SINGAPORE CHINESE GIRLS' SCHOOL
Preliminary Examination
Secondary Four

CANDIDATE NAME	**ANSWERS**				
CLASS	4			INDEX NUMBER	

BIOLOGY

5158/01

Paper 1 Multiple Choice

Monday **7 August 2017** **1 Hour**

Additional Materials: Optical Answer Sheet

READ THESE INSTRUCTIONS FIRST

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

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.

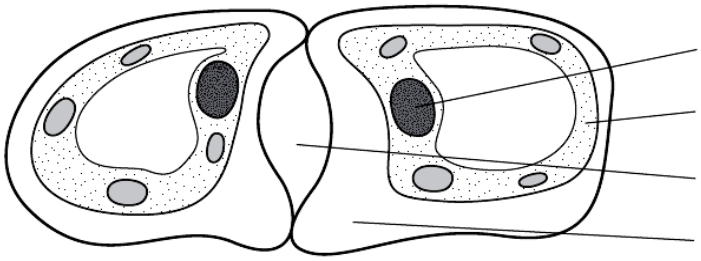
Read the instructions on the Answer Sheet very carefully.

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.

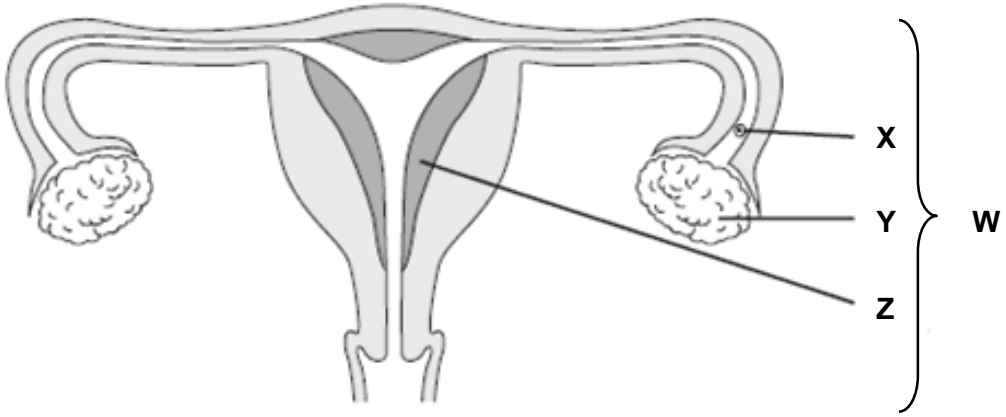
This question paper consists of **25** printed pages.

1 The diagram shows a student's drawing of guard cells.
Which label is **not** correct?



A

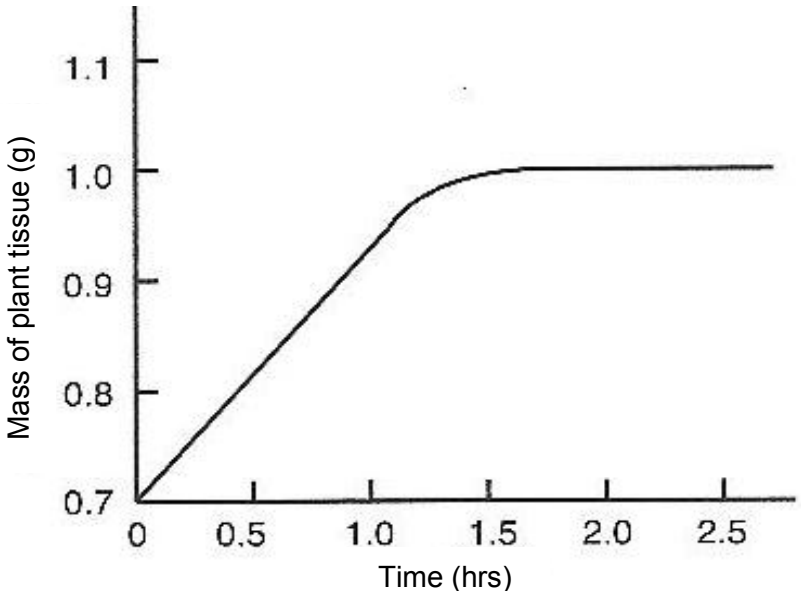
2 The diagram shows the female reproductive system.



Which level of organization are the structures **W**, **X**, **Y** and **Z** at?

	Cell	Tissue	Organ	Organ system
A	X	Y	W	Z
B	X	Z	Y	W
C	Y	X	Z	W
D	Y	W	Z	X

3 The graph shows the changes in the mass of a piece of plant tissue in distilled water at 30°C.



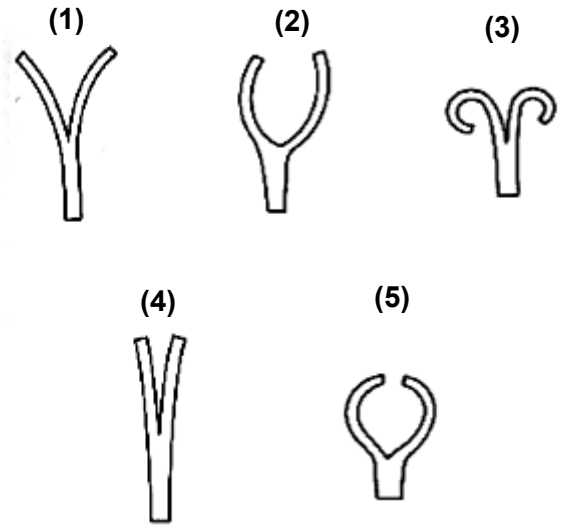
The following conclusions are made.

1 The plant cells are plasmolysed between 1.5 hrs to 2.5 hrs.
2 The plant cells are fully turgid between 1.5 hrs to 2.5 hrs.
3 The rate of osmosis is highest from 1.5 hrs to 2.5 hrs.
4 There was no movement of water molecules from 1.5 hrs to 2.5 hrs.

Which conclusion/s is/are correct?

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

4 Figure **(1)** represents the appearance of a freshly split petiole of a *Coleus*. The appearances of the petioles in solutions of different water potentials after 30 minutes are shown below.



Arrange the petioles in the order of how they appear in solutions of increasing water potential.

