

CANDIDATE
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PHYSICAL SCIENCE

8780/02

Paper 2 Short Response

October/November 2014

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, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

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.

This document consists of **9** printed pages and **3** blank pages.

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

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

- 1 Units can be expressed with a prefix which changes the size of the unit. Table 1.1 gives some examples.

Table 1.1

prefix	symbol	power of ten
centi	c	10^{-2}
		10^{-6}
	M	
giga		

Complete the table.

[3]

- 2 Briefly describe how iron obtained from a blast furnace is purified before it is made into steel.

.....

.....

.....[2]

- 3 Fig. 3.1 shows a circuit diagram. The battery of electromotive force 12V and negligible internal resistance, is used to light a filament lamp.

When switch **S** is closed, the current initially rises to a peak before decreasing to a steady value.

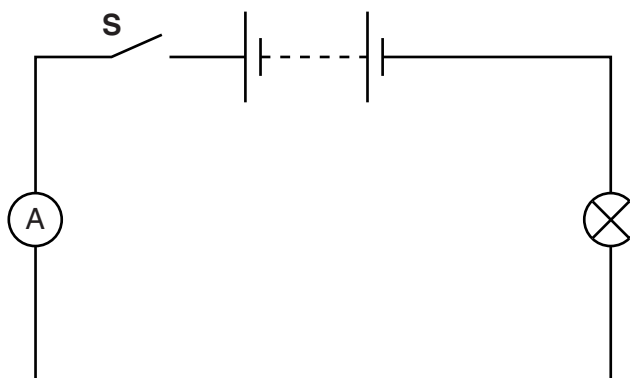


Fig. 3.1

Explain why the current rises to a peak and then decreases.

.....

.....

.....[2]

- 4 An alkane burns completely in oxygen. The resulting gaseous mixture contains **seven** times as many moles of carbon dioxide as there were moles of the alkane.

Write a balanced chemical equation for this combustion reaction.

.....[2]

- 5 A sound wave passes through a medium.

Fig. 5.1 shows the displacement of particles in the medium at a given moment in time.

Fig. 5.2 shows the displacement of particles in the same medium as the sound wave passes a point.

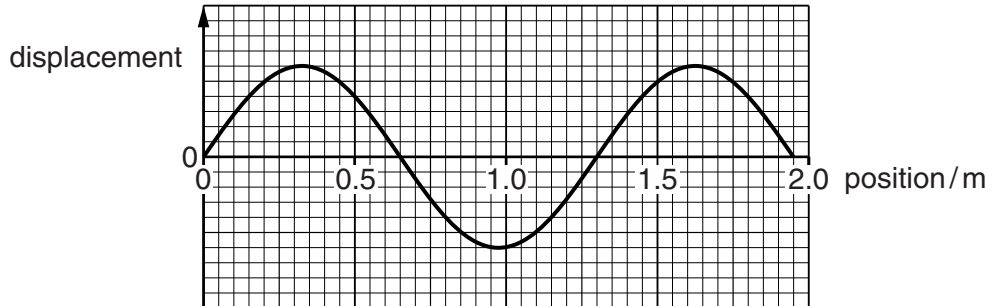


Fig. 5.1

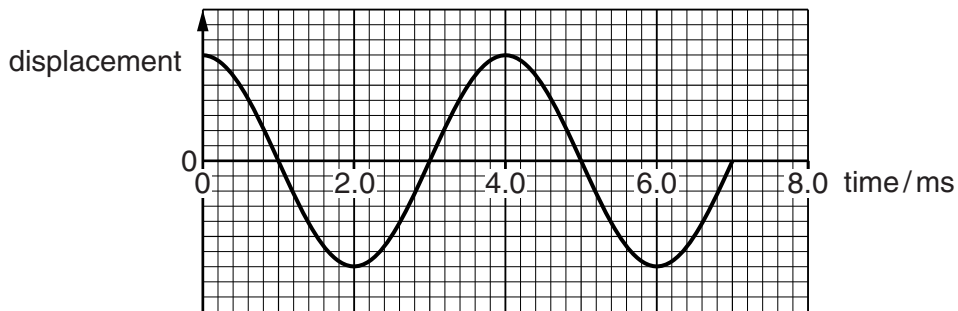


Fig. 5.2

- (a) Determine the wavelength of the sound wave.

wavelength =m [1]

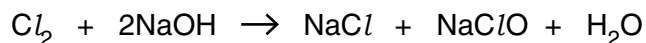
- (b) Determine the frequency of the sound wave.

frequency = Hz [2]

- (c) Determine the speed of the sound wave through the medium.

speed = ms^{-1} [1]

- 6 When chlorine is bubbled into dilute sodium hydroxide, a solution containing sodium chlorate(I) is formed. This is a redox reaction.



- (a) Deduce the oxidising agent and the reducing agent in this reaction.

Explain your answers in terms of changes in oxidation numbers.

oxidising agent

explanation

.....

