Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4435127001

PHYSICAL SCIENCE **0652/32**

Paper 3 (Core) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

A copy of the Periodic Table is printed on page 20.
Electronic calculators may be used.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

[Turn over

1 A student measures the density of a liquid.

Fig. 1.1 shows the apparatus she uses.

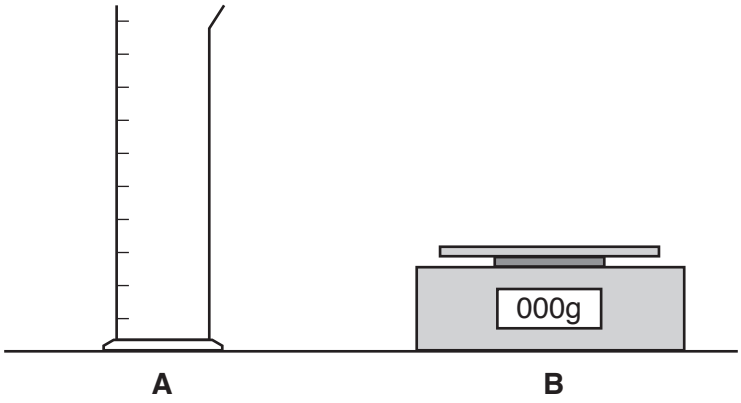


Fig. 1.1

(a) (i) Name apparatus **A**, which is used to measure the volume of the liquid.

.....[1]

(ii) Name apparatus **B**, which is used to measure the mass of the liquid.

.....[1]

(b) Table 1.1 shows the student's results.

Table 1.1

mass of **A** when empty / g	mass of **A** and liquid / g	volume of liquid / cm^3
275	429	118

(i) Calculate the mass of the liquid in **A**.

.....g [1]

(ii) Calculate the density of the liquid in **A**.

Show your working and give a unit.

density = ... unit ..... [3]

(c) The student pours the liquid into a beaker.

She puts some aluminium powder at the bottom of the beaker.

She gently heats the beaker, as shown in Fig. 1.2.

She observes the aluminium powder slowly move upwards.

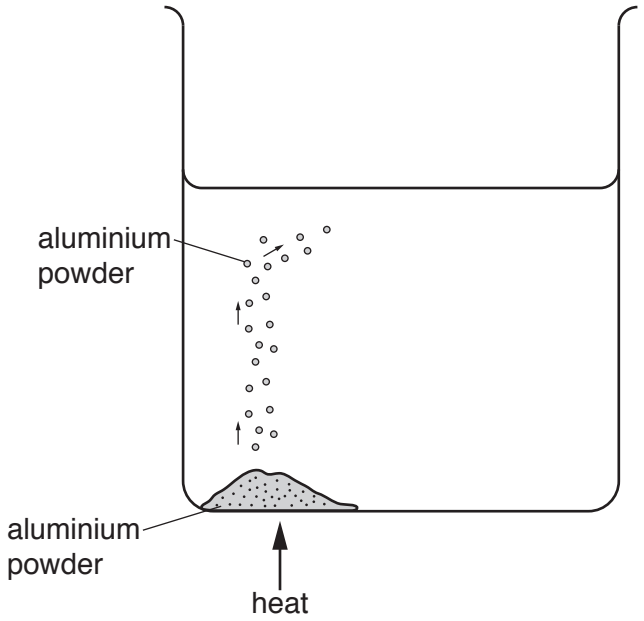


Fig. 1.2

(i) Fill in the blanks in the sentence to explain why the aluminium powder moves upwards.

When the liquid is heated it ....., causing the density to

..... and the warm water to rise to the top of the liquid. [2]

(ii) Name the method of thermal energy transfer that the experiment demonstrates.

..... [1]

[Turn over

2 Complete the passage by writing terms from the list in the blank spaces.

Each term may be used once, more than once or not at all.

addition polymerisation **bitumen** **boiling points** **chromatography**

diesel **ethanol** **fractional distillation** **gases**

hydrocarbons **melting points** **paraffin**

Crude oil is a mixture of ..... . The components in crude oil are separated using ..... .

