

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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10	
11	
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.

This document consists of 12 printed pages.



- 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.

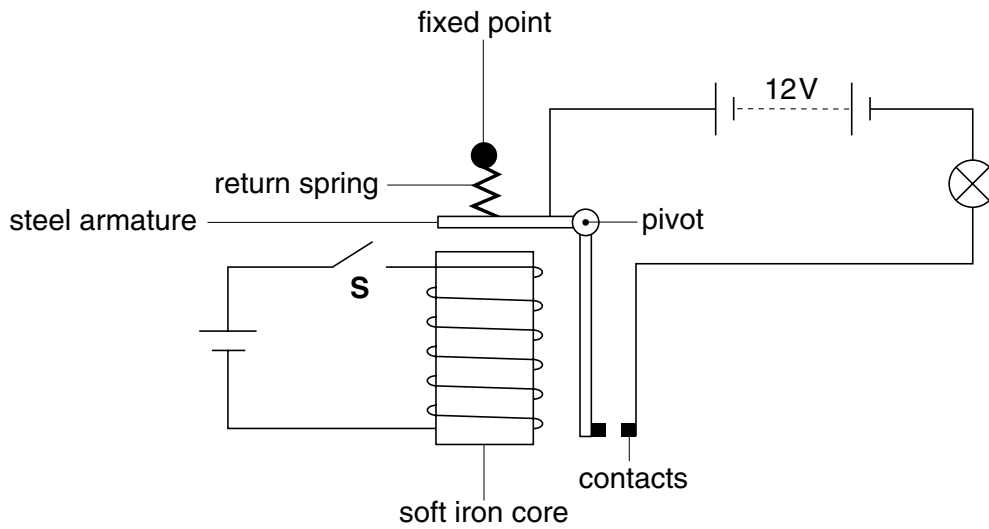


Fig. 2.1

(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, CH_4 . 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.

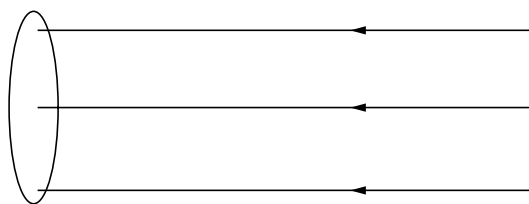


Fig. 4.1

- (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.

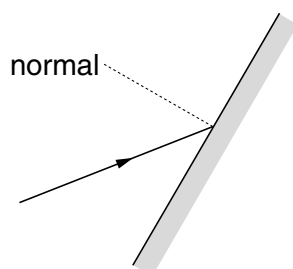


Fig. 4.2

- (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.

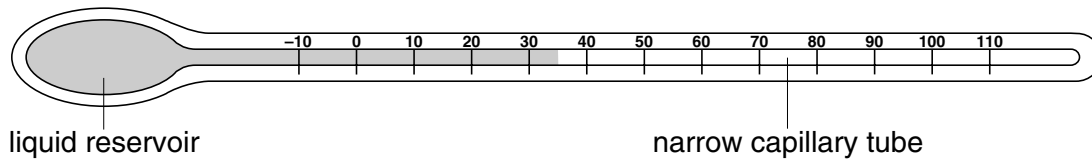


Fig. 6.1

(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 arrows show the direction of the waves in the deep water.

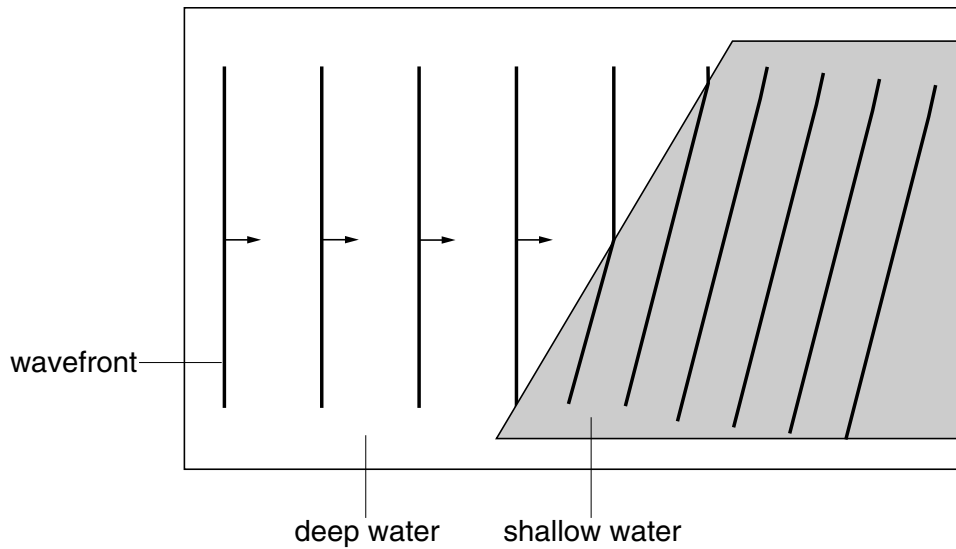


Fig. 8.1

- (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, calcium 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.