A **(3), (4), (2)** and **(5)**

B **(3), (5), (2)** and **(4)**

C **(5), (2), (4)** and **(3)**

D **(5), (3), (4)** and **(2)**

5 Which food would be best for a person suffering from anaemia?

	food	iron/mg per 100g of food	calcium/mg per 100g of food	vitamin C/mg per 100g of food	vitamin D/mg per 100g of food
A	bananas	0.4	7	10	0
B	fish	0.4	28	0	6.38
C	lentils	7.6	39	0	0
D	milk	0.1	120	0.5	0.002

6 A student carried out an experiment to identify the two food substances present in each of three test tubes. The table shows the result of the student's tests.

test tube	reagent added to test tube		
	Biuret test	Benedict's test	Iodine test
X	turns violet	brick red precipitate	remains brown
Y	remains blue	remains blue	turns blue-black
Z	turns violet	remains blue	turns blue-black

Which conclusion is consistent with the results?

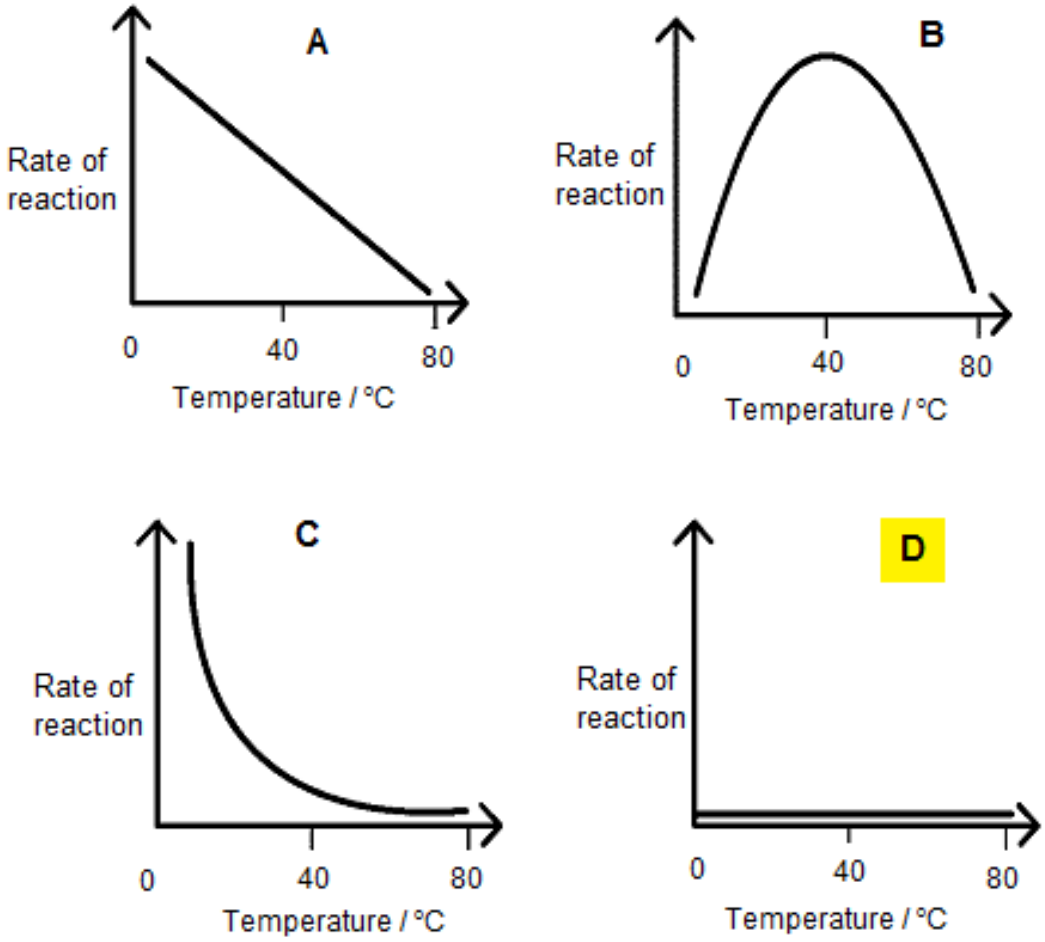
A Maltose and starch had been placed in tube **Z**.

B Starch and sucrose had been placed in tube **Y**.

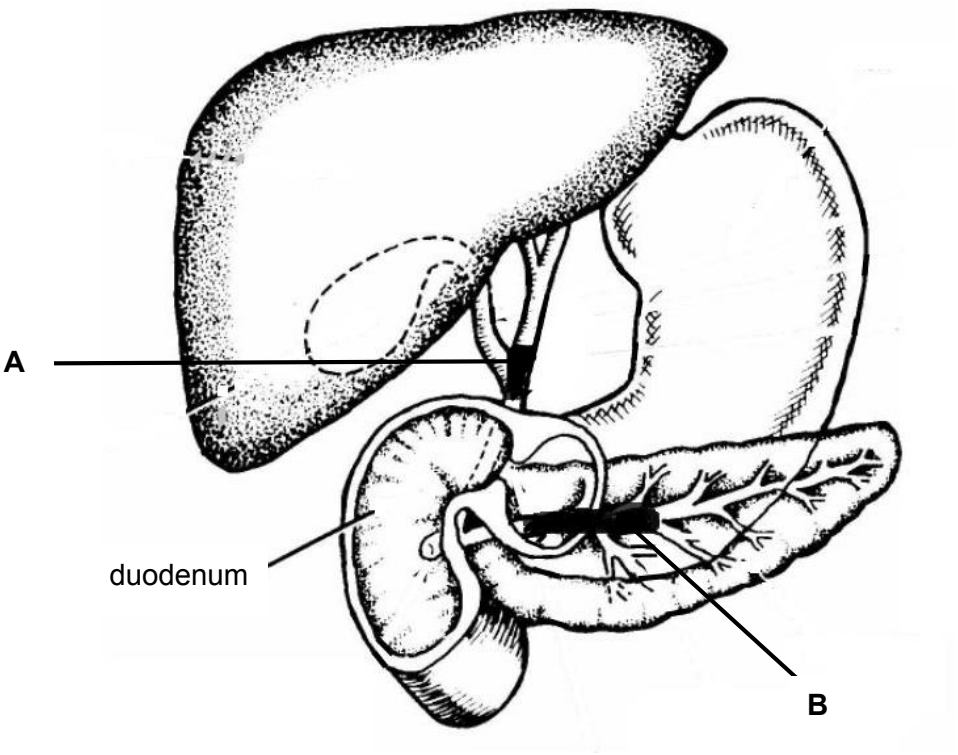
C Maltose and sucrose had been placed in tube **X**.

D Egg white and sucrose had been placed in tube **X**.

7 Which graph shows the changes in reaction rate when amylase is added to a hot starch solution at 80°C and the solution is then cooled down to 0°C?



