



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

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PHYSICAL SCIENCE

0652/02

Paper 2 (Core)

October/November 2009

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) Name the type of bonding in a hydrogen molecule, H₂.

.....

(b) Draw a dot and cross diagram to show the arrangement of the outer electrons in a molecule of hydrogen chloride gas, HCl.

[1]

(c) Give two characteristic properties of ionic compounds.

1.

2. [2]

2 Fig. 2.1 shows a circuit diagram, with a battery of e.m.f. 6.0 V and three identical resistors R_1 , R_2 and R_3 .

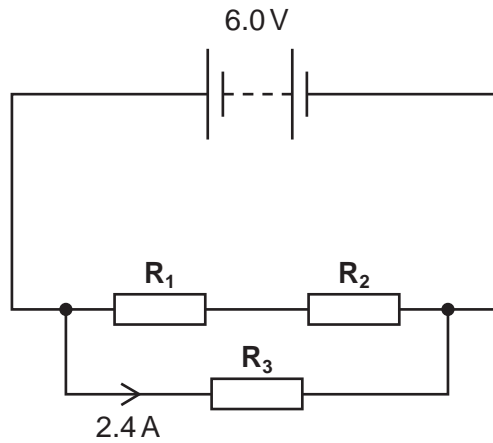


Fig. 2.1

(a) The current through R_3 is 2.4 A. Calculate the resistance of R_3 .

resistance = Ω [2]

(b) Calculate the combined resistance of R_1 , and R_2 .

resistance = Ω [1]

(c) Use your answer to (b) to calculate the current through R_1 , and R_2 .

current = A [2]

3 (a) State what is meant by the term *fuel*.

..... [1]

(b) (i) Suggest two reasons why hydrogen makes a good fuel.

1.

2. [2]

(ii) Suggest **one** reason why hydrogen is **not** widely used as a fuel.

..... [1]

(c) Ethanol is a useful fuel which can be made from sugar.

(i) Name the process used to make ethanol from sugar.

..... [1]

(ii) Describe how you could show that carbon dioxide is produced in this reaction.

.....

.....

..... [2]

(iii) Name the process used to separate ethanol from the resulting mixture from **c(i)**.

..... [1]

4 A microphone is connected to a cathode ray oscilloscope.
Fig. 4.1 shows the pattern produced on the cathode ray oscilloscope when a guitar string is plucked.

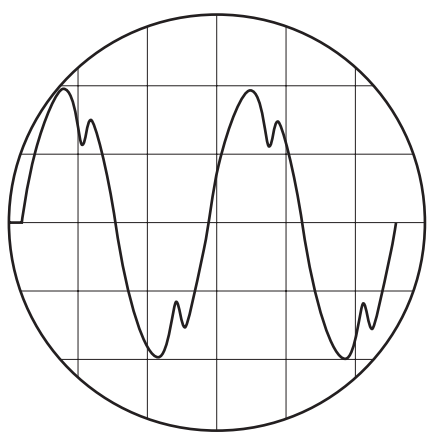


Fig. 4.1

(a) (i) State how the trace changes if a louder note, of the same pitch, is played.
 [1]

(ii) State how the trace changes if a higher pitched note is played.
 [1]

(b) Bats navigate by emitting short high pitched sounds, above the threshold of human hearing.

(i) State the maximum frequency that the human ear can detect.
 Hz [1]

(ii) Sound travels at 320 m/s in air.
 A bat emits a pulse of sound and hears the echo from a wall 0.075 s later.
 Calculate the distance from the bat to the wall.
 Show your working.

distance = m [3]

- 5 (a) A fisherman is steering his boat using a single oar as shown in Fig. 5.1a. Fig. 5.1b shows the same boat viewed from above. To keep the oar stationary the fisherman applies a force of 250 N to the end of the oar.



Fig. 5.1a

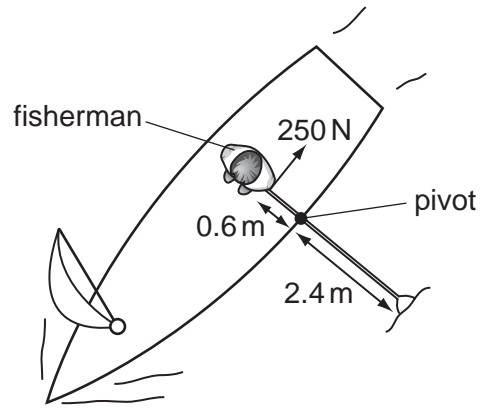


Fig. 5.1b

- (i) Calculate the moment produced by the fisherman about the pivot.

