



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

**COMBINED SCIENCE**

**0653/12**

Paper 1 Multiple Choice

**October/November 2015**

**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.

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

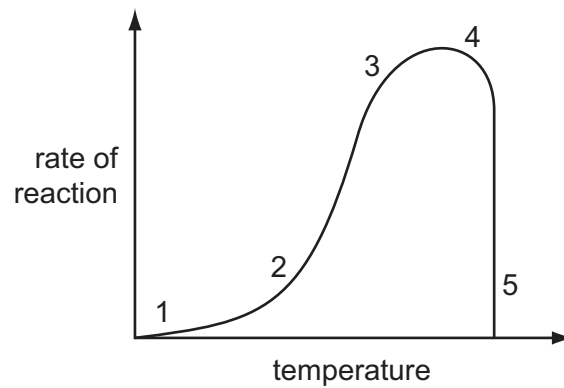
1 Which is a characteristic of all living organisms?

- A breathing
- B eating
- C egestion
- D movement

2 Which process depends on diffusion?

- A circulation
- B digestion
- C gaseous exchange
- D phagocytosis

3 The graph shows the effect of temperature on the rate of an enzyme-controlled reaction.



Where on the graph has all the enzyme been denatured?

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

4 What is the main use in the human body of carbohydrate?

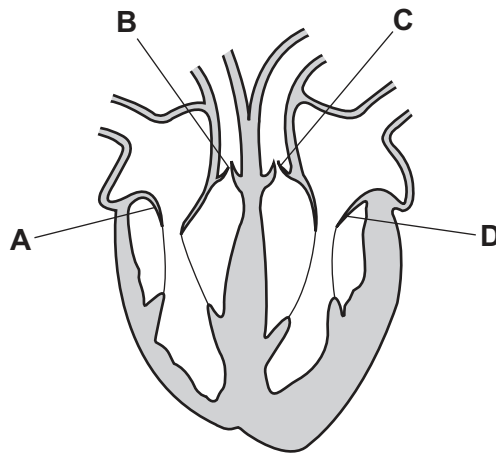
- A insulating against cold
- B making growth possible
- C providing energy
- D rebuilding damaged tissues

5 Which mineral salt and which vitamin does a child need to produce strong bones?

|          | mineral salt | vitamin |
|----------|--------------|---------|
| <b>A</b> | calcium      | C       |
| <b>B</b> | calcium      | D       |
| <b>C</b> | iron         | C       |
| <b>D</b> | iron         | D       |

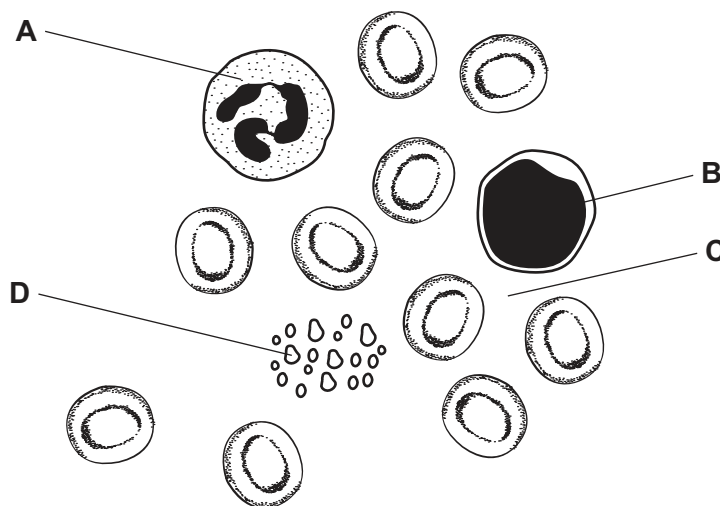
6 The diagram shows a section through the heart.

To ensure that blood will flow to the lungs, which valve must be closed?



