Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

**BIOLOGY** **9700/12**

Paper 1 Multiple Choice **May/June 2015**

**1 hour**

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

*8865472371*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.


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CAMBRIDGE International Examinations

**1** What is the diameter of a typical plant cell?

**A** $4.0 \times 10^1\ \mu m$

**B** $1.0 \times 10^0\ \mu m$

**C** $4.0 \times 10^2$ nm

**D** $1.0 \times 10^2$ nm

**2** A specimen is viewed under a microscope using green light with a wavelength of 510 nm.

If the same specimen is viewed under the same conditions, but using red light with a wavelength of 650 nm instead, what effect will this have on the magnification and on the resolution of the microscope?

| | magnification | resolution |
|---|---|---|
| **A** | decreased | remains the same |
| **B** | increased | increased |
| **C** | remains the same | decreased |
| **D** | remains the same | increased |

**3** What is the function of plasmodesmata in plant cells?

**A** to act as a barrier to water soluble substances

**B** to allow active transport of ions and sucrose between cells

**C** to allow the symplastic movement of substances between cells

**D** to enable cells to recognise each other

**4** Which size of ribosome is found in both chloroplasts and mitochondria?

**A** 60S **B** 70S **C** 80S **D** 90S

**5** Which function is correct for the description of the cell structure?

| | function | cell structure |
|---|---|---|
| **A** | organises microtubules to produce the spindle | membrane-bound sacs, arranged as a flattened sac |
| **B** | packages hydrolytic enzymes used in cell | non-membrane bound cylindrical structures |
| **C** | synthesises lipids | membranes which surround an enclosed inner cavity |
| **D** | synthesises polypeptides | membrane bound spherical structure |

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**6** Ribosomes consist of two subunits, each containing rRNA. An analysis of **all** the 70S ribosomes from a single cell of the bacterium, *Escherichia coli*, showed that there were:

- 38 000 rRNA molecules
- 2 main types of rRNA molecule
- 19 000 copies of each type of rRNA molecule

How many 70S ribosomes were there in the *E. coli* cell?

**A** 9500 **B** 19 000 **C** 38 000 **D** 76 000

**7** Which type of bond holds together an $\alpha$-helix or $\beta$-pleated sheet of a protein?

**A** disulfide

**B** hydrogen

**C** ionic

**D** peptide

**8** What describes only the quaternary structure of haemoglobin?

1 $\alpha$-helix

2 a dipeptide

3 a globular structure

4 the specific order of amino acids

5 four polypeptide chains joined together

**A** 1, 2 and 3 **B** 2, 4 and 5 **C** 1 and 4 **D** 5 only

**9** The statements are about the properties of water.

1 ability to form hydrogen bonds with other molecules

2 less dense when frozen

3 able to hold a lot of heat

What allows a small insect to rest on the surface of a pond?

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

**10** Which bonds hold together the structure of cellulose?

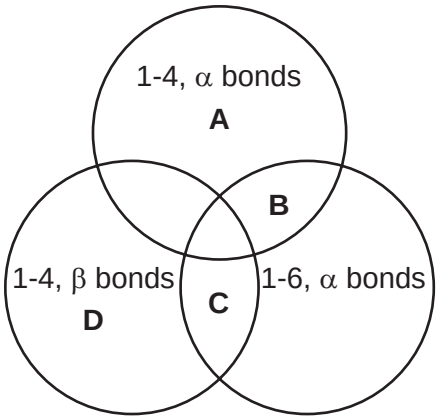
1 glycosidic

2 hydrogen

3 ionic

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

**11** Which bonds are found in glycogen?




**12** Solutions of biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

| solution | heated with Benedict's solution | boiled with hydrochloric acid, neutralised, then heated with Benedict's solution |
|---|---|---|
| 1 | blue | orange |
| 2 | green | green |
| 3 | yellow | red |

Which may contain non-reducing sugars?

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

**13** Which levels of protein structure are always involved when competitive and non-competitive inhibitors bind to enzymes?

| | competitive | non-competitive |
|---|---|---|
| **A** | primary, secondary and tertiary | secondary |
| **B** | quaternary and tertiary | quaternary and tertiary |
| **C** | secondary | primary and tertiary |
| **D** | tertiary | tertiary |

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**14** Which statements are true about the optimum temperature of **all** enzymes?

