Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICAL SCIENCE **0652/02**

Paper 2

October/November 2004

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 12.

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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13	
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Total	

This document consists of **12** printed pages.

1 Fig. 1.1 shows a current carrying coil in a magnetic field. There is a force of 5.0 N on each side of the coil acting as shown.

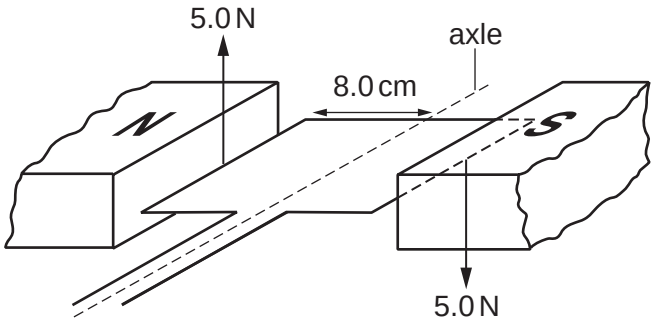


Fig. 1.1

(a) (i) Calculate the moment about the axle produced by the force on the right hand side of the coil. Show your working and state the unit.

moment = ...

(ii) Write down the moment about the axle produced by the force on the left hand side of the coil.

.....

(iii) Calculate the total moment on the axle.

moment = ... [5]

(b) (i) State the effect on the total moment about the axle of increasing the current in the coil.

.....

(ii) State the effect on the total moment about the axle of decreasing the number of turns of wire in the coil.

.....[2]

(c) Name a device or a piece of apparatus which relies on the turning effect on a coil in a magnetic field.

.....[1]

2 Using a microscope, the small drops of fat in milk can be seen moving about slowly in a random way.

(a) Name this type of movement. ..... [1]

(b) Use words from the list below to complete the sentences describing this type of movement. You may use each word once, more than once or not at all.

collide **combine** **electrons** **larger** **molecules** **smaller**

The ..... of water are moving about quickly. They ..... with the drops of fat. The drops of fat move slowly because they are much ..... than the ..... of water.

[4]

3 Fig. 3.1 shows a hot water system for a house.

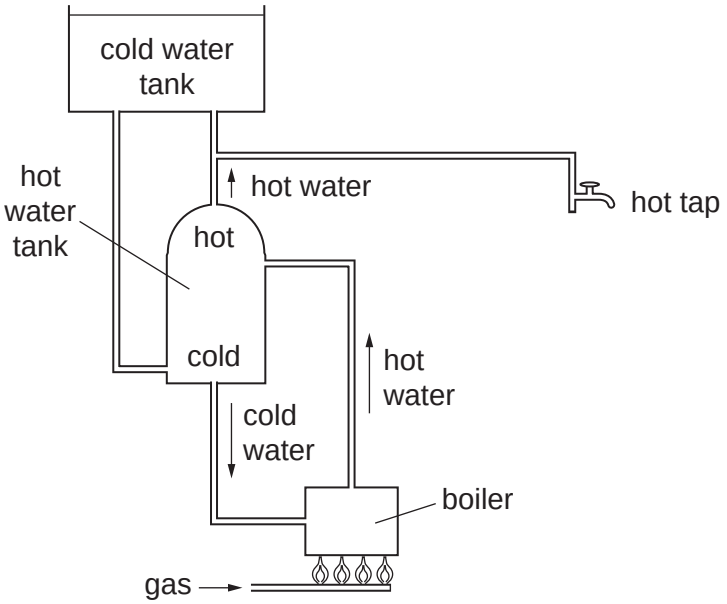


Fig. 3.1

(a) (i) Name the main process by which hot water rises from the boiler to the hot water tank.

.....

(ii) Explain why this process occurs.

.....

.....[3]

(b) (i) Name the main process by which the energy is transferred through the boiler wall to the water.

.....

(ii) Complete the sentences below, which describe the energy changes as the gas is burnt.

When the gas is burnt ..... energy of the gas is converted into ..... energy which raises the temperature of the water. The combustion process is an ..... change. [4]

(c) Energy is lost from the hot water tank causing the water to cool. Suggest a way in which this loss could be minimised.

.....[1]

4 A student uses paper chromatography to investigate three substances, **X**, **Y** and **Z**.

The result of her experiment in Fig. 4.1 shows three components, **P**, **Q** and **R**.

