Name: _____ **Class:** _____ **Index No. :** _____

ST JOSEPH'S INSTITUTION

PRELIMINARY EXAMINATION 2017
SECONDARY 4 (O LEVEL PROGRAMME)

BIOLOGY

5158/01

Paper 1 Multiple Choice

24 August 2017

1 hour

Candidates answer on Multiple Choice Answer Sheet (OTAS).

(1030 hr – 1130 hr)

READ THESE INSTRUCTIONS FIRST

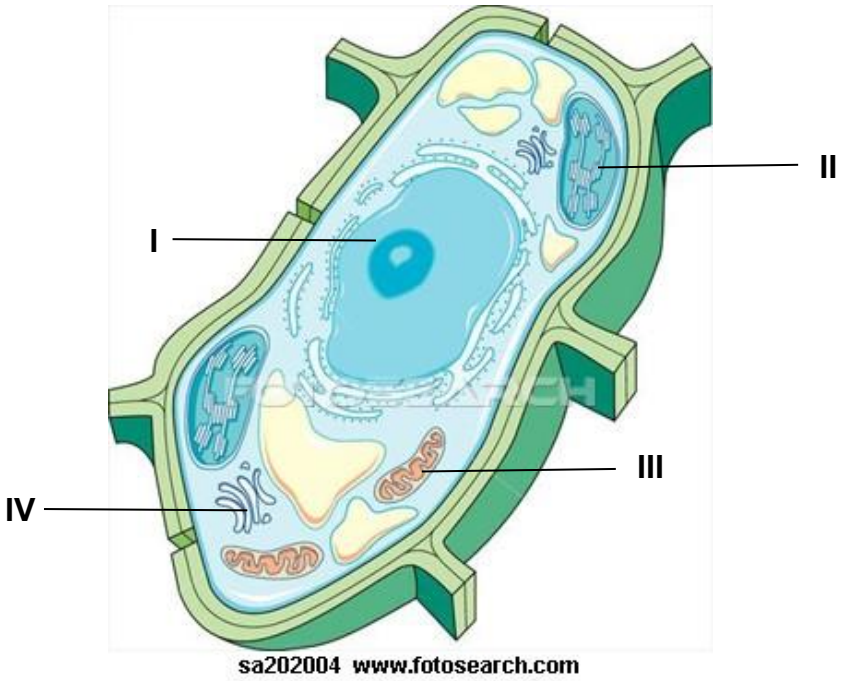
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and index number on the Answer Sheet (OTAS) in the spaces provided.

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 (OTAS).

This document consists of **17** printed pages including this cover page.

[Turn over]

1 The diagram shows a drawing of a typical plant cell.



Which organelle, seen only under the electron microscope, is correctly matched to its function?

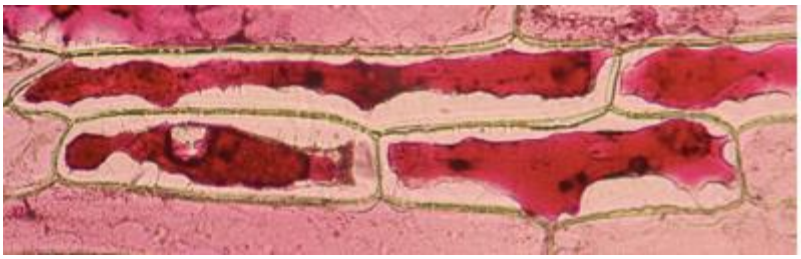
	Structure	Function
A	I	Chemically modifies and transports substances out of cell
B	II	Contains pigments that carry out photosynthesis
C	III	Site of aerobic respiration and releases energy for cell
D	IV	Controls the movement of substances in and out of cell

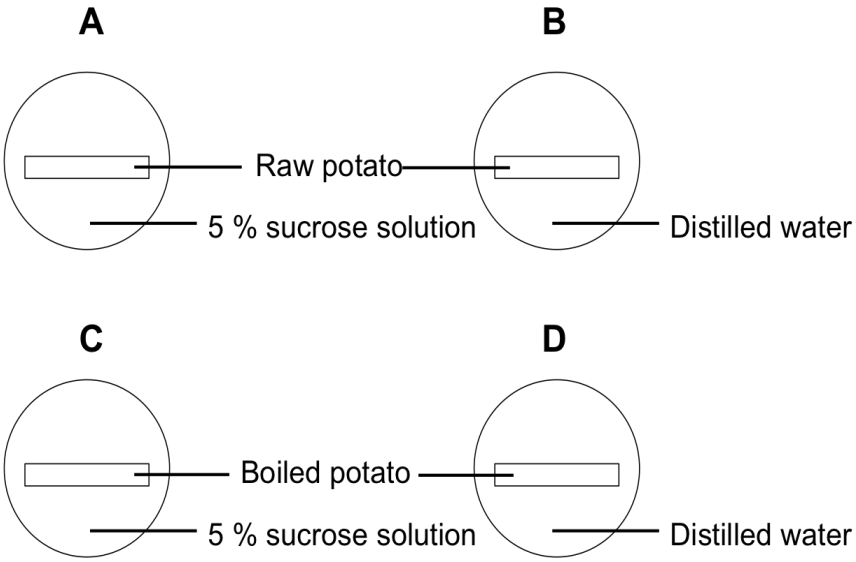
2 Which of the following correctly compares between a red blood cell and a xylem cell?

