Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICAL SCIENCE **0652/02**

Paper 2

October/November 2005

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 in the spaces provided on the Question Paper.
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.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on page 16.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
1	
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11	
12	
13	
Total	

This document consists of **16** printed pages.

1 **(a)** A glider is an aeroplane without an engine. Glider pilots use columns of rising warm air to lift their gliders to a greater height, as shown in Fig. 1.1.

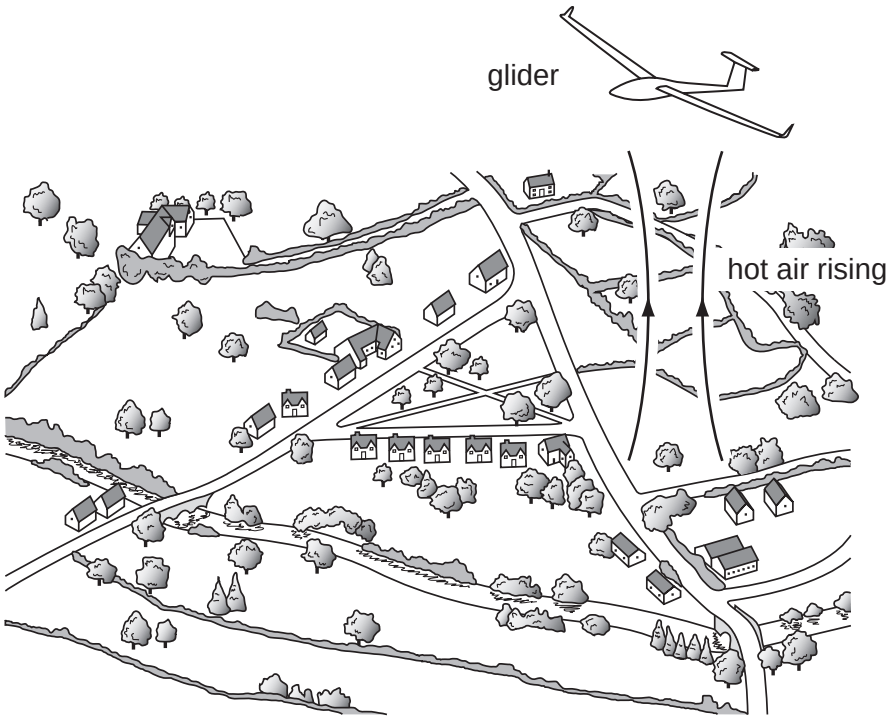

Fig. 1.1

(i) Name the process which causes the warm air to rise.

.....

(ii) Explain why the warm air rises.

.....

.....

..... [3]

(b) The warm air sometimes carries water vapour higher into the atmosphere where it changes to small water drops to form clouds.

Name the process when water vapour turns to liquid.

..... [1]

(c) As the water drops get larger they begin to fall. Fig. 1.2 shows a speed – time graph of the fall of one of the water drops.

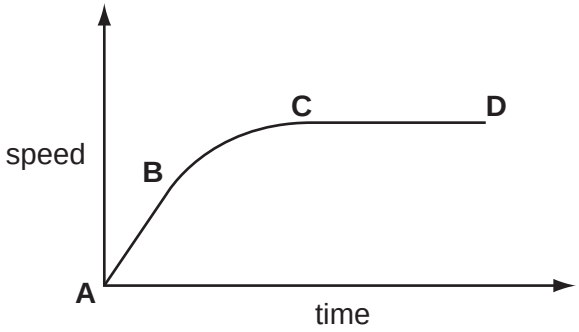

Fig. 1.2

(i) Describe the motion of the water drop between points **A** and **B**.

.....

(ii) Describe the motion of the water drop between points **C** and **D**.

..... [3]

[Turn over

2 A coloured gas is put into the bottom of a gas-jar of air. The lid is quickly replaced on the jar. This is shown in Fig. 2.1.

After several minutes the coloured gas can be seen halfway up the jar. This is shown in Fig. 2.2.

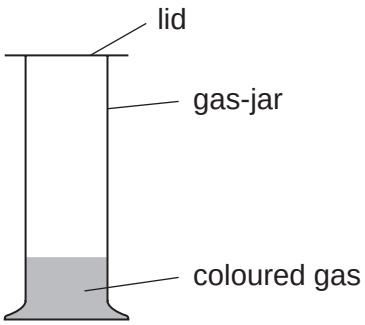

Fig. 2.1

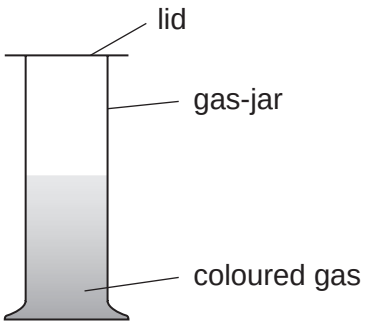

Fig. 2.2

(a) Name this process of one gas mixing slowly with another.

.....

[1]

(b) The molecules of the coloured gas move about quickly yet the process of mixing with the air is very slow.

Explain why the mixing is slow.

.....

.....