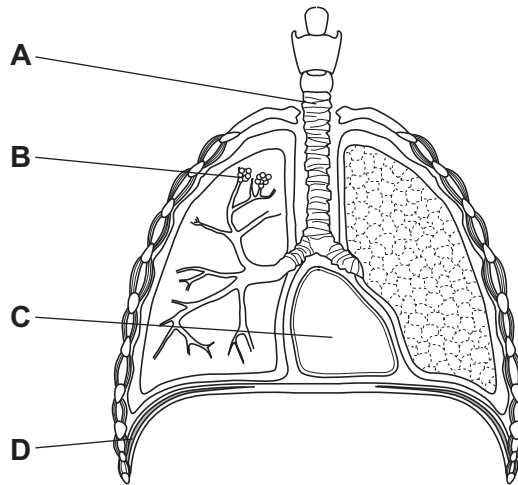
7 The drawing shows some blood, as it appears under the microscope.

Which part carries glucose to muscles?

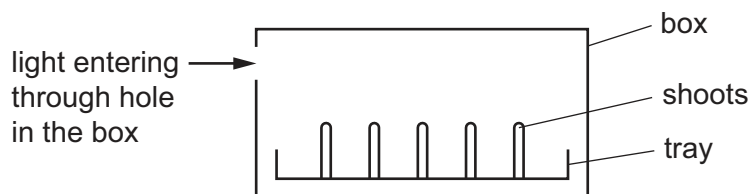


8 The diagram shows some structures in the human thorax (chest).

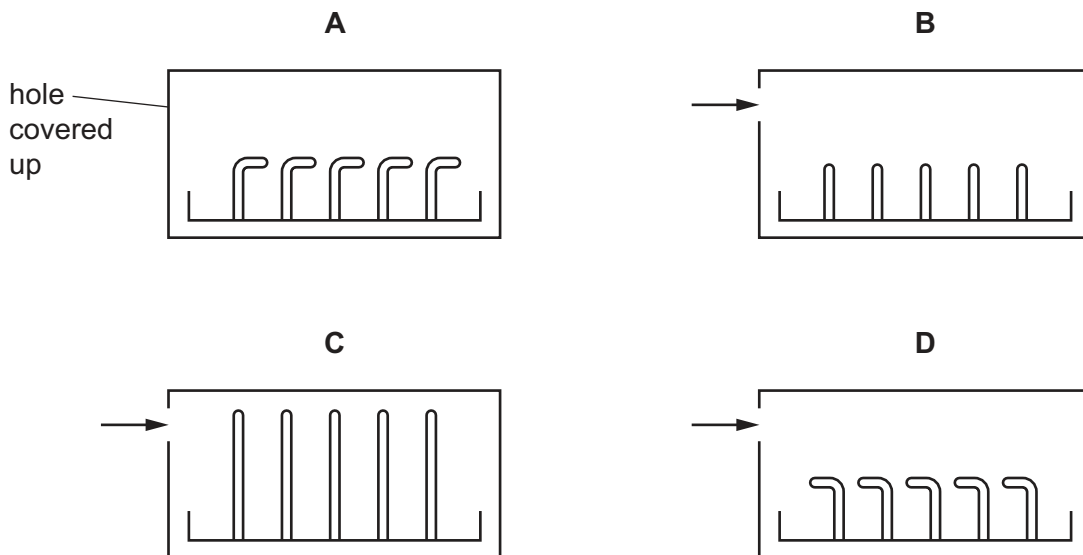
Into which part does carbon dioxide pass immediately after leaving the blood?



9 The diagram shows the shoots of a tray of seedlings in a box. Light enters the box as shown.



Which diagram shows the phototropic response of the shoots after 48 hours?



- 10 When an athlete prepares for the start of a sprint race, excitement causes the concentration of a hormone in the blood to increase.

