UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

**COMBINED SCIENCE** **5129/12**

Paper 1 Multiple Choice **October/November 2011**

**1 hour**

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

*0604852821*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, highlighters, 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.

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.
A copy of the Periodic Table is printed on page 20.



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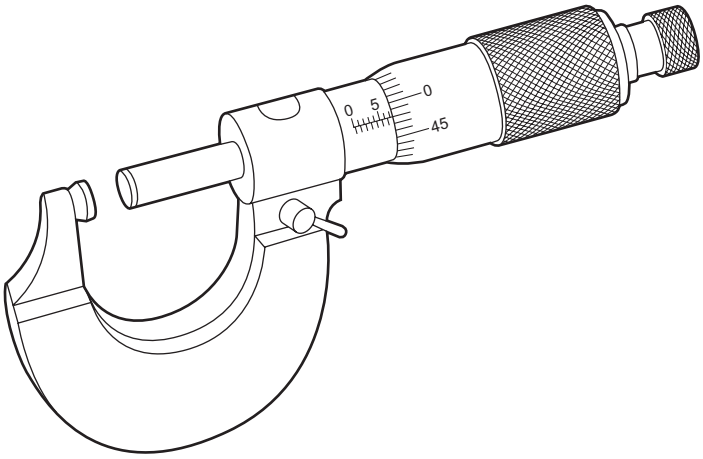
UNIVERSITY of CAMBRIDGE International Examinations

**[Turn over**

**1** The diagram shows an instrument used in Physics.




What is the name of this instrument and what is it used to measure?

| | name | used to measure |
|---|---|---|
| **A** | calipers | length |
| **B** | calipers | pressure |
| **C** | micrometer | length |
| **D** | micrometer | pressure |

**2** In an energy transformation sequence, what produces kinetic energy from gravitational potential energy as part of the sequence?

**A** burning fuel in a power station

**B** generating hydroelectric energy

**C** generating energy in a nuclear power station

**D** generating energy in a geothermal power station

**3** Which car, moving from rest, has an average acceleration of $2.0\,m/s^2$?

**A** a car reaching a speed of 10 m/s in 2 s

**B** a car reaching a speed of 20 m/s in 5 s

**C** a car reaching a speed of 30 m/s in 10 s

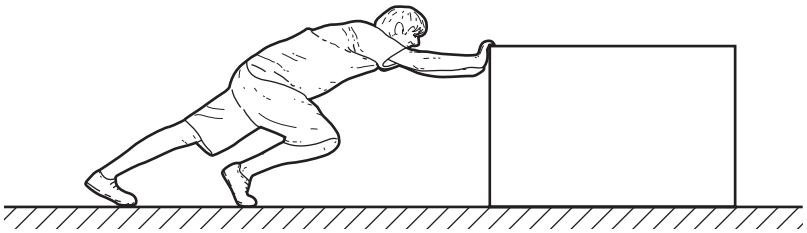
**D** a car reaching a speed of 40 m/s in 20 s

**4** A force is applied to an object on a frictionless surface. It produces an acceleration of $3\,m/s^2$.

What are possible values for the applied force and for the mass of the object?

| | force / N | mass / kg |
|---|---|---|
| **A** | 2 | 5 |
| **B** | 2 | 6 |
| **C** | 5 | 2 |
| **D** | 6 | 2 |

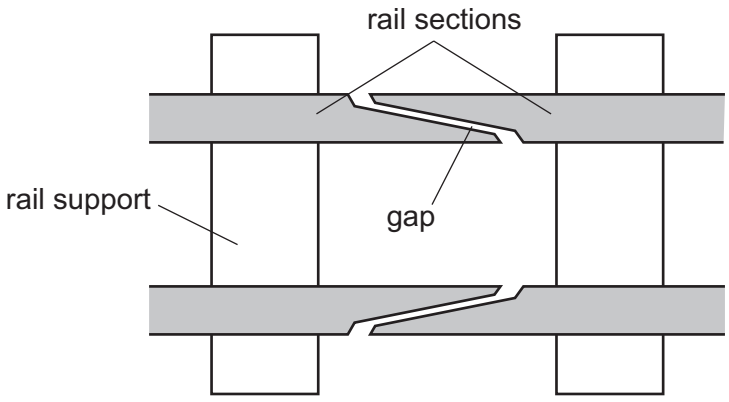
**5** A man pushes a heavy box across a floor. He exerts a force of 80 N and the box moves 4.0 m in 5.0 seconds.



