



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

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PHYSICAL SCIENCE

0652/22

Paper 2 (Core)

October/November 2011

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.

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.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

A copy of the Periodic Table is printed on page 16.

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.

For Examiner's Use	
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Total	

This document consists of **16** printed pages.



- 1 A list of apparatus commonly found in the laboratory is shown below.

balance beaker burette spatula thermometer

Choose the item from the list which you would use to carry out each of the following actions.

- (a) weigh 0.5 g of copper(II) carbonate
- (b) measure 25.0 cm³ of water
- (c) find the temperature of boiling ethanol
- (d) react together an acid and an alkali

[4]

- 2 Two cars are being tested on a straight level track.

Fig. 2.1 shows the speed-time graphs for the two cars, each of mass 1500 kg.

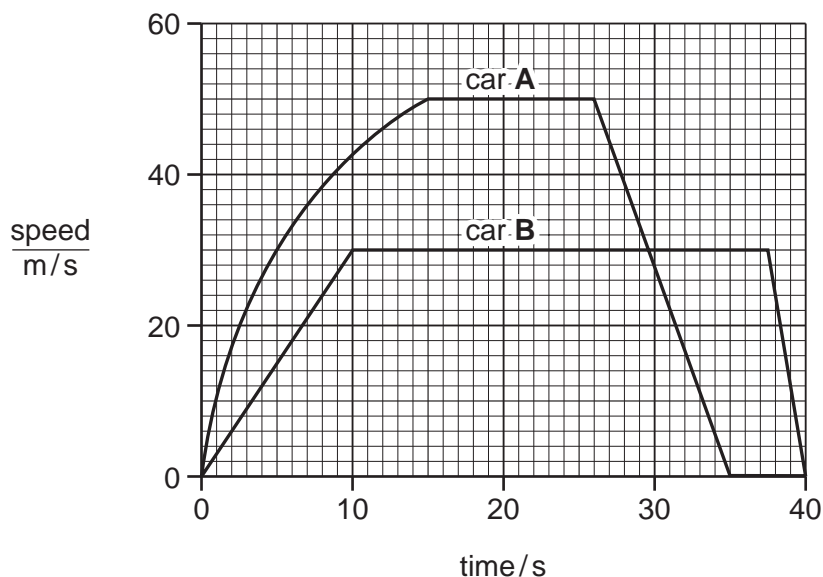


Fig. 2.1

- (a) Determine the maximum speed of car A.

maximum speed = m/s [1]

(b) Describe the motion of car **B** during the last 2.5 s of the test.

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

(c) Use the graph to determine the distance travelled by car **B** during the first 10 s of the test.

distance = m [2]

(d) From 10.0 s to 37.5 s car **B** is travelling at constant speed in a straight line.

(i) State the resultant force on the car during this time.

force = [1]

(ii) Explain why the car engine must continue to do work during this period.

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

(e) At the beginning of the test both cars accelerate from rest.

Explain which car produces the greater accelerating force.

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

- 3 (a) Give an example of an ionic compound and an example of a covalent compound.

ionic compound

covalent compound [2]

- (b) Describe **two** differences in the properties of ionic and covalent compounds.

1

.....

2

..... [2]

- (c) Draw a dot and cross diagram to show the electron arrangement in an atom of magnesium.

[2]

4 (a) Name the main ore of aluminium.

..... [1]

(b) Explain why aluminium is not extracted from its ore by heating with carbon.

.....

.....

..... [2]

- 5 A student is investigating the melting of fruit flavoured crushed ice. Initially, the temperature of the ice is -10°C . He measures the temperature every 30 s.

Fig. 5.1 shows the apparatus he uses.

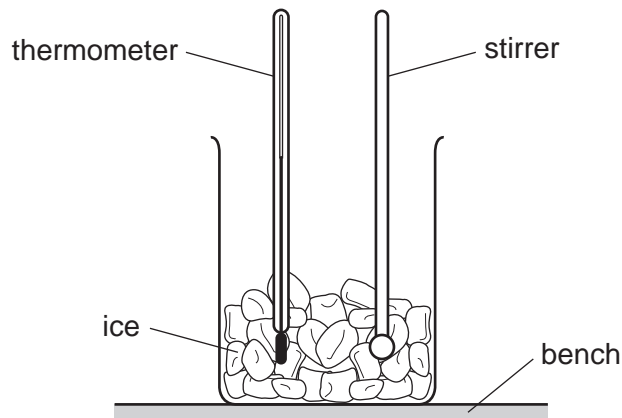


Fig. 5.1

- (a) (i) Explain why the student stirs the crushed ice just before taking each temperature reading.

