



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
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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	
1	
2	
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9	
10	
11	
12	
13	
Total	

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



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

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

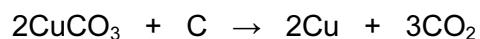
relative formula mass [2]

(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:



(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]

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- 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.

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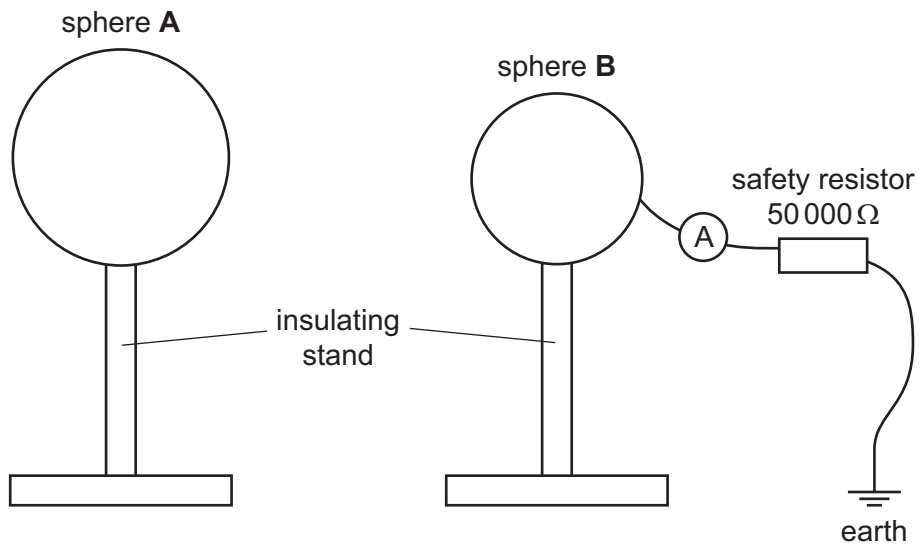


Fig. 2.1

- (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.

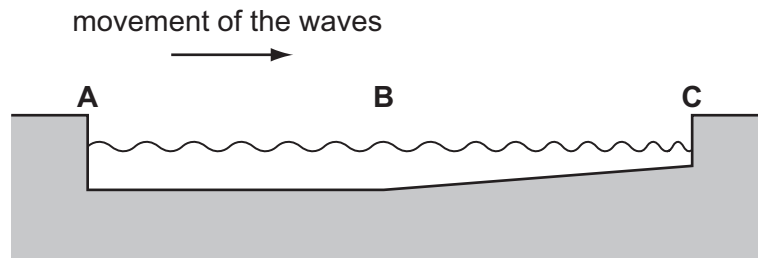


Fig. 3.1

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]

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

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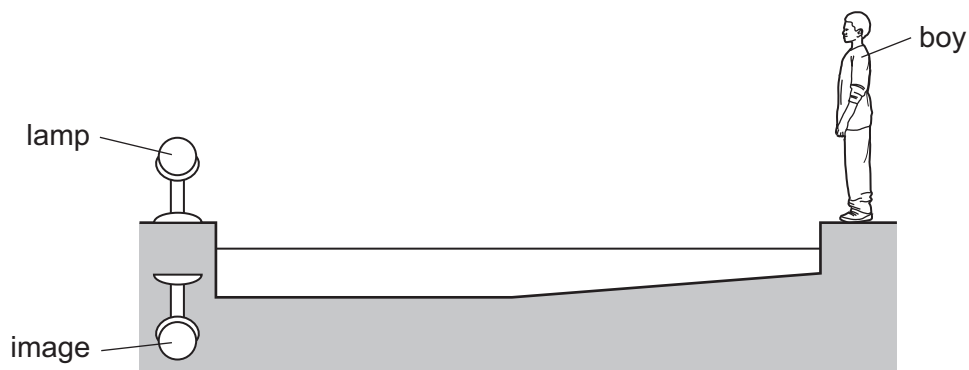


Fig. 3.2

- (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]

- 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.

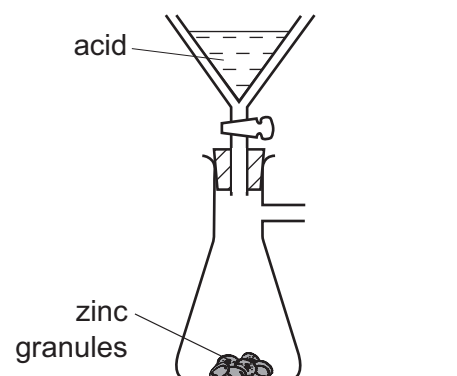


Fig. 4.1

[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]

5 A student measures the density of sea water.

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(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 280g 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.

