

Extended writing questions

- A student used a $0.0500 \text{ mol dm}^{-3}$ solution of ethanedioic acid to find an accurate concentration of a potassium hydroxide solution which was known to have an approximate concentration of 0.1 mol dm^{-3} .

Describe a procedure to obtain reliable titration results using standard laboratory equipment.

(6)

| Answer | Additional guidance | Mark | | | | | | | | | | | | | | | | | | | | |
|--|--|---|---|---|-----|---|-----|---|---|---|---|---|--|--|---|---|---|---|--|---|---|---|
| <p>This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning.</p> <p>Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.</p> <p>The following table shows how the marks should be awarded for indicative content.</p> <table><tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr><tr><td>6</td><td>4</td></tr><tr><td>5-4</td><td>3</td></tr><tr><td>3-2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr></table> <p>The following table shows how the marks should be awarded for structure and lines of reasoning.</p> <table><tr><th></th><th>Number of marks awarded for structure and sustained lines of reasoning</th></tr><tr><td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout.</td><td>2</td></tr><tr><td>Answer is partially structured with some linkages and lines of reasoning.</td><td>1</td></tr><tr><td>Answer has no linkages between points and is unstructured.</td><td>0</td></tr></table> | Number of indicative marking points seen in answer | Number of marks awarded for indicative marking points | 6 | 4 | 5-4 | 3 | 3-2 | 2 | 1 | 1 | 0 | 0 | | Number of marks awarded for structure and sustained lines of reasoning | Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout. | 2 | Answer is partially structured with some linkages and lines of reasoning. | 1 | Answer has no linkages between points and is unstructured. | 0 | <p>Guidance on how the mark scheme should be applied.</p> <p>The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points that is partially structured with some linkages and lines of reasoning, scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning).</p> <p>If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages).</p> <p>In general, it would be expected that 5 or 6 indicative points would get 2 reasoning marks, and 3 or 4 indicative points would get 1 mark for reasoning, and 0, 1 or 2 indicative points would score zero marks for reasoning.</p> <p>If there is any incorrect chemistry, deduct mark(s) from the reasoning. If no reasoning mark(s) awarded, do not deduct mark(s).</p> <p>Comment: Look for the indicative marking points first, then consider the mark for the structure of the answer and sustained line of reasoning.</p> | 6 |
| Number of indicative marking points seen in answer | Number of marks awarded for indicative marking points | | | | | | | | | | | | | | | | | | | | | |
| 6 | 4 | | | | | | | | | | | | | | | | | | | | | |
| 5-4 | 3 | | | | | | | | | | | | | | | | | | | | | |
| 3-2 | 2 | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | | | | | | | | | | | | | | | | | | | | | |
| | Number of marks awarded for structure and sustained lines of reasoning | | | | | | | | | | | | | | | | | | | | | |
| Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout. | 2 | | | | | | | | | | | | | | | | | | | | | |
| Answer is partially structured with some linkages and lines of reasoning. | 1 | | | | | | | | | | | | | | | | | | | | | |
| Answer has no linkages between points and is unstructured. | 0 | | | | | | | | | | | | | | | | | | | | | |

| | Answer | Additional guidance | A |
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| | <p>Indicative points:</p> <ul style="list-style-type: none"> • rinse glassware with appropriate solutions • fill the burette with potassium hydroxide solution, ensuring there are no air bubbles • use a pipette and pipette filler to transfer 25.0 cm³ / 10 cm³ of acid to a conical flask • (add indicator to the acid in the conical flask and) carry out a range finder/rough titration • add potassium hydroxide drop by drop near the end point • repeat titrations until concordant/within ± 0.2 cm³. | <p>Do not award just 'rinse with distilled water'. Alternative IP 2 to 5 if acid (solution) used in burette:</p> <ul style="list-style-type: none"> • fill the burette with (ethanedioic) acid solution, ensuring there are no air bubbles • use a pipette and pipette filler to transfer 25.0 cm³ of potassium hydroxide solution to a conical flask • (add indicator to the potassium hydroxide in the conical flask and) carry out a range finder/rough titration • add (ethanedioic) acid drop by drop near the end point. | |