



Geylang Methodist School (Secondary) Preliminary Examination 2018

BIOLOGY

Paper 1

6093/01

Sec 4 Express

Additional materials: Optical Answer Sheet

1 hour

Setter: Mrs Cheryl Tang

20 Aug 2018

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, papers clips, highlighters, glue or correction fluid on the Optical Answer Sheet.

Write your name, class and index number on the Optical Answer Sheet provided.

There are **forty** questions on this paper. Answer **all** questions.

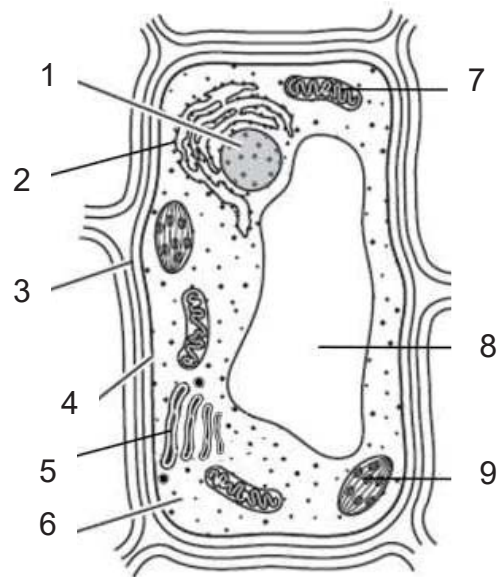
For each question, there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

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.

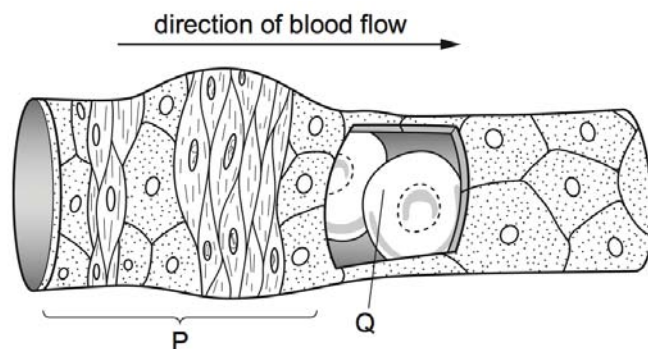
Any rough working should be done in this booklet.

- 1 The diagram below shows a plant cell in a leaf of a tree.



Which of the following correctly shows the pathway involving the synthesis of a protein molecule needed for the development of a fruit?

- A** 1 → 2 → 5 → 4
B 1 → 6 → 5 → 9
C 2 → 5 → 7 → 1
D 7 → 1 → 2 → 5
- 2 The diagram shows blood passing through an arteriole into a capillary. Part of the capillary wall has been cut away to show the blood.



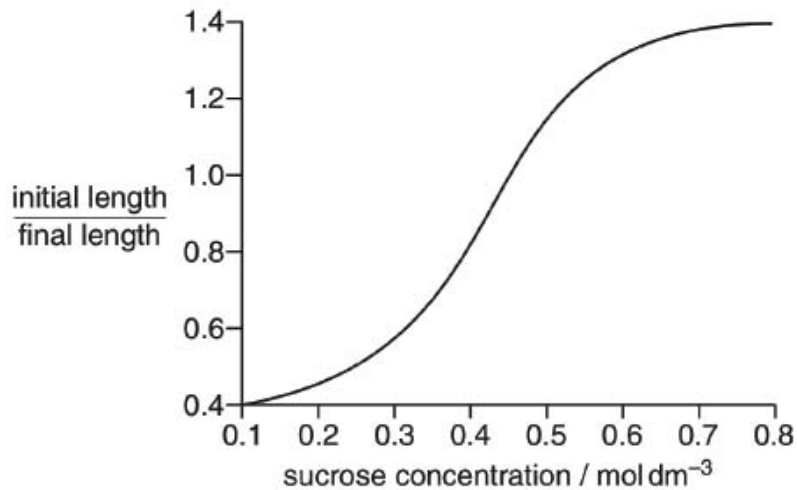
What is the level of organisation of the structures labelled P and Q?

	P	Q
A	organ	cell
B	organ	tissue
C	tissue	cell
D	tissue	tissue

- 3** Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations.

Their lengths were measured before immersion and after 30 minutes in the different solutions.

The graph shows the ratio of their initial length to final length.

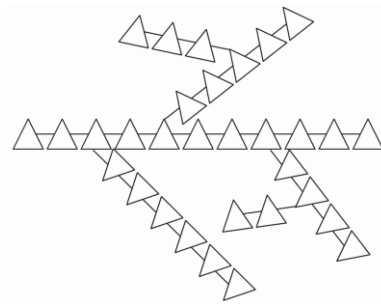


Which concentration of sucrose solution, in mol dm⁻³, has the same water potential as the cell sap before immersion?

- A** 0.10
B 0.25
C 0.45
D 0.80
- 4** Where and how does carbon dioxide enter a plant?

	where	how
A	root hair cells	active uptake
B	root hair cells	diffusion
C	stomata	active uptake
D	stomata	diffusion

- 5 The diagram shows a biological molecule.



What type of molecule is this likely to be?

- A** fat
 - B** glycogen
 - C** protein
 - D** sucrose
- 6 A mixture of food gives the following results on testing:

a purple colour in the biuret test;
 a blue colour when heated with Benedict's solution;
 a yellow colour with iodine;
 a white emulsion with ethanol.

What does the mixture contain?

- A** fat and protein
 - B** protein and reducing sugar
 - C** reducing sugar and starch
 - D** starch and fat
- 7 Protease enzyme breaks down protein to amino acids.

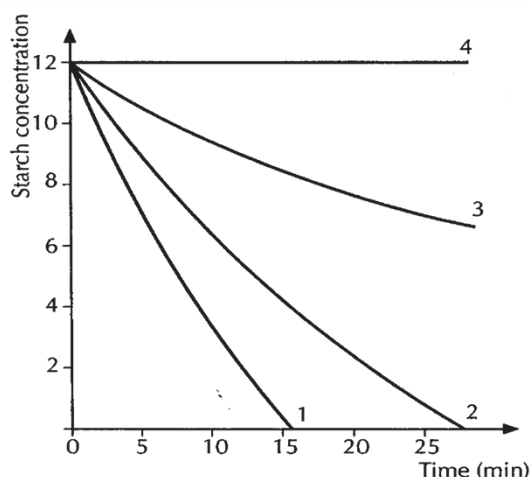
In the 'lock and key' hypothesis, what is the lock and what is the key?

	lock	key
A	amino acid	protease
B	protease	amino acid
C	protease	protein
D	protein	protease

- 8 Four flasks labelled Q, R, S and T were prepared. The contents of each flask are given in the table below.

flask	contents of flask	experiment temperature ($^{\circ}\text{C}$)
Q	20 cm ³ of starch + 5 cm ³ salivary amylase	35
R	20 cm ³ of starch + 2 cm ³ salivary amylase	35
S	20 cm ³ of starch + 5 cm ³ boiled salivary amylase	35
T	20 cm ³ of starch + 5 cm ³ salivary amylase	10

Equal volumes of samples from each flask were obtained and tests for starch were done at 5-minute intervals. Each experiment was carried out over a time span of 25 minutes. The results of the experiments are shown in the graph.