What useful power does the man develop?

**A** 4.0 W **B** 64 W **C** 100 W **D** 1600 W

**6** At regular intervals along a railway line there is a gap between the rail sections.




What is the reason for the gap between the rail sections?

**A** to allow for expansion of the rail sections during hot weather

**B** to allow for vibrations of the rail sections as the train passes over them

**C** to allow rain water to drain from the rail sections

**D** to keep the wheels of the train and carriages on the rail sections

**7** Which property is essential to a clinical thermometer?

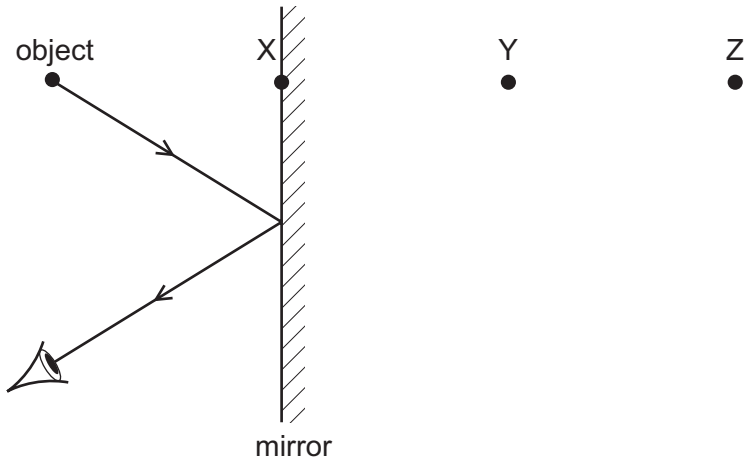
**A** It contains mercury.

**B** It has a constriction in its bore.

**C** It has a range of 40 °C.

**D** It is accurate to 0.001 °C.

**8** The diagram shows the reflection of a ray of light from an object in a plane mirror.




Which statement is correct?

**A** The image is at X.

**B** The image is between X and Y.

**C** The image is at Y.

**D** The image is between Y and Z.

**9** A VHF radio station broadcasts at a frequency of 60 MHz ($6.0 \times 10^7$ Hz). The speed of radio waves is $3.0 \times 10^8$ m/s.

What is the wavelength of the waves broadcast by the station?

**A** 5.0 m **B** 2.0 m **C** 0.5 m **D** 0.2 m

**10** Which diagram correctly shows the directions of the electrostatic forces on a pair of charged spheres?

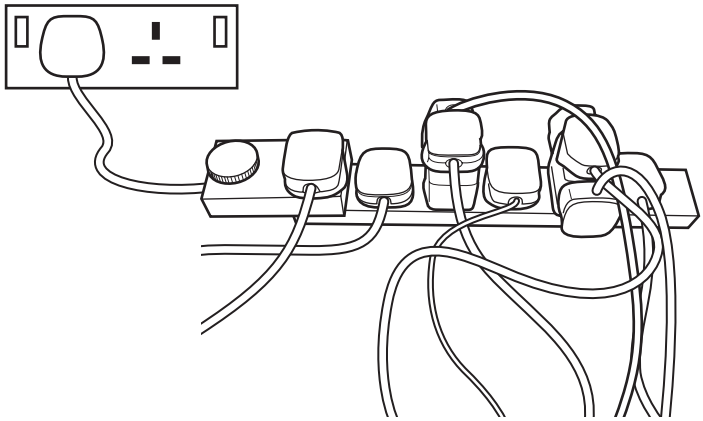
**A**

**B**

**C**

**D**

**11** The diagram shows an unsafe use of an extension cable.



What is the electrical hazard?

