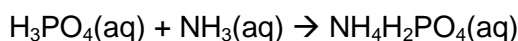


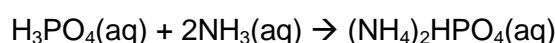
Preparation of diammonium hydrogenphosphate

Student worksheet

Diammonium hydrogenphosphate (DAP) is a simple salt, but a complex fertiliser, as it is a source of two nutrients – nitrogen and phosphorous. It can be made by partially neutralising dilute phosphoric acid with dilute ammonia solution. Ammonia is titrated with phosphoric acid using methyl orange indicator to find the volume of acid that reacts with 10 cm³ of ammonia to form ammonium dihydrogenphosphate:



Then you add this volume of acid to 20 cm³ of ammonia to form diammonium hydrogen phosphate.



Equipment and materials

- Evaporating basin
- Tripod and gauze
- Bunsen burner
- 10 cm³ pipette
- Burette and stand
- 100 cm³ conical flask
- Filter funnel, filter paper and conical flask (to stand funnel on)
- Glass rod.
- 1 mol dm⁻³ phosphoric acid
- 1 mol dm⁻³ ammonia solution
- Methyl orange indicator solution

Method

Care: Wear eye protection. 1 mol dm⁻³ ammonia solution and 1 mol dm⁻³ phosphoric acid are irritants to the eyes, lungs and the respiratory system. Work in a well-ventilated lab.

1. Use a pipette to transfer 10 cm³ of 1 mol dm⁻³ ammonia solution to a conical flask. Add a few drops of methyl orange indicator to the conical flask, and stand it on a white background.
2. Note the initial burette reading before adding 1 mol dm⁻³ phosphoric acid to the flask from a burette until the indicator changes colour. Make a note of the volume of acid added.
3. Use a pipette to transfer 20 cm³ of 1 mol dm⁻³ ammonia solution to an evaporating basin. Then use a burette to add the volume of 1 mol dm⁻³ phosphoric acid noted in step 2 to the evaporating basin.
4. Put the evaporating basin on a tripod and gauze. Slowly evaporate the solution until it is about one-fifth of its original volume. Caution: Do not boil the solution as it may spit.
5. Allow the concentrated solution to cool until crystals form. Filter off the crystals and put the filter paper and crystals on a watch glass and dab dry with another piece of filter paper. Cover them with a piece of clean filter paper and leave them to dry at room temperature.
6. Label a sample tube with the name of the product, your name and the date. Weigh the labelled sample tube and record its mass. Tip your dry product into the sample tube. Weigh the tube again. Record its mass.

Calculations

Calculate the theoretical yield and percentage yield of diammonium hydrogenphosphate, (NH₄)₂HPO₄.