



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/12

Paper 1 Multiple Choice (Core)

May/June 2017

45 minutes

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

* 8 8 3 5 5 5 4 5 1 2 *

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.

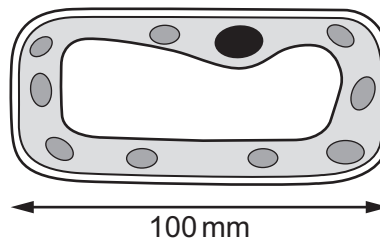
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 20.
Electronic calculators may be used.

This document consists of **18** printed pages and **2** blank pages.

- 1 A person moves their hand away from a hot object.

Which characteristic of living organisms is this?

- A growth
 - B nutrition
 - C reproduction
 - D sensitivity
- 2 The diagram shows an image of a plant cell that has been magnified.



The magnification is $\times 200$.

What is the length of the actual cell?

- A 0.2 mm
 - B 0.5 mm
 - C 2 mm
 - D 20 000 mm
- 3 Which statement about enzymes is correct?
- A They are killed by high temperatures.
 - B They are made from amino acids.
 - C They are unaffected by pH.
 - D They are used up in biological reactions.

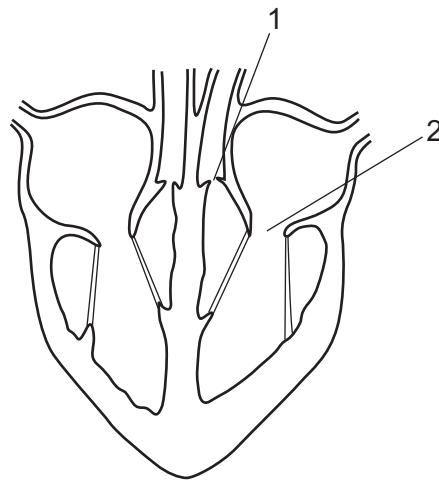
- 4 An unknown liquid is divided into three test-tubes and tested as shown in the table.

| test-tube number | test solution added to mixture | final colour in test-tube |
|------------------|--------------------------------|---------------------------|
| 1 | Benedict's solution | blue |
| 2 | biuret | violet |
| 3 | iodine solution | yellow |

Which conclusion about the unknown liquid is correct?

- A It contains reducing sugar and starch.
 - B It contains protein and a reducing sugar.
 - C It only contains protein.
 - D It only contains starch.
- 5 What are the products of photosynthesis?
- A carbohydrates + oxygen
 - B carbohydrates + water
 - C carbon dioxide + oxygen
 - D carbon dioxide + water
- 6 What is transpiration?
- A absorption of water by root hair cells
 - B evaporation of water at the surfaces of mesophyll cells
 - C loss of water vapour from the roots of plants
 - D transport of food substances in the phloem

7 The diagram shows a section through the heart.

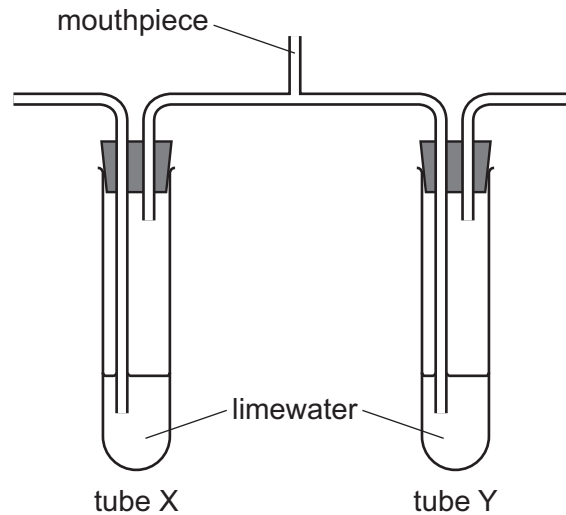


The ventricles contract and blood is forced into the arteries.

