



AS 1.2/B

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STANDARDISING HYDROCHLORIC ACID



Instructions for performing titrations

Preparation of stock solutions

- 1) Find the mass of a clean, dry weighing bottle (high precision balance). All masses should be recorded in a table.
- 2) Measure out the approximate mass of sample (low precision balance). Always take the bottle off the balance when adding sample (to avoid spilling sample on the balance which can both damage the balance and makes the weighing inaccurate).
- 3) Find the mass of the sample on the high precision balance.
- 4) Wash the contents of the weighing bottle into a 250 cm³ volumetric flask using de-ionised water and a clean funnel.
- 5) Add more de-ionised water and shake well to dissolve.
- 6) Make up to 250 cm³ (shake well before and after reaching the mark – make up to mark using a clean teat pipette).

Titrations

- 1) Wash burette with water and then the solution to be used.
- 2) Fill the burette, ensuring the bottom part is filled. Make sure you take the funnel out of the burette before doing a titration.
- 3) Clean pipette first with water (blow out all water with the filler and dry the outside with a cloth) and then with the solution that it going to be measured in it.
- 4) Transfer 25 cm³ with pipette into a clean conical flask (drain by gravity and touch the tip under the surface at the end).
- 5) Add a few drops of indicator to the conical flask.
- 6) The first titration is rough (unless judged to be accurate) – note the start and end burette readings.
- 7) Repeat titrations, going dropwise near the end point – washing and swirling (a white tile may help, as may another flask with original colour).
- 8) Repeat until you have concordant results (two within 0.10 cm³)
- 9) Record results to the nearest 0.05 cm³, e.g. 24.80 cm³, etc., in a table similar to the one below.

	rough	accurate 1	accurate 2	accurate 3
initial reading (cm ³)	0.10	24.35	0.00	23.90
final reading (cm ³)	24.35	48.40	23.85	28.00
titre (cm ³)	24.25	24.05	23.85	24.10
used in mean	*	✓	*	✓

- 10) Indicate which results are used in the mean (only use concordant results within the mean).

Cleaning glassware

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|------------------|---|
| Weighing bottle | Wash and put in oven to dry (lids should go in the drying rack area). |
| Volumetric flask | Wash and return to cupboard (with stopper in flask). |
| Burette | Wash and return to drawer. |
| Pipette | Wash and return to drawer. |
| Other glassware | Wash and put back in trays. |
| Other apparatus | Return to where it came from. |

6) Calculate the maximum percentage apparatus error in the final result. Standard errors in apparatus are as follows:

balance	$\pm 0.001 \text{ g}$
volumetric flask	$\pm 0.1 \text{ cm}^3$
25 cm ³ pipette	$\pm 0.1 \text{ cm}^3$
burette (start & end readings and end point)	$\pm 0.15 \text{ cm}^3$

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Evaluation 7) Comment on the reliability of your titration results and so your titration technique.

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8) Write down the mean class value for the concentration of the hydrochloric acid (we shall assume that the class mean is the correct value).

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9) Find the difference between your value and the class mean value, as a percentage of the class mean (this is your percentage experimental error).

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10) Comment on the accuracy of your results.

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11) If you had spilled some sodium carbonate and not transferred it to the standard solution, explain how it would have affected the calculated value of the acid concentration.

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12) If you had consistently overshoot the end point by not washing down the flask with water, explain how it would have affected the calculated value of the acid concentration.

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