A Both are unable to carry out cell division
B Cell membrane is absent in both cells
C Cellulose cell wall is absent in both cells
D Both are involved in active transport

3 Four potato strips were each placed in a petri dish of either 5 % sucrose solution or distilled water for 20 minutes.

Which of petri dishes would show the result of the appearance of cells shown below?





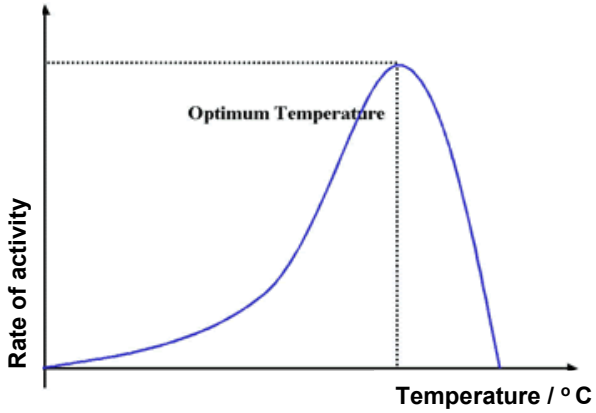
4 The following is a list of laboratory steps.

(I) Add copper(II) sulfate drop by drop
(II) Shake well to mix
(III) Place in a boiling water-bath
(IV) Add Benedict's solution
(V) Add sodium hydroxide solution

Arrange the steps in the order which they need to be carried out to show the presence of a protein.

A	IV	I	II	III
B	IV	V	II	-
C	V	I	II	III
D	V	II	I	-

5 Which of the following biological activities produces the graph shown below when affected by temperature?



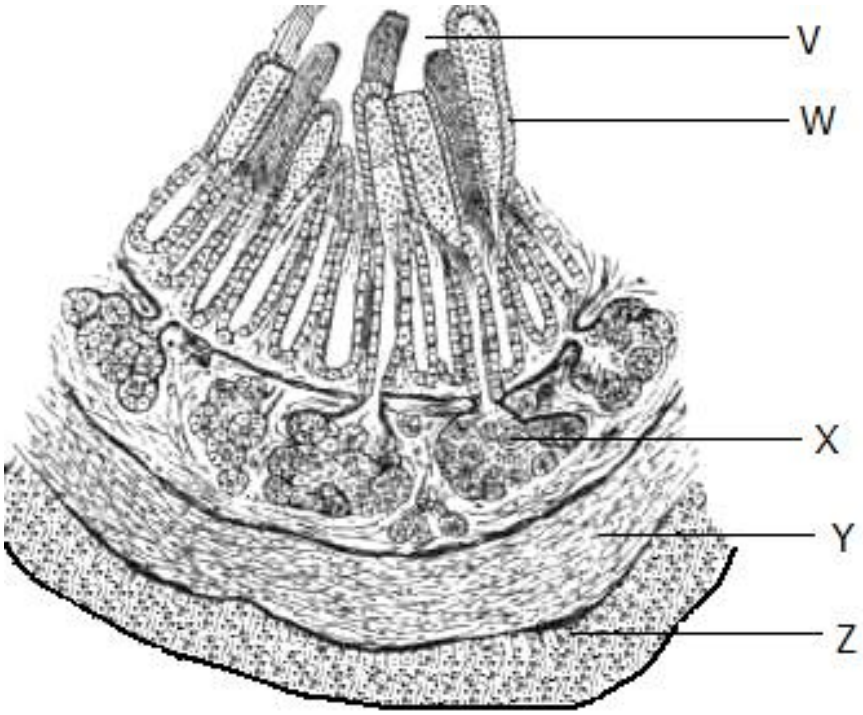
A Removal of salt through the sweat duct of skin during sweating.

B Absorption of glucose in duodenum down concentration gradient.

C Ultrafiltration at glomeruli to remove urea in kidneys.

D Formation of carbon dioxide with bicarbonate ions and water in blood cells.

For questions **6**, **7 and 8**, refer to the following diagram of a section of the wall of the duodenum.



6 An extract was taken from point X. Which of the following is correct?

A Its contents will be acidic in nature.

B Its contents will contain enzymes active in both neutral and alkaline pH.

C Its contents will be able to digest polypeptides.

D Its contents will contain a substance that can physically digest fats.