What effects does the hormone have on the blood glucose concentration and the heart rate of the athlete?

|          | blood glucose concentration | heart rate |
|----------|-----------------------------|------------|
| <b>A</b> | decreases                   | decreases  |
| <b>B</b> | decreases                   | increases  |
| <b>C</b> | increases                   | decreases  |
| <b>D</b> | increases                   | increases  |

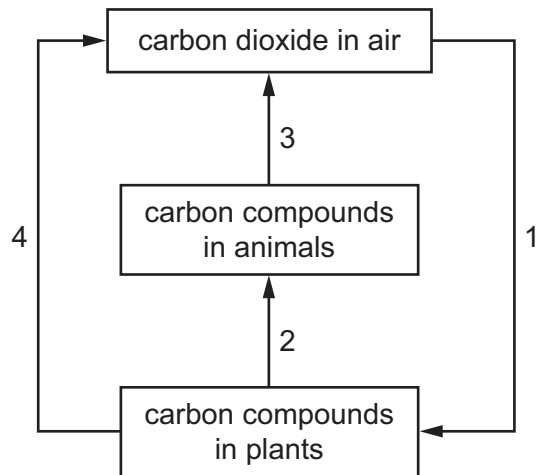
- 11 Which structure in a flower produces pollen?

- A** sepal
- B** stamen
- C** stigma
- D** style

- 12 When does the development of a baby begin?

- A** ejaculation of semen
- B** fertilisation of the ovum
- C** implantation in the wall of the uterus
- D** start of the mother's menstrual cycle

13 The diagram shows part of the carbon cycle.

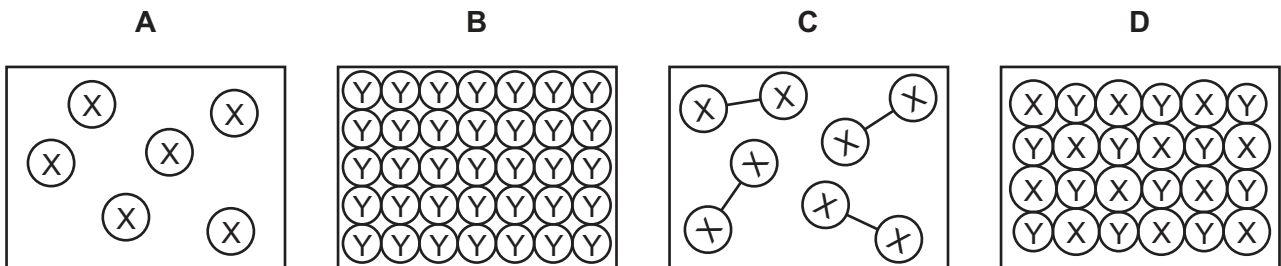


Where does respiration occur?

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

14 (X) and (Y) represent atoms of two different elements.

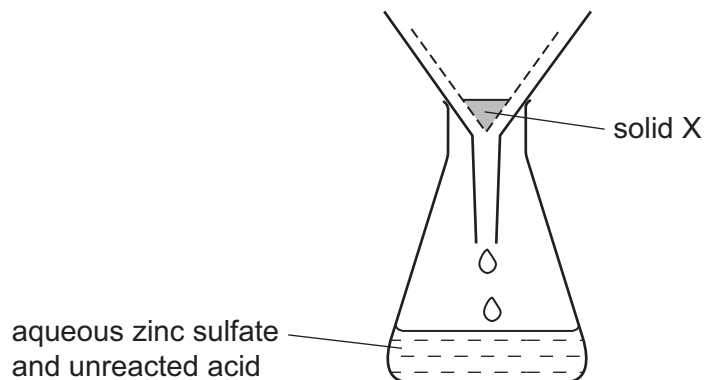
Which diagram represents molecules?



- 15 In an experiment, a mixture of 0.5g of copper and 3g of zinc is added to an excess of dilute sulfuric acid.

The copper acts as a catalyst.

After all the zinc has dissolved, the resulting mixture is filtered.