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

- (ii) Suggest why, in the first two minutes of the experiment, the temperature of the ice rises, even though there is no apparent heat source.

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

The graph in Fig. 5.2 shows how the temperature of the ice changes with time.

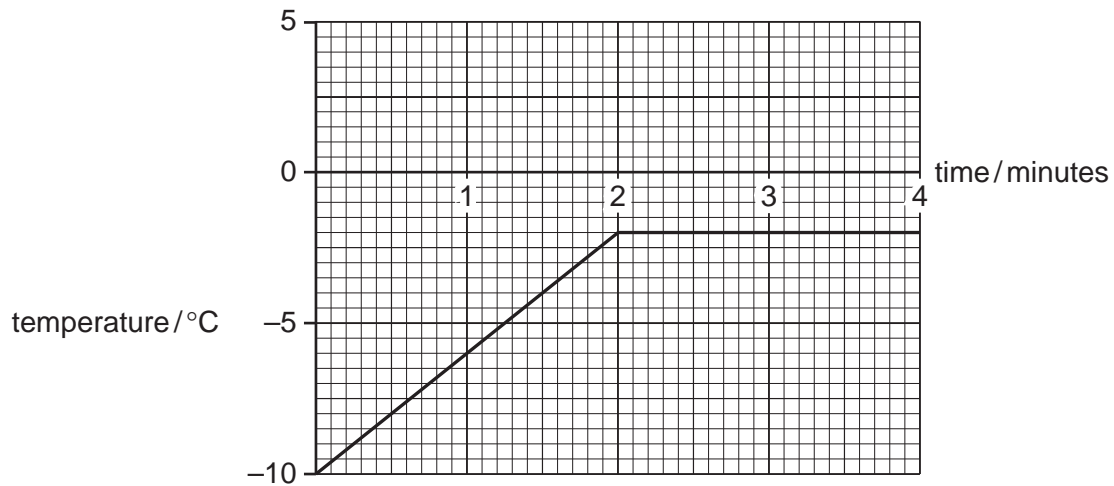


Fig. 5.2

(b) Determine the temperature at which this sample of ice melts.

temperature = °C [1]

(c) Explain in terms of the kinetic theory what is happening to the sample from two minutes to four minutes.

.....

 [2]

- 6 (a) Complete Table 6.1 by putting in the missing names, formulae and molar masses.

Table 6.1

name	formula	mass of 1 mole / g
.....	H ₂ O
hydrogen chloride	36.5
sodium fluoride	42
.....	N ₂

[4]

- (b) Give the symbols for the ions in sodium fluoride and the number of protons present in each ion.

sodium ion number of protons

fluoride ion number of protons [2]

- 7 The radioactive isotope $^{105}_{45}\text{Rh}$ decays by emitting a beta-particle (β -particle).

- (a) (i) State the number of protons in the nucleus of this isotope.

number of protons = [1]

- (ii) Calculate the number of neutrons in the nucleus.

number of neutrons = [1]

(b) (i) What is a beta-particle?

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

(ii) Describe the changes in the nucleus when a beta-particle is emitted.

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

8 (a) Give an advantage and a disadvantage of using hydrogen as a fuel for motor vehicles.

advantage

disadvantage [2]

(b) Write a balanced equation for the burning of hydrogen in air.

..... [2]

(c) Describe a test for hydrogen and state the expected result.

test

result [2]

(d) The reaction between hydrogen and nitrogen is an important industrial process.

(i) Name the gas formed.

..... [1]

(ii) Name this industrial process.

..... [1]

- 9 A student experiments with a rubber band. She stretches it between two retort stands and notices that it produces a sound when she plucks it. The apparatus is shown in Fig. 9.1.

