

Centre Number	Candidate Number	Name
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CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICAL SCIENCE

0652/02

Paper 2

May/June 2003

1 hour

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.

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.

A copy of the Periodic Table is printed on page 12.

For Examiner's Use

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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.

2

- 1 An isotope of silicon has the atomic notation ${}_{14}^{29}\text{Si}$.

Use this information to complete the table in Fig. 1.1.

number of protons in nucleus of atom	14
number of neutrons in nucleus of atom	
total number of electrons around nucleus	
arrangement of these electrons in shells	

Fig. 1.1

[3]

2 Fig. 2.1 shows an electromagnetic relay switch.

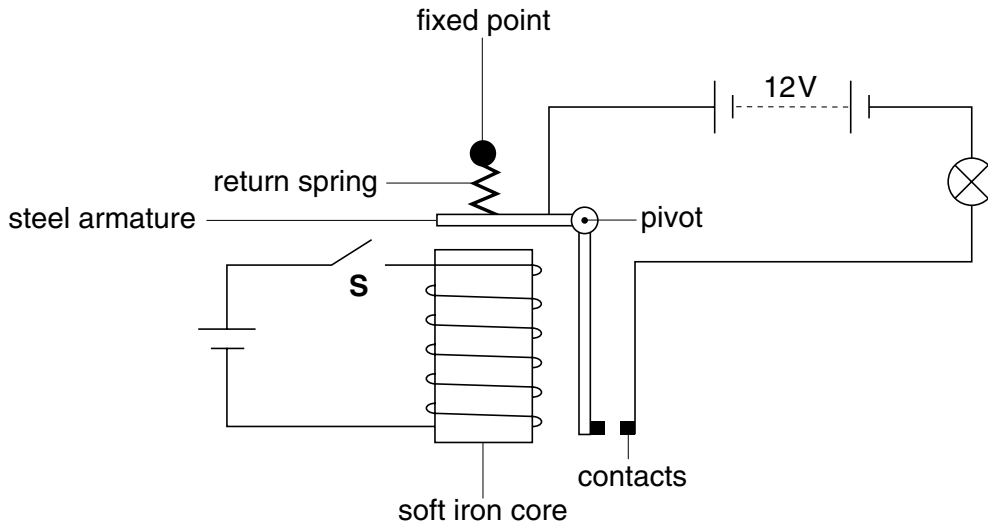


Fig. 2.1

(a) (i) Explain why the contacts close when switch S is closed.

.....

.....

.....

.....[3]

(ii) Explain why soft iron, not steel, is used for the core.

.....

.....[2]

(b) The lamp in the circuit has a current of 4 A through it when there is a potential difference of 12 V across it.

Calculate the resistance of the lamp. Show your working and state the unit of resistance.

resistance = [3]

3 (a) (i) Draw a 'dot-cross' diagram to describe the bonding in a molecule of methane. You need show only the outer electrons of each atom.

[2]

(ii) Name the type of bonding between the atoms in the methane molecule.

.....[1]

(b) One molecule of an alcohol consists of one carbon atom, four hydrogen atoms and one oxygen atom.

(i) Write the structural formula of this compound.

.....[2]

(ii) Calculate the relative molecular mass, M_r , of this compound.

[1]

- 4 (a) Fig. 4.1 shows parallel light entering a converging lens.

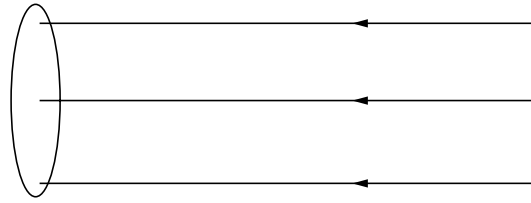


Fig. 4.1

- (i) Complete the diagram to show the paths of the rays of light after passing through the lens.
- (ii) Mark the focal length of the lens on the diagram. [3]
- (b) Fig. 4.2 shows a ray of light striking a mirror.