8 The diagram shows part of the digestive system of a mammal. What is a likely change in the duodenum due to the blockages at **A** and **B**?



A decrease in pH of the duodenum

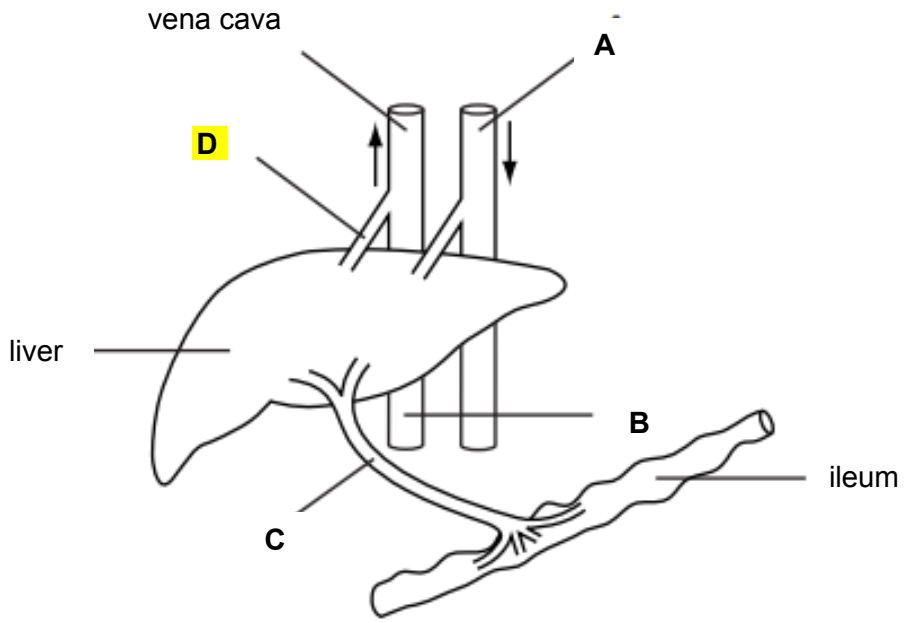
B decrease in the release of glucagon

C increase in the physical digestion of fats

D increase in release of pancreatic proteases

9 The diagram shows the liver and its associated blood vessels.

If a person is fasting, which blood vessel would have the highest concentration of glucose after 24 hours?



10 Grace is a healthy girl. Blood samples from three veins (X, Y and Z) in her body were taken and the concentrations of carbon dioxide, oxygen and urea were measured.

The results, in arbitrary units, are shown in the following table.

vein	carbon dioxide concentration / arbitrary units	oxygen concentration / arbitrary units	urea concentration / arbitrary units
X	45	34	0.3
Y	48	37	6.8
Z	33	98	5.1

Alexis is suffering from some illness and his blood samples from similar locations (X, Y and Z) were taken and the concentrations of the substances were measured and recorded in the table below.

vein	carbon dioxide concentration / arbitrary units	oxygen concentration / arbitrary units	urea concentration / arbitrary units
X	43	33	2.9
Y	47	35	6.6
Z	33	97	5.3

What could Alexis be suffering from?

A atherosclerosis

B diabetes mellitus

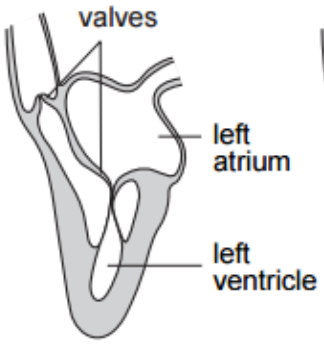
C emphysema

D kidney failure

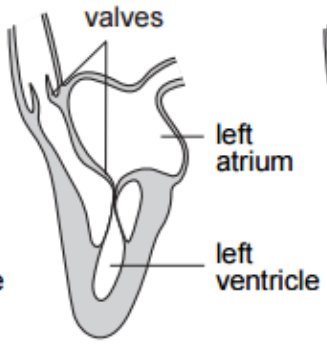
11 The diagrams show sections through the left side of the heart.

Which diagram shows the state of the valves during ventricular contraction?

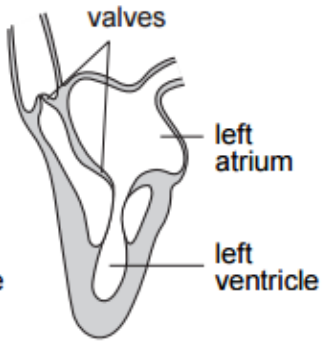
A



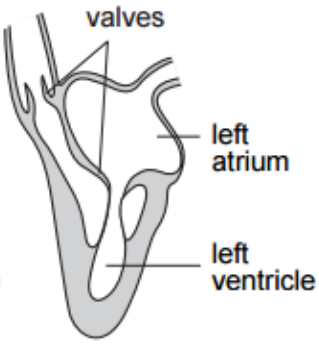
B



C



D



12 What is the function of platelets in wound healing?

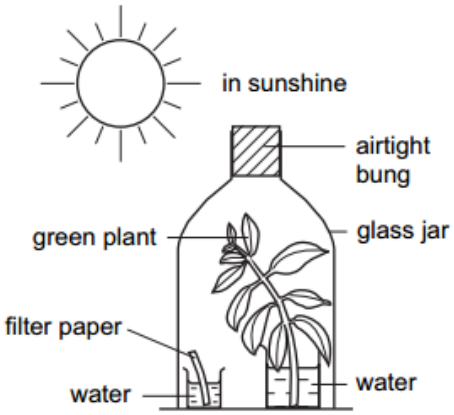
A to break down insoluble threads

B to convert insoluble trypsinogen to soluble trypsin

C to release thrombokinase

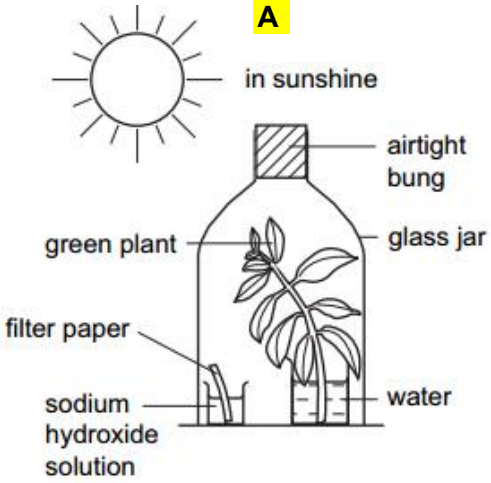
D to synthesise soluble threads

13 The diagram shows a green shoot photosynthesizing under a glass jar. This was used as a control experiment to investigate the need for CO_2 in photosynthesis.

