

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Ordinary Level

SCIENCE (PHYSICS, CHEMISTRY)

5124/01

Paper 1 Multiple Choice

October/November 2009

1 hour

Additional Materials:

Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

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.

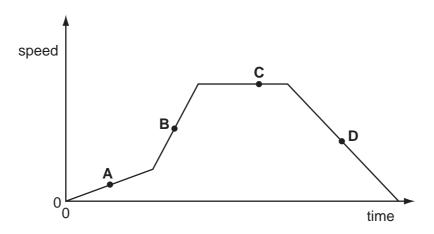
A copy of the Periodic Table is printed on page 16.

This document consists of 13 printed pages and 3 blank pages.



- 1 What gives the most accurate value for the internal diameter of a test tube?
 - a measuring tape
 - В a metre rule
 - C a micrometer screw gauge
 - D vernier calipers
- 2 The speed-time graph shows the journey of a train.

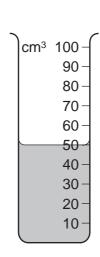
At which point does the acceleration have its highest value?

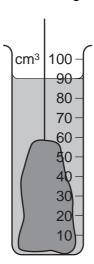


3 A horizontal force of 8 N is applied to a block of mass 2 kg, resting on a frictionless table.

What is the acceleration of the block?

- $0.25 \,\mathrm{m/s^2}$
- **B** $4.0 \,\mathrm{m/s^2}$ **C** $6.0 \,\mathrm{m/s^2}$
- **D** $16 \, \text{m/s}^2$
- 4 An object of mass 100 g is immersed in water as shown in the diagram.





What is the density of the material from which the object is made?

- $\mathbf{A} \quad 0.4 \,\mathrm{g/cm^3}$
- **B** $0.9 \,\mathrm{g/cm^3}$
- $1.1 \,\mathrm{g/cm^3}$
- **D** $2.5 \,\mathrm{g/cm^3}$

| 5 | If a | nut and bolt are | diffi | cult to undo, it | may l | be easier to tu | urn the | nut by using a longer spanner. |
|---|------|--------------------------------------|---------|-----------------------------------|--------|------------------------------|--------------------|-------------------------------------|
| | Thi | s is because the | e lon | ger spanner giv | es | | | |
| | Α | a larger turning | g mo | ment. | | | | |
| | В | a smaller turnir | ng m | oment. | | | | |
| | С | less friction. | | | | | | |
| | D | more friction. | | | | | | |
| 6 | A c | crane lifts a conc | rete | block, whose w | /eight | t is 60 000 N, | to a he | ight of 20 m in 30 s. |
| | Wh | nat power is achi | evec | I by the crane? | | | | |
| | A | 100W | В | 4000 W | С | 40 000 W | D | 90 000 W |
| 7 | | e earliest Ford ckly than lighter | | • | • | | | because black paint dried more dry. |
| | Wh | nich property of b | olack | paint makes it | dry n | nore quickly? | | |
| | Α | It is the best at | osort | er of heat. | | | | |
| | В | It is the best co | ondu | ctor of heat. | | | | |
| | С | It is the best in | sulat | or of heat. | | | | |
| | D | It is the best re | flect | or of heat. | | | | |
| 8 | The | e volume of a fix | ed n | nass of liquid ca | an be | used to meas | sure tei | mperature. |
| | Wh | ny is this? | | | | | | |
| | Α | It can be colou | red. | | | | | |
| | В | It expands whe | en it i | s heated. | | | | |
| | С | It is a poor con | duct | or of heat. | | | | |
| | D | It is cheap. | | | | | | |
| 9 | The | e frequency of a | cert | ain v.h.f. radio t | ransı | mitter is 2×10^{-1} | 0 ⁸ Hz. | |
| | The | e speed of the w | aves | s is $3 \times 10^8 \mathrm{m/s}$ | - | | | |
| | Wh | nat is the wavele | ngth | ? | | | | |
| | Α | 0.67 m | В | 1.0 m | С | 1.5 m | D | 6.0 m |
| | | | | | | | | |
| | | | | | | | | |

10 A ray of light travels from air into glass. The refractive index of the glass is 1.5.

Which of the following pairs could be values of the angle of incidence and the angle of refraction?

| | angle of incidence | angle of refraction |
|---|--------------------|---------------------|
| Α | 21.5° | 20.0° |
| В | 40.0° | 30.0° |
| С | 60.0° | 35.3° |
| D | 80.0° | 53.3° |

11 A sonic 'tape measure' is used to measure the length of a room. It measures a time interval of 0.060 s between transmitting a sound pulse and receiving the echo. The speed of sound in air is 330 m/s.

