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.

[Turn over

PAPA CAMBRIDGE
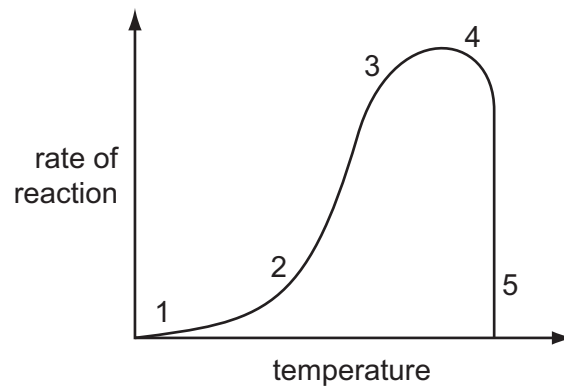
1 Which is a characteristic of all living organisms?

    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?
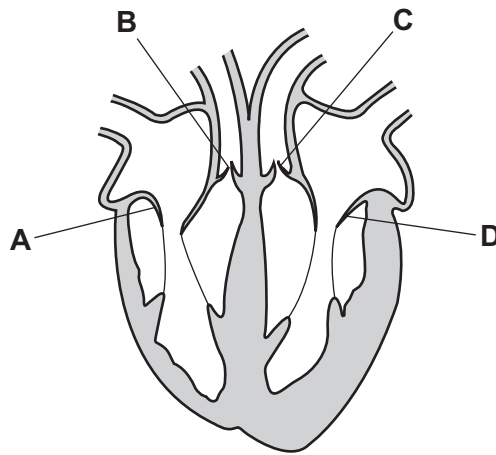
    A insulating against cold

    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?

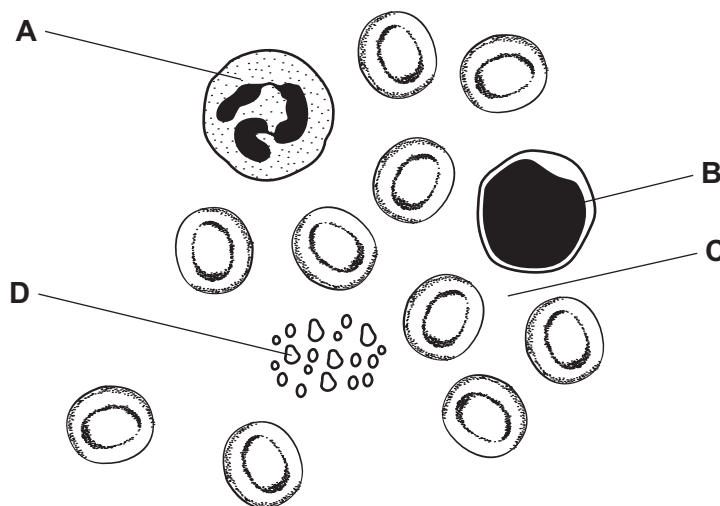|	mineral salt	vitamin
A	calcium	C
B	calcium	D
C	iron	C
D	iron	D

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.
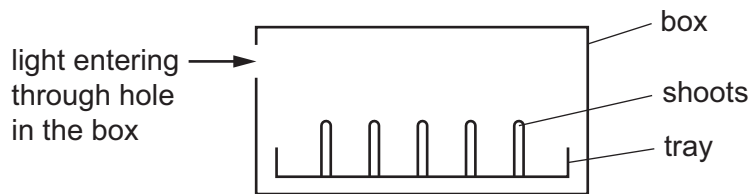
Which part carries glucose to muscles?

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

Into which part does carbon dioxide pass immediately after leaving the blood?
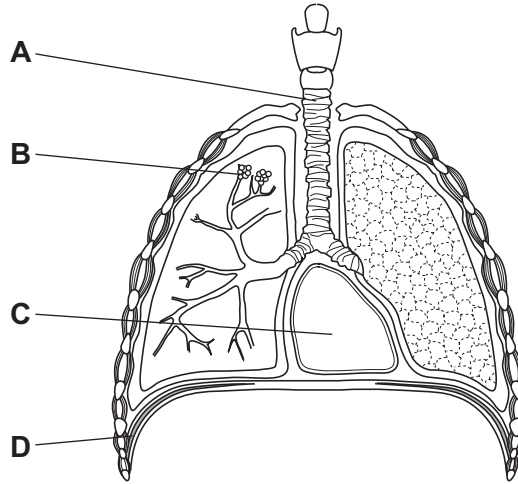
9   The diagram shows the shoots of a tray of seedlings in a box. Light enters the box as shown.

