



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

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**COMBINED SCIENCE**

**0653/01**

Paper 1 Multiple Choice

**October/November 2007**

**45 minutes**

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



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**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 16.

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This document consists of **16** printed pages.

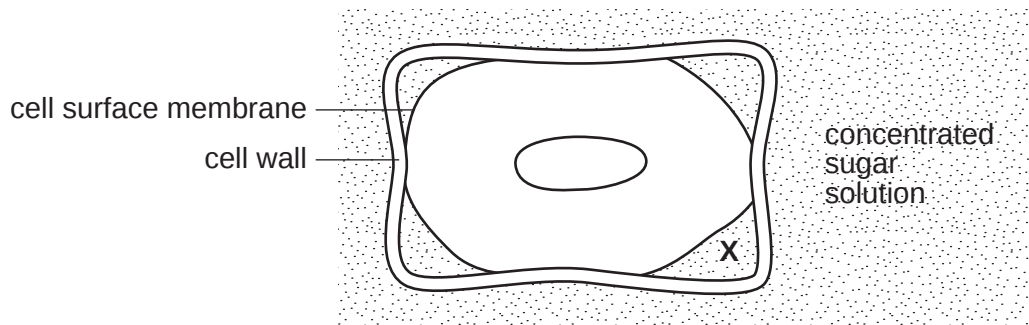


1 Which cell has **no** DNA?

- A goblet cell
- B red blood cell
- C sperm cell
- D spongy mesophyll cell

2 A plant cell is placed in a sugar solution that is more concentrated than the cell sap.

The diagram shows the appearance of the cell after 10 minutes.



Why does space **X** become filled with sugar solution?

- A The cell wall and cell surface membrane are both fully permeable.
- B The cell wall and cell surface membrane are both partially permeable.
- C The cell wall is fully permeable and the cell surface membrane is partially permeable.
- D The cell wall is partially permeable and the cell surface membrane is fully permeable.

3 Which gas is given off when the enzyme catalase is added to a solution of hydrogen peroxide?

- A carbon dioxide
- B carbon monoxide
- C hydrogen
- D oxygen

- 4 A water plant is exposed to sunlight. After a short period of time bubbles are given off from the plant.

Which gas do the bubbles contain, and which process produces this gas?

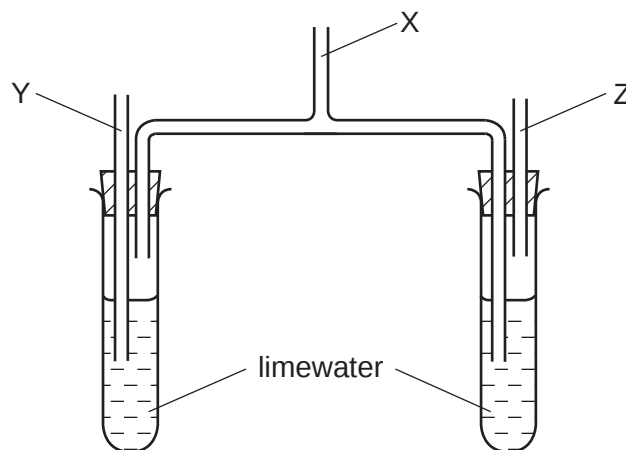
|          | gas            | process        |
|----------|----------------|----------------|
| <b>A</b> | carbon dioxide | photosynthesis |
| <b>B</b> | carbon dioxide | respiration    |
| <b>C</b> | oxygen         | photosynthesis |
| <b>D</b> | oxygen         | respiration    |

- 5 What is a symptom of vitamin C deficiency?

- A** bleeding from skin and gums
- B** developing soft bones
- C** low red blood cell count
- D** teeth decay easily

- 6 The diagram shows apparatus that can be used to demonstrate that the air breathed out by a person contains more carbon dioxide than the air breathed in.

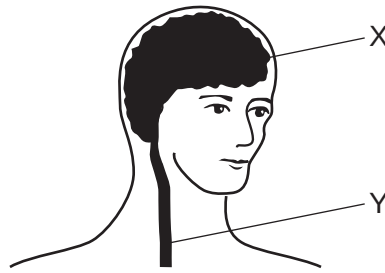
The person breathes in and out at X.



