

Identification of an Organic Unknown

Said Q.

I am given an investigation which I have to plan myself; it is about an unknown organic compound that is either an alcohol, aldehyde, ketone, carboxylic acid, ester or phenol. I have to suggest a series of simple chemical tests, which could be done in test tubes, to distinguish the functional group of this organic compound. I am going to be observing any change of colour, formation of precipitate or the evolution of gas when adding certain chemicals to this compound.

The aim of this investigation is to find the functional group by carrying out simple chemical tests and, later, identify the organic compound by using the spectra.

Chemicals and Apparatus

- 10 * test tubes
- measuring cylinder (5 cm³)
- pipette
- Bunsen burner
- Splint
- Gas syringe
- Unknown organic compound
- Brady's reagent
- Bromine water
- Sodium metal
- Tollen's reagent
- Calcium Carbonate
- Limewater

Safety Plan

Read the method carefully and understand it before attempting on carrying out any experiment. Have some knowledge of the chemicals to be used to minimise hazards in the procedure. Wear gloves, goggles and a lab coat at all times during the experiment to prevent accidents to one and to fellow pupils.

Method

Test 1.A

- Set up the apparatus carefully.
- Measure 3 cm³ of the unknown compound into a small measuring cylinder.
- Pour this into a test tube.
- Add 3-6 drops of Brady's reagent (a solution of 2, 4-dinitrophenylhydrazine in dilute acid) to the test tube.
- If yellow/ orange crystals start to appear, then the test has shown a positive result and.....
- The unknown is proved to be either an aldehyde or a ketone. Move on to Test 1.B
- If no reaction happened, then the test has shown a negative result. So skip to Test 2.A.

Test 1.B

- To distinguish the carbonyl compound, measure 3 cm³ of the carbonyl compound in a measuring cylinder.
- Pour this into a new test tube
- Add 3-6 drops of Tollen's reagent (a solution of silver nitrate in aqueous ammonia) to the test tube.
- If a silver mirror forms around the inside of the test tube, the compound is proved to be an aldehyde. However if no reaction occurs, it is a ketone.

Test 2.A

- Measure 3 cm³ of the unknown into a measuring cylinder.
- Pour this into new a test tube.
- Throw a pinch of Sodium metal to the unknown.
- If gas is liberated, quickly light a splint and place it over the test tube.
- If you hear a popping sound, this confirms that the gas is in fact Hydrogen and the unknown compound is either a phenol, alcohol or a carboxylic acid. Move on to Test 2.B.
- If no reaction occurs then the unknown is an ester which should also give a sweet smell.

Test 2.B

- Measure 3 cm³ of the unknown into a measuring cylinder.
- Pour this into new a test tube.
- Add 6-10 drops of Bromine water to the test tube.
- If Bromine is decolourised (from orange to clear) and a white precipitate forms then this confirms that the unknown is actually a phenol.
- If no precipitate forms then the unknown is either an alcohol or a carboxylic acid. So move on to Test 2.C.

Test 2.C

- Measure 3 cm³ of the unknown into a measuring cylinder.
- Pour this into new a test tube.
- Throw a pinch of Calcium Carbonate to the unknown
- If a gas is liberated, shut the tube with a cork that has a hole in it and is connected to a tube and a gas syringe.
- The gas should collect in the gas syringe. When gas stops evolving, bubble the gas into 5 cm³ of limewater.
- If the limewater goes milky in colour, this proves that the gas is Carbon Dioxide and that the unknown is a carboxylic acid.
- If no reaction occurs, then the unknown is confirmed to be an alcohol.

Fair test

Doing a fair test is completely essential for achieving accurate and reliable results which would take a large part in the conclusion at the end, and also for avoiding errors and anomalous results. I will make sure that this happens by many ways, by choosing:

1. Relevant and accurate equipment with very small percentage errors.
2. Washing and drying up the equipment thoroughly after each experiment ensuring that they are contamination-free.
3. Taking measurements carefully as specified by the method.
4. keeping a straight line of sight when reading measurements of solution in the measuring cylinder
5. Always read the bottom of the meniscus of any solution when taking measurements.

Bibliography

For this investigation, I mainly used the 'yahoo' search engine from the internet as my primary source of information e.g. Brady's reagent; with addition to a variety of books, where I looked up various reactions of compounds. The rest of this investigation is done using my knowledge and understanding of this subject.