Purity and Formulations

Purity

- **Purity** mean something quite **different** from the **everyday term**.
- In everyday language, we use the word pure to describe when something is **natural** or **clean** and to which nothing else has been added.
- In chemistry, a pure substance may consist of a **single element** or **compound** which contains no other substances

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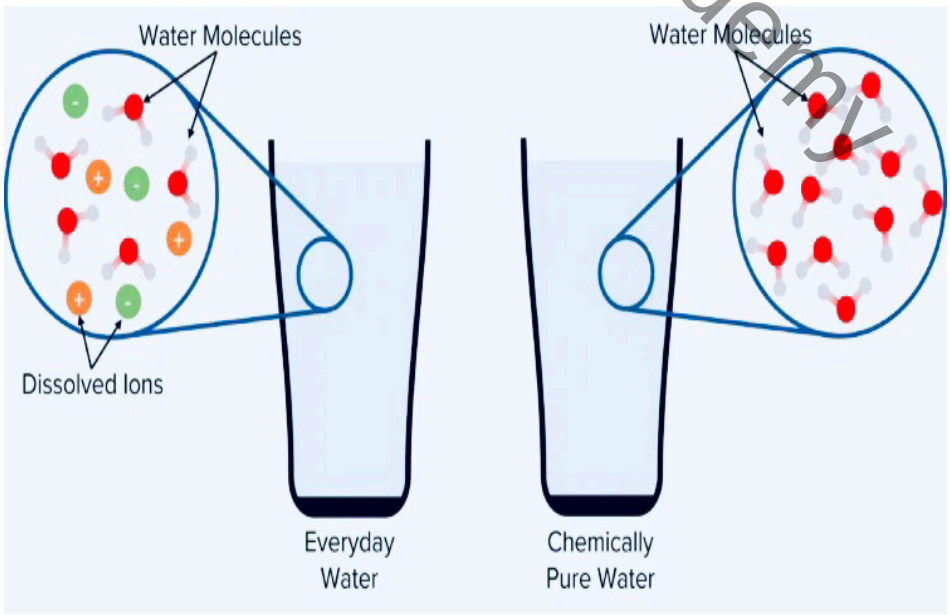
EXAMPLE

- For example, when we talk about a glass of pure water in the **everyday sense**, we simply mean a glass **without contaminants** such as bacteria, dirt, or unwanted chemicals. This glass of water will contain other substances apart from the H2OH2 O molecule, such as **dissolved ions**.
- For a **chemist** however, this water would be far from pure. In chemistry, pure substances are defined as ones containing **only one compound or element**. For a glass of water to be chemically pure, it must contain **water molecules**, and **nothing else**.



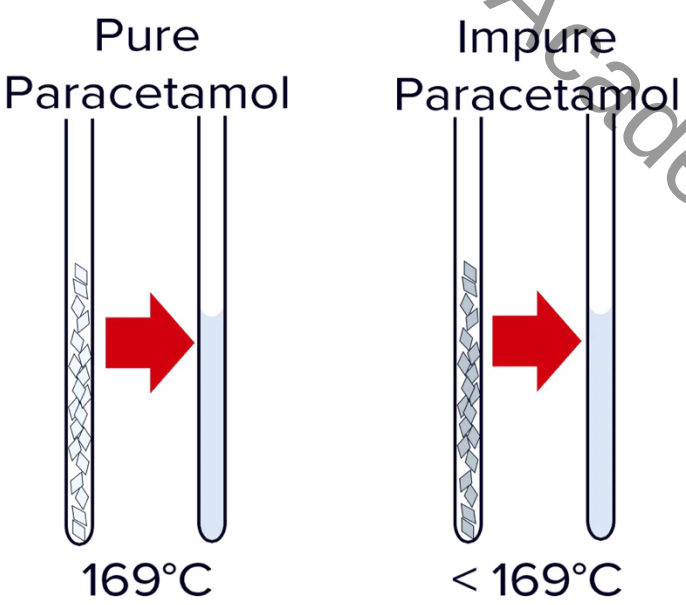
Testing for purity

- Chemists are often concerned establishing the purity of substances, particularly in the pharmaceutical industry.
- There are two quick ways to establish the purity of a substances, both involving changes of state.

