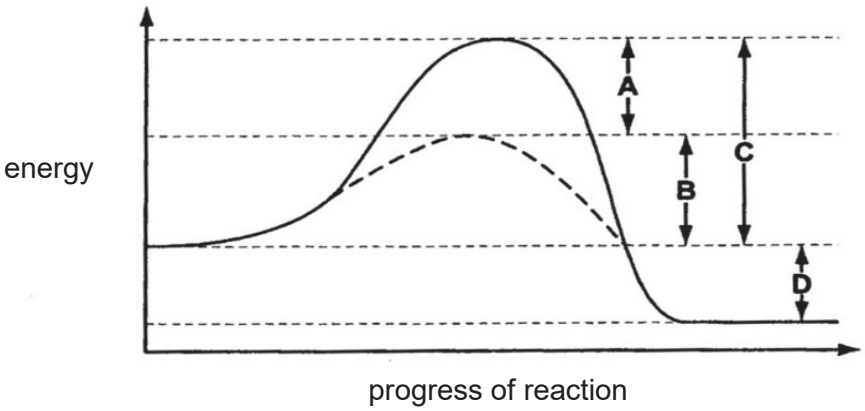


Which of the following shows the correct temperatures and times for the complete digestion of starch?

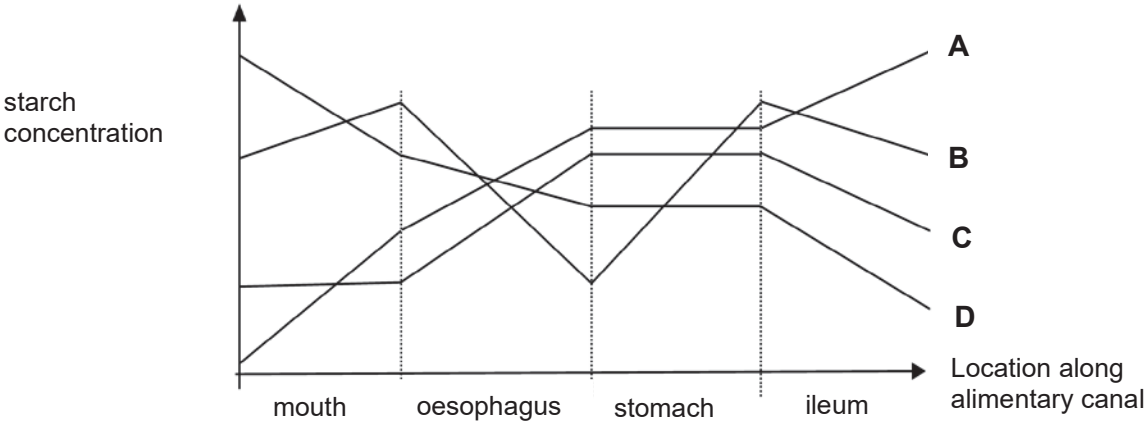
	Temperature / ^{0}C	time/s
A	10	60
	40	210
B	10	210
	40	60
C	40	45
	10	195
D	40	195
	10	45

6. The graph shows changing energy levels during a reaction, with and without the presence of the enzyme specific to this reaction.

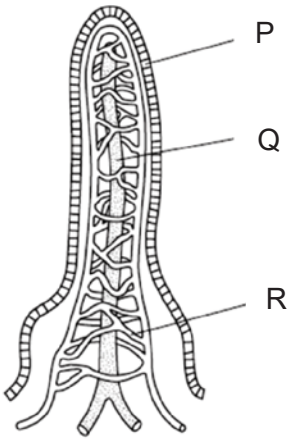
What is the activation energy of the reaction without the presence of the enzyme?



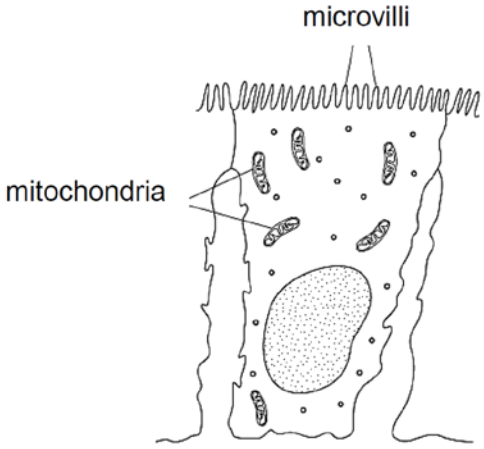
7. Which graph represents the activity of amylase in starch digestion?



8. The diagrams show a villus from the small intestine and an enlarged view of a cell from region P.



magnification x110



magnification x2600

Which statement is correct?

