



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

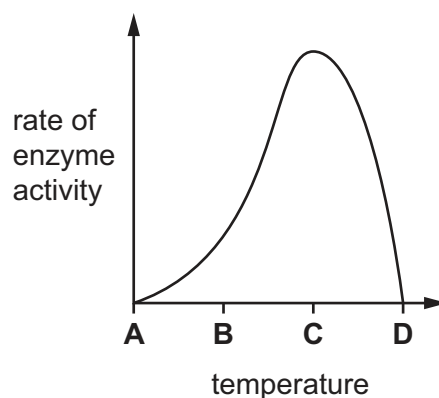
2 Which statement about diffusion is correct?

- 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

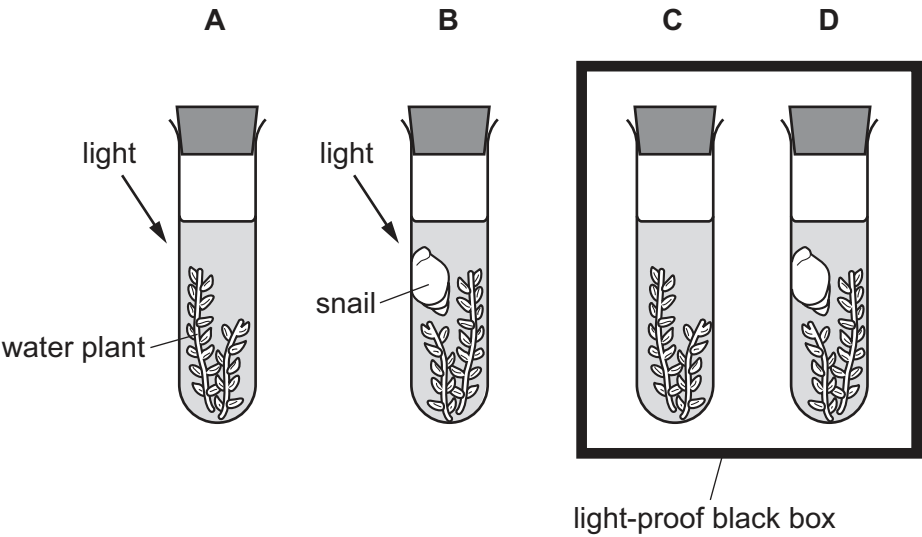
- 8** Some features of the human gas exchange system are listed.

- 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?

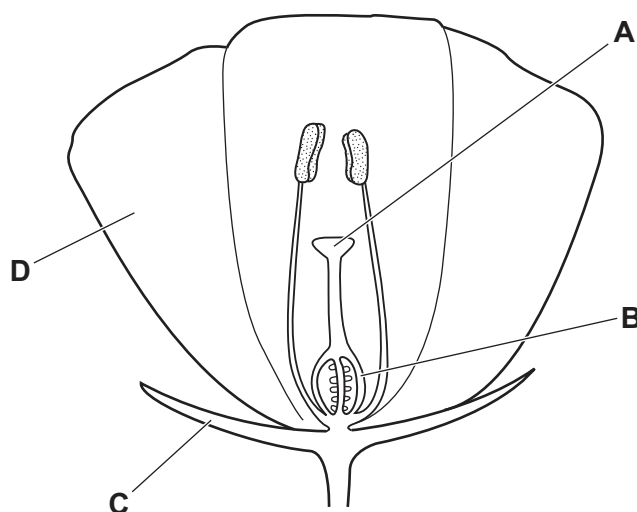


- 10 The table shows some statements about reproduction.
- Which row is correct for asexual reproduction?