**A** the danger of burning out the appliances

**B** the danger of melting the fuse

**C** the danger of overheating the cable

**D** the danger of the appliances not being earthed

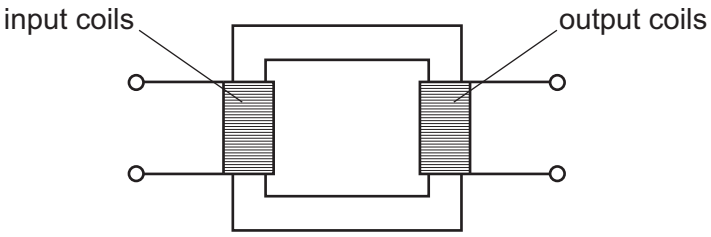
**12** A constant-voltage source is connected to a resistor which has a current $I$ through it.

Two more identical resistors are then added in series with the first.

What is the current now?

**A** $\frac{I}{4}$ **B** $\frac{I}{3}$ **C** $I$ **D** $3I$

**13** The transformer in the diagram has an input coil with $N_i$ turns and an output coil with $N_o$ turns.

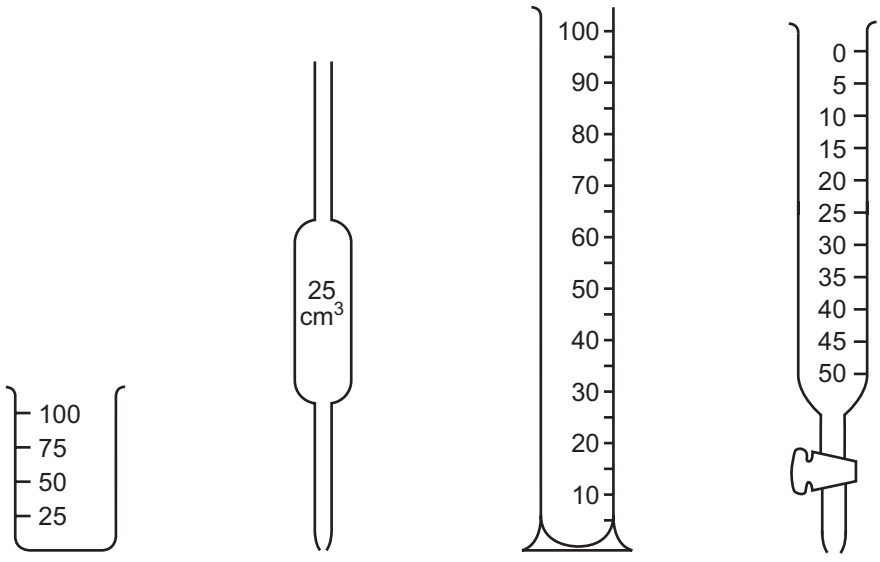



The output voltage needs to be lower than the input voltage.

What is needed for the transformer to work correctly?

| | input supply | relative values of $N_i$ and $N_o$ |
|---|---|---|
| **A** | a.c. | $N_i > N_o$ |
| **B** | a.c. | $N_i < N_o$ |
| **C** | d.c. | $N_i > N_o$ |
| **D** | d.c. | $N_i < N_o$ |

**14** Which piece of apparatus would be most suitable to measure accurately the volume of acid needed to neutralise 25.0 $cm^3$ of an alkali?



**15** An atom of element X is represented by $^{7}_{3}X$.

Which statement about this atom of X is correct?

**A** It is in Group III of the Periodic Table.

**B** It is in Group VII of the Periodic Table.

**C** The total number of protons and electrons is 6.

**D** The total number of protons and neutrons is 10.

**16** The table shows the electronic structures of four elements.

| element | electronic structure |
|---|---|
| W | 2, 6 |
| X | 2, 8 |
| Y | 2, 8, 1 |
| Z | 2, 8, 7 |

Which pair of atoms form a covalent molecule?

