A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

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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

For this paper you must have:
- a calculator
- Periodic Table
- separate insert for Question 02.1
- formulae sheet.

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

[Turn over]

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.
- 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

- 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.
- 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.

ADVICE

- You are advised to spend approximately 30 minutes on this section.
- Please read each question carefully before starting.

DO NOT TURN OVER UNTIL TOLD TO DO SO

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, on page 5, shows titration curves for combinations of different acids and bases.

All solutions have the same concentration.

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 _____

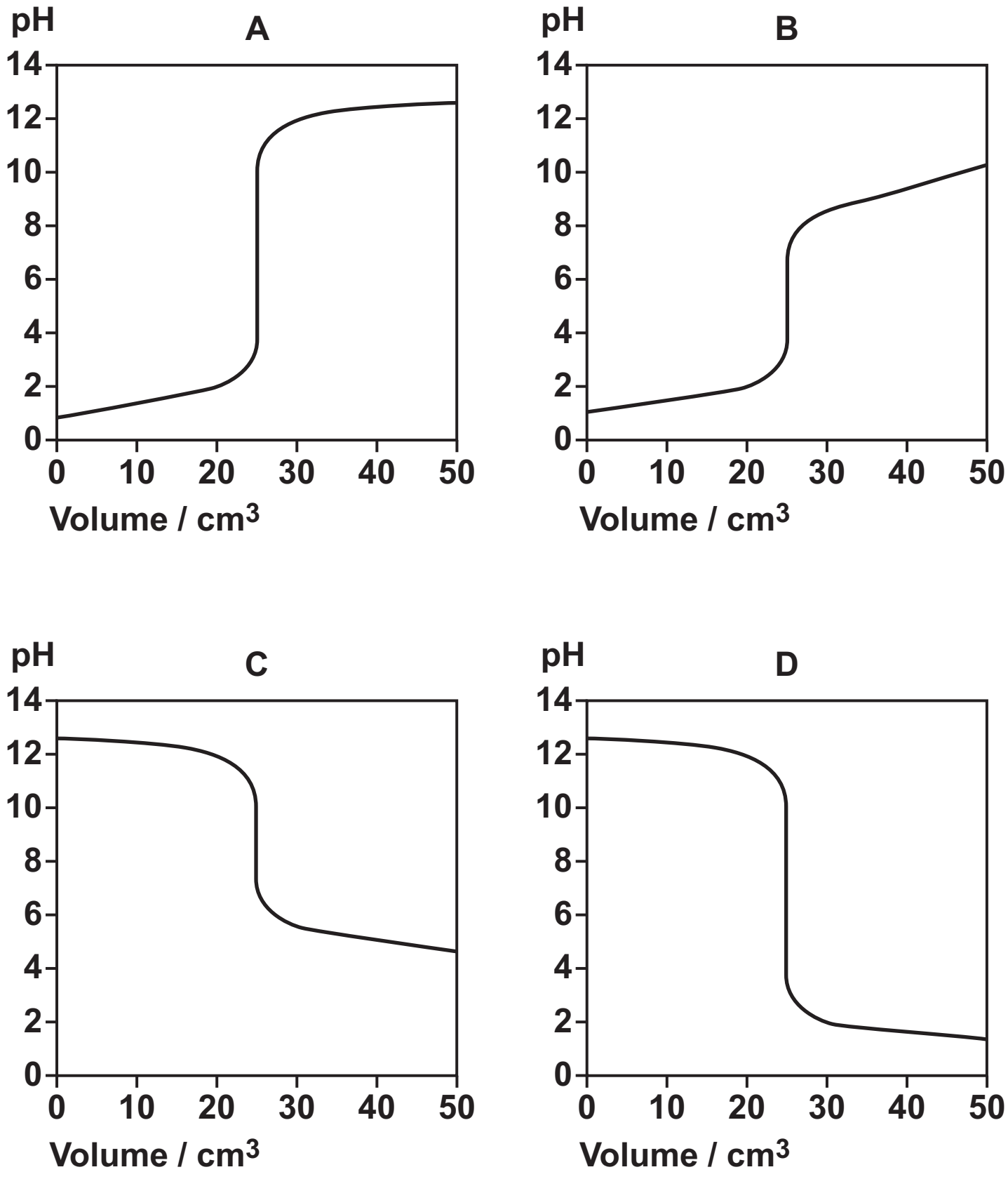
ammonia solution (a weak base) to 25 cm^3

of hydrochloric acid _____

hydrochloric acid to 25 cm^3

of sodium hydroxide _____

FIGURE 1



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 _____

_____

_____

_____

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.

$$NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O$$

sodium hydroxide	+	ethanoic acid	→	sodium ethanoate	+	water

[Turn over]

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 = _____

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

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 on the separate insert for Question 02.1.

Draw a line of best fit. [2 marks]

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

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]

5

END OF QUESTIONS

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Examiner's Initials	
Question	Mark
1	
2	
3	
TOTAL	