1 It is the temperature at which the enzymes work best.

2 It is the highest temperature at which the enzyme will work.

3 It is between 35 °C and 40 °C.

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

**15** Which description of cell surface membrane permeability is correct?

**A** An increase in the concentration of cholesterol molecules in the cell surface membrane can increase its permeability to hydrophilic substances.

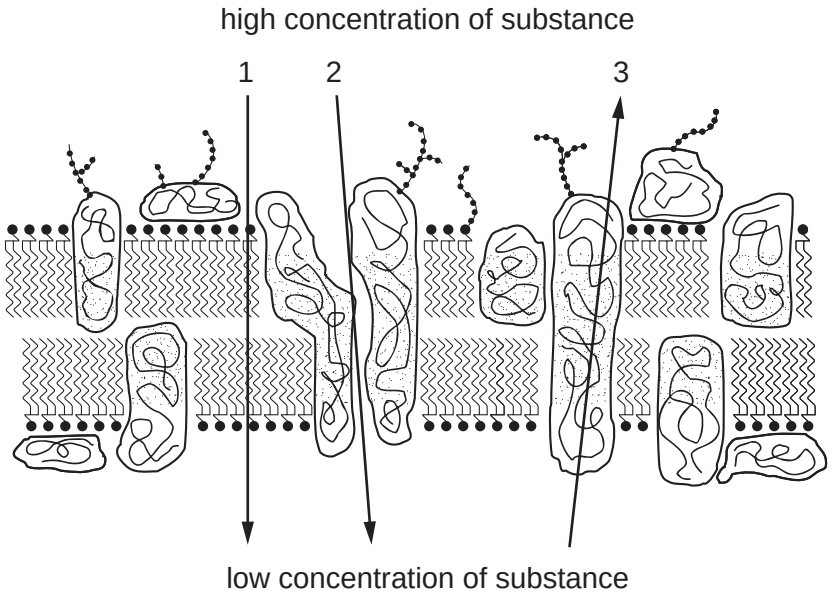
**B** Cell surface membrane permeability to large hydrophilic molecules is high and can be increased by membrane transport proteins involved in facilitated diffusion.

**C** The permeability of the cell surface membrane to ions is increased with an increase in the proportion of saturated fatty acids in the phospholipids.

**D** Without the presence of carrier and channel membrane proteins, the cell surface membrane has a low permeability to large polar molecules.

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**16** The diagram represents a cell surface membrane.




Three pathways through the membrane are shown.

Which process is represented by each arrow?

| | 1 | 2 | 3 |
|---|---|---|---|
| **A** | active transport | diffusion | facilitated diffusion |
| **B** | diffusion | active transport | facilitated diffusion |
| **C** | diffusion | facilitated diffusion | active transport |
| **D** | facilitated diffusion | diffusion | active transport |

**17** Which set of factors will produce the **most** fluid cell surface membrane?

| | an increase in |
|---|---|
| **A** | • proportion of phospholipids with saturated fatty acid chains<br>• distance between phospholipid molecules |
| **B** | • proportion of long fatty acid chains<br>• proportion of phospholipids with unsaturated fatty acid chains |
| **C** | • proportion of long fatty acid chains<br>• temperature |
| **D** | • proportion of phospholipids with unsaturated fatty acid chains<br>• temperature |

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**18** The protein p53 is produced in a cell in response to DNA damage.

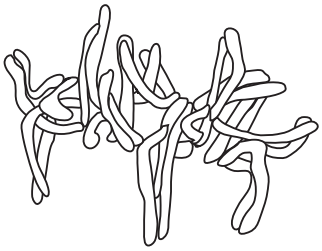
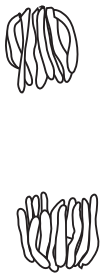
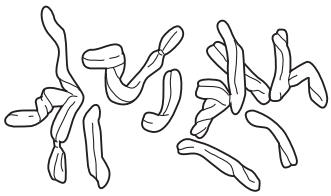
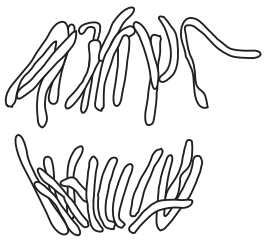
A scientist exposed three groups of cells, X, Y and Z, to different conditions.

| group of cells | conditions cells were exposed to |
|---|---|
| X | ionising radiation |
| Y | ultra-violet light |
| Z | nicotine |

In which groups of cells would the scientist find large quantities of p53 mRNA?

