



Cambridge IGCSE™

COMBINED SCIENCE

0653/23

Paper 2 Multiple Choice (Extended)

October/November 2023

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



1 Which adaptation of root hair cells increases their rate of absorption of water?

- A large surface area
- B phloem present
- C small surface area
- D xylem present

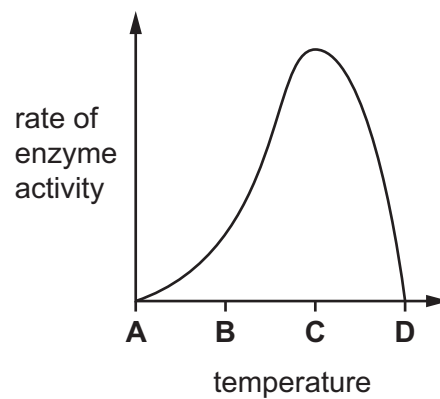
2 Which statement about diffusion is correct?

- A Diffusion occurs only in living organisms.
- B Diffusion occurs only in solution.
- C Diffusion occurs only through a cell wall.
- D Diffusion occurs only down a concentration gradient.

3 Which row contains all of the elements in fats?

	carbon	hydrogen	nitrogen	oxygen
A	✓	x	✓	✓
B	✓	✓	✓	x
C	✓	✓	x	✓
D	x	✓	✓	✓

4 At which temperature is the enzyme denatured?



- 5** A plant shoot is 5 cm tall and has two leaves half way up the stem.

What can happen to the simple sugars made by these leaves?

- 1 move down the stem from the leaves
- 2 move up the stem from the leaves
- 3 remain in the leaves

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

- 6** What is the role of mechanical digestion?

- A** It breaks down large food molecules into smaller molecules.
- B** It forms new chemical compounds for the body to utilise.
- C** It breaks down large pieces of food into smaller pieces.
- D** It makes the food particles soluble for better absorption.

- 7** From which part of a leaf does water evaporate during transpiration?

- A** the cuticle
- B** the mesophyll cells
- C** the upper epidermis
- D** the stomata

- 8** Some features of the human gas exchange system are listed.

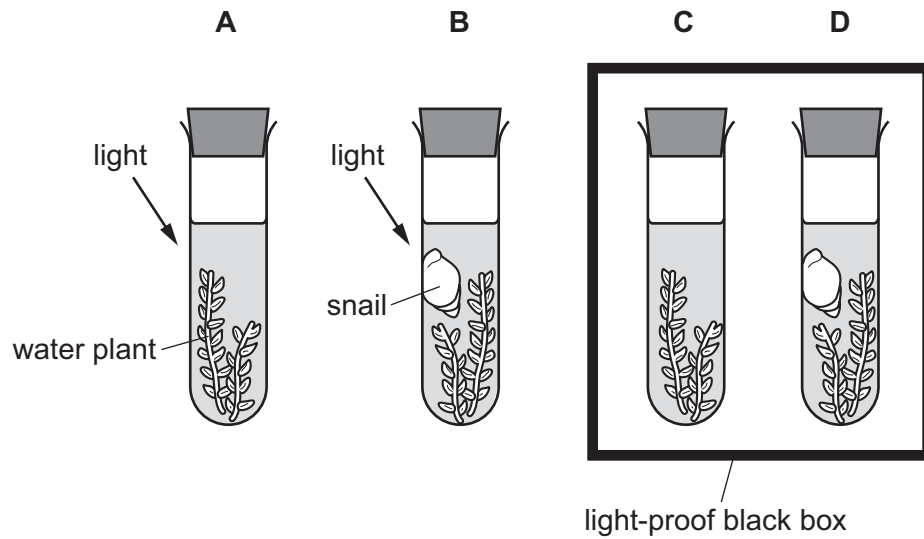
- 1 has large surface area
- 2 contains goblet cells
- 3 has a good blood supply
- 4 has ciliated cells
- 5 inner surfaces are lined with mucus

Which features are necessary for efficient diffusion of gases?