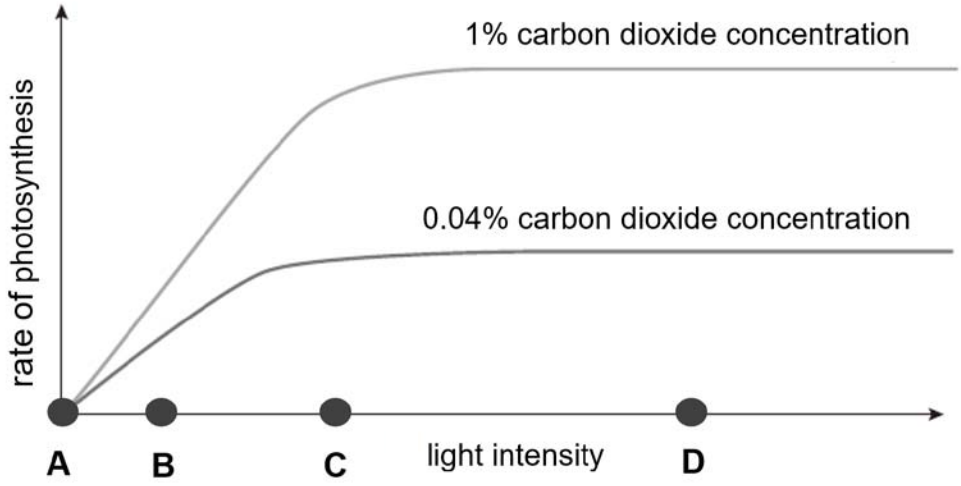
A Amino acids are absorbed through the microvilli and used by the cell for aerobic respiration.
B Fats diffuse into P and enter Q to be distributed.
C Mitochondria releases energy for the active transport of proteins into R.
D Microvilli increases surface area to volume ratio of P for the absorption of glucose into R.

9. A photosynthetic plant was given the radioactive isotope of oxygen, O^{18}.
Where would this isotope be eventually located?

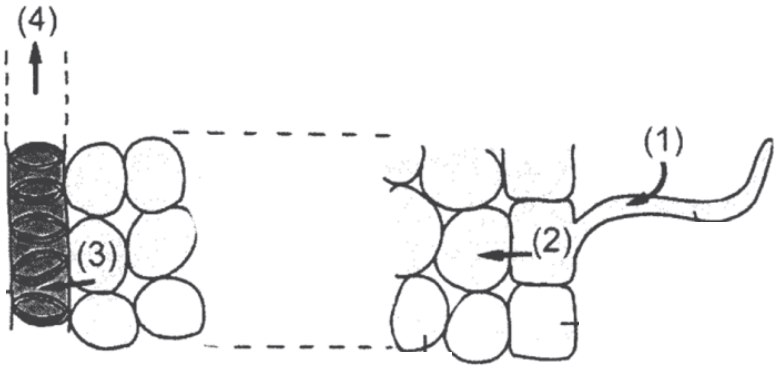
A the starch grains in the mesophyll cells
B the oxygen gas given out by photosynthesis
C the carbon dioxide formed in respiration
D the glucose made from photosynthesis

10. The graph below shows how the rate of photosynthesis in a plant varies with light intensity at two different carbon dioxide concentrations. The temperature is kept constant at 20°C.

At which light intensity is light **not** a limiting factor at both 0.04% and 1% carbon dioxide concentration?



11. The diagram below shows the pathway of water movement from the soil into the root of a plant.



Osmosis occurs in _____.

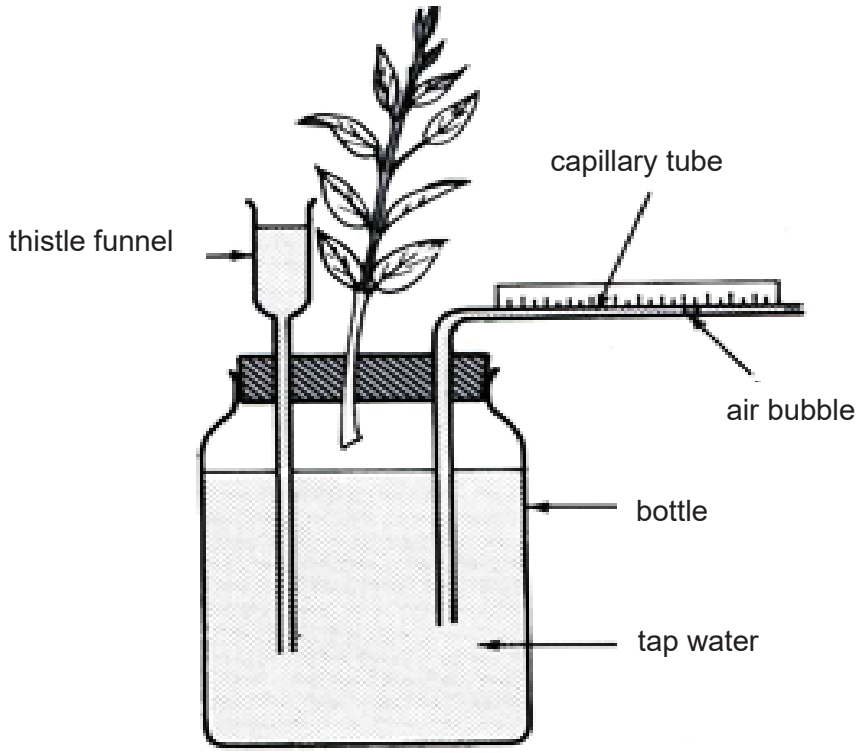
A (1) and (2) only

B (1) , (2) and (3) only

C (2) , (3) and (4) only

D (1), (2), (3) and (4)