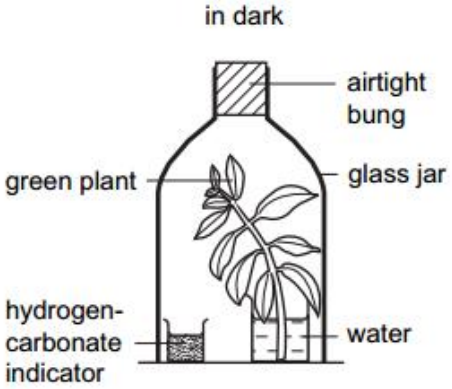


Which diagram shows the other set-up in order to ensure a fair experiment?

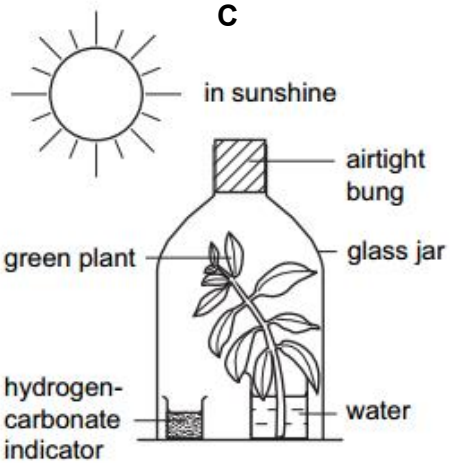
A



B



C



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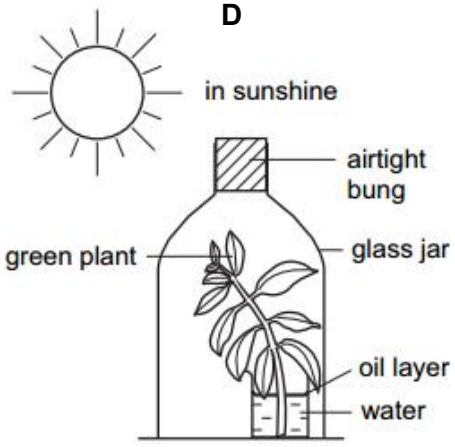
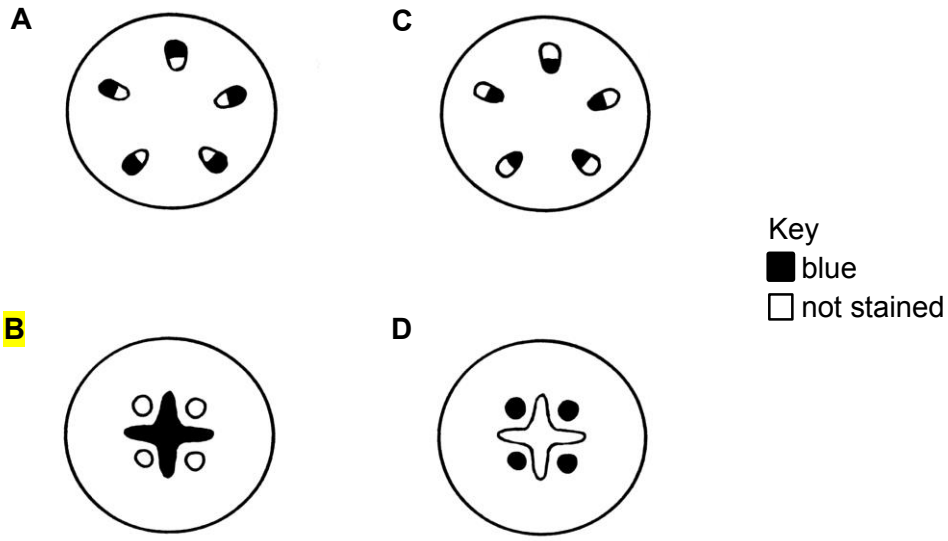
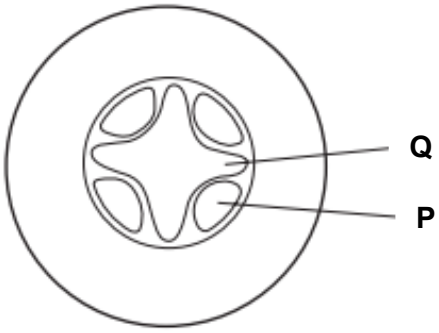


14 Joanna bought a bunch of blue flowers from the market. In order to find out if the colour was artificially introduced, she prepared a section of the root and observed it under a microscope.

Which of the following correctly shows the condition of the section if the colour of the flowers was artificially introduced?



15 A herbaceous plant, growing in a nutrient solution, is placed in a well-lit experimental chamber through which humid air is being passed slowly. The diagram shows a section through part of the plant.

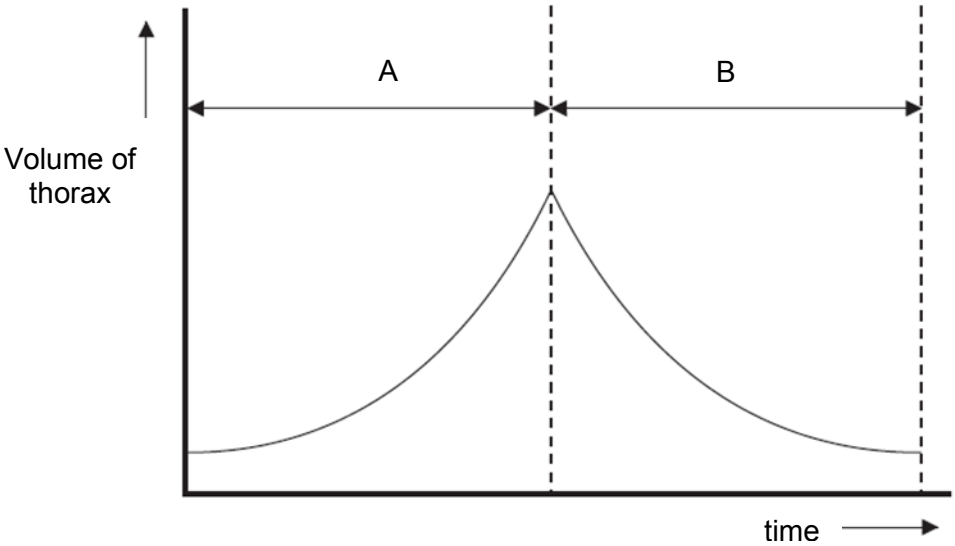


The speeds of the movement of the fluids in tissues **P** and **Q** are measured. The humid air is then replaced by dry air and the speeds of movement of the fluids change.