- A** 1, 2, 3, 4 and 5
- B** 1, 3 and 5 only
- C** 1 and 3 only
- D** 2, 4 and 5 only

- 9 The diagram shows the apparatus used in an investigation on gas exchange in organisms.

In which test-tube would the concentration of oxygen decrease most rapidly?



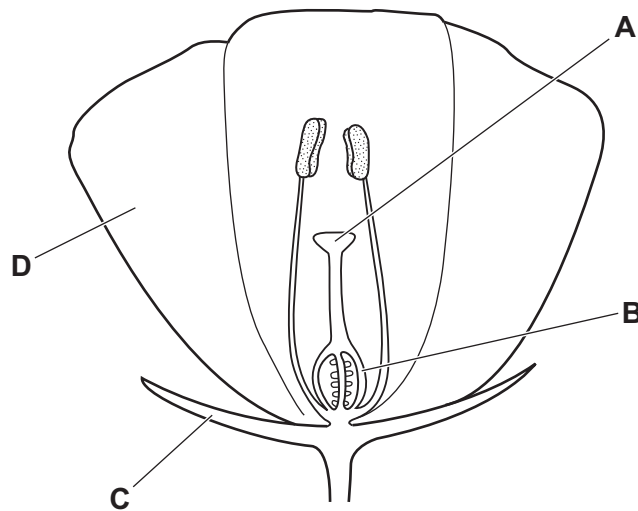
- 10 The table shows some statements about reproduction.

Which row is correct for asexual reproduction?

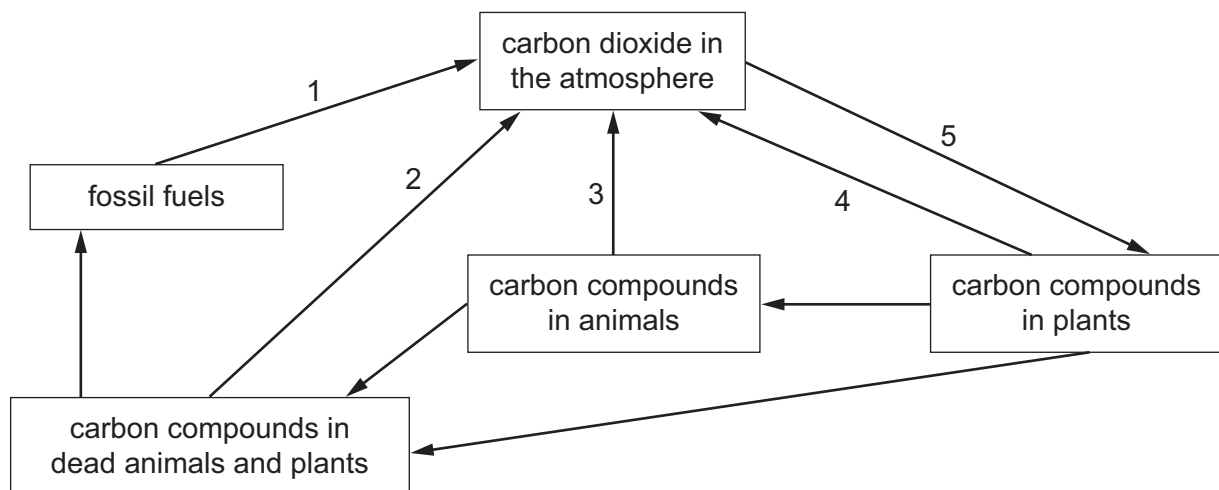
	offspring are genetically identical to each other	offspring are genetically identical to the parent	the zygote is produced when gametes fuse
A	✓	✓	x
B	✓	x	x
C	x	✓	✓
D	x	x	✓

11 The diagram shows an insect-pollinated flower.

Which label identifies a petal?



