UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICAL SCIENCE **0652/02**

Paper 2 (Core) **October/November 2010**

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 a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
A copy of the Periodic Table is printed on page 20.

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.

For Examiner's Use	
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Total	

This document consists of **17** printed pages and **3** blank pages.

For Examiner's Use

1 Copper is extracted from malachite, an ore containing copper carbonate, $CuCO_3$.

(a) Calculate the relative formula mass of copper carbonate.

relative formula mass ..... [2]

(b) Heating copper carbonate produces copper(II) oxide, CuO, and carbon dioxide.

Write a balanced equation for this reaction.

..... [1]

(c) Heating copper carbonate with carbon (charcoal) produces copper. The equation for this reaction is:

$$2CuCO_3 + C \rightarrow 2Cu + 3CO_2$$

(i) Describe how you could show that carbon dioxide has been given off.

.....

..... [2]

(ii) The copper is formed as a pinkish brown solid.

State how you could show that it is a metal.

..... [1]

For Examiner's Use

2 Fig. 2.1 shows two conducting spheres. Sphere **B** is connected to earth through a sensitive ammeter. Sphere **A** has a very large positive charge on it. When sphere **B** is brought near to sphere **A**, a spark jumps between the two spheres and the ammeter needle moves rapidly up the scale and then back to zero.

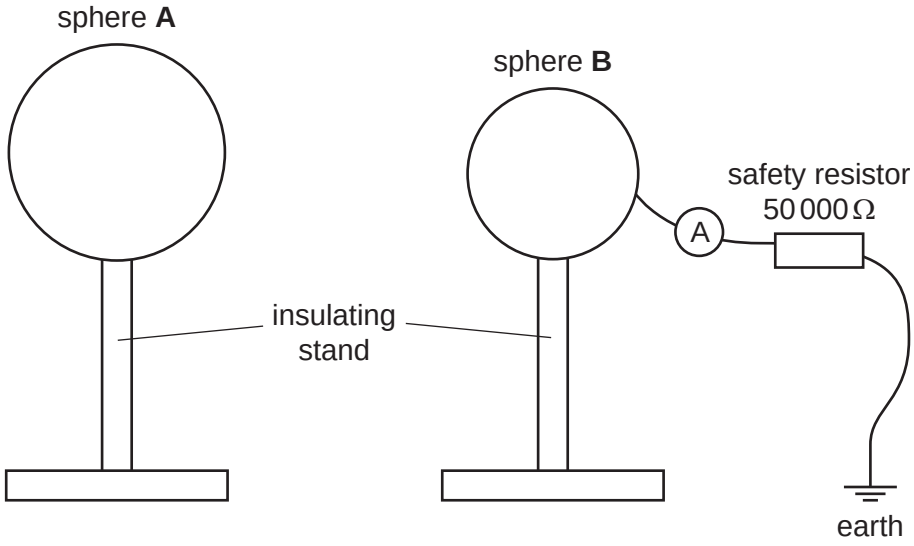

Fig. 2.1

(a) (i) Explain why the ammeter needle moves.

.....

.....

..... [2]

(b) The current through the ammeter is 0.0012 mA.

Calculate the potential difference across the safety resistor.

potential difference = ... [3]

3 Fig. 3.1 shows a side view of a shallow pool.

For Examiner's Use

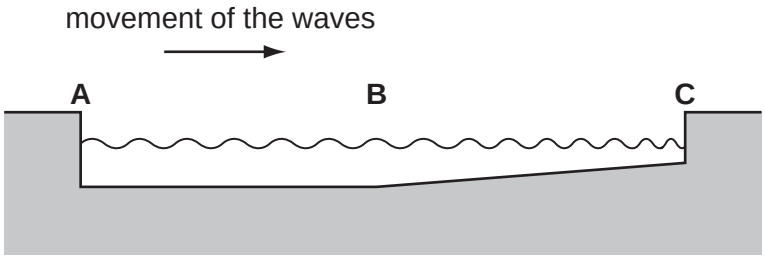

Fig. 3.1

Some waves move across the surface of the water.

(a) (i) Mark on the diagram, between **A** and **B**, **one** wavelength of the waves. [1]

(ii) Explain why the wavelength of the waves changes as the waves go across the pool from **B** to **C**.

.....

.....

..... [2]

(b) In 4.0 s a boy counts 18 waves hitting the side of the pool.

Calculate the frequency of the waves.

frequency = ... [2]

(c) When the pool is perfectly calm, a boy observes that an image of a lamp is formed as shown in Fig 3.2.