7 Extracts taken from points V and W were compared.

Which of the following shows an accurate description of the relative concentrations of various nutrients when V is compared to W?

	V	W
A	More galactose	More lactose
B	More fats	More glycerol and fatty acids
C	More amino acids	More polypeptides
D	More maltose	More starch

8 Which of the following is false about the layers Y and Z?

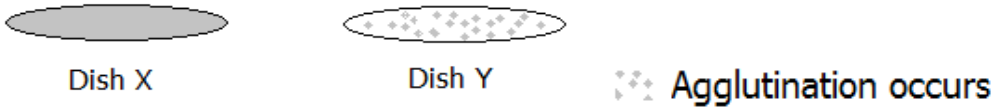
A They are present in the walls of stomach.

B They are present at the ribcage in the respiratory system

C They are antagonistic to each other.

D They require energy to work.

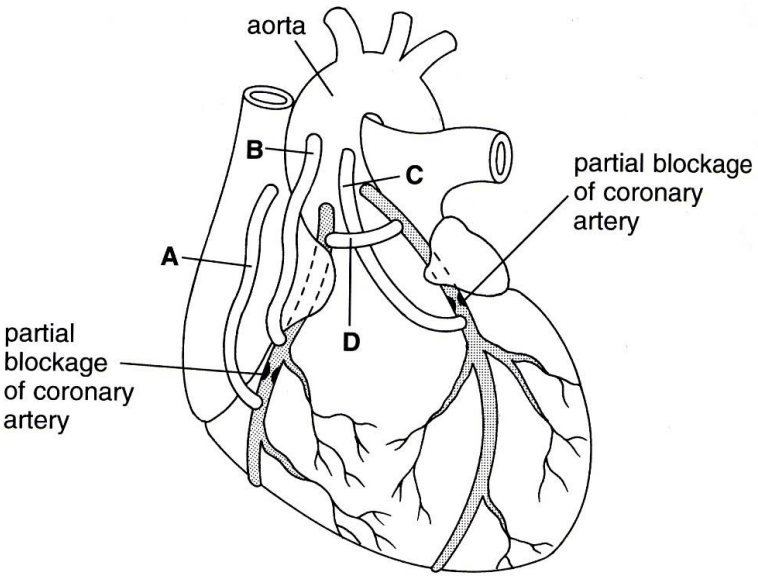
9 A drop of a man's blood was placed into Dish X and Dish Y and the results are shown below.



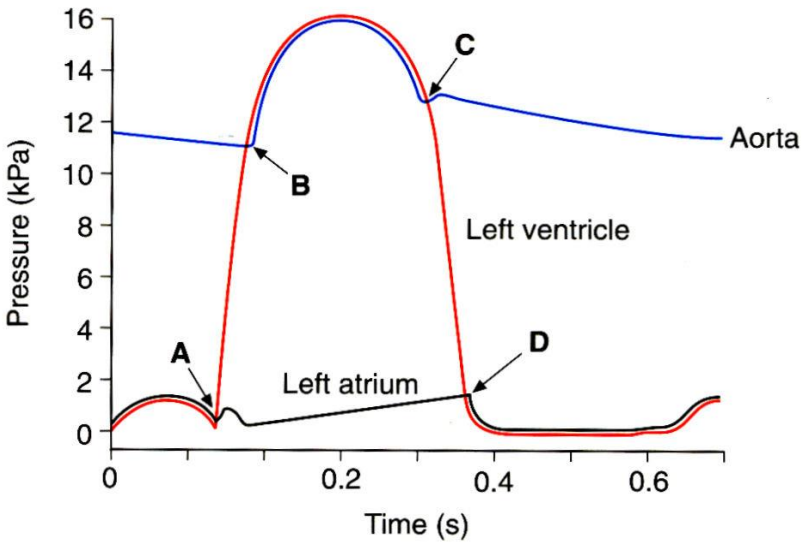
Dishes X and Y may each contain an antibody or contain no antibody at all. Which of the following combination of antibody present in each dish and man's blood group would give the results shown above?

	Dish X antibody	Dish Y antibody	Man's blood group
A	a	b	AB
B	-	b	AB
C	b	a	B
D	a	-	A

10 The diagram shows partial blockage in a coronary artery. Which of the tubes, **A**, **B**, **C** or **D** shows correctly a successful coronary bypass operation?

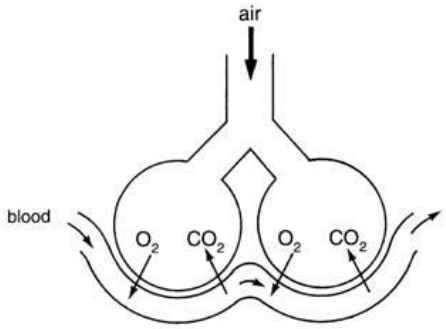


11 The following shows the pressure changes in the left side of the heart during one cardiac cycle.



At which point is the aortic valve (semi lunar valve) beginning to open?