12 The diagram shows part of the carbon cycle.



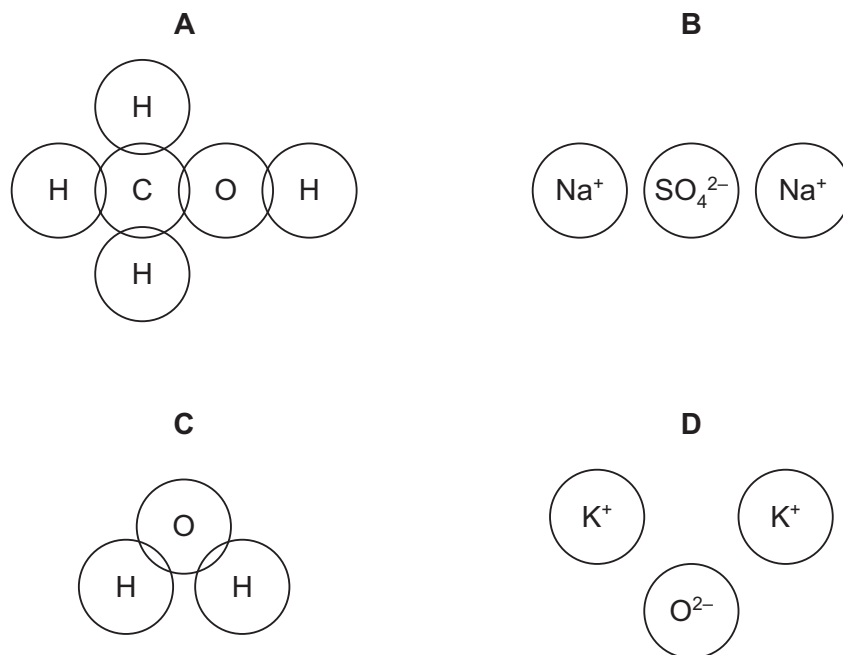
Which processes use oxygen and produce oxygen?

	uses oxygen	produces oxygen
A	1	2
B	2	3
C	3	4
D	4	5

13 What occurs as a result of eutrophication?

- A There is a decrease in the availability of nitrate ions.
- B There is a decrease in the availability of oxygen molecules.
- C There is a decrease in the growth rate of producers.
- D There is a decrease in the rate of decomposition.

14 Which diagram represents a covalent molecule containing three different types of atom?



15 What is a general property of metals?

- A They are malleable.
- B They are soluble in water.
- C They act as catalysts.
- D They have low melting points.

16 Which statement about the melting points of aluminium oxide, Al_2O_3 , and methanol, CH_3OH , is correct?

- A Aluminium oxide has a higher melting point than methanol because ionic bonding is stronger than covalent bonding.
- B Aluminium oxide has a higher melting point than methanol because the attraction between ions is stronger than the attraction between molecules.
- C Methanol has a higher melting point than aluminium oxide because covalent bonding is stronger than ionic bonding.
- D Methanol has a higher melting point than aluminium oxide because the attraction between molecules is stronger than the attraction between ions.

- 17 Aqueous lead nitrate and aqueous sodium chloride react to form aqueous sodium nitrate and solid lead chloride.

What is the ionic equation for this reaction?