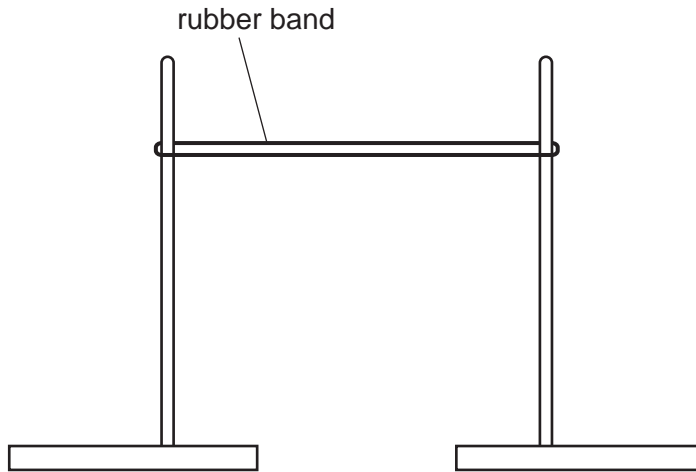


Fig. 9.1

- (a) Explain why the sound is produced.

.....

 [2]

- (b) The student sets up a cathode ray oscilloscope and a microphone as shown in Fig. 9.2 to display the sound trace produced by the apparatus in Fig. 9.1.

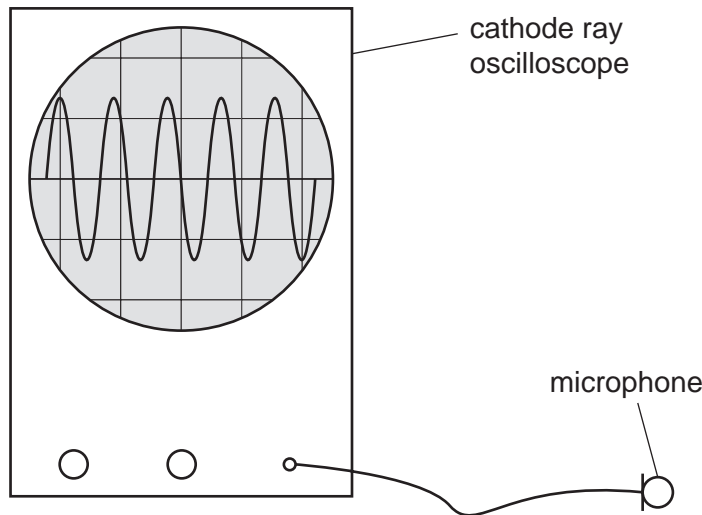
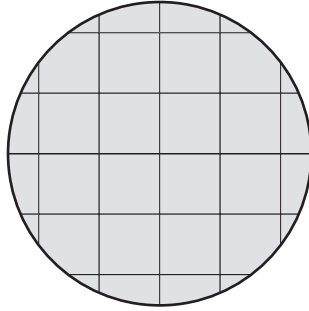


Fig. 9.2

- (i) She now plucks the rubber band so that a quieter note of the same frequency is heard.

Draw, on Fig. 9.3, the trace that is now seen.



[2]

Fig. 9.3

- (ii) She moves the stands further apart. She plucks the band again. The frequency of the sound now heard is greater than before.

Explain what is meant by the term *frequency* and state the unit used to measure it.

.....
.....

unit [2]

10 Chlorine is in Group VII of the Periodic Table.

(a) Name this Group.

..... [1]

(b) Name another element in this Group.

..... [1]

(c) State **one** use of chlorine.

..... [1]

(d) Name the Group II element which is in the same period as chlorine.

..... [1]

(e) Describe how, using chlorine, you can show that a solution contains bromide ions.

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

(f) Write down the number of electrons in a bromine atom and in a bromide ion.

bromine atom

bromide ion [2]

11 Fig. 11.1 shows an electric circuit. The e.m.f. of the battery is 9.0 V.

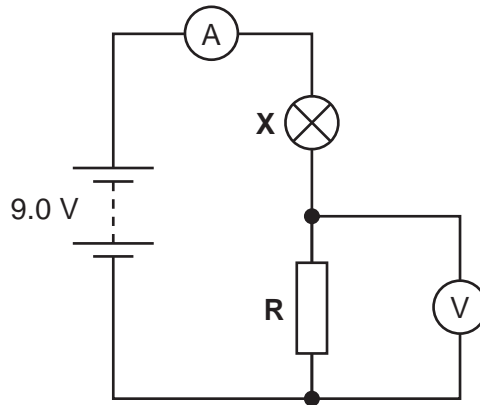


Fig. 11.1

(a) Name component **X**. [1]

(b) The resistance of resistor **R** is $12\ \Omega$ and the resistance of component **X** is $8.0\ \Omega$.