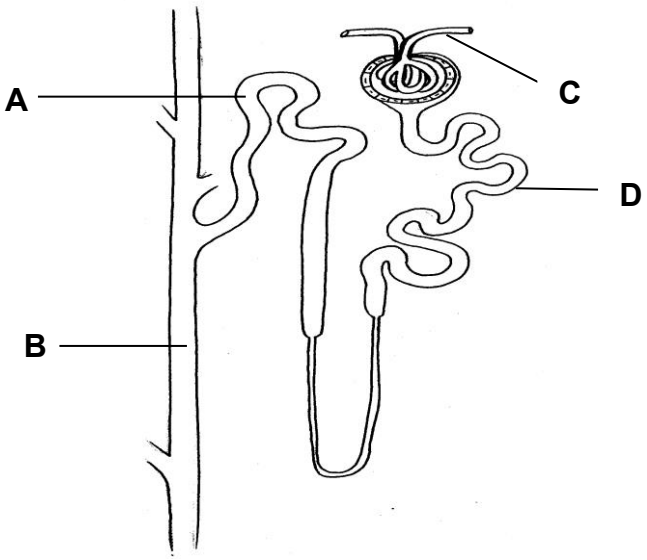
12 The diagram below shows the gaseous exchange in a pair of alveoli in a human lung.



Which of the following must occur to allow gaseous exchange to take place as shown in the diagram above?

	External intercostal muscles	**Diaphragm**	**Thoracic volume**
A	Contract	Relaxes	Increases
B	Relax	Contracts	Decreases
C	Contract	Contracts	Increases
D	Relax	Relaxes	Decreases

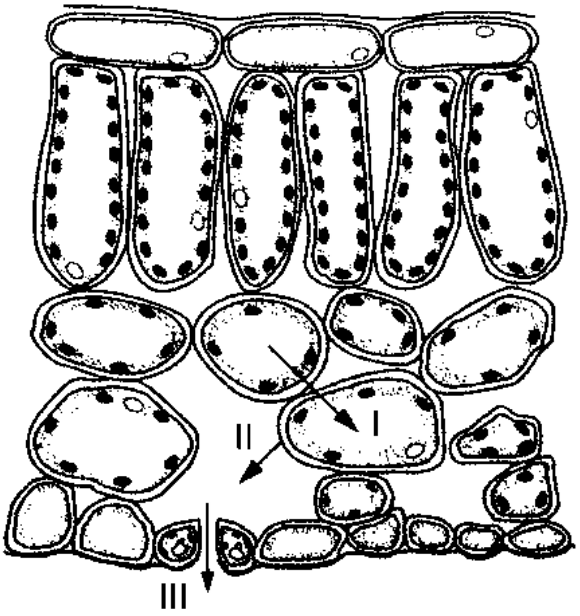
13 The following is a diagram of a kidney nephron and a collecting duct of a healthy person.



A Biuret test and Benedict's test were done on samples taken from A, B, C and D. Which of the following is accurate for the results of these tests?

	Biuret Test	**Benedict's test**
A	Negative	Positive
B	Positive	Negative
C	Positive	Negative
D	Negative	Positive

14 The diagram below shows the cross section of a dicotyledonous leaf. The numbered arrows indicate the movement of water across the cells and out of the leaf.



Which of the above arrows will show an increase in water movement when the external environment is of a very high humidity and temperature?

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

15 In humans, a decrease in urine production occurs as a result of

I an increase in the environmental temperature.
II an increase in the water uptake.
III an increase in the uptake of sodium chloride.
IV decreased sweating.

A Only I is correct.
B I and III are correct.
C I, II and III are correct.
D I, III and IV are correct.

16 A baker stands near a hot oven for about ten minutes. Some of the changes that occur in response to the increase in external temperature are listed.

1. Blood vessels in the skin dilate
2. Brain (hypothalamus) is stimulated
3. Skin temperature changes
4. Temperature receptors (thermoreceptors) in the skin detect the change

Which sequence of events occurs?

