The City School

North Nazimabad Boys Campus

E-Notes

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Notes for 'Thermal Properties of Matter'

- Specific heat capacity is the amount of heat required to raise the temperature of a unit mass of a substance by one degree.
- It is represented by 'c' and the unit is J/Kg ˚C.
- It is calculated by $c = \frac{Energy}{Mass \times \Delta T}$ (ΔT is the change in temperature).
- Melting point is the temperature at which solid changes into a liquid without a change in temperature. (solidification being the opposite).
- Boiling point is the temperature at which liquid changes in to a gas without change in temperature. (condensation being the opposite).
- During melting or boiling process, the energy consumed in overcoming the attractive forces between the molecules of the substance to change its phase. As the energy is being consumed for this process, the temperature does not rise.
- Evaporation is the process in which liquid turns into a gas below its boiling point.
- During evaporation, molecules on the surface gain enough energy to change its phase and rise away.
- Effect of evaporation can be increased by:
  - Increasing temperature.
  - Increasing the surface area.
  - Reduction in humidity.
  - Blowing air across the surface.
- Evaporation causes high energy molecules to leave the low energy molecules behind which causes a cooling effect.
- This effect is used by our body to cool itself by sweating.
- Latent heat is the energy consumed during a change of phase.
- The heat transferred while a substance melts, is called the Latent heat of Fusion.
- The heat transferred while a substance boils, is called the latent heat of vaporization.
- It is denoted by 'L' and its unit is J/Kg.
- It can be calculated by $L = \frac{Energy}{Mass}$.
- The temperature-time graphs can show that at melting and boiling point the temperature remains constant.
- Increasing the temperature of an object increases the average kinetic energy of the atoms and molecules, causing them to vibrate more vigorously.
- This increases in vibration (or movement in case of liquids and gases), causes the object to expand as they now require more space.

- The rate of expansion in all three states is different with solids expanding the least and liquids expanding more than solids and gases expending the most.
- Thermal expansion can be used in many ways:
    - Expansion of liquid used in the Liquid-in-glass thermometer.
    - Difference in the expansion of dissimilar metal strips used in the bimetallic thermostat.
    - Expansion of lids of jars to open them easily.
- On the other hand, thermal expansion can also have some very dangerous and costly consequences like:
    - Buckling of railway lines and expansion of bridges.
    - Expansion of concrete resulting in cracks.
    - Contraction of overhead electrical cables.
- On increasing the temperature of a gas at constant pressure, the volume of the gas increases as the molecules of gas start moving more rapidly and their collisions increase.