



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

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PHYSICAL SCIENCE

0652/21

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	
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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.

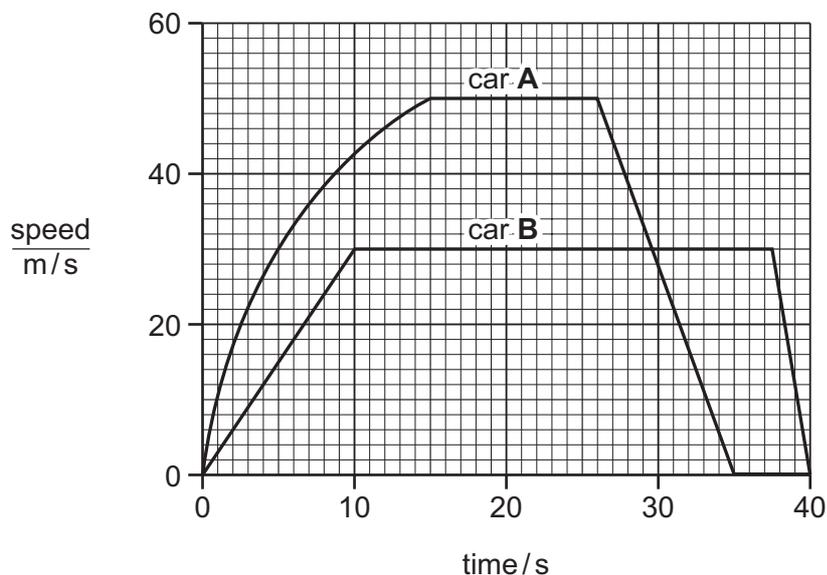


Fig. 2.1

- (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]

- 5 A student is investigating the melting of fruit flavoured crushed ice. Initially, the temperature of the ice is $-10\text{ }^{\circ}\text{C}$. He measures the temperature every 30 s.

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Fig. 5.1 shows the apparatus he uses.

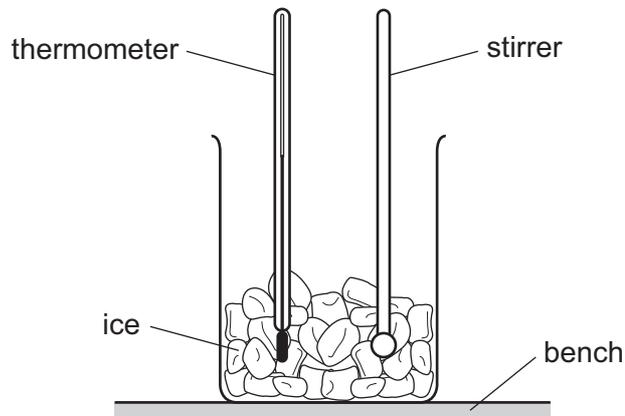


Fig. 5.1

- (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.

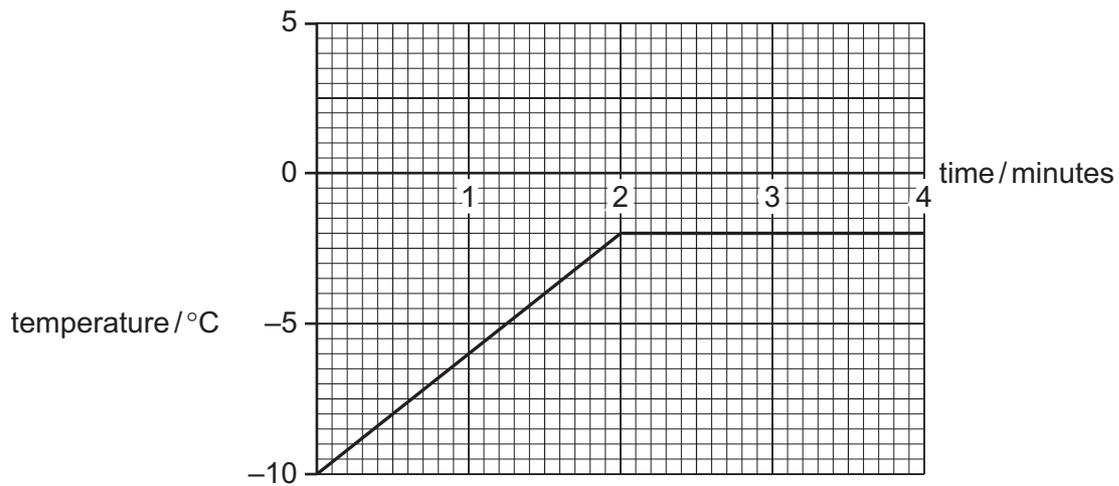


Fig. 5.2

(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]

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- 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]