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

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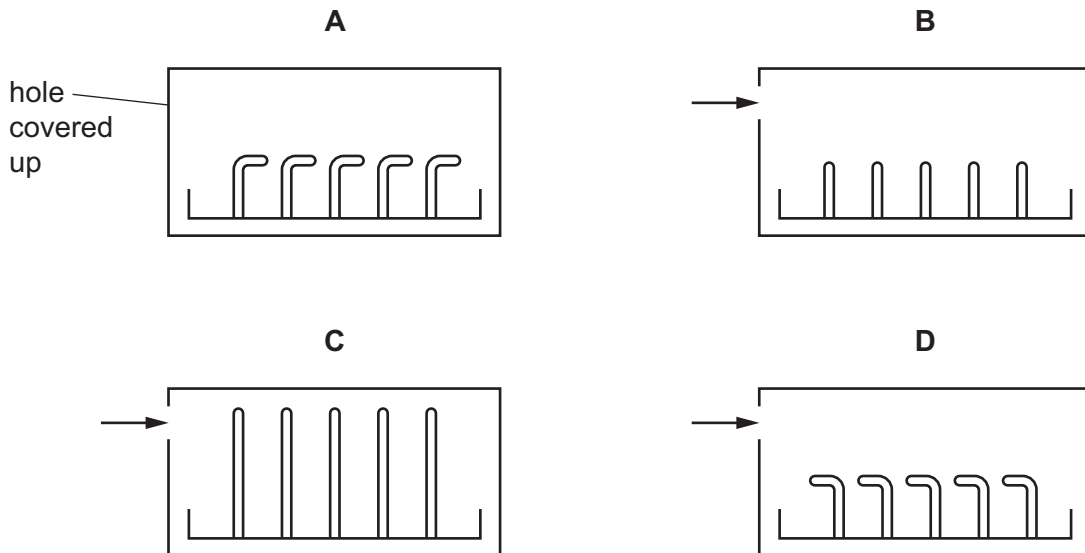
10 When an athlete prepares for the start of a sprint race, excitement causes the concentration of a hormone in the blood to increase.

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

	blood glucose concentration	heart rate
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	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.

