PU1 Energy

Potential Energy

Gravitational potential energy (GPE) is stored when an object is raised above ground level. The amount of GPE depends on the mass of the object (kg), height (m) and gravitational field strength (9.8N/kg on earth).

GPE= mass x gravitational field strength x height

Energy Efficiency

Efficiency is an indication of how much of the energy supplied to a device is transferred into useful energy output. Waste energy is transferred to the surroundings usually as heat or sound.

Efficiency= Useful energy output x100

Total energy input

Energy stores

Energy store	Description	Examples
Magnetic	The energy stored when repelling poles have been pushed closer together or when attracting poles have been pulled further apart.	Fridge magnets, compasses, maglev trains which use magnetic levitation.
Internal (thermal)	The total kinetic and potential energy of the particles in an object, in most cases this is the vibrations - also known as the kinetic energy - of particles. In hotter objects, the particles have more internal energy and vibrate faster.	Human bodies, hot coffees, stoves or hobs. Ice particles vibrate slower, but still have energy.
Chemical	The energy stored in chemical bonds, such as those between molecules.	Foods, muscles, electrical cells.
Kinetic	The energy of a moving object.	Runners, buses, comets.
Electrostatic	The energy stored when repelling charges have been moved closer together or when attracting charges have been pulled further apart.	Thunderclouds, Van De Graaff generators.
Elastic potential	The energy stored when an object is stretched or squashed.	Drawn catapults, compressed springs, inflated balloons.
Gravitational potential	The energy of an object at height.	Aeroplanes, kites, mugs on a table.

Kinetic Energy

Kinetic energy must be transferred to make objects move. The kinetic energy (K.E.) store of an object can be increased by increasing mass m in (kg) and increasing speed v in (m/s).

KE= $^1/_2mv^2$

Specific heat capacity

The amount of thermal energy stored or released as the temperature of a system changes can be calculated using the equation:

change in thermal energy = mass × specific heat capacity × temperature change

$$\Delta E_t = m \times c \times \Delta\Theta$$

change in thermal energy (ΔE_t) is measured in joules (J)mass (m) is measured in kilograms (kg)specific heat capacity (c) is measured in joules per kilogram per degree Celsius (J/kg°C)

Using Energy Resources

Fossil fuels-coal, oil and natural gas are non-renewable. Advantages –Energy is concentrated a small amount releases large amounts of energy. Disadvantages- Take a long time to form, are used up faster than they are made, produce carbon dioxide when combusted.

Wind, tidal, solar, hydroelectric, geothermal, biofuels are renewable. Advantages- No carbon dioxide, easy to replace when used. Disadvantages- Produce less energy, Wind depends on wind speed solar depends on sunlight.

Dissipation of Energy

Friction increases amount of work needed to be done to make an object move. Reduction of energy transfer waste can be achieved by- lubrication of moving parts, insulation of hot/ cool objects to reduce thermal transfer. Insulation of buildings reduces energy loss for example cavity walls, carpets, loft insulation and curtains. These usually contain a layer of trapped air. Air is an insulator so doesn't conduct.

Thermal Conductivity

The conductivity of materials can be compared by examining the time taken to transmit energy through them. A material that heats the quickest is said to have a high thermal conductivity.

Insulating houses

When trying to keep houses warm, the choice is between materials that are poor conductors such as brick, wood, plastic and glass.