Candidate Name _____ Centre Numb... ...date

International General Certificate of Secondary Education
CAMBRIDGE INTERNATIONAL EXAMINATIONS

PHYSICAL SCIENCE 0652/2

PAPER 2

OCTOBER/NOVEMBER SESSION 2002

1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

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	
3	
4	
5	
6	
7	
8	
TOTAL	

1 Fig. 1.1 shows the design of a periscope.

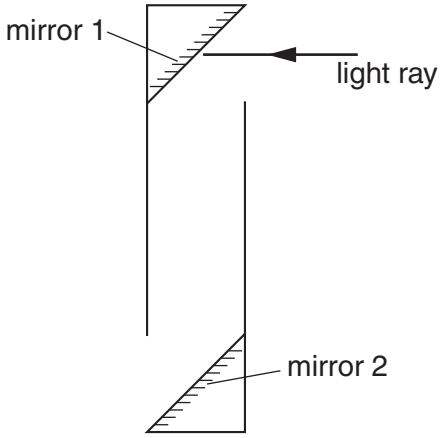

Fig. 1.1

(a) Complete the path of the light ray after it strikes mirror 1. [2]

(b) Draw in the normal to the surface of mirror 1.
Mark the angle of incidence and label it ***i***. [1]

(c) State the relationship between the angle of incidence and the angle of reflection.

.....[1]

(d) Suggest a possible use for the periscope.

.....[1]

2 **(a)** A student investigates the rate of reaction between limestone (calcium carbonate) and dilute hydrochloric acid.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Describe the effect on the rate of reaction of

(i) decreasing the concentration of the acid

.....[1]

(ii) decreasing the temperature of the acid

.....[1]

(iii) decreasing the size of the pieces of limestone.

.....[1]

(b) Describe a chemical test for carbon dioxide.

test .....

result .....[2]

3 Fig. 3.1 shows a speed-time graph of a sprinter in a 100 m race. He took 12 s to comp race.

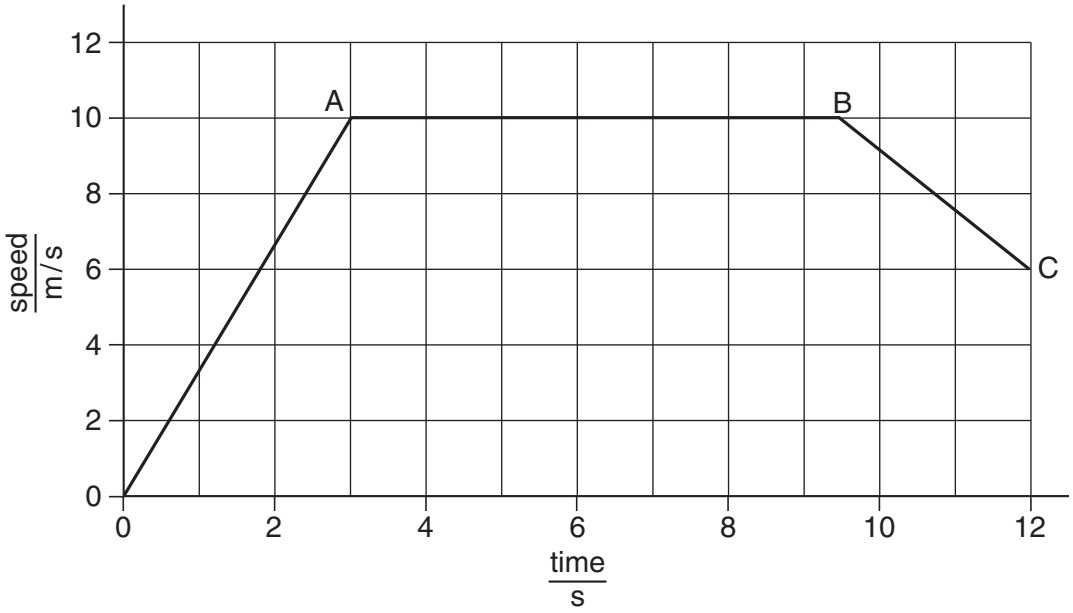

Fig. 3.1

(a) **(i)** Describe the motion of the sprinter during the first three seconds.

