AQA

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)

Tuesday 23 January 2018 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
- 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 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.

Information
- You will be provided with a copy of the Periodic Table and formulae 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	
3	
TOTAL	

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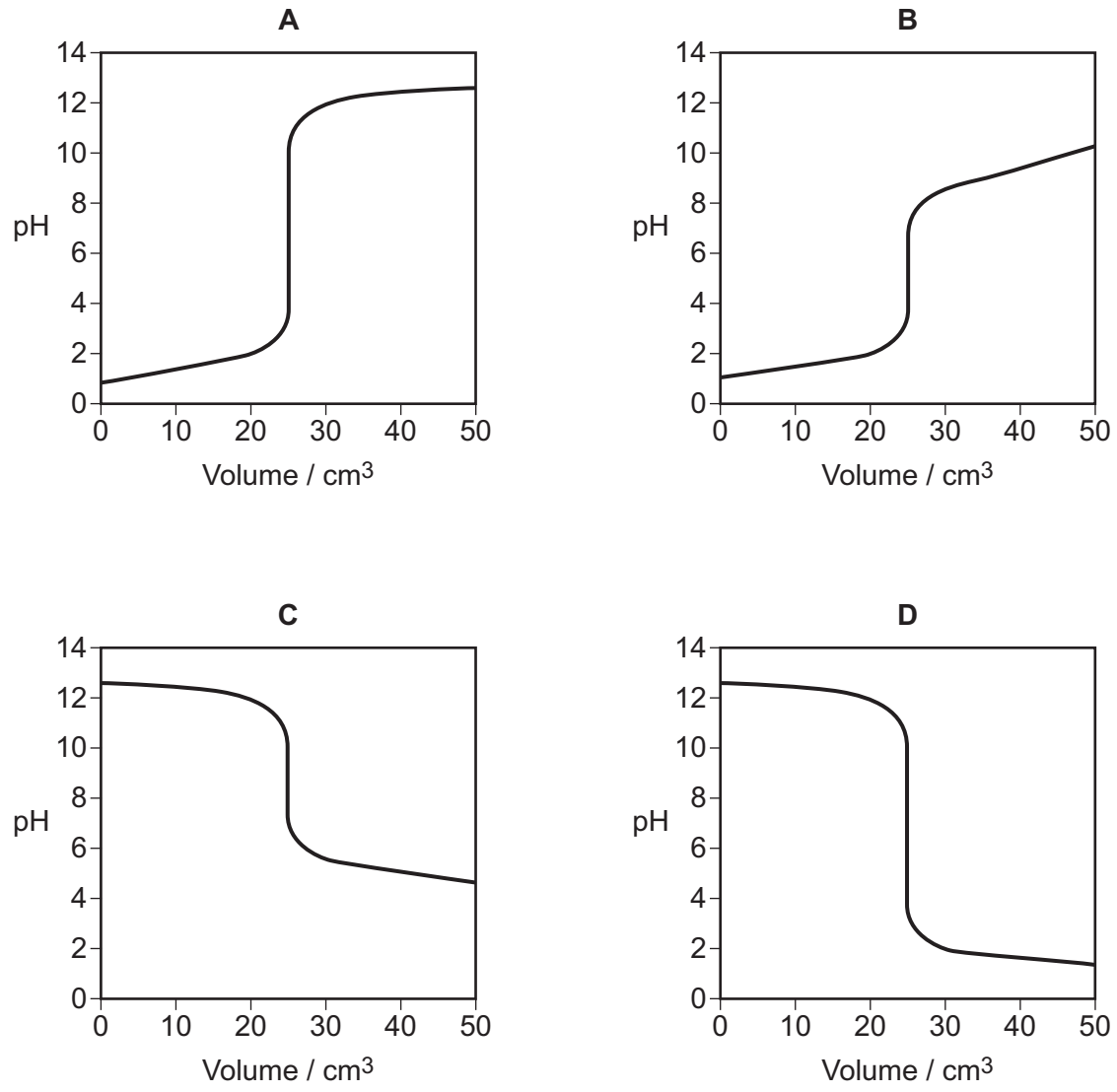
Section B – Chemistry

Answer **all** questions in this section.