..... [2]

3 The properties of iron can be changed by the controlled use of additives to form steel alloys.

(a) State **one** use of mild steel.

.....

State **one** use of stainless steel.

..... [2]

(b) A piece of mild steel in everyday use is protected with paint.
Stainless steel does not need this protection.
Explain this difference.

.....

.....

..... [2]

4 In a coal-fired power station coal is burnt in a furnace. This heats water to provide steam to drive a generator.

(a) Complete the sentences below to explain the energy changes.

In the furnace ..... energy of the coal is converted to

.....energy in the steam. This is then converted into .....

energy at the generator. [3]

Another method of obtaining steam to drive a generator is to pump water deep into the ground. The water is heated by hot rocks.

(b) (i) What name is given to this type of power station?

.....

(ii) State **one** advantage of this method over the coal-fired power station.

..... [2]

(c) Explain how the generator is driven in a hydroelectric power station. In your answer refer to relevant energy changes.

.....

.....

..... [2]

5 **(a)** A method to separate and analyse mixtures uses a vertical strip of paper dipping into a solvent.

(i) Name this method of separating mixtures.

..... [1]

(ii) Some experiments using this method require a *locating agent* to show the positions of the components.

Explain why a *locating agent* may be required.

.....

..... [1]

(b) Bitumen is used to make roads.

Describe how bitumen is obtained from the mixture of hydrocarbons in crude oil (petroleum).

.....

.....

..... [2]

6 Fig. 6.1 shows the electromagnetic spectrum.

radio waves	micro waves	infra red	visible	**P**	X-rays	gamma rays

increasing frequency

Fig. 6.1

(a) Name the type of radiation found in the section labelled **P**.

.....

(b) State what happens to the speed of electromagnetic radiation, in a vacuum, as the frequency of the radiation increases.

.....

..... [2]

(c) The photograph in Fig. 6.2 shows a replacement joint in a person's arm.

Fig. 6.2

Name the part of the electromagnetic spectrum used to take this photograph.

..... [1]

(d) Another method of obtaining images of internal organs is to use sound waves of frequency above the human threshold of hearing.

State the maximum frequency sound that a human can hear.

..... Hz [1]

[Turn over

7 **(a)** When ethene, C_2H_4, reacts with hydrogen in an addition reaction, an alkane is formed.

(i) Name this alkane.

.....

[1]

(ii) Draw a diagram to show the structure of this alkane.

[1]

(b) When ethene, C_2H_4, reacts with steam in an addition reaction, an alcohol is formed.

(i) Name this alcohol.

.....

[1]

(ii) Draw a diagram to show the structure of this alcohol.

[1]

(c) When ethene, C_2H_4, reacts with itself in an addition reaction, a polymer is formed.

(i) Name this polymer.

.....

[1]

(ii) Draw a diagram to show the structure of this polymer.

[1]

8 **(a)** Describe how you would carry out an experiment to find the magnetic field pattern around a bar magnet.

.....

.....

.....

.....

.....

..... [4]

(b) On Fig. 8.1 draw the magnetic field pattern of the bar magnet.

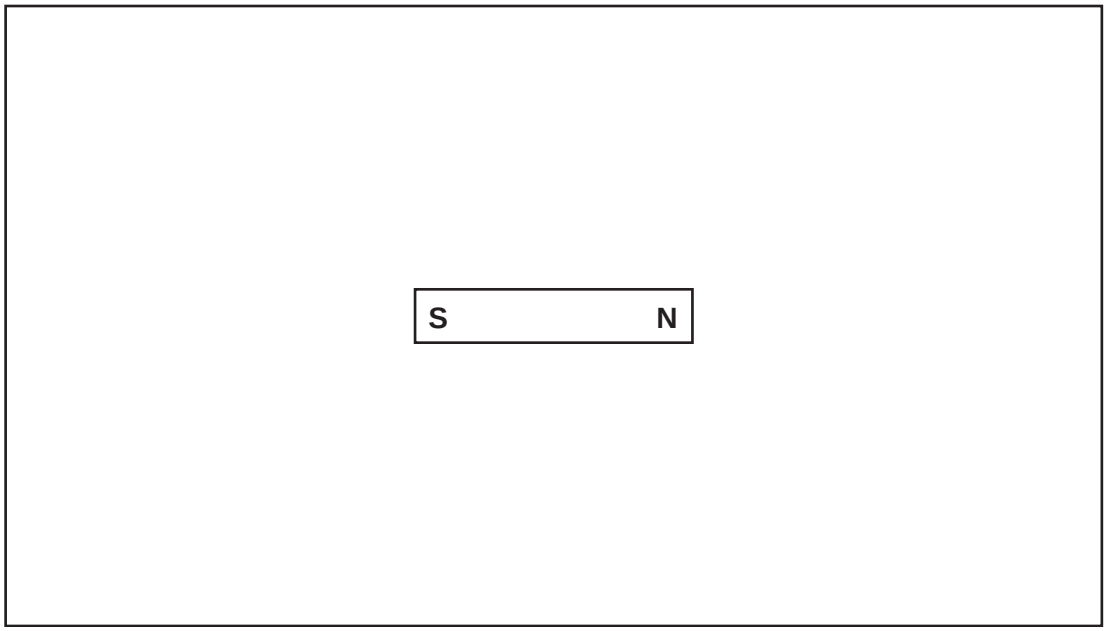

Fig. 8.1

[3]

9 **(a)** Chlorine has two isotopes, $^{35}_{17}Cl$ and $^{37}_{17}Cl$.