What are the changes in both tissues **P** and **Q** respectively?

	tissue **P**	tissue **Q**
A	little change	little change
B	greatly increased downward movement	little change
C	greatly increased downward movement	greatly increased upward movement
D	little change	greatly increased upward movement

16 The graph shows changes in the volume of the thorax during one breath.



Which process(es) is/are likely to occur during time period A?

1 Diaphragm relaxes and flattens.

2 External intercostal muscles contract.

3 Ribcage moves upwards and outwards.

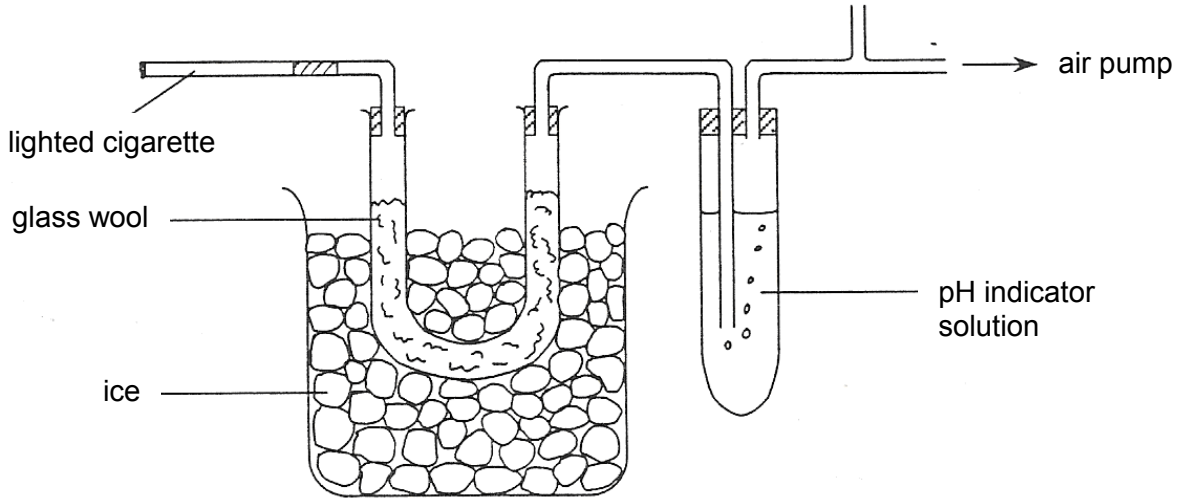
A 2 only

B 1 and 2 only

C 2 and 3 only

D 1, 2 and 3

17 The experimental set-up was used to investigate the products of cigarette smoke.



After 20 minutes, a sticky brown substance was collected on the glass wool. A second cigarette was placed in the same apparatus and more of the same substance accumulated on the glass wool.

It was proposed that by smoking a second cigarette, the risk of a certain condition may be increased.

What is the most likely condition?

A lung cancer

B increased blood clot formation

C reduced transport of oxygen by red blood cells.

D increased heart rate and blood pressure

18 Five processes are listed below.

1 release of carbon dioxide
2 production of energy
3 release of oxygen
4 uptake of water
5 release of water

Which processes occur during aerobic respiration?

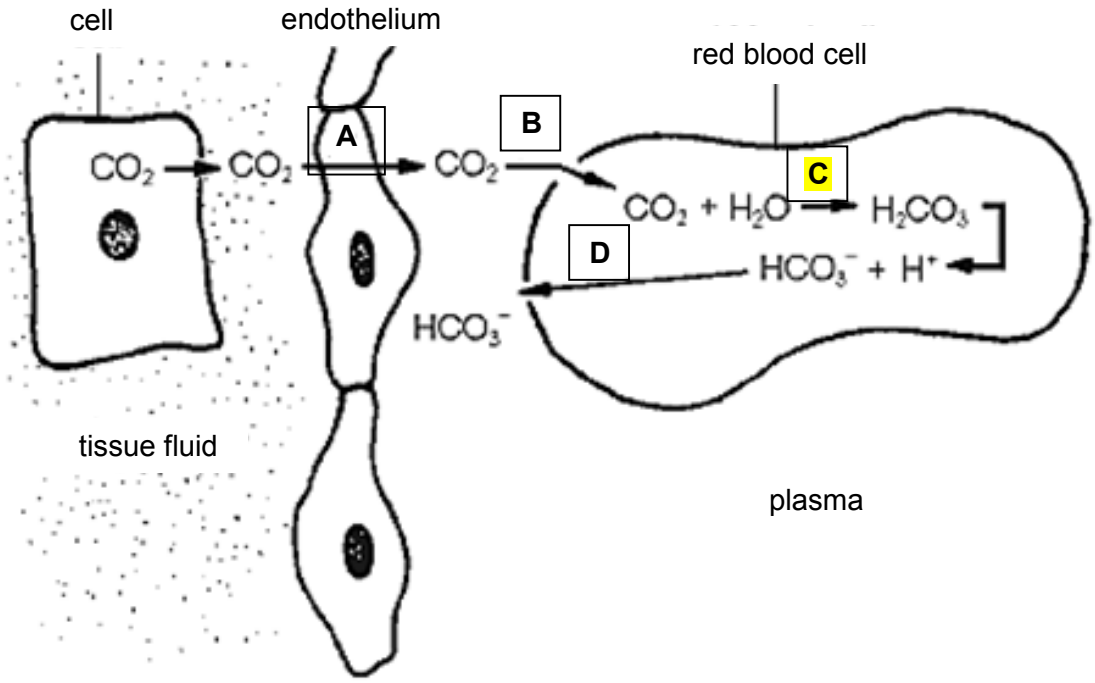
A 1, 2 and 4 only

B 1 and 5 only

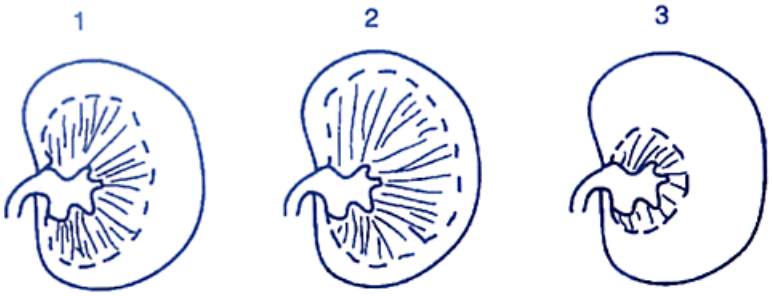
C 1, 2, 4 and 5 only

D 1, 4 and 5 only

19 The diagram shows the relationship between tissue cells and blood capillaries in the transport of carbon dioxide. Which label shows the reaction catalyzed by carbonic anhydrase?