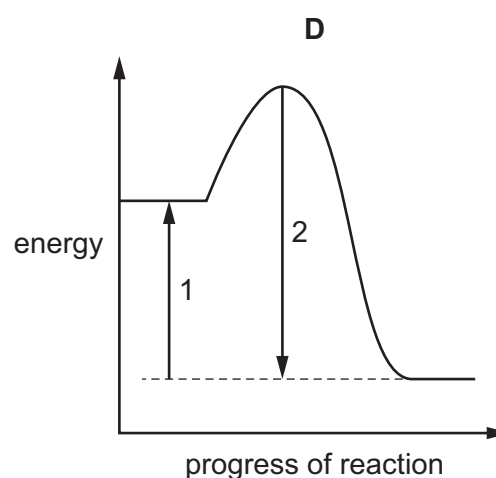
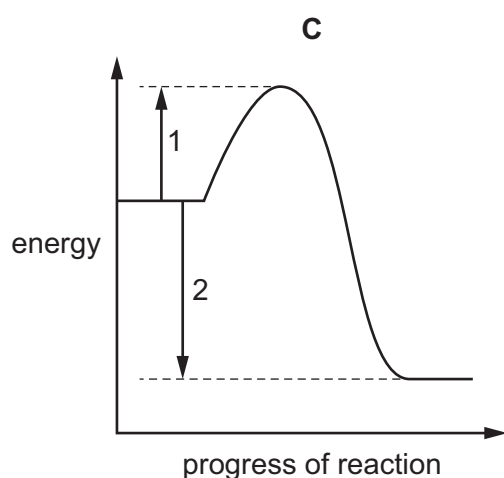
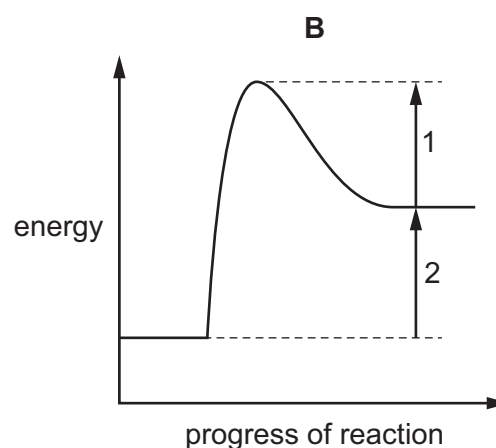
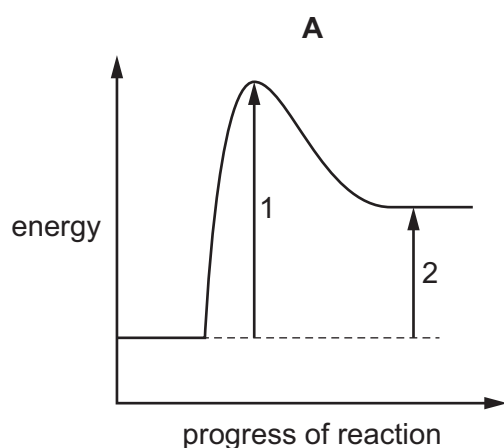
- A $\text{Pb}^{2+}(\text{aq}) + \text{Cl}^{2-}(\text{aq}) \rightarrow \text{PbCl}(\text{s})$
B $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^{-}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
C $\text{Na}^{+}(\text{aq}) + \text{NO}_3^{-}(\text{aq}) \rightarrow \text{NaNO}_3(\text{aq})$
D $\text{Na}^{+}(\text{aq}) + 2\text{NO}_3^{-}(\text{aq}) \rightarrow \text{Na}(\text{NO}_3)_2(\text{aq})$

- 18 Which energy level diagram identifies the activation energy and the energy change for an exothermic reaction?

key

1 = activation energy

2 = energy change for the reaction



- 19** Rutile is an ore of titanium. Rutile contains titanium oxide, TiO_2 .

The first step in the extraction of titanium from rutile is heating with chlorine and carbon at a high temperature.

The equation for the reaction is shown.



Which row shows the role of carbon and of titanium oxide in this reaction?

	carbon	titanium oxide
A	oxidising agent	oxidising agent
B	oxidising agent	reducing agent
C	reducing agent	oxidising agent
D	reducing agent	reducing agent

- 20** Which element reacts with dilute sulfuric acid to form a salt?

- A** carbon
- B** copper
- C** sulfur
- D** zinc

- 21** Substance X is warmed with aqueous sodium hydroxide and aluminium.

A gas is produced which turns damp red litmus paper blue.

