Cambridge Assessment
International Education

# Cambridge O Level

**BIOLOGY** **5090/12**

Paper 1 Multiple Choice **May/June 2020**

**1 hour**

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)



**INSTRUCTIONS**

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

**INFORMATION**

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.



This document has **20** pages. Blank pages are indicated.




[Turn over

1 Starting with the smallest, and ending with the largest, what is the correct sequence of these parts of an organism?

A chromosome → gene → nucleus → cell → tissue

B chromosome → gene → nucleus → tissue → cell

C gene → chromosome → nucleus → cell → tissue

D gene → chromosome → nucleus → tissue → cell

2 Which movement of a substance in plants is an energy-consuming process?

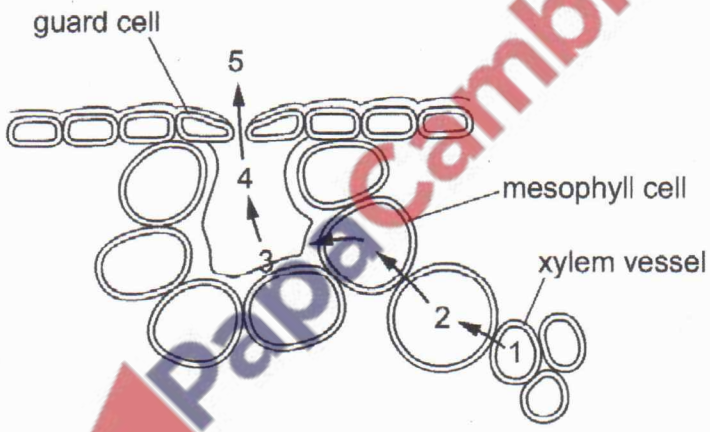
A absorption of carbon dioxide by a palisade cell

B absorption of oxygen by a mesophyll cell

C nitrate uptake by root hair cells

D transport of water up through the xylem

3 The diagram shows the movement of water through part of a leaf.




Which processes are involved in the movement of water at these stages?

| | 1–2 | 3–4 | 4–5 |
|---|---|---|---|
| A | diffusion | evaporation | osmosis |
| B | evaporation | diffusion | osmosis |
| C | osmosis | diffusion | evaporation |
| D | osmosis | evaporation | diffusion |

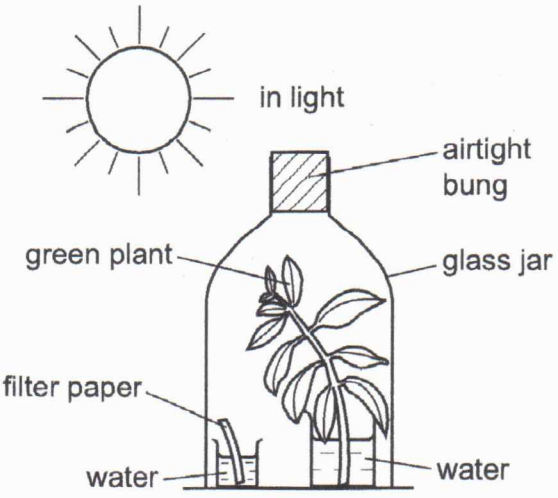
4 Which substance is an enzyme?

A chlorophyll – pigment
B fibrinogen – protein
C insulin – hormone
D lipase – enzyme that acts on lipids

5 What is the effect on plants of a lack of magnesium ions?

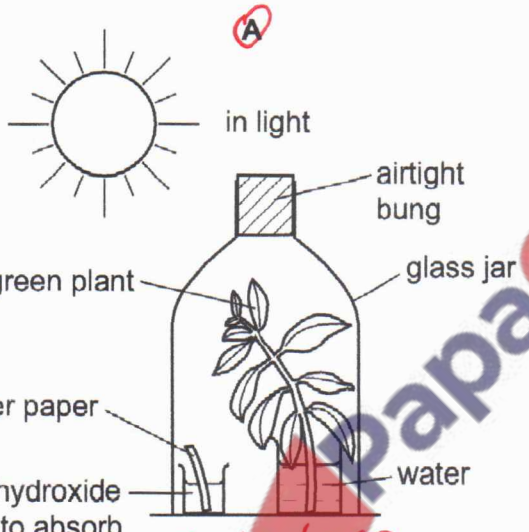
A Chlorophyll production is reduced. – lack of $Mg^{2+}$ ions
B Leaves turn dark green. – presence of Nitrates
C Starch production increases. – excess production of glucose
D Young leaves wilt. – excessive water loss (transpiration)

6 The diagram shows a green plant photosynthesising under a glass jar. This was used as a control experiment in a laboratory investigation.




Which diagram shows the experiment carried out to investigate the need for carbon dioxide in photosynthesis?

