**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

**PHYSICAL SCIENCE** **0652/11**

Paper 1 Multiple Choice **October/November 2016**

**45 minutes**

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



**READ THESE INSTRUCTIONS FIRST**

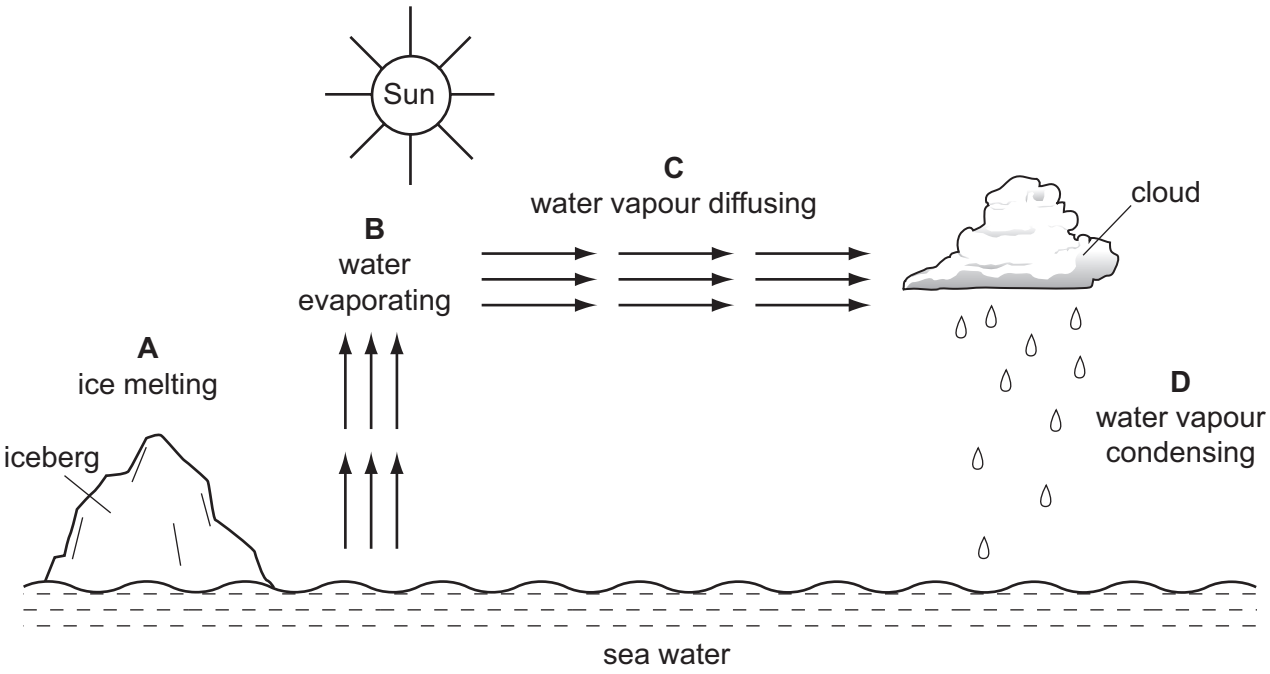
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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.

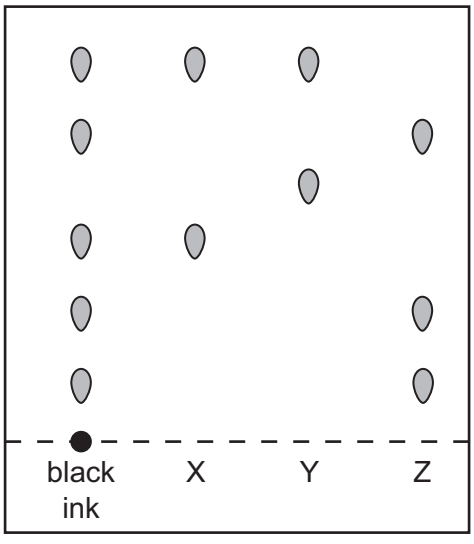
**Read the instructions on the Answer Sheet very carefully.**

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 16.
Electronic calculators may be used.

