



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

1	
2	
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4	
5	
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7	
8	
9	
10	
11	
12	
13	
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.

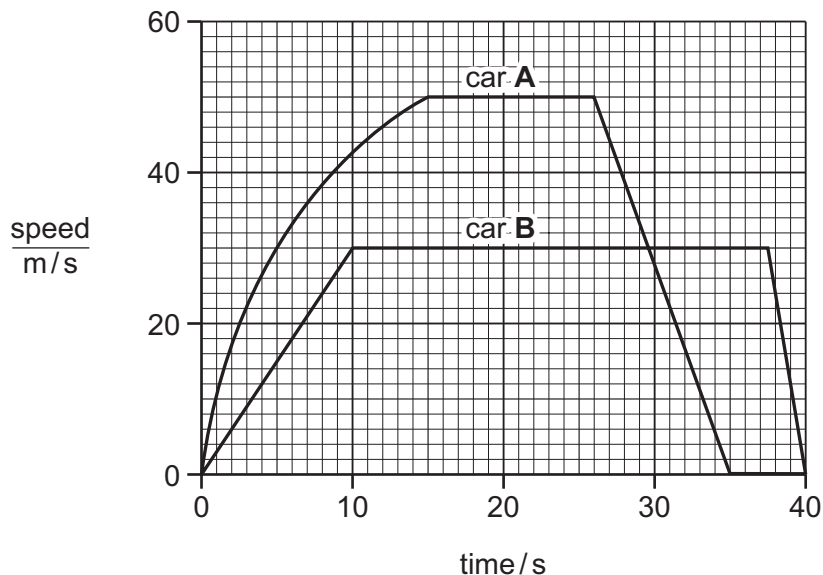


Fig. 2.1

- (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]

*For
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- 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.

For
Examiner's
Use

Fig. 5.1 shows the apparatus he uses.

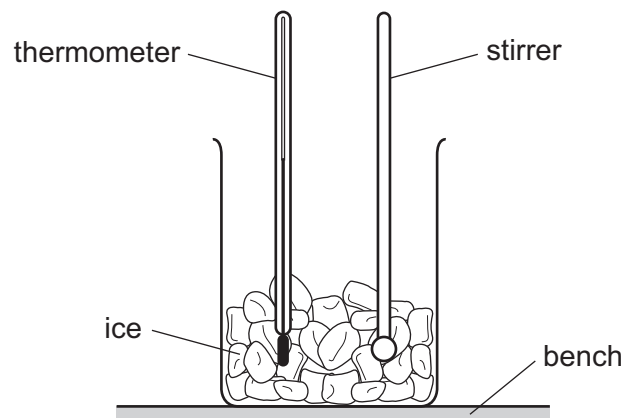


Fig. 5.1

- (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.

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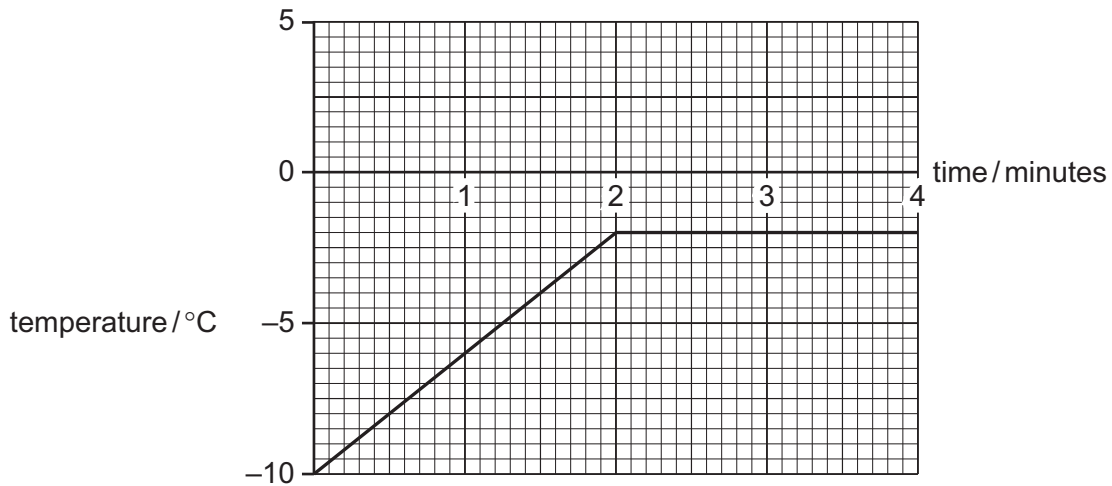


Fig. 5.2

(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]

For
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Use

(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.

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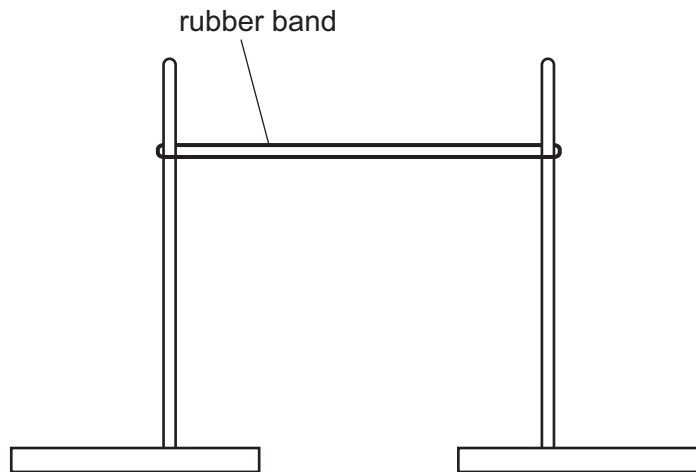


Fig. 9.1

- (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.