Complete Fig. 9.1 for these isotopes.

	$^{35}_{17}Cl$	$^{37}_{17}Cl$
number of protons in nucleus	17	
number of neutrons in nucleus		20
arrangement of electrons in shells in the atom		

Fig. 9.1 [3]

(b) Draw a diagram to show the covalent bonding in a molecule of hydrogen chloride, HCl

[2]

(c) **(i)** Describe the formation of each of the ions in sodium chloride, NaCl, from the elements.

.....

.....

..... [2]

(ii) Explain how these ions are held together in the compound.

.....

..... [1]

(d) Explain why sodium chloride conducts electricity when liquid but not when solid.

.....

.....

..... [2]

(e) Describe a chemical test for the chloride ion in solution.

test .....

result ..... [2]

10 The noble gas, radon, is radioactive. Radon nuclei decay by emitting alpha-particles.

(a) (i) Explain what is meant by the term *noble gas*.

.....

.....

(ii) Explain what is meant by the term *alpha-particle*.

.....

..... [3]

(b) Complete the equation which shows the decay of a nucleus of radon-220.

$$^{220}_{86}\text{Rn} \longrightarrow {}^{\cdots\cdots}_{\cdots\cdots}\text{Po} + {}^{\cdots\cdots}_{\cdots\cdots}\alpha \text{ (alpha)}$$

[2]

(c) A sample consists of 36.0 μg of radon-220. After a period of 3 minutes only 4.5 μg of radon-220 remained.

Calculate the half-life of radon-220. Show your working.

half-life = ... minute(s) [3]

11 Carbon monoxide and oxides of nitrogen are common pollutants of air.

Describe how each pollutant is formed.

carbon monoxide .....

.....

.....

oxides of nitrogen .....

.....

..... [4]

12 (a) (i) State the main method to obtain calcium oxide (lime) from calcium carbonate (limestone).

..... [1]

(ii) Complete the equation for this process.

$CaCO_3 \longrightarrow$ ..... + ...

[2]

(iii) The energy required to break the bonds in calcium carbonate is greater than the energy released when the products are formed.

What does this show about the total energy change in the reaction?

.....

..... [1]

(iv) Describe a test to identify the gas produced in this process.

test .....

result ..... [2]

(b) Calcium hydroxide (slaked lime) is used to treat acidic industrial waste products.

Name the main chemical process involved in this treatment.

..... [1]

13 Fig. 13.1 shows two types of switch that can be used to control an electric light.

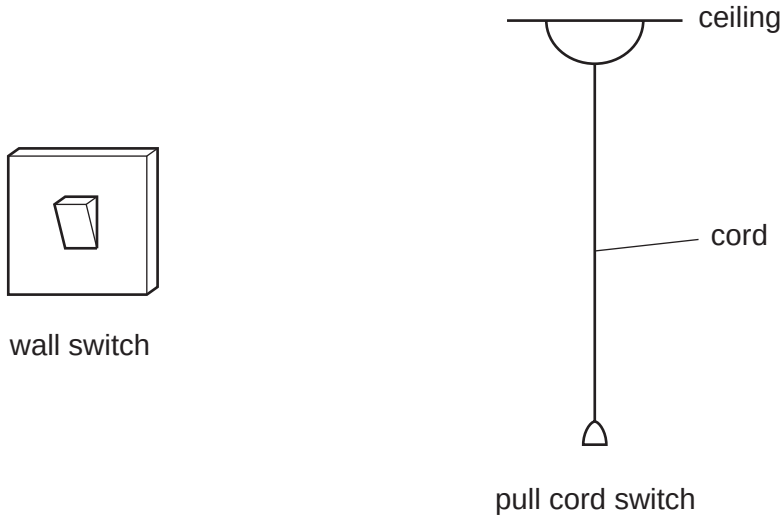

Fig. 13.1

(a) Explain why a pull-cord switch, not a wall switch, should always be used in a bathroom or shower-room.

.....

.....

..... [3]

(b) Fig. 13.2 shows part of a circuit that could be used to operate lights in a room.

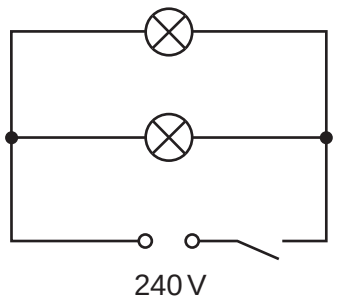

Fig. 13.2

The two lamps are identical and each takes a current of 0.25 A.

(i) Calculate the resistance of each lamp. Show your working and include the unit.

resistance = ... [3]

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(ii) What is the total current taken from the supply when both lamps are switched on?

current ..... A [1]

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 Sulphur 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 Radius 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.).