Show your working.

moment = Nm [2]

- (ii) Use your answer from (a)(i) to calculate the force the oar produces on the water.

Show your working.

force = N [2]

(b) The boat moves through the water at a steady speed of 2.5 m/s for 12 s. It then decelerates to rest at a uniform rate in a further 8.0 s.

(i) On Fig. 5.2 draw a speed-time graph to show this motion.

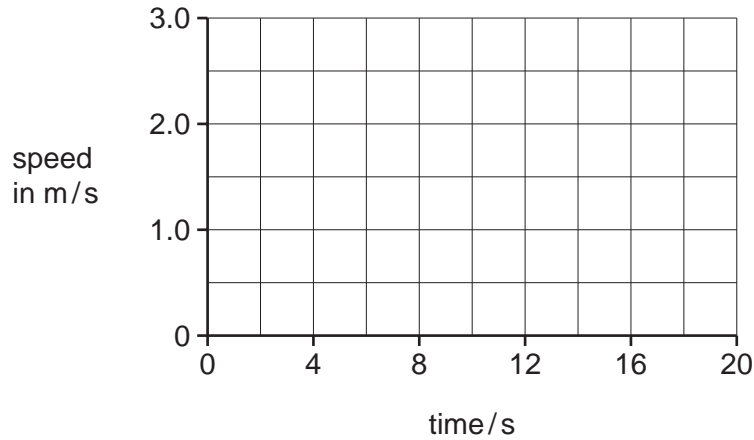


Fig. 5.2

[2]

(ii) Calculate the total distance travelled by the boat.

Show your working.

distance travelled = m [3]

6 Bronze, an alloy containing copper and tin, is used to make statues.

(a) State what is meant by the term *alloy*.

..... [1]

(b) Name another alloy of copper and give a use for it.

alloy

use [2]

(c) Car bodies can be made from mild steel.

(i) State how car manufacturers try to prevent car bodies from rusting.

..... [1]

(ii) Suggest a reason why copper is not suitable for use in making car bodies.

..... [1]

7 A solar power station is designed for use in desert countries. Fig. 7.1 shows the steps involved in the production of electricity.

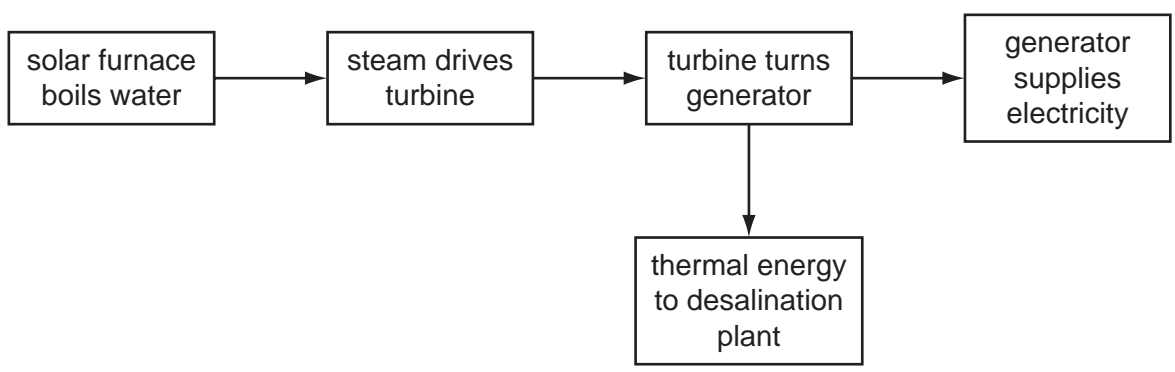


Fig. 7.1

(a) A solar furnace consists of many mirrors. These mirrors are arranged so that sunlight is reflected onto a large container of water, as shown in Fig. 7.2.