(i) Calculate the combined resistance of **R** and **X**.

resistance = Ω [1]

(ii) Calculate the current measured by the ammeter.

current = [2]

(iii) Calculate the reading on the voltmeter.

reading = V [2]

12 Methane and ethane are hydrocarbons. They are members of the same homologous series.

(a) Name this homologous series.

..... [1]

(b) Give the name and formula of the next member of this series.

name

formula

(c) Explain why ethanol, C_2H_5OH , is not a hydrocarbon.

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

- 13 (a) Fig. 13.1 shows a stiff copper rod suspended between two magnetic poles. The rod is freely hinged at the top.

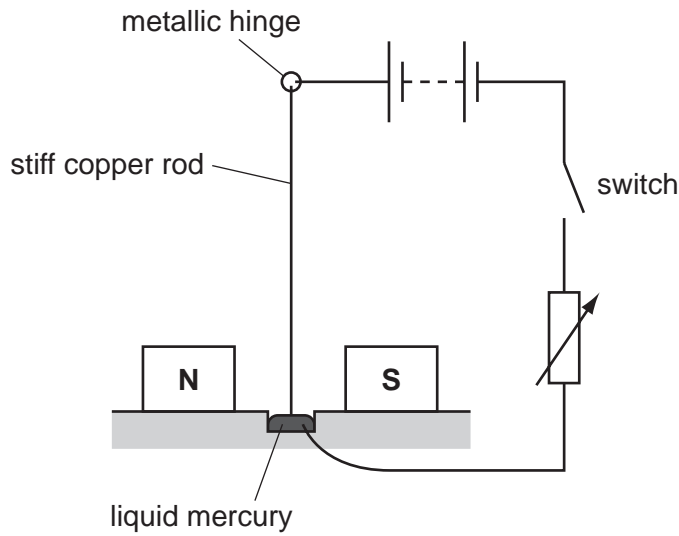


Fig. 13.1

- (a) Draw, on Fig. 13.1, the magnetic field between the poles. [3]

- (b) Explain why a current passes through the circuit when the switch is closed.

 [2]

- (c) State what will be observed when switch is closed.

 [2]

- (d) The connections to the battery are reversed so that the current in the circuit is in the opposite direction.
 State how the observations change.

 [1]

DATA SHEET
The Periodic Table of the Elements

		Group													
I	II	III	IV	V	VI	VII	0					0			
		1 H Hydrogen 1											4 He Helium 2		
7 Li Lithium 3	9 Be Beryllium 4											19 F Fluorine 9			
23 Na Sodium 11	24 Mg Magnesium 12	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	17 Cl Chlorine 17	20 Ne Neon 10					35.5 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 Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18					84 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					131 Xe Xenon 54			
133 Cs Caesium 55	137 Ba Barium 56	65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 28	56 Fe Iron 26	115 In Indium 49	112 Cd Cadmium 48	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	209 Bi Bismuth 83	207 Pb Lead 82	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86
226 Ra Radium 88	227 Ac Actinium 89	65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 28	56 Fe Iron 26	115 In Indium 49	112 Cd Cadmium 48	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	209 Bi Bismuth 83	207 Pb Lead 82	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86
												169 Tm Thulium 69			
												167 Er Erbium 68			
												165 Ho Holmium 67			
												162 Dy Dysprosium 66			
												159 Tb Terbium 65			
												157 Gd Gadolinium 64			
												152 Eu Europium 63			
												150 Sm Samarium 62			
												144 Nd Neodymium 60			
												141 Pr Praseodymium 59			
												140 Ce Cerium 58			
												238 U Uranium 92			
												232 Th Thorium 90			
												94 Pu Plutonium 94			
												93 Np Neptunium 93			
												91 Pa Protactinium 91			
												96 Cm Curium 96			
												95 Am Americium 95			
												97 Bk Berkelium 97			
												98 Cf Californium 98			
												99 Es Einsteinium 99			
												100 Fm Fermium 100			
												101 Md Mendelevium 101			
												102 No Nobelium 102			
												103 Lr Lawrencium 103			
												71 Lu Lutetium 71			
												70 Yb Ytterbium 70			
												175 Lu Lutetium 71			
												173 Yb Ytterbium 70			

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

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

a	X
b	

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