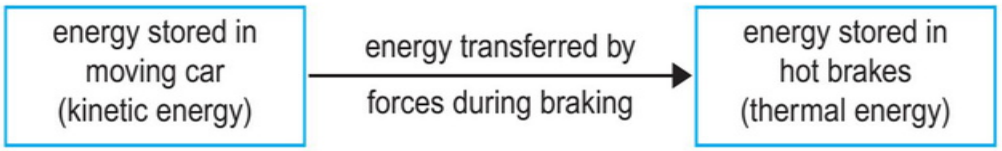
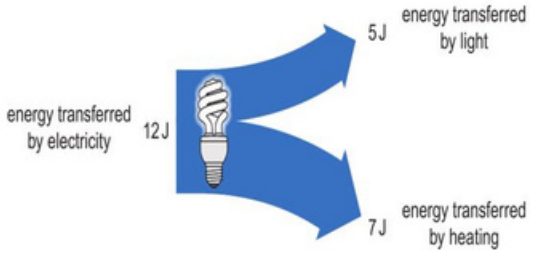
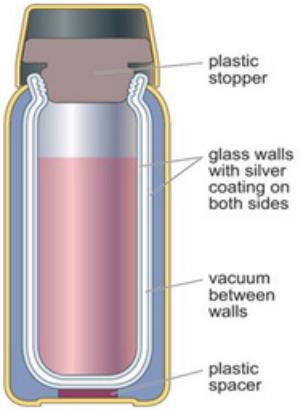
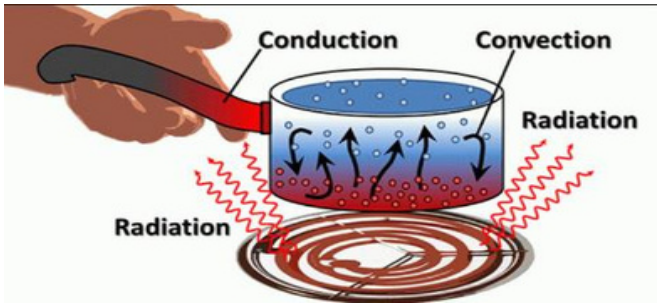
1	Law of conservation of energy = **Energy cannot be created or destroyed**, energycanonlytransformedfromoneformtoanother
2	Energy is measured in **Joules** (J) Energy stores include **thermal**energy (hot
3	objects), **chemical** energy (food, fuels, batteries), **kinetic** (moving objects), **gravitational** 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.**



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

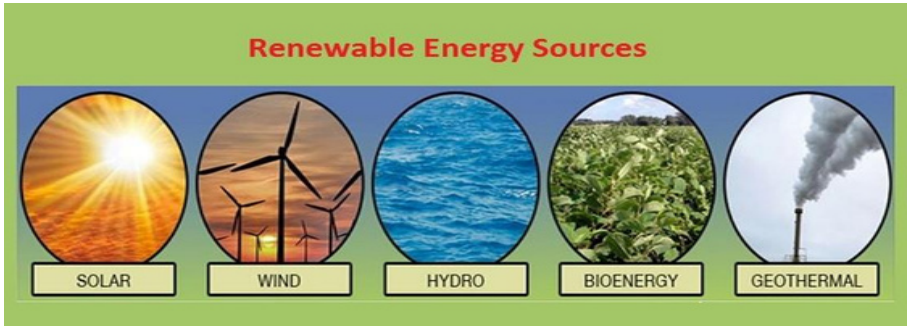






13	**A vacuum is the where there are no particles such as space**
14	**Insulation** is used to **minimise thermal energy transfers** from warmer to cooler areas. Most insulation relies on trapped gases or absence of particles e.g. vacuum flask

1	Thermal energy is always transferred hot —> cold.
2	Gravitationalpotentialenergy(J)=mass (kg) x gravitational field strength (N / kg) x change in height (m)
3	**Kinetic energy (J) = 1/2 x mass (kg) x velocity2 (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 turnsaturbinewhich thenturns a generatorthat creates electricity
13	**Geothermal -**hot rocks under deep in the crust create steam which runs a generator



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