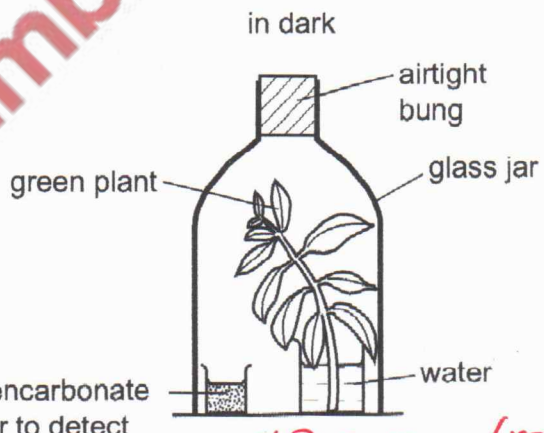
A




NaOH absorbs $CO_2$

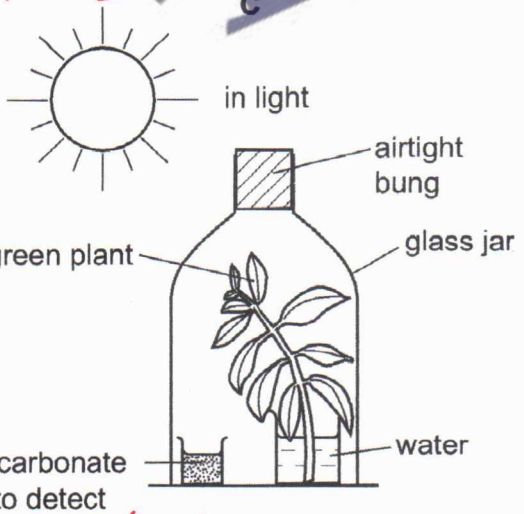
No photosynthesis if $CO_2$ is eliminated

B



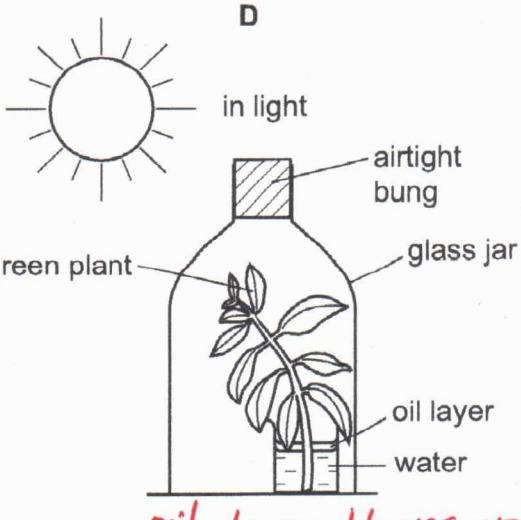

No photosynthesis (no light)

C




The hydrogen carbonate does not affect $CO_2$.

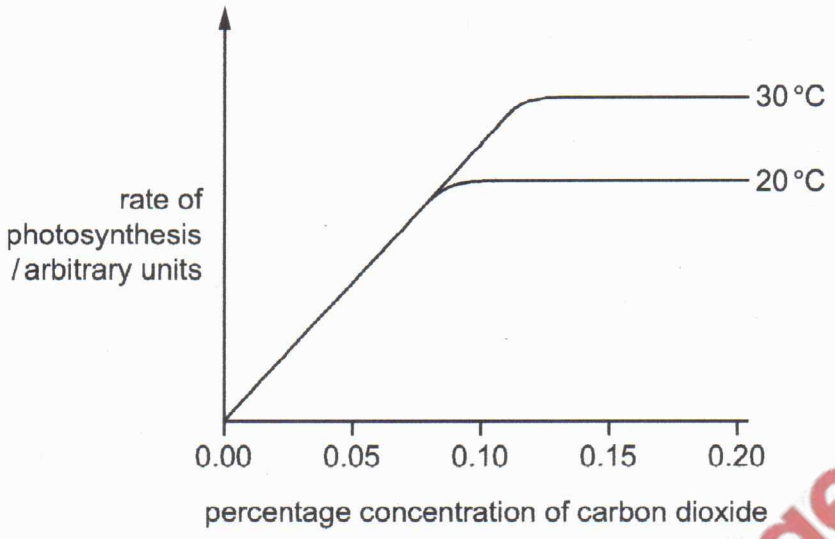
D




oil layer blocks water vapour from air

photosynthesis takes place

7 The graph shows the rate of photosynthesis in a plant in full sunlight at two different temperatures and different concentrations of carbon dioxide.




At normal atmospheric carbon dioxide concentrations, what limits the rate of photosynthesis?