.....[2]

(ii) Describe the motion of the sprinter during the section AB.

.....[1]

(b) Calculate the distance the sprinter covers in the first three seconds.
Show your working.

distance = ... m [3]

(c) State the speed of the sprinter as he finishes the race.

speed = ... m/s [1]

4 **(a)** **(i)** Use the Periodic Table on page 12 to find the total number of electrons in one atom of magnesium, Mg.

total number of electrons = ... [1]

(ii) State the number of electrons in the shells around the nucleus of a magnesium atom.

first shell .....

second shell .....

third shell ..... [1]

(b) A piece of magnesium ribbon burns when heated in air to form the oxide.

A piece of sodium oxidises spontaneously at room temperature when exposed to air to form the oxide.

A piece of copper wire does not burn when heated in air but does form a layer of oxide.

(i) Place these three metals in an order of increasing reactivity, the most reactive on the right.

.....
least reactive most reactive
[1]

(ii) Name a metal in Group I that will oxidise more readily than sodium.

..... [1]

(iii) State and explain why these oxides are classified as *basic* oxides.

.....

.....

.....[2]

5 Fig. 5.1 shows an electrical circuit.

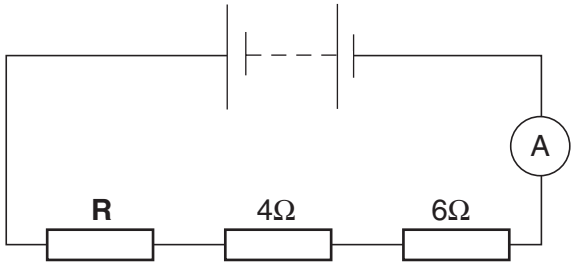

Fig 5.1

The reading on the ammeter is 0.8 A, and the potential difference across the resistor labelled **R** is 4.0 V.

(a) Complete the diagram to show how a voltmeter would be connected to measure the potential difference across resistor **R**. [2]

(i) Calculate the value of the resistor **R**. Show your working.

resistance = ...

(ii) State the unit in which the resistance is measured.

..... [3]

(c) Calculate the total resistance in the circuit. Show your working.

total resistance = ... [1]

(d) Calculate the potential difference across the battery in this circuit. Show your working.

potential difference across the battery = ... V [2]

6 **(a)** Sodium chloride is an ionic compound, containing the ions Na^+ and Cl^-.

(i) Describe the formation of each of these ions in terms of electron transfer between atoms.

.....

.....

.....[2]

(ii) In terms of forces between these ions, explain why sodium chloride has a high melting point.

.....

.....

.....[2]

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

test .....

result .....[2]

