Ratna Sagar

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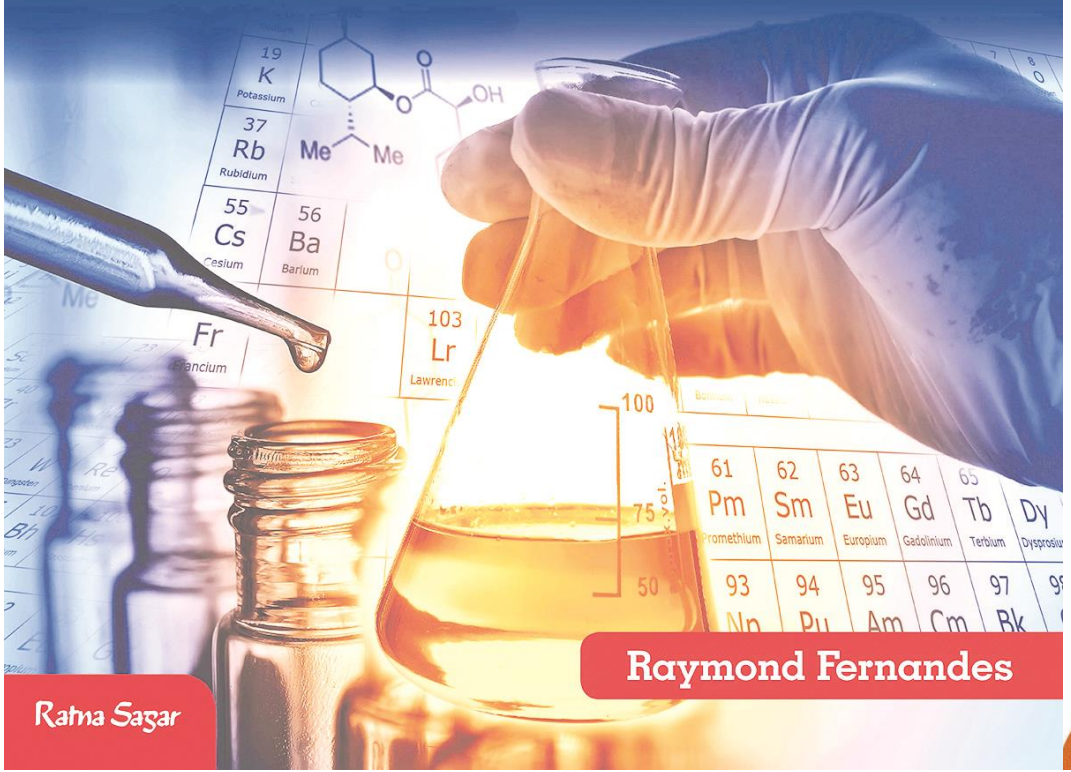
Education, Our Mission

As per the latest ICSE syllabus

9

Revised and Updated

Living Science CHEMISTRY



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ICSE
Living Science
Chemistry

Class 9

Chapter 9 Practical Work

LEARNING OBJECTIVES

Identification of Gases

Effect of Heat on Compounds

- **Action of dilute acid on a given compound**
- **Flame test**

Hard and Soft Water

Water Pollution

- **Preventive steps to control pollution of water bodies**

"Every experiment proves something. If it does not prove what you wanted it to prove, it proves something else."

— Robert Hoffman

Identification of Gases

When a substance is heated or reacted with a reagent it may liberate a gas. The characteristics of the gas evolved help in the identification of the radicals of the compound.

Oxygen

Characteristics of the gas released:

1. Colourless **2.** Odourless **3.** Neutral to litmus paper

4. Relights a glowing splinter **5.** Turns a colourless alkaline pyrogallol solution to brown when passed through it

Hydrogen

Characteristics of the gas released:

1. Colourless **2.** Odourless **3.** Neutral to litmus paper

4. Burns with a pale blue flame when a burning splinter is brought near it.

5. Produces a pop sound on burning.

Note: **Refer to Page 111-112 for the characteristics of more such gases**

Effect of Heat on Compounds

Many characteristic changes are observed when compounds are heated. Some of them decompose to give off gas or vapours. Some change their colour while a few of them sublime on heating. Careful observation of these changes and identification of the evolved gases (through the above mentioned characteristics) helps in the identification of the salt.

Experiment

Take the given compound in a clean dry, hard glass test tube. Heat it gently at first and then strongly. Make your observations and note your inferences.

A. Effect of heat on oxides

Mercuric oxide, HgO

Observations and inferences

1. Mercuric oxide is an orange red amorphous powder.
2. On strong heating, it turns deep red and then black.
3. A colourless, odourless gas is liberated which rekindles a glowing splint. This suggests that the liberated gas is oxygen.
4. Vapours of mercury condense on the cooler parts of the test tube to give a mirror like appearance.

$$2HgO \longrightarrow 2Hg + O_2$$

Note: **Refer to P 112-114 for the Effects of Heat on different Compounds**

Action of dilute acid on a given compound

Add dilute sulphuric acid to the given compound (or substance). Warm the reaction mixture gently if necessary. Note your observations and make deductions.