A carbon dioxide concentration – if $CO_2$ concentration is increased, rate of photosynthesis is also increases

B light intensity

C temperature

D water availability

8 Which process happens in the duodenum?

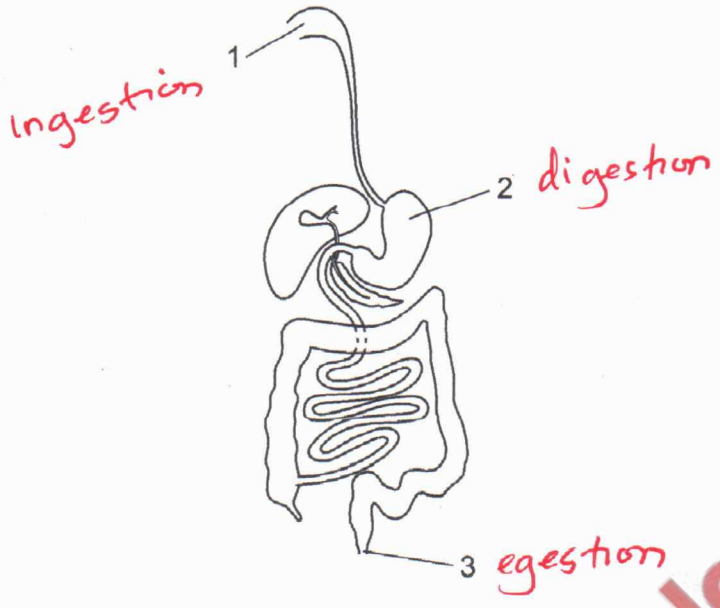
A bile is formed – pancreas

B faeces are formed – rectum

C fats are digested by lipase – fats are broken into glycerols and fatty acids – duodenum

D pancreatic juice lowers the pH – pancreas

9 The diagram shows the human alimentary canal.

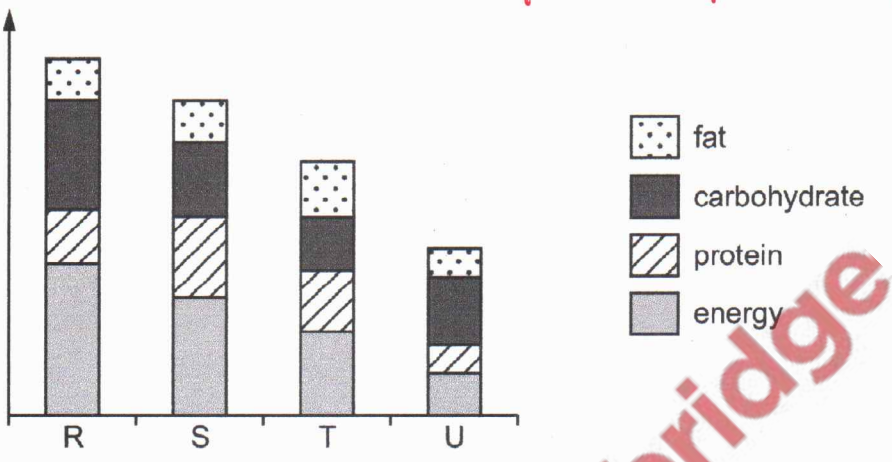



Where do egestion and ingestion occur?

| | egestion | ingestion |
|---|---|---|
| A | 1 | 3 |
| B | 2 | 3 |
| C | 3 | 1 |
| D | 3 | 2 |

**10** The bar chart shows the recommended daily food intake of four people:

- an 80 year-old retired man
- a male manual worker – more carbohydrates needed
- a 6 year-old child – needs energy for growth
- a breast-feeding mother. – more proteins for milk production




Which row correctly identifies two of these four people?

**A** child is U; retired man is R

**B** manual worker is T; child is S → manual worker needs more energy. He needs to consume more carbohydrates. Mother is needs more proteins to make milk for the breast-feeding baby

**C** mother is S; manual worker is R

**D** retired man is R; mother is U

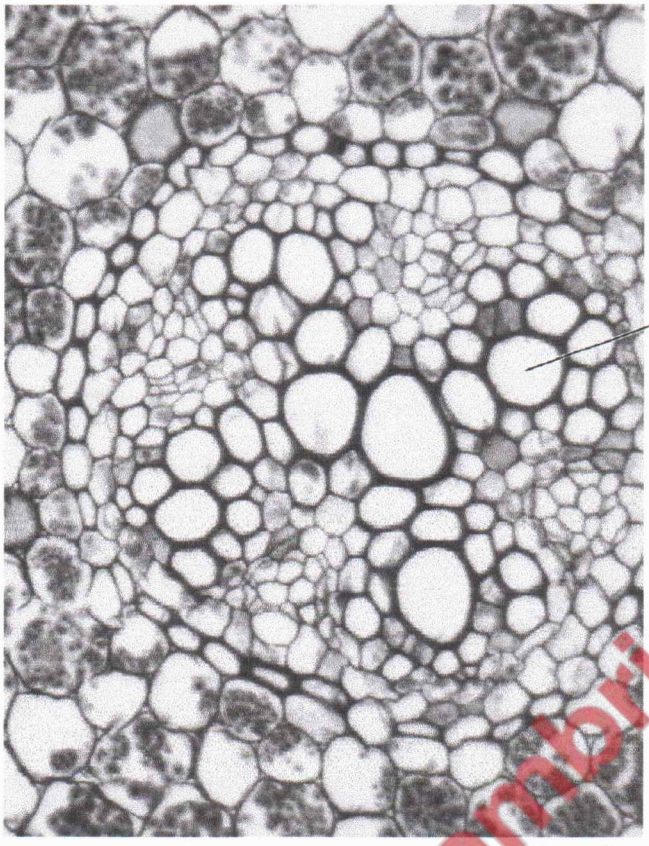
**11** Water and ions can reach the xylem of a plant root through cell walls, without passing through a cell membrane.