Which of the following shows the accurate trends for reactions in flasks Q and S?

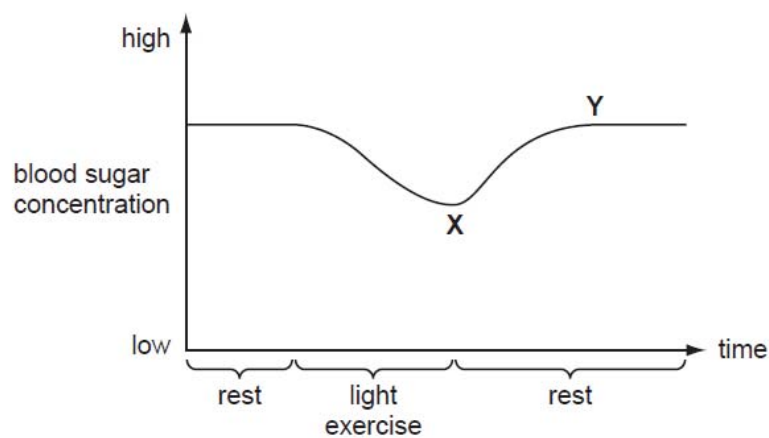
	Q	S
A	4	1
B	1	4
C	3	1
D	3	2

- 9 Rachel has a damaged liver due to excessive drinking. Many functions of the body will be affected.

Which of the following function will **not** be affected?

- A secretion of digestive enzymes
- B formation of urea
- C production of bile
- D formation of glycogen

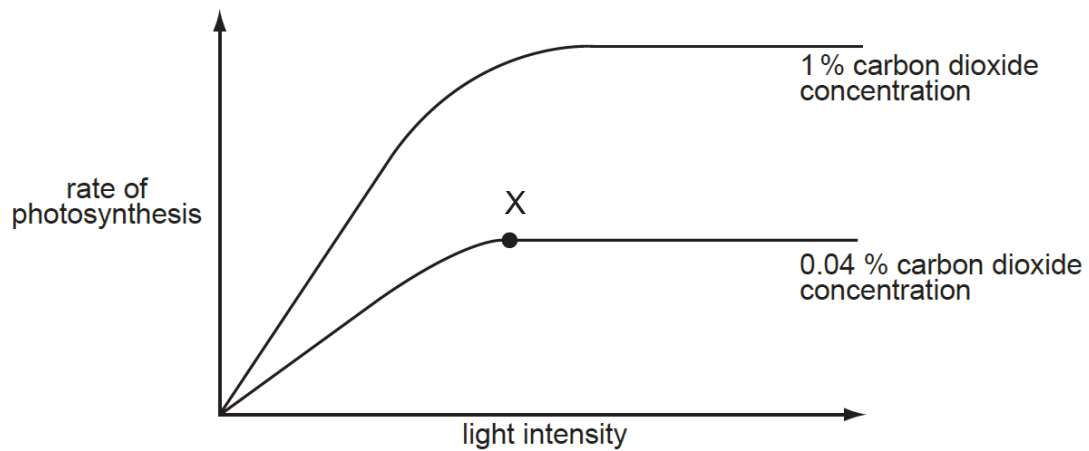
- 10 The graph shows the changes in blood glucose concentration during periods of rest and exercise.



What causes the change in blood glucose level between **X** and **Y**?

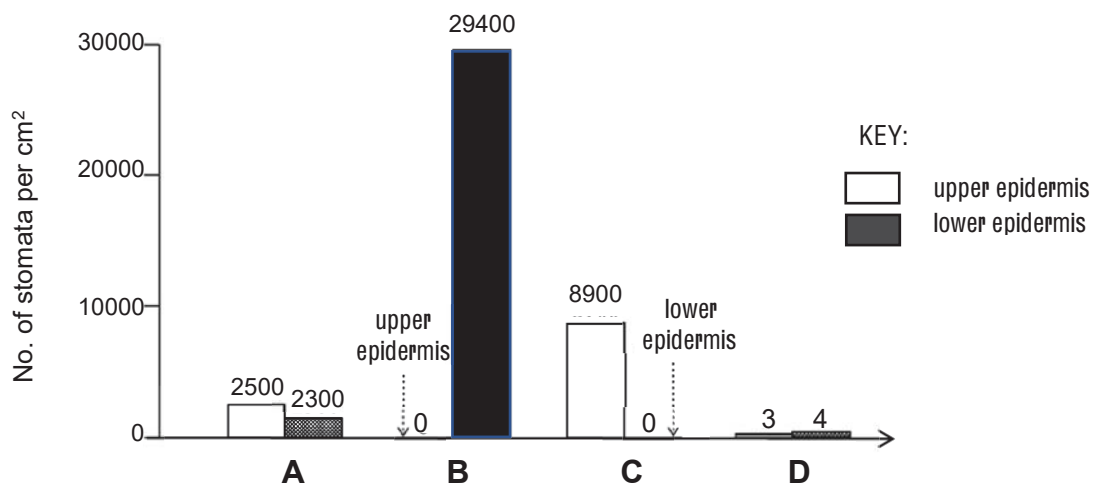
	glucagon secretion	insulin secretion	glycogen stored in liver
A	decreases	increases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	decreases	increases

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



Which factor is limiting the rate of photosynthesis at point X?

