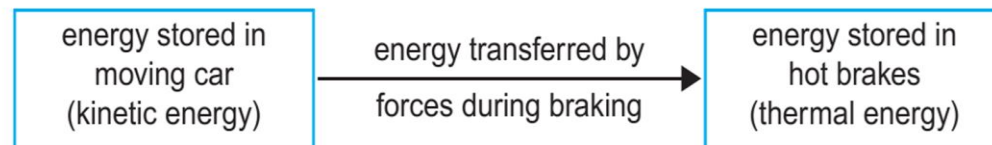
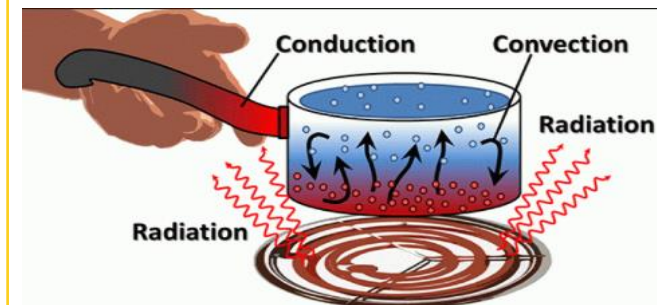
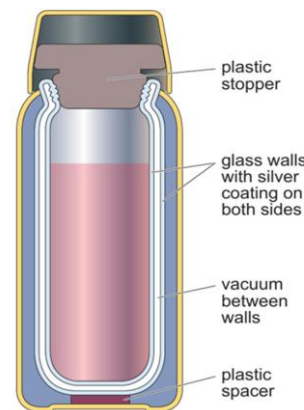
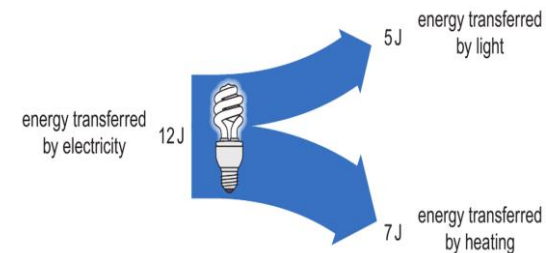




- 1 Law of conservation of energy = **Energy cannot be created or destroyed**, energy can only transformed from one form to another
- 2 Energy is measured in **Joules (J)**
- 3 Energy stores include **thermal** energy (hot objects), **chemical** energy (food, fuels, batteries), **kinetic** (moving objects), **gravitational** potential energy (objects higher up in a gravitation field), **elastic** potential energy (springs), **atomic** or **nuclear** energy (radioactive decay)
- 4 Energy can be **transferred mechanically** - by a force moving a distance, **electrically**- by use of an electric current, **thermally** - because of a difference in temperature , **radiation** - by waves such as electromagnetic or sound
- 5 **Energy transfer diagrams** show the energy stores (boxes) and ways in which energy moves (arrows)
- 6 **Friction** a contact force (two surfaces come into contact) Work done to overcome friction is mainly transferred to **thermal energy**
- 7 **Lubricants** such as oil are used to reduce friction between moving parts
- 8 **Efficiency** is how good a machine is at transferring energy into **useful** forms. Efficiency is written as a percentage e.g. 50% or as a decimal fraction e.g. 0.50.
- 9 **Sankey** diagrams show how energy is transferred by the device and show efficiency
- 10 Energy can be **dissipated** (spreads out) to the **surroundings** and cannot be used for other useful energy transfers is said to be **wasted**.
- 11 **Heat energy** can be **transferred** by **conduction**, **convection** or infra red **radiation**.
- 12 Conduction (happens in solids) and convection (happens in liquids and gases) need **particles**, radiation does not need particles therefore it can travel through a **vacuum**.



$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

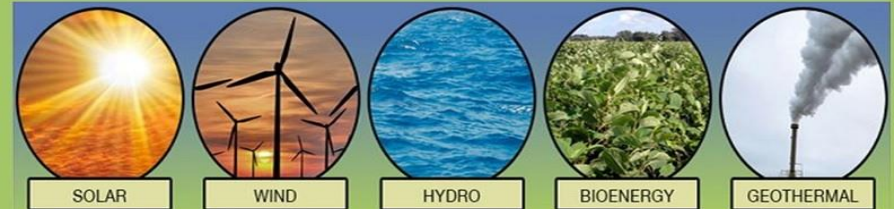


- 13 **A vacuum is the where there are no particles such as space**
- 14 **Insulation** is used to **minimise thermal energy transfers** from warmer to cooler areas. Most insulation relies on trapped gases or absence of particles e.g. vacuum flask



- 1 Thermal energy is always transferred hot → cold.
- 2 Gravitational potential energy (J) = mass (kg) x gravitational field strength (N / kg) x change in height (m)
- 3 **Kinetic energy (J) = $1/2 \times \text{mass (kg)} \times \text{velocity}^2 \text{ (m/s)}$**
- 4 **Non-renewable** resources - a resource that cannot be replaced after it has been used up
- 5 **Fossil fuels** were fuels created millions of years ago and include **oil, coal** and **natural gas**
- 6 **Combustion** (burning) of fossil fuels creates carbon dioxide that causes global warming and oxides of sulphur which cause acid rain.
- 7 Nuclear power stations split large atoms such as **Uranium** releasing large amounts of heat energy this is called **nuclear fission**
- 8 Renewable resources can be replaced in our lifetime e.g. solar, wind, hydroelectricity, biomass and wave
- 9 **Biomass**- plants e.g. trees are grown for burning. This resource is **carbon neutral** - plants absorb carbon dioxide when they are growing but this is released again when burnt.
- 10 **Wave**- kinetic energy from waves moves a generator
- 11 **Solar** -light energy from the sun creates electricity or infra-red energy heats water.
- 12 **Hydroelectric** the gravitational potential energy of water is turned into kinetic energy that turns a turbine which then turns a generator that creates electricity
- 13 **Geothermal** - hot rocks under deep in the crust create steam which runs a generator

Renewable Energy Sources



$$KE = \frac{1}{2}mv^2$$