0 1 Analytical chemists use indicators and pH curves to determine the end point of a titration. **Figure 1** shows titration curves for combinations of different acids and bases.

All solutions have the same concentration.

Figure 1



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0 1 . 1 Select from **A**, **B**, **C** and **D** the curve produced by the addition of:

[3 marks]

ethanoic acid (a weak acid) to 25 cm^3 of sodium hydroxide _____

ammonia solution (a weak base) to 25 cm^3 of hydrochloric acid _____

hydrochloric acid to 25 cm^3 of sodium hydroxide _____

0 1 . 2 **Table 1** shows some acid–base indicators and the pH ranges over which they change colour.

Table 1

Indicator	pH range
Bromophenol blue	3.0–4.6
Phenol red	6.8–8.2
Bromothymol blue	6.0–7.6
Thymolphthalein	9.3–10.5

State which indicator from **Table 1** could be used in the titration that produces curve **D** but not in the titration that produces curve **C**.

Explain your choice.

[2 marks]

Indicator _____

Explanation _____

_____

_____

Question 1 continues on the next page

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0 1 . 3 An analytical chemist at a vinegar manufacturer used titration to monitor the concentration of ethanoic acid in vinegar.

The chemist:

- diluted 50.0 cm^3 of the vinegar with distilled water to make a total volume of 500 cm^3
- titrated a 25.0 cm^3 sample against a standard solution of 0.100 mol dm^{-3} NaOH.

$$NaOH + CH_3COOH \longrightarrow CH_3COONa + H_2O$$

sodium hydroxide + ethanoic acid ⟶ sodium ethanoate + water

The results are shown in **Table 2**.

Table 2

	Titration			
Volume / cm^3	**Rough**	**1**	**2**	**3**
At start	0.00	20.20	0.00	14.45
At end	20.20	39.40	14.45	33.55
Used	20.20	19.20	14.45	19.10

Calculate the average volume of sodium hydroxide used in the experiment.

[1 mark]

Average volume = _____ cm^3

0 1 . 4 Calculate the number of moles of sodium hydroxide used in the experiment. Use your answer from Question **01.3**.

[1 mark]

Number of moles used = _____

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0 1 . 5 State the number of moles of ethanoic acid that reacted with the number of moles of sodium hydroxide in Question **01.4**.

[1 mark]

_____

_____

0 1 . 6 Calculate the concentration of the **original** sample of ethanoic acid.

[2 marks]

Concentration = _____ mol dm^{-3}

10

Turn over for the next question

0 2 Research chemists use trends in the properties of some elements to predict the properties of other elements.

Table 3 shows the values of atomic radii for the elements in Group 0 that the research chemist found.

Table 3

Element	Atomic Number	Atomic Radius /m × 10^{-12}
Helium	2	28
Neon	10	58
Argon	18	106
Krypton	36	116
Xenon	54	140
Radon	86	150

0 2 . 1 Plot a graph of atomic radius against atomic number on **Figure 2**.

Draw a line of best fit.

[2 marks]