A 2 → 1 → 3 → 4

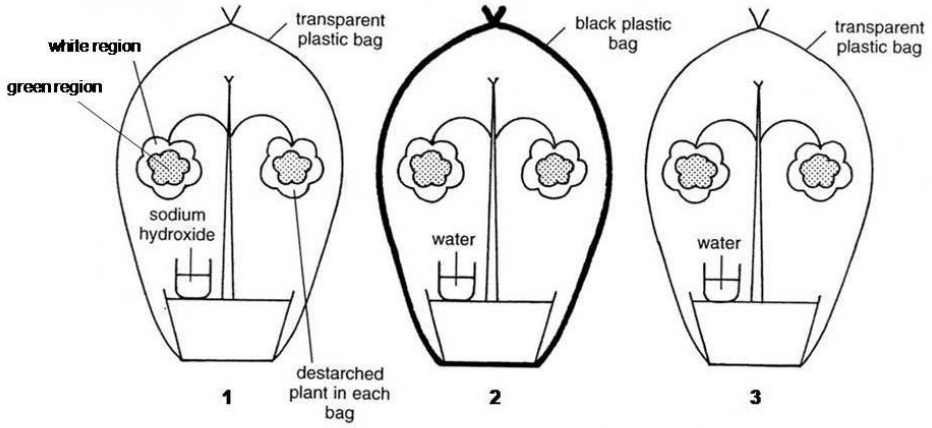
B 3 → 1 → 4 → 2

C 4 → 2 → 1 → 3

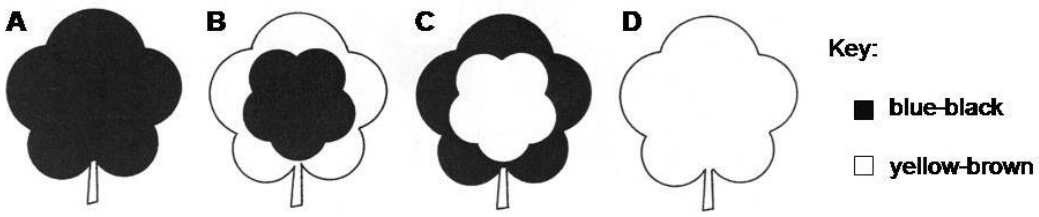
D 4 → 1 → 2 → 3

Questions 17 and **18** refer to experimental set ups below.

Three experiments, **1**, **2** and **3**, are set up to investigate which factors are necessary for photosynthesis. The plants have variegated leaves, with green and white regions.



After two days, a leaf was plucked from each plant and tested with iodine solution.



17 Which of the leaves **A**, **B**, **C** or **D** was taken from plant **1**?

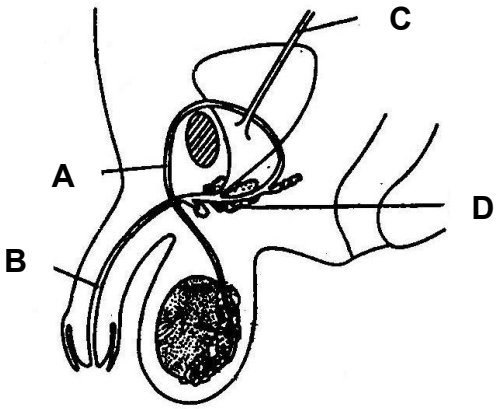
18 Which of the leaves **A**, **B**, **C** or **D** was taken from plant **3**?

19 The photomicrograph shows a pollen grain seen under a scanning electron microscope.

Which deduction about its flower can be made based on the photomicrograph?

A The flower contains feathery stigma.
B The flower is adapted only for cross-pollination.
C The flower contains nectary.
D The flower is always bisexual.

20 The diagram shows the male reproductive and part of the urinary systems. Which structure is important for both reproduction and excretion?



21 Which one of the following statements about the placenta is incorrect?

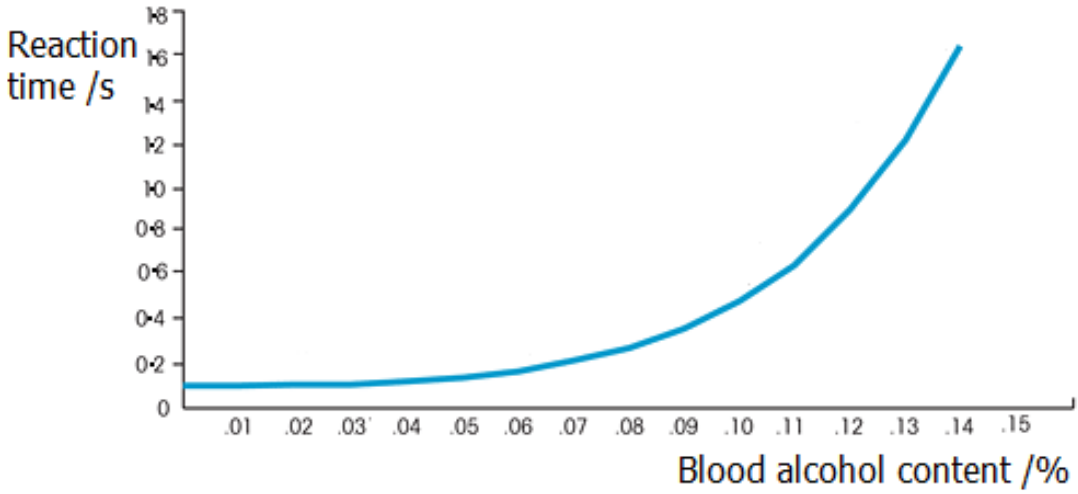
A It provides the pathway for excretion by the foetus.
B It is connected to the foetus by the umbilical cord.
C It transfers the mother's blood to the foetus.
D It releases hormones during pregnancy.