Where does air enter and leave the apparatus?

|          | air enters at | air leaves at |
|----------|---------------|---------------|
| <b>A</b> | Y             | Y             |
| <b>B</b> | Y             | Z             |
| <b>C</b> | Z             | Y             |
| <b>D</b> | Z             | Z             |

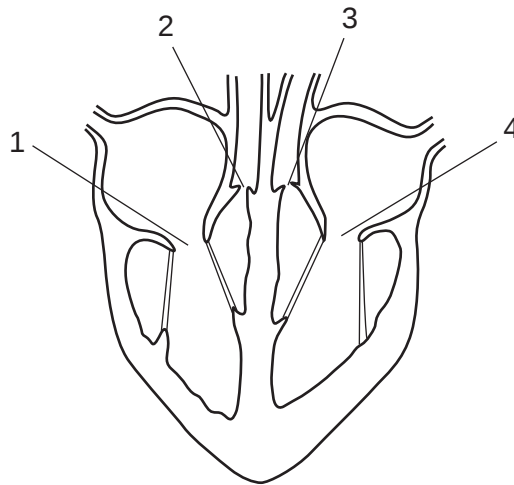
- 7 The diagram shows part of the human nervous system.



What are X and Y?

|          | X        | Y           |
|----------|----------|-------------|
| <b>A</b> | brain    | effector    |
| <b>B</b> | brain    | spinal cord |
| <b>C</b> | receptor | effector    |
| <b>D</b> | receptor | spinal cord |

- 8 The diagram shows a section through the heart.



The ventricles contract and blood is forced into the arteries.

What is the state of valve 3 and 4 when this happens?

|          | valve 3 | valve 4 |
|----------|---------|---------|
| <b>A</b> | closed  | closed  |
| <b>B</b> | closed  | open    |
| <b>C</b> | open    | closed  |
| <b>D</b> | open    | open    |

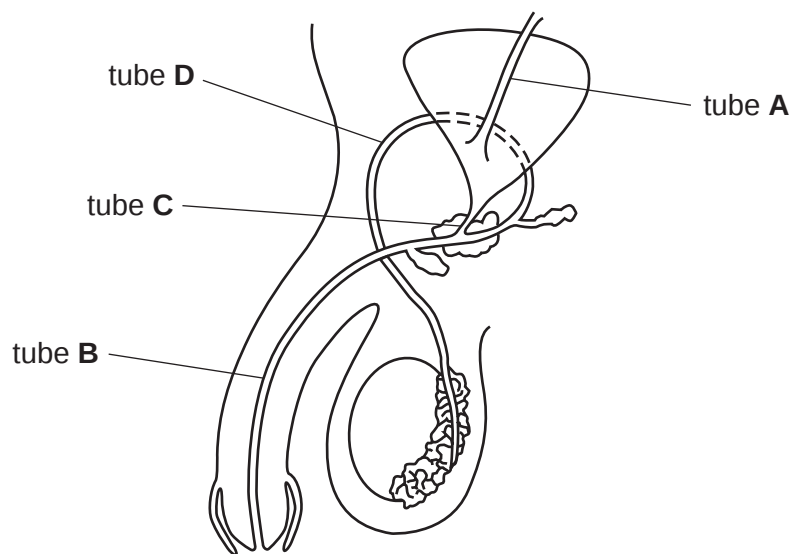
- 9 It is possible to grow plants that are genetically identical.

What are plants grown in this way called?

- A clones
- B gametes
- C seeds
- D zygotes

- 10 The diagram shows the male reproductive system.

Which tube is cut when carrying out male sterilisation (a vasectomy)?



- 11 In which part of a plant is the embryo found?

- A anther
- B pollen grain
- C seed
- D stigma

- 12 Jamal and Javan are identical twins, but Jamal is 10 kg heavier than Javan.

What will have caused the difference in their weights?

|   | genes | environment |
|---|-------|-------------|
| A | ✓     | ✓           |
| B | ✓     | x           |
| C | x     | ✓           |
| D | x     | x           |

key

✓ = yes

x = no

13 The diagram shows a food chain.



What is represented by the black arrows and by the white arrows?

|          | black arrows    | white arrows    |
|----------|-----------------|-----------------|
| <b>A</b> | chemical energy | heat            |
| <b>B</b> | chemical energy | sunlight        |
| <b>C</b> | heat            | chemical energy |
| <b>D</b> | sunlight        | chemical energy |

14 When a metal X is added to water, it reacts and two ions are formed.

What could these ions be?