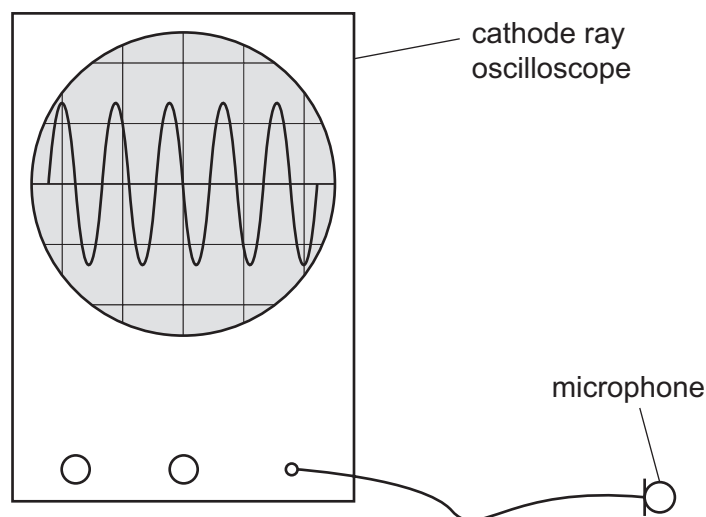
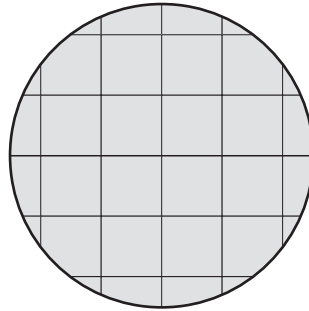


Fig. 9.2

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

For
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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.

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(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.

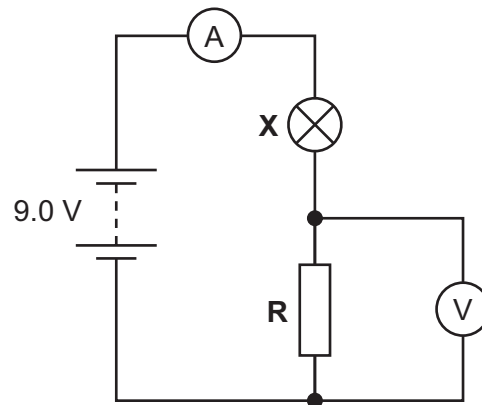


Fig. 11.1

For
Examiner's
Use

(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.

For
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Use

(a) Name this homologous series.

..... [1]

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

name

formula [2]

(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 copper rod is freely hinged at the top.

For
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Use

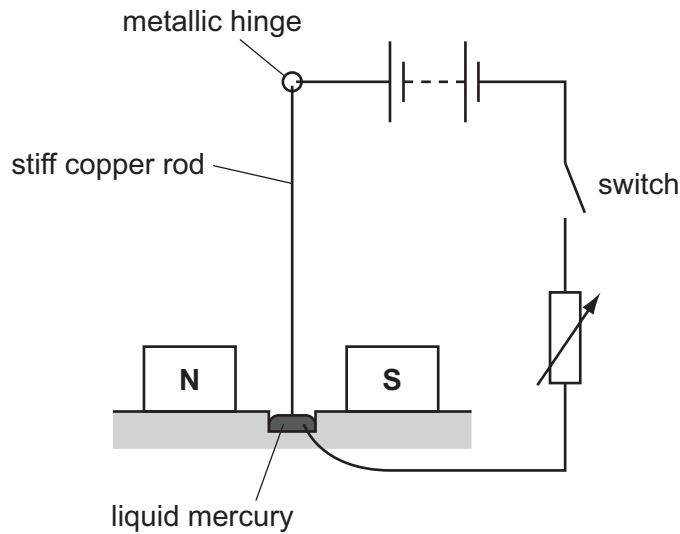


Fig. 13.1

- (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										
	1											2	4 He Helium					
	1											2	4 He Helium					
7	3	9											10	18	36	54	86	
7 Li Lithium	3 Na Sodium	9 Be Beryllium	11 B Boron	12 C Carbon	13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon				20 Ne Neon	36 Kr Krypton	54 Xe Xenon	86 Rn Radon	
11	19	24											16	35.5	54	86		
11 Na Sodium	19 K Potassium	24 Mg Magnesium	13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon				10 F Fluorine	17 Cl Chlorine	36 Kr Krypton	54 Xe Xenon	86 Rn Radon		
19	37	40											29	33	48	64	80	
19 K Potassium	37 Rb Rubidium	40 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37	55	56											47	51	68	84	102	
37 Rb Rubidium	55 Cs Caesium	56 Ba Barium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon	84 Po Polonium	102 No Nobelium
55	87	88											72	81	108	138	176	
55 Cs Caesium	87 Fr Francium	88 Ra Radium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon	108 Lr Lawrencium	
87	103	104											96	108	146	184	222	
87 Fr Francium	103 Ac Actinium	104 Ra Radium	*58-71 Lanthanoid series †90-103 Actinoid series										96 Cm Curium	108 Lr Lawrencium	146 Lu Lutetium	184 Yb Ytterbium	222 Ac Actinium	
	a	X											b					
Key	a	X											b					
	a	X											b					
	a	X											b					

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.).

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