



## Questions

Q1.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

This question is about acids and bases.

Bromothymol blue, methyl orange and phenolphthalein are indicators used in titrations.

Which, if any, of these indicators could be used for a titration of ammonia,  $\text{NH}_3(\text{aq})$ , with ethanoic acid,  $\text{CH}_3\text{COOH}(\text{aq})$ ?

(1)

- A bromothymol blue
- B methyl orange
- C phenolphthalein
- D none of these three indicators

(Total for question = 1 mark)

Q2.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

This is a question about buffer solutions.

A buffer solution always

(1)

- A keeps the pH less than 7.
- B contains equimolar amounts of acid and its conjugate base.
- C keeps the pH constant if small quantities of acid or base are added.
- D resists changes in pH if small quantities of acid or base are added.

(Total for question = 1 mark)



Q3.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

This question is about acids and bases.

Which of these mixtures would form a buffer solution with a pH **below** 7?

(1)

- A NaOH(aq) and excess HCl(aq)
- B NaOH(aq) and excess CH<sub>3</sub>COOH(aq)
- C excess NaOH(aq) and HCl(aq)
- D excess NaOH(aq) and CH<sub>3</sub>COOH(aq)

(Total for question = 1 mark)

Q4.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

This question is about acids and bases.

What is the order of **decreasing** pH for 0.100 mol dm<sup>-3</sup> solutions of these three acids?

(1)

- A CH<sub>3</sub>COOH > CH<sub>2</sub>ClCOOH > HCl
- B HCl > CH<sub>3</sub>COOH > CH<sub>2</sub>ClCOOH
- C CH<sub>2</sub>ClCOOH > CH<sub>3</sub>COOH > HCl
- D HCl > CH<sub>2</sub>ClCOOH > CH<sub>3</sub>COOH

(Total for question = 1 mark)



Q5.

This question is about acids and bases.

The pH of two salt solutions, **J** and **K**, are

solution **J** pH = 5

solution **K** pH = 9

The solutions are equimolar.

Which acids and bases could form the salts in solutions **J** and **K**?

(1)

|                                   | Acid and base forming the salt in solution <b>J</b> | Acid and base forming the salt in solution <b>K</b> |
|-----------------------------------|---|---|
| <input type="checkbox"/> <b>A</b> | HCl(aq) and NH <sub>3</sub> (aq)                    | CH <sub>3</sub> COOH(aq) and NaOH(aq)               |
| <input type="checkbox"/> <b>B</b> | HCl(aq) and NaOH(aq)                                | CH <sub>3</sub> COOH(aq) and NH <sub>3</sub> (aq)   |
| <input type="checkbox"/> <b>C</b> | CH <sub>3</sub> COOH(aq) and NaOH(aq)               | HCl(aq) and NaOH(aq)                                |
| <input type="checkbox"/> <b>D</b> | CH <sub>3</sub> COOH(aq) and NH <sub>3</sub> (aq)   | HCl(aq) and NH <sub>3</sub> (aq)                    |

(Total for question = 1 mark)

Q6.

Boric acid, H<sub>3</sub>BO<sub>3</sub>, is a weak acid with antiseptic properties.

Boric acid can undergo further dissociation.

Which is the conjugate acid of the HBO<sub>3</sub><sup>2-</sup> ion?

(1)

- A** BO<sub>3</sub><sup>3-</sup>
- B** H<sub>2</sub>BO<sub>3</sub><sup>-</sup>
- C** H<sub>3</sub>BO<sub>3</sub>
- D** H<sub>3</sub>O<sup>+</sup>

(Total for question = 1 mark)



Q7.

Answer the question with a cross in the box you think is correct  . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross  .

This question is about acids and buffer solutions.

The reaction of ammonia with water can be represented by



Which is the acid-conjugate base pair?