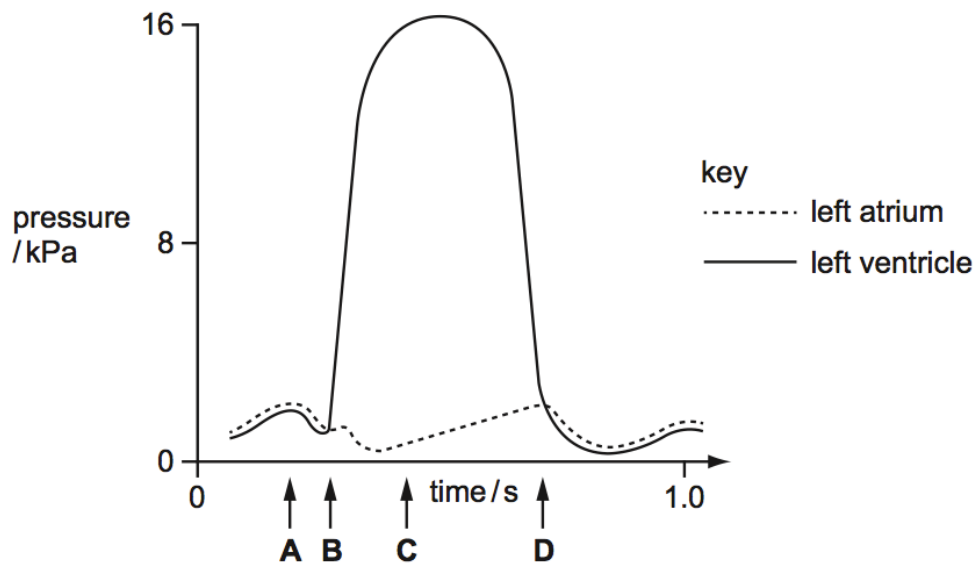
- A** availability of chlorophyll
B availability of water
C concentration of carbon dioxide
D intensity of light
- 12** The chart below shows the distribution of stomata on the upper and lower epidermis of the leaves of four plants.



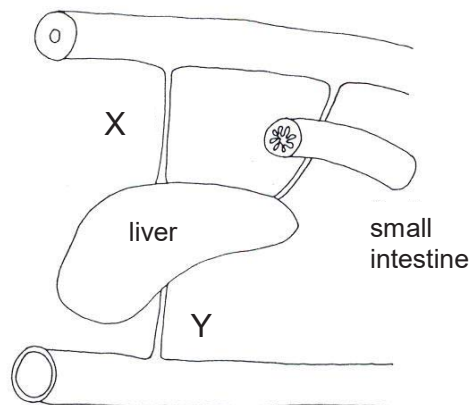
Which of these plants would be found floating on the surface of a pond?

- 13** The diagram shows pressure changes in the left side of the heart during part of the human cardiac cycle.

At which point do the atrioventricular valves open?



- 14** The diagram below shows the mammalian blood vessels connected with the small intestines and the liver.



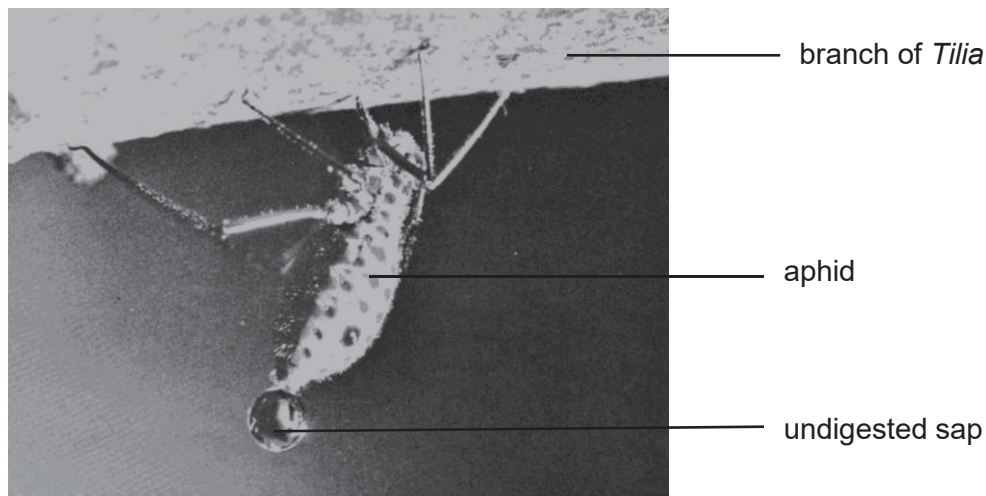
Which of the following is correct?

	blood vessel X	blood vessel Y
A	more urea	less urea
B	more oxygen	less oxygen
C	more carbon dioxide	less carbon dioxide
D	valves present	valves absent

- 15** The life span of red blood cells is approximately 120 days. New red blood cells are released into the bloodstream from the bone marrow. Unlike typical cells in the body, they do not reproduce by mitosis.

What is the likely explanation for this?

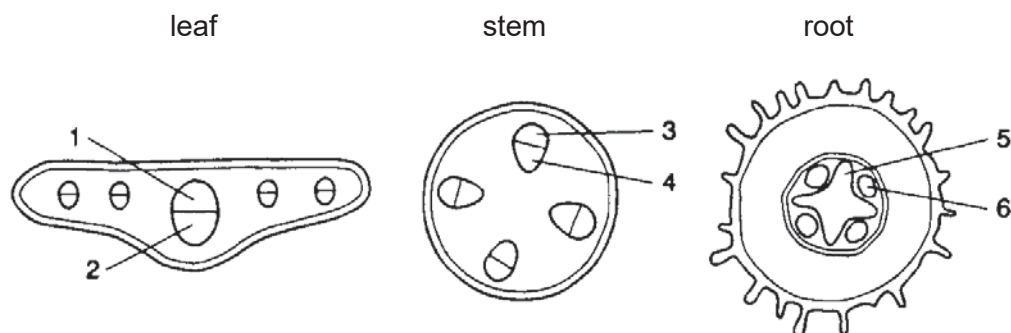
- A** Red blood cells have haemoglobin which inhibits cell division.
- B** Red blood cells move around constantly, so they are not able to remain stationary for cell division to occur.
- C** Red blood cells have lost their nuclei, so they are not able to carry out cell division.
- D** Red blood cells are too small for cell division to take place.
- 16** The photomicrograph shows an aphid feeding on a branch of a woody tree, *Tilia*. The fluid extracted by the aphid consists of sieve element sap. The high turgor pressure in the sieve element forces the cell contents through the food canal of the aphid. Once every 30 minutes, a droplet of undigested sap exits from the aphid. Plants exhibiting extensive aphid damage can have a variety of symptoms, such as decreased growth rates, stunted growth, low yields and death.