22 Which statement about reproduction in plants is correct?

A All the adult offspring formed by asexual reproduction have identical phenotypes.
B Self-fertilisation is an example of asexual reproduction.
C Sexual reproduction always produces gametes by the fusion of zygotes.
D Offspring formed from sexual reproduction have genetic materials from two individuals.

23 An experiment was carried out to find out how blood alcohol concentrations will affect reaction time. A man was given increasing amounts of alcohol and at each concentration, he was told to hit the "spacebar" key on a keyboard when he saw a ball appear on the monitor.

The time between the appearance of the ball and his hitting of the "spacebar" was recorded. The results are shown in the graph below.



What can be concluded from the information given and the graph above?

A The man's action in this experiment is a reflex action.

B The man's liver does not break down alcohol into acetaldehyde from 0.07% alcohol content and above.

C The reaction time increases drastically after 0.1% blood alcohol content.

D The reaction time is fastest only when no alcohol was drunk at all.

24 Which of the following does not describe the peripheral nervous system?

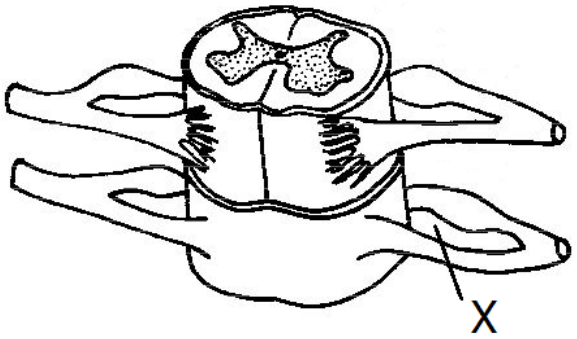
A It consists of cranial and spinal nerves.

B It helps in the maintenance of body temperature.

C It is capable of processing stimuli to bring about a reflex action.

D It sends nerve impulses to and from the central nervous system.

25 The diagram below shows a section of the spinal cord taken from the vertebral column near the arms.



An injury caused a nerve to be severed along the line X. The patient's finger is pricked. Which of the following is true?

A Pain is felt and a reflex action occurs.

B Pain is not felt so no reflex action occurs.

C Pain is felt but no reflex action occurs.

D Pain is not felt but voluntary action occurs.

26 The diagrams show two sections through the eye of the same person.

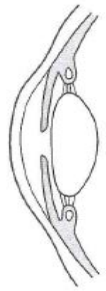


Diagram 1

Focussing on an object 2 metres away in bright light

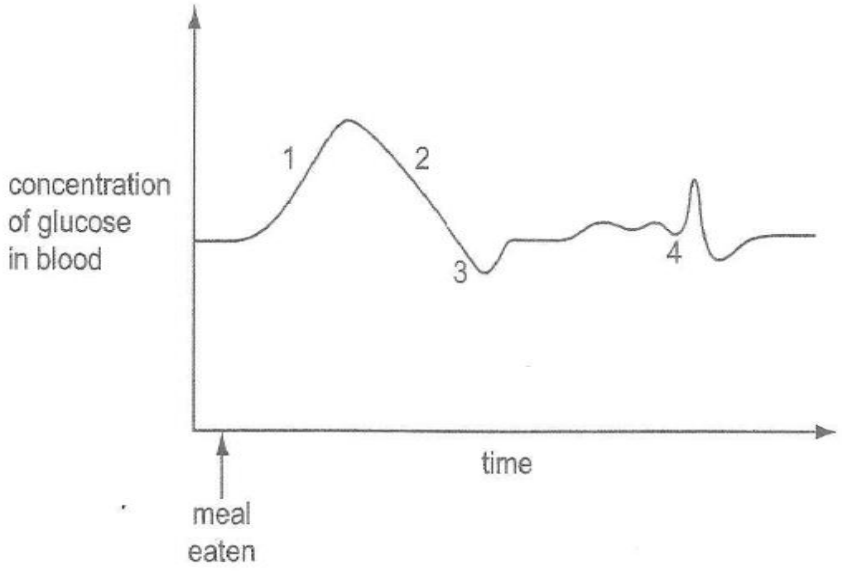
Diagram 2

Focussing on an object 60 metres away in dim light

What happens to achieve the changes from the eye in diagram 1 to the eye in diagram 2 under the different conditions?