What is the state of valves 1 and 2 when this happens?

| | valve 1 | valve 2 |
|----------|---------|---------|
| A | closed | closed |
| B | closed | open |
| C | open | closed |
| D | open | open |

- 8 The diagram shows apparatus at the start of a breathing experiment.



A person breathes in and out through the mouthpiece for a short time.

Which row shows the results?

| | limewater in tube X | limewater in tube Y |
|----------|---------------------|---------------------|
| A | stays clear | stays clear |
| B | stays clear | turns cloudy |
| C | turns cloudy | stays clear |
| D | turns cloudy | turns cloudy |

- 9 Which characteristics of living organisms does a plant show during a geotropism?

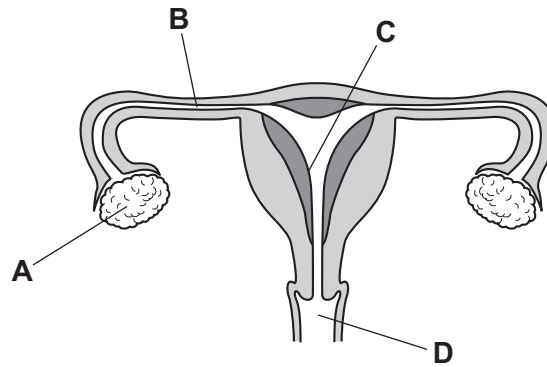
| | growth | movement | sensitivity |
|----------|--------|----------|-------------|
| A | ✓ | ✓ | ✓ |
| B | ✓ | ✓ | x |
| C | ✓ | x | x |
| D | x | ✓ | ✓ |

- 10 Which environmental factor is **not** a requirement for the germination of most seeds?

- A** light
- B** oxygen
- C** suitable temperature
- D** water

11 The diagram shows the female reproductive system.

Where does implantation of the embryo normally occur?