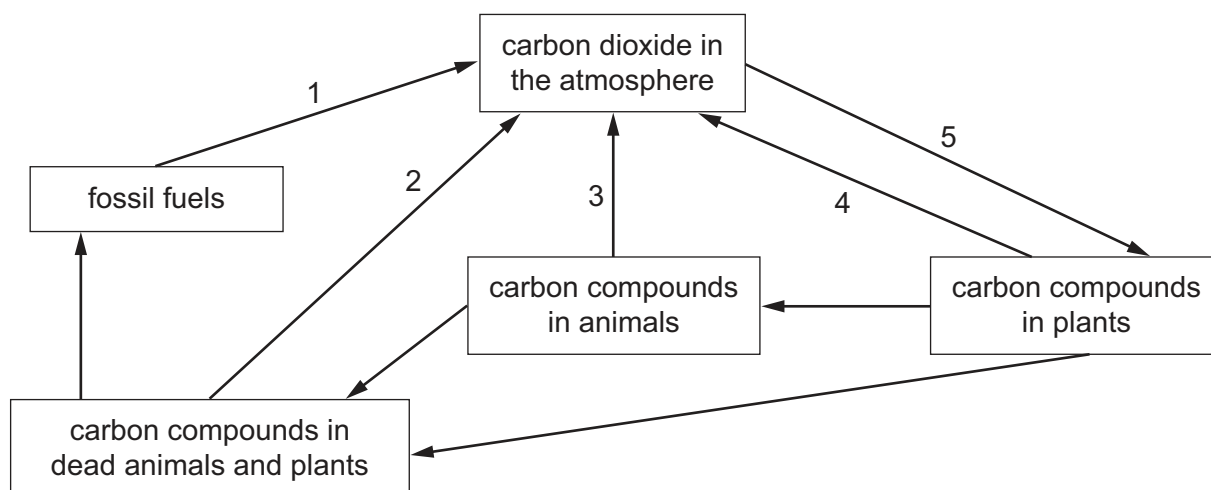
	offspring are genetically identical to each other	offspring are genetically identical to the parent	the zygote is produced when gametes fuse
A	✓	✓	x
B	✓	x	x
C	x	✓	✓
D	x	x	✓

11 The diagram shows an insect-pollinated flower.

Which label identifies a petal?



12 The diagram shows part of the carbon cycle.



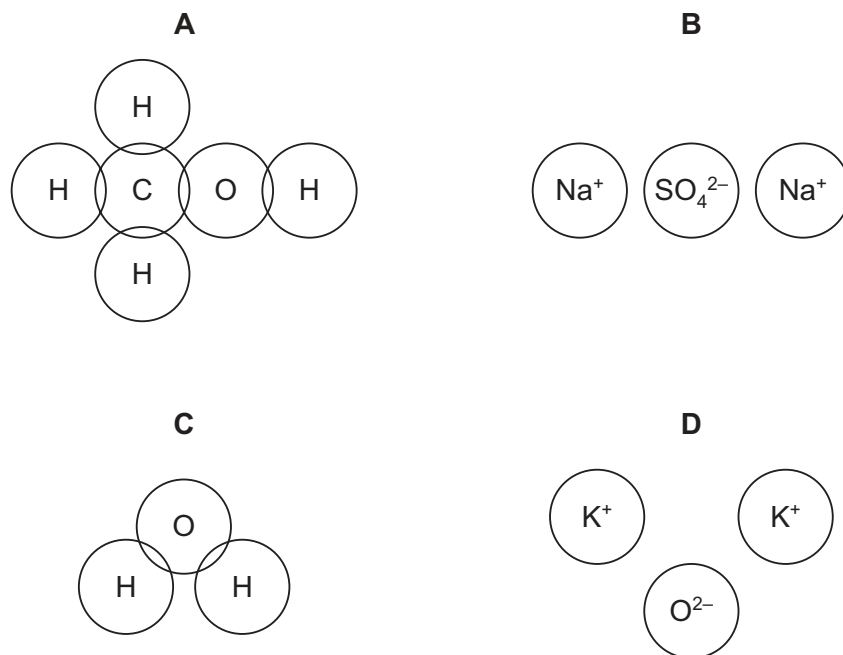
Which processes use oxygen and produce oxygen?

	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?