**A** X, Y and Z **B** X and Y only **C** Y and Z only **D** Y only

**19** Which row is correct?

| | diagram | stage |
|---|---|---|
| **A** |  | interphase |
| **B** |  | metaphase |
| **C** |  | telophase |
| **D** |  | anaphase |

**20** What is needed to transcribe DNA?

**A** DNA ligase

**B** DNA polymerase

**C** ribosomes

**D** RNA polymerase

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**21** In a ribosome, which bond holds together two adjacent amino acids?

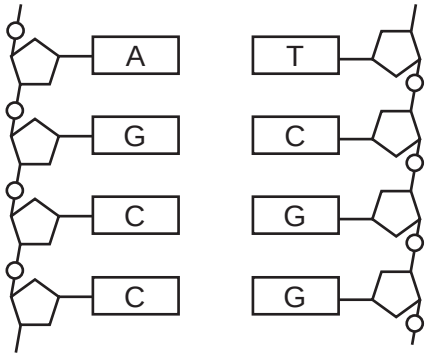
**A** disulfide

**B** hydrogen

**C** ionic

**D** peptide

**22** The diagram shows part of a DNA molecule.




How many hydrogen bonds are involved in holding these strands of DNA together?

**A** 11 **B** 9 **C** 8 **D** 4

**23** Which features of these cells make them suitable for their function?

| | companion cells | xylem vessel elements |
|---|---|---|
| **A** | circulating contents allow transport in both directions | lignified walls provide support |
| **B** | cellulose walls provide support | nuclei allow cell division |
| **C** | nuclei allow cell division | gaps between cells allow rapid transport |
| **D** | numerous mitochondria supply energy | absence of cytoplasm allows mass flow |

**24** What is the sequence of events in the translocation of sucrose?

**A** active loading of sucrose into sieve elements at the source, increased hydrostatic pressure, mass flow, unloading at the sink

**B** hydrolysis of storage compounds in sinks, lowered water potential, unloading of sucrose from sieve elements, mass flow from the source

**C** lowered pressure in sieve elements at the source, movement of sucrose down the pressure gradient, mass flow down a diffusion gradient to the sink

**D** mass flow of dissolved sucrose into the sieve element at the source, lowered hydrostatic pressure, diffusion of sucrose to sink, active unloading

**25** Where does water evaporate from during transpiration?

**A** inside the guard cells

**B** the outer surface of the epidermal cell layer

**C** the sub-stomatal cavity

**D** the surface of spongy mesophyll cell walls

**26** Which changes to the water potential and the volume of liquid in the phloem occur when amino acids are taken out of a sink in a phloem sieve tube?

| | water potential in phloem sieve tubes | volume of liquid in phloem sieve tubes |
|---|---|---|
| **A** | higher | decreased |
| **B** | higher | increased |
| **C** | lower | decreased |
| **D** | lower | increased |

**27** Which reaction takes place in a capillary in the lungs?

**A** the formation of carbaminohaemoglobin from carbon dioxide and haemoglobin

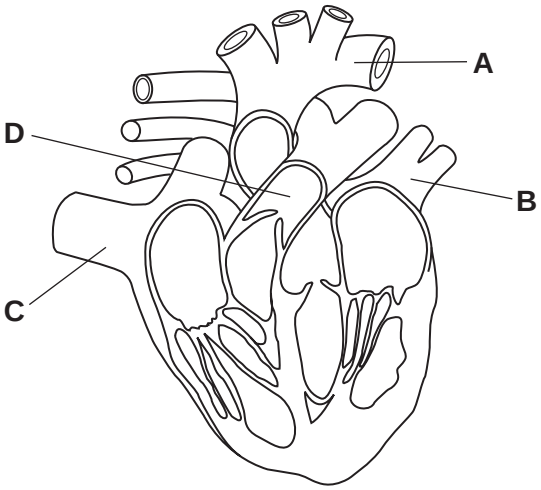
**B** the formation of carbon dioxide and water from hydrogen carbonate ions and hydrogen ions

**C** the formation of carbonic acid from carbon dioxide and water

**D** the formation of haemoglobinic acid from haemoglobin and hydrogen ions

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**28** Which structure is correctly identified?