12. The diagram below shows an experiment set-up to measure the rate of transpiration of a shoot.



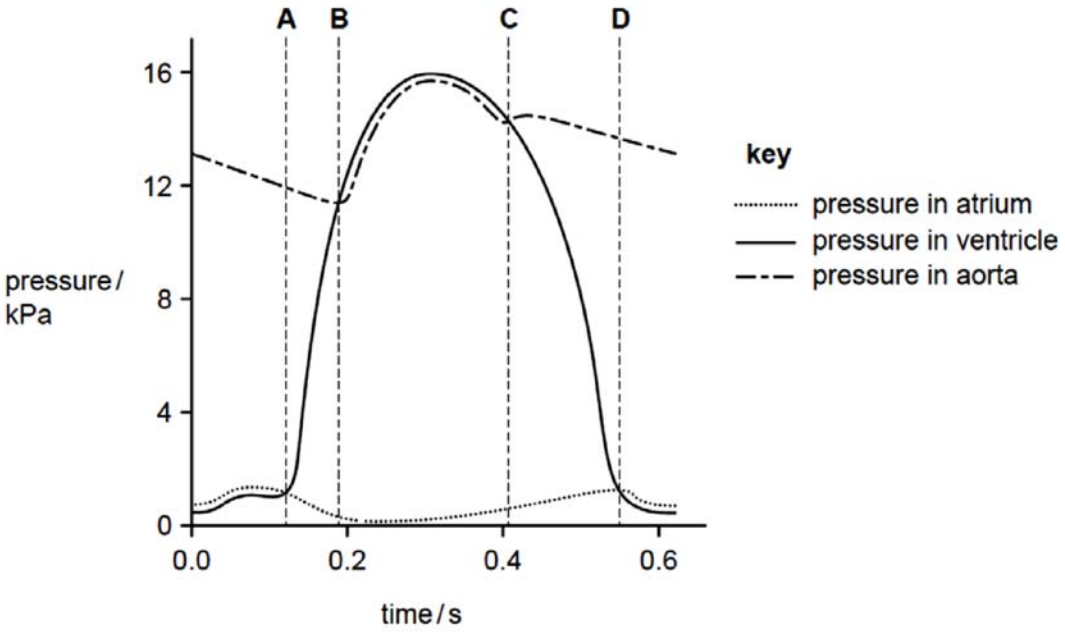
There were several mistakes in the above experimental set-up.
Which of the following are the corrections that have to be made?

I The bottle should be completely filled with water.
II A tap funnel should be used instead of a thistle funnel.
III The end of the shoot should be completely immersed in water.
IV Dilute hydrogencarbonate solution should be used instead of tap water to provide a source of carbon dioxide to the shoot.

A I and III
B II and III
C I, II and IV
D II, III, IV

13. The graph below shows the pressure changes in the left side of the heart during a single heartbeat.

At which point A to D, is the atrioventricular/bicuspid valve pushed close?



14. A certain genetic disease results in the inability to produce prothrombin.
Which symptoms will the patients suffering from this disease most likely have?

A aching muscles and insomnia
B fatigue and breathlessness
C headaches and chronic diarrhoea
D nosebleeds and blood in urine

15 Which reaction is catalyzed by carbonic anhydrase when red blood cells pass through the lungs?

A $CO_2 + H_2O \rightarrow H_2CO_3$
B $HCO_3^- + H^+ \rightarrow H_2CO_3$
C $H_2CO_3 \rightarrow CO_2 + H_2O$
D $H_2CO_3 \rightarrow HCO_3^- + H^+$

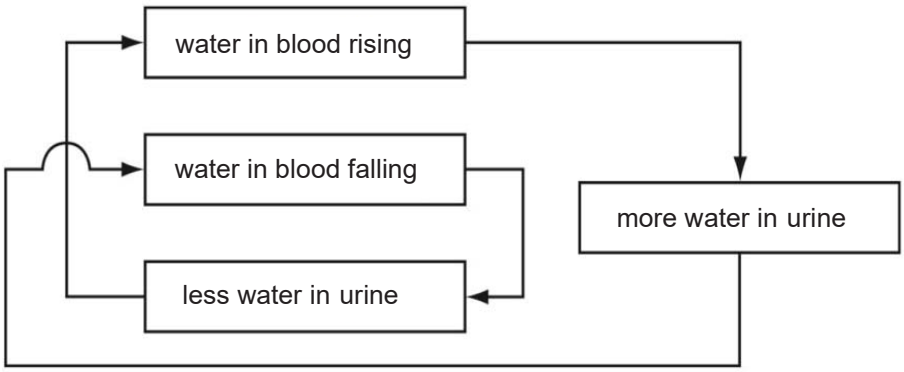
16. Some effects of tobacco smoking are listed below.

1 Bronchitis
2 Uncontrolled division in some cells
3 Increase in alertness
4 Increase in heart rate
5 Increase in mucus production
6 Increase in blood pressure

Which effects are caused by nicotine and tar respectively?

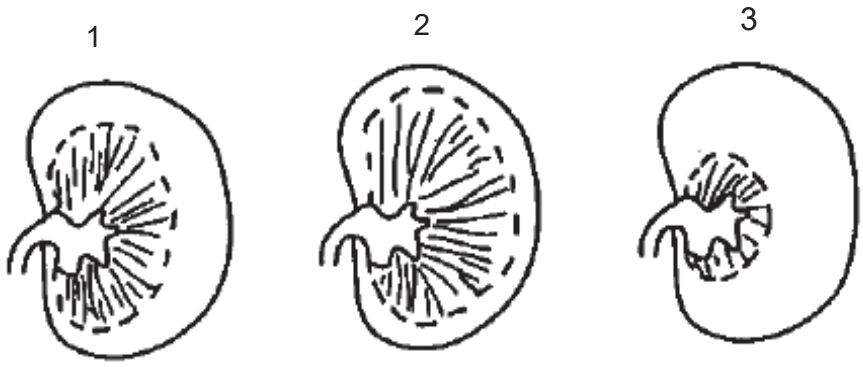
	nicotine	tar
A	1, 2 and 5	4 and 6
B	3 and 6	1 and 5
C	3, 4 and 6	1, 2 and 5
D	1, 2 and 4	3, 5 and 6

17. The diagram refers to the control of water potential in blood.
Which statement best explains why this is a negative feedback system?