**1** In which process is heat energy neither given out nor taken in?




**2** The chromatogram of black ink and three coloured dyes, X, Y and Z, is shown.




Which colours make up the black ink?

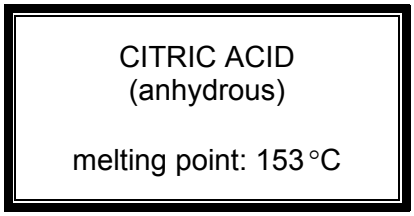
**A** X and Y only

**B** X and Z only

**C** X, Y and Z

**D** Z only

**3** A bottle of a solid is labelled as shown.




The melting point of a sample from the bottle is measured.

The sample melts over a temperature range from 140 °C to 150 °C.

Which statement explains this observation?

**A** The sample contains a mixture of citric acid and other solids.

**B** The sample is too large.

**C** The sample has a pH less than 7.

**D** The sample is too small.

**4** A new element was officially named as flerovium at the end of May 2012.

An atom of flerovium is represented by the symbol $^{289}_{114}Fl$.

Which statement about the atom of flerovium is correct?

**A** It contains 114 electrons and 175 nucleons.

**B** It contains 114 electrons and 289 protons.

**C** It contains 114 neutrons and 175 protons.

**D** It contains 114 protons and 289 nucleons.

**5** Which statement about the structure of diamond is correct?

**A** Each atom has three covalent bonds.

**B** Electrons in the structure are free to move.

**C** It is made up of layers of atoms.

**D** It is tetrahedral.

**6** X is a compound that contains the elements potassium, manganese and oxygen.

X has twice as many potassium atoms as manganese atoms and twice as many oxygen atoms as potassium atoms.

What is the formula of X?

**A** $KMnO_2$ **B** $K_2MnO_2$ **C** $K_2MnO_4$ **D** $KMn_2O_4$



[Turn over

**7** What is the relative formula mass, $M_r$, of lead nitrate, $Pb(NO_3)_2$?

**A** 237 **B** 269 **C** 317 **D** 331

**8** Which statement about all exothermic reactions is correct?

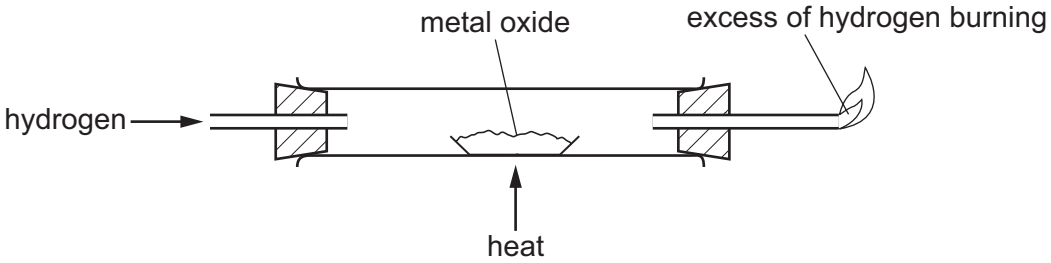
**A** They absorb heat energy.

**B** They produce flames.

**C** They release heat energy.

**D** They require oxygen gas.

**9** Hydrogen is passed over a heated metal oxide as shown.




The metal and steam are formed.

What happens to the hydrogen and to the metal oxide?

| | hydrogen | metal oxide |
|---|---|---|
| **A** | oxidised | oxidised |
| **B** | oxidised | reduced |
| **C** | reduced | oxidised |
| **D** | reduced | reduced |

**10** Which gas is produced when sodium carbonate reacts with hydrochloric acid?

**A** carbon dioxide

**B** chlorine

**C** hydrogen

**D** oxygen

**11** A gas was tested as shown.

| test | observation |
|---|---|
| lighted splint placed in the gas | lighted splinted went out |
| damp red litmus paper placed in the gas | red litmus paper turned blue |
| gas passed through limewater | limewater was colourless |

What is the gas?