How do these substances move through the cell walls?

| | water | ions |
|---|---|---|
| **A** | diffusion | diffusion |
| **B** | diffusion | osmosis |
| **C** | osmosis | diffusion |
| **D** | osmosis | osmosis |

Water molecules and ions diffuse across the smaller openings on the cell walls of a plant cell

**12** The photomicrograph shows part of a section through a root.




xylem

The contents of Y are tested with Benedict's solution and with iodine solution.

Benedicts solution tests presence of simple sugar.

Which results are expected?

Iodine solution is used to test for presence of starch.

| | Benedict's solution | iodine solution |
|---|---|---|
| A | + | + |
| B | + | – |
| C | – | + |
| D | – | – |

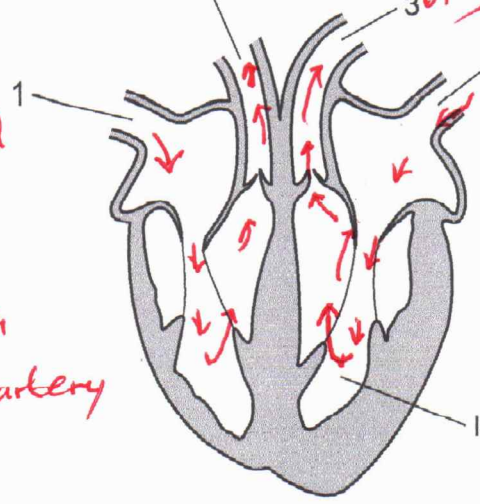
key

+ = positive result

– = negative result

Simple sugars are made by process of photosynthesis in the green leaves of plants. The simple sugars are then converted into starch for storage in the sinks. Starch is absent in the xylem tissue (X). Benedict solution is absent in the xylem tissue

**13** The diagram shows a section through the heart.




2 deoxygenated blood
3 oxygenated blood
4 oxygenated blood
Deoxygenated blood
1 – vena cava
2 – pulmonary artery
3 – aorta
4 – pulmonary vein

Which two numbered parts contain oxygenated blood?

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

**14** Which blood vessels contain valves?

| | capillary | renal artery | renal vein |
|---|---|---|---|
| A | ✓ | ✗ | ✗ |
| B | ✗ | ✗ | ✓ |
| C | ✓ | ✓ | ✗ |
| D | ✗ | ✓ | ✓ |

key
✓ = contains valves
✗ = does not contain valves

Capillary – no valves (1 cell thick)
Renal vein – blood is deoxygenated and is flowing at low pressure – Valves present.
Blood in renal artery flows at high pressure. No need for valve (oxygenated blood)

**15** Which chamber of the heart would be the first to receive nicotine absorbed into the blood in the lungs of a cigarette smoker?

**A** left atrium
**B** left ventricle
**C** right atrium
**D** right ventricle

order of blood flow
L. atrium → L. ventricle → lungs → pulmonary vein →
R. atrium → R. ventricle → aorta → body organs

**16** During which activity is anaerobic respiration most likely to occur?

**A** breathing – aerobic respiration
**B** sleeping – aerobic respiration
**C** sprinting 100 metres – high energy demand in a short time. No time to take in lots of oxygen. This calls for anaerobic respiration.
**D** walking to school – aerobic

17 Which structure is lined with cilia?

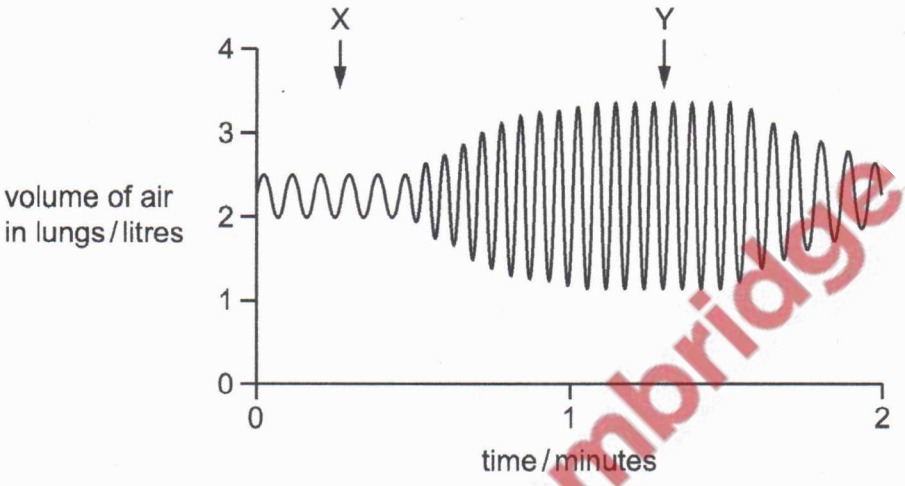
A alveolus – lined with capillaries

B bronchus – lined with cilia to remove foreign particles in the inhaled air

C oesophagus – for swallowing (lined with muscles)