20 The diagrams vertical sections of the kidneys of coypu, brown rat and kangaroo rat. Note 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 on for some days without drinking. Kangaroo rats are able to live in deserts without drinking at all.

Which kidney belongs to which animal?

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

21 Which process is **not** a result of negative feedback?

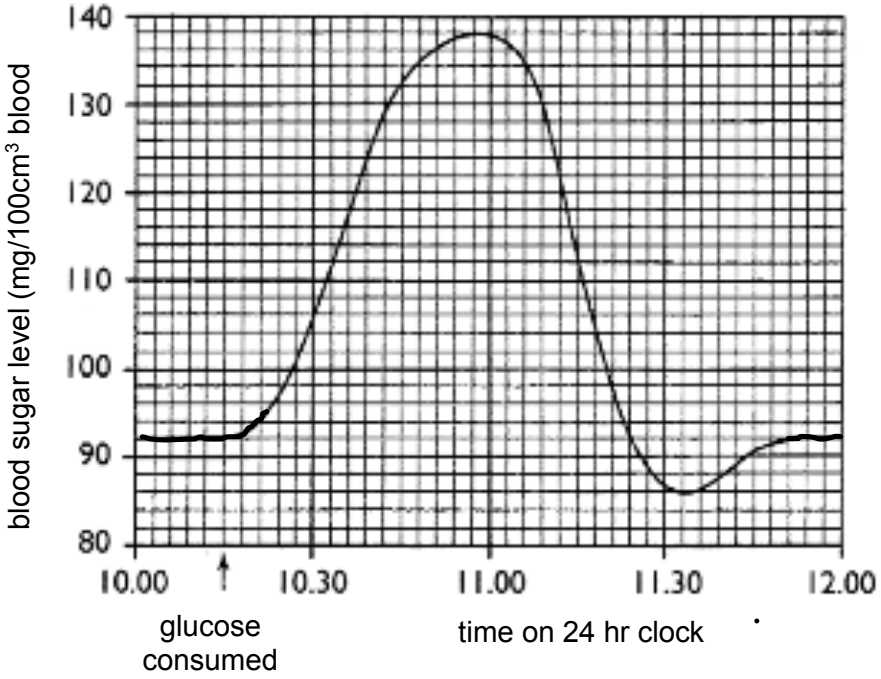
A A decrease in the surrounding temperature leads to a decrease in respiration rate.

B A decrease in the surrounding temperature leads to a decrease in sweating.

C A decrease in the surrounding temperature leads to a decrease in blood flow through the skin surface.

D A decrease in the surrounding temperature leads to shivering.

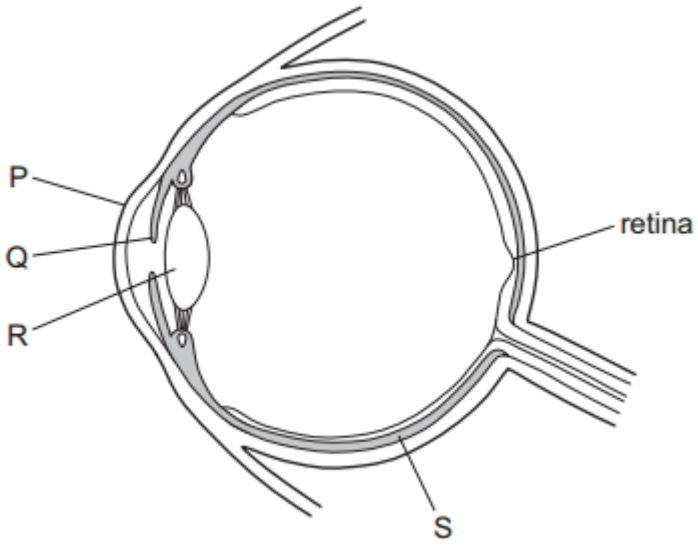
22 The graph shows the blood sugar level of a person who has consumed 50g of glucose at the time indicated.



At which time of the two-hour period would the secretion of insulin and glucagon increase?

	increased amount of insulin	increased amount of glucagon
A	10.30	11.00
B	10.30	11.30
C	11.00	10.30
D	11.30	10.30

23 The diagram shows a section through the eye.



Which structures focus light rays onto the retina?