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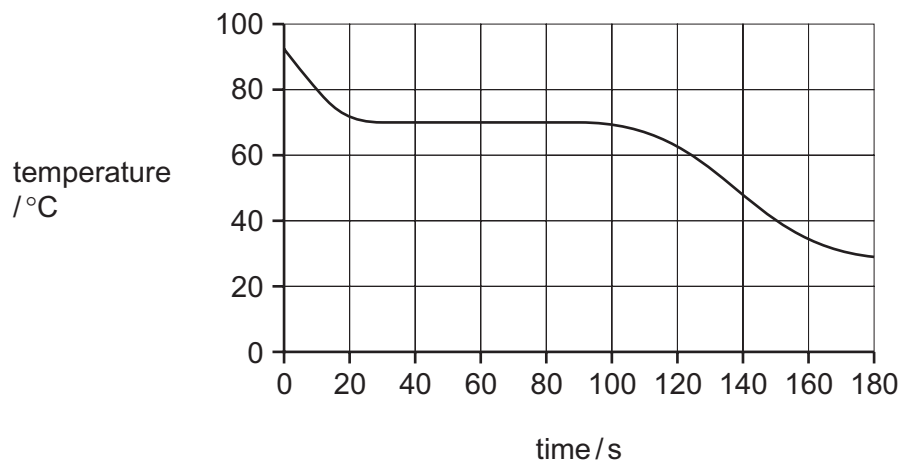


Fig. 6.1

- (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]

- 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]

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- 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.

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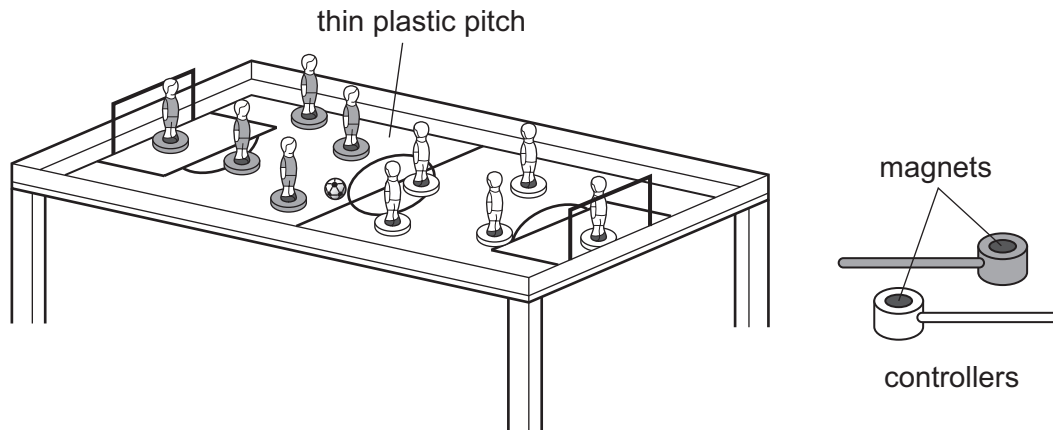


Fig. 9.1

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

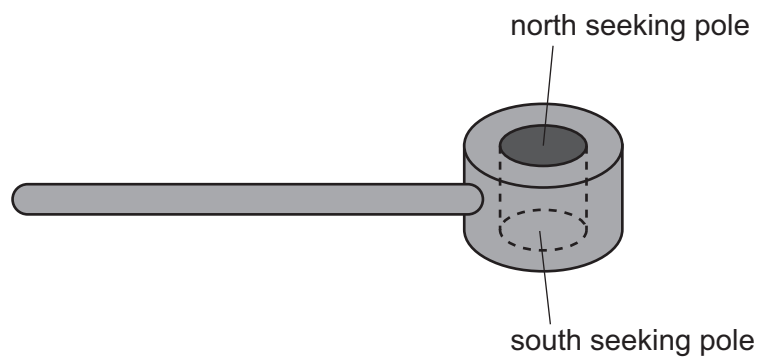


Fig. 9.2

- (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.