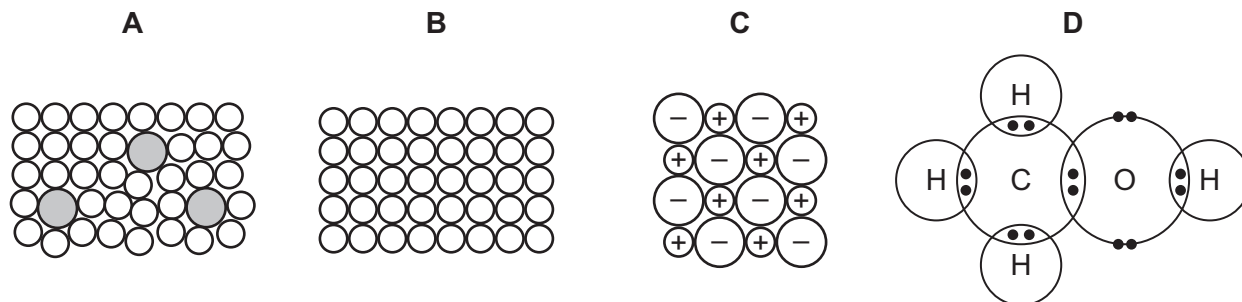
Which anion is present in X?

- A** carbonate
- B** hydroxide
- C** nitrate
- D** sulfate

- 22** Which equation represents a reaction that occurs when a halogen is added to an aqueous potassium halide?

- A** $2\text{KBr} + \text{Cl}_2 \rightarrow 2\text{KCl} + \text{Br}_2$
- B** $2\text{KBr} + \text{I}_2 \rightarrow 2\text{KI} + \text{Br}_2$
- C** $2\text{KCl} + \text{Br}_2 \rightarrow 2\text{KBr} + \text{Cl}_2$
- D** $2\text{KCl} + \text{I}_2 \rightarrow 2\text{KI} + \text{Cl}_2$

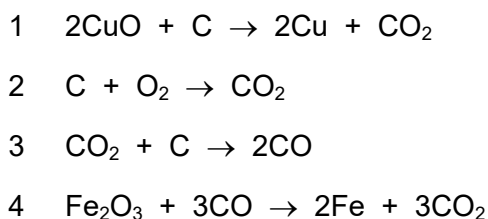
23 Which diagram represents an alloy?



24 Which row shows elements in order of reactivity?

	most reactive → least reactive			
A	aluminium	iron	zinc	hydrogen
B	calcium	carbon	aluminium	copper
C	magnesium	zinc	hydrogen	copper
D	sodium	potassium	magnesium	aluminium

25 The equations show reactions that occur in the extraction of copper and of iron.



Which equations show the reduction of a compound?

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

26 Which processes contribute to the enhanced greenhouse effect?

- 1 the electrolysis of concentrated aqueous sodium chloride
- 2 the extraction of iron in a blast furnace
- 3 the reaction of magnesium with dilute hydrochloric acid
- 4 the reaction of sodium carbonate with dilute hydrochloric acid

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

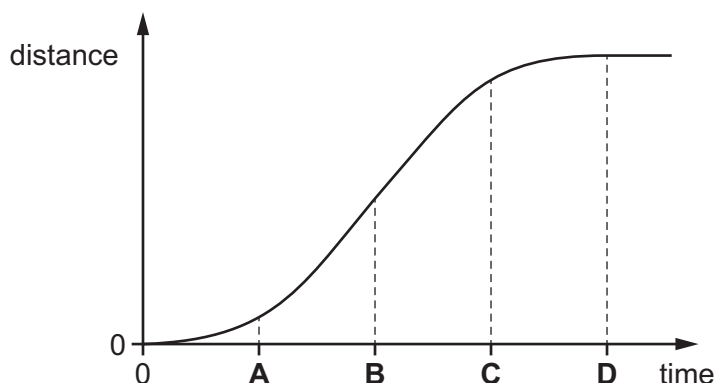
27 Which statement about alkanes is correct?