1. Melting point Analysis
2. Boiling point Analysis

1. Melting point Analysis:

- In this method, crystals of a solid substances are added to a small vessel called a capillary tube. This capillary tube is placed inside a melting point device.
- This machine gradually increases the temperature of the sample until it is hot enough to melt. A small viewing window at the front of the machine allows for the sample to be observed and for the temperature at which it melts to be recorded.
- Pure substances will melt exactly at their melting point, where as impure ones will melt below the melting point of the substances and over a range of temperatures.



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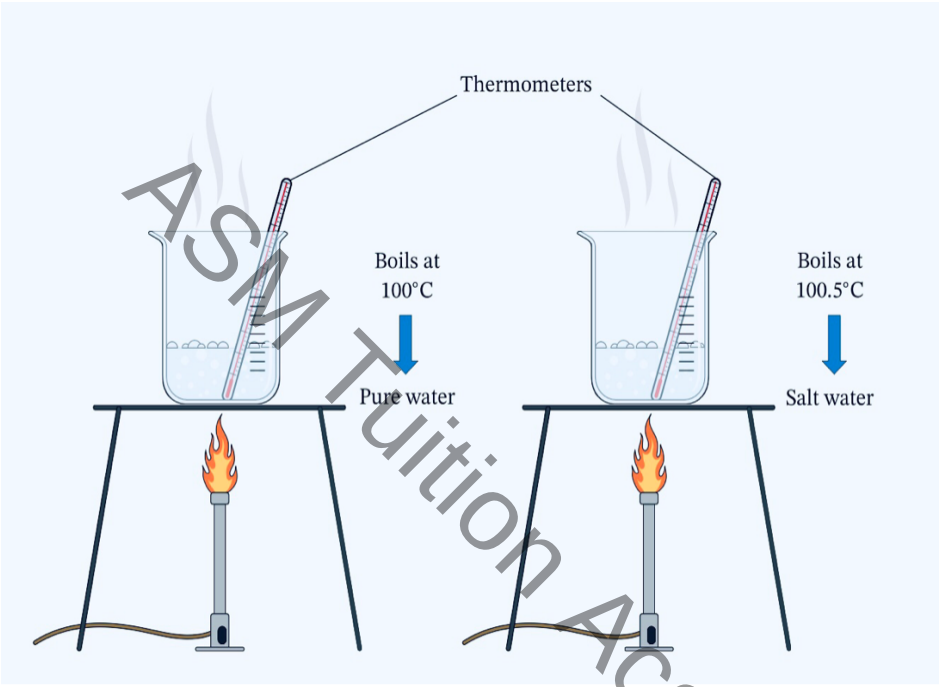
2. Boiling Point Analysis

- In this method, the temperature of a liquid is increased and the temperature at which it starts to boil is measured.
- Pure substances will boil exactly at their boiling point, but impure ones will boil at a higher temperature over a wider range.



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Formulations

- Formulations are **useful mixtures** designed for **specific purposes**. They are often **complex mixtures** of chemicals that contain a range of different substances, each chosen to meet a **specific need** within the formulation.
- To produce a formulation, chemicals are mixed in **determined** quantities to ensure that the **right properties** are created.
- If one or more components of the formulation are added in the wrong quantity, the properties of the product will change, leading to **less useful** and **potentially dangerous** substances being produced.

EXAMPLE

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- **Paint** is a common example of a formulation. It is made up of a **pigment**, a **solvent**, a **binder**, and **additives**.

I. The **pigment** is chosen to give the paint its **colour**. Most of the time this is a **metal oxide**, such as **titanium oxide** for **white** paints.

II. The **solvent** is used to dissolve the **other components** of the formulation to produce a **solution** and alter the **viscosity** of the paint. This component will then **evaporate** off when the paint is applied.

III. The **binder** is used to **stick** the pigment to whatever is being painted.

IV. The **additives** are added to give the paint any other **desired properties**, such as a **gloss** or **matt** finish, or to achieve certain behaviours like **glowing in the dark**.

- Other common examples of formulations are **medicines**, **soft** and **alcoholic drinks**, **metal alloys**, **Fertilisers, fuels, Cosmetics, cleaning products**, and a whole host of other industrially produced chemicals.

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