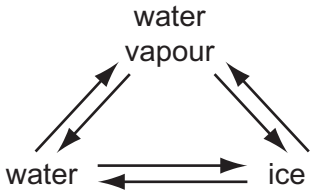
**A** two atoms of W

**B** two atoms of X

**C** an atom of W and an atom of X

**D** an atom of Y and an atom of Z

**17** In which conversion do water molecules lose speed?




**A** ice → water

**B** ice → water vapour

**C** water vapour → ice

**D** water → water vapour

**18** Which process is endothermic?

**A** the formation of a hydrogen-chlorine bond

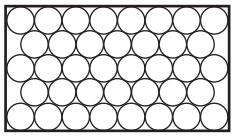
**B** the formation of silver from silver salts in photography

**C** the formation of water from oxygen and hydrogen

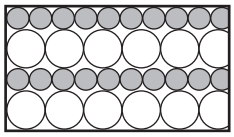
**D** the formation of water from steam

**19** Which diagram represents the structure of an alloy?

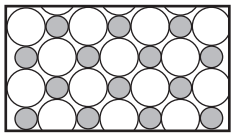
**A**



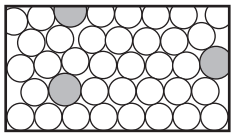
**B**



**C**



**D**



**20** What are the properties of bromine?

| | state at room temperature | result of adding bromine to aqueous potassium iodide |
|---|---|---|
| **A** | gas | no reaction |
| **B** | gas | reaction |
| **C** | liquid | no reaction |
| **D** | liquid | reaction |

**21** Which statement about all acids is correct?

**A** They contain both hydrogen and oxygen.

**B** They give ammonia with an ammonium salt.

**C** They have a pH value below 7.

**D** They react with all metals to form hydrogen.

**22** Ammonia may be obtained from ammonium chloride by heating with

**A** aqueous calcium chloride.

**B** aqueous sodium hydroxide.

**C** dilute hydrochloric acid.

**D** water.

**23** Water is formed when hydrogen is passed over the heated oxide of metal X.

No water is formed when hydrogen is passed over the heated oxide of metal Y.

What is the order of reactivity of hydrogen, metal X and metal Y?

| | most reactive ⟶ | | least reactive |
|---|---|---|---|
| **A** | hydrogen | X | Y |
| **B** | X | hydrogen | Y |
| **C** | X | Y | hydrogen |
| **D** | Y | hydrogen | X |

**24** Aluminium is used to make saucepans because of its apparent lack of reactivity.

Which property of aluminium explains its unreactivity?

**A** It has a high electrical conductivity.

**B** It has a layer of oxide on its surface.

**C** It has a low density.

**D** It is in Group III of the Periodic Table.

**25** Which substance can be oxidised to form ethanoic acid?

**A** $CH_3OH$ **B** $C_2H_5OH$ **C** $C_3H_7OH$ **D** $C_4H_9OH$

**26** The table shows the boiling point ranges of fractions collected from distillation of a sample of petroleum (crude oil).

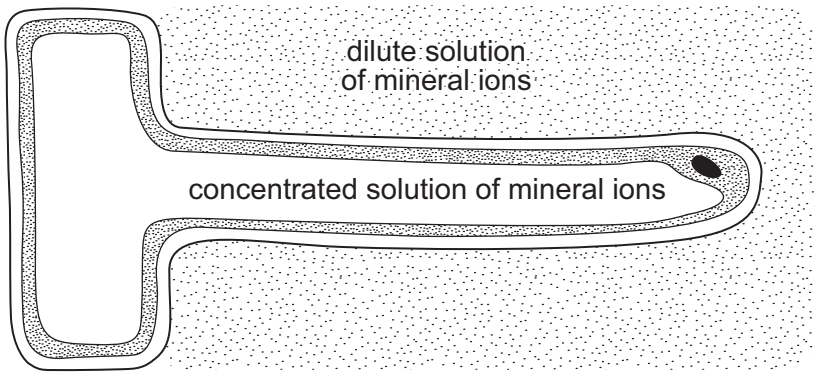
Which fraction contains the smallest molecules?

| fraction | boiling point range |
|---|---|
| **A** | 20 – 50°C |
| **B** | 50 – 100°C |
| **C** | 100 – 150°C |
| **D** | 150 – 250°C |

**27** Which is the molecular formula of an alkane?

**A** $C_3H_6$ **B** $C_4H_{10}$ **C** $C_6H_{12}$ **D** $C_7H_{18}$

**28** The diagram shows a root hair, surrounded by a dilute solution of mineral ions.




Which statement describes what happens?