D small intestine – villi

18 The graph shows changes in the volume of a person's lungs over a period of two minutes.




What could cause the change in the pattern of the graph between X and Y?

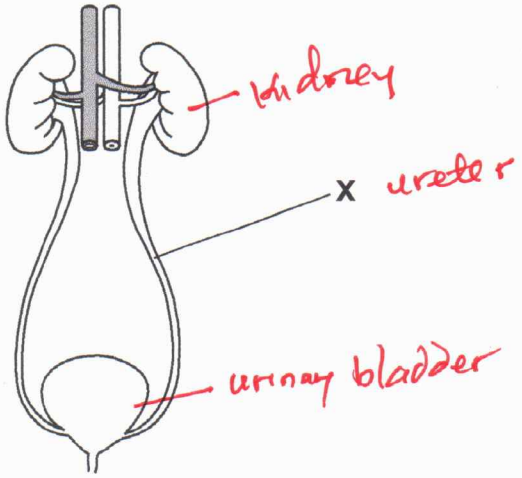
A changing from running to walking – low energy demand

B changing from walking to running – volume of inhaled air increases suddenly due to increased energy demand. This gets in more oxygen for aerobic respiration

C decreased frequency of contractions of the internal intercostal muscles – low energy demand

D decreased strength of contractions of the internal intercostal muscles – decreased energy demand

**19** The diagram shows the human kidneys and their associated structures.




What is the structure labelled **X**?

**A** renal artery

**B** renal vein

**C** ureter

**D** urethra

**20** Which of these statements describes control by **negative** feedback?

**A** An injury to body tissue activates platelets in the blood and these activated platelets release chemicals which activate more platelets.

**B** During the menstrual cycle, luteinising hormone (LH) stimulates the release of oestrogen which in turn stimulates the release of more LH.

**C** A higher concentration of carbon dioxide in the atmosphere increases temperature, which increases photosynthesis producing more carbon dioxide.

**D** When blood pressure is high, nerve impulses from the brain cause the blood vessels to dilate and blood pressure is reduced.

**21** Which structures does light pass through when it is focused on the retina?

| | cornea | lens | sclera |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✓ | ✗ |
| **C** | ✓ | ✗ | ✓ |
| **D** | ✗ | ✓ | ✓ |

key
✓ = yes
✗ = no

22 Where are receptors found?

A along the length of all neurones - axon

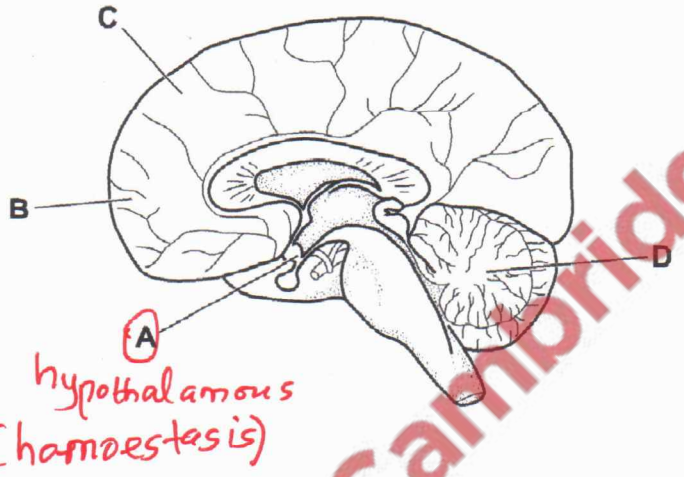
B at both ends of relay neurones — interneurone

C at one end of motor neurones — in CNS (brain)