Which of the following pairs of observation and explanation is correct?

	observation	explanation
A	sieve element sap	rich in solutes, especially sucrose and amino acids.
B	high turgor pressure in sieve element	numerous mitochondria in sieve tubes to carry out active transport.
C	undigested sap	product of defecation and not excretion.
D	variety of symptoms	due to low levels of manufactured food substances left for <i>Tilia</i> plant.

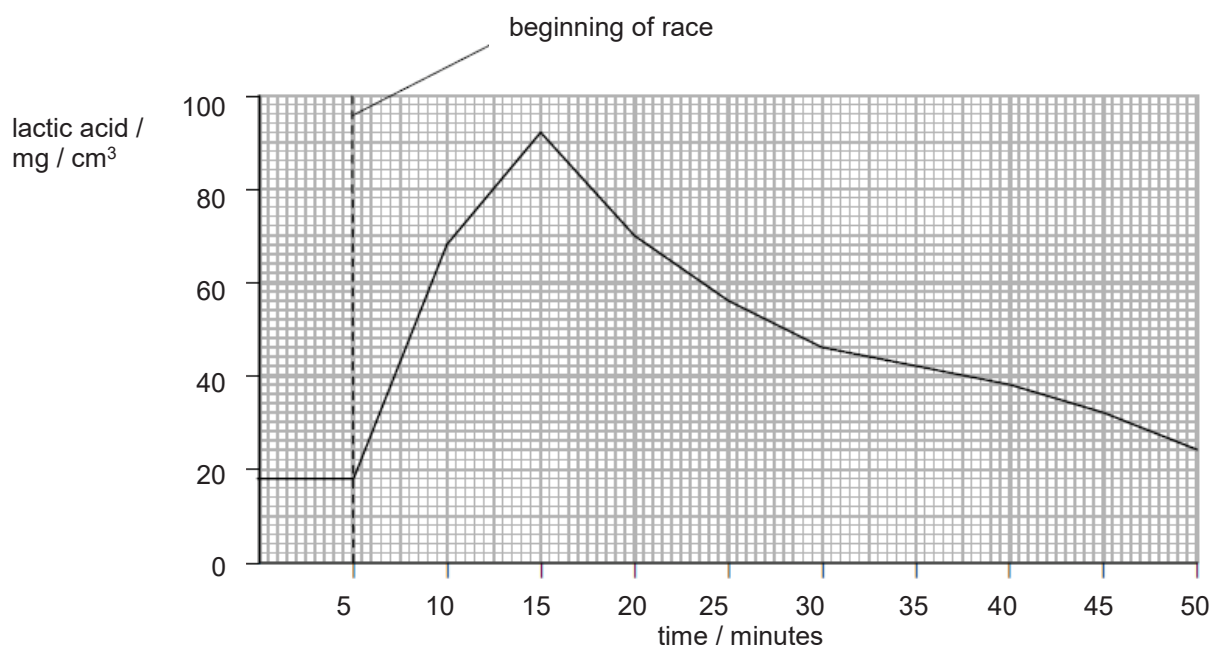
- 17** A plant was enclosed in an environment that contained radioactive carbon dioxide for 24 hours. The leaf, stem and root of the plant was then sectioned to detect radioactivity. The diagram below shows a leaf, stem and root of the plant.



Which of the numbered parts would show radioactivity?

	leaf	stem	root
A	1	3	5
B	1	4	5
C	2	3	6
D	2	4	6

- 18** The graph shows the concentration of lactic acid in the blood vessel leaving the leg muscle of a runner before, during and after a race.

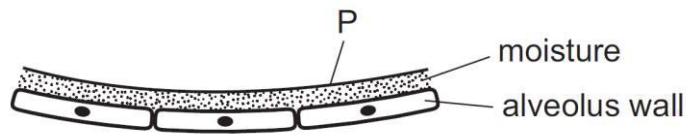


What is the concentration of lactic acid 15 minutes after the race has finished?

- A** 32 mg/cm³
B 46 mg/cm³
C 70 mg/cm³
D 92 mg/cm³

- 19** The diagram shows the gas exchange surface of a person who has just smoked a cigarette.

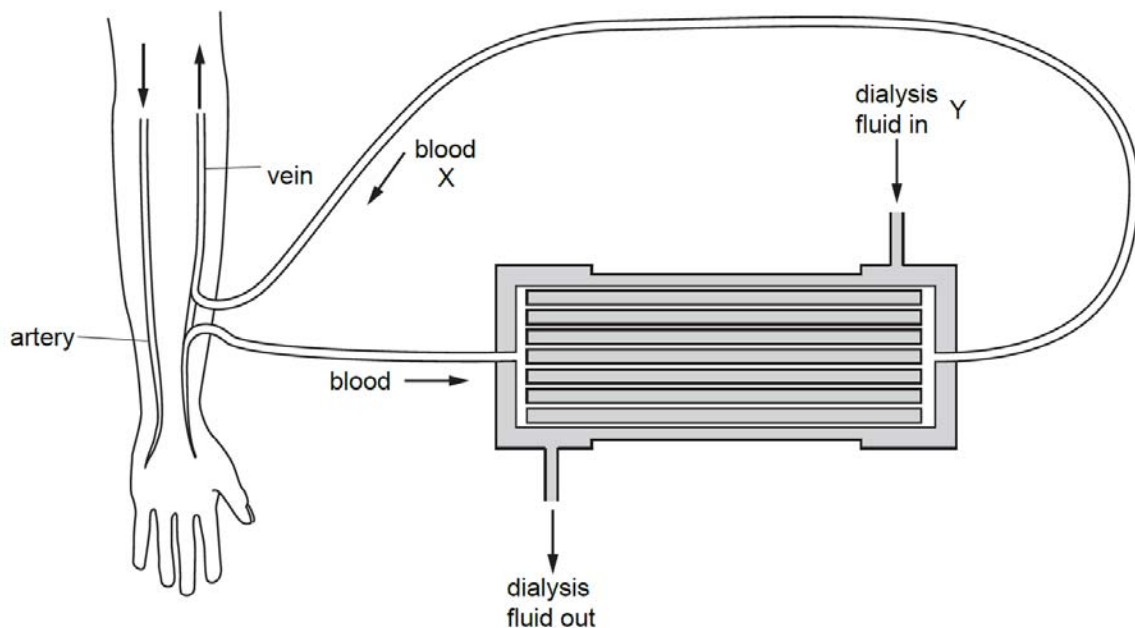
Substance P can cause cancer.



What is substance P?