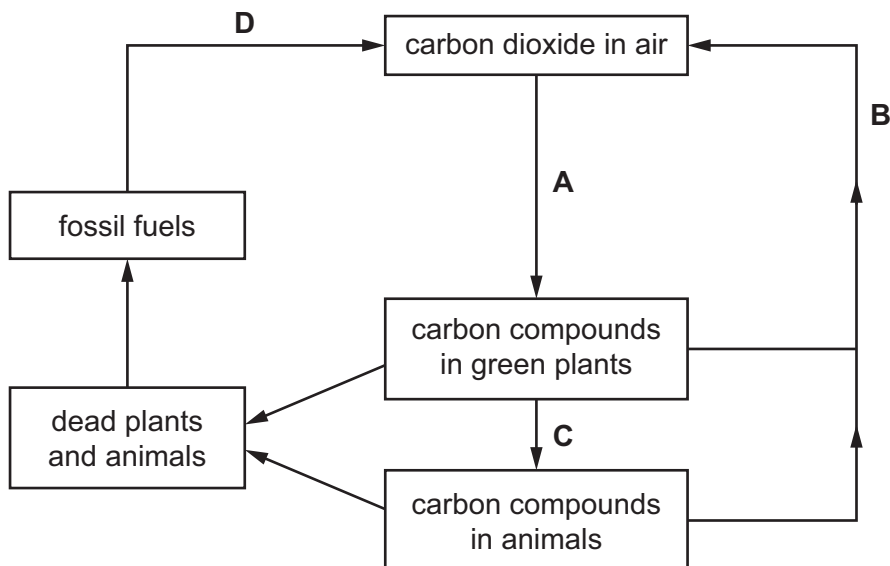


12 What is the correct name for organisms that get their energy by eating plants?

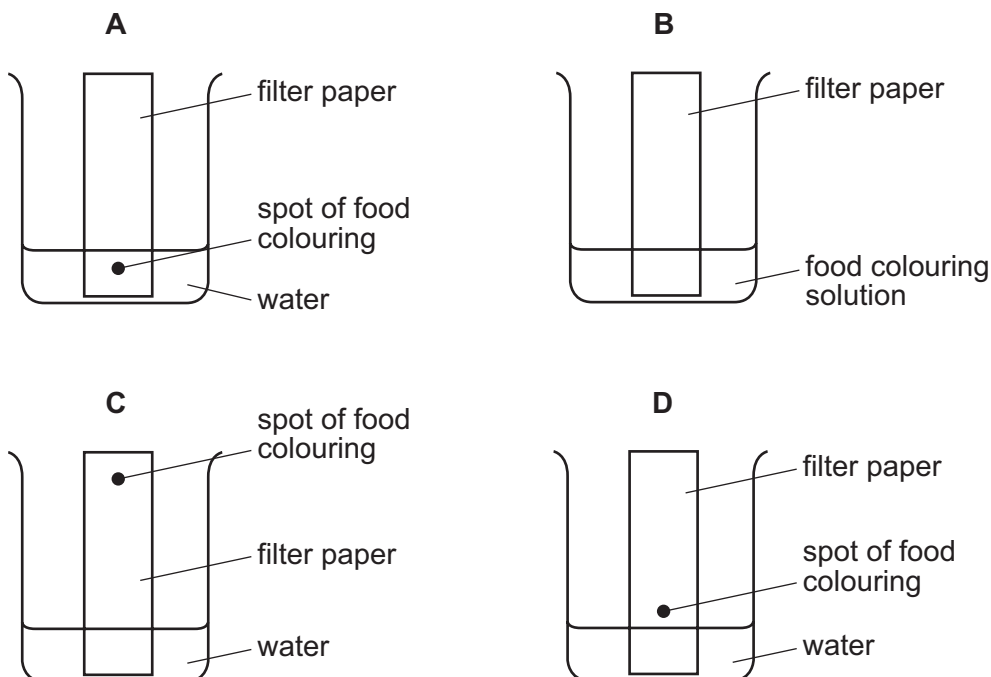
- A carnivores
- B herbivores
- C producers
- D secondary consumers

13 The diagram shows the carbon cycle.

Which arrow represents combustion?



14 Which diagram shows how a mixture of dyes in a food colouring are separated?



15 Which process is a physical change?

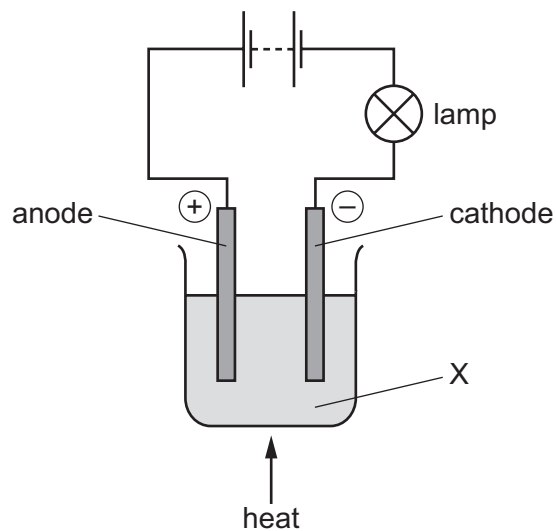
- A adding zinc to dilute sulfuric acid
- B bubbling carbon dioxide through limewater
- C electrolysis molten lead bromide
- D separating petroleum by fractional distillation

16 A neutral atom of chlorine contains 17 electrons and 18 neutrons.

What is the atomic (proton) number and what is the mass (nucleon) number of this atom?

| | atomic number | mass number |
|----------|---------------|-------------|
| A | 17 | 35 |
| B | 17 | 52 |
| C | 18 | 35 |
| D | 18 | 52 |

17 A molten compound X is electrolysed as shown.

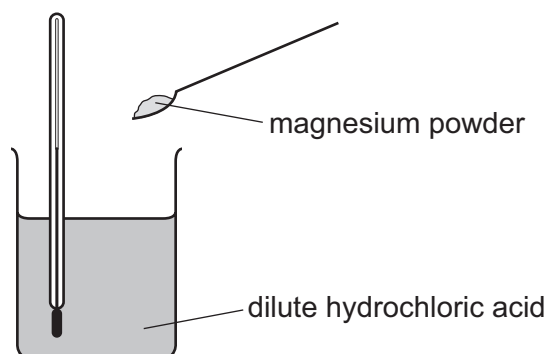


A brown gas is produced at the anode and a grey metal is produced at the cathode.