A P and Q

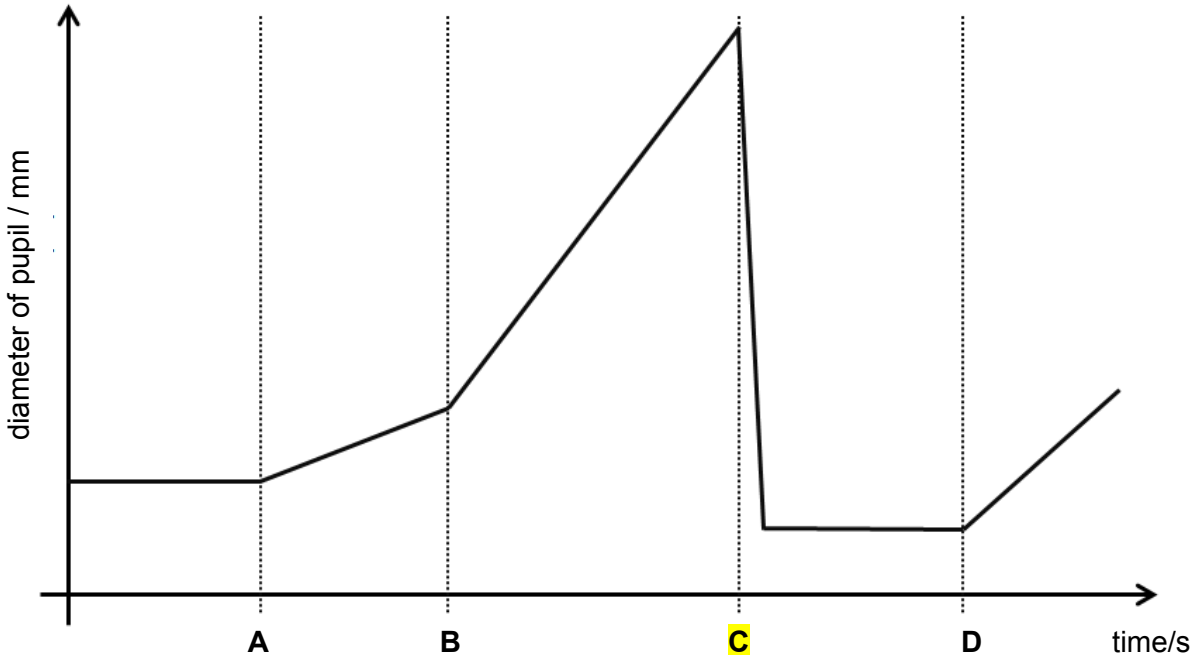
B Q and R

C R and S

D P and R

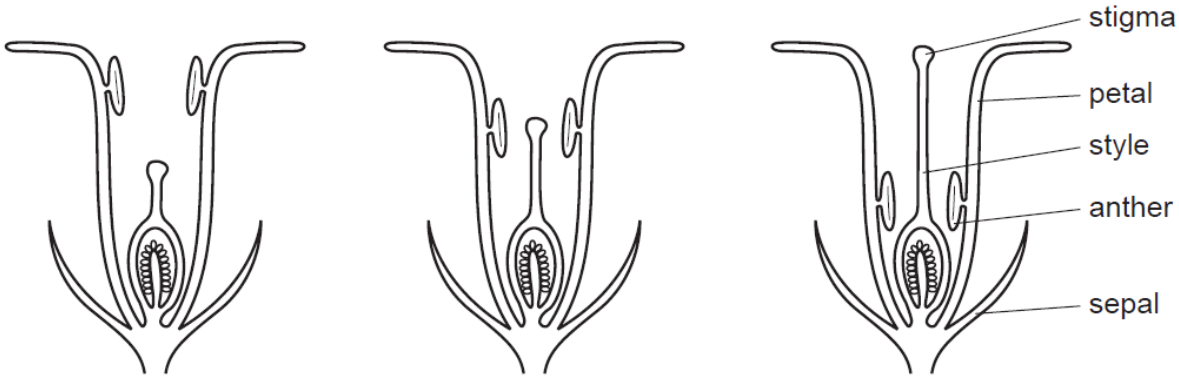
24 Jessica was wearing a pair of sunglasses on a sunny day but removed it as she prepares to enter the pool to swim. The following is a graph of the diameter of her pupil against time.

At which point on the graph did she remove her sunglasses?



25 The primrose, *Primula vulgaris*, is a small plant which is common in cooler areas of the Northern Hemisphere.

The flowers of the primrose have many different shapes adapted for pollination, of which three variations are represented below.



Which statement(s) is/are correct?

1 The stigma of the pin-eyed primrose is able to receive pollen grains by wind.
2 The intermediate primrose is pollinated by insects.
3 The pollen grains of the thrum-eyed primrose is pollinated only by wind and gravity.

A 1 only

B 1 and 2 only

C 1 and 3 only

D 1, 2 and 3 only

26 The trigeminal nerve in a human connects the brain to the teeth and skin of the face.

When a dentist administers a local anaesthetic by injection in the mouth, a person can no longer feel pain there and cannot smile properly.

What can you conclude about the trigeminal nerve?

A It contains only sensory neurons.

B It contains only relay neurons.

C It contains sensory and motor neurons.

D It contains relay and motor neurons.

27 Which comparison about voluntary and reflex actions is incorrect?

	voluntary action	reflex action
A	not inborn	inborn
B	may involve a stimulus	we are not aware of the action
C	we are aware of the action	we are not aware of the action
D	stimulus may lead to different responses	stimulus leads to the same response

28 Which of the following events(s) is/are under the influence of hormones in humans?

1 breakdown of endometrium
2 diffusion of glucose into cells
3 selective reabsorption in glomerulus

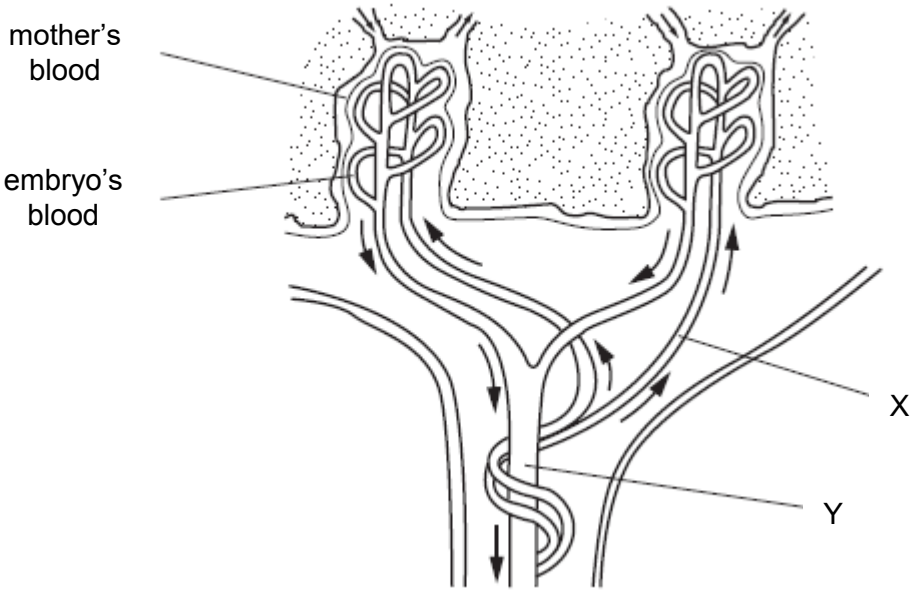
A 1 only

B 1 and 2 only

C 2 and 3 only

D 1, 2 and 3

29 The diagram shows how the blood of a human embryo flows close to the mother's blood in the placenta.



Which substances are present at X in higher concentrations than at Y?

A carbon dioxide and glucose

B carbon dioxide and urea

C glucose and oxygen

D glucose and urea

30 The diagrams show the reproductive structures of a mammal, P and a flowering plant, Q.

Which of the following statement is correct?

A Both P and Q are male gametes.

B Both structures 1 and 4 carry the Y chromosome.

C Both structures 1 and 4 contain the same number of chromosomes.

D Both structures 2 and 3 enable the male gamete to meet the female gamete.

31 Two parents both have blood group A. Their first child has blood group O.

What is the probability that their second child will also have blood group O?

A 0.00

B 0.25

C 0.50

D 1.00

32 The table shows the genotypes and phenotypes for hair colour for the members of a family but one phenotype is shown incorrectly.

	genotype		phenotype
family member	allele 1	allele 2	hair colour
mother	a	A	brown
father	A	A	brown
son 1	a	A	blonde
daughter 1	a	a	blonde
son 2	A	A	brown
daughter 2	A	a	brown

Which family member has the incorrect phenotype?