- A** carbon dioxide
- B** carbon monoxide
- C** nicotine
- D** tar

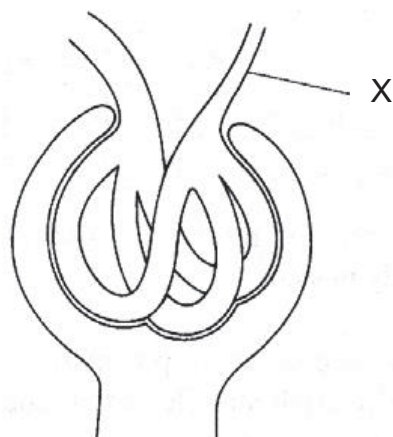
- 20** The diagram shows the flow of blood and dialysis fluid through a kidney machine.



Which substances have the lowest concentration at X and the highest concentration at Y?

	lowest concentration at X	highest concentration at Y
A	glucose	salts
B	salts	glucose
C	urea	water
D	water	urea

- 21** The diagram shows a glomerulus and Bowman's capsule of a mammalian nephron



What happens if the diameter of the blood vessel is enlarged at X?

- A** More sodium will appear in the urine.
B Less glucose will appear in the urine.
C Water reabsorption will be decreased.
D The rate of urine production will be reduced
- 22** The hypothalamus detects a rise in blood temperature above normal.
 Which of the following would correct it?

	arterioles in the skin	sweat glands	hair erector muscles
A	constrict	active	relax
B	constrict	inactive	contract
C	dilate	active	relax
D	dilate	inactive	contract

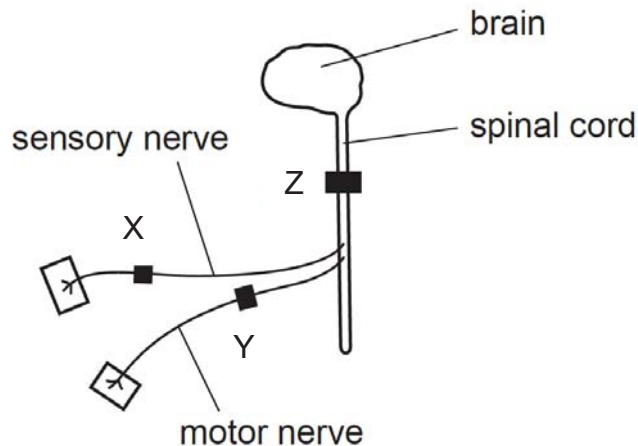
- 23** Four processes that take place in the human body are listed.

1. absorption of amino acids through the villi
2. maintenance of constant body temperature
3. production of lactic acid in muscles
4. regulation of blood glucose concentration

Which two processes are directly controlled by negative feedback?

- A** 1 and 3
B 1 and 4
C 2 and 3
D 2 and 4

- 24** The diagram represents a central nervous system. X, Y, and Z show possible sites where the system can be blocked by a local anaesthetic.



Of four men, one had no anaesthetic block and the other three had only one anaesthetic block at X, Y or Z.

One of the men can feel a pinprick on his leg but cannot move it.

Where is the anaesthetic block for this man?

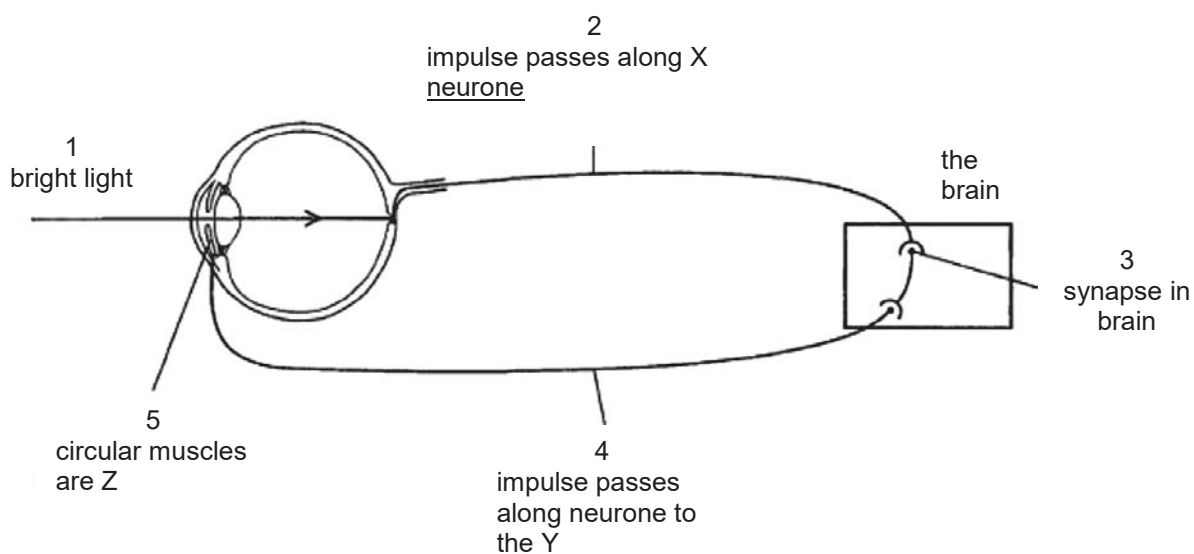
- A** block is at X
 - B** block is at Y
 - C** block is at Z
 - D** no block
- 25** Tom was waiting at a taxi stand in the middle of the night when a robber came up to him and demanded money from him at knife point.

Which of the following are likely to take place in Tom's body at that moment?

- (i) relaxation of radial muscle in the iris
- (ii) dilation of arterioles supplying blood to the gastro-intestinal tract
- (iii) dilation of arterioles supplying blood to skeletal muscle
- (iv) increased heart rate

- A** (i), (ii) and (iv)
- B** (iii) and (iv)
- C** (ii) and (iii)
- D** (iii) only

- 26** The flow diagram shows the pupil reflex.

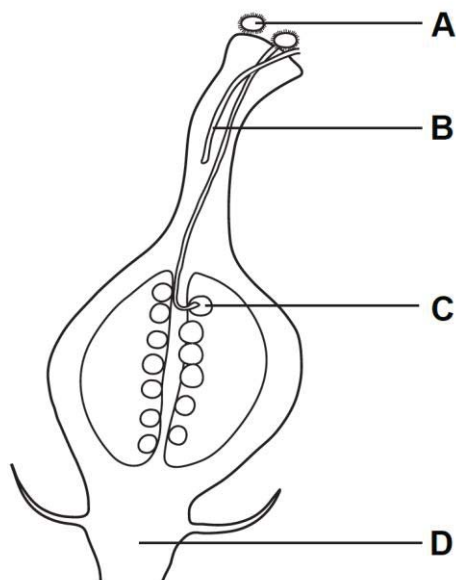


Which words complete the flow diagram?