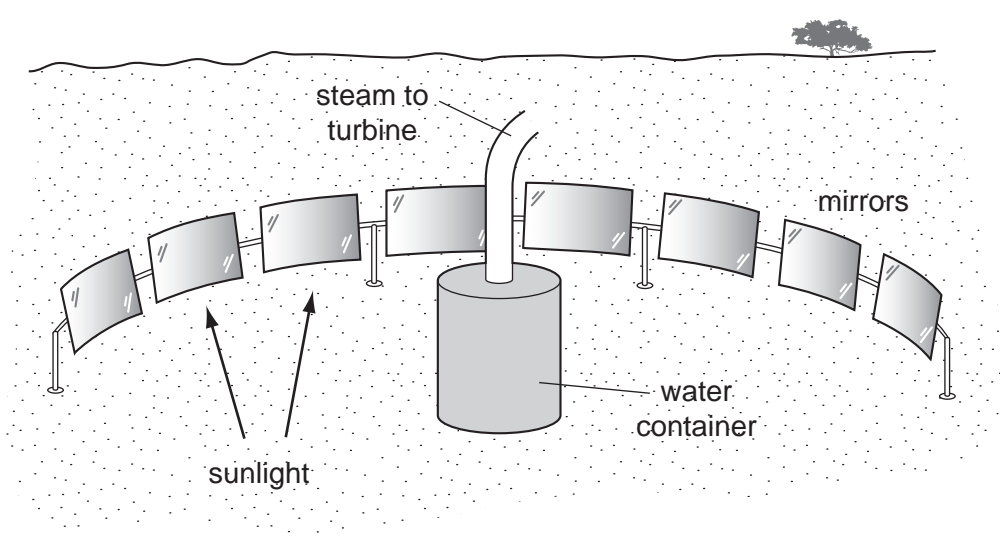


Fig. 7.2

(i) Name the process by which the Sun's energy is transmitted to Earth.

..... [1]

(ii) Fig. 7.3 shows a ray of sunlight incident on a mirror.

Complete the diagram to show the ray after it is reflected from the mirror.

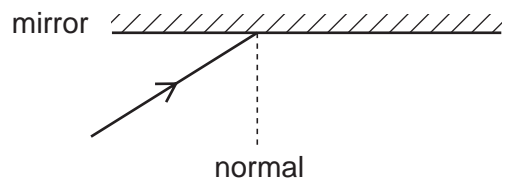
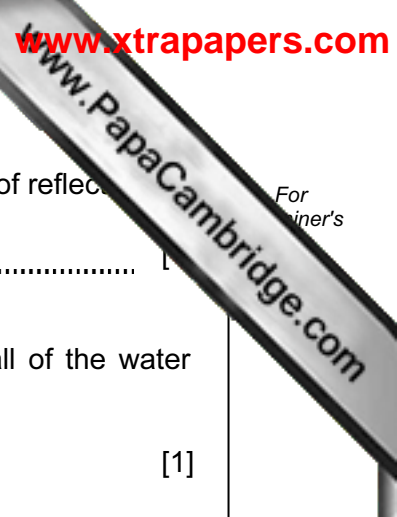


Fig. 7.3

(iii) On Fig. 7.3, mark and label the angle of incidence and the angle of reflection. [1]



(iv) State the relationship between the angle of incidence and the angle of reflection.

..... [1]

(b) (i) Name the process by which the energy is passed through the wall of the water container.

..... [1]

(ii) Explain why the water at the top of the water container is hotter than the water at the bottom of the container.

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

(c) (i) At the desalination plant the thermal energy from the turbine is used to recover pure water from sea water.

Name the process by which pure water is recovered from sea water in this desalination plant.

..... [1]

(ii) Explain the advantage of combining the desalination plant with the power station.

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

8 Test-tubes **A**, **B** and **C** contain dilute hydrochloric acid. A different substance is added to each tube as shown in Fig. 8.1.

