Report on physical properties of water

Technology, Development

This experiment involved the measurement of temperature of a sample of water being heated at 30 seconds intervals. One real world application of the experiment is that it can be used for distinguishing between pure and impure water. There are certain terms such as melting point, boiling point, physical change, chemical change, physical property, chemical property, intensive property, extensive property and temperature that are overly important to this experiment hence an understanding of the difference in the meanings of these words is of essence. While melting point is the temperature point at which a solid substance changes to liquid, Boiling point is the point at which a liquid changes into a gaseous state. There is also a thin difference between physical change and chemical change whereby physical change is the term used to denote a change whereby there is no effect in the chemical composition of the substance while chemical change is a change the involves changes in the chemical composition of a substance and in most is a permanent change. By extension, intensive property is a property of a material that is not dependent on the proportional amount of substance in the material while extensive property is a property of a substance that is overly dependent on the amount of substance in the material. Temperature, on its parts, can be plainly delineated as the degree of hotness or coldness of a body.

There is a difference in the arrangement of particles in the difference states of water; in solid state, the molecules are closely packed and are arranged in a regular manner; in liquid state, the molecules are closely parked but in an irregular manner; and in gaseous state, the molecules are spaces further apart with in an irregular manner. This can be better emphasized by the use

of a diagram as shown below.

With regards to shape of the obtained graph, as water is heated, the particles gain more and more kinetic energy. Melting takes place when ice is heated. The particles in ice have very low kinetic energy, and if at all are they are vibrating, the vibration is unnoticeably very low. Heating the ice results into an increase in kinetic energy of the molecules thus the particles vibrate at a faster rate compared to the particle in ice. At boiling point, the vibration rate is extremely high compared to liquid and solid states. Ideally, boiling and melting point are physical changes because they do not involve any change in the chemical property of water and are reversible

For this experiment, there are two major possible sources of errors; inaccurate reading of temperature and impurities. The experiment entailed taking temperature readings every 30 seconds hence in accurate reading of the temperature reading, especially because the temperature readings were taken while, heating was continuing. Additionally, by noting that impurities lower melting point and raises the boiling point of water, the presence of impurities on the set up, probably as a result of using unclean apparatus, could act as another source of error.

Taking a look at the graph, for the first two minutes, there is not temperature change. Slight increase in temperate are noticed after the second minute with an unprecedented sharp but small increase being witnessed in the third minute. After the third minute, there is a gradual rise in temperature up to the tenth minute when a slow rise in temperature begins to be experienced. At the onset of the eleventh minute through to the thirtieth minute, there is no temperature change.

In explanation, there was a steady rise in temperature of the water before the start of melting, but there was no change in temperature of water as it was melting. This is because, prior to melting, the heat is used to increase the kinetic energy of the water molecules up to a point which the molecules can be able to break the intermolecular forces holding up the particles in solid state. A few minutes after the start of melting, there is no change in temperature as heat absorbed is used to break the intermolecular forces. Furthermore, There was a steady rise in temperature of the water as it was heated prior to boiling point, but there was no change in temperature of water as the water was boiling. This is because, before boiling, the heat is used to increase the kinetic energy of the water molecules. Some minutes after the start of boiling, there is no change in temperature as heat absorbed is used to completely break the intermolecular forces between the molecules.

As can be seen from the graph, there are unique features that can be used to tell the melting point and boiling point of water. Referred to as plateaus, these are particular region of the graph in which there was no change temperature even as heating continued. These features are utile in determining the melting and boiling points of water even though the water sample experienced a wide range of temperatures during the experiment. Concisely, the determination of melting and boiling points can yield important information about the purity of a substance (in this case it was water). Normally, heating ice and plotting a graph of temperature against time using readings by recoding the temperature change after a given time interval for a given period of time should give a graph of a particular shape.

Since the graph obtained conforms with the theoretical heating curve of water, it can be concluded that the objective of the experiment was achieved. It can also be concluded that the use of Vernier equipment Logger Pro were learnt sufficiently.