



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Advanced Subsidiary Level

CANDIDATE  
NAME

CENTRE  
NUMBER

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**PHYSICAL SCIENCE**

**8780/02**

Paper 2 Short Response

**October/November 2011**

**40 minutes**

Candidates answer on the Question Paper.

Additional Materials: Data Booklet

**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 pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

You may lose marks if you do not show your working or if you do not use appropriate units.

A Data Booklet is provided.

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	
14	
<b>Total</b>	

This document consists of **8** printed pages.



Answer **all** the questions in the spaces provided.

Relevant Data, Formulae and the Periodic Table are provided in the Data Booklet.

- 1 At a school sports day, a runner's time for one lap of an 800 m race is measured using a hand-held stopwatch.

Estimate the uncertainty in the measurement of the time.

uncertainty =  $\pm$  ..... s [1]

- 2 An unloaded van is travelling along a straight, level road when a dog runs into the road. The driver fully applies his brakes and comes to rest after travelling a further 20 m.

If the van had been fully loaded, state whether it would have stopped in the same, a greater or a smaller distance.

.....

Explain your answer.

.....

.....

..... [2]

- 3 Explain why the weight of an object on the Earth's surface is different from its weight on the Moon's surface.

.....

.....

..... [2]

- 4 Define the term *relative atomic mass*.

.....

.....

..... [2]

- 5 The two isotopes  $^{12}\text{C}$  and  $^{13}\text{C}$  are found in a sample of carbon.  
State **one** difference and **two** similarities in the atomic structure of the two isotopes.

difference

.....  
 .....

similarities

1. ....  
 .....  
 2. ....  
 .....

[2]

- 6 Table 6.1 gives the relative abundance of each isotope in a mass spectrum of a sample of germanium, Ge.

**Table 6.1**

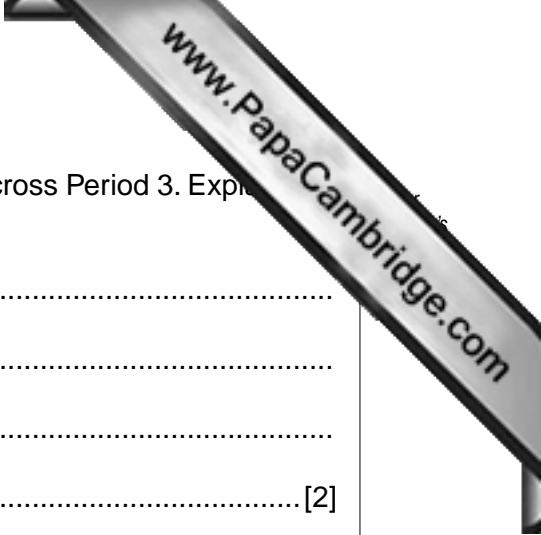
<i>m/e</i>	70	72	74
relative abundance (%)	24.4	32.4	43.2

- (a) Complete the electron arrangement of a Ge atom.

$1s^2$  ..... [1]

- (b) Use the data in Table 6.1 to calculate the relative atomic mass of this sample of germanium.  
Give your answer to **one** decimal place.

$A_r$  of Ge = ..... [2]



7 In general, the first ionisation energies of the elements increase across Period 3. Explain this trend.

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

8 There is a potential difference of 12 volts between two points. Explain what this means.

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

9 A golfer uses an electrically powered trolley to carry her clubs. The trolley is designed so that when it is going downhill the change in gravitational potential energy is used to generate electricity, which recharges the battery.

Explain why she will occasionally **still** need to recharge the battery from the mains supply.

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

- 10 There are four structural isomers of empirical formula  $C_4H_9Br$ . The **structural** formulae of two of these isomers are shown in Table 10.1.

(a) Complete Table 10.1 by drawing the **displayed** formulae of the other two isomers.

Table 10.1

isomer <b>A</b> $CH_3CH_2CH_2CH_2Br$	isomer <b>B</b> $CH_3-CH-CH_2Br$   $CH_3$
isomer <b>C</b>	isomer <b>D</b>

[2]

(b) Give the name of isomer **B**.

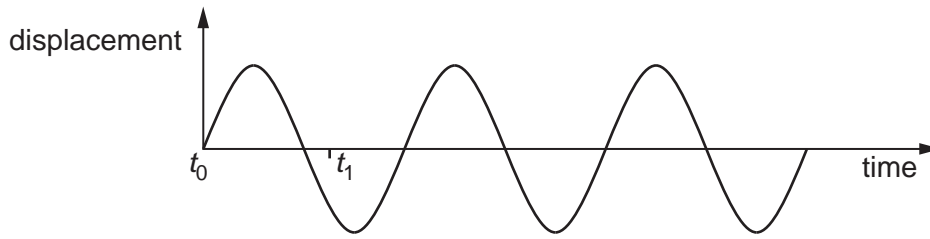
.....[1]

- 11 The polymerisation of propene, to form poly(propene), is an important industrial process.