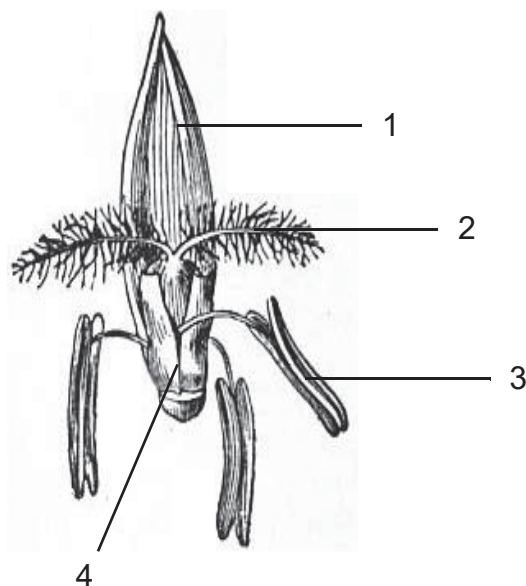
	X	Y	Z
A	motor	ciliary body	contract
B	motor	iris	relax
C	sensory	ciliary body	relax
D	sensory	iris	contract

- 27** New plants may be grown from groups of cells that are taken from other plants. The diagram shows part of plant X.

From which structure will cell samples grow into new plants that are genetically identical to plant X?



- 28** The diagram shows the flower of a species of grass that is growing extensively in a grassland.

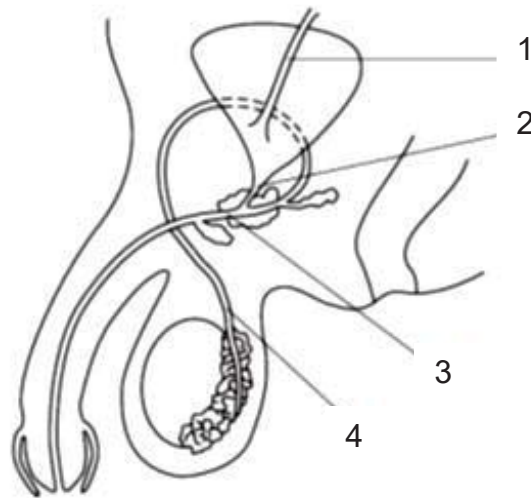


Both the male and female reproductive parts matured within 48 hours of each other three days ago.

Assuming normal climatic conditions, where can intact pollen grains be found in the flower above?

- A** 1 and 2
B 1 and 2
C 2 and 3
D 2, 3 and 4
- 29** Which precautions should be taken to prevent the spread of HIV?
- 1 avoidance of any direct skin contact with another person
 - 2 medical staff wearing gloves when treating patients
 - 3 not sharing soap used by another person
 - 4 prevent exchange of body fluids being in direct contact
 - 5 treatment of blood products to destroy the virus
- A** 1, 2 and 3
B 1, 3 and 4
C 2, 3 and 5
D 2, 4 and 5

- 30** The diagram shows part of the male urinary and reproductive systems in side view.

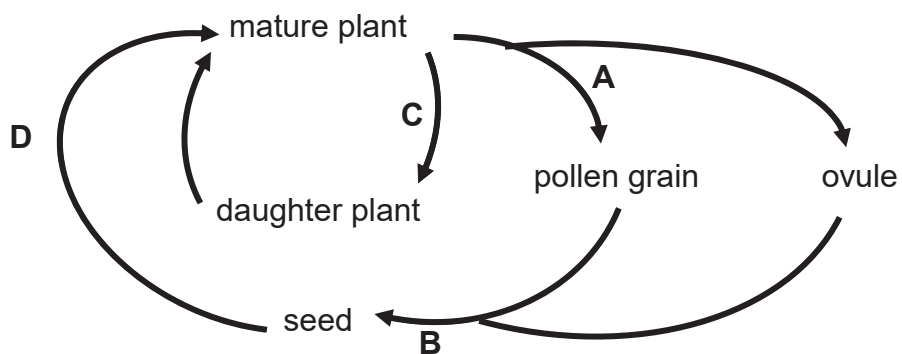


What is transported in the tubes labelled 1, 2, 3 and 4?

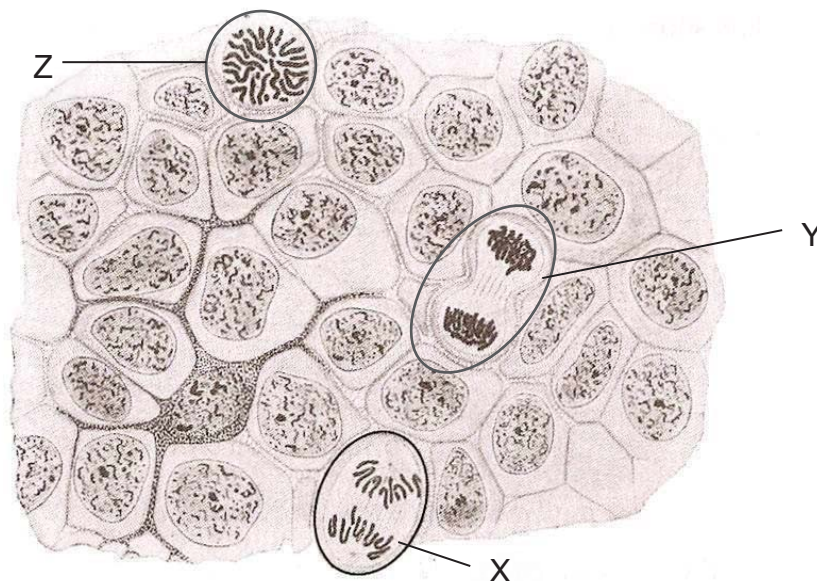
	1	2	3	4
A	urine only	urine only	urine and sperm	sperm only
B	sperm only	urine and sperm	urine only	urine only
C	urine only	urine and sperm	sperm only	urine only
D	urine and sperm	urine only	sperm only	urine only

- 31** The diagram shows the life cycle of a species of plant.

During which stage does meiosis occur?



- 32** The diagram below shows animal cells undergoing various stages of mitosis.



Identify the stages of mitosis occurring in the cells labelled X, Y and Z.

