WJEC (Wales) Chemistry A-level

SP 1.7b - Standardisation of an Acid Solution

Flashcards

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What is a standard solution?

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What is a standard solution?

A solution with a known concentration.

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What apparatus is required to make up a standard solution?

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What apparatus is required to make up a standard solution?

- Weighing bottle or boat
- 250 cm^3 volumetric flask
- Digital mass balance
- Funnel
- 250 cm^3 beaker
- Glass rod
- Pipette

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Describe how to make up a standard solution of anhydrous sodium carbonate

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Describe how to make up a standard solution of anhydrous sodium carbonate

1. Accurately weigh out approximately 2.75g of anhydrous Na_2CO_3 into a weighing bottle. Record the mass.
2. Tip the solid into a 250 cm^3 beaker and reweigh the weighing bottle.
3. Dissolve the solid in deionised water, stirring with a glass rod. Do not add more than 150 cm^3 of distilled water.
4. Pour the solution into the 250 cm^3 volumetric flask via a funnel.
5. Rinse the beaker and glass rod three times and transfer the washings into the flask.
6. Make the solution up to the mark with distilled water so that the bottom of the meniscus is level with the graduation mark.
7. Add the stopper and shake the mixture thoroughly.

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Why must the weighing bottle be reweighed after the contents are transferred to a beaker?

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Why must the weighing bottle be reweighed after the contents are transferred to a beaker?

This means that the exact mass of solid transferred can be calculated - as some traces of the solid may have been left behind in the weighing bottle.

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When making up a standard solution, why is it important to not add more than 150 cm^3 of deionised water when dissolving the solid?

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When making up a standard solution, why is it important to not add more than 150 cm^3 of deionised water when dissolving the solid?

Exactly 250 cm^3 of deionised water will be added in total. Only 150 cm^3 should be added to dissolve the solid as this is enough to dissolve it and this leaves enough volume left for the washings, allowing the solution to be carefully made up to the 250 cm^3 mark.

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Why must the volumetric flask and graduation mark be at eye level when adding the final drops?

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Why must the volumetric flask and graduation mark be at eye level when adding the final drops?

This ensures the graduation mark is being viewed at the right angle, allowing the solution to be made up to 250 cm^3 more accurately.

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What is the meniscus?

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What is the meniscus?

The meniscus is the curved surface of the liquid within a tube. When making the solution up to the graduation mark, the bottom of the meniscus should be exactly in line with the graduation mark.

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What is the purpose of ‘washing’ the beaker and glass rod into the solution in the volumetric flask?

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What is the purpose of ‘washing’ the beaker and glass rod into the solution in the volumetric flask?

Washings ensures there is no solute left behind in the beaker or on the glass rod. This is important to ensure the concentration of the standard solution is as accurate as possible.

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What apparatus is required to carry out a titration?

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What apparatus is required to carry out a titration?

- 50 cm^3 burette
- 25 cm^3 pipette and filler
- Conical flasks
- Funnel
- Stand and clamp

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Why can methyl orange be used as an indicator in the titration between HCl and Na_2CO_3?

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Why can methyl orange be used as an indicator in the titration between HCl and Na_2CO_3?

Methyl orange can be used for titrations between a strong acid (HCl) and a weak base (Na_2CO_3) since the pH range of colour change coincides with the point of neutralisation.

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What is the colour change of methyl orange and at what pH does the colour change occur?

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What is the colour change of methyl orange and at what pH does the colour change occur?

- Red in acid
- Yellow in alkali

Methyl orange will change colour in the pH range 3.1-4.4.

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Describe how to titrate a standard solution with HCl

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Describe how to titrate a standard solution with HCl

1. Fill the burette with the HCl solution and record the initial burette reading.
2. Accurately pipette 25.0 cm^3 of the Na_2CO_3 solution into a conical flask.
3. Add 3 drops of methyl orange indicator to the flask.
4. The standard solution is titrated with the acid until, on the addition of one drop of acid, the indicator changes colour from yellow to pink/red.
5. Record the burette reading and repeat until the results are concordant.

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What is the chemical equation for the reaction between Na_2CO_3 and HCl?

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What is the chemical equation for the reaction between Na_2CO_3 and HCl?

$$2HCl + Na_2CO_3 \rightarrow 2NaCl + H_2O + CO_2$$

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How could you identify the gas produced in the reaction between Na_2CO_3 and HCl?

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How could you identify the gas produced in the reaction between Na_2CO_3 and HCl?

Carbon dioxide is produced which can be collected and identified by bubbling through limewater. The limewater will go cloudy if carbon dioxide is present.

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What type of reaction takes place between HCl and Na_2CO_3?

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What type of reaction takes place between HCl and Na_2CO_3?

Neutralisation

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Why should the burette be filled below eye level?

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Why should the burette be filled below eye level?

The burette should be filled below eye level so that if any of the acid spills whilst being poured in, it will not splash into your face.

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What is a rough titration?

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What is a rough titration?

A rough titration is often done first. Its purpose is to ascertain the approximate point of neutralisation. This means that for further titres, the acid can be added quickly until around the point of neutralisation - where it is then added dropwise. The rough titre is not accurate enough to be included in calculations.

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What are concordant results?

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What are concordant results?

Results are usually said to be concordant if they are within 0.1 cm^3 of one another.

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Why are titrations usually carried out on a white tile?

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Why are titrations usually carried out on a white tile?

The white tile allows the point of colour change to be easily identified.

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How can you calculate how much HCl was required to neutralise the Na_2CO_3?

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How can you calculate how much HCl was required to neutralise the Na_2CO_3?

Volume of HCl =

Initial burette reading - final burette reading

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Why is the Na_2CO_3 solution placed in a conical flask?

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Why is the Na_2CO_3 solution placed in a conical flask?

The conical flask allows the mixture to be swirled without losing any of the contents.

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Why must the reaction mixture be swirled during the titration?

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Why must the reaction mixture be swirled during the titration?

Swirling ensures all the reacting particles collide and react. This helps to give a more accurate end point for the reaction.

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Why are burettes and pipettes always used in titrations?

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Why are burettes and pipettes always used in titrations?

Burettes and pipettes measure the amount of HCl and Na_2CO_3 very precisely.

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Why is the pipette rinsed with Na_2CO_3 before use and the burette rinsed with HCl before use?

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Why is the pipette rinsed with Na_2CO_3 before use and the burette rinsed with HCl before use?

Rinsing the equipment with the solutions removes any water which may be in the equipment. This is important because the water will affect the concentrations of the solutions. Therefore, rinsing ensures a more accurate titration experiment.

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