What is X?

- A aluminium oxide
- B copper chloride
- C lead(II) bromide
- D sodium chloride

- 18 The diagram shows how the temperature change is measured when magnesium powder reacts with dilute hydrochloric acid.



Thermometer reading before adding magnesium powder = 20.6°C

Thermometer reading after adding magnesium powder = 32.4°C

Which statement is correct?

- A The reaction is endothermic and gives out heat.
 - B The reaction is endothermic and takes in heat.
 - C The reaction is exothermic and gives out heat.
 - D The reaction is exothermic and takes in heat.
- 19 Magnesium ribbon reacts with dilute hydrochloric acid to form hydrogen gas.

Which change increases the rate of the reaction?

- A adding water to the mixture
 - B trapping the hydrogen gas
 - C using a lower temperature
 - D using powdered magnesium
- 20 In which reactions is the underlined substance oxidised?
- 1 iron when it rusts
 - 2 methane when it burns in air
 - 3 copper oxide when it reacts with carbon
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

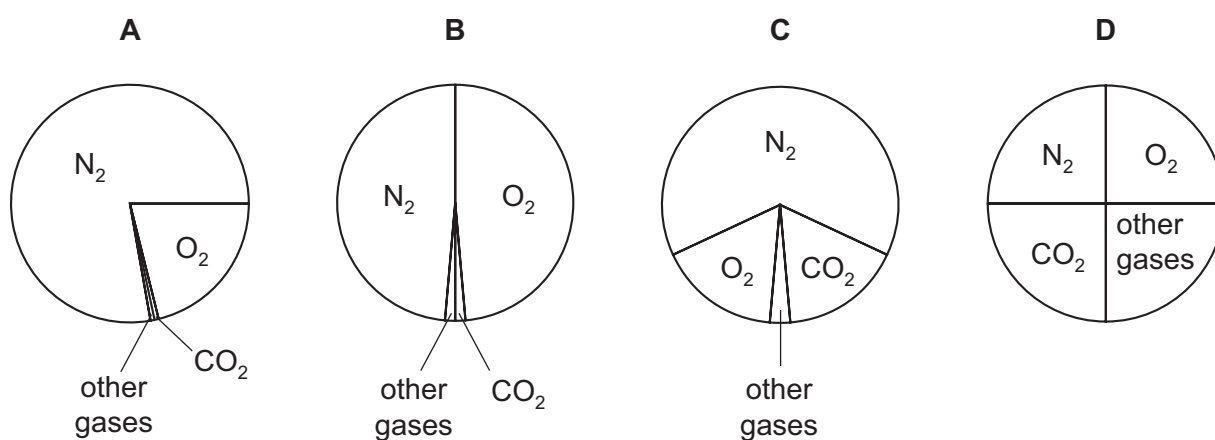
25 A mixture of copper(II) oxide and substance Q is heated.

The reaction produces copper.

What is Q?