- A They are unsaturated hydrocarbons.
- B They are very reactive.
- C They burn to form carbon dioxide and hydrogen.
- D They contain only single covalent bonds.

28 A train travels between two stations.

The distance–time graph for the train is shown.

At which labelled time is the train travelling the fastest?



29 A student performs an experiment to determine the density of an irregularly shaped stone.

The student pours some water into a measuring cylinder and then lowers the stone into the water so that the stone is fully submerged. The table shows the measurements.

mass of empty measuring cylinder	270 g
volume of water	80 cm ³
mass of measuring cylinder and water	350 g
volume of water and stone	110 cm ³
mass of measuring cylinder, water and stone	420 g

What is the density of the stone?

- A 2.3 g/cm³ B 2.7 g/cm³ C 3.8 g/cm³ D 5.0 g/cm³

30 Which energy source is renewable?

- A geothermal
- B natural gas
- C nuclear fission
- D oil

31 What is the main energy transfer that takes place in the Sun?

- A chemical potential energy to thermal energy
- B thermal energy to chemical potential energy
- C thermal energy to nuclear energy
- D nuclear energy to thermal energy

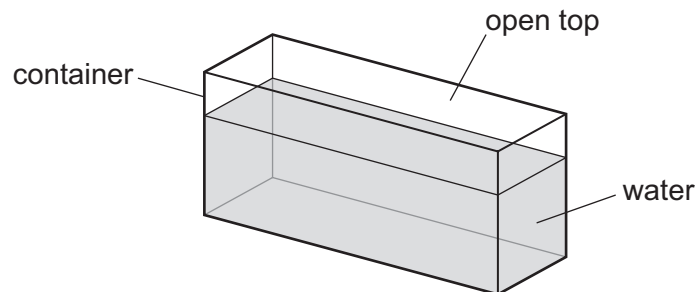
32 Which row describes the arrangement and separation of the particles in a liquid?

	arrangement of particles	separation of particles
A	random	closer than in a gas
B	random	further apart than in a gas
C	regular	closer than in a gas
D	regular	further apart than in a gas

33 An open container in a laboratory contains water. The container is placed on a bench near a closed window.

The container is in bright sunlight and it is a windy day outside.

The water in the container evaporates slowly.



Four actions are listed.

- 1 adding more water to the container
- 2 opening the window
- 3 covering the window with a curtain
- 4 increasing the room temperature

Which two actions, on their own, increase the rate of evaporation?

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

- 34** A sound wave travels in air.

What is the name of the region of the wave where the separation of particles is greatest?

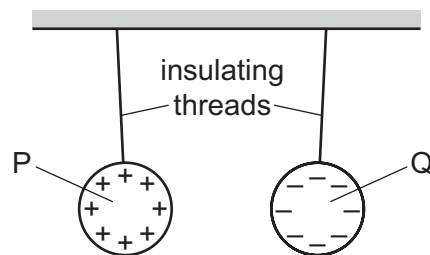
- A** compression
- B** medium
- C** rarefaction
- D** reflection

- 35** A loudspeaker vibrates with different amplitudes and at different frequencies to make a sound.

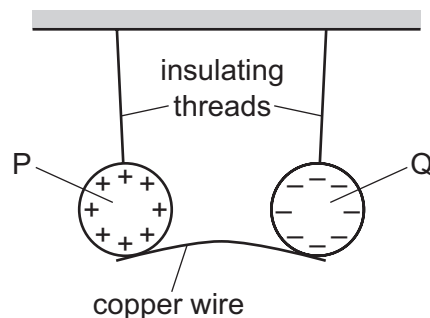
Which amplitude and frequency produces the louder, higher-pitched sound?

- A** large amplitude and high frequency
- B** large amplitude and low frequency
- C** small amplitude and high frequency
- D** small amplitude and low frequency

- 36** The diagram shows two charged metal spheres, P and Q, suspended from insulating threads. P is positively charged and Q is negatively charged.



