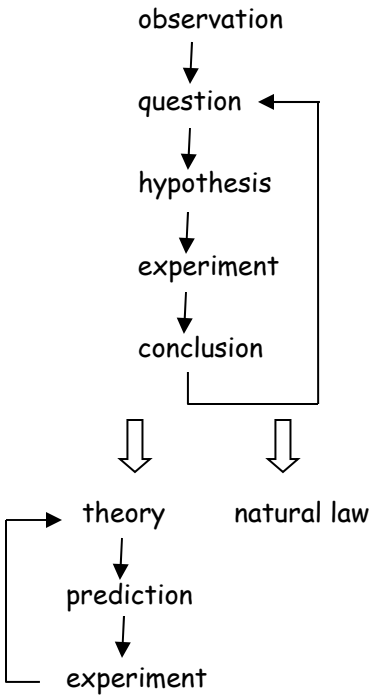
Introduction to Chemistry – Matter and its Changes

Scientific Method

- Scientific method is a structured procedure allowing a way of answering questions about the world we live in. Information is collected through the use of our senses (our observations lead to a question) and interpretation is an attempt to put meaning to an observation. Thinking about the question produces a hypothesis (tentative answer to question). The hypothesis is tested via collection of data and analysis of this data. The result of the experiment may lead to a new question, hypothesis and experiment.



- After a number of experiments one may be able to summarize results into a natural law (explains how but not why).

- Finally may reach a theory (explains why).

- What is the difference between;

a.) observations and data? observations = non number/data = number

b.) observations and interpretation? observation = fact/interpretation = meaning from mind

Practice – Worksheet – Scientific Method

Properties of Matter

- Chemistry is the science that studies the properties, composition and behaviour of matter (anything that has mass and occupies space).

- There are two categories of properties:

    1.) Chemical properties - cannot be observed without altering the substance.

        Ex. – hydrogen will burn in air to produce water.

    2.) Physical properties – can be found through observations (new substance not needed).

        Ex. – color, density, texture.

- Physical properties can be **in**tensive or **ex**tensive.

    - Intensive properties – depend only on the nature of the substance and not how much is present (density and melting point). Often used to identify a substance.
    - Extensive properties – depend on the amount (mass and volume). Not used to identify a substance.

    Ex. – Which is which? Intensive or extensive?

    Atom Shape - ___ ___ Smell - ___ ___ Color - ____ ___ Length - ___ ___

- More examples of physical properties are;

    1.) Hardness – ability of a substance to resist scratching.

    2.) Malleability – ability to be hammered in to sheets.

    3.) Ductility – ability to be stretched into wires.

    4.) Lustre – manner in which a solid surface reflects light (metallic, adamantine or diamond like, glossy, oily, pearly, silky or dull.

    5.) Viscosity – resistance of a fluid to flow.

    Ex. – Give an example of something which is observable but which does not contain matter.

        Answer – light, heat and sound.

Ex 2. – Small steel pellets are dropped down three glass tubes simultaneously. Each tube is one metre long and contains hexane, glycerol or carbon tetrachloride (CCl_4). The pellet in the hexane arrives first, followed by the pellet in the carbon tetrachloride. The glycerol tubes pellet is by far the slowest. Afterward you pour all three tubes of liquid into one container and three distinct layers are seen. Carbon tetrachloride is on the bottom, glycerol in the middle and hexane on the top.

a.) Rank the liquids from lowest to highest viscosity. ___ ___, ___ ___, ___ ___

b.) Rank the liquids from lowest to highest density. ___ ___, ___ ___, ___ ___

c.) What is the relationship that appears to exist between density and viscosity of liquids?

Answer – increasing viscosity in liquids occurs with increasing density.