What is solid X and what is its mass?

|          | solid X          | mass of pure X    |
|----------|------------------|-------------------|
| <b>A</b> | copper           | less than 0.5g    |
| <b>B</b> | copper           | 0.5g              |
| <b>C</b> | copper(II) oxide | 0.5g              |
| <b>D</b> | copper(II) oxide | greater than 0.5g |

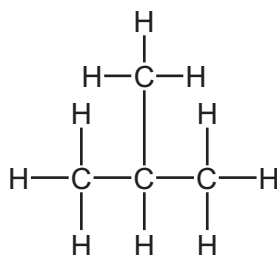
- 16 Element Y has a proton number of 18 and a nucleon number of 40.

Which statements about element Y are correct?

- 1 It has 40 neutrons in its nucleus.
- 2 It has 22 electrons.
- 3 It is unreactive.
- 4 It is in Group 0 of the Periodic Table.

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

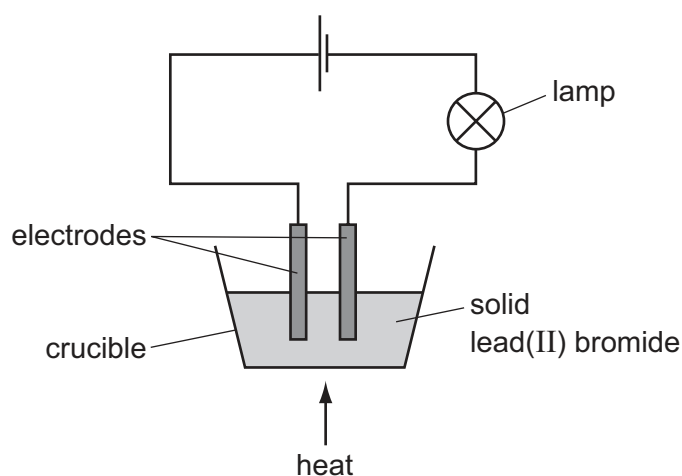
17 The structure of a hydrocarbon is shown.



What is the formula of the hydrocarbon?

- A**  $\text{C}_2\text{H}_5$       **B**  $\text{C}_3\text{H}_8$       **C**  $\text{C}_4\text{H}_9$       **D**  $\text{C}_4\text{H}_{10}$

18 The apparatus shown is set up.



The crucible needs to be heated for the lamp to give out light.

Why is heat needed?

- A** An exothermic reaction takes place in the crucible.  
**B** Electrodes only conduct electricity when hot.  
**C** Heat causes the lead(II) bromide to react with air.  
**D** The lead(II) bromide must be molten.



19 Four different solids are added to water. The initial and final temperatures are recorded.

Which change is the **most** exothermic?

|          | initial temperature /°C | final temperature /°C |
|----------|-------------------------|-----------------------|
| <b>A</b> | 19                      | 30                    |
| <b>B</b> | 20                      | 25                    |
| <b>C</b> | 22                      | 18                    |
| <b>D</b> | 25                      | 14                    |

20 Which method **cannot** be used to investigate the rate of a chemical reaction?

- A** Measuring the change in the mass of catalyst.
- B** Measuring the change in the mass of the reaction mixture.
- C** Measuring the time taken for the reaction to complete.
- D** Measuring the volume of gas produced.

21 Sulfuric acid reacts with potassium hydroxide.

What are the products of this reaction?

|          | potassium hydroxide | potassium sulfate | carbon dioxide | water |
|----------|---------------------|-------------------|----------------|-------|
| <b>A</b> | ✓                   | x                 | ✓              | ✓     |
| <b>B</b> | x                   | ✓                 | x              | ✓     |
| <b>C</b> | x                   | ✓                 | ✓              | ✓     |
| <b>D</b> | x                   | ✓                 | x              | x     |

key  
 ✓ = yes  
 x = no

22 A substance reacts with dilute acid, producing a gas.

The gas ignites with a pop when tested with a lighted splint.

What is the substance?