	Ciliary muscles	Iris radial muscles	Suspensory ligament
A	contract	relax	taut
B	contract	relax	laxed
C	relax	contract	taut
D	relax	contract	laxed

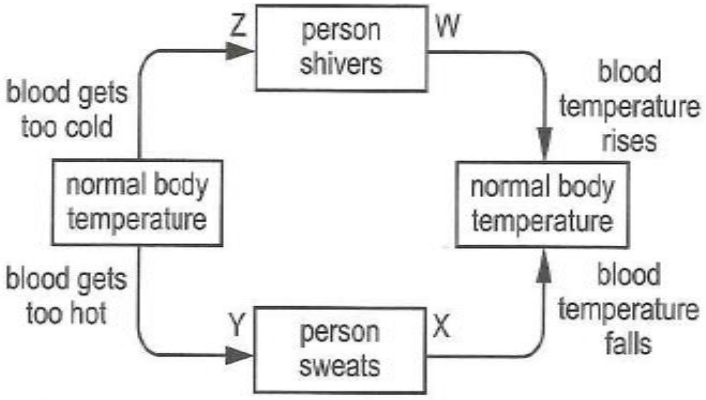
27 The diagram shows a person's blood glucose concentration over a period of time.



At which points are adrenaline and glucagon being secreted?

	adrenaline	glucagon
A	1	2
B	2	3
C	3	4
D	4	3

28 The diagram shows an example of homeostasis in a person.



Which of the letters, W, X, Y, Z represent negative feedback changes?

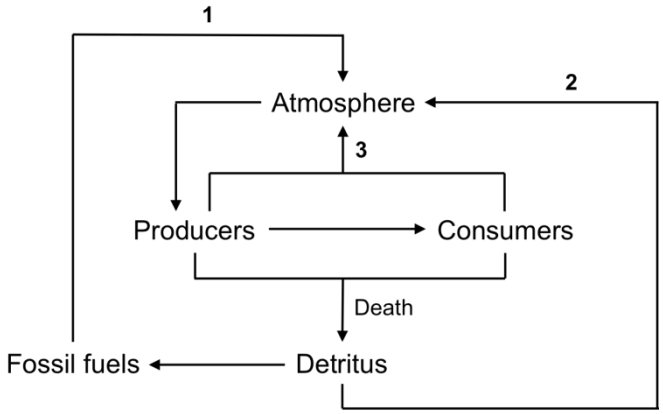
A W and X

B W and Y

C X and Z

D Y and Z

29 The diagram shows the carbon cycle.



Which of the following rows contain the correct labels for the processes numbered above?

	Process 1	Process 2	Process 3
A	Decomposition	Respiration	Combustion
B	Decomposition	Combustion	Respiration
C	Combustion	Respiration	Decomposition
D	Combustion	Decomposition	Respiration

30 Which of the following processes which are involved in meiosis may give rise to genetic variation?

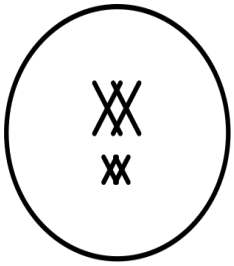
1 Metaphase I
2 Prophase I
3 Prophase II
4 Random fusion of gametes

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

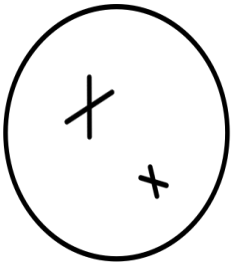
31 The skin cells of an organism have 4 chromosomes each.

Which of the following shows the appearance of chromosomes during mitosis in this organism?

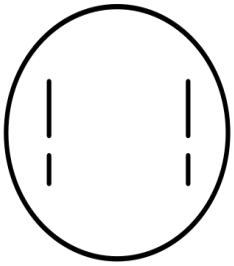
A



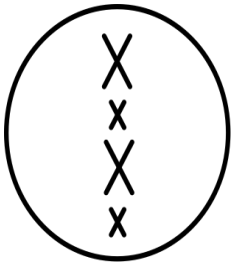
B



C



D



32 Which of the following statements correctly describes an advantage that genetic engineering has over artificial selection?

A It is a quicker process, as only one species is required for beneficial traits to be passed down to offspring.

B It always creates organisms that are more suited to their natural environment.

C Genetically modified food is always more nutritious and safe for all consumers.

D There is a higher chance of offspring receiving the beneficial trait from the genetically engineered parent compared to using artificial selection.

33 Cats have the same inheritance pattern as humans in sex determination. In addition, the gene for cat coat colour lies on the X chromosome. The allele for orange fur is X^O while the allele for black fur is X. Cats that are heterozygous have tortoise-shell coat colour (patches of orange and black).

Using your knowledge on monohybrid inheritance and sex determination, which of the following offspring cannot be produced when a tortoise-shell female cat is mated with an orange male cat?

A Black female

B Orange female

C Orange male

D Tortoise-shell female

34 Some stages in the transfer of genes from one species to a second species during genetic engineering are listed:

1. Bacteria containing the recombinant DNA replicate.
2. DNA is cut into pieces to isolate the target gene.
3. Organisms from a second species are infected with bacteria.
4. Plasmids from bacteria accept the target gene.

Which of the following is the correct order of the stages?