(1)

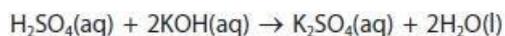
|                            | Acid             | Conjugate base               |
|----------------------------|------------------|------------------------------|
| <input type="checkbox"/> A | NH <sub>3</sub>  | OH <sup>-</sup>              |
| <input type="checkbox"/> B | NH <sub>3</sub>  | NH <sub>4</sub> <sup>+</sup> |
| <input type="checkbox"/> C | H <sub>2</sub> O | OH <sup>-</sup>              |
| <input type="checkbox"/> D | H <sub>2</sub> O | NH <sub>4</sub> <sup>+</sup> |

(Total for question = 1 mark)



Q8.

The reaction of sulfuric acid with potassium hydroxide is a neutralisation. The equation for this reaction is



A titration was carried out using the following method.

- Potassium hydroxide solution of unknown concentration was placed in a burette and the initial reading was recorded.
- 25.0 cm<sup>3</sup> of sulfuric acid solution, concentration 0.0800 mol dm<sup>-3</sup>, was transferred to a conical flask.
- Three drops of phenolphthalein indicator were added to the sulfuric acid.
- Potassium hydroxide was added from the burette until the solution just changed colour and then the burette reading was recorded.
- Repeat titrations were carried out until concordant titres were obtained.

What is the colour of the solution when neutralisation has just occurred?

(1)

- A colourless
- B orange
- C pale pink
- D red

**(Total for question = 1 mark)**

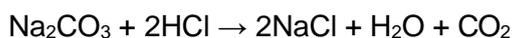


Q9.

Hydrochloric acid is prepared by dissolving hydrogen chloride gas in water. It is difficult to dissolve a known amount of hydrogen chloride, so the exact concentration of such solutions is uncertain. A solution of hydrochloric acid of concentration between  $0.095 \text{ mol dm}^{-3}$  and  $0.105 \text{ mol dm}^{-3}$  was prepared.

Before a class attempted a practical using this solution, a technician standardised the hydrochloric acid with sodium carbonate solution. The technician dissolved 1.30 g of anhydrous sodium carbonate in water and made up the solution to  $100 \text{ cm}^3$ .

The equation for the reaction which occurs is shown.



A  $10.0 \text{ cm}^3$  portion of the sodium carbonate solution was transferred to a conical flask. Three drops of methyl orange indicator were added and the solution titrated with hydrochloric acid. The results for the experiment are shown.

| Titration                               | 1     | 2     | 3     | 4     | 5     |
|---|-------|-------|-------|-------|-------|
| Final burette reading / $\text{cm}^3$   | 26.00 | 34.00 | 36.10 | 24.15 | 48.20 |
| Initial burette reading / $\text{cm}^3$ | 0.00  | 10.00 | 11.00 | 0.05  | 24.15 |
| Titre / $\text{cm}^3$                   |       |       |       |       |       |
| Concordant results (✓)                  |       |       |       |       |       |

The colour change at the end-point when methyl orange is used as an indicator for this titration is from

(1)

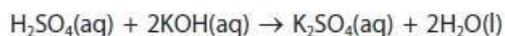
- A orange to yellow
- B red to orange
- C yellow to orange
- D yellow to red

(Total for question = 1 mark)



**Q10.**

The reaction of sulfuric acid with potassium hydroxide is a neutralisation. The equation for this reaction is



A titration was carried out using the following method.

- Potassium hydroxide solution of unknown concentration was placed in a burette and the initial reading was recorded.
- 25.0 cm<sup>3</sup> of sulfuric acid solution, concentration 0.0800 mol dm<sup>-3</sup>, was transferred to a conical flask.
- Three drops of phenolphthalein indicator were added to the sulfuric acid.
- Potassium hydroxide was added from the burette until the solution just changed colour and then the burette reading was recorded.
- Repeat titrations were carried out until concordant titres were obtained.

Select the most appropriate piece of apparatus to measure the 25.0 cm<sup>3</sup> of sulfuric acid.

(1)

- A** burette
- B** measuring cylinder
- C** pipette
- D** volumetric flask

**(Total for question = 1 mark)**