- A**  $\text{Cu}^{2+}$ ,  $\text{H}^+$
- B**  $\text{Cu}^{2+}$ ,  $\text{OH}^-$
- C**  $\text{Na}^+$ ,  $\text{H}^+$
- D**  $\text{Na}^+$ ,  $\text{OH}^-$

15 Which two elements combine to form an ionic compound?

- A** carbon and oxygen
- B** chlorine and magnesium
- C** copper and zinc
- D** hydrogen and oxygen

16 Which displayed formulae correctly represent a molecule of carbon dioxide and of nitrogen?

|          | carbon dioxide, $\text{CO}_2$ | nitrogen, $\text{N}_2$   |
|----------|-------------------------------|--------------------------|
| <b>A</b> | $\text{O}-\text{C}-\text{O}$  | $\text{N}-\text{N}$      |
| <b>B</b> | $\text{O}-\text{C}-\text{O}$  | $\text{N}\equiv\text{N}$ |
| <b>C</b> | $\text{O}=\text{C}=\text{O}$  | $\text{N}-\text{N}$      |
| <b>D</b> | $\text{O}=\text{C}=\text{O}$  | $\text{N}\equiv\text{N}$ |

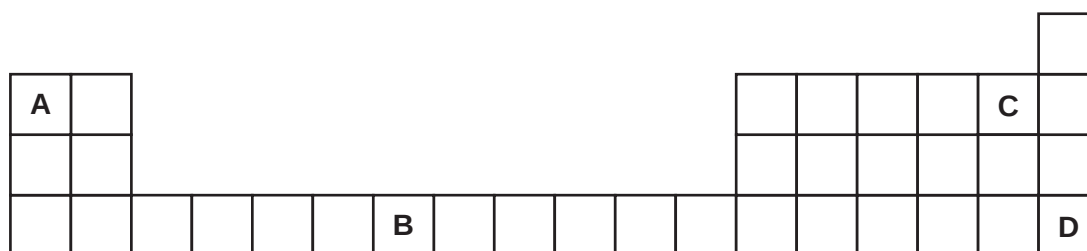
- 17 Two products, X and Y, are formed in the complete combustion of methane.

What are X and Y?

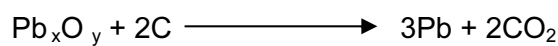
- A carbon and hydrogen
- B carbon and water
- C carbon dioxide and hydrogen
- D carbon dioxide and water

- 18 The diagram shows a simplified outline of the Periodic Table.

Which letter shows the position of a metal with a low melting point?



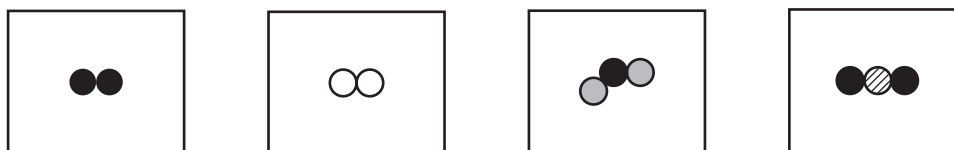
- 19 An oxide of lead is changed to lead by heating it with carbon.



What is the formula of this oxide of lead?

- A  $\text{Pb}_2\text{O}_3$
- B  $\text{Pb}_3\text{O}_2$
- C  $\text{Pb}_3\text{O}_4$
- D  $\text{Pb}_4\text{O}_3$

- 20 The diagrams show molecules of four gases present in clean air. Different circles represent atoms of different elements.



Which elements could be shown as ● and ○?

|   | ●        | ○        |
|---|----------|----------|
| A | hydrogen | nitrogen |
| B | hydrogen | oxygen   |
| C | oxygen   | hydrogen |
| D | oxygen   | nitrogen |

21 Which substance has a dangerously explosive reaction with sodium?

- A ammonia
- B hydrogen
- C hydrochloric acid
- D nitrogen

22 Aluminium oxide, dissolved in melted cryolite, is electrolysed.

Aluminium is produced by .....1..... and energy is .....2..... .