This process depends on the different ..... of the components.

The molecules in crude oil with the longest carbon chains make up the fraction called ..... . One of the products made from crude oil is ethene, which can be made into poly(ethene) by a process called ..... .

[5]

3 **(a)** Fill in the blanks in the sentences to describe the operation of the solar cells.

Solar energy is transferred to the Earth by infra-red and ..... radiation.

Solar energy from the ..... is converted by the solar cells to

..... energy. [3]

(b) **(i)** Nuclear power stations use nuclear fission to produce power.

Explain what is meant by *nuclear fission*.

.....

.....

.....

.....

.....[3]

(ii) Suggest **one** advantage and **one** disadvantage of nuclear power stations compared with coal-fired power stations.

advantage of nuclear power stations

.....

.....

disadvantage of nuclear power stations

.....

.....[2]

[Turn over

4 Fig 4.1 shows apparatus used to react iron filings with air.

Fig 4.2 shows the same apparatus a few days later.

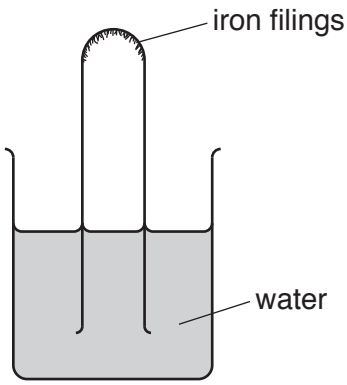


Fig. 4.1

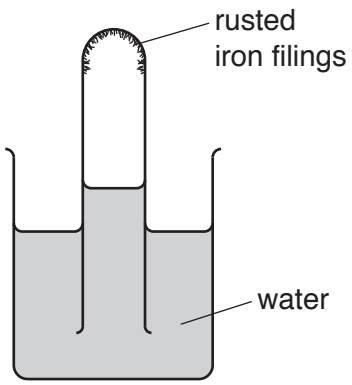


Fig. 4.2

(a) (i) The oxygen in the air in the test-tube reacts with the iron.

Suggest why the water level stops rising 21% of the way up the test-tube.

.....

.....[1]

(ii) Name the main gas present in the test-tube in Fig. 4.2 after the oxygen has reacted.

.....[1]

(b) (i) Balance the equation for the reaction between iron and oxygen.

..... Fe + ... O_2 → ..... Fe_2O_3 [1]

(ii) Name the type of reaction shown in this experiment.

.....[1]

(c) The experiment is repeated using copper instead of iron.

Suggest what is observed.

Give a reason for your answer.

observation .....

.....

reason .....

.....[2]

5 **(a)** Fig. 5.1 shows a ray of light incident on the surface of a rectangular glass block.

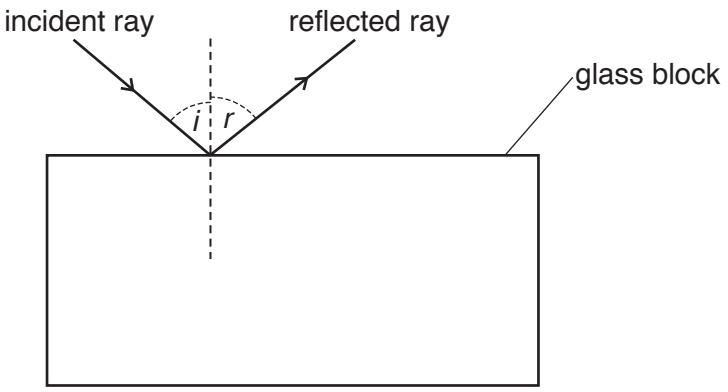


Fig. 5.1

Some of the light is reflected at the surface and some is refracted through the block.