- A** copper
- B** copper(II) oxide
- C** magnesium
- D** magnesium carbonate



27 Methane, ethane and propane are all alkanes. Their formulae are shown below.

methane, CH<sub>4</sub>

ethane, C<sub>2</sub>H<sub>6</sub>

propane, C<sub>3</sub>H<sub>8</sub>

Which statement is **not** correct?

- A All three of these compounds are hydrocarbons.
- B All three of these compounds burn.
- C Methane is the main constituent of natural gas.
- D Propane burns completely to form carbon dioxide and hydrogen.

28 In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

What is the average speed of the car?

- A 1.5 km/h      B 90 km/h      C 144 km/h      D 216 km/h

29 Which quantity is measured in newtons?

- A density
- B energy
- C potential difference
- D weight

30 A student tries to determine the density of a metal block. First he measures the mass of the block and finds its weight. Next he measures the length of the sides of the block and calculates its volume. Finally he divides the weight by the volume.

The student has made a mistake.

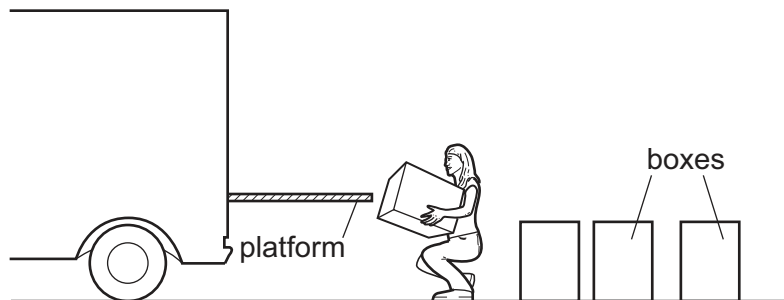
What should he do to determine the density?

- A divide mass by volume
- B divide mass by weight
- C divide volume by mass
- D divide volume by weight

31 What is the unit for work and what is the unit for power?

|          | work | power |
|----------|------|-------|
| <b>A</b> | J    | N     |
| <b>B</b> | J    | W     |
| <b>C</b> | N    | W     |
| <b>D</b> | W    | J     |

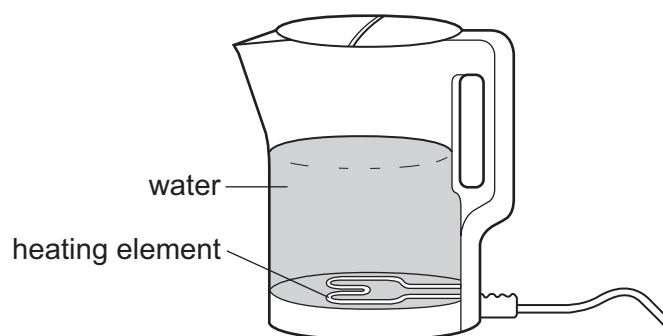
32 A person lifts boxes of equal weight on to a platform.



Which quantity will **not** affect the work done by the person?

- A** the height of the platform above the ground
  - B** the number of boxes lifted
  - C** the time taken to lift the boxes
  - D** the weight of the boxes
- 33 Which statement about the molecules of a gas at  $0^{\circ}\text{C}$  is correct?
- A** They do not move.
  - B** They move about randomly.
  - C** They move around each other in circular orbits.
  - D** They vibrate about fixed positions.

- 34 An electric kettle contains a metal heating element.

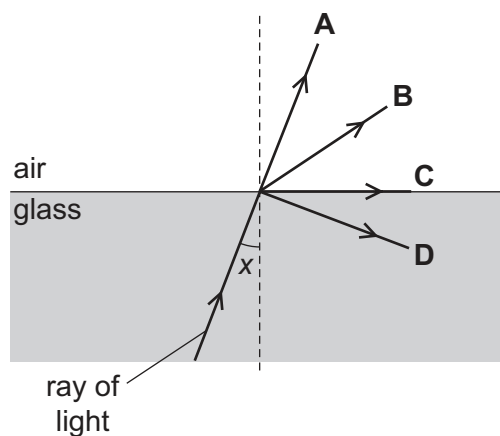


What are the main processes by which heat energy is transferred from the element to the water, and throughout the water?

|          | heat transfer process |                  |
|----------|-----------------------|------------------|
|          | element to water      | throughout water |
| <b>A</b> | conduction            | convection       |
| <b>B</b> | conduction            | radiation        |
| <b>C</b> | convection            | radiation        |
| <b>D</b> | radiation             | conduction       |

- 35 A ray of light in glass is incident on a boundary with air.