D at one end of sensory neurones - recieve/detect impulses

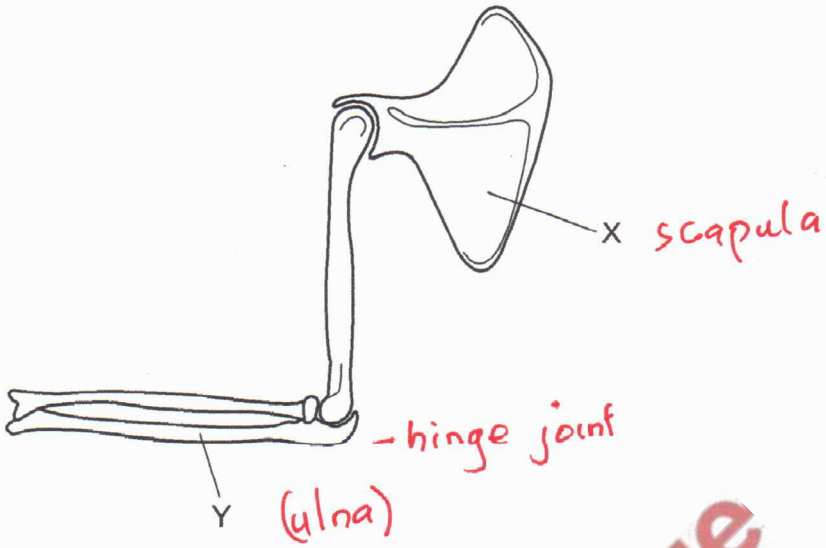
23 The diagram shows a section through the human brain.

Which part senses and reacts to a change in blood temperature?




hypothalamous (homoestasis)

**24** The diagram shows the bones of the human forearm.




X scapula

- hinge joint

Y (ulna)

What are the bones X and Y?

| | X | Y |
|---|---|---|
| **A** | humerus | radius |
| **B** | humerus | ulna |
| **C** | scapula | radius |
| **D** | scapula | ulna |

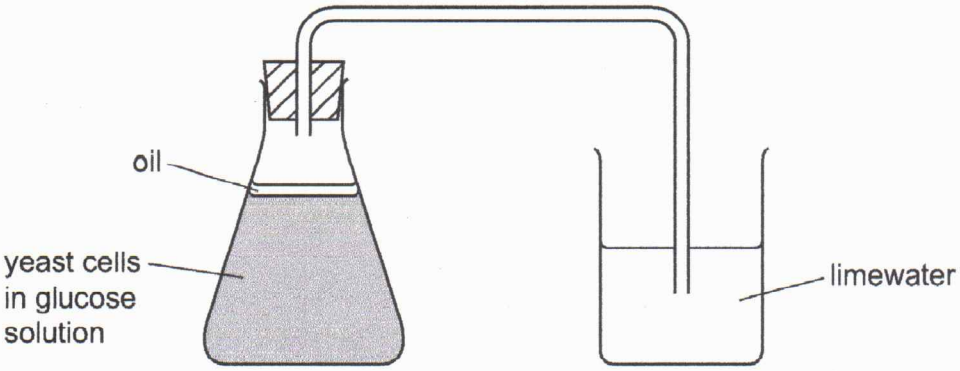
**25** When a mother smokes during pregnancy, the oxygen supply to the fetus is reduced.

Which row shows how components of tobacco smoke cause this?

| | combines with haemoglobin | constricts blood vessels in umbilical cord |
|---|---|---|
| **A** | carbon monoxide | nicotine |
| **B** | carbon monoxide | tar |
| **C** | tar | carbon monoxide |
| **D** | tar | nicotine |

CO reduces uptake of $O_2$
Nicotine constricts blood vessels in umblical cord. This reduces blood flow to the fetus.

**26** The diagram shows some apparatus set up to produce alcohol by fermentation.




What is the purpose of the oil layer?

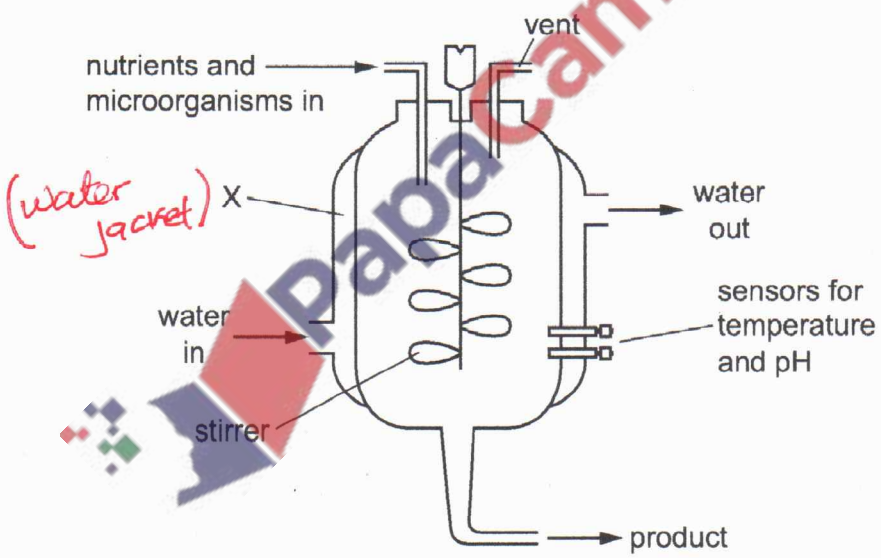
**A** to keep the alcohol in the solution

**B** to prevent aerobic respiration – blocks air from reaching yeast cells. Lack of air (no oxygen) promotes Anaerobic respiration in yeast

**C** to produce carbon dioxide

**D** to provide nutrients for the yeast

**27** The diagram shows the equipment used in the industrial production of penicillin.




What is the purpose of the structure labelled X?

