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.

For Examiner's Use				
1				
2				
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11				
12				
13				
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Total				

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.

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.

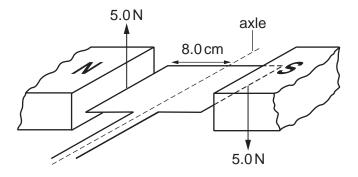


Fig. 1.1

(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 =	
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(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]

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

2

rand	dom way.								
(a)	Name this type of movement								
(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.

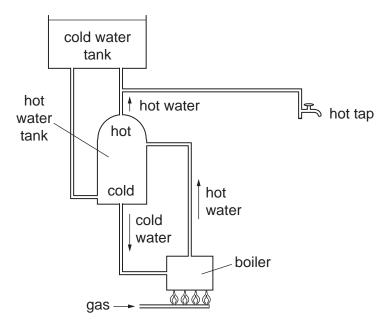


Fig. 3.1

(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)		ergy is lost from the hot water tank causing the water to cool. Suggest a way in which loss could be minimised.
		[1]

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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.

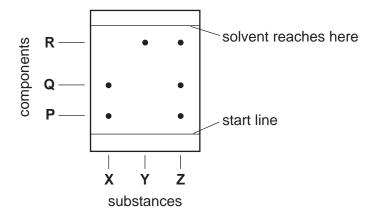


Fig. 4.1

(a)	State and explain which substance is a mixture of the other two.	
(b)	State and explain which component is most soluble in the solvent.	
		[2]

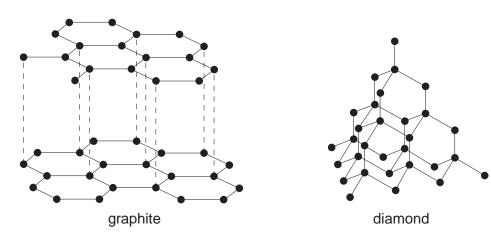


Fig. 5.1

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

	(i)	grap	phite,
	/ii\	dion	[2] nond.
	(ii)	ulai	nona.
			[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)	Hen	ce 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.

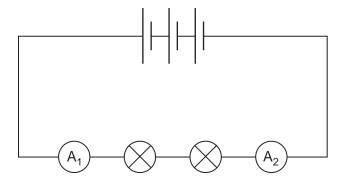


Fig. 7.1

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 A₂? 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]

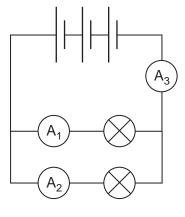


Fig. 7.2

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 A₃ read? A [1]
- (c) Explain whether the bulbs would be brighter in the circuit in Fig. 7.1 or Fig. 7.2.

.....

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8	A sa	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, $M_{\rm r}$, of this hydrocarbon.				
			$M_{\rm r} = \dots [1]$				
	(b)	This	gas burns completely in air to form carbon dioxide and water.				
			hydrocarbon gas + oxygen \rightarrow carbon dioxide + water				
		Con	struct a balanced chemical equation for this reaction.				
			[2]				
9	(a)	Cop	per oxide heated in hydrogen forms copper and water.				
		Use	this example to explain the meaning of <i>reduction</i> .				
			[2]				
	(b)	Stat	e two properties of copper that show this metal is a transition element.				
		1					
		2	[2]				
10			nt prepares magnesium sulphate by adding pieces of magnesium to dilute sulphuric I there is excess magnesium and the reaction stops.				
	(a)		cribe how the student can obtain crystals of magnesium sulphate from the mixture queous magnesium sulphate and excess magnesium.				
			[2]				
	(b)	Hyd	rogen is also produced in the first experiment.				
		Des	cribe a test to identify this gas.				
		test					
		resu	ılt[2]				

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

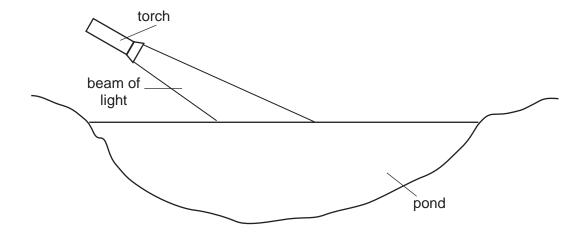


Fig. 11.1

- (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.



Fig. 11.2 shows the front of a police car.