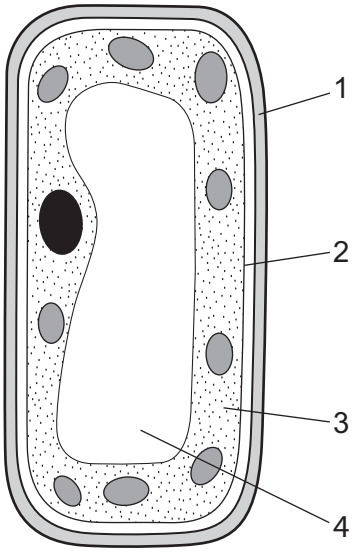
**A** Water molecules move into the root hair because their concentration is lower inside.

**B** Water molecules move into the root hair because their concentration is lower outside.

**C** Water molecules move out of the root hair because their concentration is lower inside.

**D** Water molecules move out of the root hair because their concentration is lower outside.

**29** The diagram shows a plant cell.




Which structures are the cell membrane, cell wall and cytoplasm?

| | cell membrane | cell wall | cytoplasm |
|---|---|---|---|
| **A** | 1 | 2 | 3 |
| **B** | 1 | 2 | 4 |
| **C** | 2 | 1 | 3 |
| **D** | 2 | 1 | 4 |

**30** Where and how does carbon dioxide enter a plant?

| | where | how |
|---|---|---|
| **A** | root hair cells | osmosis |
| **B** | root hair cells | diffusion |
| **C** | stomata | osmosis |
| **D** | stomata | diffusion |

**31** An experiment is performed to investigate the germination of barley grains, as follows.

- Three petri dishes are set up as shown in diagram 1.
- The dishes are left for 3 days.
- Iodine solution is added to the starch-agar substrate.

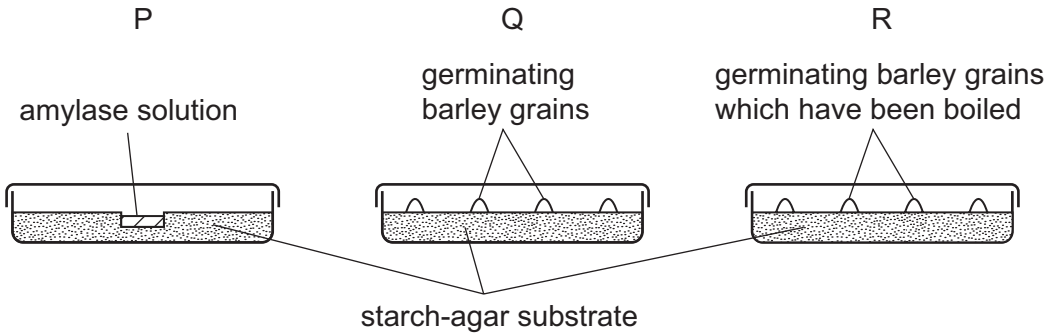



**diagram 1**
petri dishes viewed from the side

The results are shown in diagram 2. The shaded areas went blue-black.

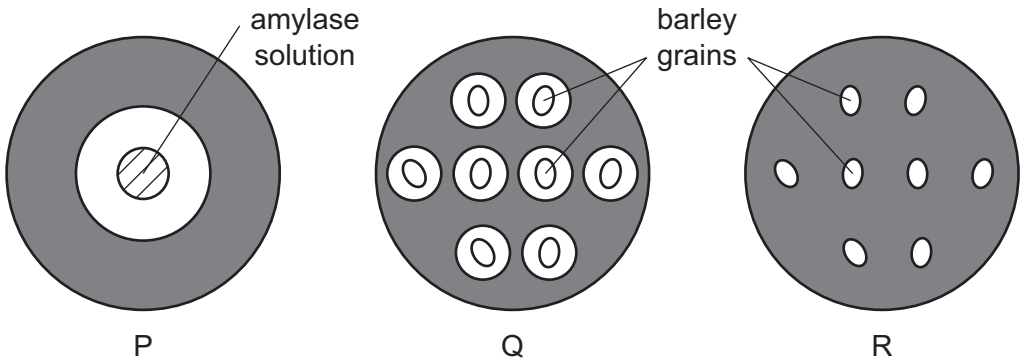



**diagram 2**
after 3 days, the same petri dishes viewed from above

Which is the **best** explanation of the results?

