A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

Level 3 Certificate/Extended Certificate

APPLIED SCIENCE

Unit 1 Key Concepts in Science
Section B – Chemistry

ASC1/C

Tuesday 11 June 2019 Afternoon

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

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

For this paper you must have:
- **a calculator**
- **Periodic Table**
- **Formulae 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 on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**

INFORMATION

- **You will be provided with a copy of the Formulae Sheet and Periodic Table.**
- **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.

DO NOT TURN OVER UNTIL TOLD TO DO SO

SECTION B – CHEMISTRY

Answer ALL questions in this section.

0 1 **Lithium carbonate is an important compound in the manufacture of lithium ion batteries.**

0 1 . 1 **Which block of the periodic table is lithium in?**

Tick (✓) ONE box. [1 mark]

☐ **d block**

☐ **f block**

☐ **p block**

☐ **s block**

0 1 . 2 **11.1 g of lithium carbonate (Li_2CO_3) was dissolved in water and made up to a volume of 250 cm^3**

Calculate the number of moles of Li_2CO_3 in 11.1 g of lithium carbonate. [2 marks]

Number of moles = _____

0 1 . 3 **Calculate the concentration of the lithium carbonate solution. [1 mark]**

Concentration = _____ **mol dm^{-3}**

[Turn over]

4

0 2 **Cobalt is a transition element.**

Cobalt compounds are often used to colour ceramics.

0 2 . 1 **Complete the electron configuration of a cobalt atom. [1 mark]**

$1s^2\ 2s^2$ _____

_____

0 2 . 2 **Some cobalt (II) compounds in solution are pink.**

Explain why cobalt (II) compounds in solution are coloured.

Use the idea of electron transitions in your explanation. [2 marks]

_____

_____

_____

_____

_____

_____

0 2 . 3 **The chemical equation shows the addition of hydroxide ions to aqueous cobalt ions.**

$$[Co(H_2O)_6]^{2+}(aq) + 2OH^-_{(aq)} \longrightarrow$$

$$Co(H_2O)_4(OH)_{2(s)} + 2H_2O_{(l)}$$

What type of reaction is this? [1 mark]

_____

_____

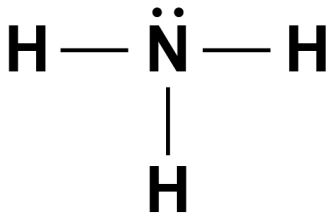
4

0 3 **Ammonia (NH_3) is used to manufacture dyes, explosives and fertilisers.**

0 3 . 1 **The nitrogen and hydrogen atoms in an ammonia molecule are joined by single covalent bonds.**

FIGURE 1 shows an ammonia molecule.

FIGURE 1



Describe a covalent bond. [2 marks]

0 3 . 2 **Ammonia is a gas at room temperature and pressure.**

Explain why ammonia has a low boiling point. [2 marks]

0 3 . 3 **Substances that have a low boiling point are often described as volatile.**

What is meant by the term volatile?
[1 mark]

Chemical engineers are responsible for monitoring all aspects of any large-scale production.

Ammonia is produced on a large scale from nitrogen and hydrogen.

$$N_2 + 3H_2 \longrightarrow 2NH_3$$

Mean bond enthalpies can be used to calculate enthalpy changes.

0 3 . 4 Describe what is meant by the term 'mean bond enthalpy'. [2 marks]

0 3 . 5 **Why do calculations of enthalpy changes using mean bond enthalpies not give accurate values? [1 mark]**

_____

_____

_____

[Turn over]

0 3 . 6 **TABLE 1 shows some mean bond enthalpy data.**

TABLE 1

Bond	N ≡ N	H – H	N – H
Mean bond enthalpy / kJmol^{-1}	945	436	390

Calculate the enthalpy of formation of ammonia.

Use the data given in TABLE 1. [4 marks]

Enthalpy of formation of ammonia =

_____ **kJmol^{-1}**

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END OF QUESTIONS

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
3	
TOTAL	