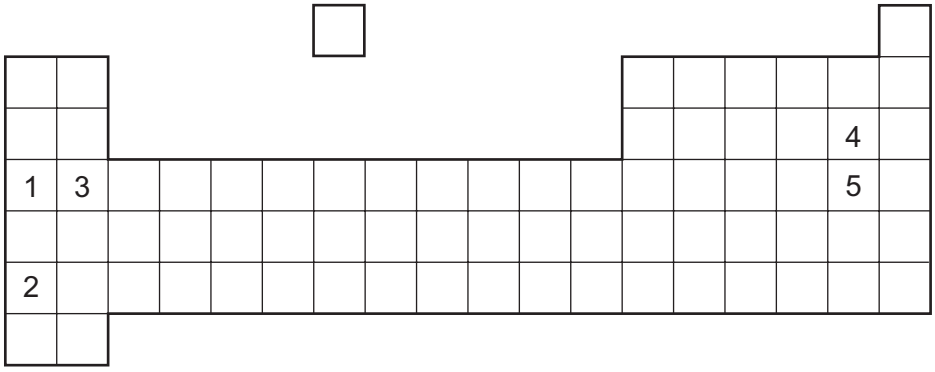
**A** ammonia

**B** carbon dioxide

**C** chlorine

**D** hydrogen

**12** Part of the Periodic Table is shown.




Which pair of elements combine together to form an ionic compound?

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

**13** Which row describes a transition element?

| | melting point | often acts as a catalyst | conduction of electricity |
|---|---|---|---|
| **A** | high | no | good |
| **B** | high | yes | good |
| **C** | high | yes | poor |
| **D** | low | no | poor |

**14** Which statement about metals or non-metals is correct?

**A** Metals are poor conductors of heat.

**B** Most metals have low melting points.

**C** Most non-metals are poor conductors of electricity.

**D** Non-metals are malleable.

**15** Zinc is a metal which has many uses.

When zinc is mixed with copper it forms .....1..... which is an .....2..... .

Zinc is also used in the process of .....3..... to protect iron.

Which words correctly complete gaps 1, 2 and 3?

| | 1 | 2 | 3 |
|---|---|---|---|
| **A** | brass | alkali | rusting |
| **B** | brass | alloy | galvanising |
| **C** | brass | alloy | rusting |
| **D** | steel | alloy | galvanising |

**16** Hydrated copper(II) sulfate is heated.

Which type of reaction takes place and what is the colour of the product?

| | type of reaction | colour of product |
|---|---|---|
| **A** | irreversible | blue |
| **B** | irreversible | white |
| **C** | reversible | blue |
| **D** | reversible | white |