(i) State the relationship between angle *i* and angle *r* shown on Fig. 5.1.

.....[1]

(ii) On Fig. 5.1, draw the refracted ray through the glass block and out again. [2]

(b) Fig 5.2 shows two rays of light from a small lamp at the bottom of a swimming pool.

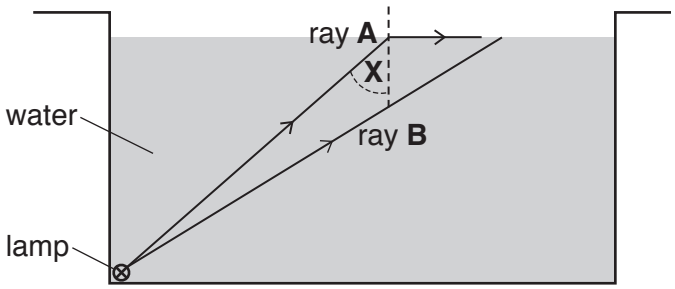


Fig. 5.2

(i) Ray **A** emerges parallel to the surface of the water.

Name the incident angle **X** shown in Fig. 5.2.

.....[1]

(ii) Complete ray **B** to show its path after it reaches the surface of the water. [1]

6 **(a)** Zinc reacts with hydrochloric acid to form hydrogen.

A student sets up the apparatus shown in Fig. 6.1 to collect the hydrogen from this reaction.

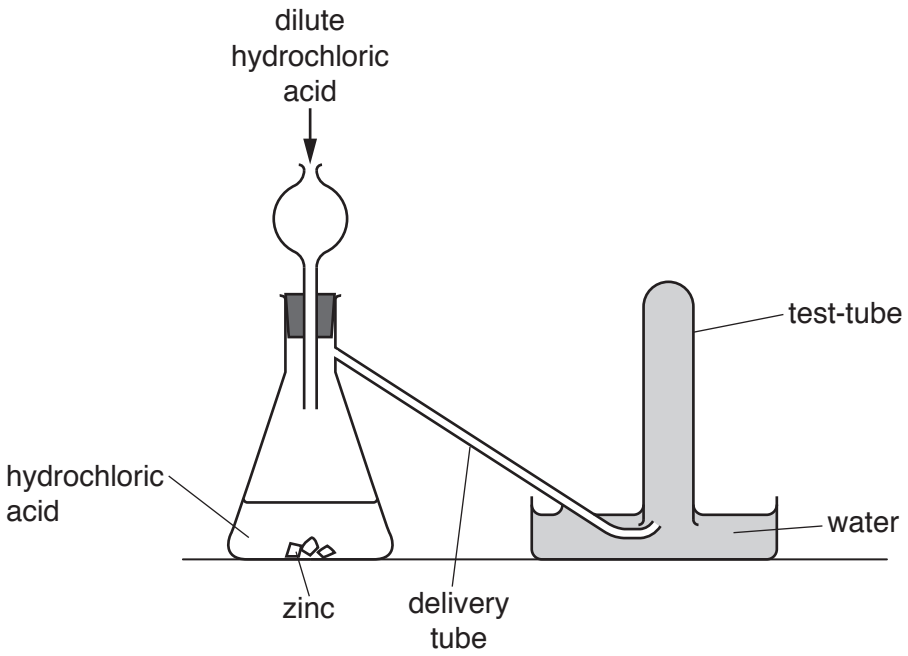


Fig. 6.1

(i) The apparatus has not been set up correctly. The hydrogen escapes into the atmosphere instead of going along the delivery tube.

Suggest how the apparatus could be safely changed so that the hydrogen is collected in the test-tube.

.....

.....[1]

(ii) Adding a catalyst to a reaction increases the rate of that reaction.

State **two** other ways of making the reaction shown in Fig. 6.1 faster.

1 .....

2 .....

[2]

(iii) State what is observed when a lighted splint is placed near the mouth of a test-tube full of hydrogen.

.....