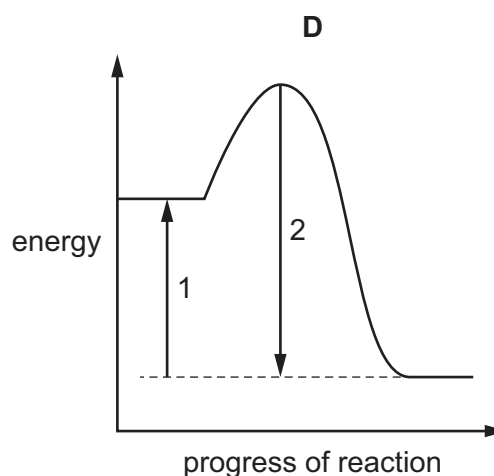
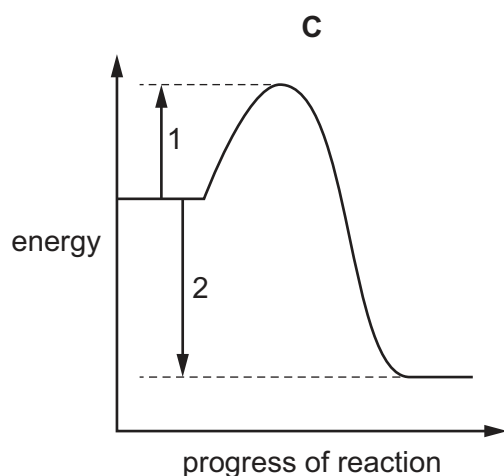
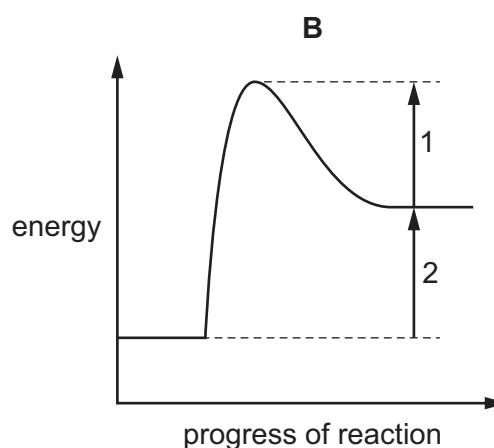
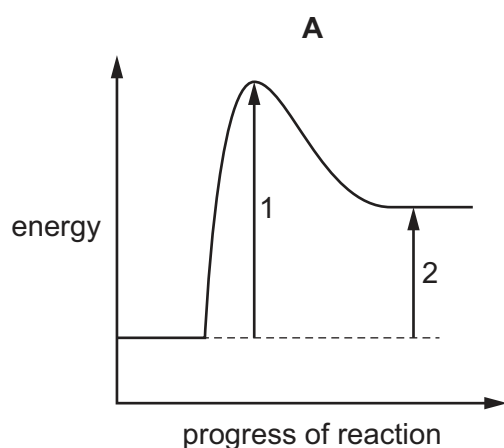
- A $\text{Pb}^{2+}(\text{aq}) + \text{Cl}^{2-}(\text{aq}) \rightarrow \text{PbCl}(\text{s})$
 B $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^{-}(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$
 C $\text{Na}^{+}(\text{aq}) + \text{NO}_3^{-}(\text{aq}) \rightarrow \text{NaNO}_3(\text{aq})$
 D $\text{Na}^{+}(\text{aq})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

- 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.

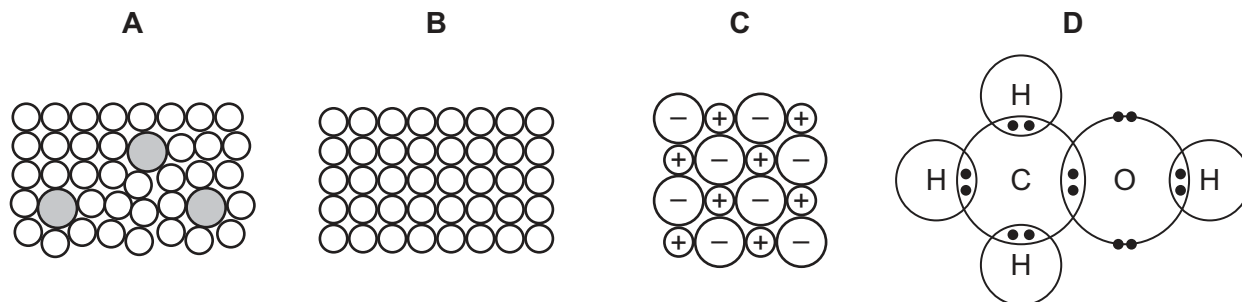
Which anion is present in X?