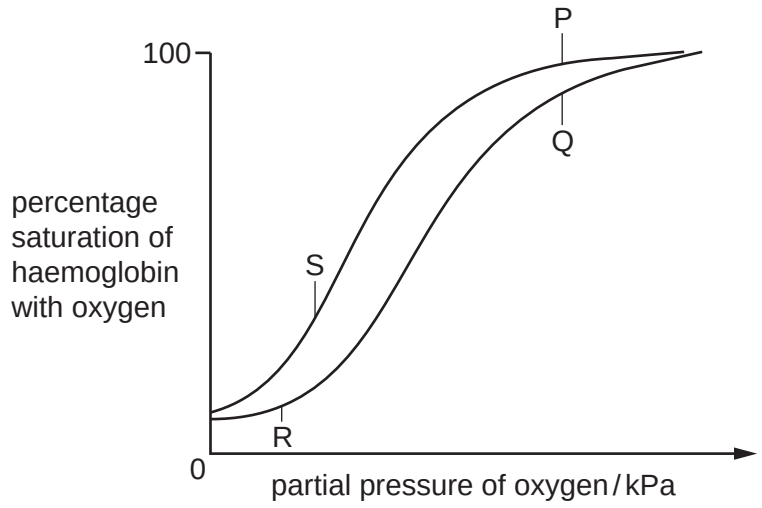

**A** aorta

**B** pulmonary artery

**C** pulmonary vein

**D** vena cava

**29** Resting muscle has a lower respiration rate than active muscle. The graph shows the oxygen dissociation curves for haemoglobin at carbon dioxide concentrations that are found in a resting muscle and an active muscle.
P and Q are at the partial pressures of oxygen found in the lungs.
R and S are at the partial pressures of oxygen found in **either** a resting muscle **or** an active muscle.




Which statements are correct?

1 The % saturation at P minus the % saturation at S represents the amount of oxygen delivered to a resting muscle.

2 The % saturation at Q represents the amount of oxygen carried to an active muscle.

3 The % saturation at R represents the amount of oxygen required by a resting muscle.

4 The % saturation at P minus the % saturation at Q represents the amount of oxygen delivered to an active muscle.

5 The % saturation at Q minus the % saturation at S represents the amount of oxygen delivered to a resting muscle.

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

**30** What does **not** help to maximise uptake of oxygen as blood flows through capillaries in the lungs?

**A** Dissociation of carbon dioxide from carboxyhaemoglobin allows more haemoglobin to be available for oxygen binding.

**B** Each haemoglobin molecule can temporarily bind to eight oxygen atoms.

**C** Oxyhaemoglobin formation increases the capacity of red blood cells to transport oxygen.

**D** The binding of the first oxygen molecule to haemoglobin increases the molecule's affinity for binding other oxygen molecules.

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**31** What correctly describes the role of elastic fibres in the lungs?

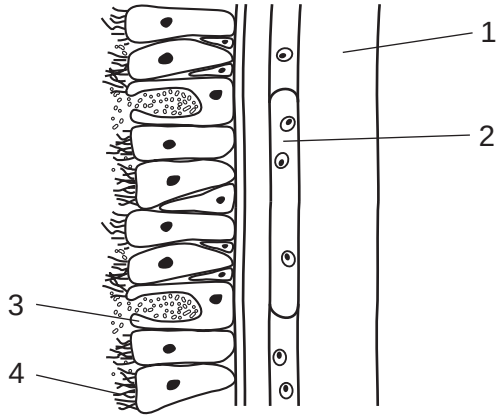
**A** They allow the walls of stretched alveoli to recoil as air is breathed out.

**B** They increase in the walls of alveoli as a result of the release of the enzyme elastase.

**C** They increase in the walls of the alveoli as emphysema develops.

**D** They prevent the walls of the alveoli from collapsing as air is breathed in.

**32** The diagram represents a section through the wall of a bronchus (not to scale).




In a person with chronic obstructive pulmonary disease (COPD), what happens in each of the numbered structures?

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **A** | contracts | contracts | inhibited | not affected |
| **B** | contracts | not affected | overactive | inhibited |
| **C** | relaxes | contracts | inhibited | paralysed |
| **D** | relaxes | not affected | overactive | overactive |

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**33** The symptoms of two diseases are listed.