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(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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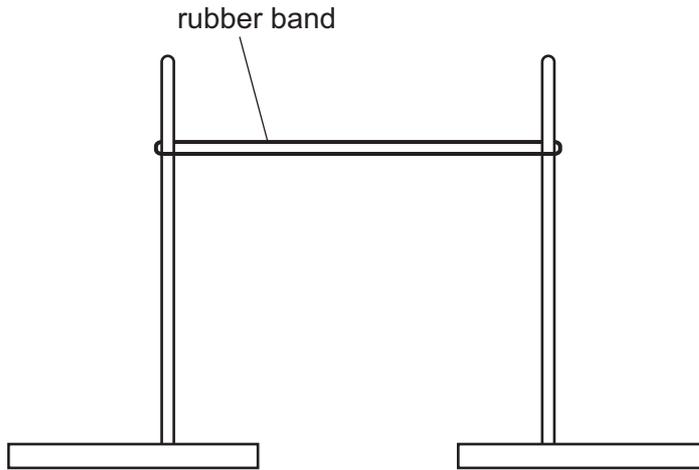


Fig. 9.1

- (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.

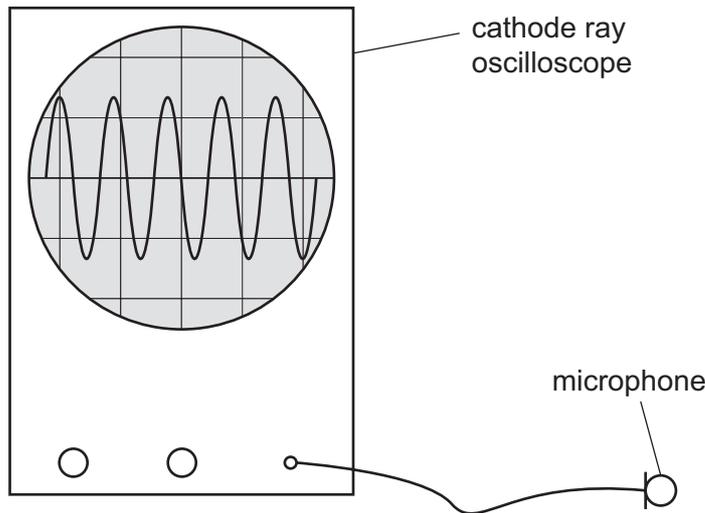
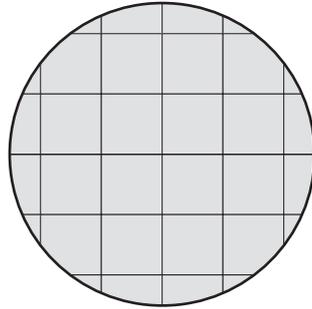


Fig. 9.2

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

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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.

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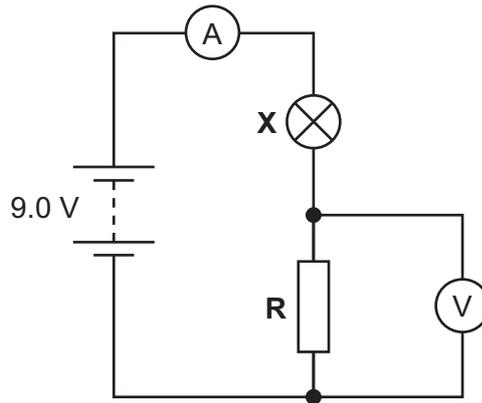


Fig. 11.1

(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.

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(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.

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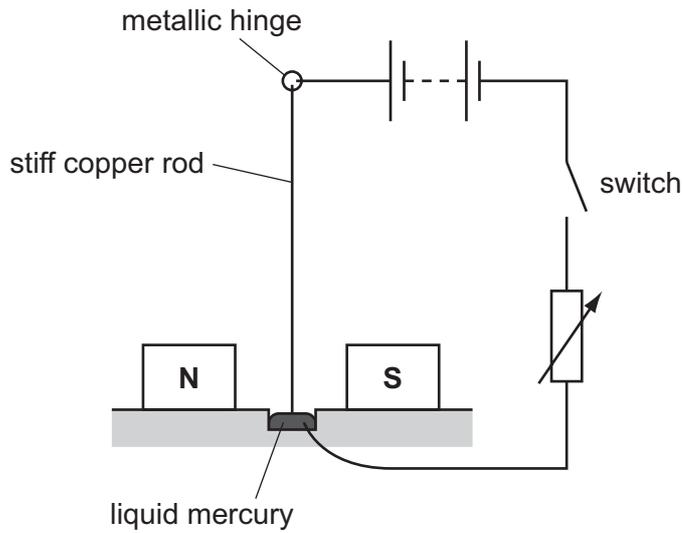


Fig. 13.1

- (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]