How far is the reflecting wall from the 'tape measure'?

- **A** 5.5 m
- **B** 9.9 m
- **C** 11 m
- **D** 20 m

12 An electrical quantity is defined as 'the energy dissipated by a source in driving unit charge round a complete circuit.'

What is this quantity called?

- A current
- **B** electromotive force
- **C** potential difference
- **D** power

13 A wire has a resistance of 8Ω . A second wire, made of the same material, has half the length and twice the cross-sectional area.

What is the resistance of the second wire?

- **A** 1Ω
- **B** 2Ω
- \mathbf{C} 8 Ω
- **D** 16Ω

14 A set of lights consists of 40 identical lamps connected in series to a 240 V mains supply.

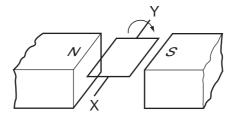
What is the potential difference across each lamp?

- **A** 6V
- **B** 40 V
- **C** 240 V
- **D** 9600 V

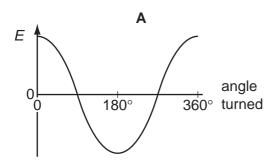
15 An electric kettle is plugged in and switched on. The fuse in the plug blows immediately.

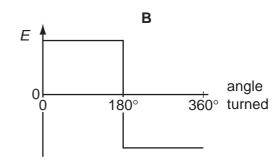
Which single fault could cause this?

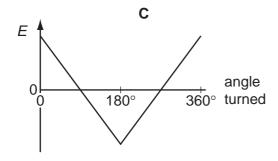
- **A** The earth wire is not connected to the kettle.
- **B** The live wire and neutral wire connections in the plug are swapped around.
- **C** The live wire touches the metal case of the kettle.
- **D** The wires connected to the plug are too thin.
- **16** In a simple a.c. generator, a coil is rotated about a horizontal axis XY between the poles of two bar magnets.

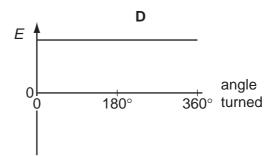


Which graph shows the e.m.f., E, induced in the coil during one complete revolution?









- 17 Which statement about the action of a transformer is correct?
 - A An e.m.f. is induced in the secondary coil when an alternating voltage is applied to the primary coil.
 - An e.m.f. is induced in the secondary coil when there is a steady direct current in the primary coil
 - **C** The current in the secondary coil is always larger than the current in the primary coil.
 - **D** The voltage in the secondary coil is always larger than the voltage in the primary coil.

18 Two nuclides of neon are represented by the symbols below.

²⁰₁₀Ne

²²₁₀Ne

One nuclide contains more particles than the other.

What are these extra particles?

- A electrons
- **B** ions
- C neutrons
- **D** protons
- 19 Radioactive decay occurs in some nuclei.

Which word describes these nuclei?

- A expanding
- **B** neutral
- C stable
- **D** unstable
- 20 The half-life of a radioactive material is 24 years.

The activity of a sample falls to a fraction of its initial value after 72 years.

What is the fraction?

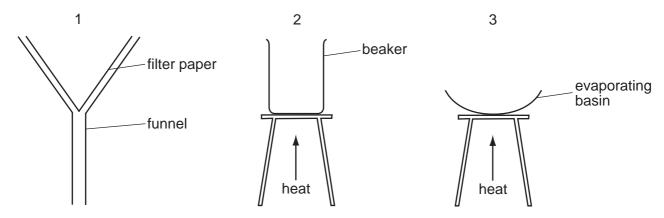
A $\frac{1}{3}$

B $\frac{1}{4}$

c <u>{</u>

 $D = \frac{1}{8}$

21 The diagrams show three sets of apparatus.



What apparatus would be used to obtain separate samples of sand and salt from a mixture of sand and seawater?