**A** to insulate the fermentation vessel

**B** to maintain the pressure of the fermentation vessel

**C** to monitor the temperature of the fermentation vessel

**D** to remove the heat produced by the fermentation process – The cold water in the jacket absorbs heat from the fermenter. The warm water is finally taken out of the jacket by an outlet.

**28** The diagram shows a food chain.

aquatic plant → tadpole → small fish → bird → decomposers

Which group of organisms is missing from this food chain?

A carnivores – secondary consumers

B decomposers – they breakdown the dead body of organisms in the food chains for the nutrients to return to the soil.

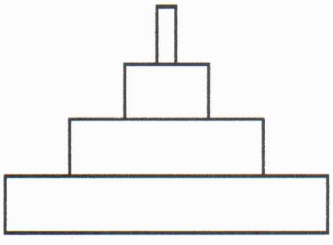
C herbivores – primary consumers

D producers – starters of food chains

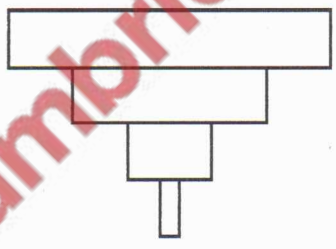
**29** Insects feed on a tree's leaves. The insects are eaten by small birds that are the prey of larger birds.

Which pyramid of numbers illustrates this food chain?

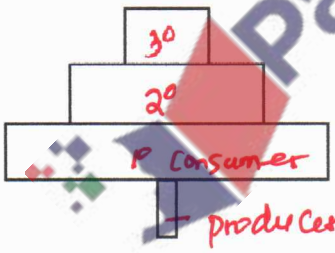
A



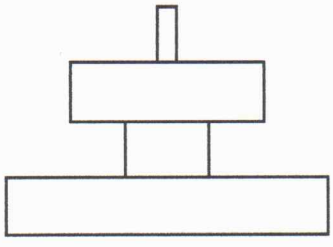
B



C



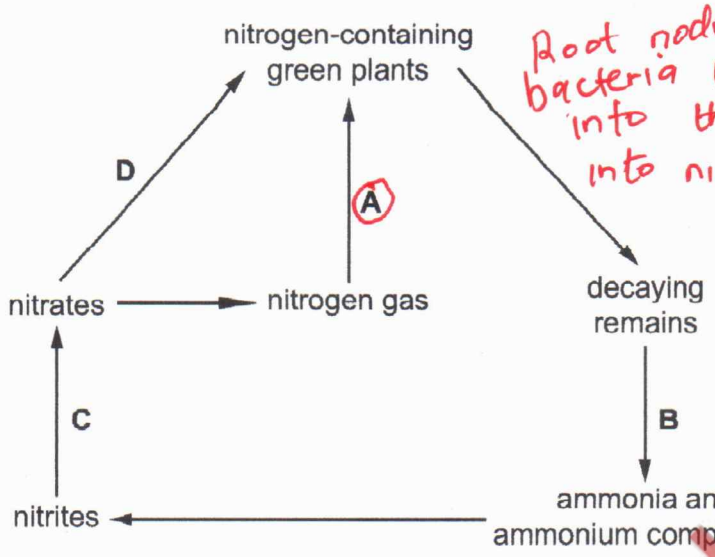

D



A single tree with several leaves can support several consumers.

**30** The diagram shows parts of the nitrogen cycle.

Which arrow represents the action of the root nodule bacteria of leguminous plants?




Root nodules have rhizobium bacteria that fixes nitrogen into the soil. Converts $N_2$ into nitrates ($NO_3^-$).

**31** Which row shows the malarial parasite and the vector involved in its transmission?

| | parasite | vector |
|---|---|---|
| A | female mosquito | human |
| B | human | male mosquito |
| C | malarial pathogen | female mosquito |
| D | male mosquito | malarial pathogen |

malarial pathogen (plasmodium) is spread by female anopheles mosquito (vector).