**17** Which reaction describes how lime is made from limestone?

**A** adding limestone to calcium hydroxide

**B** adding water to limestone

**C** heating limestone

**D** heating limestone and dilute sulfuric acid

**18** Which statement explains why the members of a homologous series have similar chemical properties?

**A** They have the same functional group.

**B** They have the same number of carbon atoms.

**C** They have the same number of electrons.

**D** They have the same types of atom.

**19** Which statements about the alkanes are correct?

1 Their boiling point increases as the number of carbon atoms increases.

2 They burn in air to produce carbon dioxide and water.

3 They contain carbon to carbon double bonds.

4 They decolourise bromine water.

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

**20** What is **not** a use of ethanol?

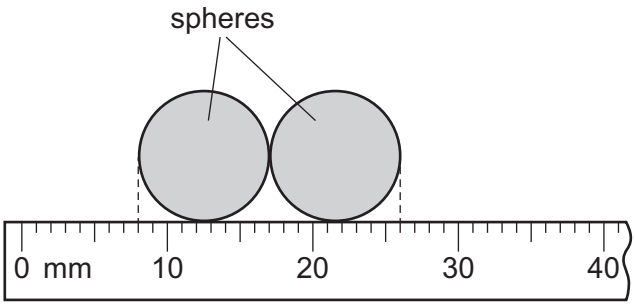
**A** as a solvent

**B** making ethane

**C** making alcoholic drinks

**D** producing heat energy

**21** The diagram shows two identical spheres placed beside a scale.



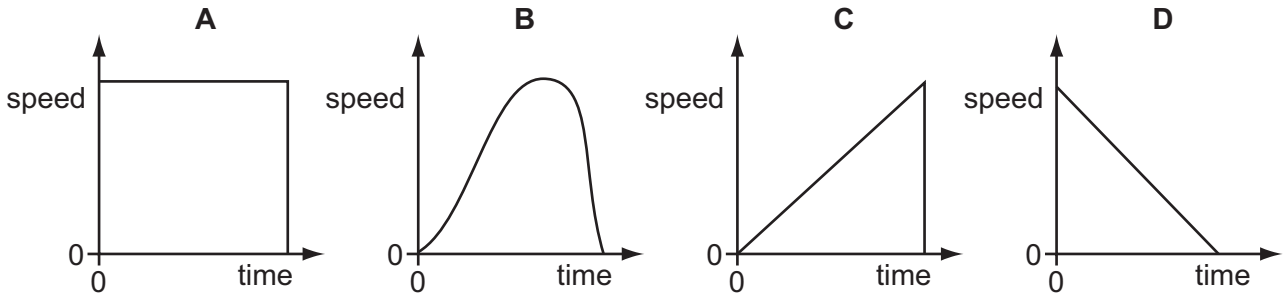

What is the radius of one sphere?

**A** 4.5 mm **B** 6.5 mm **C** 9.0 mm **D** 13.0 mm

**22** A stone is dropped from the top of a building. It falls until it hits the ground.

Which graph shows how the speed of the stone changes with time?

Ignore air resistance.




**23** Three properties of a gas are its mass, its volume and its density.

Which of these properties can be changed by a force?

| | mass | volume | density |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✗ | ✗ |
| **C** | ✗ | ✓ | ✓ |
| **D** | ✗ | ✓ | ✗ |

key

✓ = can be changed

✗ = cannot be changed

**24** A student needs to find the density of a large cubic block of wood.

Which two pieces of apparatus should she use?

