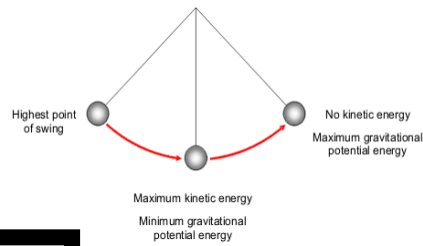


Kinetic

- When an object falls and gains speed, its kinetic energy store increases.
- When a falling object hits the ground without bouncing back, its kinetic energy store decreases.
- The energy in the kinetic store of a moving object depends on its mass and its speed.
- The kinetic energy of an object is $E_k = \frac{1}{2} m v^2$



G.P.E

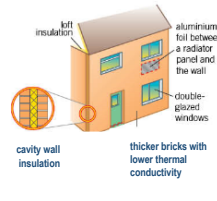
- The gravitational potential energy of an object increases when it moves up and decreases when it moves down.
- An object increases gravitational potential energy when it is lifted up because work is done on it to overcome the gravitational force.
- The gravitational field strength at the surface of the Moon is less than on the Earth.
- The change of gravitational potential energy of an object is $\Delta E_p = m g \Delta h$

Heat (thermal)

- Metals are the best conductors of energy through heating.
- Non-metal materials such as wood and fibreglass are the best insulators.
- The higher the thermal conductivity of a material, the higher the rate of energy transfer through it.
- The thicker a layer of insulating material, the lower the rate of energy transfer through it.
- All objects emit and absorb infrared radiation.
- The hotter an object is, the more infrared radiation it emits in a given time.
- Blackbody radiation is radiation emitted by a body that absorbs all the radiation incident on it.
- The temperature of an object increases if it absorbs more radiation than it emits.

- The specific heat capacity of a substance is the amount of energy needed to change the temperature of 1 kg of the substance by 1 °C.
- Use the equation $\Delta E = m c \Delta \theta$ to calculate the energy needed to change the temperature of mass m by $\Delta \theta$.
- The greater the mass of an object, the more slowly its temperature increases when it is heated.

- Energy loss from houses can be reduced by using:
 - loft insulation
 - cavity wall insulation
 - double-glazed windows
 - aluminium foil behind radiators
 - external walls with thicker bricks and lower thermal conductivity.



- Cavity wall insulation is insulation material that is used to fill the cavity between the two brick layers of an external house wall.

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Chemical

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Electrical

- Uses of everyday electrical appliances include heating, lighting, making objects move (using an electric motor), and producing sound and visual images.
- Power is rate of transfer of energy.
- The power of an appliance is $P = E/t$
- Efficiency of an appliance = $\frac{\text{useful power out}}{\text{total power in}} (\times 100\%)$
- Power wasted by an appliance = total power input – useful power output
- Your energy demands are met mostly by burning oil, coal, and gas.
- Fossil fuels produce increased levels of greenhouse gases, which could cause global warming.
- Gas-fired power stations can meet variations in demand.
- Carbon capture of fossil fuel emissions is likely to be very expensive.
- Nuclear power, biofuels, and renewable resources provide energy to generate some of the energy you use.
- Biofuels are renewable sources of energy. Biofuels such as methane and ethanol can be used to generate electricity.
- Renewable energy resources will never run out, they do not produce harmful waste products (e.g. greenhouse gases or radioactive waste), and they can be used in remote places. But they cover large areas and can disturb natural habitats.
- Renewable resources are cheap to run but expensive to install.
- A wind turbine is an electricity generator on top of a tall tower.
- Waves generate electricity by turning a floating generator.
- Hydroelectricity generators are turned by water running downhill.
- A tidal power station traps each high tide and uses it to turn generators.
- Solar cells are flat solid cells and use the Sun's energy to generate electricity directly.
- Solar heating panels use the Sun's energy to heat water directly.
- Geothermal energy comes from the energy released by radioactive substances.
- Water pumped into hot rocks underground produces steam to drive turbines at the Earth's surface that generate electricity.

Elastic

- Elastic potential energy is the energy stored in an elastic object when work is done on the object.
- The elastic potential energy in a stretched spring is $E_e = \frac{1}{2} m e^2$, where e is the extension of the spring.

- Energy can be stored in a variety of different energy stores.
- Energy is transferred by heating, by waves, by an electric current, or by a force when it moves an object.
- The conservation of energy states that energy cannot be created or destroyed. It applies to all energy changes.
- A closed system is an isolated system in which no energy transfers take place out of or into the system.
- Energy transfers can take place inside a closed system, but the total energy of the system does not change.

Nuclear

- Uranium or plutonium is used as the fuel in a nuclear power station. Much more energy is released per kilogram from uranium or plutonium than from fossil fuels.
- Nuclear fuels produce radioactive waste.
- Nuclear power stations are expensive to build, run and decommission.

- Work is done on an object when a force makes the object move
- Energy transferred = work done
- Work done is $W = F s$

- Useful energy is energy in the place we want it and in the form we need it
- Wasted energy is eventually transferred to the surroundings, which become warmer
- As energy dissipates (spreads out), it gets less and less useful.