Note: **Action of dilute acid on active metal, carbonate, sulphide, sulphite, given on P-114**

Flame test

A thin platinum wire is thoroughly cleaned by dipping in concentrated HCl and then heating in a non-luminous flame till no colour is imparted by the wire. Then, dip the wire again in conc. HCl and then in a given compound. Hold the wire containing the compound in the non-luminous zone of the flame of the burner. Note the colour imparted by the wire to the flame.

Note: **Refer to Table 9.1 for Characteristic colours released during flame test**

Hard and Soft Water

Water that does not lather with soap but instead forms a sticky mass called scum is called hard water. Water becomes hard because it contains certain dissolved salts such as bicarbonates, sulphates and chlorides of calcium and magnesium. Hardness of water is of two kinds:

1. Temporary hardness

a. Temporary hard water contains only the bicarbonates of calcium and magnesium.

b. Temporary hardness can be removed by boiling.

2. Permanent hardness

a. Permanent hard water contains chlorides and sulphates of calcium and magnesium.

b. Permanent hardness can be removed by adding washing soda.

Soap and Detergent

A detergent works better than soap in hard water as it does not form scum. This is because detergents are sodium salts of sulphonic acid. These radicals do not form scum because their salts are soluble in water. Soap on the other hand is a compound of long chain fatty acids. These fatty acids react with the calcium and magnesium salts to form insoluble scum.

Water Pollution

When physical, chemical and biological materials contaminate the water bodies, degradation of the quality of water takes place, making it harmful for living organisms and the environment.

The main sources of pollution of water bodies in the locality are as follows:

- household detergents
- sewage and industrial wastes
- agricultural run-offs
- thermal pollution
- oil spills

It is important to measure water quality in our surroundings. This helps in:

- setting a “standard” for specific purposes (i.e. as drinking water, as a habitat for aquatic life, for agriculture and industry, etc.).
- assessing its suitability for specific purposes.
- monitoring the water quality at a particular place and identifying changes in it.
- assessing effectiveness of control on discharge of pollutants into water bodies.
- spreading awareness in the community.

To determine the quality of water of water bodies in the locality

Procedure:

1. Collect water in a clean jerrycan or plastic bottle, from a water body in or near your locality.

2. Use a simple portable water testing kit to perform the tests and measure the essential parameters of the water sample.

3. Measure the following parameters of the water sample:

i. *Physical:* colour, odour, temperature, turbidity, pH and hardness

ii. *Chemical*: salinity, specific conductance, dissolved oxygen (DO) content, biochemical oxygen demand (BOD), phosphates from agricultural run-offs, alkali metals (Na, K), Ca and Mg, trace metals (N, P, Cl, F) and heavy metals (Ni, Fe, Cu, Pb, Zn)

iii. *Biological*: microorganisms

Note: Refer to P 116-118 to measure the parameters of the water sample

Preventive steps to control pollution of water bodies

1. Create a water body regulation zone, which bans human activities from taking place within a certain radius of the water body.

2. Decentralise sewage treatment by ensuring that colonies, group housing societies, etc. treat their own sewage by energy efficient and safe technologies and recycle the treated water.

3. Chemicals released from factories should be treated to neutralise their toxic contents.

4. Promote use of organic fertilisers in agriculture. If possible, use treated sewage water for irrigation purposes.

5. Spread mass awareness on “How to protect our water bodies”.

SUMMARY..

1. The characteristics of the gas evolved help us identify the radicals of the compound.

2. If the gas evolved turns blue litmus red and lime water milky, then the gas liberated is either CO_2 or SO_2. This implies that the radicals present are either $CO3^{2-}$ or $SO3^{2-}$. To distinguish between the carbon dioxide and the sulphur dioxide gas, acidified potassium dichromate ($K_2Cr_2O_7$) paper is used.
If the gas turns acidified $K_2Cr_2O_7$ paper green, then the gas is SO_2.
If the gas has no effect on acidified $K_2Cr_2O_7$ paper, then the gas is CO_2.

3. If the gas evolved turns blue litmus red and gives white fumes with a rod dipped in ammonium hydroxide solution (NH_4OH), then the gas liberated is HCl.

4. If the gas evolved is neutral to litmus and relights a glowing splint, then the gas liberated is O_2. This implies that the compound is either a higher oxide or a nitrate of a heavy metal or an alkali metal.

5. If the gas liberated is reddish brown in colour and turns moist blue litmus red, then the gas liberated is NO_2.

6. If the gas evolved turns red litmus blue and gives white fumes with a rod dipped in concentrated HCl, then the gas evolved is NH_3.

7. If droplets of water are condensed on the cooler parts of the test tube it implies that the salt contains water of crystallisation.
This means that the salt is a crystalline salt.


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