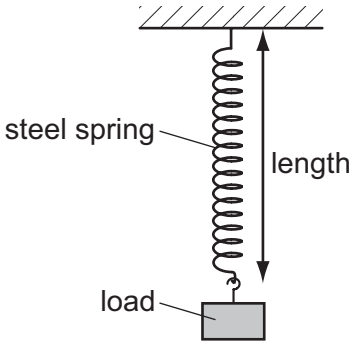
**A** balance and metre rule

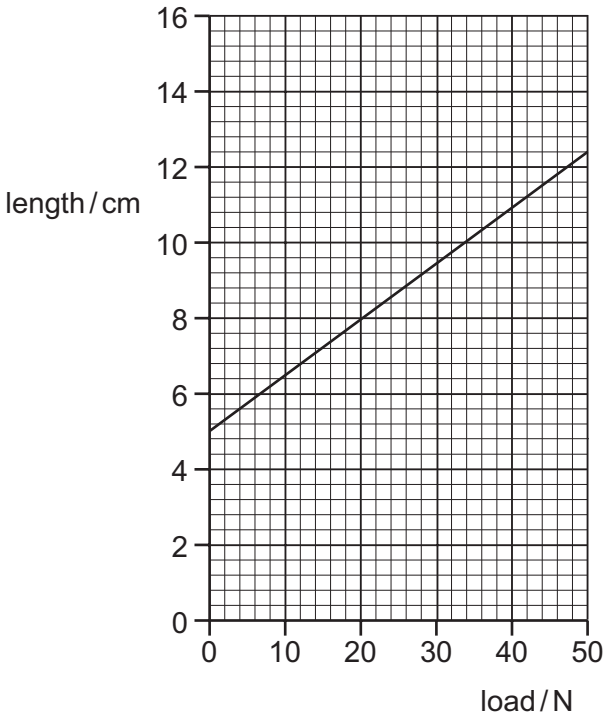
**B** balance and thermometer

**C** measuring cylinder and metre rule

**D** measuring cylinder and thermometer

**25** The diagrams show a steel spring and a graph of its length against the load applied to it.



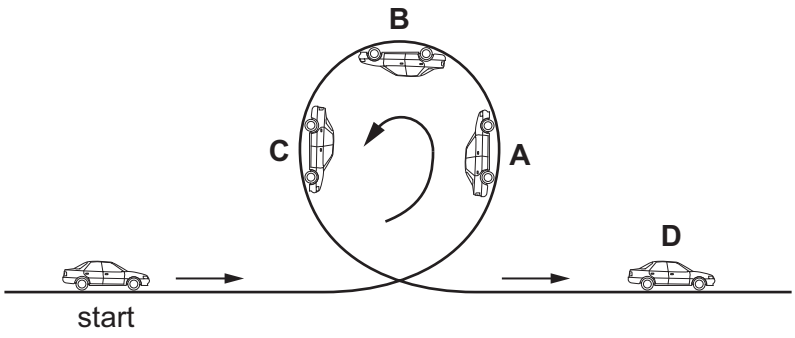




What is the extension of the spring when a load of 20 N is applied to it?

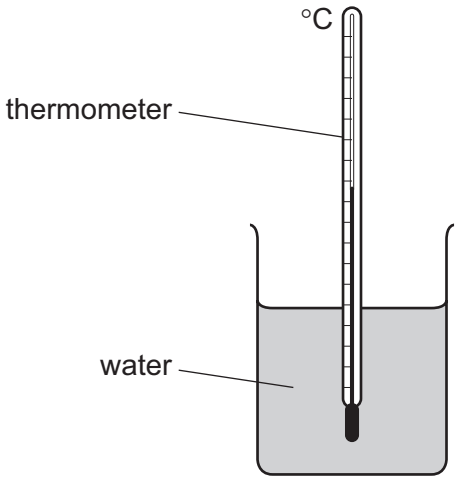
**A** 3.0 cm **B** 4.5 cm **C** 5.0 cm **D** 8.0 cm

**26** A toy car without a motor is pushed, then follows the looped track shown.

At which labelled point on the track is the energy of motion (kinetic energy) of the car decreasing and the energy of position (gravitational energy) increasing?



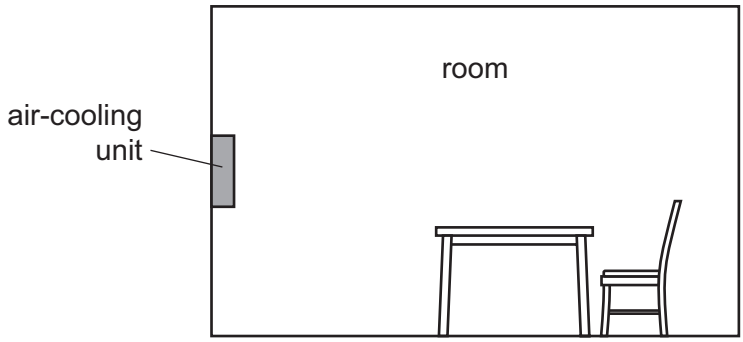
**27** A liquid-in-glass thermometer can measure temperatures between –20 °C and 120 °C. The diagram shows the thermometer placed in water at 60 °C.




Which temperature is a fixed point on the scale of the thermometer?

**A** –20 °C **B** 60 °C **C** 100 °C **D** 120 °C

**28** An air-cooling unit is fitted halfway up the wall of a room. The unit changes the density of the air in the room near it which causes the air to move.



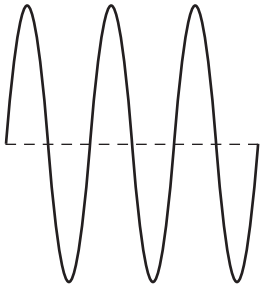

In which way does the cooling unit change the density of the air, and in which direction does the air move?

| | change to the density of the air | direction of air movement |
|---|---|---|
| **A** | decreases | downwards |
| **B** | decreases | upwards |
| **C** | increases | downwards |
| **D** | increases | upwards |

**29** The diagrams represent water waves in a deep pond. The diagrams are all drawn to the same scale.

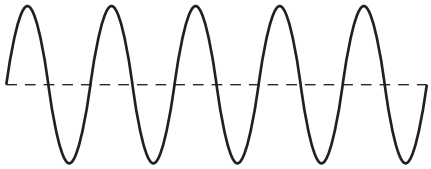
Which diagram shows the wave with the highest frequency?

