

Teacher Resource Bank

GCE Chemistry

PSA1: AS Inorganic Chemistry

- Make up a Volumetric Solution



AS Inorganic Chemistry

PSA1 Make up a volumetric solution

TECHNICAL SHEET

To prepare a standard solution of sodium hydrogensulfate.

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

- weighing bottle or boat
- one 250 cm³ volumetric (graduated) flask
- sodium hydrogensulfate solid (see below)
- filter funnel
- spatula
- de-ionised or distilled water in a wash bottle
- one 250 cm³ beaker
- glass rod

The composition of the sodium hydrogensulfate should be known; either anhydrous (and the purest available) or the monohydrate. Students need to be advised which they are using.

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



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

The task is to prepare 250 cm³ of a standard solution of sodium hydrogensulfate with a concentration in the range 0.0900 to 0.110 mol dm⁻³

The procedure is as follows

- Calculate the mass of sodium hydrogensulfate solid needed to produce 250 cm³ of a 0.100 mol dm⁻³ solution. Show your working. If you are using the anhydrous solid, the mass to weigh out will be between 2.7 and 3.3 g and if you are using the monohydrate, the mass to weigh out should be between 3.1 and 3.8 g
- Weigh a clean dry weighing bottle (or weighing boat).
- Place the weighing bottle on the pan of a digital balance and, using a spatula, place into the bottle **approximately** the mass of sodium hydrogensulfate that you have calculated to be necessary.
- Weigh the weighing bottle and its contents accurately and record the **precise** mass.
- Pour the contents of the weighing bottle into a beaker and re-weigh the weighing bottle (which may contain traces of sodium hydrogensulfate).
- Calculate the mass of sodium hydrogensulfate that you have transferred. Remember to record all weighings to the precision of the balance that you have used.
- Add approximately 100 cm³ of de-ionised (or distilled) water to the beaker containing the solid and using a glass rod, stir the contents of the beaker until all of the sodium hydrogensulfate dissolves.
- Using a funnel, pour the contents of the beaker into a 250 cm³ volumetric (graduated) flask and then using the wash bottle rinse the beaker into the same volumetric flask. Rinse the glass rod into these washings.
- Make the volumetric flask up to the graduated mark by carefully adding de-ionised water from the wash bottle. You will need to be careful so that you do not over-shoot the mark.
- Stopper the volumetric flask and shake it thoroughly to mix the contents of the flask.
- Calculate the exact concentration in mol dm⁻³ of your solution quoting the value to the appropriate precision. Show all of your working.



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 weighing is precise and within the required range.
The transfer of solid to a graduated flask is done with care.
The solution is made up to the mark, accurately.

1 mark: One of the areas of the task is performed poorly.
The weighing is imprecise or outside the required range **OR**
The transfer of solid to the graduated flask is careless **OR**
The solution is made up inaccurately. (e.g. the flask is over-filled)

0 marks: At least two of the areas of the task are performed poorly.
The weighing is imprecise or outside the required range.
The transfer of solid to the graduated flask is careless.
The solution is made up inaccurately.

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 exercise appropriate care when

- weighing out and transferring the solid,
- dissolving and transferring the solution and washings to the volumetric flask,
- filling the volumetric flask to the correct level.

It is not difficult for candidates to prepare a solution by this method provided they follow the instructions and exercise appropriate care.

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**.