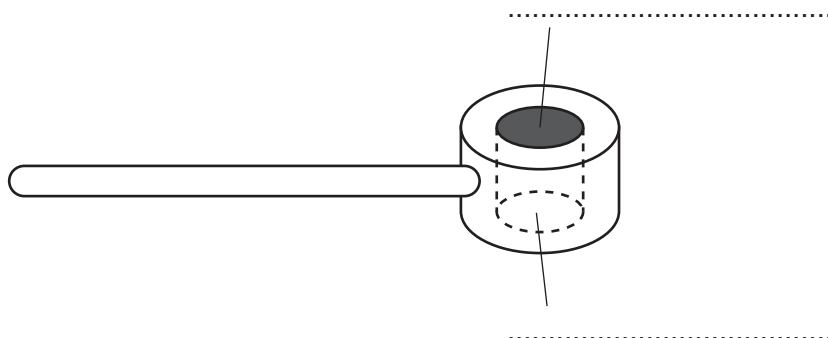


Fig. 9.3

[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
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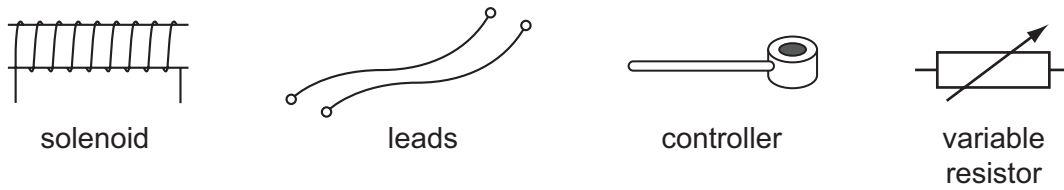


Fig. 9.4

(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]

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.

For
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Use

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]

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.

For
Examiner's
Use

Table 12.2

type of radiation	present (✓) absent (x)	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

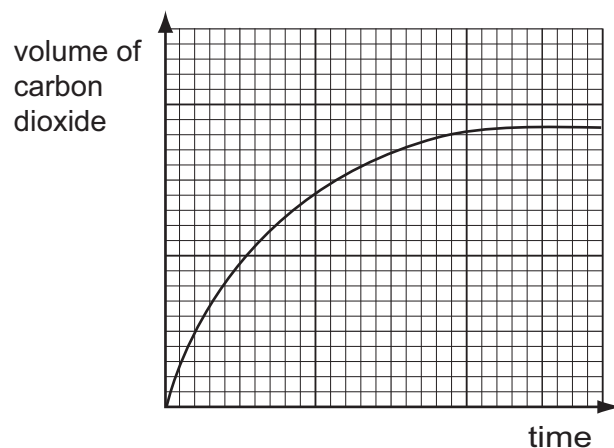


Fig. 13.1

- (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	VIII	IX	X							
		1 H Hydrogen 1																
		4 He Helium 2																
7	9	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Li Lithium	Be Beryllium	B Boron	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon	Na Sodium	Mg Magnesium	Al Aluminium	Si Silicon	P Phosphorus	S Sulfur	Cl Chlorine	Ar Argon	K Potassium	Ca Calcium	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K Potassium	Ca Calcium	Sc Scandium	Ti Titanium	V Vanadium	Cr Chromium	Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb Rubidium	Sr Strontium	Y Yttrium	Zr Zirconium	Nb Niobium	Mo Molybdenum	Tc Technetium	Ru Ruthenium	Rh Rhodium	Pd Palladium	Ag Silver	Cd Cadmium	In Indium	Sn Tin	Sb Antimony	Te Tellurium	I Iodine	Xe Xenon	
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Cs Caesium	Ba Barium	La Lanthanum	Hf Hafnium	Ta Tantalum	W Tungsten	Re Rhenium	Os Osmium	Ir Iridium	Pt Platinum	Au Gold	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	At Astatine	Rn Radon	
87	88	89	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	
Fr Francium	Ra Radium	Ac Actinium																
		*58-71 Lanthanoid series										†90-103 Actinoid series						
		58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
		90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
		140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156
		172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188
		226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242
		288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
		348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364
		408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424
		468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484
		528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
		588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604
		648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664
		708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
		768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784
		828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844
		888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904
		948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964
		1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024
		1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084
		1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144
		1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204
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		2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000	3001	3002	3003	3004

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

a

X

b

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

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