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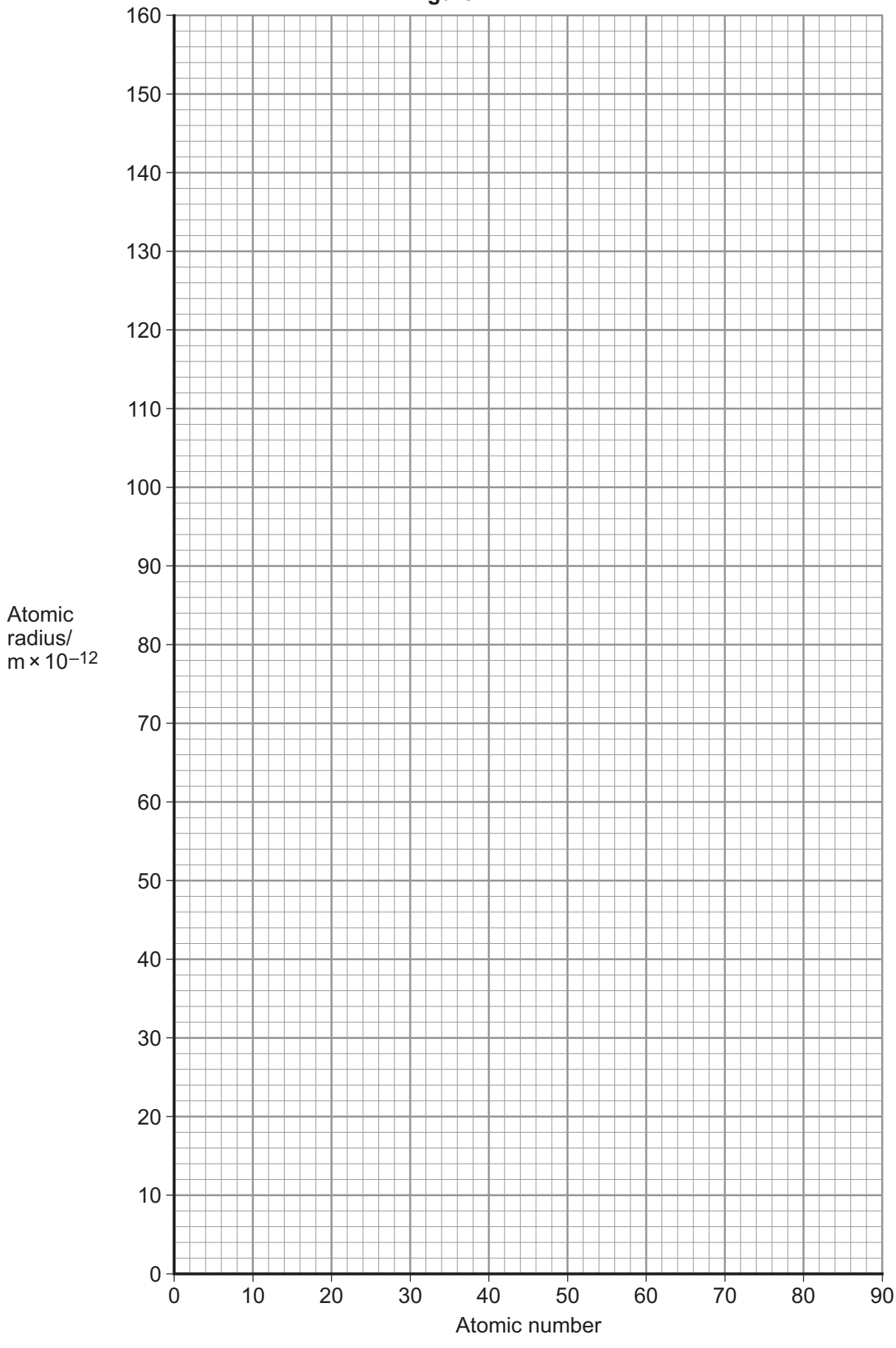
Figure 2



Question 2 continues on the next page

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0 2 . 2 Identify the anomalous result.

[1 mark]

0 2 . 3 Explain why atomic radius increases as atomic number increases in Group 0.

[2 marks]

5

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0 3 A large proportion of the elements of the Periodic Table are metals.

Aluminium is a metal widely used in the aerospace industry.

0 3 . 1 Give the electron configuration of an atom of aluminium, Al.

[1 mark]

0 3 . 2 Describe the bonding in aluminium. Include a labelled diagram in your answer.

[4 marks]

END OF QUESTIONS

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