.....[1]

[Turn over

(b) Hydrogen is used as a fuel.

(i) State what is meant by a *fuel*.

.....

.....[1]

(ii) State the product(s) when hydrogen is used as a fuel.

.....[1]

(iii) Hydrogen is rarely used as a fuel for cars.

Suggest **two** reasons why it is difficult to use hydrogen as a fuel for cars.

1 .....

.....

2 .....

.....
[2]

7 **(a)** Pitchblende is an ore of uranium.

State what is meant by an *ore*.

.....

.....[1]

(b) Pitchblende contains radioactive isotopes.

A scientist examines the radioactive nature of pitchblende.

Fig. 7.1 shows the apparatus that is used.

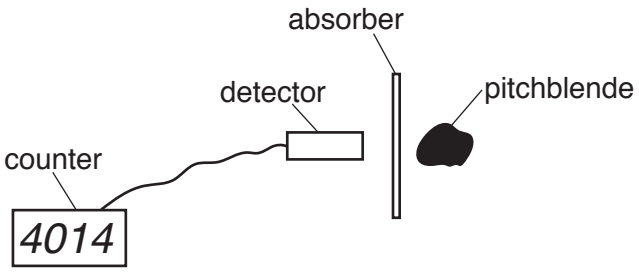


Fig. 7.1

The count on the count meter shows the number of emissions detected by the detector.

The emissions over 5 minutes are measured with no pitchblende present.

Different absorbers are then placed between the detector and the pitchblende.

The number of emissions over 5 minutes for each absorber is measured using the detector and the count meter.

The experiment is repeated.

Table 7.1 over the page shows the results.

[Turn over

Table 7.1

	count				
test	A	B	C	D	E
pitchblende	No	Yes	Yes	Yes	Yes
absorber	none	none	3 cm lead	3 cm aluminium	0.1 mm aluminium
experiment 1	38	5049	1045	1855	2735
experiment 2	42	5026	1058	1835	2812

(i) State why there is a count, even when there is no pitchblende near the apparatus.

.....

.....[1]

(ii) Identify from Table 7.1 which two tests show that α-radiation is present in the emissions from pitchblende.

test ..... and test ..... [2]

(iii) Describe the nature of an α-particle.

.....

.....

.....

.....[2]

(iv) The results for experiment 2 are slightly different from the results for experiment 1.

Explain what this tells us about the nature of radioactive emission.

.....

.....[1]

8 Table 8.1 gives information about some elements of the Periodic Table.

Table 8.1

element	group	proton number	nucleon number	electron arrangement	state at room temperature	ion
argon	VIII	18	40	2.8.8	.....	does not ionise
fluorine	.....	9	19	2.7	.....	F^-
sodium	I	11	23	.....	solid	.....
sulfur	VI	.....	.....	2.8.6	solid	S^{2-}

Complete Table 8.1 by writing in the correct information in the blank spaces. [7]

[Turn over

9 Fig. 9.1 shows an electrical circuit.

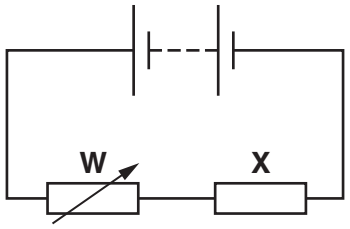


Fig. 9.1

(a) **(i)** Identify the component labelled **W**.

W is a ..... [1]

(ii) The resistance of component **W** is increased.

State the effect, if any, this has on the current in the resistor **X**.

.....[1]

(b) Fig. 9.2 shows a second circuit.

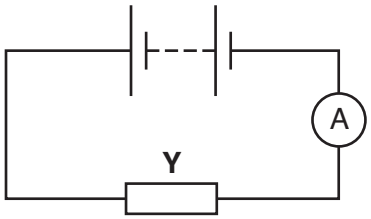


Fig. 9.2

Resistor **Y** has a resistance of 8.0 Ω.