Which path does the light take when the angle of incidence  $x$  is significantly less than the critical angle?



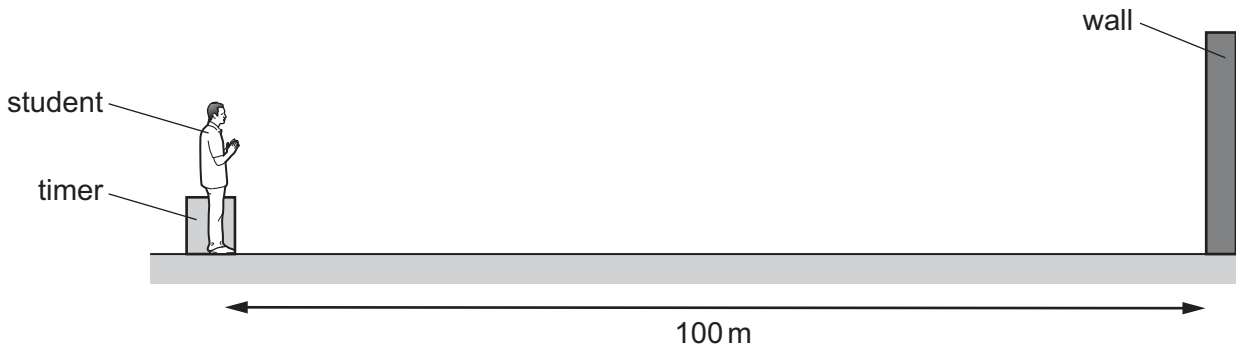
36 The diagram represents the electromagnetic spectrum. Sections P and Q are not named.

|            |   |                   |               |                 |   |             |
|------------|---|-------------------|---------------|-----------------|---|-------------|
| gamma rays | P | ultraviolet waves | visible light | infra-red waves | Q | radio waves |
|------------|---|-------------------|---------------|-----------------|---|-------------|

Which type of wave does P represent, and which type of wave does Q represent?

|          | P           | Q           |
|----------|-------------|-------------|
| <b>A</b> | microwaves  | sound waves |
| <b>B</b> | microwaves  | X-rays      |
| <b>C</b> | sound waves | microwaves  |
| <b>D</b> | X-rays      | microwaves  |

37 A student measures the speed of sound. He claps his hands and the sound reflects from a wall which is 100 m away from him.



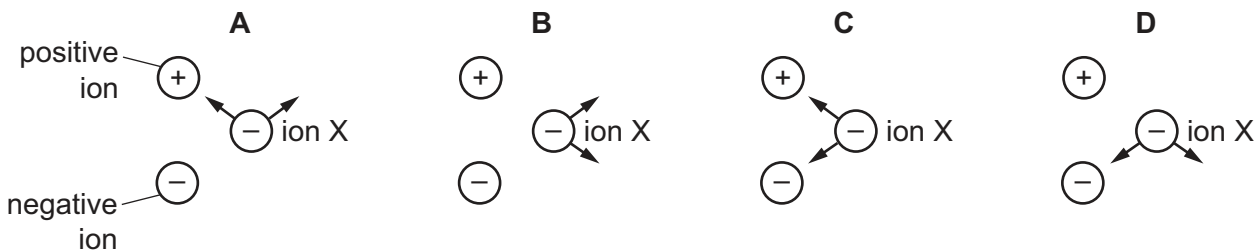
An electronic timer detects the echo of the sound 0.60 s after it is made.