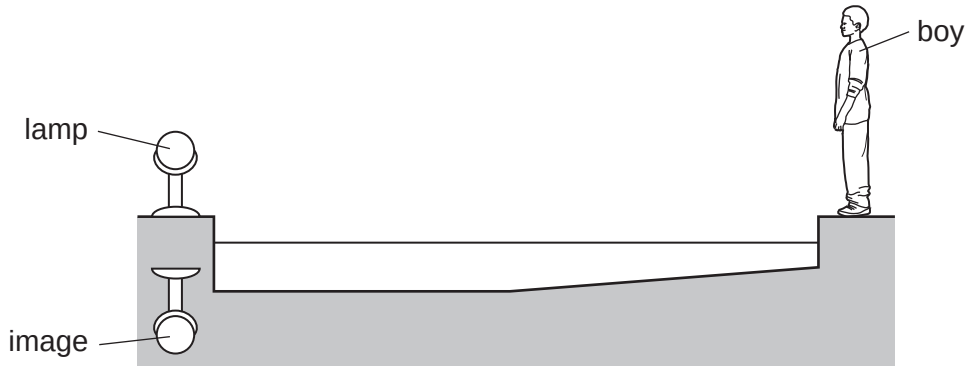

Fig. 3.2

(i) On Fig. 3.2, draw a ray from the lamp to the boy's eye to show how the image is formed. [2]

(ii) The image formed is virtual.

Explain what is meant by a *virtual image*.

.....

..... [1]

For Examiner's Use

4 **(a)** **(i)** Name the acid which is reacted with zinc to make zinc chloride.

.....

[1]

(ii) Name the gas formed during the reaction.

.....

[1]

(iii) Complete and label Fig. 4.1 to show how a sample of the gas, produced in this reaction, could be collected.

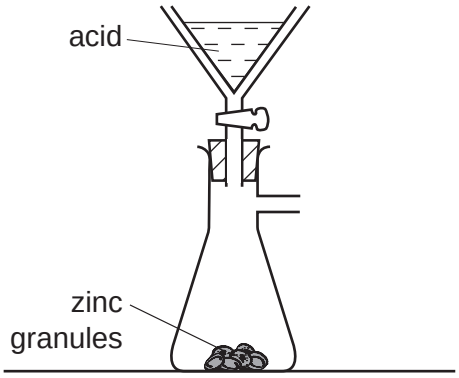

Fig. 4.1

[2]

(b) Calculate the mass of zinc in 272 g of zinc chloride, $ZnCl_2$.

[relative atomic masses, A_r: Zn, 65; Cl, 35.5]

mass of zinc ..... g [2]

For Examiner's Use

5 A student measures the density of sea water.

(a) (i) Name **two** pieces of apparatus he might use.

1. .....

2. ..... [2]

(ii) State the measurements he makes.

.....

.....

..... [2]

(iii) Explain how he uses his results to find the density of sea water.

.....

.....

..... [2]

(b) A beaker contains 280 g of sea water which has a density of 1.12 g / cm^3.

Calculate the volume of sea water in the beaker.

volume = ... cm^3 [2]

6 Cora has a test-tube containing molten naphthalene. She allows the naphthalene to cool recording the temperature every 10 s. Fig. 6.1 shows the graph she plotted from her readings.

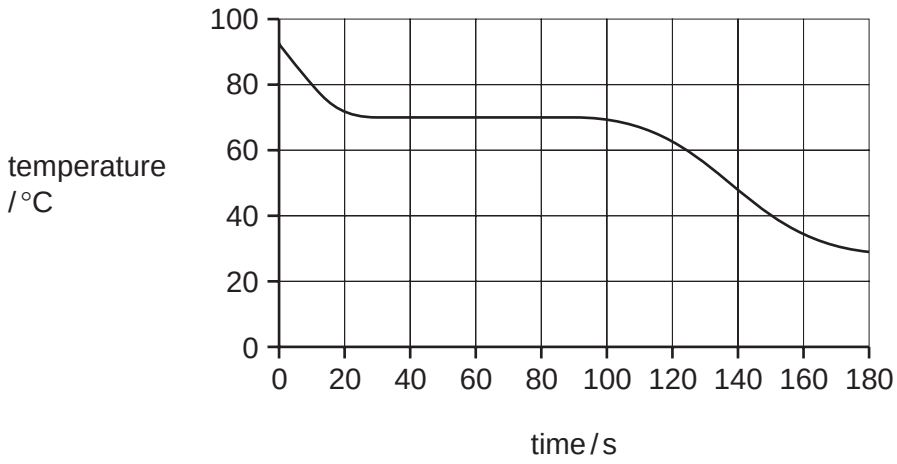

Fig. 6.1

(a) Explain why the results produce a graph with a flat section between 30 s and 100 s.

.....

.....

..... [2]

(b) It is a very hot day so Cora and her brother decide to go to the beach. Cora takes a bottle of frozen water whose temperature is 0 °C. Paul takes a bottle of liquid water at the same temperature. After a couple of hours Paul's water is warm and not nice to drink, but Cora's is still very cold.

