Teacher Resource Bank

GCE Chemistry

PSA2: AS Inorganic Chemistry

- Carry out a Simple Acid-Base Titration

Copyright © 2008 AQA and its licensors. All rights reserved.
The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334). Registered address: AQA, Devas Street, Manchester M15 6EX.
Dr Michael Cresswell, Director General.

AS Inorganic Chemistry

PSA2 Carry out a simple acid-base titration

TECHNICAL SHEET

To determine the concentration of a solution of sodium hydroxide by titration using standard sodium hydrogensulfate solution.

Whenever possible, students should work individually.
If it is essential to work in a pair or in a small group, because of the availability of apparatus, supervisors must be satisfied that they are able to assess the contribution from each student to the practical activity.

Requirements

- burette
- stand and clamp
- 25 cm^3 pipette
- pipette filler
- Two 250 cm^3 conical flasks
- Two 250 cm^3 beakers
- funnel
- wash bottle
- phenolphthalein indicator
- standard sodium hydrogensulfate solution (200 cm^3)
- sodium hydroxide solution (200 cm^3)

The sodium hydrogensulfate solution needs to be a standard solution with an accurately known concentration between 0.0900 mol dm^{-3} and 0.100 mol dm^{-3} or could be the standard solution which the student prepared as part of PSA1.

Centres should use a sodium hydroxide solution with an accurately known concentration between 0.0900 mol dm^{-3} and 0.100 mol dm^{-3} but labelled as “sodium hydroxide of unknown concentration”.

Centres are expected to carry out and be responsible for their own safety risk assessments.

Copyright © 2008 AQA and its licensors. All rights reserved.

AS Inorganic Chemistry

PSA2 Carry out a simple acid-base titration

Wear Eye Protection

Student Sheet

It is the responsibility of the student to carry out and be responsible for their own safety risk assessment before carrying out this experiment. Wear safety glasses at all times. Assume that all of the reagents and liquids are toxic, corrosive and flammable.

Experiment

a) Pour approximately 100 cm^3 of the sodium hydrogensulfate solution into a clean, dry beaker that is labelled sodium hydrogensulfate. Use a small volume of this solution to rinse the burette before filling it with the sodium hydrogensulfate solution.

b) Pour approximately 100 cm^3 of the sodium hydroxide solution into a second clean, dry beaker labelled sodium hydroxide.

c) Rinse a 25 cm^3 pipette with the sodium hydroxide solution provided and then, using a pipette filler, pipette exactly 25.0 cm^3 of sodium hydroxide solution into a 250 cm^3 conical flask (which has been rinsed with de-ionised water).

d) Add **two to three drops** of phenolphthalein indicator to the solution in the conical flask and note the colour of the indicator in alkali.

e) **Before you start** to titrate, construct a Table ready to record your results.

f) Record the initial burette reading. Make sure that all your burette readings are to the appropriate precision.

g) Titrate the contents of the conical flask by adding sodium hydrogensulfate solution to it from the burette. Add the sodium hydrogensulfate solution slowly, swirling the flask gently to mix the solution. Add the sodium hydrogensulfate solution dropwise until the indicator undergoes a definite colour change; this is the end-point of the titration. Record the colour change in your results. Record the final burette reading in your Table of results.

h) Calculate and record in your Table of results the volume of sodium hydrogensulfate solution used.

i) Repeat the titration until you obtain **two** results, which are **concordant.** You should always carry out **at least three** titrations. **Record all of the results** that you obtain.

j) Calculate and record the mean volume of sodium hydrogensulfate solution used in the titration. Show your working.

AS Inorganic Chemistry

PSA2 Carry out a simple acid-base titration

Wear Eye Protection

TEACHER NOTES AND MARKING GUIDANCE

The specific marking guidance in the specification is as follows

2 marks: All areas of the task are carried out competently.
The burette is filled safely with the correct reagent (including below the tap)
The pipette and filler, burette and conical flask are all used correctly.
The titration results are concordant and the average titre is judged accurate.

1 mark: One of the areas of the task is performed poorly.
The burette is filled with the incorrect reagent or the funnel is left in or the burette is not filled below the tap **OR**
One of either, the pipette, pipette filler, burette or conical flask is not used correctly **OR**
The titration results are not concordant or the average titre is inaccurate.

0 marks: At least two of the areas of the task are performed poorly.
The burette is filled with the incorrect reagent or the funnel is left in or the burette is not filled below the tap.
One of either, the pipette, pipette filler, burette or conical flask is not used correctly.
The titration results are not concordant or the average titre is inaccurate.

Guidance for Teachers and Students

Teachers are expected to exercise professional judgement in assessing the competence of their candidates in following the instructions.

Candidates should have been given guidance in the correct use of equipment and this guidance **can continue during the practical session** for which this PSA forms a part.

If, however, the guidance required is fundamental or frequent, then the student should **not** be awarded 2 marks.

Judgement of 2 marks, 1 mark or 0 marks will depend on whether the candidate can achieve concordance and whether the result is judged accurate.
Centres can judge accuracy either by comparing the student result with

- the **known accurate value**, assuming that this is certain.
- **OR** a **teacher value** for the titration taken using the same reagents and on the same day as the PSA.
- **OR** a **class average** which has excluded significant anomalies.

In each case the student value should be judged sufficiently accurate provided it is within 2% of the value chosen by the teacher, against which the class is being compared.

It is important to remember when marking these practical exercises that PSA is about student competence and that for a student to score full marks on this exercise **perfection is neither expected nor required**.

Copyright © 2008 AQA and its licensors. All rights reserved.