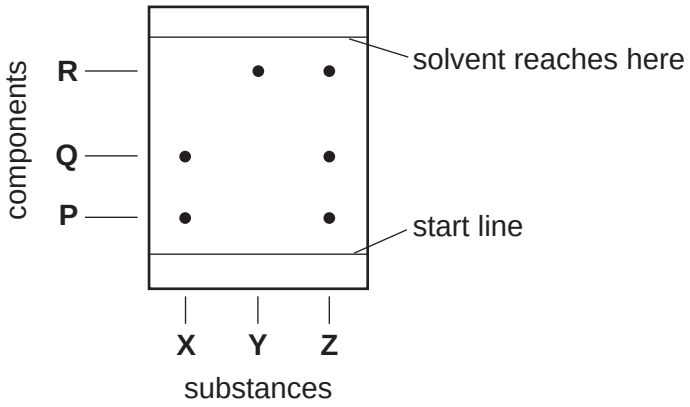


Fig. 4.1

(a) State and explain which substance is a mixture of the other two.

.....

.....[2]

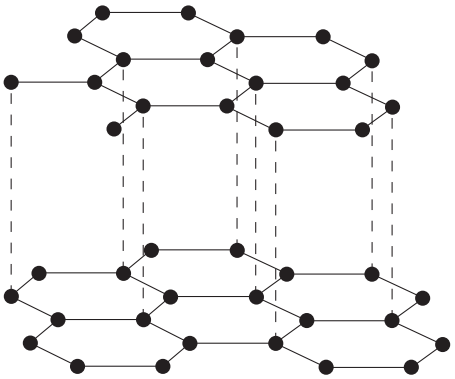
(b) State and explain which component is most soluble in the solvent.

.....

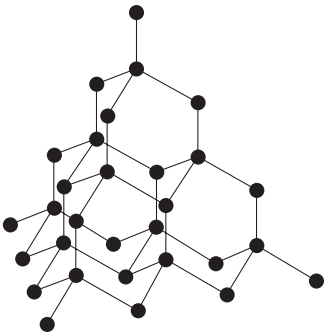
.....[2]

[Turn over

5



graphite



diamond

Fig. 5.1

Use the information in Fig. 5.1 to describe the structures of

(i) graphite,

.....

.....

.....[2]

(ii) diamond.

.....

.....

.....[2]

6 **(a)** **(i)** Describe how a potassium atom, K, forms a potassium ion.

.....

.....[1]

(ii) Describe how an iodine atom, I, forms an iodide ion.

.....

.....[1]

(b) Hence describe how potassium iodide is formed from potassium and iodine.

.....

.....[2]

7 Fig. 7.1 shows a circuit being used to light two identical bulbs.

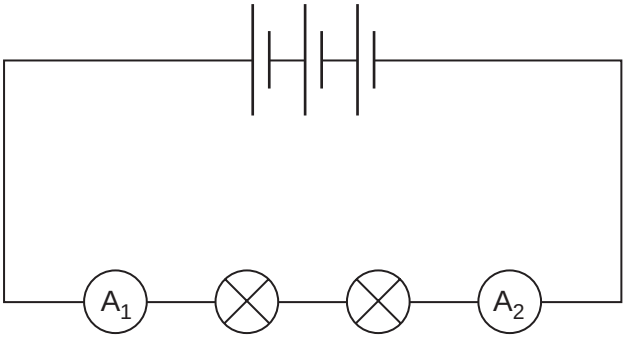


Fig. 7.1

Ammeter A_1 reads 0.75 A and the potential difference across the **two** bulbs is 4.5 V.

(a) (i) What is the reading on ammeter A_2? ..... A

(ii) Calculate the total resistance in the circuit. Show your working and state the unit.

resistance = ...

(iii) What is the resistance of one bulb?

resistance = ... [5]

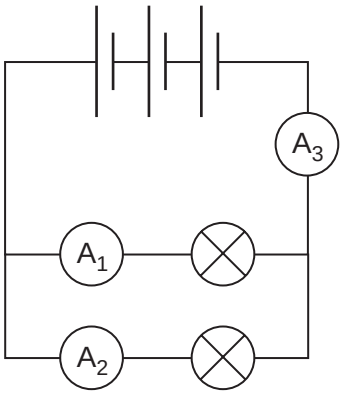


Fig. 7.2

Fig. 7.2 shows another circuit which could be used to light the two bulbs.

Both ammeter A_1 and ammeter A_2 read 1.5 A.

(b) What would ammeter A_3 read? ..... A [1]

(c) Explain whether the bulbs would be brighter in the circuit in Fig. 7.1 or Fig. 7.2.

.....

.....[2]

8 A saturated hydrocarbon gas is given off from decaying rubbish.

(a) One molecule of this hydrocarbon contains one carbon atom and four hydrogen atoms.

(i) Write the molecular formula of this hydrocarbon. ..... [1]

(ii) Use the information in the Periodic Table on page 12 to calculate the relative molecular mass, M_r, of this hydrocarbon.