Which calculation should the student use to determine the speed of sound?

- A**  $\frac{100}{0.60}$  m/s      **B**  $\frac{100}{1.2}$  m/s      **C**  $\frac{200}{0.30}$  m/s      **D**  $\frac{200}{0.60}$  m/s

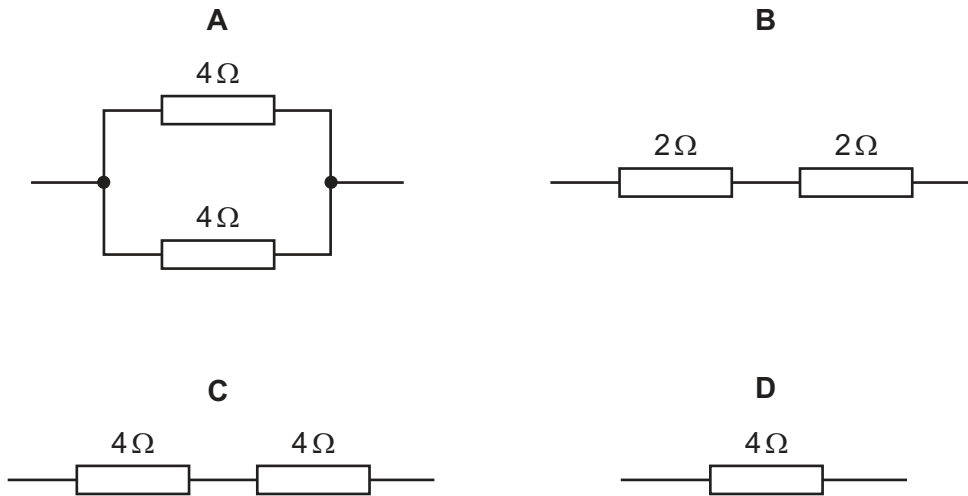
38 A negative ion X is close to a positive ion and another negative ion. Electrical forces act on ion X because of the charges in the other two ions.

Which diagram shows the directions of the two forces acting on ion X?

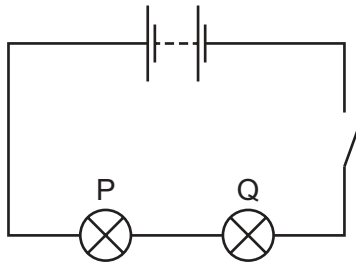


39 The diagrams show four arrangements of resistors.

Which arrangement has the **smallest** total resistance?



40 Two identical lamps P and Q are connected in a circuit as shown in the diagram.



The circuit is now switched on.

Which statement is correct?

- A** Each lamp can be switched off independently.
- B** If lamp Q breaks, lamp P stays alight.
- C** Lamp P is brighter than lamp Q.
- D** The current is the same in both lamps.