A 1 only

B 1 and 3

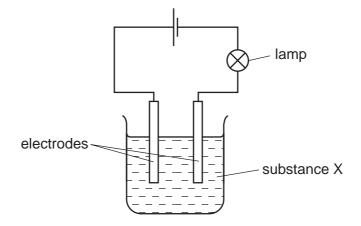
C 2 and 3

D 3 only

22 The symbol for an atom of potassium is $^{39}_{19}$ K.

What does the number 39 represent for an atom of potassium?

- A the number of nucleons
- B the number of protons
- **C** its position in the Periodic Table
- **D** the number of electrons plus protons plus neutrons
- 23 In the circuit below, the lamp lights up.



What could substance X be?

- A a solution of ethanol in water
- **B** a solution of sodium chloride in water
- **C** liquid ethanol
- D solid sodium chloride
- 24 Which pair of elements form a compound by sharing electrons?
 - A carbon and chlorine
 - B lithium and iodine
 - **C** neon and oxygen
 - D potassium and bromine

25 The following equation is incomplete.

2KOH +
$$H_2SO_4 \rightarrow X$$

What is represented by X?

A
$$KSO_4 + H_2O$$

B
$$K_2SO_4 + H_2O$$

C KSO₄ +
$$2H_2O$$

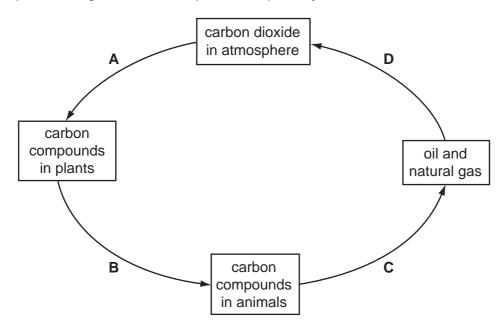
D
$$K_2SO_4 + 2H_2O$$

26 For the reaction shown, which volume of 1.0 mol / dm³ hydrochloric acid is required to react completely with 3 g of magnesium?

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

- \mathbf{A} 3 cm³
- \mathbf{B} 6 cm³
- **C** 125 cm³
- **D** $250 \, \text{cm}^3$

27 Which step in the diagram shows the process of photosynthesis?



28 Calcium carbonate was reacted with an excess of dilute hydrochloric acid at room temperature.

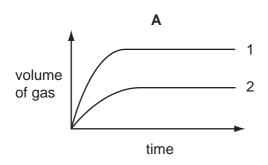
$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

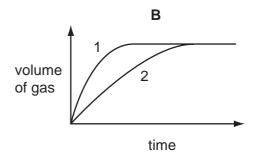
Two experiments were carried out.

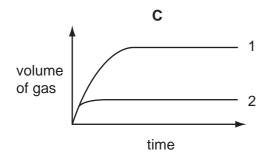
Experiment 1 10 g of calcium carbonate in large lumps

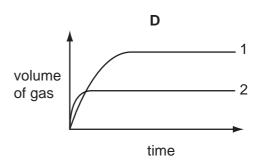
Experiment 2 5g of calcium carbonate as a fine powder

Which graph is correct?









29 Which reactants could be used safely to prepare potassium chloride?

- A aqueous potassium hydroxide and dilute hydrochloric acid
- B aqueous potassium sulfate and aqueous sodium chloride
- C potassium and aqueous sodium chloride
- D potassium and dilute hydrochloric acid

30 Caesium is in the same group of the Periodic Table as sodium and potassium.

What is a property of caesium?

- A It does not conduct electricity.
- B It forms an acidic oxide.
- **C** It forms an ionic chloride, $CsCl_2$.
- **D** It reacts with water, forming hydrogen.

31 Which row in the table gives a correct use for the metal stated?

| | metal | use |
|---|------------|-------------------------|
| Α | aluminium | manufacture of aircraft |
| В | copper | galvanising dustbins |
| С | mild steel | cutlery |
| D | zinc | cooking utensils |

32 Nickel is placed between zinc and iron in the reactivity series.

Which metal reduces the oxide of nickel?