**A** Amylase is produced by barley grains that have been boiled.

**B** Amylase from barley grains is destroyed when they are boiled.

**C** Germinating grains prevent iodine from staining starch blue / black.

**D** Starch from the substrate is used by the grains as an energy source.

**32** To investigate whether bacteria in the mouth produce acids, a student

- rubbed two pieces of sterile cotton wool on his teeth,
- dipped only one of these pieces into finely powdered sugar,
- left both pieces in separate petri dishes for thirty minutes,
- covered both pieces with Universal Indicator solution.

[Universal Indicator solution colours: above pH 7, dark green to blue; pH 6-7, green; below pH 6, yellow to red]

Which colours will be observed at the end of the experiment?

| | sample dipped into sugar | sample not dipped into sugar |
|---|---|---|
| **A** | green | green |
| **B** | green | red |
| **C** | red | green |
| **D** | red | red |

**33** Which equation represents anaerobic respiration in yeast?

**A** glucose → alcohol + carbon dioxide

**B** glucose → alcohol + water

**C** glucose → lactic acid + carbon dioxide

**D** glucose → lactic acid + water

**34** What is the excretory product in blood that is removed by the lungs?

**A** carbon dioxide

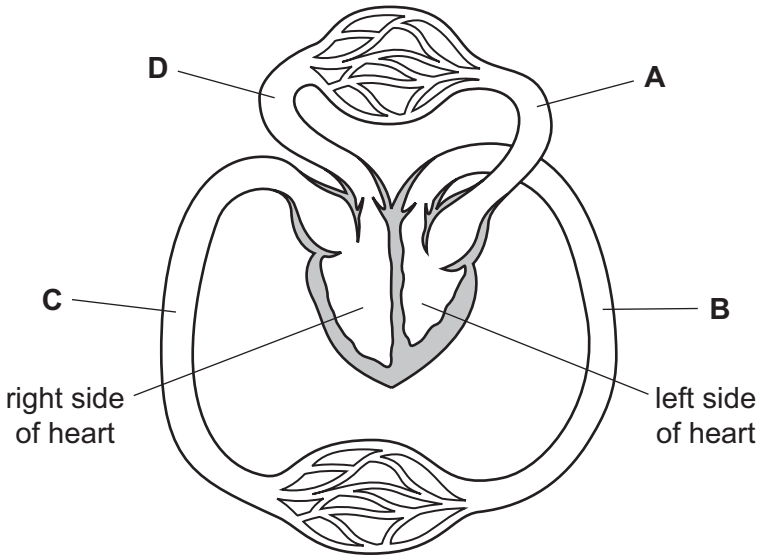
**B** lactic acid

**C** urea

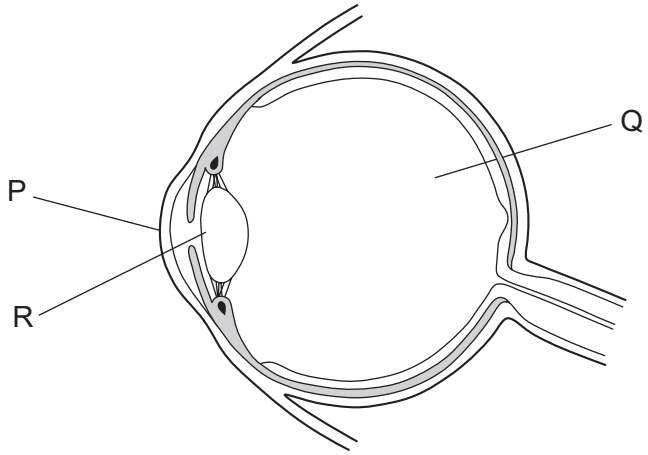
**D** water

**35** The diagram represents part of the human circulatory system.

Where is the blood pressure highest?