- A aluminium oxide
- B carbon
- C carbon dioxide
- D oxygen

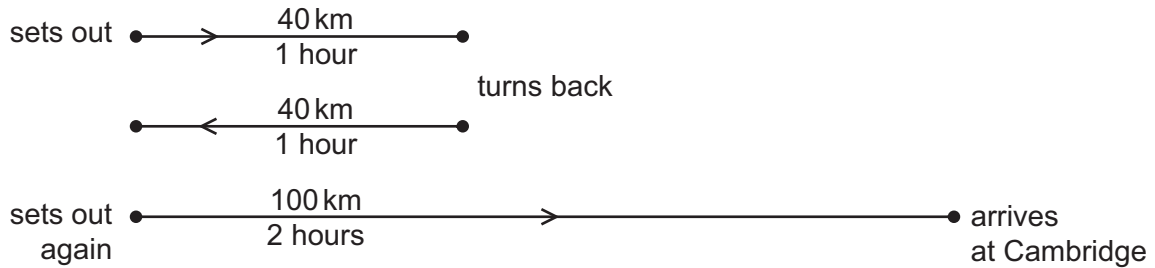
26 Which pie chart shows the proportions of gases in clean air?



27 Which property of the compounds in petroleum is used to separate it into useful fractions?

- A boiling point
- B density
- C melting point
- D solubility

- 28** A car driver sets out from home to travel to Cambridge. After 1 hour he is 40 km from home. He discovers that he must return home to collect his briefcase. This journey also takes him 1 hour. He sets off again immediately. He reaches Cambridge, 100 km from home, 2 hours later.



What is the average speed for the whole of his journey from leaving home the first time?

- A** 25 km/h **B** 45 km/h **C** 50 km/h **D** 90 km/h
- 29** Which row shows the unit for force, the unit for mass and the unit for weight?

| | force | mass | weight |
|----------|-------|------|--------|
| A | kg | kg | N |
| B | kg | N | kg |
| C | N | kg | N |
| D | N | N | kg |

- 30** A car uses petrol as fuel. The car has been parked overnight.

The engine is now started and the car is driven along a horizontal road at an increasing speed.

Which two forms of energy of the car both increase as the car moves?

- A** chemical and gravitational
B chemical and thermal
C gravitational and kinetic
D kinetic and thermal

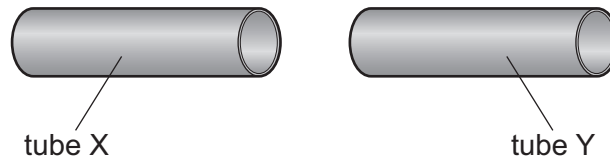
31 Four different forces move an object by different distances in different times.

Which row shows the situation in which the greatest power is produced by the force?

| | time taken /s | force /N | distance moved / m |
|----------|------------------|-------------|-----------------------|
| A | 10 | 400 | 3.0 |
| B | 20 | 200 | 2.0 |
| C | 30 | 400 | 2.0 |
| D | 40 | 200 | 3.0 |

32 The diagram shows two thin steel tubes X and Y. The tubes have identical dimensions at room temperature.

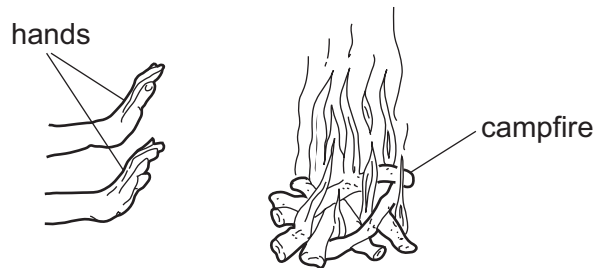
Tube X needs to be made to fit inside tube Y.



How can this be done?

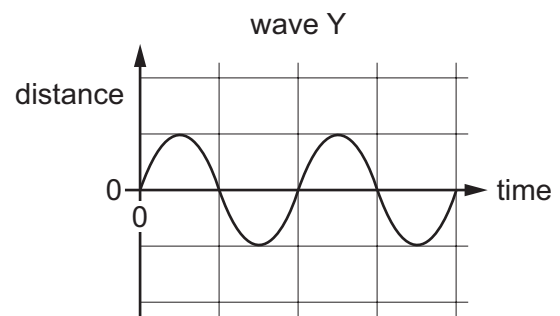
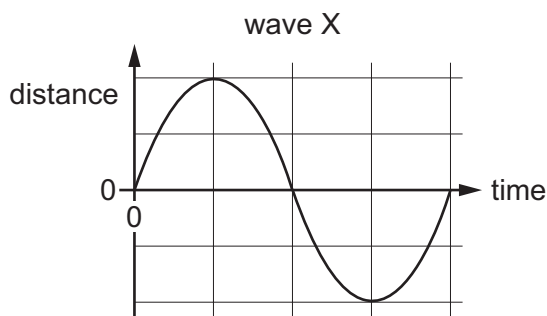
- A** Cool both tubes to the same low temperature.
- B** Cool tube X only, to a low temperature.
- C** Heat both tubes to the same high temperature.
- D** Heat tube X only, to a high temperature.