A It decreases the amount of water in blood.
B It increases any change in the amount of water in blood.
C It increases the amount of water in blood.
D It reverses any change in the amount of water in blood.

18. The diagrams show vertical sections of kidneys of coypu, brown rat and kangaroo rat, showing the relative sizes of cortex and medulla.



Coypu are found in fresh water and are never short of water to drink. Brown rats are able to go some days without drinking. Kangaroo rats are able to live in deserts without drinking at all.

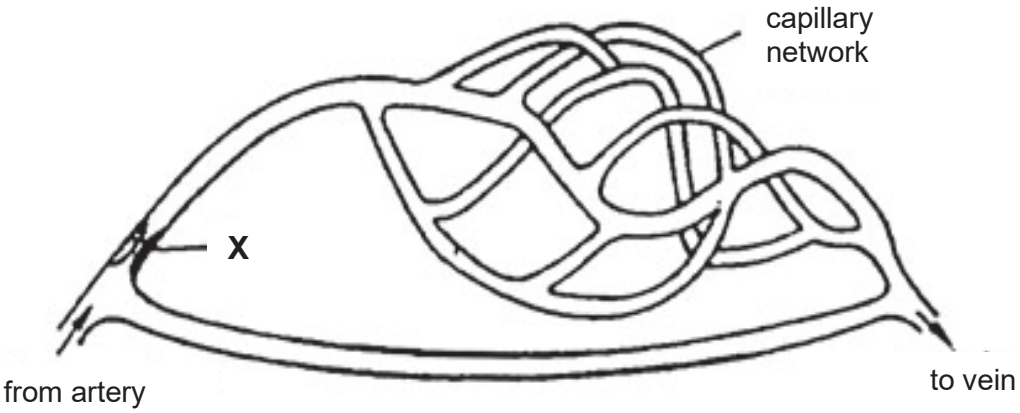
Which kidney 1, 2 or 3 is suitable for coypu, brown rats and kangaroo rats in order for them to adapt to their living environment?

	1	2	3
A	brown rat	coypu	kangaroo rat
B	brown rat	kangaroo rat	coypu
C	kangaroo rat	brown rat	coypu
D	kangaroo rat	coypu	brown rat

19. Which factors are controlled by homeostasis?

	Temperature in the stomach	pH in the duodenum	Glucose concentration in blood	Water content in the ileum
A	√	×	√	×
B	√	×	×	√
C	×	√	√	√
D	×	×	√	×

20. The diagram below shows a capillary network in the dermis of the skin.



Which one of the following would be the direct result of the relaxation of the muscle labelled **X**?

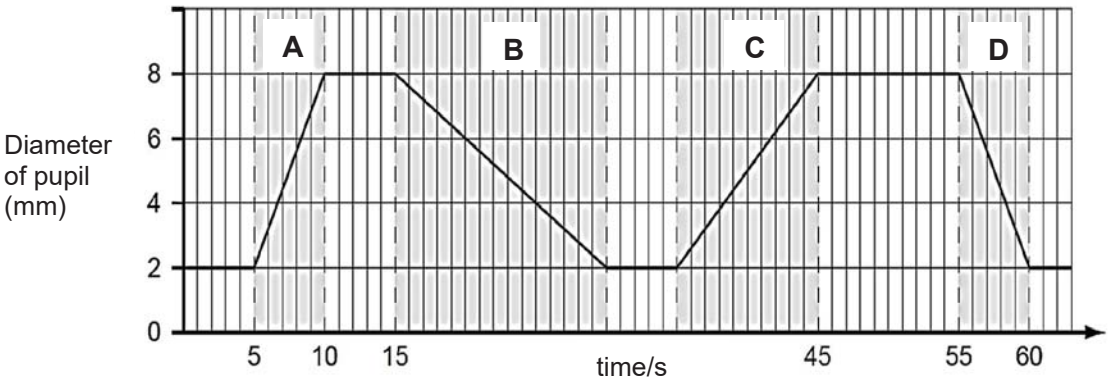
A greater heat loss

B shivering

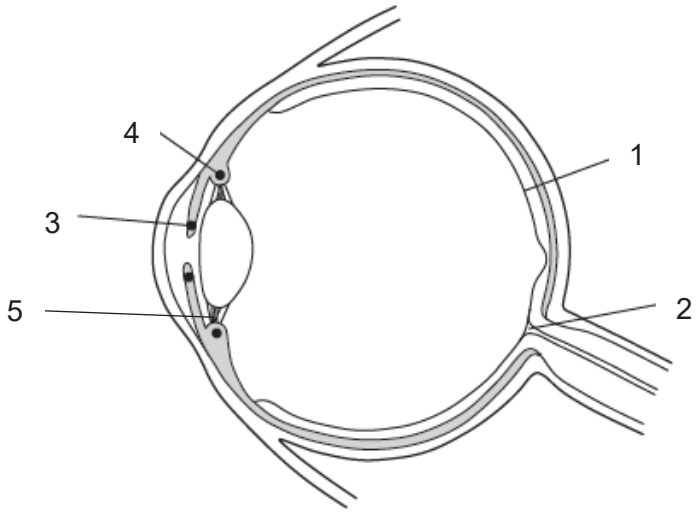
C raising of skin hair

D raising the body temperature

21. The diameter of a person's pupil is measured as the light intensity is varied. During which time period does the light intensity increase fastest?