A 1 → 2 → 3 → 4

B 2 → 4 → 3 → 1

C 2 → 4 → 1 → 3

D 3 → 1 → 4 → 2

35 A gene of a DNA molecule consists of 600 guanine bases, which makes up 20% of the sequence. How many thymine bases does the gene contain?

A 900

B 1800

C 2400

D Cannot be determined

36 The table below shows how energy from food, which provides 100 units of energy, is used by a herbivore:

Uses of energy during metabolic activities	Amount of energy /arbitrary units
Growth and repair tissues	14
Heat loss during sweating	10
Respiration and movement	30
Formation of urine and faeces	46

What is the total percentage of energy available to both the consumers and decomposers?

A 14 %

B 46 %

C 60 %

D 70 %

37 Which of the following statements about bioaccumulation and bioamplification is true?

A The toxic waste must be soluble in water.

B They are both the result of untreated sewage.

C They occur after eutrophication has depleted oxygen from the water.

D They occur because some wastes are non-biodegradable.

38 Organic fertiliser is applied each year to fields beside a lake. The fertiliser runs off into the lake and causes six changes which together result in the death of the fish.

1. Aerobic bacteria feed on dead plants.
2. Algae reproduce faster.
3. Light cannot penetrate the water.
4. Oxygen levels fall.
5. Water becomes green.
6. Underwater plants die.

In which order do the changes take place?

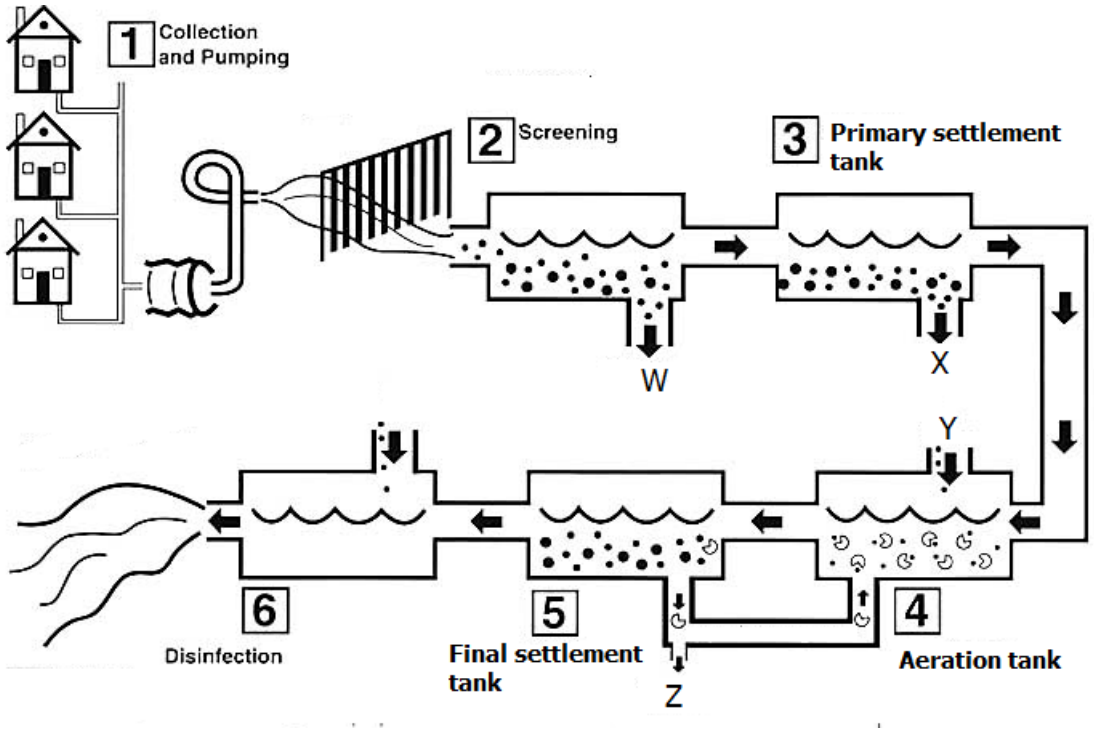
A 2 → 5 → 1 → 6 → 4 → 3

B 2 → 5 → 3 → 6 → 1 → 4

C 3 → 6 → 1 → 4 → 2 → 5

D 4 → 6 → 1 → 2 → 5 → 3

39 The diagram below shows how sewage is treated before it is released into water bodies.



Which of the following correctly identifies W, X, Y and Z?

	W	X	Y	Z
A	Grit and coarse materials	Sludge	Glucose	Methane
B	Grit and coarse materials	Sludge	Oxygen	Sludge
C	Sludge	Microorganisms	Oxygen	Carbon dioxide
D	Sludge	Sewage	Chlorine	Microorganisms

40 Which of the following is not a conservation measure?

A Banning the use of timber.

B Limiting the time a fishing vessel may fish.

C Planting new seedlings to replace trees that are cut down.

D Using nets of a specific mesh size.