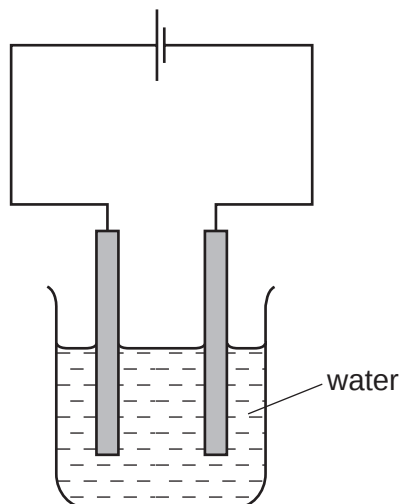
Which words correctly complete the gaps?

|          | gap 1     | gap 2     |
|----------|-----------|-----------|
| <b>A</b> | oxidation | given out |
| <b>B</b> | oxidation | used up   |
| <b>C</b> | reduction | given out |
| <b>D</b> | reduction | used up   |

23 Which word equation shows a thermal decomposition?

- A ammonia + nitric acid → ammonium nitrate
- B hydrogen + oxygen → water
- C magnesium carbonate → magnesium oxide + carbon dioxide
- D potassium chloride + silver nitrate → potassium nitrate + silver chloride

24 The diagram shows an apparatus used for electrolysis.



Which substance, when added to water, would act as an electrolyte?

- A calcium carbonate
- B copper(II) chloride
- C graphite
- D sugar

25 Are iron and sodium hydroxide obtained by electrolysis?

|   | iron | sodium hydroxide |
|---|------|------------------|
| A | ✓    | ✓                |
| B | ✓    | x                |
| C | x    | ✓                |
| D | x    | x                |

26 The description below of a plastic is incomplete.

To make a plastic, .....1..... of a .....2..... combine to form a long chain .....3..... .

Which words correctly complete the gaps?

|   | gap 1     | gap 2   | gap 3   |
|---|-----------|---------|---------|
| A | atoms     | monomer | polymer |
| B | atoms     | polymer | monomer |
| C | molecules | monomer | polymer |
| D | molecules | polymer | monomer |

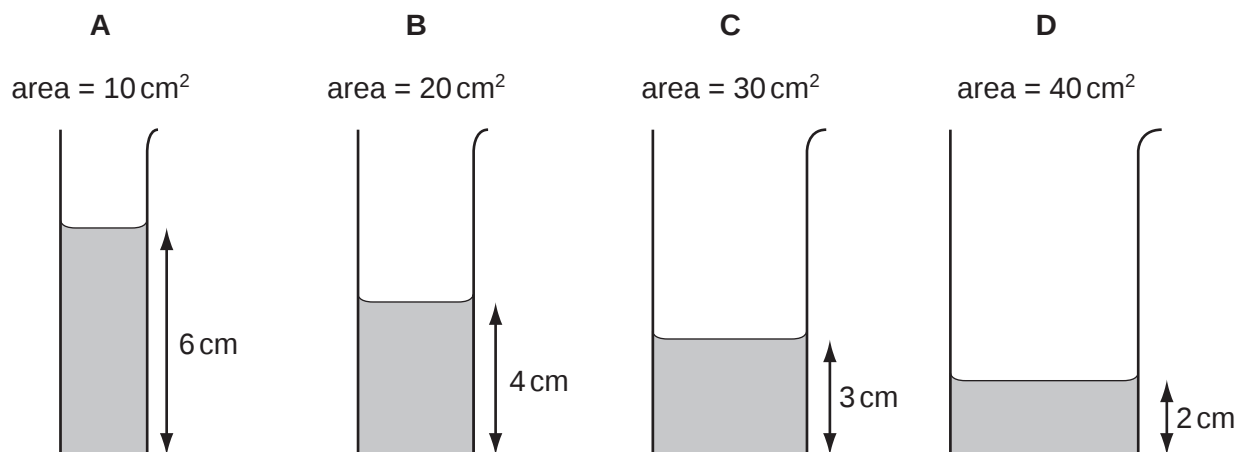
27 Ethanol, hydrogen and methane are used as fuels.

Which line in the table is correct?

|          | ethanol | hydrogen | methane |
|----------|---------|----------|---------|
| <b>A</b> | solid   | gas      | gas     |
| <b>B</b> | solid   | liquid   | liquid  |
| <b>C</b> | liquid  | gas      | gas     |
| <b>D</b> | liquid  | liquid   | liquid  |

28 Some water is poured into four tubes of different cross-sectional areas.

Which tube contains the largest volume of water?



29 Four students try to explain what is meant by acceleration.

Which student makes a correct statement?

- A** It is related to the changing speed of an object.
- B** It is the distance an object travels in one second.
- C** It is the force acting on an object divided by the distance it travels in one second.
- D** It is the force acting on an object when it is near to the Earth.