**A**



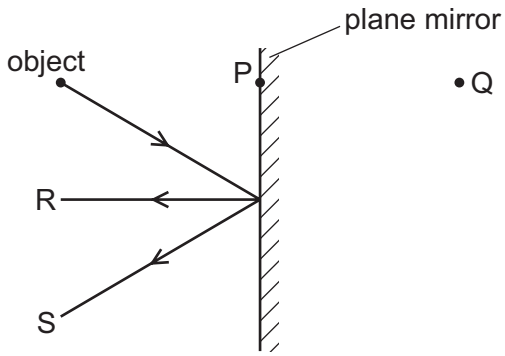
**B**

**C**



**D**

**30** The diagram shows an object in front of a plane mirror. A ray of light from the object strikes the mirror and is reflected. Two positions P and Q are labelled, and two arrows R and S are labelled.




Which row shows the position of the image formed and the reflected ray?

| | position of image | the reflected ray |
|---|---|---|
| **A** | P | R |
| **B** | P | S |
| **C** | Q | R |
| **D** | Q | S |

**31** Radio waves and light waves travel *in vacuo* (in a vacuum).

How do the frequency and the speed of the radio waves compare with the frequency and speed of the light waves?

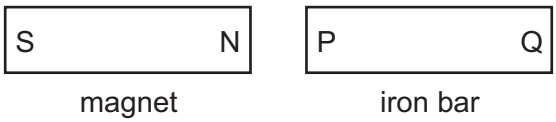
| | frequency of radio waves | speed of radio waves |
|---|---|---|
| **A** | greater than light | greater than light |
| **B** | greater than light | the same as light |
| **C** | less than light | greater than light |
| **D** | less than light | the same as light |

**32** Three loudspeakers vibrate at different frequencies of 5 hertz, 25 kilohertz and 50 kilohertz.

Which row shows whether the vibrations from each loudspeaker can be heard by a human?

| | 5 hertz | 25 kilohertz | 50 kilohertz |
|---|---|---|---|
| **A** | no | no | no |
| **B** | no | yes | no |
| **C** | yes | no | yes |
| **D** | yes | yes | yes |

**33** The north pole of a bar magnet is placed next to end P of an iron bar PQ, as shown. As a result, magnetic poles are induced in the iron bar.




What are the magnetic poles induced at P and at Q?

| | magnetic pole at P | magnetic pole at Q |
|---|---|---|
| **A** | north | north |
| **B** | north | south |
| **C** | south | north |
| **D** | south | south |

**34** Three charged plastic balls, P, Q and R are suspended by insulating threads. Ball P is positively charged.

Diagram 1 shows what happens when ball Q is brought close to ball P.

Diagram 2 shows what happens when ball Q is brought close to ball R.

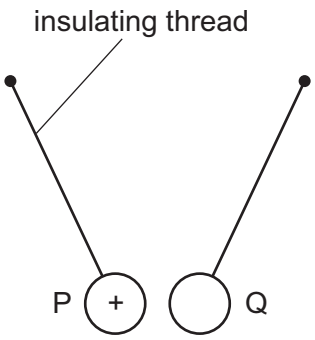



diagram 1

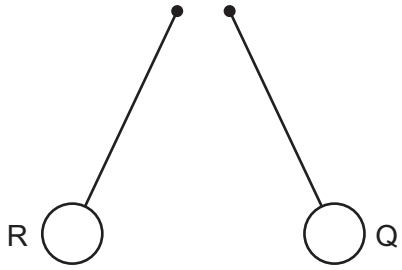



diagram 2

What are the charges on ball Q and ball R?

| | charge on ball Q | charge on ball R |
|---|---|---|
| **A** | negative | negative |
| **B** | negative | positive |
| **C** | positive | negative |
| **D** | positive | positive |