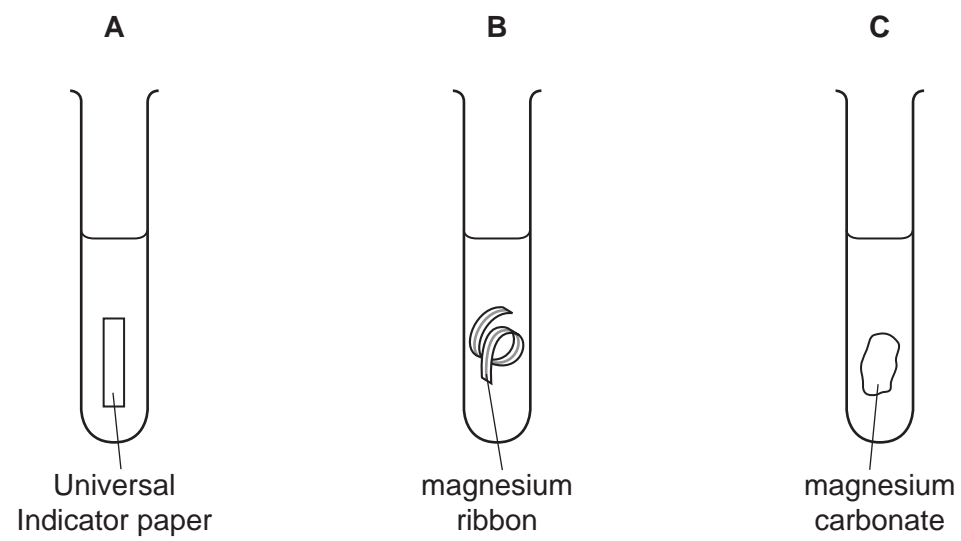


Fig. 8.1

(a) Complete Table 8.1 to show what you would observe in each test-tube and name any gases produced. If no gas is produced write 'no gas' in the table.

Table 8.1

test-tube	observation	gas
A		
B		
C		

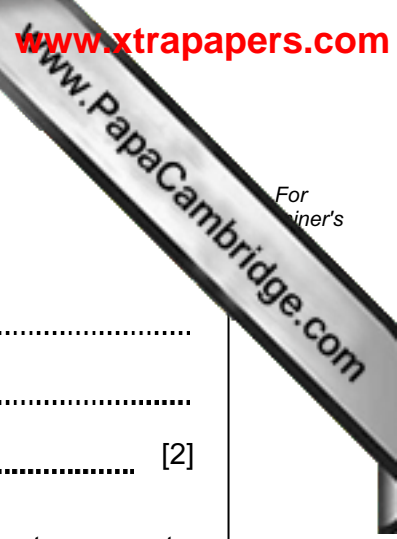
[6]

(b) State any difference if sulfuric acid is used instead of hydrochloric acid. Explain your answer.

.....

.....

..... [2]



9 (a) The isotope uranium-236 is unstable and undergoes fission.

Explain what is meant by the term fission.

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

(b) State one advantage and one disadvantage of using nuclear energy to generate electricity.

advantage

.....

disadvantage

..... [2]

10 Ammonium sulfate, (NH₄)₂SO₄, and ammonium nitrate NH₄NO₃ are important fertilizers.

(a) In the first column of Table 10.1 complete the list of elements in ammonium sulfate, (NH₄)₂SO₄.
In the second column write the number of atoms of each element.

Table 10.1

name of element	number of atoms
nitrogen	

[4]

(b) Calculate the mass of nitrogen in one mole of ammonium nitrate, NH₄NO₃.

mass =g [2]

11 Fig. 11.1 shows the apparatus used to measure the half-life of the isotope, phosphorus-34, which decays by emitting a β -particle.

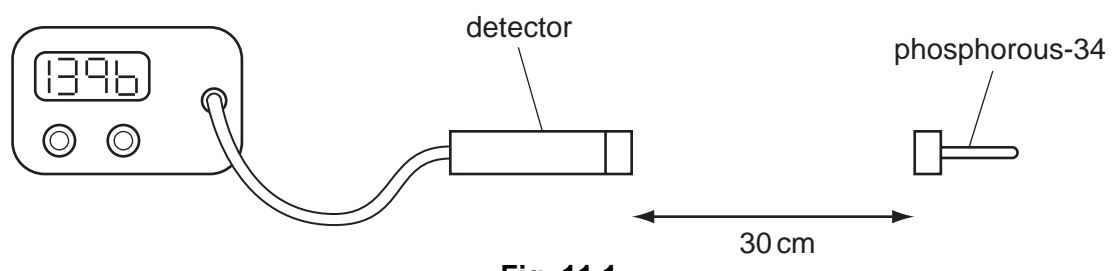


Fig. 11.1

(a) Explain how the apparatus would need to be altered if the isotope decayed by emitting an α -particle.

.....

..... [2]

(b) Fig. 11.2 shows part of the table of readings taken in the experiment.

time/s	number of counts per second	corrected counts per second
0	1396	1368
5	1072	1044
10	814	786
15	636	608

Fig. 11.2

(i) Explain why a corrected count rate is included.

.....

..... [2]

- (ii) The readings are plotted on Fig. 11.3.
Complete the graph by drawing the best fit curve.