- 33 On a cold night, a person stands near a campfire. He holds his hands out towards the fire. His hands are heated by the fire.



Which process is responsible for transferring thermal energy from the fire to his hands?

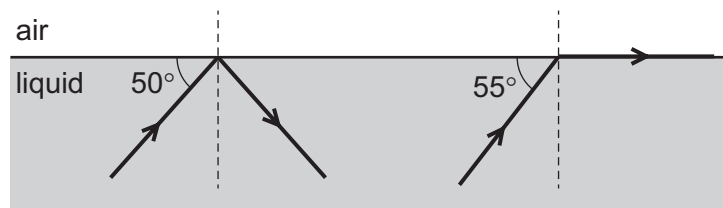
- A conduction
 - B convection
 - C evaporation
 - D radiation
- 34 The diagrams represent two waves X and Y. The diagrams are drawn to the same scale.



From this information, which property must be greater for wave X, and which property must be greater for wave Y?

| | greater for wave X | greater for wave Y |
|---|--------------------|--------------------|
| A | amplitude | frequency |
| B | amplitude | wavelength |
| C | frequency | amplitude |
| D | frequency | wavelength |

- 35 The diagram represents the surface of a transparent liquid. Two rays of light are travelling within the liquid. They both reach the surface. The path of each ray is shown.

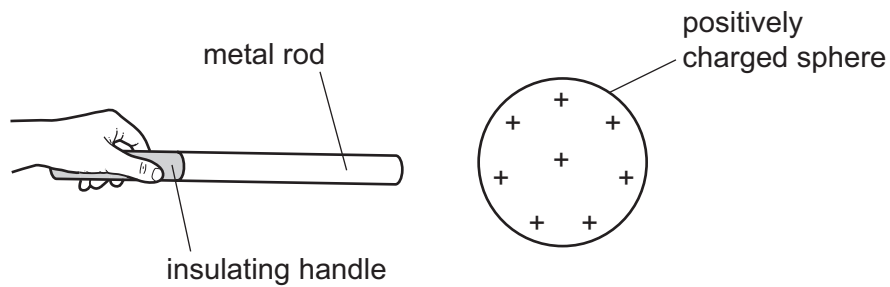


What is the critical angle for this liquid?

- A** 35° **B** 40° **C** 50° **D** 55°
- 36 Which type of electromagnetic wave is used in airport security scanners?
- A** gamma-rays
B microwaves
C radio waves
D X-rays
- 37 An electronic circuit in a fire alarm makes a loudspeaker vibrate alternately at two different frequencies.
- Which pair of frequencies is suitable to use in the alarm to alert people to the danger of fire?
- A** 1.5 Hz and 15 Hz
B 15 Hz and 150 000 Hz
C 150 Hz and 15 000 Hz
D 150 000 Hz and 15 000 000 Hz