.....

reducing agent

explanation

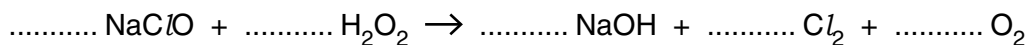
.....

.....

[3]

- (b) When sodium chlorate(I) reacts with hydrogen peroxide, oxygen gas is produced.

Balance the equation for this reaction.



[1]

- 7 (a) Define *electric field strength*.

.....
 [1]

- (b) Fig. 7.1 shows the path of a β -particle as it moves in a uniform electric field.

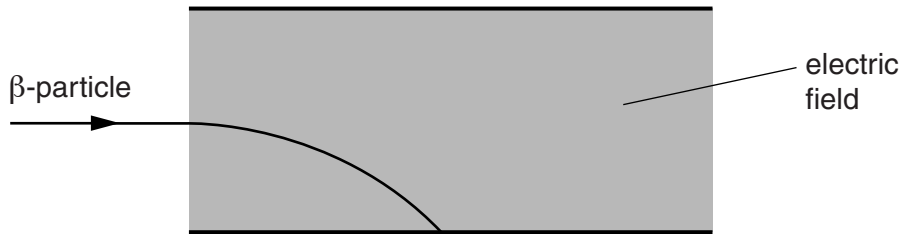


Fig. 7.1

- (i) Complete Fig. 7.2 to show the path that a proton, travelling at a similar speed to the β -particle, would take in the same electric field. [2]



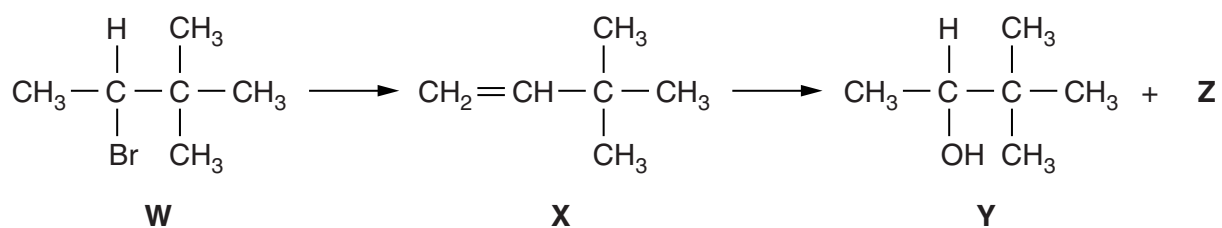
Fig. 7.2

- (ii) Complete Fig. 7.3 to show the path that a neutron, travelling at a similar speed to the β -particle, would take in the same electric field. [1]



Fig. 7.3

8 Consider the reaction scheme below.



(a) Briefly describe how compound **W** can be converted into compound **X**.

.....
[1]

(b) Give the systematic name for compound **X**.

.....[1]

(c) Compound **Z** is a structural isomer of **Y**.

Draw the structural formula of **Z**.

[1]

9 Fig. 9.1 shows a satellite orbiting the Moon in a circular orbit.

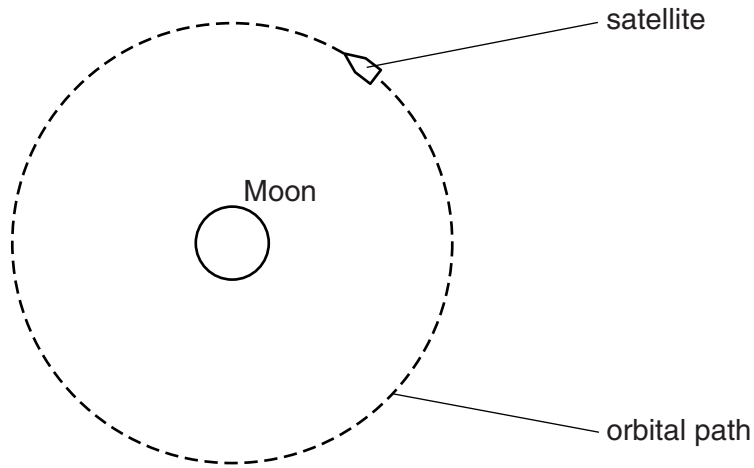


Fig. 9.1

(a) Draw an arrow on Fig. 9.1 to show the direction of the resultant force on the satellite. [1]

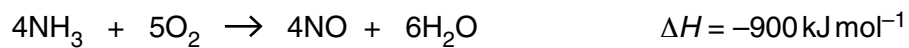
(b) Explain why the work done by the satellite as it orbits is zero.

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

10 (a) Draw a dot-and-cross diagram to show the outer electrons in a molecule of NH_3 .

[1]

(b) Ammonia reacts with oxygen to produce nitrogen monoxide.



Use this equation, and data from the Data Booklet, to determine a value for the bond energy in a nitrogen monoxide molecule.

bond energy in NO = kJ mol^{-1} [3]

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