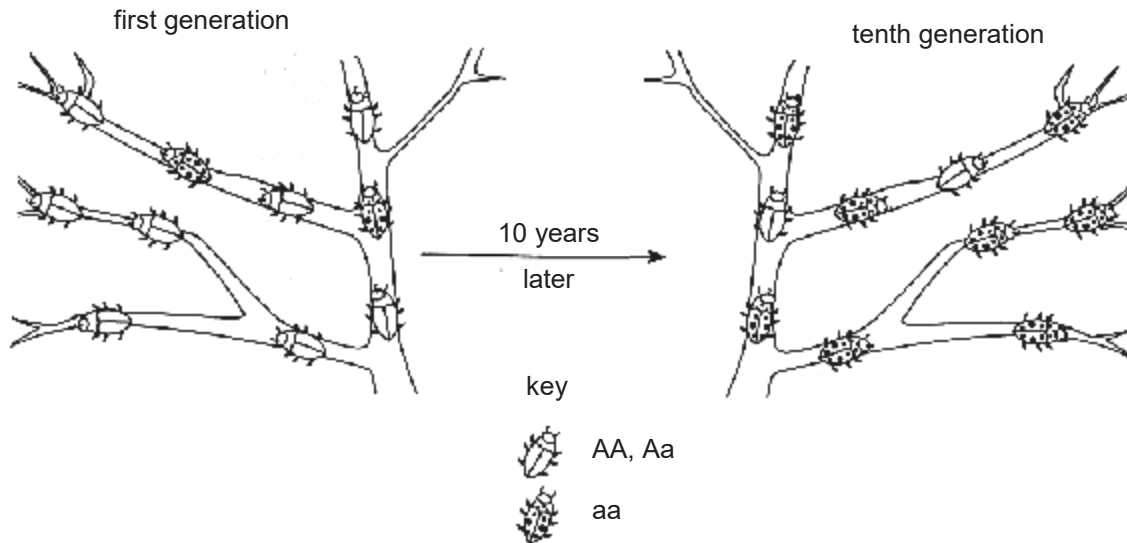
	X	Y	Z
A	anaphase	prophase	interphase
B	anaphase	telophase	prophase
C	prophase	metaphase	telophase
D	prophase	anaphase	telophase

- 33** A woman with blood type A marries a man with blood type B. They have children with each of the four blood groups.

Which of the following statements correctly describes the children in this family?

- A** Some of the children would have the same genotypes as the parents.
- B** None of the children would be homozygous for any of the blood type alleles.
- C** All the children would have at least one copy of the I^O .
- D** Each of them would have either one I^A or one I^B allele.

- 34** The diagram shows the change that occurs in the frequency of phenotypes in an insect population over 10 generations.



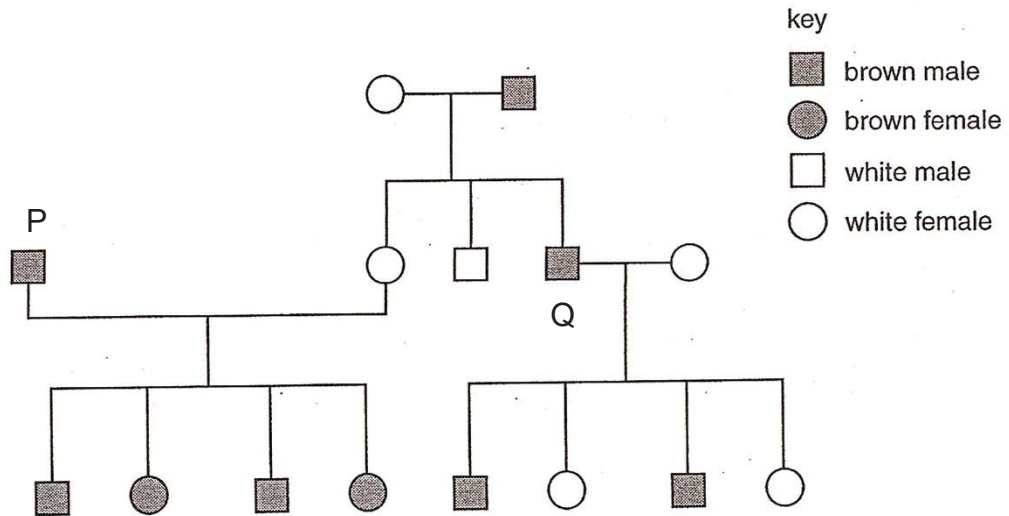
Which of the following best explains the change in the frequency of phenotype over 10 generations?

- A** A decrease in the adaptive value of allele *a*.
 - B** A decrease in the mutation rate of allele *a*.
 - C** An increase in the adaptive value of allele *a*.
 - D** An increase in the population of this insect.
- 35** A person with Down's syndrome is born with 47 chromosomes in each of his/her cells, instead of 46.

What could cause this?

- A** A mutation happened during the production of the egg cell.
- B** More than one sperm fused with the egg at fertilisation.
- C** Radiation caused a change in structure of a gene in the father's sperm.
- D** The mother was exposed to harmful chemicals while she was pregnant.

- 36** The chart shows the inheritance of coat colour in mice. The allele for brown coat (B) is dominant of the allele for white coat (b).

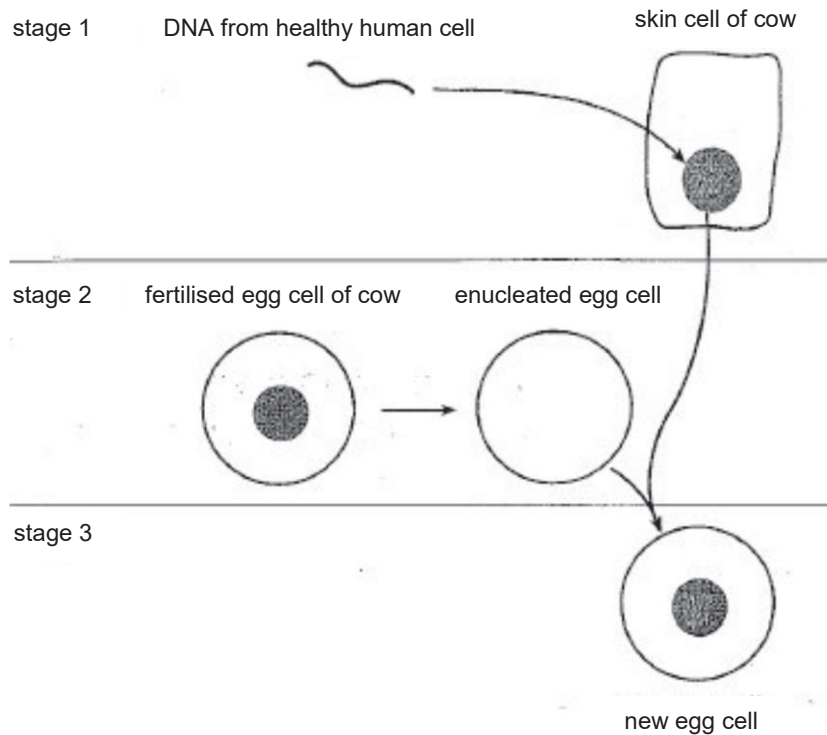


What are the genotypes of individuals P and Q most likely to be?