Use **displayed** formulae to write an equation for the polymerisation of propene.

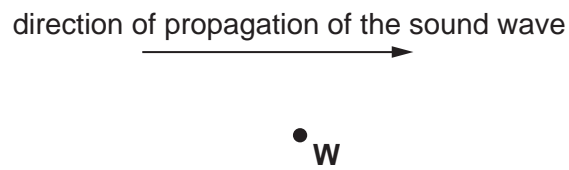
[2]

- 12 The graph in Fig. 12.1 shows the displacement of a water particle when a sound wave passes.



**Fig. 12.1**

Fig. 12.2 shows the position **W** of the water particle at time  $t = t_0$ .



**Fig. 12.2**

On Fig. 12.2, draw

- (a) a possible position of the particle at time  $t_1$ ,
- (b) an arrow to show the direction in which the particle is moving at that instant.

[2]

- 13 Fig. 13.1 shows three measuring cylinders. Cylinders **A** and **B** contain fresh water, while cylinder **C** contains sea water.

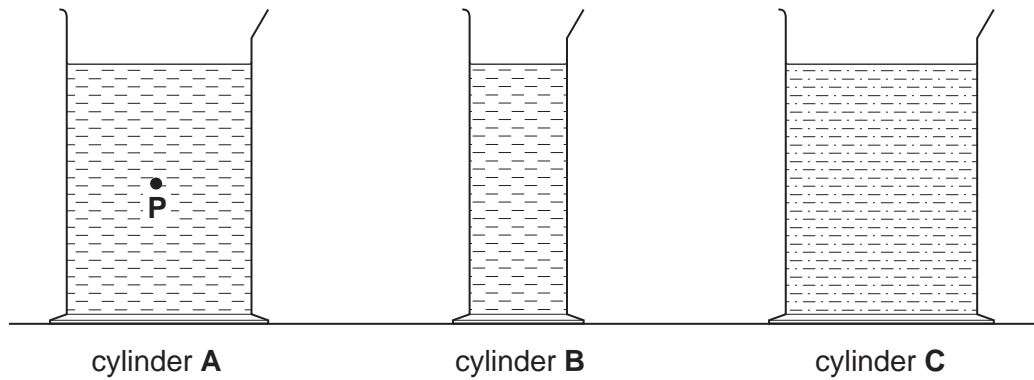


Fig. 13.1

- (a) Mark a point in cylinder **B** where the pressure exerted by the water is the same as the pressure at point **P**. Label the point **Q**.  
Explain why you have chosen this point.

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

- (b) Mark a point in cylinder **C** where the pressure exerted by the sea water is the same as the pressure at point **P** in cylinder **A**. Label the point **R**.  
Explain why you have chosen this point.

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

Question 14 is on the next page.

14 The reaction between hydrogen gas and iodine vapour to form hydrogen iodide is reversible.



The activation energy for the forward reaction,  $E_a(\text{F})$ , (hydrogen with iodine) is  $157 \text{ kJ mol}^{-1}$ . The activation energy for the reverse reaction,  $E_a(\text{R})$ , (decomposition of hydrogen iodide) is  $183 \text{ kJ mol}^{-1}$ .

On Fig. 14.1, complete the reaction pathway diagram for this reaction.

Indicate with an arrow, and label clearly,

- the activation energy for the forward reaction,  $E_a(\text{F})$ ,
- the activation energy for the reverse reaction,  $E_a(\text{R})$ ,
- the enthalpy change,  $\Delta H$ , for the reaction.

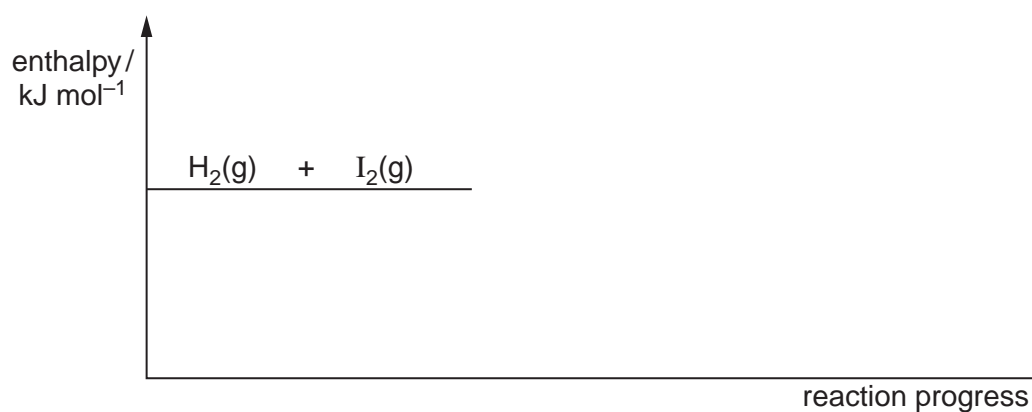


Fig. 14.1

[3]