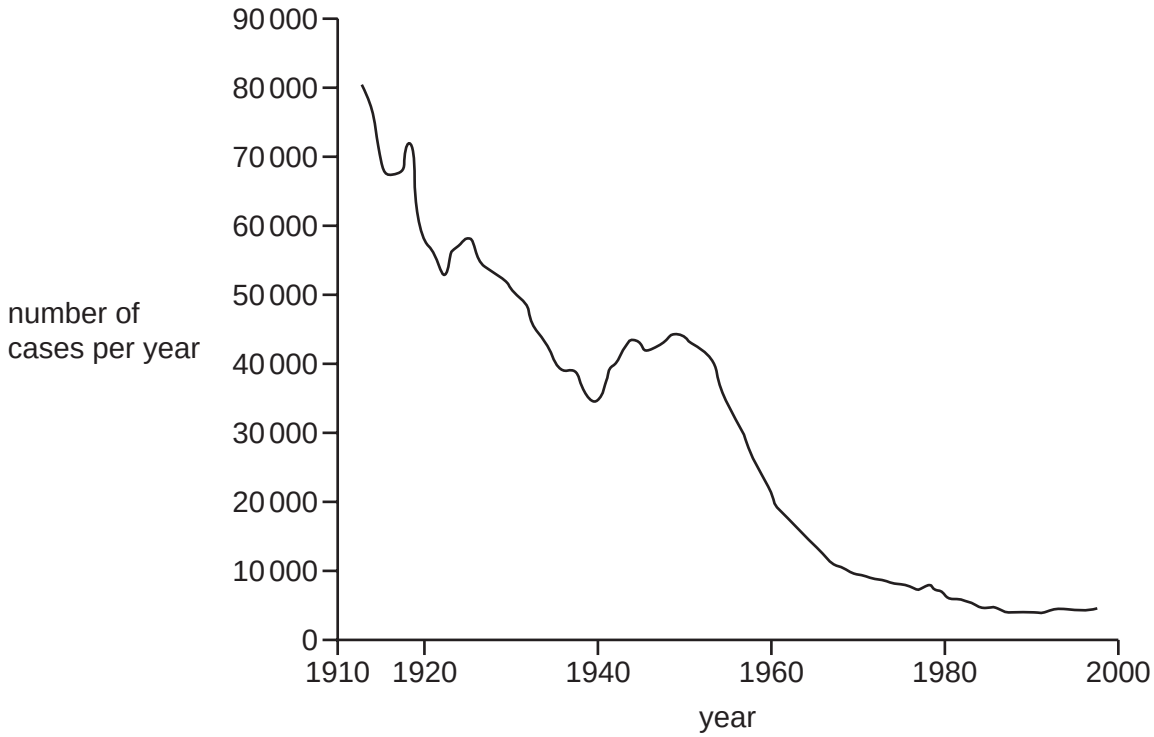
| disease 1 | disease 2 |
|---|---|
| persistent cough | shortness of breath |
| pain when breathing | wheezing |
| loss of weight | fatigue |

Which row identifies diseases 1 and 2?

| | disease 1 | disease 2 |
|---|---|---|
| **A** | chronic bronchitis | emphysema |
| **B** | emphysema | lung cancer |
| **C** | lung cancer | chronic bronchitis |
| **D** | lung cancer | emphysema |

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**34** The graph shows the fall in cases of tuberculosis (TB) in a country between 1910 and 2000.




Which factors could have contributed to the fall over this period?

1 pasteurisation of milk

2 the provision of new housing

3 chemical treatment of sewage

4 identification of contacts of people infected with TB

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

**35** Which row is correct for cholera?

| | nature of disease | method of transmission | causative agent (pathogen) |
|---|---|---|---|
| **A** | infectious | insect vector | species of *Plasmodium* |
| **B** | infectious | water-borne | species of *Vibrio* |
| **C** | non-infectious | insect vector | species of *Plasmodium* |
| **D** | non-infectious | water-borne | species of *Vibrio* |

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**36** Which action is taken by a B-lymphocyte activated by an antigen?

**A** It attaches to the infected cell displaying the antigen and destroys it.

**B** It divides repeatedly to form a clone of genetically identical plasma cells.

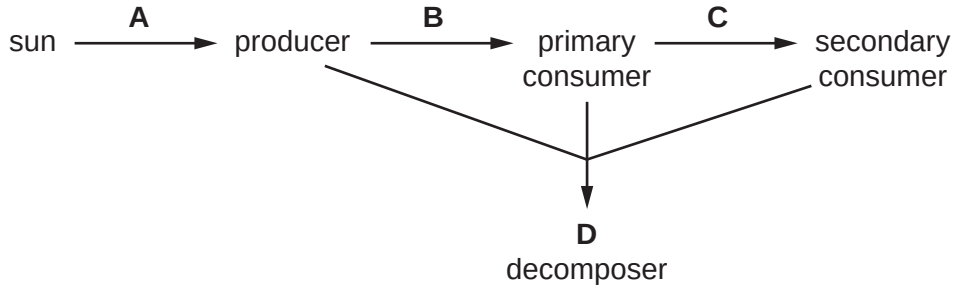
**C** It engulfs the infected body cell which displays the antigen.

