Teacher Resource Bank

GCE Chemistry

PSA3: AS Inorganic Chemistry

- Carry Out Some Inorganic Tests

AS Inorganic Chemistry

PSA3 Carry out some inorganic tests

Technical Sheet

To carry out tests for the presence of anions and to make accurate observations.

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

- sodium carbonate solution
- dilute hydrochloric acid
- calcium hydroxide solution (limewater)
- magnesium sulfate solution
- barium chloride solution
- potassium chloride solution
- potassium chloride solid
- potassium bromide solution
- potassium bromide solid
- potassium iodide solution
- potassium iodide solid
- silver nitrate solution
- dilute ammonia solution
- potassium dichromate(VI) solution
- lead nitrate solution (or lead ethanoate solution)
- blue litmus paper (or universal indictor paper)
- test tubes and stoppers
- teat pipettes

In a fume cupboard

- concentrated sulfuric acid in dropping bottles
- concentrated ammonia solution (0.880)

The concentrations of the solutions to be tested need to be sufficient to ensure that an obvious reaction takes place. In practice, this is likely to mean 2 mol dm^{-3} for most solutions.

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

AS Inorganic Chemistry

PSA3 Carry out some inorganic tests

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 series of experiments.
Wear safety glasses at all times. Assume that all of the reagents and liquids are toxic, corrosive and flammable.

This experiment is divided into three parts.
In every case, you should present all of your observations in a Table. The presentation of an organised record of your observations is an important skill which you will be expected to demonstrate as part of this assessment.

Part 1 – The test for carbonate and sulfate ions in aqueous solution.

Test for carbonate ions in aqueous solution

a) To a small volume of the solution of sodium carbonate in a test tube, add an equal volume of dilute hydrochloric acid.
b) Carefully transfer some of the gas produced into a second test tube containing a small volume of calcium hydroxide solution (limewater). Transfer of the gas is possible either by pouring it from one tube to another or by using a teat pipette.
   Put a stopper into the test tube containing the calcium hydroxide solution (limewater) and shake the tube from side to side.
c) Record your observations.

Test for sulfate ions in aqueous solution

a) To a small volume of the solution of magnesium sulfate in a test tube, add an equal volume of dilute hydrochloric acid followed by an equal volume of barium chloride solution.
b) Record your observations.

AS Inorganic Chemistry

PSA3 Carry out some inorganic tests

Part 2 – The test for halide ions in aqueous solution.

Test for chloride, bromide and iodide ions in aqueous solution

a) To a small volume of each of the solutions of potassium chloride, potassium bromide and potassium iodide in three separate test tubes, add an equal volume of dilute nitric acid followed by approximately 2 cm^3 of silver nitrate solution.
b) Record your observations.
c) Swirl the tubes to ensure that the precipitates formed in each case are evenly distributed and then divide the contents of each tube in half.
    i) To one half of the contents, add an excess of dilute aqueous ammonia solution and observe what happens. Record your observations.
    ii) To the other half, and **working in a fume cupboard**, add an excess of concentrated ammonia solution and observe what happens. Record your observations.

Part 3 – The test for halide ions in <u>solid</u> salts using concentrated sulfuric acid.

Test for chloride, bromide and iodide ions in solid potassium halides

a) To a small spatula measure of **solid** potassium chloride in a **dry** test tube held in a test tube rack, and **working in a fume cupboard,** add a few drops of concentrated sulfuric acid. Record carefully what happens. Test the gas evolved with moist blue litmus or universal indicator paper
b) Repeat the experiment with solid potassium bromide **working in a fume cupboard,** using a second clean dry test tube and record carefully what happens. Test the gas evolved with acidified potassium dichromate(VI) solution which has been soaked onto a small piece of filter paper.
c) Repeat the experiment with solid potassium iodide **working in a fume cupboard,** using a third clean dry test tube and record carefully what happens. Test the gas evolved with lead nitrate solution which has been soaked onto a small piece of filter paper.

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 quantities of reagents are appropriate.
The tests (heating, shaking etc.) are carried out safely and with due care.
Nearly all of the observations are correct.

1 mark: One of the areas of the task is performed poorly.
The quantities of reagents are inappropriate **OR**
The tests (heating, shaking etc.) are carried out in a careless manner **OR**
Only some of the observations are correct.

0 marks: At least two of the areas of the task are performed poorly.
The quantities of reagents are inappropriate.
The tests (addition, heating, shaking etc.) are carried out in a careless manner.
Few of the observations are correct.

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

- collects sensible quantities of reagents for each test,
- carries out each test tube reaction with care and with due regard to safety,
- is able to make and record correct observations.

Students should not be judged on their ability to write balanced equations. They should be judged on their ability to follow the practical instructions and to carry out the practical task which leads to the production of a correct set of observations.

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**.