30 What are the correct units for force and for weight?

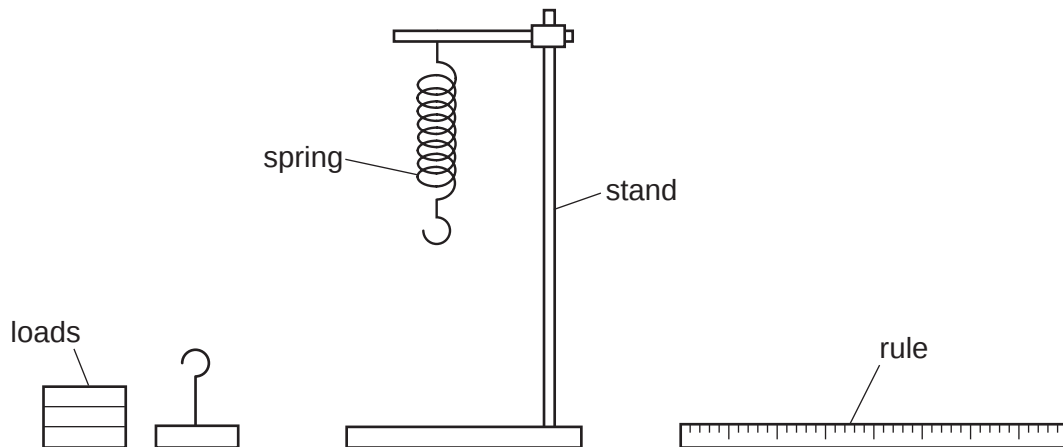
|          | force | weight |
|----------|-------|--------|
| <b>A</b> | kg    | kg     |
| <b>B</b> | kg    | N      |
| <b>C</b> | N     | kg     |
| <b>D</b> | N     | N      |

- 31 A metal drum has a mass of 200 kg when empty and 1000 kg when filled with  $1.0 \text{ m}^3$  of methylated spirit.

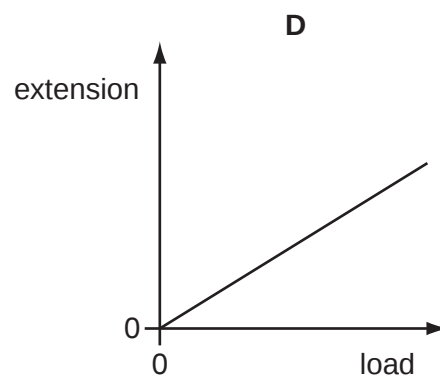
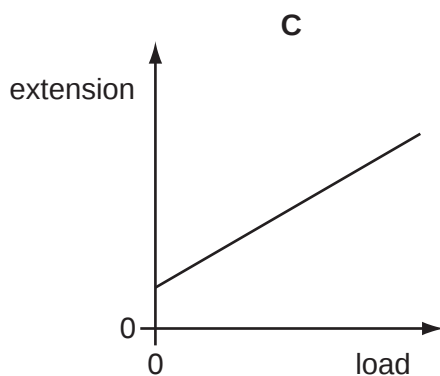
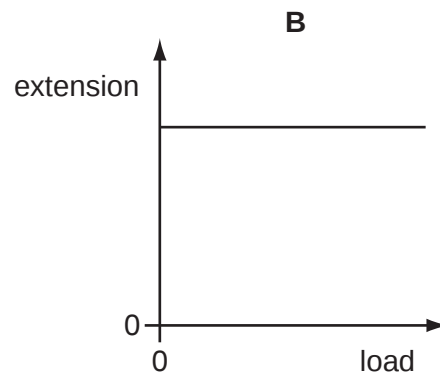
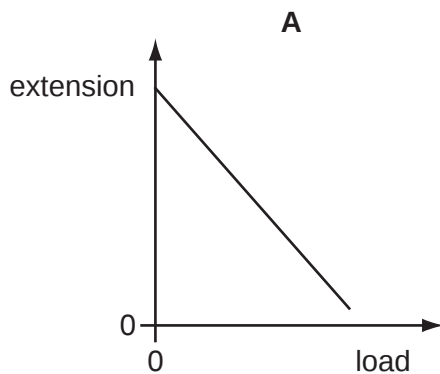
What is the density of methylated spirit?