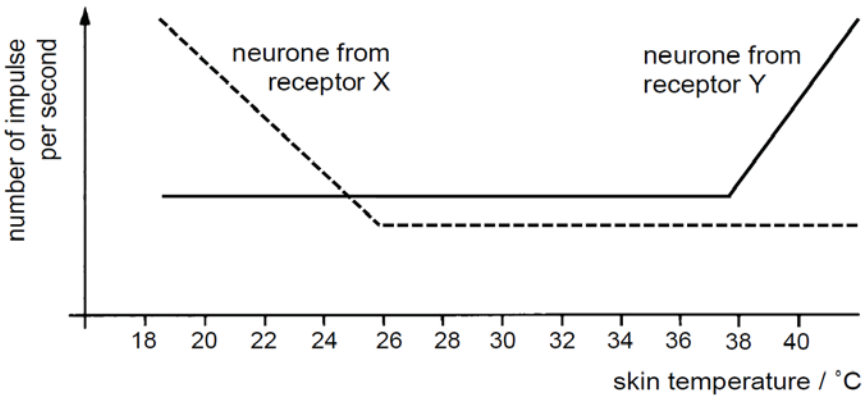
22. The diagram shows a section through the eye.



Which labelled structures are effectors and which are receptors?

	effectors	receptors
A	1	4
B	3	2
C	5	3
D	4	1

23. The graph shows the number of nerve impulses per second travelling along two sensory neurones from the skin to the brain, labelled as receptors X and Y, at different skin temperatures.



Which of the following statements best illustrates the graph?

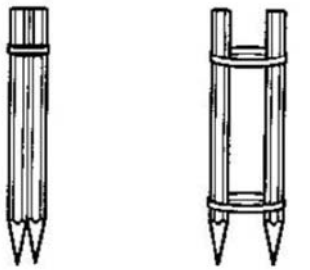
A Receptor X responds most strongly to temperatures above 18^0C.

B Receptor Y responds most strongly to temperatures above 38^0C.

C Receptor X and Y respond most strongly outside the range of 26^0C to 38^0C.

D Receptor X and Y respond most strongly at temperatures between 26^0C to 38^0C.

24. During an experiment, a student was blindfolded.
The skin on his fingertip, the palm of his hand and his forearm were then touched several times by two pencil points, either one centimeter or two centimetres apart.



During the record of results, there were instances when he inaccurately said he had only been touched by one point.
The table below shows the number of times he accurately said that he had been touched by two points.

distance between pencil points / cm	% number of times he felt two pencil points		
	fingertip	palm	forearm
1	100	5	20
2	100	75	30

Which of the following conclusions could be made from the above results?

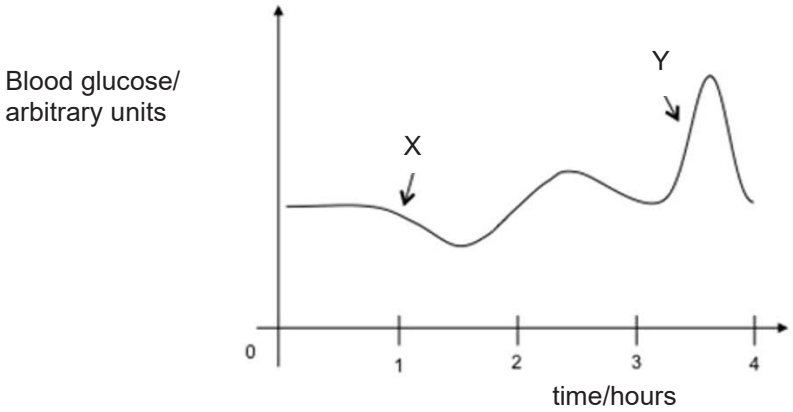
A Only a few touch receptors were present in the skin of the palm.

B No touch receptors were present on the skin of the forearm.

C Touch receptors were the furthest apart in the skin of the forearm.

D Touch receptors were closest together in the skin of the fingertip.

25. The graph below shows changes in a person's blood glucose concentration over a four-hour period.



What causes the changes at X and Y?

	X	Y
A	decreased insulin	Increased adrenaline
B	increased insulin	decreased adrenaline
C	increased insulin	Increased glucagon
D	increased insulin	Increased adrenaline

26. Dentists inject the drug procaine into gums so that they can drill into teeth without causing pain.
What is the most probable reason for procaine preventing pain?

A It prevents the brain from interpreting impulses from the teeth.

B It prevents impulses passing along the sensory neurones to the brain.

C It blocks the synapses between the sensory neurones and motor neurones.

D It makes the tissues of the gums numb.

27. Which of the following statements about a hormone is correct?

I It is transported in the blood.
II It is secreted by an endocrine gland.
III It is under both voluntary and involuntary control.