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          ┌─────────────────────┐
      ┌──▶│  carbon dioxide in air │──┐
      │   └─────────────────────┘   │
      │             ▲                │
      │             │ 3              │
      │   ┌─────────────────────┐   │
   4  │   │  carbon compounds    │   │ 1
      │   │     in animals       │   │
      │   └─────────────────────┘   │
      │             ▲                │
      │             │ 2              │
      │   ┌─────────────────────┐   │
      └───│  carbon compounds    │◀──┘
          │      in plants       │
          └─────────────────────┘
```
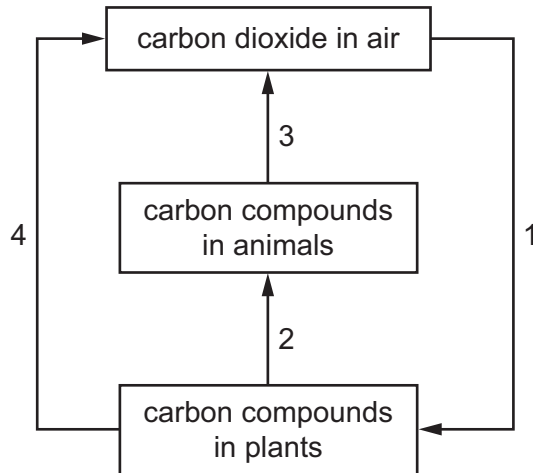
Where does respiration occur?

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?

A	B	C	D

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

The copper acts as a catalyst.
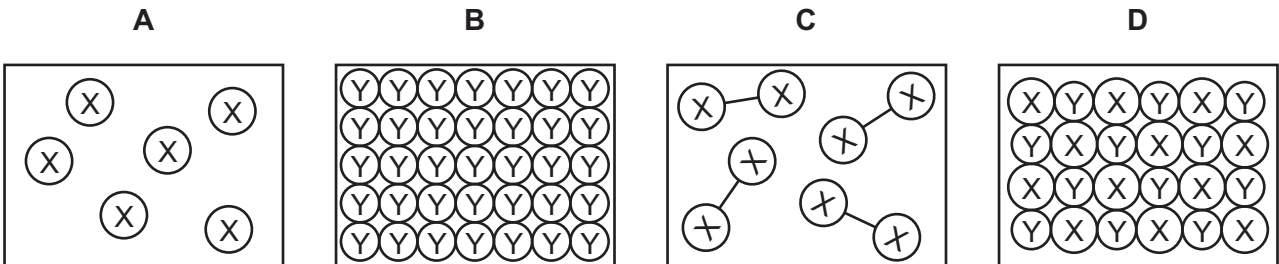
After all the zinc has dissolved, the resulting mixture is filtered.

solid X

aqueous zinc sulfate and unreacted acid
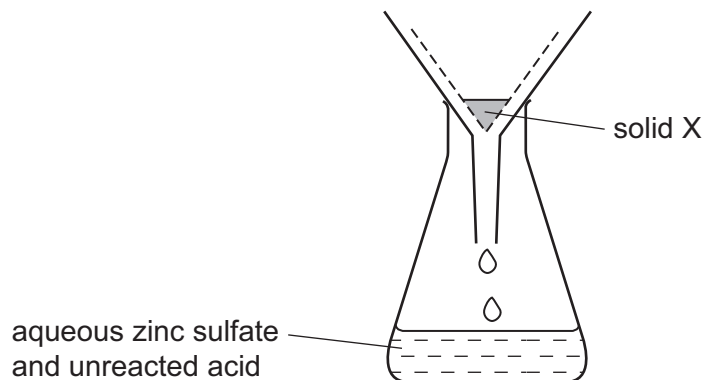
What is solid X and what is its mass?

	solid X	mass of pure X
A	copper	less than 0.5 g
B	copper	0.5 g
C	copper(II) oxide	0.5 g
D	copper(II) oxide	greater than 0.5 g

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.
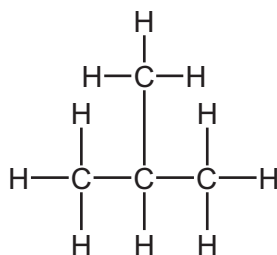
What is the formula of the hydrocarbon?

A C_2H_5 **B** C_3H_8 **C** C_4H_9 **D** C_4H_{10}

18 The apparatus shown is set up.
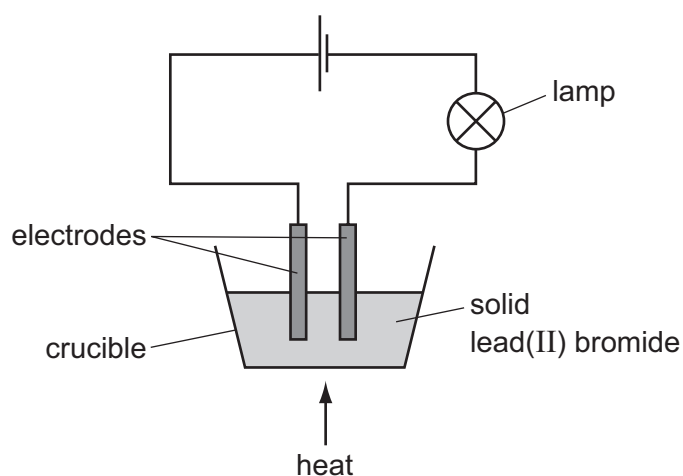
The crucible needs to be heated for the lamp to give out light.

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
A	19	30
B	20	25
C	22	18
D	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	
A	✓	✗	✓	✓	key
B	✗	✓	✗	✓	✓ = yes
C	✗	✓	✓	✓	✗ = no
D	✗	✓	✗	✗	

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

23 The positions of four elements are shown in the outline of the Periodic Table.

Which element has a high melting point and forms coloured compounds?

24 Which statement about elements in Period 3 of the Periodic Table is correct?

