UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

* 5 9 6 4 3 6 9 4 8 4 *

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]

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.

For Examiner's Use

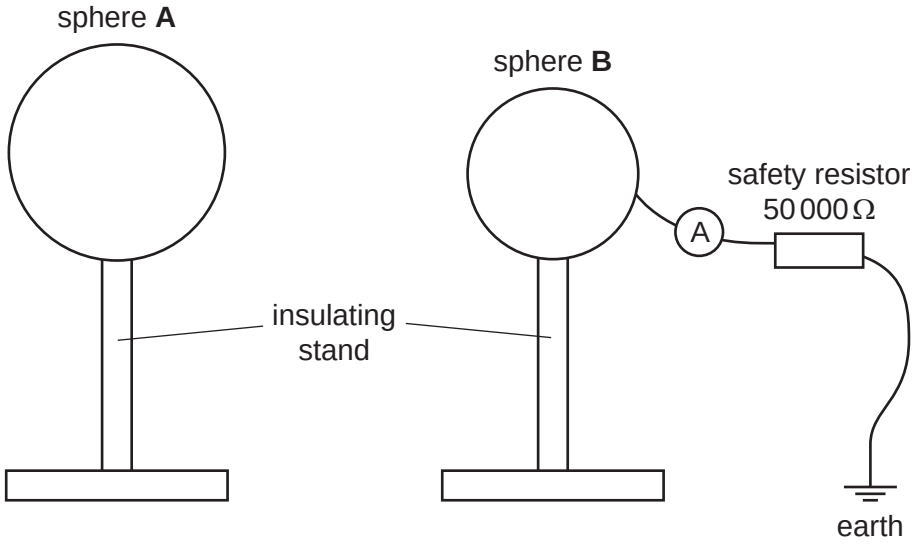

Fig. 2.1

(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]

For Examiner's Use

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

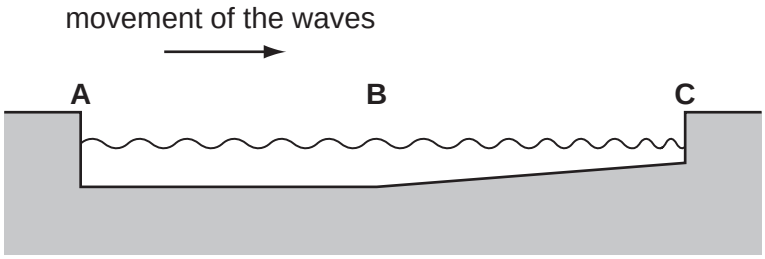

Fig. 3.1

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.

For Examiner's Use

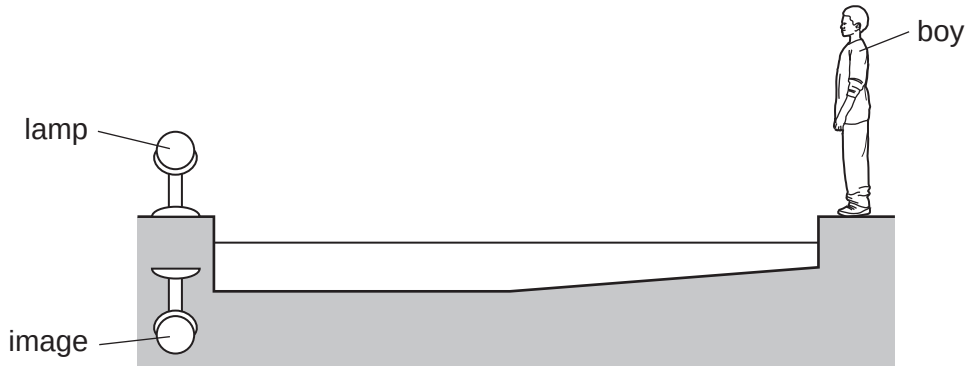

Fig. 3.2

(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.

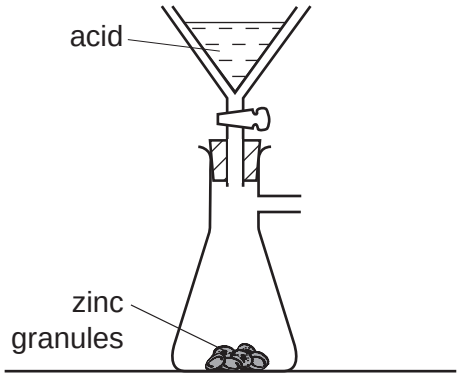

Fig. 4.1

[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]

For Examiner's Use

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.

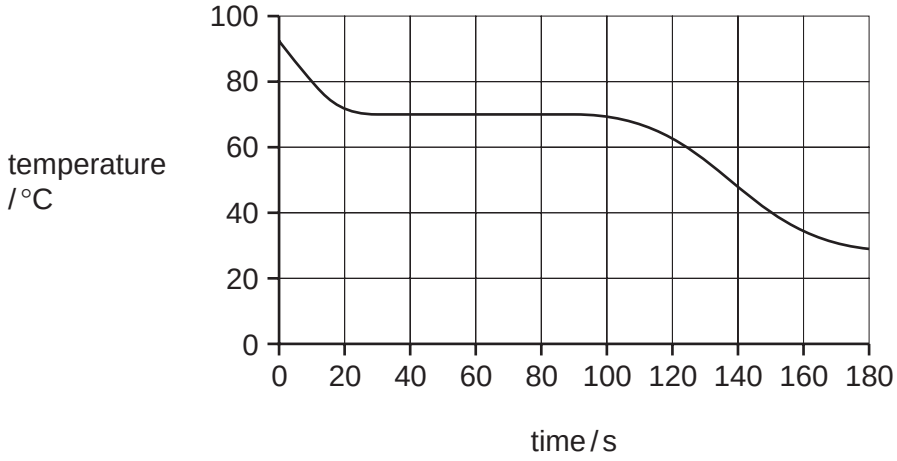

Fig. 6.1

(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]

For Examiner's Use

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.