**36** The diagram shows a section through a human eye.




The eye produces an image by refracting (bending) light onto the retina.

How much of this refraction is created by the parts P, Q and R?

| | most refraction | some refraction | no refraction |
|---|---|---|---|
| **A** | P | Q | R |
| **B** | P | R | Q |
| **C** | R | P | Q |
| **D** | R | Q | P |



**[Turn over**

**37** Cutting down large areas of tropical forest can lead to a reduction in rainfall.

What is the reason for the reduction in rainfall?

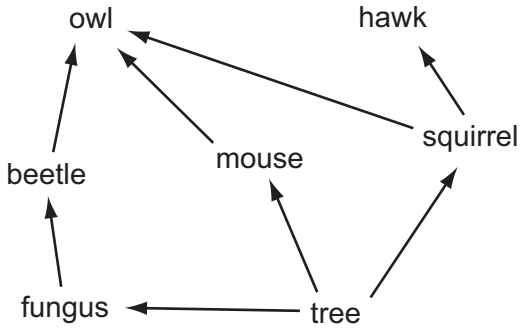
**A** a reduction in photosynthesis

**B** a reduction in transpiration

**C** an increase in flooding

**D** an increase in respiration

**38** The diagram shows a food web.




Which of the organisms, shown in the food web, can survive by taking in only simple inorganic materials?

**A** beetle

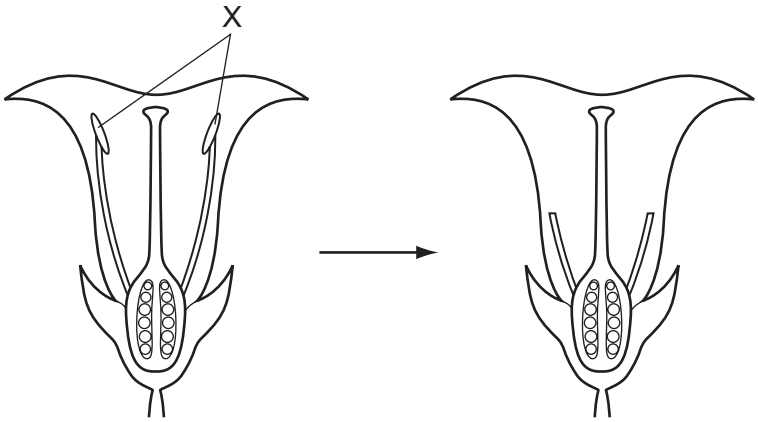
**B** fungus

**C** owl

**D** tree

**39** The diagram shows a flower in longitudinal section.

Before they had developed fully, a plant breeder removed the structures labelled X, as shown.




What is the effect of removing these structures?

**A** It prevents asexual reproduction.

**B** It prevents the flower from being pollinated.

**C** It prevents the flower from producing seeds.

**D** It prevents the flower from pollinating itself.

**40** What is a method of preventing the spread of HIV?

**A** avoiding sharing cups for drinking

**B** checking blood before transfusions

**C** taking the contraceptive pill

**D** using spermicides

**DATA SHEET**
**The Periodic Table of the Elements**

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | III | IV | V | VI | VII | 0 |
| | | | | | | | | | | | | | | | 4 He Helium 2 |
| | | | | | 1 H Hydrogen 1 | | | | | | | | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 |
| 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 |
| 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 59 Ni Nickel 28 | 64 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 |
| 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 |
| 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 * | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |
| Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 † | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 162 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |
| † | 232 Th Thorium 90 | Pa Protactinium 91 | 238 U Uranium 92 | Np Neptunium 93 | Pu Plutonium 94 | Am Americium 95 | Cm Curium 96 | Bk Berkelium 97 | Cf Californium 98 | Es Einsteinium 99 | Fm Fermium 100 | Md Mendelevium 101 | No Nobelium 102 | Lr Lawrencium 103 |

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).