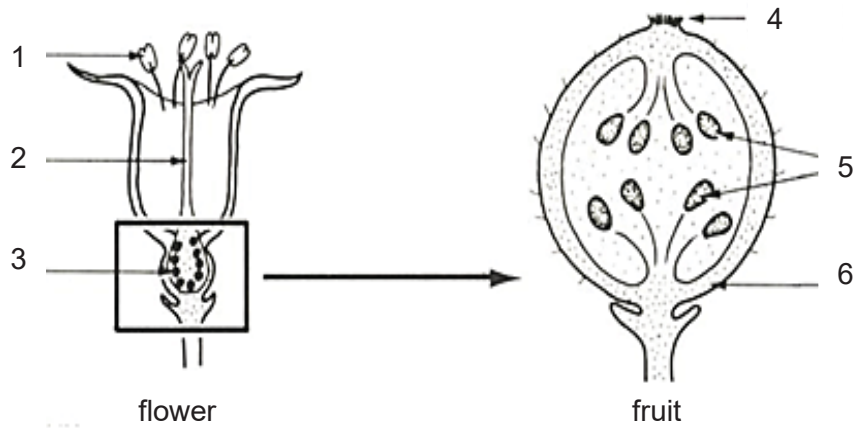
A I and II only

B II and III only

C I and III only

D I, II and III

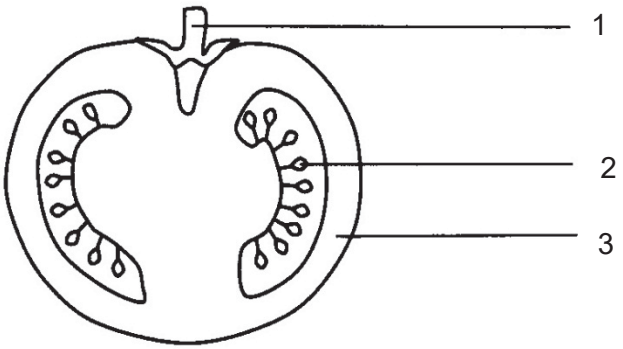
28. The diagram shows the development of a flower into a fruit.



Where does meiosis occur?

A 5 only
B 1 and 3 only
C 2 and 4 only
D 5 and 6 only

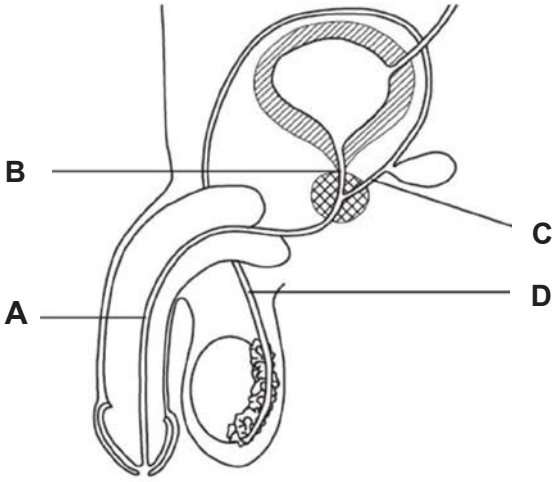
29. The diagram shows a vertical section of a tomato fruit.



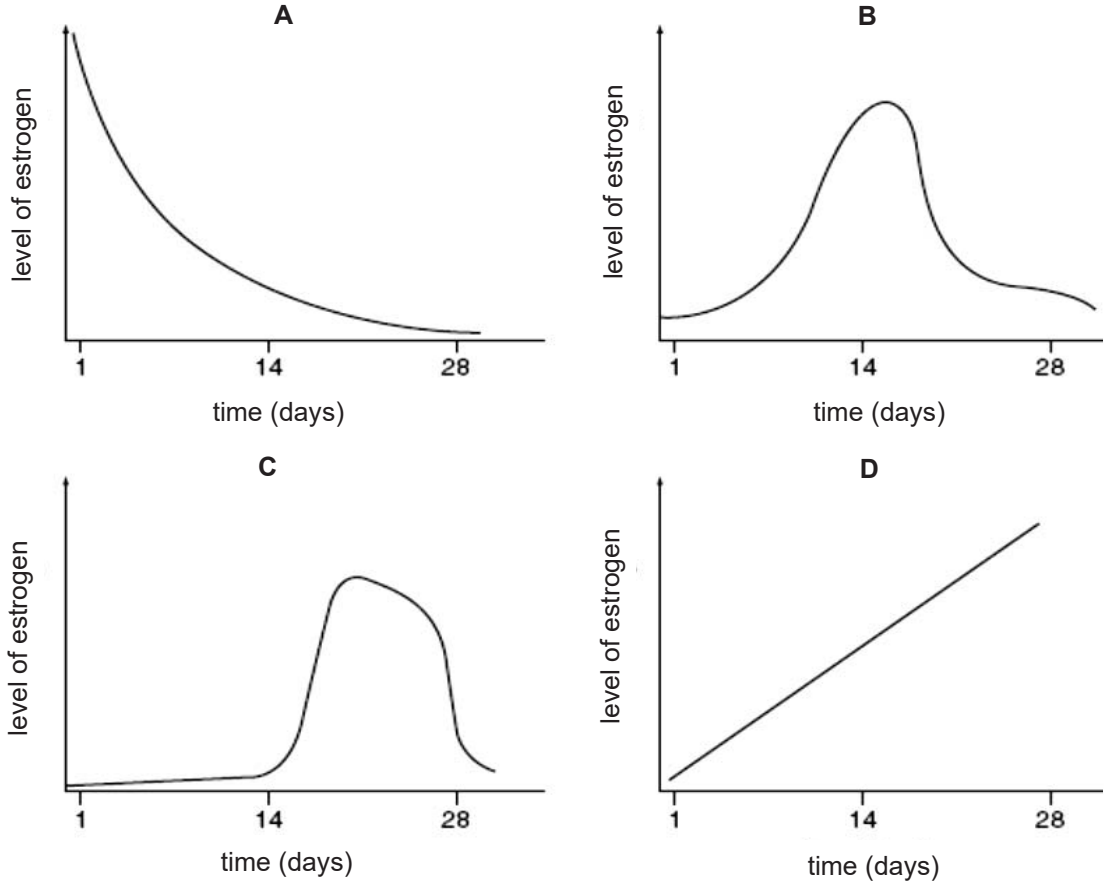
Which of the following correctly identifies the floral parts from which structures 1, 2 and 3 have developed?