**35** Which two quantities are both measured in volts?

**A** current, potential difference

**B** current, resistance

**C** electromotive force, resistance

**D** electromotive force, potential difference



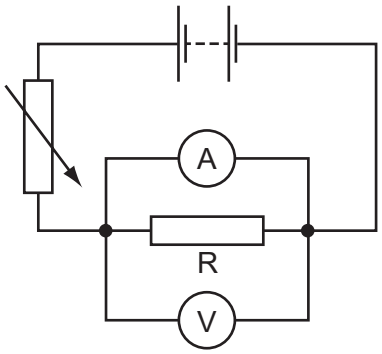


**[Turn over**

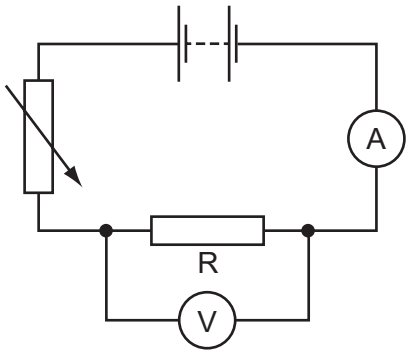
**36** A student investigates how the current in a resistor R varies with the voltage across it.

Which circuit is suitable for the student to use?

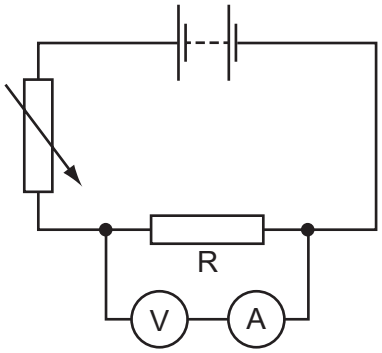
**A**



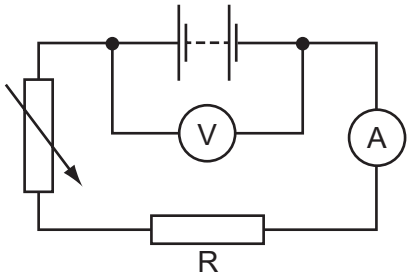

**B**




**C**




**D**




**37** Overheating of a cable in an electric circuit is a safety hazard.

How can overheating of a circuit be prevented?

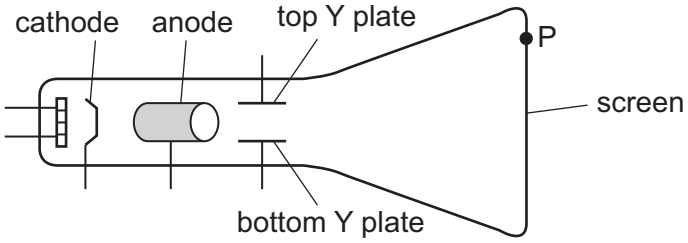
**A** Do not switch off the circuit with damp hands.

**B** Make sure that the current does not become too large.

**C** Use thicker insulation on the wires in the circuit.

**D** Use thinner wires in the circuit.

**38** The diagram shows a cathode-ray tube.




A student wants the cathode rays to make a spot at P on the screen.

Which parts of the cathode-ray tube should be positive?

**A** anode and top Y plate

**B** anode and bottom Y plate

**C** cathode and top Y plate

**D** cathode and bottom Y plate

**39** Radiation from a radioactive source passes through thick paper into a magnetic field. Some of this radiation is deflected by the magnetic field and some is not deflected.

Which radiation enters the magnetic field?

**A** alpha-particles, beta-particles and gamma-rays

**B** beta-particles and gamma-rays only

**C** beta-particles only

**D** gamma-rays only

**40** A carbon-14 nucleus is represented by ${}^{14}_{6}\mathrm{C}$.

Which statement is correct?

**A** A nucleus ${}^{14}_{7}\mathrm{X}$ is an isotope of carbon-14.

**B** The carbon-14 nucleus contains 8 neutrons.

**C** The carbon-14 nucleus contains 14 positive charges.

**D** The nucleon number of the carbon-14 nucleus is 6.

## The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 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 | | | | | | | | | | | 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 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 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 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium – | 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 | 57–71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 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 – | 89–103 actinoids | 104 Rf rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**Key**

atomic number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lanthanoids | 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 |
| actinoids | 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 – |

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