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

|                                    |                                    | Group                              |                                        |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       |                               |
|------------------------------------|------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|----------------------------------------|-------------------------------------|---------------------------------------|-------------------------------|
| I                                  | II                                 | III                                | IV                                     | V                                   | VI                                   | VII                                 | 0                                     |                                       |                                    |                                        |                                     |                                       |                               |
|                                    |                                    | 1<br><b>H</b><br>Hydrogen<br>1     |                                        |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     |                                       | 4<br><b>He</b><br>Helium<br>2 |
| 7<br><b>Li</b><br>Lithium<br>3     | 9<br><b>Be</b><br>Beryllium<br>4   |                                    |                                        |                                     |                                      |                                     |                                       |                                       |                                    |                                        |                                     | 19<br><b>F</b><br>Fluorine<br>9       |                               |
| 23<br><b>Na</b><br>Sodium<br>11    | 24<br><b>Mg</b><br>Magnesium<br>12 | 5<br><b>B</b><br>Boron<br>5        | 12<br><b>C</b><br>Carbon<br>6          | 14<br><b>N</b><br>Nitrogen<br>7     | 16<br><b>O</b><br>Oxygen<br>8        | 20<br><b>Ne</b><br>Neon<br>10       |                                       |                                       |                                    |                                        |                                     |                                       |                               |
| 39<br><b>K</b><br>Potassium<br>19  | 40<br><b>Ca</b><br>Calcium<br>20   | 13<br><b>Al</b><br>Aluminium<br>13 | 28<br><b>Si</b><br>Silicon<br>14       | 31<br><b>P</b><br>Phosphorus<br>15  | 32<br><b>S</b><br>Sulfur<br>16       | 40<br><b>Ar</b><br>Argon<br>18      |                                       |                                       |                                    |                                        |                                     |                                       |                               |
| 85<br><b>Rb</b><br>Rubidium<br>37  | 88<br><b>Sr</b><br>Strontium<br>38 | 70<br><b>Ga</b><br>Gallium<br>31   | 73<br><b>Ge</b><br>Germanium<br>32     | 75<br><b>As</b><br>Arsenic<br>33    | 79<br><b>Se</b><br>Selenium<br>34    | 84<br><b>Kr</b><br>Krypton<br>36    |                                       |                                       |                                    |                                        |                                     |                                       |                               |
| 133<br><b>Cs</b><br>Caesium<br>55  | 137<br><b>Ba</b><br>Barium<br>56   | 65<br><b>Zn</b><br>Zinc<br>30      | 64<br><b>Cu</b><br>Copper<br>29        | 59<br><b>Ni</b><br>Nickel<br>28     | 112<br><b>Cd</b><br>Cadmium<br>48    | 131<br><b>Xe</b><br>Xenon<br>54     |                                       |                                       |                                    |                                        |                                     |                                       |                               |
| 223<br><b>Fr</b><br>Francium<br>87 | 226<br><b>Ra</b><br>Radium<br>88   | 204<br><b>Tl</b><br>Thallium<br>81 | 197<br><b>Au</b><br>Gold<br>79         | 195<br><b>Pt</b><br>Platinum<br>78  | 201<br><b>Hg</b><br>Mercury<br>80    | 222<br><b>Rn</b><br>Radon<br>86     |                                       |                                       |                                    |                                        |                                     |                                       |                               |
|                                    |                                    | 140<br><b>Ce</b><br>Cerium<br>58   | 141<br><b>Pr</b><br>Praseodymium<br>59 | 144<br><b>Nd</b><br>Neodymium<br>60 | 147<br><b>Pm</b><br>Promethium<br>61 | 159<br><b>Tb</b><br>Terbium<br>65   | 162<br><b>Dy</b><br>Dysprosium<br>66  | 165<br><b>Ho</b><br>Holmium<br>67     | 167<br><b>Er</b><br>Erbium<br>68   | 169<br><b>Tm</b><br>Thulium<br>69      | 173<br><b>Yb</b><br>Ytterbium<br>70 | 175<br><b>Lu</b><br>Lutetium<br>71    |                               |
|                                    |                                    | 232<br><b>Th</b><br>Thorium<br>90  | 231<br><b>Pa</b><br>Protactinium<br>91 | 238<br><b>U</b><br>Uranium<br>92    | 237<br><b>Np</b><br>Neptunium<br>93  | 247<br><b>Bk</b><br>Berkelium<br>97 | 251<br><b>Cf</b><br>Californium<br>98 | 252<br><b>Es</b><br>Einsteinium<br>99 | 257<br><b>Fm</b><br>Fermium<br>100 | 258<br><b>Md</b><br>Mendelevium<br>101 | 259<br><b>No</b><br>Nobelium<br>102 | 260<br><b>Lr</b><br>Lawrencium<br>103 |                               |

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

|     |          |   |
|-----|----------|---|
| a   | <b>X</b> | † |
| b   |          | ‡ |
| Key |          |   |

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

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).