	P	Q
A	BB	Bb
B	BB	BB
C	Bb	Bb
D	Bb	BB

- 37** In an experiment, cows were used to make 'designer milk' containing human antibodies.

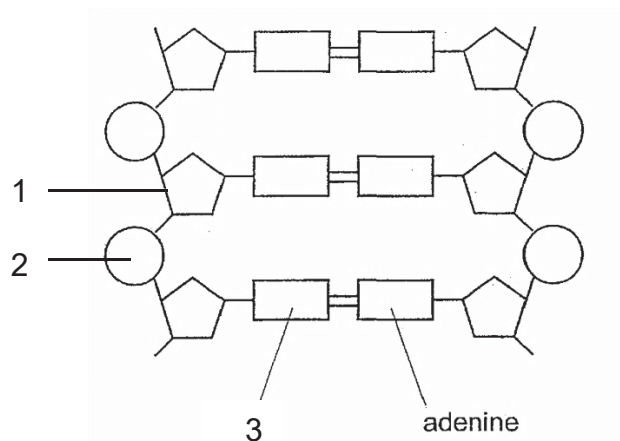
The diagram shows the first three stages of the process.



In which stages in the diagram above are transgenic cells present?

- A** stages 1 and 2
- B** stages 1 and 3
- C** stages 2 and 3
- D** stages 1, 2 and 3

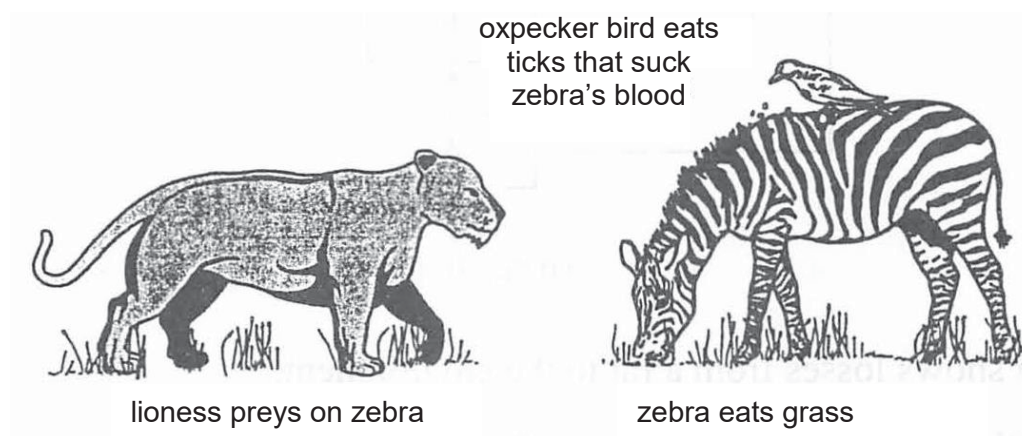
- 38 The diagram shows a short section of a molecule of DNA.



Which of the following sets of labels is correct?

	1	2	3
A	ribose	sugar-phosphate backbone	adenine
B	ribose	phosphate	cytosine
C	deoxyribose	sugar-phosphate backbone	guanine
D	deoxyribose	phosphate	thymine

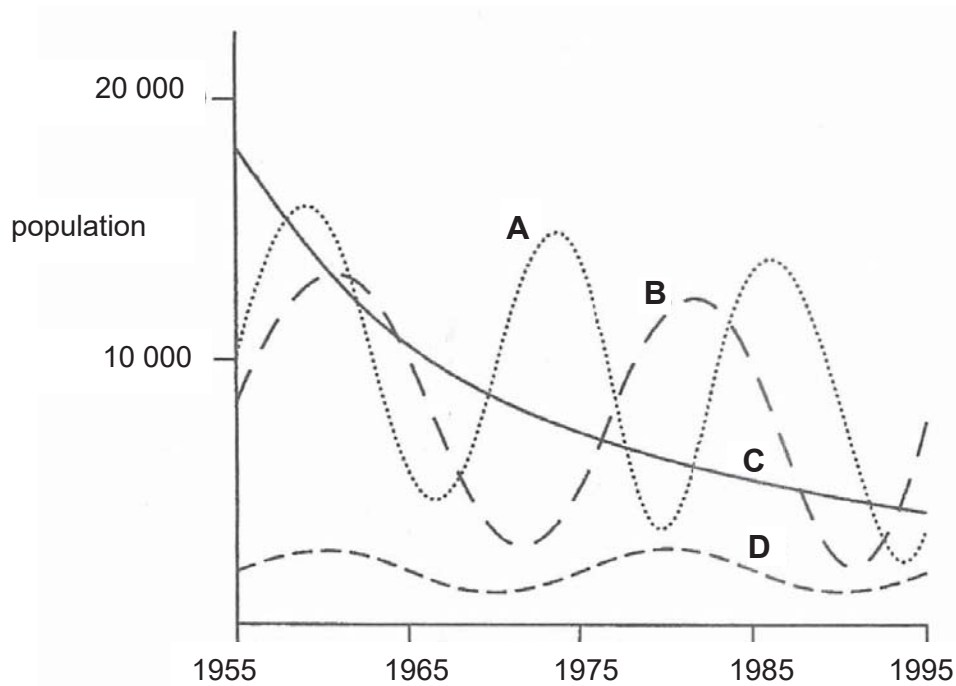
- 39 The diagram shows some organisms (not drawn to scale), which live in the same habitat.



Which of the following is a food chain for this habitat?

- A** grass → zebra → lion → oxpecker bird
B grass → zebra → tick → oxpecker bird
C oxpecker bird → lion → zebra → grass
D oxpecker bird → tick → zebra → grass

- 40** The population sizes of four different species of insect were monitored over a period of 40 years. The results are shown on the graph.
- Which species is in the greatest danger of extinction?



End of Paper