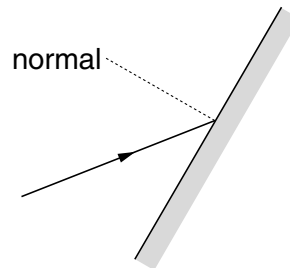


Fig. 4.2

- (i) Mark the angle of incidence at the mirror and label it i .
- (ii) Complete the path of the ray of light after it strikes the mirror. [2]

- 5 (a) In an experiment using Group VII elements, a student adds bromine water to a colourless solution of potassium iodide. The solution changes to an orange-brown colour.

In terms of the bromine reacting with the iodide ion, state the reason for this change of colour.

.....
.....
.....[2]

- (b) Complete the table in Fig. 5.1 about ethane and ethene.

	ethane	ethene
diagram for structure of molecule		
effect of hydrocarbon on bromine water		

Fig. 5.1

[4]

6 (a) Fig. 6.1 shows a liquid-in-glass thermometer.

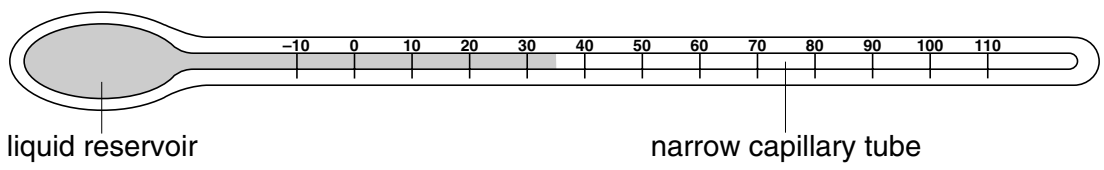


Fig. 6.1

- (i) Name a suitable liquid to use in the thermometer.
- (ii) State the reading on the thermometer. °C
- (iii) Explain why a narrow capillary tube is used.

.....

.....[3]

(b) The thermometer bulb is put in melting ice.

- (i) Explain why the liquid moves in the capillary tube.
-
-
-
- (ii) Mark on the diagram the new position of the liquid. [3]

7 (a) Use the kinetic particle theory of matter to explain why energy is needed to melt a solid, at its melting point, to form a liquid.

.....

.....

.....[2]

(b) A student puts a drop of coloured ink into water. The ink slowly spreads throughout the water.

Use the kinetic particle theory of matter to explain this observation.

.....

.....

.....[2]

- 8 (a) Fig. 8.1 shows water waves going from deep water into shallow water. The arrow shows the direction of the waves in the deep water.

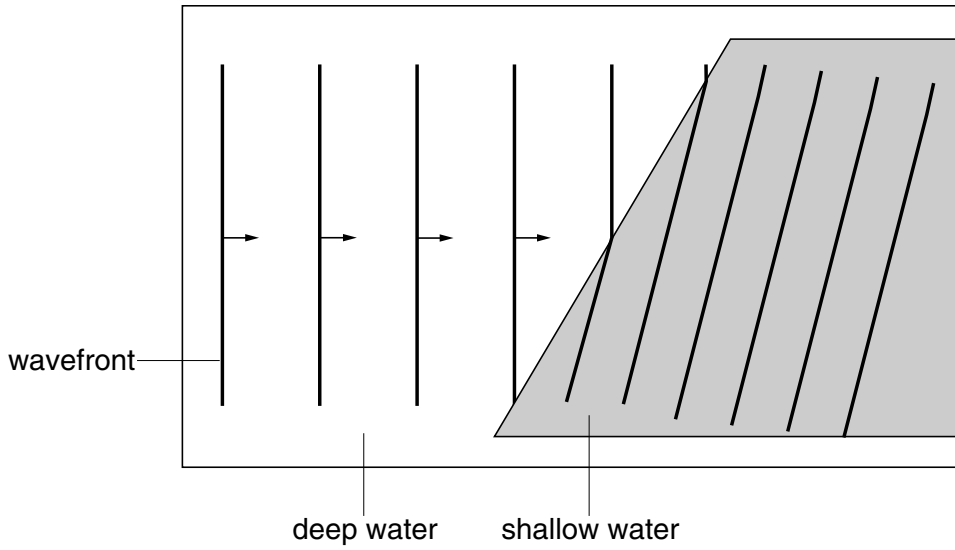


Fig. 8.1

- (a) (i) Name the process illustrated.
- (ii) Draw an arrow to show the direction of the waves in the shallow water. [2]
- (b) When the waves enter the shallow water, state what happens to
- (i) their speed,
- (ii) their frequency,
- (iii) their wavelength.[3]