M_r = ... [1]

(b) This gas burns completely in air to form carbon dioxide and water.

hydrocarbon gas + oxygen → carbon dioxide + water

Construct a balanced chemical equation for this reaction.

.....[2]

9 **(a)** Copper oxide heated in hydrogen forms copper and water.

Use this example to explain the meaning of *reduction*.

.....

.....[2]

(b) State two properties of copper that show this metal is a **transition** element.

1 .....

2 ..... [2]

10 A student prepares magnesium sulphate by adding pieces of magnesium to dilute sulphuric acid until there is excess magnesium and the reaction stops.

(a) Describe how the student can obtain crystals of magnesium sulphate from the mixture of aqueous magnesium sulphate and excess magnesium.

.....

.....

.....[2]

(b) Hydrogen is also produced in the first experiment.

Describe a test to identify this gas.

test .....

result .....[2]

11 Fig. 11.1 shows a beam of light being shone on a pond.

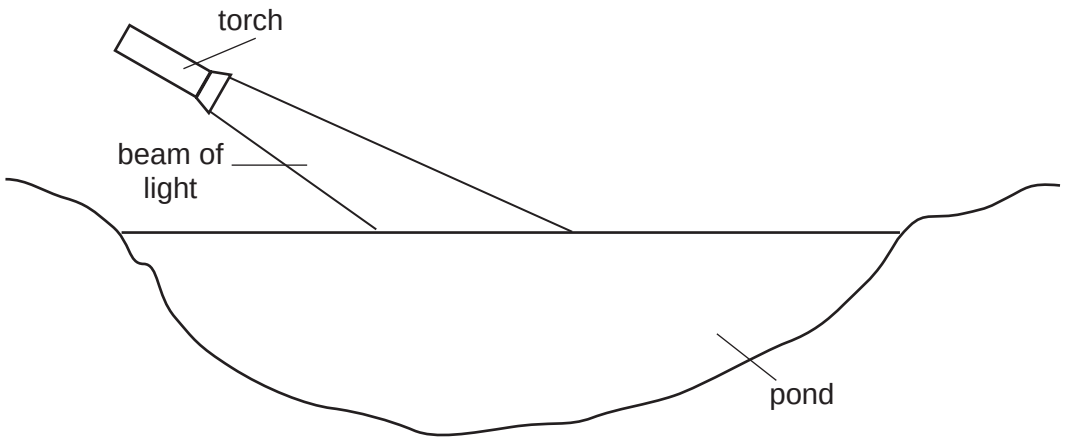


Fig. 11.1

(a) **(i)** Complete the two rays, which mark the edges of the beam of light, to show the path of the beam after it enters the water.

(ii) For one of the rays, mark the angle of incidence and label it *i*.

(iii) Name the effect that this experiment demonstrates.

..... [4]

Fig. 11.2 shows the front of a police car.

Fig. 11.2

(b) Explain, using appropriate scientific terms, why the car has the mirror writing on the front.

.....

.....

.....[2]

12 **(a)** A student adds aqueous bromine to a colourless solution of potassium iodide. The solution changes colour, showing a reaction has occurred.

(i) State the product of this reaction that causes the change of colour.

..... [1]

(ii) In terms of the reactivity of the halogens, explain why there is a reaction in this experiment.

.....

.....[1]

(b) Another student adds aqueous bromine to a colourless solution of potassium chloride. There is no reaction.

In terms of the reactivity of the halogens, explain why there is no reaction in this experiment.

.....

.....[1]

13 State and explain the purpose of the two main steps in the purification of the water supply for domestic purposes.

step 1

.....

.....[2]

step 2

.....

.....[2]

14 **(a)** Draw the structures of ethane, C_2H_6, and ethene, C_2H_4. Show all the atoms and all the bonds.

ethane ethene

[2]

(b) Explain why alkenes, such as ethene, do react with steam whereas alkanes, such as ethane, do not react with steam.

.....

.....[2]

15 The isotope $^{90}_{38}Sr$ is a radioactive isotope which emits β-particles.

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

.....

.....[2]

(ii) Explain what a *β-particle* is.

.....

.....[2]

(b) **(i)** Complete the table in Fig. 15.1 which describes the make up of a neutral atom of $^{90}_{38}Sr$.

Number of protons	
Number of neutrons	
Number of electrons	

Fig. 15.1

(ii) Which type of particle, listed in Fig. 15.1, is **not** found in the nucleus of an atom?

..... [4]

(c) Complete the equation below which describes the decay of $^{90}_{38}Sr$.

$$^{90}_{38}Sr \longrightarrow \underset{\ldots\ldots}{^{90}Y} + {}^{\ldots}_{-1}\beta + \text{energy}$$ [2]

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 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 = 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.).