- 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 $2\text{KCl} + \text{I}_2 \rightarrow 2\text{KI} + \text{Cl}_2$

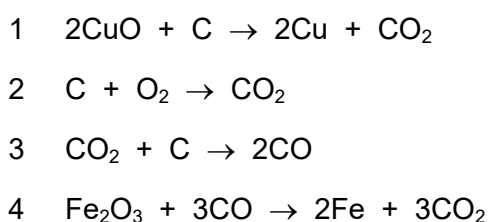
23 Which diagram represents an alloy?



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

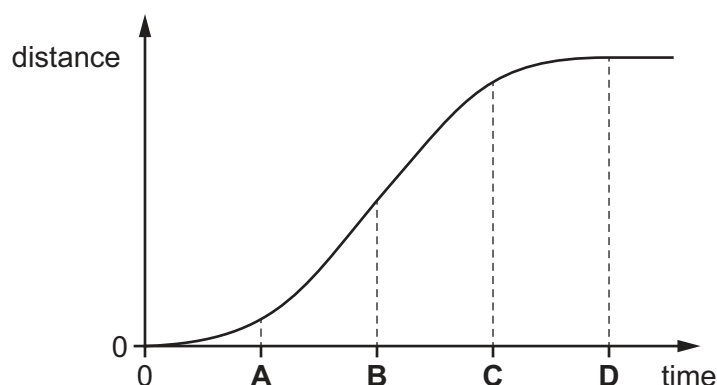
27 Which statement about alkanes is correct?

- 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

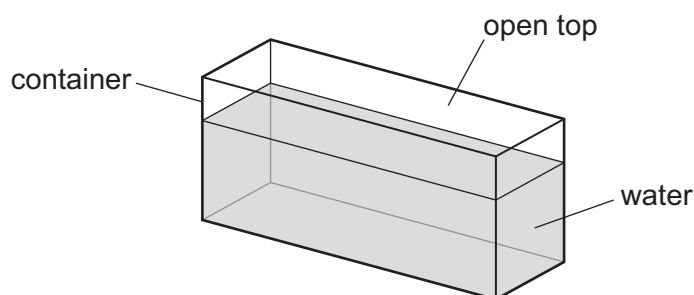
32 Which row describes the arrangement and separation of the particles in a liquid?

	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?

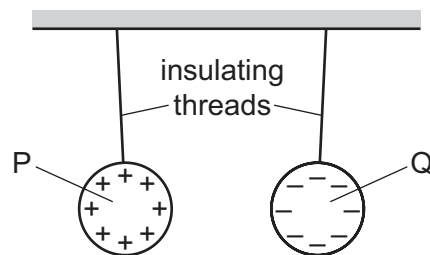
- A compression
- B medium
- C rarefaction
- D reflection

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

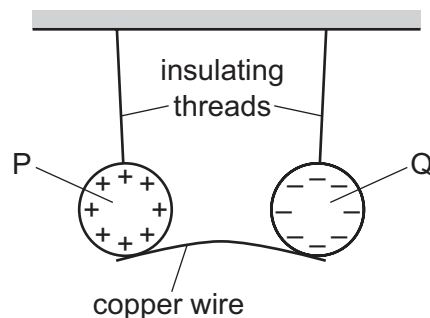
Which amplitude and frequency produces the louder, higher-pitched sound?

- 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.



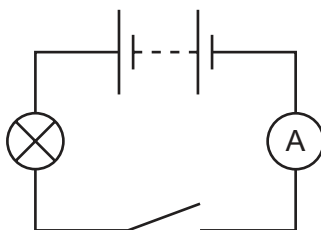
The spheres are now joined by a copper wire.



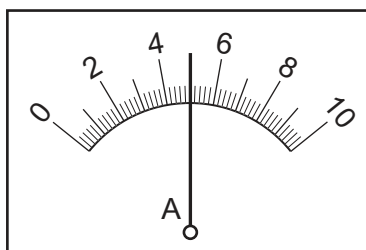
What happens in the copper wire?

- 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