	1	2	3
A	style	ovary	ovule
B	style	ovule	ovary
C	pedicel	ovule	ovary
D	pedicel	ovary	ovule

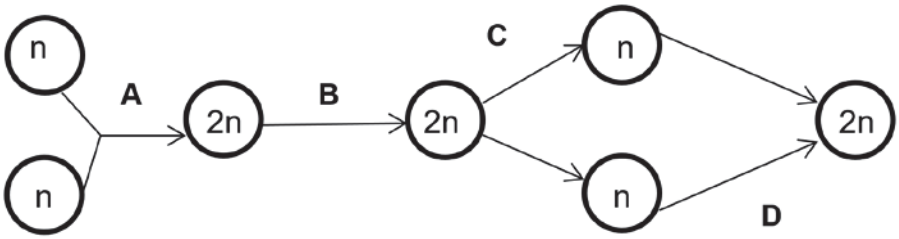
30. A surgical method of birth control involves cutting some of the tubes through which sperm pass.
At which point does the surgeon make the cuts?



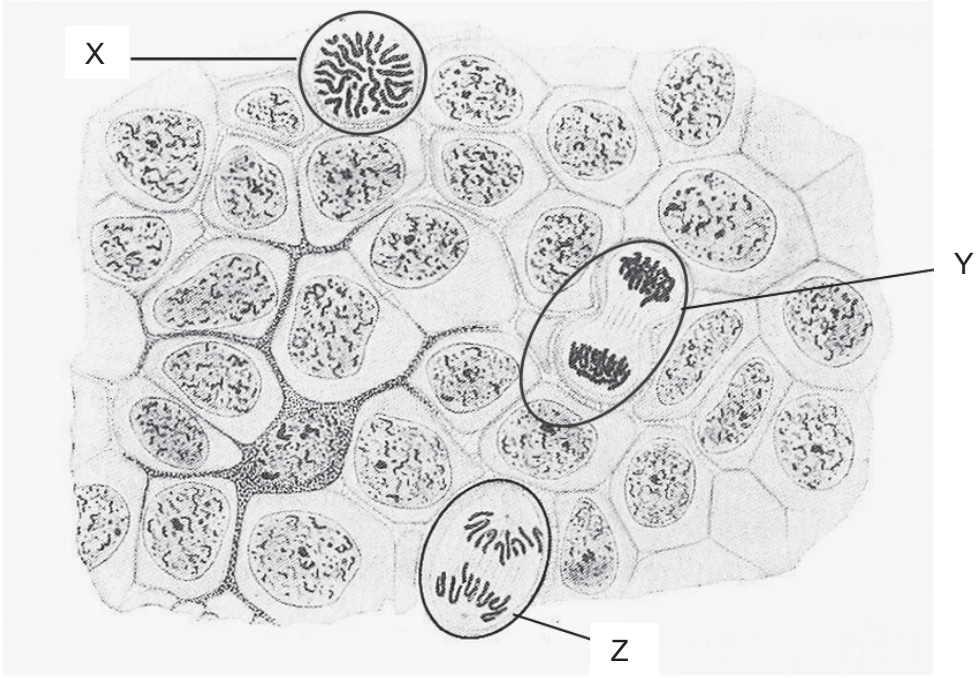
31. The level of estrogen in the blood of a woman changes during a normal menstrual cycle. Which graph shows these changes?



32. The diagram below shows the life cycle of an animal. At which stage in the life cycle does mitosis occur?



33. The diagram shows some animal cells undergoing various stages of mitosis.

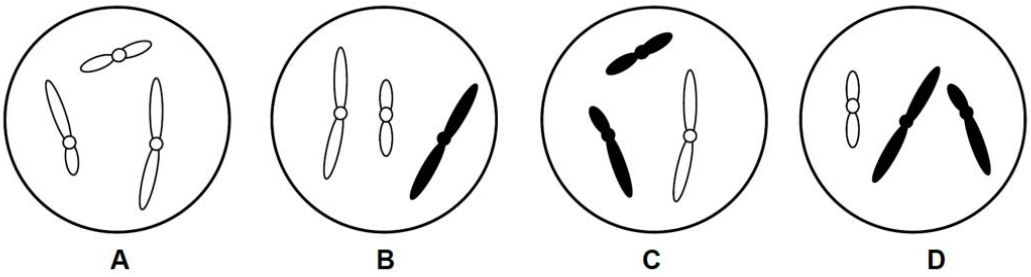


Which stages of mitosis are occurring in the cells X, Y and Z?