- A  $0.0050 \text{ kg/m}^3$   
 B  $0.11 \text{ kg/m}^3$   
 C  $800 \text{ kg/m}^3$   
 D  $1000 \text{ kg/m}^3$

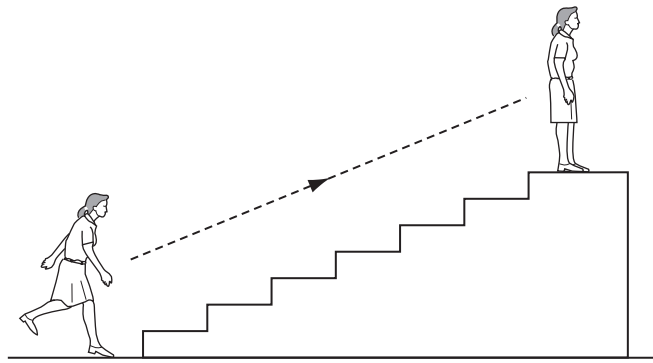
- 32 A spring is suspended from a stand. Loads are added and the extensions are measured.



Which graph shows the result of plotting extension against load?



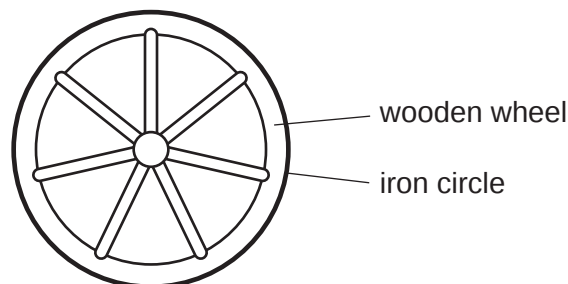
- 33 A person uses chemical energy to run up some stairs.



She stops at the top of the stairs.

What has the chemical energy been converted to when she is at the top of the stairs?

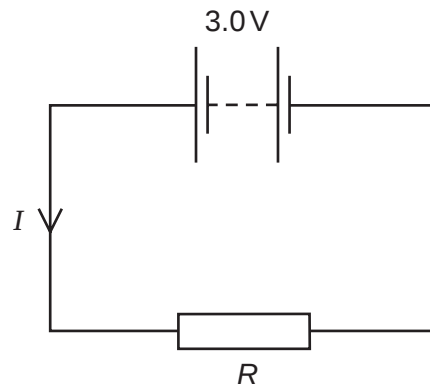
- A kinetic energy and potential energy
  - B kinetic energy and nuclear energy
  - C potential energy and heat energy
  - D nuclear energy and heat energy
- 34 A wooden wheel can be strengthened by putting a tight circle of iron around it.



Which action would make it easier to fit the circle over the wood?

- A cooling the iron circle
  - B heating the iron circle
  - C heating the wooden wheel
  - D heating the wooden wheel and cooling the iron circle
- 35 Which statement refers to convection?
- A It does not involve energy transfer.
  - B It is the transfer of heat energy without the movement of particles.
  - C It only occurs in liquids or gases.
  - D It only occurs in solids.

- 36 The circuit shows a current  $I$  in a resistor of resistance  $R$ .

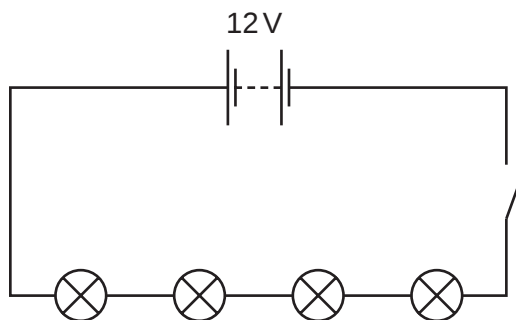


Which line gives possible values of  $I$  and  $R$ ?

|          | $I/\text{A}$ | $R/\Omega$ |
|----------|--------------|------------|
| <b>A</b> | 1.5          | 1.5        |
| <b>B</b> | 1.5          | 2.0        |
| <b>C</b> | 6.0          | 2.0        |
| <b>D</b> | 4.0          | 12         |

- 37 Four lamps are connected in a circuit as shown in the diagram.

Each lamp is designed to operate at 12V.



The circuit is now switched on.