A All the elements in Period 3 are metals.

B All the elements in Period 3 are non-metals.

C Metals are on the left, non-metals are on the right.

D Non-metals are on the left, metals are on the right.

25 A small piece of a solid element is dropped into a bowl of water.

The element floats on the water, fizzes and burns with a lilac flame.

What is the element?

A copper

B potassium

C sodium

D zinc

26 When water is purified it is passed through large tanks of sand.

What is the purpose of the sand?

A to remove all harmful bacteria

B to remove coloured soluble impurities

C to remove small insoluble particles

D to remove tree branches and other large objects

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

methane, CH_4

ethane, C_2H_6

propane, C_3H_8

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.
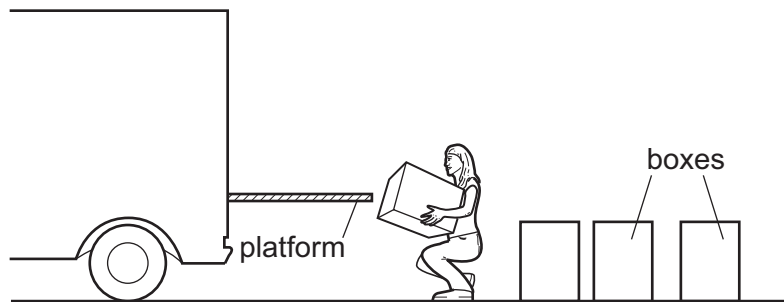
The student has made a mistake.

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
A	J	N
B	J	W
C	N	W
D	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 $0\,°C$ 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.
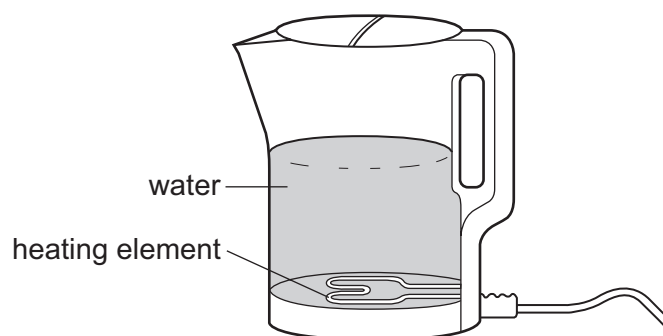
What are the main processes by which heat energy is transferred from the element to the water, and throughout the water?

	heat transfer process	
	element to water	throughout water
A	conduction	convection
B	conduction	radiation
C	convection	radiation
D	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?
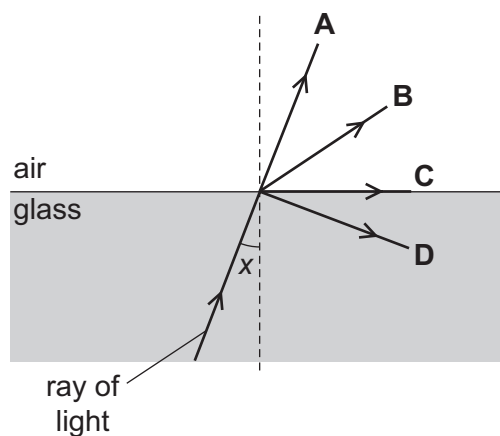
36 The diagram represents the electromagnetic spectrum. Sections P and Q are not named.

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
A	microwaves	sound waves
B	microwaves	X-rays
C	sound waves	microwaves
D	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.
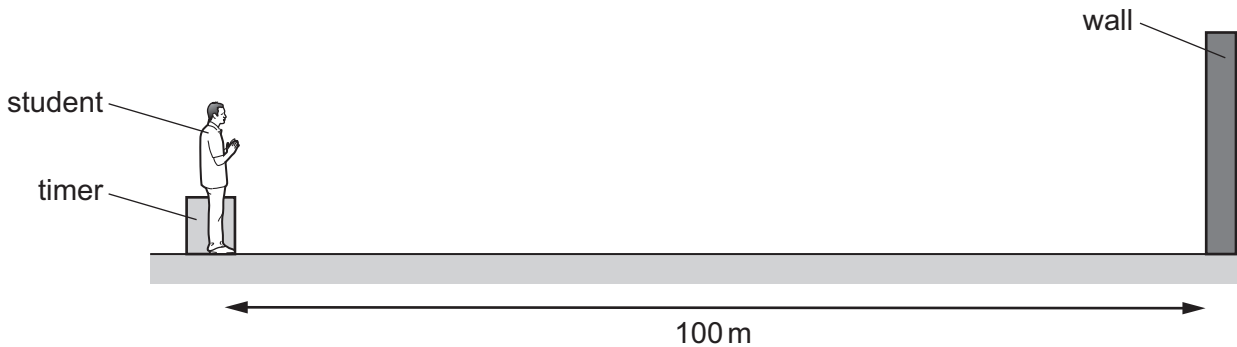
An electronic timer detects the echo of the sound 0.60 s after it is made.

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

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

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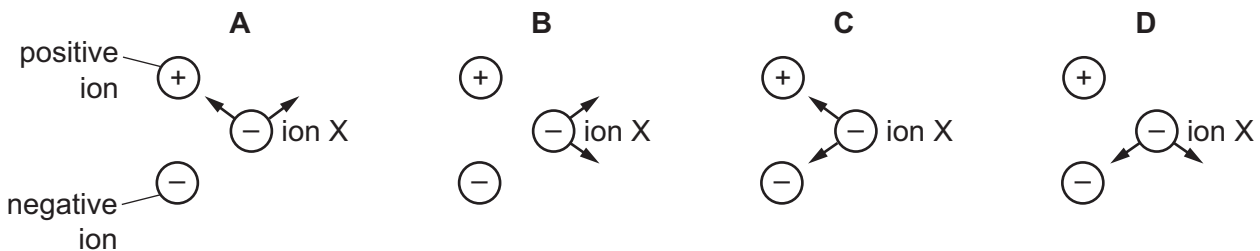
