

Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

# Level 3 Certificate and Extended Certificate in Applied Science

## KEY CONCEPTS IN SCIENCE

Unit Number: ASC1

Section B – ASC1/C (Chemistry)

Thursday 22 June 2017 Morning

Time allowed: 1 hour 30 minutes. You are advised to spend approximately 30 minutes on this section

### Materials

For this paper you must have:

- a calculator
- Periodic table
- Formula sheet

### Instructions

- Use black ink or black ball-point pen.
- Answer **all** questions in each section.
- You must answer the questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.
- Cross through any work you do not want to be marked.
- The total time for all three sections of this paper is one-and-a-half hours.

### Information

- You will be provided with a copy of the Periodic Table and formula sheet.
- There are three sections in this paper:  
Section A – Biology Section B – Chemistry Section C – Physics.
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60 and the maximum mark for this section is 20.

### Advice

Read each question carefully.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
TOTAL	

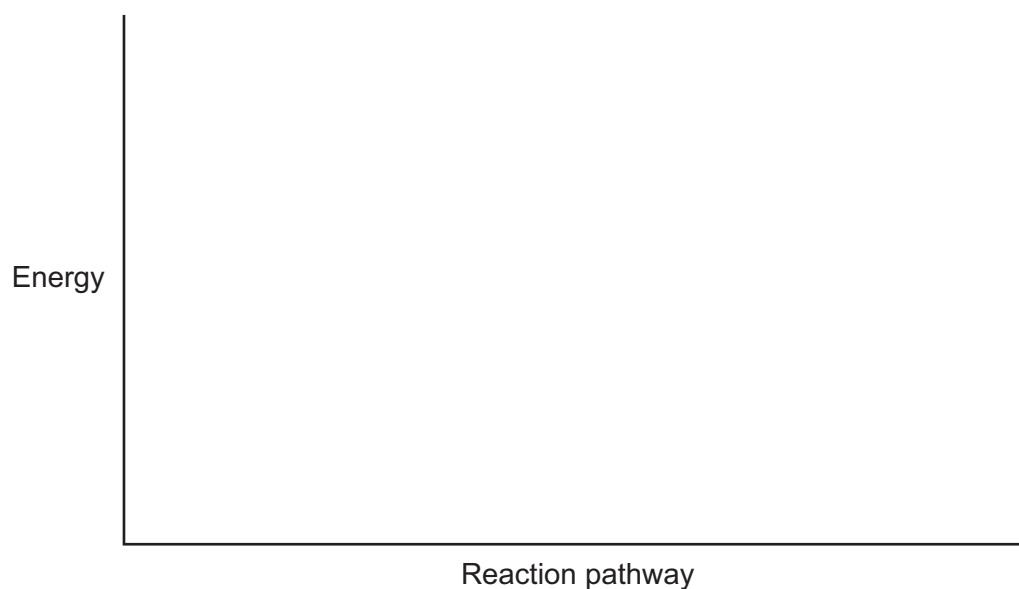


**Section B – Chemistry**Answer **all** questions in this section.**0 1**

Chemical engineers should always consider the enthalpy changes involved in chemical processes. Neutralisation reactions are exothermic and so temperatures within reaction vessels must be monitored.

**0 1 . 1**

On **Figure 1** draw the reaction profile you would expect for an exothermic reaction.

**[3 marks]****Figure 1****0 1 . 2**

Draw a line on **Figure 1** to show the activation energy.

**[1 mark]****0 1 . 3**

All acids contain hydrogen ions,  $H^+$  and an anion. Sulfuric acid contains the anion  $SO_4^{2-}$

State the formula for sulfuric acid.

**[1 mark]**

---

---



0 1 . 4

A technician is asked to determine the enthalpy of neutralisation for the reaction between sodium hydroxide, NaOH and hydrochloric acid, HCl.



Describe how the technician could do the experiment using:

- a polystyrene cup
- a thermometer
- 2 mol dm<sup>-3</sup> NaOH
- 2 mol dm<sup>-3</sup> HCl.

In your description **you should** include:

- the other apparatus to be used
- the measurements to be made
- the precautions to be taken to ensure the results are valid
- how the results should be presented
- how the enthalpy of neutralisation will be calculated.

[5 marks]

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

10

Turn over ►



0 2

Material scientists need a thorough understanding of the bonding and structure of compounds to predict the properties of materials. Different formulas give different information about compounds. An empirical formula is appropriate for an ionic compound and a molecular formula for a covalent compound.

0 2 . 1

State what is meant by an ionic bond.

**[2 marks]**

---

---

---

---

---

---

---

0 2 . 2

State what is meant by a covalent bond.

**[2 marks]**

---

---

---

---

---

---

---

0 2 . 3

State what is meant by an empirical formula.

**[2 marks]**

---

---

---

---

---

---

---



0 2 . 4

**Compound X** contains the elements carbon, hydrogen and chlorine. Analysis of a sample of X shows that it contains 24.35% of carbon and 4.05% of hydrogen by mass.

Calculate the empirical formula of compound X.

[3 marks]

---

---

---

---

---

---

---

Empirical formula of X is \_\_\_\_\_

0 2 . 5

Another **compound, Y**, has an empirical formula of  $\text{CNO}_2\text{H}_4$ .

The relative molecular mass,  $M_r$ , of Y is 124.

Calculate the molecular formula of compound Y.

[1 mark]

---

---

---

---

Molecular formula of Y is \_\_\_\_\_

10

**END OF QUESTIONS**



**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**



**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**



**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

**Copyright information**

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from [www.aqa.org.uk](http://www.aqa.org.uk) after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2017 AQA and its licensors. All rights reserved.