A daughter 1

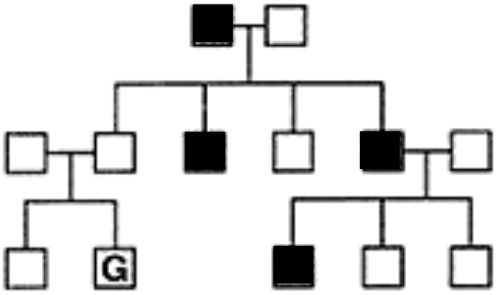
B daughter 2

C son 1

D son 2

33 A white streak in dark hair is caused by the presence of a dominant allele.

The diagram shows how this white streak was inherited in a family.



Key

Person with white streak

Person without white streak

What is the chance that G will inherit the white streak?

A 100%

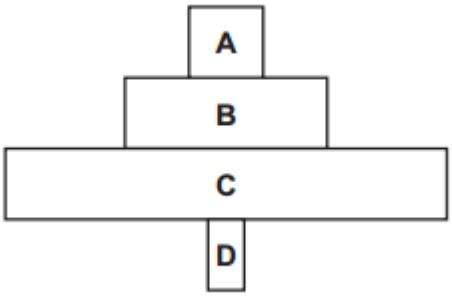
B 75%

C 25%

D 0%

34 The diagram shows a pyramid of numbers in a woodland ecosystem.

At which trophic level are the individual organisms largest in body size? D



35 Which statement correctly describes relationships in ecosystems?

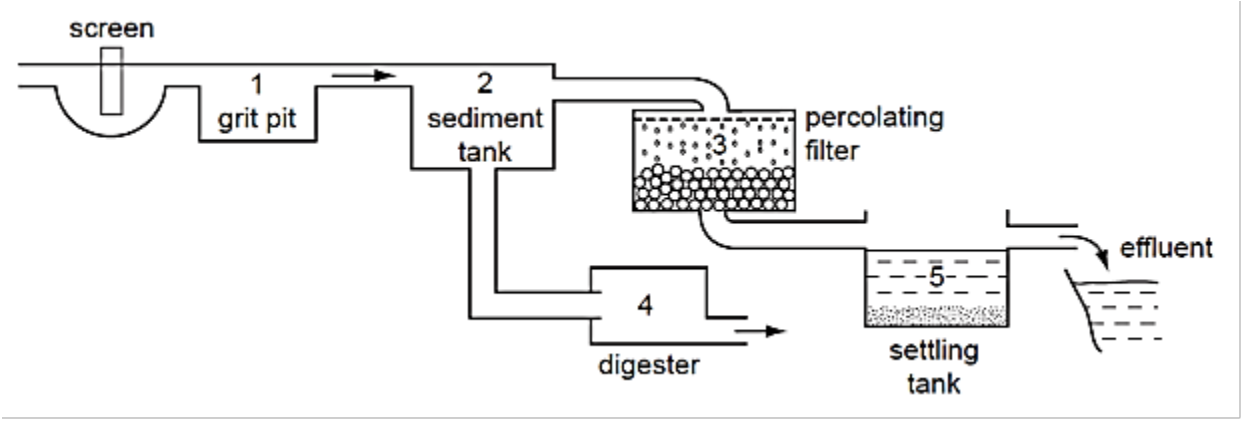
A Carbohydrates are passed from decomposers to producers.

B Energy is passed from carnivores to herbivores.

C Proteins are passed from primary producers to secondary producers.

D Water is passed from respiring decomposers to producers.

36 The diagram shows a sewage treatment plant.



In which parts do aerobic and anaerobic bacteria become most active to help to digest sewage?

	Aerobic	Anaerobic
A	3	4
B	1	3
C	5	1
D	4	2

37 Grass carp is a type of freshwater fish and some of these fishes are triploid (i.e. they contain 3n chromosomes). Which one of the following best explains why triploid grass carps are infertile?

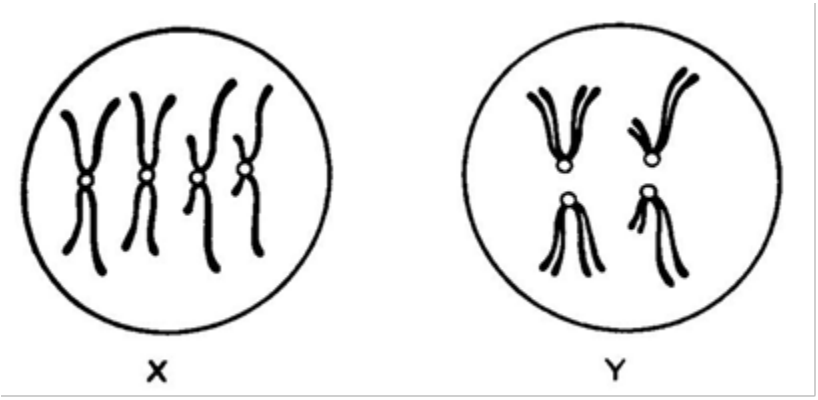
A Homologous chromosomes cannot pair up to form bivalents during meiosis I, thus the organism cannot form functional gametes.

B The chromosome number is too large, thus leading to sterility as gametes cannot form.

C The fishes will not survive to sexual maturity and would not produce viable offspring.

D The gametes formed would be too large to be released, thus their gametes cannot fuse to form viable zygotes.

38 The diagram shows two cells undergoing cell division.



Which of the following combinations about diagram X and Y is wrong?

	Diagram X	Diagram Y
A	Cytoplasm divides once.	Cytoplasm divides twice.
B	Chromosomes replicate once.	Chromosomes replicate twice.
C	Chromosome number remains the same in daughter cells.	Chromosome number is reduced by half in daughter cells.
D	Genetic make-up of the daughter cell is same as that of parent cell	Genetic make-up of the daughter cells may be different from that of parent cell.

39 The list shows some changes that may occur in a lake that is polluted with nitrogen-containing fertiliser.

1 Concentration of oxygen decreases.
2 Decomposers feed on plants.
3 Green microorganisms grow and cover the surface.
4 Plants die.

In which order do these changes occur?

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

40 How does natural selection contribute to the theory of evolution?

A Over time, natural selection results in changes in the inherited characteristics of a population.

B Over time, natural selection causes mutation that creates variation in a population.

C Over time, natural selection allows many different variations in a population to compete.

D Over time, natural selection acts on populations which in turn may result in the evolution of individuals.

End of Paper