

HEAT

THE NATURE OF HEAT

- **Heat:** the form of energy which can make the temperature of an object change /increase
- **Unit of heat energy:** Joule
- **Temperature:** a measure of how hot is an object
- **Thermometer:** measuring temperature in degrees Celsius ($^{\circ}\text{C}$)
- **Source of Heat:**
 1. Chemical Energy (fossil fuel)
 2. Electrical Energy (toasters, heaters)
 3. Mechanical Energy (spacecraft)
 4. Sound Energy (loud noise through wall)
 5. Nuclear Energy (produce steam)
 6. Solar Energy (solar hot system water)
- **Uses of Heat:** (cooking, heating, cleaning, etc.)
- **Problems of Heat** (uncomfortable, serious burn, damage, thermal pollution, machines friction)
- **The Kinetic Theory and Heat:**
 1. All matter is: made up of small particles that are moving because of heat
 2. Particles in: Solid (vibrate), Liquids (vibrate and move about), Gases (move about very rapidly and freely)
 3. Absolute Zero – all motion of particles stops

THE TRANSFER OF HEAT

- **Methods of Heat Transfer:** Conduction, Convection, and Radiation, Evaporation
- **Conduction:**
 1. Occurs mostly in solid
 2. Heat passes through particles by vibrating and colliding
 3. Metals are good conductors (Copper, iron, Aluminium, steels). Silver is the best conductor
 4. Insulator: poor conductors (non metals, plastics, gases). Examples (saucepan, insulation in house)
- **Convection:**
 1. Occurs in liquids and gases
 2. Heat is carried by moving currents in liquids and gases
 3. Examples convection in: land and sea breeze, thermals, a log fire, chimney, in room ventilation, circulation system
- **Radiation:**
 1. Different from conduction and convection which require matter to transfer heat, radiation doesn't require matter to transfer heat
 2. Radiation: a form of energy transport consisting of electromagnetic waves, no mass is exchanged and no medium is required.
 3. Examples: Sun heats the Earth (infra-red radiation)
 4. Good absorbers and radiators: dark and rough surfaces
 5. Poor absorbers and poor radiators: smooth, light surfaces
- **Vacuum Flask** (application of conduction, convection, and radiation)

EFFECTS OF HEAT AND ENERGY

- **Expansion:**
 1. increasing size of substances
 2. Solids: thermostat (bi-metallic strip), e.g. copper and brass expand more than iron, a bridge, expansion influenced by 3 factors : a. The nature of material, the size of object, the rise in temperature
 3. Liquids: expand greater than solid, liquid in solid container (the container also expands), methylated spirit expands more than water
 4. Gases: expand greater than solids and liquids. All gases expand at the same rate
- **Thermometers:** expansion of liquids to measure temperature (alcohol, mercury)
- **Changes of State:** melting (solid to liquid), boiling (liquid to gas), condensation (gas to liquid), freezing (liquid to solid)
- **Latent Heat:** changing a substance from one state to another, heat is supplied or removed during change of state
- **Evaporation:** a change from liquid to gas that occurs at all temperatures, three influenced factors: liquid temperature, surface area, vapour content
- **Altering melting points and boiling points of water** (Standard: freezing point of water 0°C , boiling point 100°C), can be different, because of:
 1. **The effect of Pressure:** (high pressure increases the boiling point and decreases the freezing point, vice versa). Example: high pressure (water boils at higher temperature, e.g. pressure cooker)
 2. **The Effect of Impurities** (increase the boiling point and decrease the freezing point), e.g. use salt on ice-covered road.