



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

CANDIDATE  
NAME

CENTRE  
NUMBER

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NUMBER

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**PHYSICAL SCIENCE**

**8780/02**

Paper 2 Short Response

**For Examination from 2011**

SPECIMEN PAPER

**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 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.

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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12	
<b>Total</b>	

This document consists of **7** printed pages and **1** blank page.

Answer **all** the questions in the spaces provided.  
Relevant Data, Formulae and the Periodic Table are provided in the Data Booklet.

*For  
Examiner's  
Use*

1 State the most appropriate instrument, or instruments, for the measurement of the following:

(a) the diameter of a wire of diameter about 1 mm,

..... [1]

(b) the resistance of a filament lamp,

..... [1]

(c) the peak value of an alternating voltage.

..... [1]

2 Derive the SI base unit of force.

SI base unit of force = ..... [1]

- 3 (a) Salt, sodium chloride, forms transparent colourless crystals. Describe the bonding in sodium chloride crystals, and sketch part of the crystal structure giving the formula for each particle

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bonding.....

sketch

[2]

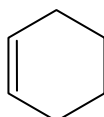
- (b) Explain why crystals of sodium chloride do not conduct electricity, but molten sodium chloride does.

.....

.....

..... [1]

- 4 The formula of the alkene cyclohexene can be written as shown.



- (a) State the molecular formula of cyclohexene. .... [1]

- (b) Calculate the percentage by mass of carbon in cyclohexene.

percentage = ..... [1]

- 5 A sky-diver jumps from a high-altitude balloon. Explain briefly why the acceleration of the sky-diver decreases with time.

.....

.....

..... [2]

- 6 A torque wrench is a type of spanner for tightening a nut and bolt to a particular torque, as illustrated in Fig. 3.1.

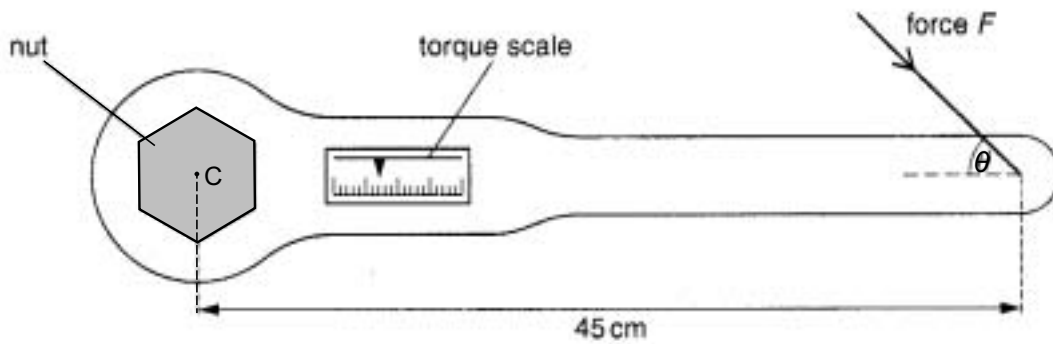


Fig. 3.1

The wrench is put on the nut and a force is applied to the handle. A scale indicates the torque applied.

The wheel nuts on a particular car must be tightened to a torque of 130Nm. This is achieved by applying a force  $F$  to the wrench at a distance of 45cm from its centre of rotation  $C$ . This force  $F$  may be applied at any angle  $\theta$  to the axis of the handle, as shown in Fig. 3.1.

For the minimum value of  $F$  to achieve this torque,

- (a) state the magnitude of the angle  $\theta$  that should be used,

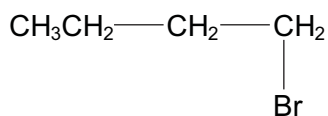
$\theta = \dots\dots\dots^\circ$  [1]

- (b) calculate the magnitude of  $F$ .

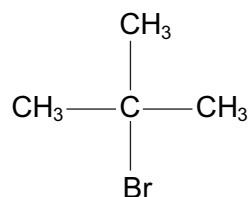
$F = \dots\dots\dots$  N [2]

- 7 1-bromobutane and 2-bromo-2-methylpropane both react with an **ethanolic (alcoholic)** solution of sodium hydroxide to form alkenes.

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1-bromobutane



2-bromo-2-methylpropane

(a) Name the type of reaction ..... [1]

(b) Identify, by means of the structural formula, the alkene formed from

(i) 1-bromobutane,

(ii) 2-bromo-2-methylpropane.

[2]

- 8 Explain why the melting point of sulfur is higher than that of chlorine.

.....

.....

.....

..... [2]

9 Explain what is meant by the *diffraction* of a wave.

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

10 (a) Evidence for the nuclear atom was provided by the  $\alpha$ -particle scattering experiment. State the results of this experiment.

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

(b) Give estimates for the diameter of

(i) an atom,

..... [1]

(ii) a nucleus.

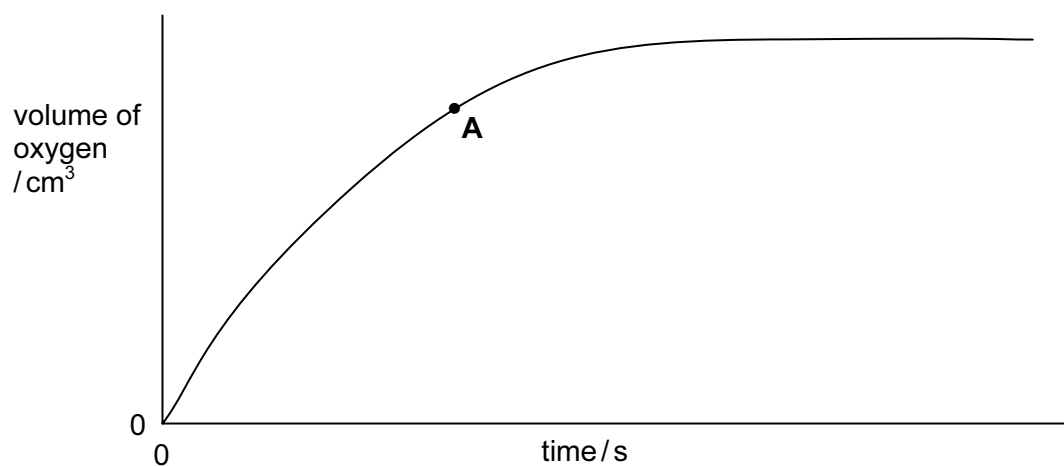
..... [1]

11 Describe how you would confirm the presence of aqueous bromide ions using simple test-tube reactions. You should give details of the reagents you would use and the observations you would make.

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

- 12 Hydrogen peroxide decomposes to form water and oxygen gas. The curve below shows the variation with time of the volume of oxygen evolved when  $100\text{ cm}^3$  of a  $2.0\text{ mol dm}^{-3}$  hydrogen peroxide solution decomposed at 298 K.

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Use



- (a) State how you would determine the rate of reaction at point A.

.....

.....

..... [1]

- (b) On the axes above, sketch a curve to show how the volume of oxygen evolved would change with time if  $50\text{ cm}^3$  of a  $2.0\text{ mol dm}^{-3}$  hydrogen peroxide solution, in the presence of a catalyst, decomposed at 298 K. [2]

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