38 An uncharged metal rod is held by an insulating handle.

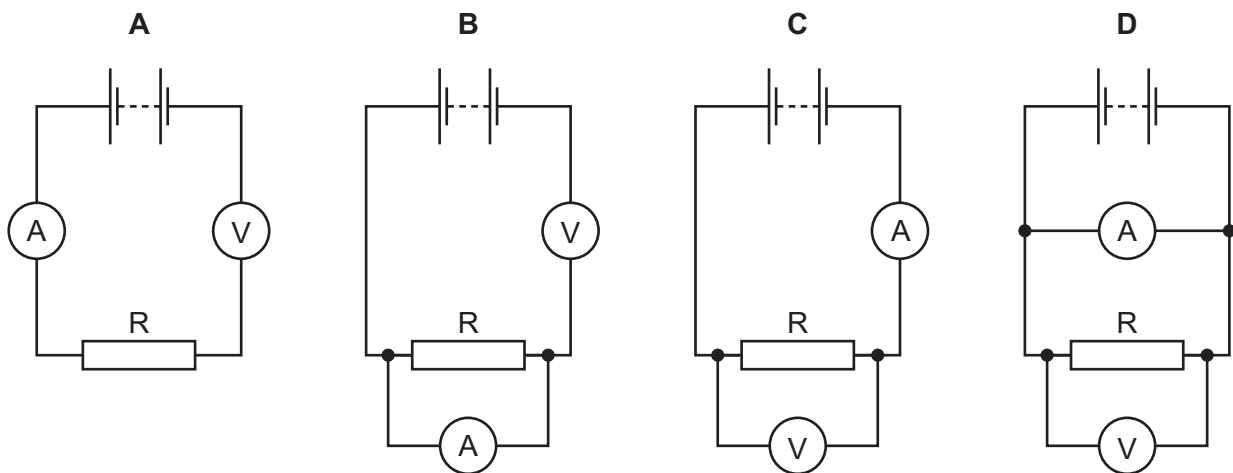
The rod is brought near to a positively charged sphere. This causes some particles in the rod to move.



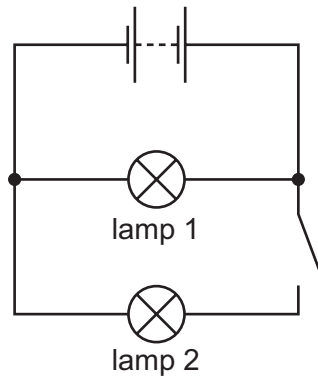
Which particles in the rod move and in which direction do the particles move?

| | particles that move | direction of movement |
|----------|---------------------|-----------------------|
| A | electrons | away from the sphere |
| B | electrons | towards the sphere |
| C | protons | away from the sphere |
| D | protons | towards the sphere |

39 Which circuit can be used when determining the resistance of resistor R?



40 The circuit shown includes two identical lamps and an open switch.



The switch is now closed.

Which statement is now correct?

- A Lamp 1 is brighter than lamp 2.
- B The brightness of lamp 1 increases.
- C The p.d. across each lamp is the same.
- D The total resistance of the circuit is greater.

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The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | |
|-----------------------------------|------------------------------------|--|-------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|------------------------------------|-------------------------------------|----------------------------------|------------------------------------|---------------------------------|-------------------------------------|----------------------------------|------------------------------------|
| I | II | III | IV | V | VI | VII | VIII | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | 1 H hydrogen 1 | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 | | | | | | | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 | |
| 19 K potassium 39 | 20 Ca calcium 40 | | | | | | | | | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 | | | | |
| 55 Cs caesium 133 | 56 Ba barium 137 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium — | 85 At astatine — | 86 Rn radon — | | | | |
| 87 Fr francium — | 88 Ra radium — | 108 Hs hassium — | 109 Mt meitnerium — | 110 Ds darmstadtium — | 111 Rg roentgenium — | 112 Cn copernicium — | 114 Fl flerovium — | 116 Lv livermorium — | | | | | | | | |

| | | | | | | | | | | | | | | |
|-------------------------------------|-----------------------------------|--|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|----------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium — | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| 89 Ac actinium — | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium — | 94 Pu plutonium — | 95 Am americium — | 96 Cm curium — | 97 Bk berkelium — | 98 Cf californium — | 99 Es einsteinium — | 100 Fm fermium — | 101 Md mendelevium — | 102 No nobelium — | 103 Lr lawrencium — |

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).