7 Fig. 7.1 shows an experiment set up to investigate the deflection of β-particles by a m field.

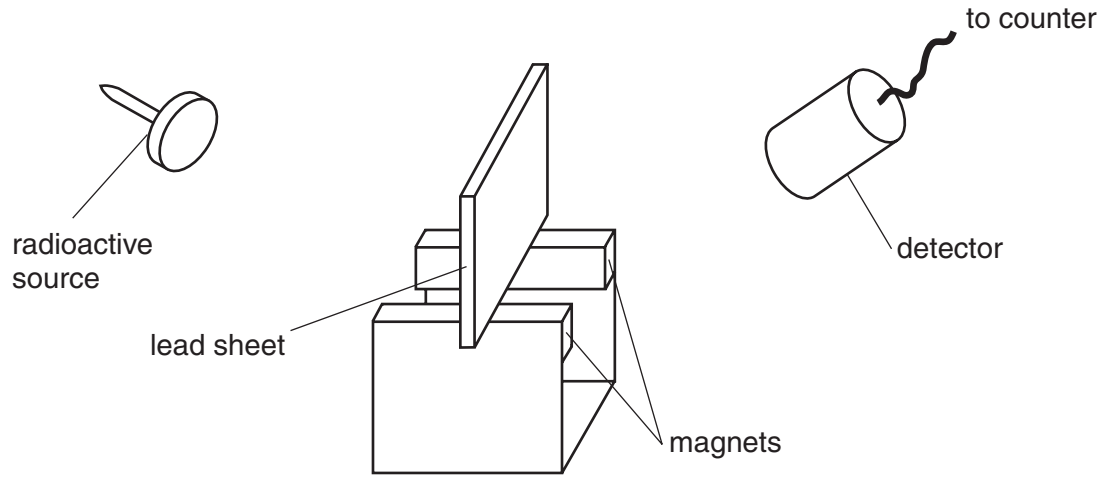

Fig. 7.1

(a) (i) Explain the purpose of the lead sheet.

.....

(ii) Name a suitable detector.

.....

Even when there is no radioactive source present, a few counts are recorded each minute.

(iii) State what causes these counts.

.....[3]

(b) State **one** precaution that should be taken when using radioactive sources.

.....

.....[1]

(c) Explain why a similar experiment to show the deflection of α-particles must be done in a vacuum.

.....

.....[2]

(d) When demonstrating the deflection of α-particles a very much stronger ma needed than with the β-particles. The deflection is very much less and it is in opposite direction.

(i) What does the small deflection and the need for a stronger magnet suggest about the mass of the α-particles compared with that of β-particles?

.....

.....[1]

(ii) What does the deflection in the opposite direction tell us about the α-particles compared with β-particles?

.....

.....[2]

(e) Explain why γ-radiation can not be deflected however strong a magnetic field is applied.

.....

.....[1]

8 **(a)** The formula of a hydrocarbon compound is $C_{20}H_{42}$.

(i) Use the Periodic Table on page 12 to calculate the relative molecular mass, M_r, of this compound. Show your working.

M_r ..... [2]

(ii) Give the formula of the next hydrocarbon in the same homologous series.

.....[1]

(iii) Name this homologous series.

.....[1]

(iv) Describe a chemical test to distinguish between alkanes (saturated hydrocarbons) and alkenes (unsaturated hydrocarbons).

test .....

result for alkanes .....

result for alkenes .....[3]

(b) One use of the hydrocarbon, $C_{20}H_{42}$, mp 37 °C, is in candles.

(i) Candles burn with a yellow sooty flame. Name three chemical products formed when the candle burns.

1 .....

2 .....

3 ..... [3]

(ii) Explain why there needs to be a pool of molten wax round the wick for the candle to burn properly.

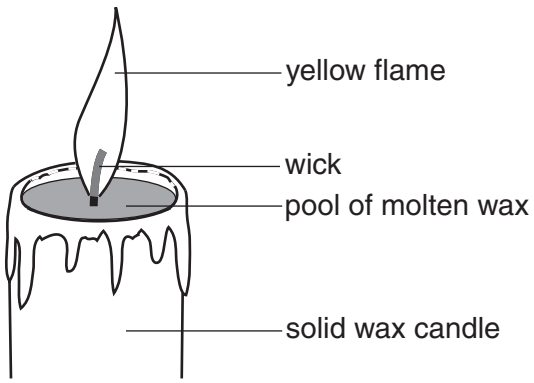

Fig. 8.1

.....

.....[1]

(iii) Suggest why candles for use in **hot** countries should be made from hydrocarbons with **more** than 20 carbon atoms in the molecule.

.....

.....

.....[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	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	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 otassium	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	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	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	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 Lawr 103

3-71 Lanthanoid series
0-103 Actinoid series

y

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.).