Using information from the experiment in **(a)**, explain the difference in temperature of the two bottles of water.

.....

.....

.....

..... [3]

For Examiner's Use

7 **(a)** Give the name and formula of the gas formed when sulfur burns in air.

name .....

formula ..... [2]

(b) Explain the consequences of releasing this gas into the atmosphere.

.....

.....

..... [2]

8 Complete Table 8.1 which is about three elements in the second period of the Periodic Table.

Table 8.1

element	number of electrons in an atom	charge on an ion
sodium	…….	…….
……..	13	…….
……..	…….	-1

[6]

9 Fig. 9.1 shows a magnetic table football game. The players are moved by placing controllers under the pitch and moving them around. The dark coloured controller attracts only the dark coloured players and the light coloured controller attracts only the light coloured players.

For Examiner's Use

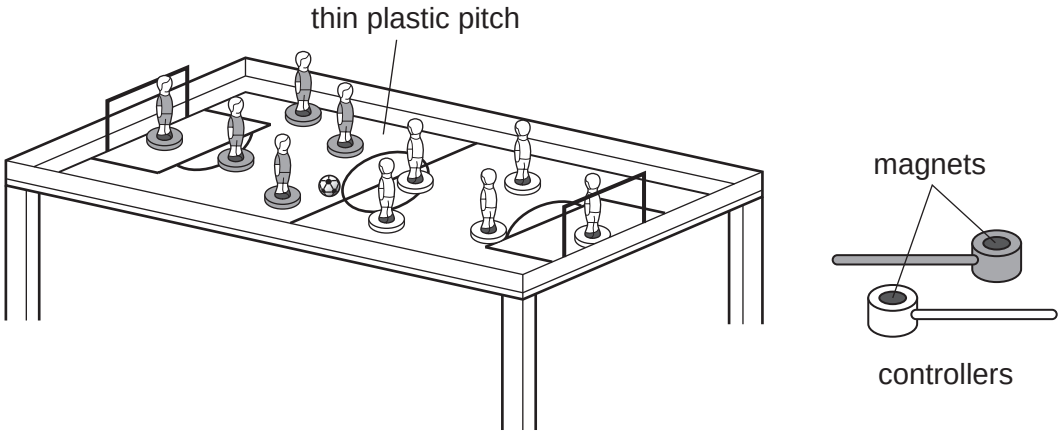

Fig. 9.1

Fig. 9.2 shows further detail of the dark coloured controller.

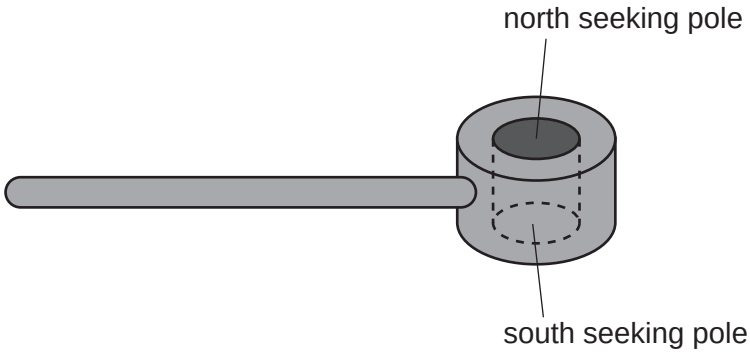

Fig. 9.2

(a) (i) State what must be placed in the base of the dark players in order for them to be attracted by the dark coloured controller and repelled by the light coloured controller.

..... [1]

(ii) Fill in the spaces to label Fig. 9.3 to show the polarity of the magnet in the light coloured controller.

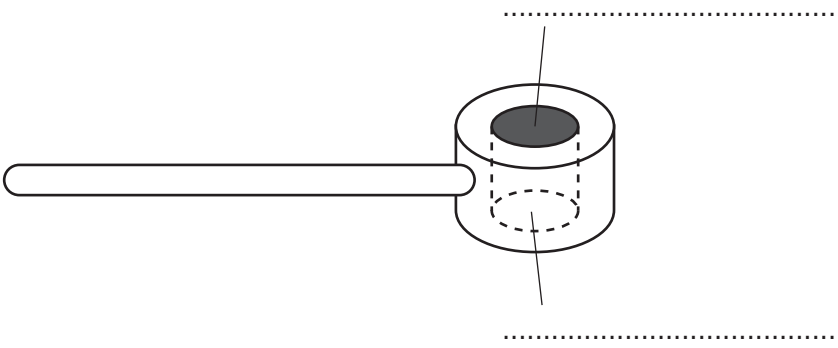

Fig. 9.3

[1]

For Examiner's Use

(b) Ian decides to play a trick on his brother and demagnetises the light coloured controller. Fig. 9.4 shows some of the apparatus he uses.