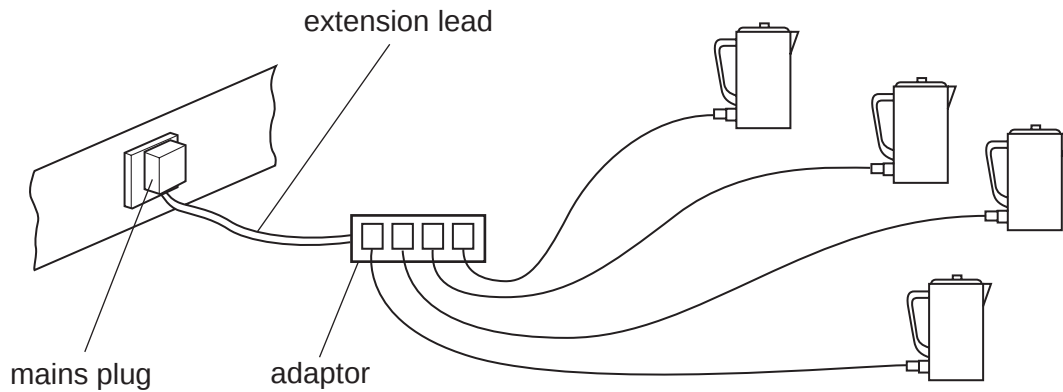
Which statement is correct?

- A** Each lamp can be switched off independently.
- B** If one lamp breaks all the others will stay alight.
- C** The current is the same in all the lamps.
- D** The lamps will all light at normal brightness.

**38** The diagram shows four electric kettles plugged into a 4-way adaptor.

An extension lead connects the adaptor to a single mains plug.

The mains plug is designed to work without a fuse.



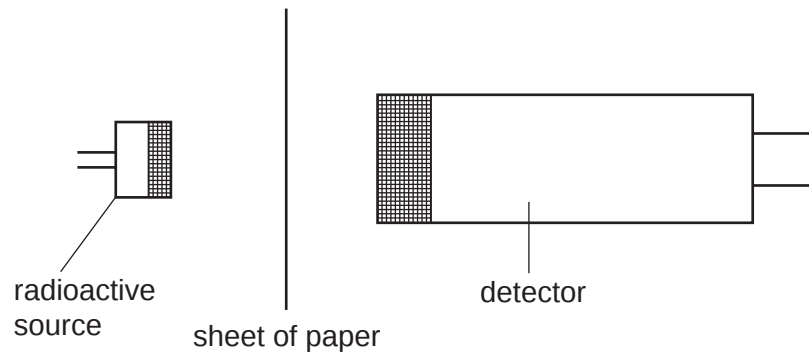
Why is this use of the adaptor dangerous?

- A** The heating elements in the kettle will overheat.
- B** The extension lead connecting the adaptor to the mains plug will overheat.
- C** The leads connecting the kettles to the adaptor will overheat.
- D** The water in the kettles will overheat.

**39** How is electricity transmitted over large distances and why is it transmitted in this way?

|          | how             | why                   |
|----------|-----------------|-----------------------|
| <b>A</b> | at high voltage | for safety            |
| <b>B</b> | at high voltage | to reduce energy loss |
| <b>C</b> | at low voltage  | for safety            |
| <b>D</b> | at low voltage  | to reduce energy loss |

40 A sheet of paper is placed between a radioactive source and a detector.



Which types of radiation can pass through the paper?

- A alpha-particles and beta-particles only
- B alpha-particles and gamma-rays only
- C beta-particles and gamma-rays only
- D alpha-particles, beta-particles and gamma-rays