	X	Y	Z
A	anaphase	metaphase	interphase
B	interphase	telophase	anaphase
C	metaphase	anaphase	prophase
D	prophase	telophase	anaphase

34. The diagram below represents the nucleus of a body cell from an organism.

Which diagram does **not** represent a possible gamete nucleus produced by the organism?



35. A DNA molecule consists of 4000 nucleotides, of which 20% contain the base adenine.
How many of the nucleotides in this DNA molecule will contain guanine?

A 800
B 1000
C 1200
D 1600

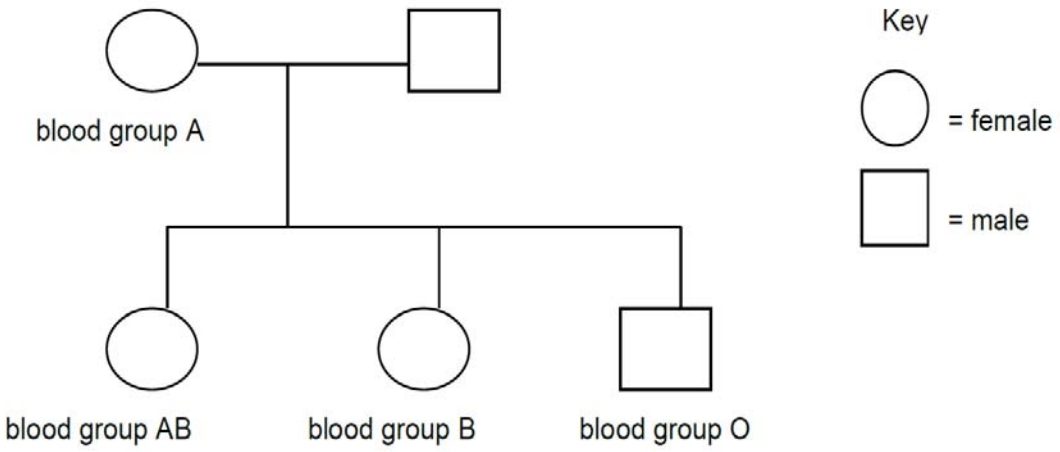
36. Bacteria are used in genetic engineering. A plasmid is used to transfer the required DNA into the bacterium.
What is the term used to describe the role of plasmid in this technology?

A recombinant
B transgenic
C host
D vector

37. Huntington's Disease is an inherited condition in humans caused by a dominant allele. A woman's father is heterozygous for the condition. Her mother is not affected by the condition.
What is the chance of the woman being affected by the condition?

A 100%
B 75%
C 50%
D 25%

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

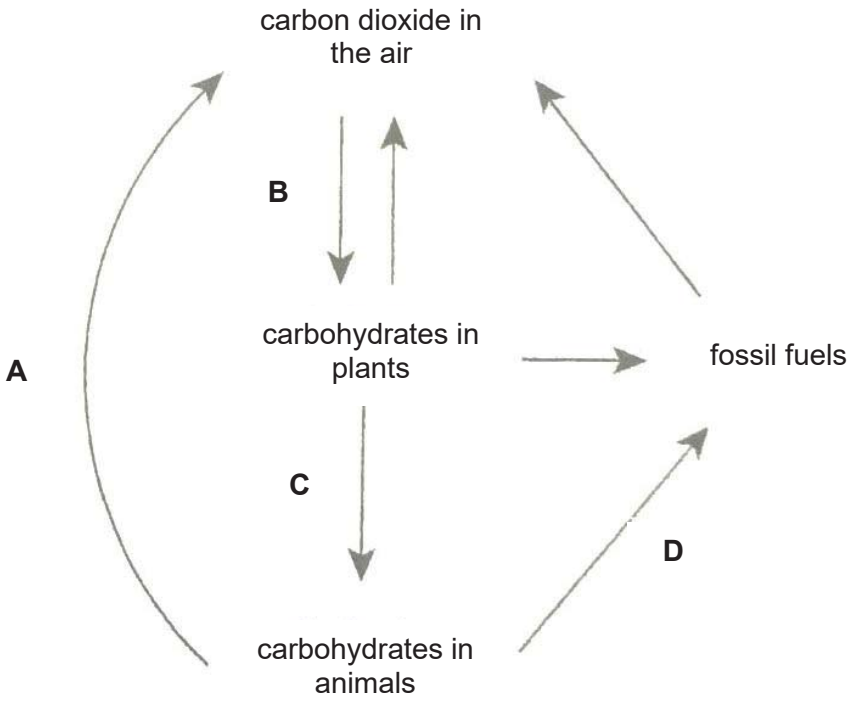


What are the blood group genotypes of the parents?

	father's genotype	mother's genotype
A	I^BI^B	I^AI^B
B	I^BI^O	I^AI^A
C	I^BI^O	I^AI^B
D	I^BI^O	I^AI^O

39. The diagram shows some of the processes which take place during the carbon cycle.

Which labelled part of the cycle may involve bacteria and fungi?



40. 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)
R	10,000	0.1
S	5	10.0
T	500	0.002
U	5	300 000.0

What is the energy flow in the chain?

A R → T → S → U
B R → T → U → S
C U → S → R → T
D U → R → S → T

End of Paper 1