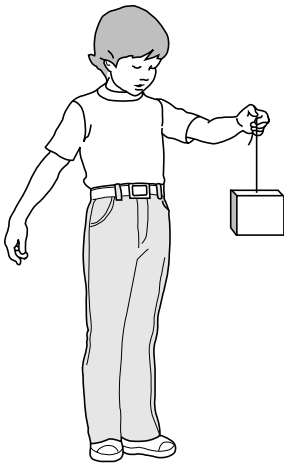
Describe how to obtain solid calcium chloride from the mixture in the beaker.

.....

.....

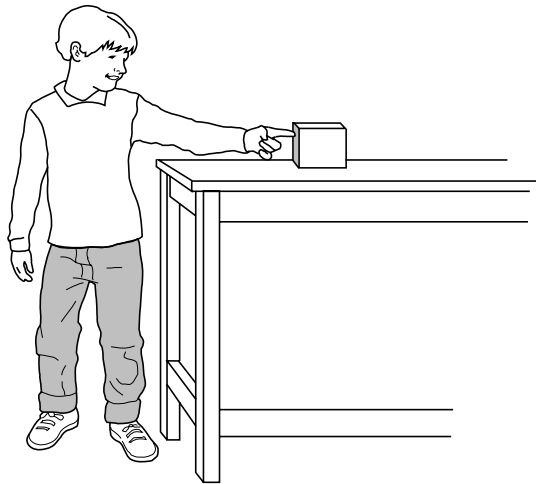
.....[2]

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
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">1 H Hydrogen 1</div> <div style="border: 1px solid black; padding: 2px;">4 He Helium 2</div> </div>							
7 Li Lithium 3	9 Be Beryllium 4								
23 Na Sodium 11	24 Mg Magnesium 12	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 N Nitrogen 7	15 P Phosphorus 15	16 O Oxygen 8	17 F Fluorine 9	18 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	65 Zn Zinc 30	64 Cu Copper 29	66 Ag Silver 47	68 Cd Cadmium 48	78 Pt Platinum 78	80 Hg Mercury 80	85 At Astatine 85	86 Rn Radon 86
226 Ra Radium 88	227 Ac Actinium 89	59 Co Cobalt 27	58 Ni Nickel 28	60 Pd Palladium 46	63 Rh Rhodium 45	77 Ir Iridium 77	79 Au Gold 79	81 Tl Thallium 81	82 Pb Lead 82
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">140 Ce Cerium 58</div> <div style="border: 1px solid black; padding: 2px;">141 Pr Praseodymium 59</div> <div style="border: 1px solid black; padding: 2px;">142 Nd Neodymium 60</div> <div style="border: 1px solid black; padding: 2px;">143 Pm Promethium 61</div> <div style="border: 1px solid black; padding: 2px;">144 Nd Neodymium 60</div> <div style="border: 1px solid black; padding: 2px;">145 Pr Praseodymium 59</div> <div style="border: 1px solid black; padding: 2px;">146 Ce Cerium 58</div> </div>									
139 La Lanthanum 57	138 Y Yttrium 39	56 Fe Iron 26	55 Mn Manganese 25	57 Co Cobalt 27	59 Ni Nickel 28	60 Cu Copper 29	61 Zn Zinc 30	62 Ga Gallium 31	63 Ge Germanium 32
178 Hf Hafnium 72	179 Ta Tantalum 73	101 Ru Ruthenium 44	100 Rh Rhodium 45	102 Pd Palladium 46	106 Ni Nickel 28	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50
227 Ac Actinium 89	227 La Lanthanum 57	186 Re Rhenium 75	187 Os Osmium 76	190 Pt Platinum 78	195 Pd Palladium 46	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">147 Bk Berkelium 97</div> <div style="border: 1px solid black; padding: 2px;">148 Cf Californium 98</div> <div style="border: 1px solid black; padding: 2px;">149 Es Einsteinium 99</div> <div style="border: 1px solid black; padding: 2px;">150 Fm Fermium 100</div> <div style="border: 1px solid black; padding: 2px;">151 Md Mendelevium 101</div> <div style="border: 1px solid black; padding: 2px;">152 Np Neptunium 93</div> <div style="border: 1px solid black; padding: 2px;">153 Pu Plutonium 94</div> <div style="border: 1px solid black; padding: 2px;">154 Am Americium 95</div> <div style="border: 1px solid black; padding: 2px;">155 Cm Curium 96</div> <div style="border: 1px solid black; padding: 2px;">156 Bk Berkelium 97</div> </div>									
175 Lu Lutetium 71	176 Yb Ytterbium 70	162 Dy Dysprosium 66	161 Er Erbium 68	163 Tm Thulium 69	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103	104 Rf Rutherfordium 104	105 Db Dubnium 105

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	X
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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.).