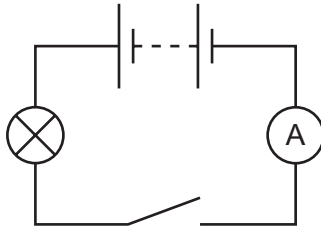
The spheres are now joined by a copper wire.



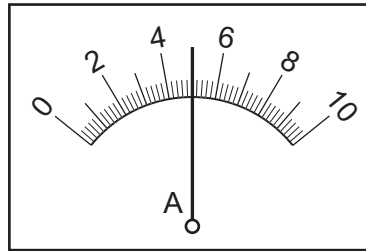
What happens in the copper wire?

- A** Electrons flow from P to Q.
- B** Electrons flow from Q to P.
- C** Protons flow from P to Q.
- D** Protons flow from Q to P.

- 37 A circuit includes a lamp, a switch and an ammeter. The switch is open.



The switch is now closed and the ammeter displays the reading shown.



The switch remains closed for 20 s before it is opened again.

What is the charge that flows while the switch is closed?

- A** 0.25 C **B** 4.0 C **C** 90 C **D** 100 C
- 38 A wire of length 3.0 m and cross-sectional area of 0.24 mm^2 has a resistance of 6.0Ω .
A second wire, made from the same material, has a cross-sectional area of 0.12 mm^2 and a resistance of 24Ω .
What is the length of the second wire?
- A** 3.0 m **B** 6.0 m **C** 12 m **D** 24 m
- 39 A car has two headlamps connected in parallel to a 12 V battery.
The power of each headlamp is 60 W.
What is the total energy supplied by the battery to the two headlamps in 5.0 minutes?
- A** 0.60 kJ **B** 18 kJ **C** 36 kJ **D** 430 kJ
- 40 A 4.0Ω resistor and a 6.0Ω resistor are connected in parallel.
What is the combined resistance of the two resistors?
- A** 0.42Ω **B** 2.4Ω **C** 5.0Ω **D** 10Ω

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The Periodic Table of Elements

Group																																	
I	II											III	IV	V	VI	VII	VIII																
<div>3 Li lithium 7</div>		<div>1 H hydrogen 1</div>												<div>Key</div> <div>atomic number atomic symbol name relative atomic mass</div>						<div>5 B boron 11</div> <div>6 C carbon 12</div> <div>7 N nitrogen 14</div> <div>8 O oxygen 16</div> <div>13 Al aluminium 27</div> <div>14 Si silicon 28</div> <div>15 P phosphorus 31</div> <div>16 S sulfur 32</div> <div>31 Ga gallium 70</div> <div>32 Ge germanium 73</div> <div>49 In indium 115</div> <div>50 Sn tin 119</div> <div>81 Tl thallium 204</div> <div>82 Pb lead 207</div> <div>114 Fl flerovium</div>						<div>9 F fluorine 19</div> <div>17 Cl chlorine 35.5</div> <div>35 Br bromine 80</div> <div>53 I iodine 127</div> <div>85 At astatine —</div> <div>117 Ts tennessine —</div>						<div>2 He helium 4</div>	
<div>11 Na sodium 23</div>		<div>12 Mg magnesium 24</div>																		<div>10 Ne neon 20</div>													
<div>19 K potassium 39</div>		<div>20 Ca calcium 40</div>																		<div>36 Kr krypton 84</div>													
<div>37 Rb rubidium 85</div>		<div>38 Sr strontium 88</div>																		<div>54 Xe xenon 131</div>													
<div>55 Cs caesium 133</div>		<div>56 Ba barium 137</div>		lanthanoids																<div>86 Rn radon —</div>													
<div>87 Fr francium —</div>		<div>88 Ra radium —</div>		actinoids																<div>118 Og oganeson —</div>													

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
	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 dm³ at room temperature and pressure (r.t.p.).