## DATA SHEET

| Group                                                                                                                                    |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------------|-------------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|----------------------------|----------------------------|-------------------------|---------------------------|---------------------------|-------------------------|----------------------------|------------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|
| I                                                                                                                                        | II                           |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              | III                         | IV                           | V                            | VI                           | VII                         | O                          |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 3<br><b>Li</b><br>Lithium                                                                                                                | 4<br><b>Be</b><br>Beryllium  | 9                            | 1<br><b>H</b><br>Hydrogen     |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              | 5<br><b>B</b><br>Boron       | 12<br><b>C</b><br>Carbon     | 14<br><b>N</b><br>Nitrogen  | 16<br><b>O</b><br>Oxygen   | 19<br><b>F</b><br>Fluorine | 20<br><b>Ne</b><br>Neon |                           |                           |                         |                            |                              |                            |                             |                            |                            |
|                                                                                                                                          |                              |                              |                               | 11                           | 23<br><b>Na</b><br>Sodium    | 24<br><b>Mg</b><br>Magnesium  | 45<br><b>Sc</b><br>Scandium   | 48<br><b>Ti</b><br>Titanium   | 51<br><b>V</b><br>Vanadium  | 52<br><b>Cr</b><br>Chromium   | 55<br><b>Mn</b><br>Manganese | 56<br><b>Fe</b><br>Iron     | 59<br><b>Co</b><br>Cobalt    |                              |                              |                             |                            |                            |                         | 59<br><b>Ni</b><br>Nickel | 64<br><b>Cu</b><br>Copper | 65<br><b>Zn</b><br>Zinc | 70<br><b>Ga</b><br>Gallium | 73<br><b>Ge</b><br>Germanium | 75<br><b>As</b><br>Arsenic | 79<br><b>Se</b><br>Selenium | 80<br><b>Br</b><br>Bromine | 84<br><b>Kr</b><br>Krypton |
|                                                                                                                                          |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 19<br><b>K</b><br>Potassium                                                                                                              | 20<br><b>Ca</b><br>Calcium   | 40<br><b>Ca</b><br>Calcium   | 21<br><b>Sc</b><br>Scandium   | 22<br><b>Ti</b><br>Titanium  | 23<br><b>V</b><br>Vanadium   | 24<br><b>Cr</b><br>Chromium   | 25<br><b>Mn</b><br>Manganese  | 26<br><b>Fe</b><br>Iron       | 27<br><b>Co</b><br>Cobalt   | 28<br><b>Ni</b><br>Nickel     | 29<br><b>Cu</b><br>Copper    | 30<br><b>Zn</b><br>Zinc     | 31<br><b>Ga</b><br>Gallium   | 32<br><b>Ge</b><br>Germanium | 33<br><b>As</b><br>Arsenic   | 34<br><b>Se</b><br>Selenium | 35<br><b>Br</b><br>Bromine | 36<br><b>Kr</b><br>Krypton |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 37<br><b>Rb</b><br>Rubidium                                                                                                              | 38<br><b>Sr</b><br>Strontium | 88<br><b>Sr</b><br>Strontium | 89<br><b>Y</b><br>Yttrium     | 91<br><b>Zr</b><br>Zirconium | 93<br><b>Nb</b><br>Niobium   | 96<br><b>Mo</b><br>Molybdenum | 99<br><b>Tc</b><br>Technetium | 101<br><b>Ru</b><br>Ruthenium | 103<br><b>Rh</b><br>Rhodium | 106<br><b>Pd</b><br>Palladium | 108<br><b>Ag</b><br>Silver   | 112<br><b>Cd</b><br>Cadmium | 115<br><b>In</b><br>Indium   | 119<br><b>Sn</b><br>Tin      | 122<br><b>Sb</b><br>Antimony | 127<br><b>I</b><br>Iodine   | 131<br><b>Xe</b><br>Xenon  |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 55<br><b>Cs</b><br>Caesium                                                                                                               | 56<br><b>Ba</b><br>Barium    | 137<br><b>Ba</b><br>Barium   | 139<br><b>La</b><br>Lanthanum | 178<br><b>Hf</b><br>Hafnium  | 181<br><b>Ta</b><br>Tantalum | 184<br><b>W</b><br>Tungsten   | 186<br><b>Re</b><br>Rhenium   | 190<br><b>Os</b><br>Osmium    | 192<br><b>Ir</b><br>Iridium | 195<br><b>Pt</b><br>Platinum  | 197<br><b>Au</b><br>Gold     | 201<br><b>Hg</b><br>Mercury | 204<br><b>Tl</b><br>Thallium | 207<br><b>Pb</b><br>Lead     | 209<br><b>Bi</b><br>Bismuth  | 83<br><b>Po</b><br>Polonium | 84<br><b>Rn</b><br>Radon   |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 87<br><b>Fr</b><br>Francium                                                                                                              | 88<br><b>Ra</b><br>Radium    | 226<br><b>Ra</b><br>Radium   | 227<br><b>Ac</b><br>Actinium  | 72                           | 73                           | 74                            | 75                            | 76                            | 77                          | 78                            | 79                           | 80                          | 81                           | 82                           | 83                           | 85                          | 86                         |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 58-71 Lanthanoid series                                                                                                                  |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| 90-103 Actinoid series                                                                                                                   |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| <div><div>a</div><div>X</div><div>b</div></div> <div>a = relative atomic mass<br/>x = atomic symbol<br/>b = proton (atomic) number</div> |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| Key                                                                                                                                      |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |
| Lr<br>Lawrencium<br>103                                                                                                                  |                              |                              |                               |                              |                              |                               |                               |                               |                             |                               |                              |                             |                              |                              |                              |                             |                            |                            |                         |                           |                           |                         |                            |                              |                            |                             |                            |                            |

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