9 A student is asked to prepare the salt calcium chloride from powdered limestone, carbonate.

(a) Name the acid she must use.

.....[1]

(b) She adds powdered limestone gradually to the acid in a beaker, stirring frequently. A gas is produced.

(i) Name the gas produced in this reaction.

.....[1]

(ii) Describe a test to identify the gas produced in this reaction.

test

result

[2]

(c) She continues to add powdered limestone until no further reaction occurs.

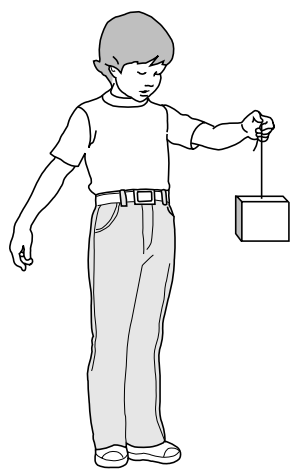
Describe how to obtain solid calcium chloride from the mixture in the beaker.

.....

.....

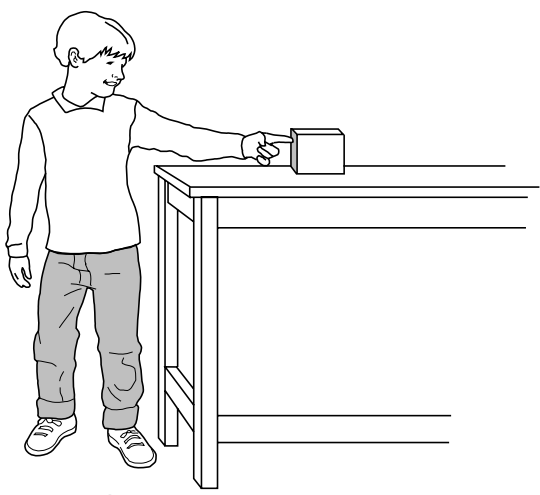
.....[2]

10 Fig. 10.1 shows two examples of a boy applying a force to an object.



example 1

The boy holds a box in a steady position.



example 2

The boy pushes the box along the bench.

Fig. 10.1

(a) State and explain in which example the boy is doing useful work on the box.

.....
.....
.....[2]

(b) The box has a mass of 1.8 kg.

Calculate the weight of the box. ($g = 10 \text{ N/kg}$)

weight = [2]

(c) In example 1, the boy drops the box.

Describe the motion of the box as it falls to the ground.

.....
.....[2]

11 Most fuels are chemicals which burn in air.

(a) Hydrogen burns in air to form water vapour.

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

.....
.....
.....[2]

(b) In terms of energy, state why hydrogen is useful as a fuel.

.....
.....[1]

(c) Explain why hydrogen is described as a *clean* fuel.

.....
.....
.....[2]

DATA SHEET
The Periodic Table of the Elements

		Group																											
I	II	III	IV	V	VI	VII	0					0																	
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1	5 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	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	56 Fe Iron 26	59 Co Cobalt 27	64 Cu Copper 29	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	84 Kr Krypton 36	85 Rb Rubidium 37	88 Sr Strontium 38	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	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	127 I Iodine 53	131 Xe Xenon 54					
133 Cs Caesium 55	137 Ba Barium 56	140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71	226 Ra Radium 88	227 Ac Actinium 89	232 Th Thorium 90	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103

8-71 Lanthanoid series
90-103 Actinoid series

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

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