**D** It secretes cytokines which stimulate T-lymphocytes to produce plasma cells.

**37** The synthesis of specific antibodies in response to vaccination is an example of which type of immunity?

| | natural | artificial |
|---|---|---|
| active | **A** | **B** |
| passive | **C** | **D** |

**38** At which stage of a food chain in a tropical grassland is the energy transfer least efficient?



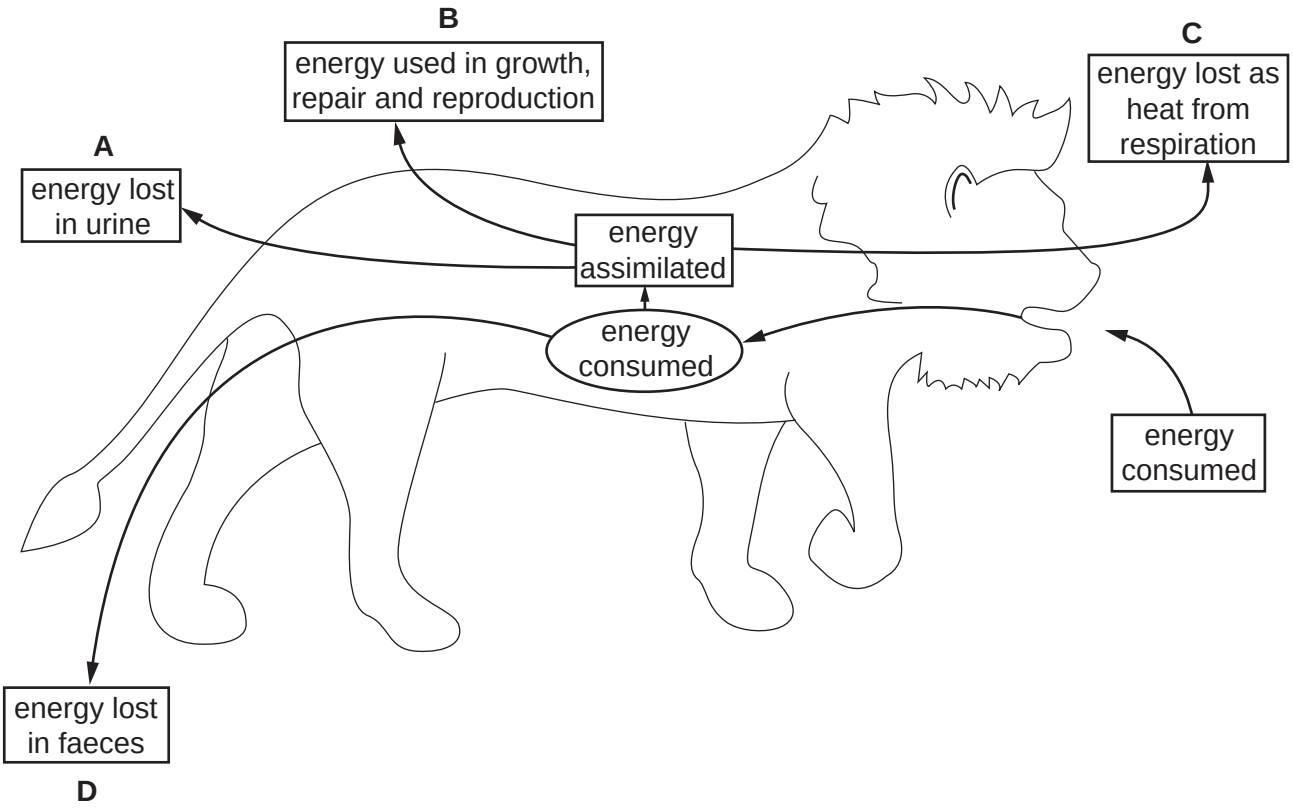

**39** A farmer grows a different crop in a field each year for three years.

In the fourth year he grows a leguminous crop, such as clover, and then ploughs this into the soil. The next year he starts the rotation again.

How does the fourth year crop add mineral ions to the soil?

| | decomposition | nitrification | nitrogen fixation |
|---|---|---|---|
| **A** | no | yes | yes |
| **B** | yes | no | yes |
| **C** | yes | yes | no |
| **D** | yes | yes | yes |

**40** Of the prey consumed by the lion, into which box does the largest amount of energy go?



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