Fig. 11.2

(b)	Explain, front.	using	appropriate	scientific	terms,	why	the	car	has	the	mirror	writing	on	the
				•••••										•••••
														1

12	(a)		tudent adds aqueous bromine to a colourless solution of potassium iodide. The ition 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)		ther student adds aqueous bromine to a colourless solution of potassium chloride. re is no reaction.
			erms of the reactivity of the halogens, explain why there is no reaction in this eriment.
			[1]
13			d explain the purpose of the two main steps in the purification of the water supply for purposes.
	step	o 1	
			[2]
	step	2	
			[2]

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14	(a)	Drav bon	w the structures of ethane, $\rm C_2H_6$, and ethene, $\rm C_2H_4$. Show all the atoms and all the ds.	
			ethane ethene	
			[2]	
	(h)	Evn	احا lain why alkenes, such as ethene, do react with steam whereas alkanes, such as	
	(D)		ne, do not react with steam.	
			[2]	
15	Tho	icot	ope $^{90}_{38}$ Sr is a radioactive isotope which emits β-particles.	
13				
	(a)	(i)	Explain what is meant by the term <i>isotope</i> .	
			[C]	
		(ii)	Explain what a β -particle is.	
		(11)	Explain what a <i>ρ-particle</i> is.	
			[c]	
	(b)	(i)	Complete the table in Fig. 15.1 which describes the make up of a neutral atom of $^{90}_{38}$ Sr.	
	(1)	(')	Tomplete the table in Fig. 13.1 which describes the make up of a fleutial atom of 3801.	
			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)	Con	pplete the equation below which describes the decay of $^{90}_{38}\mathrm{Sr}$.	
			$^{90}_{38}$ Sr \longrightarrow 90 Y + $^{\cdots}_{-1}\beta$ + energy [2]	

DATA SHEET	The Periodic Table of the Elements
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0	# He Helium	20 Ne Neon 10	40 Ar Argon	84 K rypton 36	131 Xe Xenon 54	Rn Radon 86		175 Lu
		19 Fluorine	35.5 C1 Chlorine	80 Br Bromine 35	127 I lodine	At Astatine 85		173 Yb
>		16 Oxygen	32 Sulphur 16	79 Selenium	128 Te Tellurium 52			169 Tm
>		14 N Nitrogen 7	31 Phosphorus	75 AS Arsenic 33		209 Bi Bismuth		167 Er
≥		12 C Carbon 6	28 Si licon	73 Ge Germanium	. Sn Tin 50	207 Pb Lead		165 Ho
≡		11 Boron 5	27 A1 Aluminium 13	70 Ga Gallium 31	115 In Indium	204 TL Thallium		162 Dv
				65 Zn Zinc	112 Cd Cadmium 48	201 Hg Mercury 80		159 Th
				64 Copper 29	108 Ag Silver 47	197 Au Gold		157 Gd
dno				59 Nickel	106 Pd Palladium 46	195 Pt Platinum 78		152
5				59 Co Cobalt	103 Rh Rhodium	192 Ir Iridium		150 Sm
	1 Hydrogen			56 Fe Iron	101 Ru Ruthenium 44			Pm
				Mn Manganese	Tc Technetium 43	186 Re Rhenium 75		144 Z
				Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten		141 Pr
				51 V Vanadium 23	93 Nb Niobium	181 Ta Tantalum 73		140 CP
				48 Ti Titanium	2r Zirconium 40	178 Hf Hafnium 72		
				Sc Scandium	89 ×	139 La Lanthanum 57 **	227 Ac Actinium +	series
=		9 Be Beryllium	24 Mg Magnesium	40 Ca Calcium	Sr Strontium	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series
_		7 Li Lithium	23 Na Sodium	39 X Potassium	85 Rb ubidium	133 CS Caesium 55	Fr Francium 87	58-71 La
			II	III IV VII VII				1 1 1 1 1 1 1 1 1 1

Fm Fermium 100 Erbium 89 **4** Holmium ES Californium 98 **Berkelium T**erbium 65 Gadolinium 64 Curium **Europium** Am Samarium 62 **Pu** Plutonium Neptunium Promethium 61 Neodymium **2**38 Praseodymium 59 **Pa** Protactinium 232 **7** Thorium Serium C 28 90 b = proton (atomic) number a = relative atomic mass

X = atomic symbol

а **×**

Key

ρ

Lr Lawrencium 103

Nobelium 102

Md Mendelevium 101

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