2.4 Acids and Alkalis: 10-minute Pack

Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A student performs a titration to find how much 0.1 mol/dm^3 hydrochloric acid is neutralised by sodium hydroxide. They add sodium hydroxide from a burette to 25.0 cm³ of acid with methyl orange indicator and find that the end point occurs after adding 24.5 cm³ of 0.1 mol/dm^3 sodium hydroxide. Using the idea of neutralisation (acid + alkali -> salt + water), evaluate whether the student could improve the accuracy of the titre value and give two suggestions. (This is a levels-of-response question.)

(6)

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2 The table below shows universal indicator colours with typical pH values for some common liquids. Use the table and the pH descriptions to answer the questions.

- Lemon juice: pH 2 (red-orange).
- Tomato juice: pH 4 (orange).
- Pure water: pH 7 (green).
- Milk of magnesia (dilute): pH 9 (blue-green).

(a) Which of these is the strongest acid? **(1)**

(b) Which two are alkaline or near alkaline? **(1)**

(c) Suggest why milk of magnesia can be used to treat heartburn. **(2)**

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Mark scheme · 2.4 Acids and Alkalis: 10-minute Pack

Question 1

Level 3 Clear evaluation with two appropriate improvements and reasons; uses accurate chemistry idea of end point and repeats to give reliable mean; links suggestions to how accuracy increases. **5-6**

Level 2 Some valid suggestions with brief reasons; mentions repeat readings or better indicators but limited explanation of how accuracy improves. **3-4**

Level 1 Simple statements about possible improvements with little or no explanation (for example, 'do it again' or 'use a burette carefully'). **1-2**

Indicative content:

- Repeat titration several times and use the mean of concordant titres to reduce random error.
- Use a more suitable indicator if methyl orange range is not ideal for the expected pH change, or use a pH meter to detect the equivalence point precisely.
- Ensure the burette and pipette are rinsed with the solutions before use and the meniscus is read at eye level to reduce systematic error.
- Carry out a rough titration first to estimate the end point and then perform accurate titres.
- Record volumes to correct decimal places and ensure consistent technique when swirling and adding near the end point.

Question 2

(a) lemon juice cao **B1**

(a) Answer: **Lemon juice**

(b) milk of magnesia and pure water (accept milk of magnesia and water as near alkaline) **B1**

(b) Answer: **Milk of magnesia and pure water**

(c) state that it is alkaline so neutralises excess stomach acid **M1**

(c) neutralises acid so reduces acidity and relieves heartburn cao **A1**

(c) Answer: **Because it is alkaline and neutralises excess stomach acid, reducing acidity and so relieving heartburn.**

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