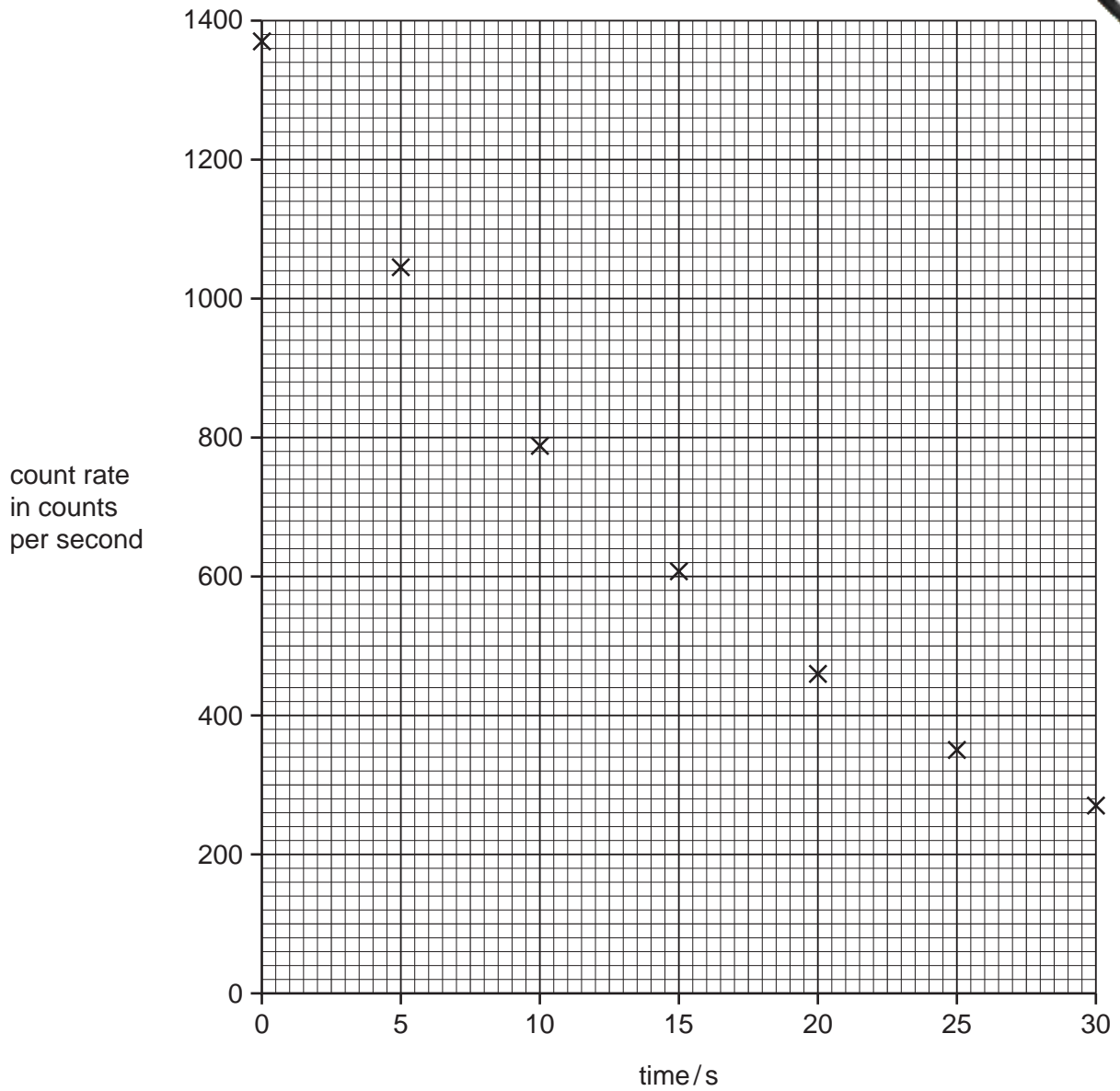


Fig. 11.3

[1]

- (iii) Use the graph to find the half-life of the isotope.

Show your working.

half life =

[2]

12 Many modern cars have a catalytic converter in the exhaust system.

(a) State the effect the catalyst has on the reactions taking place between the gases in the catalytic converter.

..... [1]

(b) The catalyst is spread very thinly on the surface of a ceramic material.

(i) State why a ceramic material is used.

..... [1]

(ii) State why the catalyst is spread very thinly.

..... [1]

(c) State why the catalyst lasts for a long time.

..... [1]

(d) Carbon monoxide, CO, and nitrogen monoxide, NO, react together in catalytic converters to form carbon dioxide, CO₂, and nitrogen, N₂.

Write a balanced equation for this reaction.

..... [1]

13 (a) Complete Table 13.1 which is about sub-atomic particles.

Table 13.1

particle	relative mass	relative charge
electron
neutron	1
.....	+ 1

[3]

(b) What is meant by the *proton number* of an element?

.....

[1]