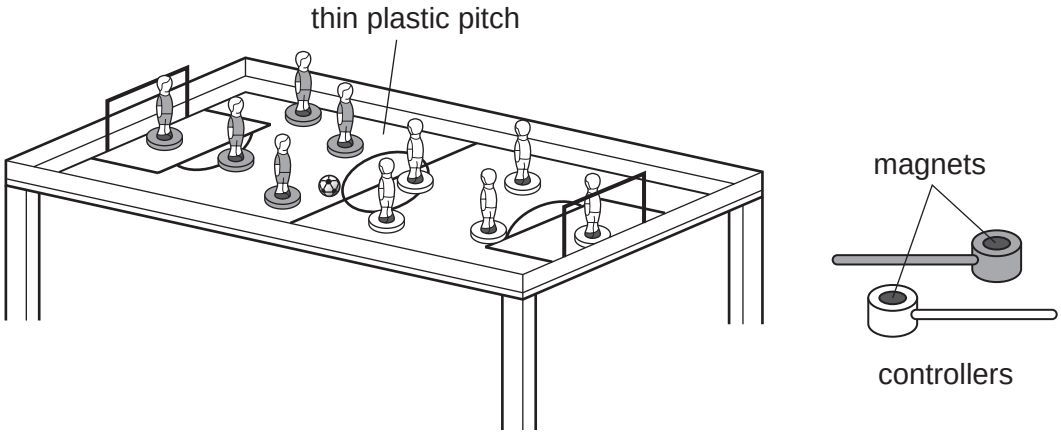

Fig. 9.1

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

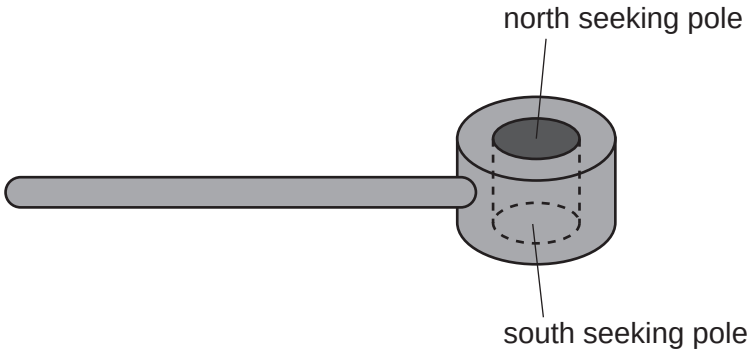

Fig. 9.2

(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.

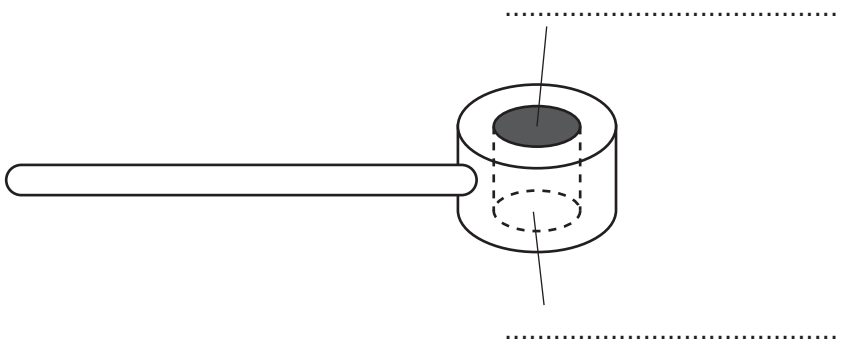

Fig. 9.3

[1]

(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.

For Examiner's Use

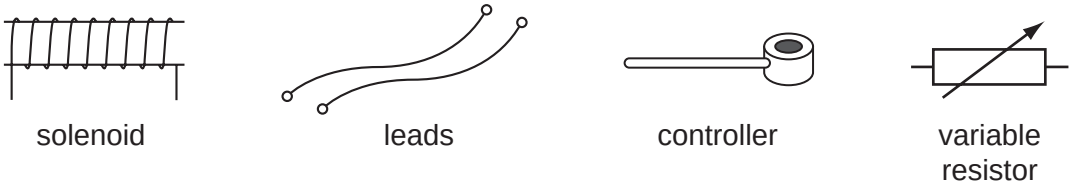

Fig. 9.4

(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]

For Examiner's Use

(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.

For Examiner's Use

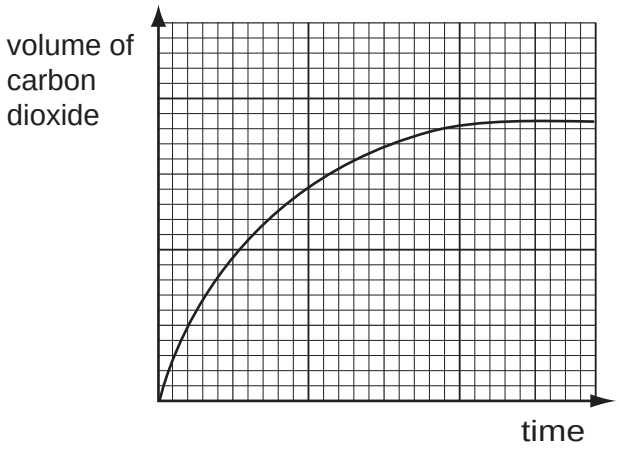

Fig. 13.1

(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.).