**32** Which pollutants may be released by agricultural practices?

| | pollutant | | | |
|---|---|---|---|---|
| | insecticides | methane | fertiliser | sulfur dioxide |
| A | yes | yes | yes | no |
| B | yes | yes | no | yes |
| C | yes | no | yes | yes |
| D | no | yes | yes | yes |

pollutants

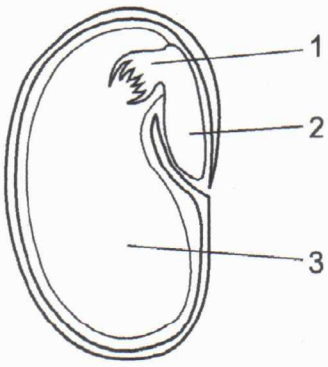
$SO_2$ - acid rain

$CH_4$ - greenhouse gas

fertilizers - eutrophication

insecticides

**33** The diagram shows a section of a seed.




1 plumule (shoot)
2 radicle (root)
3 cotyledon (food store)

What are the numbered parts?

| | 1 | 2 | 3 |
|---|---|---|---|
| **A** | cotyledon | plumule | radicle |
| **B** | plumule | cotyledon | radicle |
| **C** | plumule | radicle | cotyledon |
| **D** | radicle | plumule | cotyledon |

**34** Which statements about meiosis are correct?

| | meiosis produces genetically identical nuclei | meiosis produces haploid nuclei |
|---|---|---|
| **A** | ✗ | ✗ |
| **B** | ✗ | ✓ |
| **C** | ✓ | ✗ |
| **D** | ✓ | ✓ |

key
✓ = correct
✗ = not correct

| Mitosis | Meiosis |
|---|---|
| 2n | n |
| 2 cells | 4 cells |
| identical cells | Non-identical cells |
| No variation | Variation posible |



**35** The spread of HIV has been reduced in many countries.

Which action has assisted this reduction?

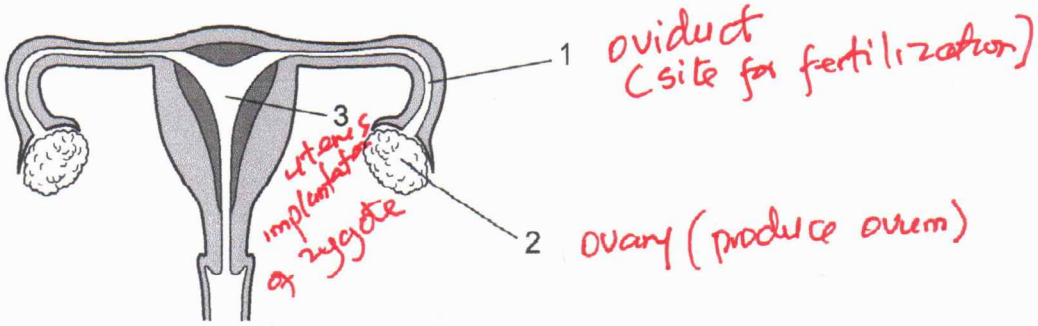
**A** development of an effective vaccine – no effective vaccine available

**B** health education – public awareness campaigns

**C** treating patients with new antibiotics – antibiotics act on bacteria only and not HIV

**D** using drugs that slow the appearance of symptoms of HIV – ARVs available but only useful to those affected already

**36** The diagram shows the female reproductive system.




In which parts are the eggs and the zygote formed?

| | eggs | zygote |
|---|---|---|
| **A** | 1 | 2 |
| **B** | 1 | 3 |
| **C** | 2 | 1 |
| **D** | 2 | 3 |

**37** What describes features of natural selection?

| | causes mutations to happen | leads to the evolution of new species | results in existing species becoming extinct |
|---|---|---|---|
| **A** | yes | yes | yes |
| **B** | yes | yes | no |
| **C** | yes | no | yes |
| **D** | no | yes | yes |



**38** A farmer uses sperm from a black male sheep to artificially inseminate (fertilise) 20 light brown female sheep.

All of the offspring produced were black.

Which statement explains these results?

**A** The alleles for light brown colour are dominant.

**B** The male sheep is heterozygous and the allele for black colour is dominant.

**C** The male sheep is homozygous and the allele for black colour is codominant.

**D** The male sheep is homozygous and the allele for black colour is dominant.

**39** The inheritance of the ABO blood groups in humans is controlled by three alleles ($I^A$, $I^B$ and $I^O$), only two of which can be present in one individual.

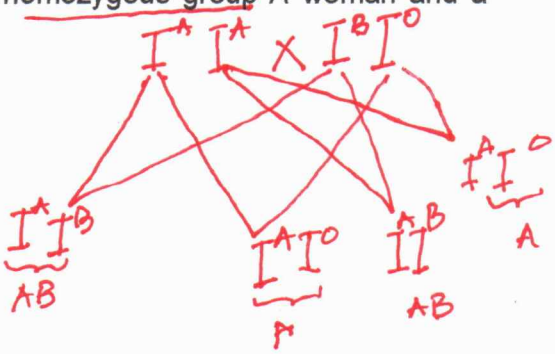
What are the possible blood groups of children born to a homozygous group A woman and a heterozygous group B man?

**A** AB and B only

**B** AB and A only

**C** A, B and AB only

**D** A, B, AB and O




**40** Which statement is **always** true of dominant alleles?

**A** They cannot undergo mutation.

**B** They give a greater chance of survival than recessive alleles.

**C** They give the same phenotype in heterozygotes and homozygotes.

**D** They occur less frequently in the population than recessive alleles.