- A copper
- **B** iron
- C lead
- **D** magnesium

33 Which shows both the correct source and the correct effect of the named pollutant?

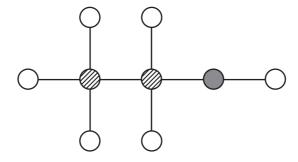
| | pollutant | source | effect |
|---|--------------------|------------------------------------------------------|----------------|
| A | carbon monoxide | incomplete combustion of carbon-containing materials | global warming |
| В | oxides of nitrogen | decaying vegetable matter | global warming |
| С | ozone | photochemical reactions | acid rain |
| D | sulfur dioxide | volcanoes | acid rain |

- 34 Which compound provides two elements essential to plant growth?
 - A potassium chloride
 - B potassium nitrate
 - C sodium phosphate
 - **D** sodium sulfate
- 35 Methane the main constituent of
 - A diesel.
 - B naphtha.
 - C natural gas.
 - **D** petrol.

36 Propene is an unsaturated hydrocarbon. Its structure is shown.

What is produced when propene reacts with bromine?

37 The diagram represents an organic compound that contains three different elements.



What could the compound be?

- ethanoic acid
- В ethanol
- C propane
- D propene

- 38 Which statement about a compound means that it **must** be an alkane?
 - A It burns easily in air or in oxygen.
 - **B** It contains carbon and hydrogen only.
 - **C** It has the general formula C_nH_{2n+2} .
 - **D** It is generally unreactive.
- **39** A compound, X, has a molecular formula $C_4H_8O_2$ and can be prepared by the reactions shown.



What is the structural formula of X?

- A HCO₂CH₂CH₂CH₃
- B CH₃CO₂CH₂CH₃
- C CH₃CH₂CO₂CH₃
- D CH₃CH₂CH₂CO₂H
- 40 In which pair of macromolecules are the linkages the same?
 - A fats and proteins
 - B nylon and fats
 - C nylon and proteins
 - **D** proteins and *Terylene*

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DATA SHEET
The Periodic Table of the Elements

| | | | | | | | | Ğ | Group | | | | | | | | |
|-----------------------------|----------------------------------------------------|-------------------------------------------------------------------------|-------------------------------|----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-----------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------------|------------------------------------|
| _ | = | | | | | | | | | | | | 2 | ^ | IN | II/ | 0 |
| | | | | | | | 1 Hydrogen | | | | | | | | | | 4 He Helium |
| 7 Lithium 3 | Be Beryllium 4 | , E | | | | | | | | | | 11 Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen | 19 T Fluorine | 20 Ne Neon |
| 23 Na Sodium | Mg Magnesium | & | | | | | | | ļ | | | 27 A 1 Aluminium 13 | 28 Si Silicon | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 C1 Chlorine | 40 Ar Argon |
| 39 K Potassium | Ca Calcium | 45 Sc no Scandium | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron | 59 Co Cobalt | 59 Ni Nickel 28 | 64 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium | AS As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 |
| Rb Rubidium 37 | Sr m Strontium | 89 Y | 2 r Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | Tc Technetium 43 | 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 | 122 Sb Antimony 51 | Te Te Tellurium 52 | 127 I lodine 53 | 131 Xe Xenon Xenon 54 |
| Caesium 55 | 137 Ba m Barium 56 | 139 La n Lanthanum s | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 I r Indium | 195 Pt Platinum 78 | 197 Au Gold | 201 Hg Mercury 80 | 204 T 1 Thallium 81 | 207 Pb Lead | 209 Bi Bismuth | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |
| Fr Francium 87 | 226 Ra m Radium | 227 A AC n Actinium | | | | | | | | | | | | | | | |
| *58-71 190-10 | *58-71 Lanthanoid serie 190-103 Actinoid series | *58-71 Lanthanoid series 190-103 Actinoid series | | 140 Ce Cerium 58 | Pr Praseodymium 59 | Neodymium 60 | Pm Promethium 61 | 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 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |
| Key | в Х | a = relative atomic mass X = atomic symbol b = proton (atomic) number | | 232 Th Thorium | Pa Protactinium 91 | 238 U Uranium 92 | Neptunium | Pu Plutonium 94 | Am Americium 95 | Cm Curium | BK Berkelium 97 | Californium | ES Einsteinium 99 | Fm Fermium | Md Mendelevium 101 | | Lr Lawrencium 103 |

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

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