(i) On Fig. 9.2, draw a voltmeter to measure the potential difference across the battery. Use the circuit symbol for a voltmeter. [2]

(ii) The voltmeter reads 4.6 V.

Calculate the current in the circuit.

Show your working.

current = ... A [2]

(c) **(i)** On Fig. 9.3, draw a second resistor connected in parallel with resistor **Y**. Label this resistor with a '**Z**'.

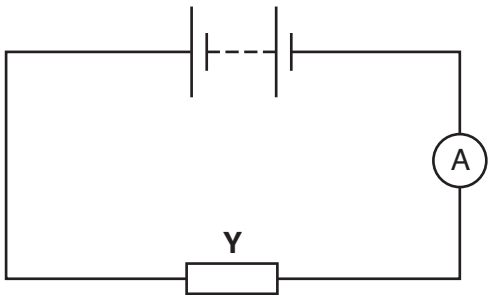


Fig. 9.3

[1]

(ii) State how the ammeter reading in this circuit compares with the ammeter reading in the circuit in Fig. 9.2.

.....[1]

[Turn over

10 **(a)** Gold is described as a native metal.

(i) Suggest what is meant by *native metal*.

.....

.....[1]

(ii) Name **one** other native metal.

.....[1]

(b) Aluminium is extracted from an ore.

(i) Name an ore of aluminium.

.....[1]

(ii) Iron ore is heated with carbon to extract iron.

State why carbon **cannot** be used to extract aluminium from its ore.

.....

.....[1]

(iii) Aluminium and stainless steel are used to make saucepans.

Name **two** other uses of stainless steel.

1 .....

2 .....

[2]

11 **(a)** A student has three metal bars, **A**, **B** and **C**.

The bars are aluminium, iron, and a magnet.

He uses a second magnet to test each bar.

- The magnet attracts both ends of bar **A**.
- There is no force between the magnet and bar **B**.
- The magnet attracts one end of bar **C** and repels the other end.

Identify which bar, **A**, **B** and **C** is

aluminium, ...

iron, ...

a magnet. ..... [2]

(b) The student hangs two nails on the magnet, as shown in Fig. 11.1.

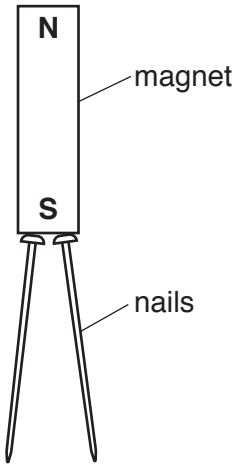


Fig. 11.1

(i) Label, on Fig. 11.1, the poles induced in each nail. [1]

(ii) Explain why the nails hang with the lower ends separated as shown in Fig. 11.1.

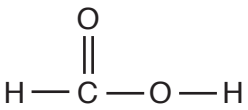
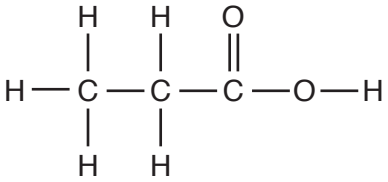
.....

.....[1]

[Turn over

12 Table 12.1 gives some information about members of a homologous series of acids.

Table 12.1

acid	formula	structure
methanoic	HCO_2H	
ethanoic	CH_3CO_2H	
propanoic	$C_2H_5CO_2H$	

(a) Explain what is meant by the term *homologous series*.

.....

.....

.....[2]

(b) Draw the structure of ethanoic acid in the space below.

[2]

(c) Ethanoic acid reacts with sodium hydroxide.

One of the products is a salt called sodium ethanoate.

Name the other product.

.....[1]

(d) Ethanoic acid is a weak acid.

(i) Suggest the pH of ethanoic acid.

..... [1]

(ii) State how you would measure the pH of ethanoic acid.

.....[1]

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

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
actinoids	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 dm^3 at room temperature and pressure (r.t.p.).