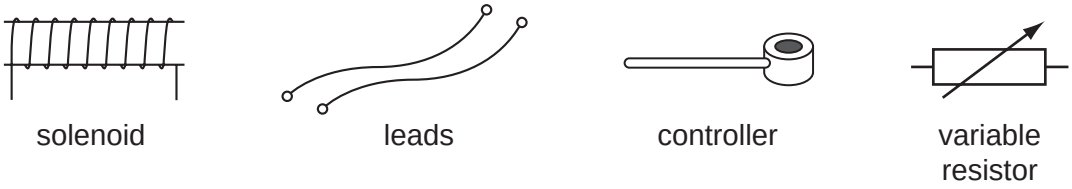

Fig. 9.4

(i) Name the other piece of apparatus that Ian requires.

..... [1]

(ii) Describe the procedure that Ian uses to demagnetise the light coloured controller. You should include a circuit diagram in your answer.

circuit diagram

.....

.....

.....

.....

.....

[3]

(iii) Describe how the players will now behave when the light coloured controller is brought up to them.

dark player .....

light player ..... [1]

For Examiner's Use

10 Hydrogen, H_2, and ethanol, C_2H_5OH, can be used instead of some fossil fuels.

(a) Complete Table 10.1 to give an advantage and a disadvantage of using hydrogen and ethanol as fuels.

Table 10.1

fuel	advantage	disadvantage
hydrogen		
ethanol		

[4]

(b) (i) Name a substance formed from the burning of both hydrogen and ethanol in air.

..... [1]

(ii) Name the process used to make ethanol from sugar.

..... [1]

For Examiner's Use

11 **(a)** Explain the difference in structure between an alkane and an alkene.

.....

..... [2]

(b) Name the alkane and the alkene each of which have two carbon atoms in a molecule.

alkane .....

alkene ..... [2]

(c) Describe a test, with results, to distinguish between an alkane and an alkene.

.....

.....

.....

..... [3]

(d) Name a type of product made from alkenes.

..... [1]

For Examiner's Use

12 Jane is given a radioactive source. She finds out what type or types of radiation it emits.

(a) Describe **one** safety precaution she must take when using the source.

.....

..... [1]

(b) She sets up a GM-tube and finds there is a count of 12 in one minute with no source present. State why there is a count with no source present.

.....

..... [1]

(c) She places the source a few centimetres from the GM-tube. Table 12.1 shows the results she obtains using different absorbers between the GM-tube and the source.

Table 12.1

absorber	reading 1 / counts per minute	reading 2 / counts per minute	reading 3 / counts per minute
none	4352	4429	4388
thin card	1265	1321	1272
2 mm aluminium	1269	1247	1285
4 cm lead	33	45	37

(i) Explain why, when there is no absorber present, the readings vary.

.....

..... [1]

(ii) Complete Table 12.2 and indicate whether beta and gamma radiation are present or absent. Use the evidence from Table 12.1 to explain the presence or absence of beta and gamma radiation.

Table 12.2

type of radiation	present (✓) absent (×)	reason
alpha	✓	There is a considerable drop between the reading for no absorber and with the thin card.
beta		
gamma		

[4]

13 The graph shows how the volume of carbon dioxide given off changes with time when marble chips (calcium carbonate) are reacted with hydrochloric acid.

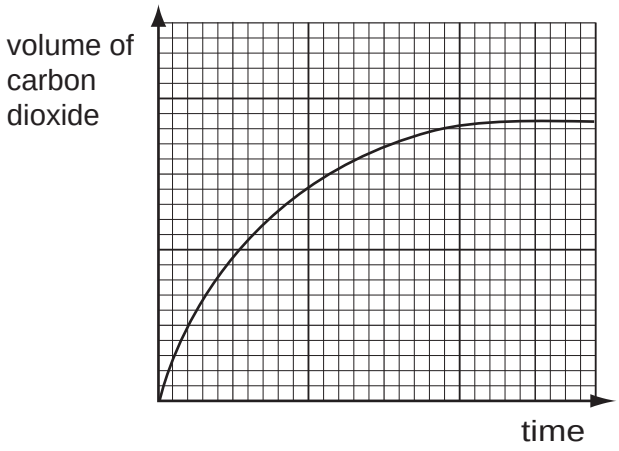

Fig. 13.1

(a) Sketch a curve on Fig. 13.1 to show how the volume of carbon dioxide varies if the experiment is repeated at a higher temperature. (All other conditions and quantities remain unchanged.)

Label this curve **X**. [2]

(b) Sketch a curve on Fig. 13.1 to show how the volume of carbon dioxide varies if the experiment is repeated using larger marble chips. (All other conditions and quantities remain unchanged.)

Label this curve **Y**. [2]

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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	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**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	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

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

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