39 The diagrams show four arrangements of resistors.

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

A

4 Ω

4 Ω

B

2 Ω   2 Ω

C

4 Ω   4 Ω

D

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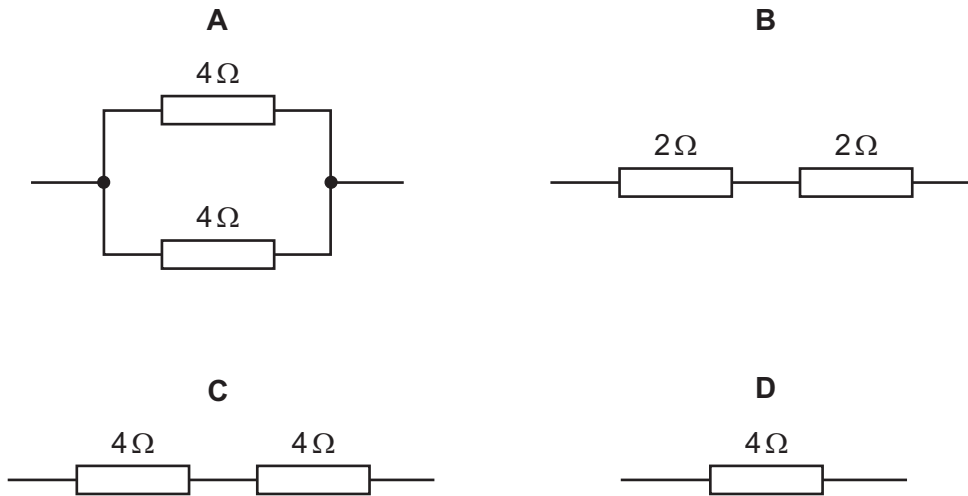
40 Two identical lamps P and Q are connected in a circuit as shown in the diagram.

P   Q
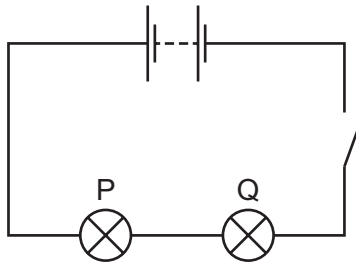
The circuit is now switched on.

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 **H** Hydrogen 1												4 **He** Helium 2
7 **Li** Lithium 3	9 **Be** Beryllium 4												11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
23 **Na** Sodium 11	24 **Mg** Magnesium 12												27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30		70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48		115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57 *	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80		204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	209 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86
223 **Fr** Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †																

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

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	147 **Pm** Promethium 61	150 **Sm** Samarium 62	152 **Eu** Europium 63	157 **Gd** Gadolinium 64	159 **Tb** Terbium 65	162 **Dy** Dysprosium 66	165 **Ho** Holmium 67	167 **Er** Erbium 68	169 **Tm** Thulium 69	173 **Yb** Ytterbium 70	175 **Lu** Lutetium 71	
232 **Th** Thorium 90	231 **Pa** Protactinium 91	238 **U** Uranium 92	237 **Np** Neptunium 93	244 **Pu** Plutonium 94	243 **Am** Americium 95	247 **Cm** Curium 96	247 **Bk** Berkelium 97	251 **Cf** Californium 98	252 **Es** Einsteinium 99	257 **Fm** Fermium 100	258 **Md** Mendelevium 101	259 **No** Nobelium 102	260 **Lr** Lawrencium 103	

Key

a
X
b

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

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

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