

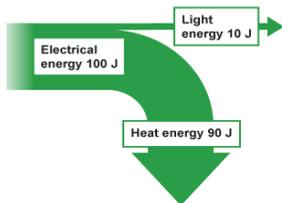
P3: Energy Knowledge Organiser

Lesson sequence

1. Storing and transferring energy
2. Energy efficiency
3. Insulation
4. Stored energy
5. Non-renewable energy resources
6. Renewable energy resources

1. Storing and transferring energy

*Energy	The capacity to do work.
*Joules	The units of energy, symbol = J.
*Kilojoules	1000 J, symbol = kJ.
*Thermal energy	Energy stored on hot objects.
*Kinetic energy	Energy stored in moving objects.
*Chemical energy	Energy stored in chemicals such as fuels.
*Nuclear energy	Aka atomic energy. Energy stored in the nucleus of atoms.
**Gravitational potential energy	Energy stored in objects based on how high they are.
**Elastic potential energy	Aka strain energy. Energy stored in bent or stretched objects.
**Other forms of energy	Light, sound, electrical.
**First law of thermodynamics	Energy cannot be created or destroyed, just transferred from one form to another.
**Energy transfers	Say what form the energy starts as <i>and</i> what it becomes.
**Sankey diagram	Shows energy transfers. The thickness of the arrow relates to the amount of energy.



2. Energy efficiency

**Dissipation	The way energy spreads out, becoming less useful as it does.
*Wasted energy	Energy that is transferred into forms that can't be used.
*Friction	Causes energy loss as heat when two surfaces rub together.
**Lubrication	Allows surfaces to move smoothly, reduces energy loss from friction.
**Electrical resistance	Causes wires to heat up, wasting electrical energy.
*Calculating efficiency	$\text{Efficiency} = \frac{\text{useful energy transferred}}{\text{total energy transferred}}$
**Energy efficiency numbers	Efficiency is between 0 and 1. 1 = no energy wasted, 0 = all energy wasted.

3. Insulation

*Convection	Heat transfer caused when hot fluids (gas or liquid) rise because they are less dense.
*Conduction	Heat transfer through solids caused by vibrating particles bumping into each other.
*Radiation	Heat transfer by infrared radiation which heats objects up when they absorb it.
**Insulation	Materials that contain lots of tiny air pockets that prevent heat loss by conduction.
**Thermal conductivity	A measure of how well a material conducts heat.
**Draught-proofing	Sealing gaps around doors and windows to prevent heat loss by convection.

4. Stored energy

*Calculating kinetic energy	$KE = \frac{1}{2}mv^2$ Where 'KE' is kinetic energy in J, 'm' is mass in kg, 'v' is velocity in m/s.
**Calculating v from KE	$v = \sqrt{\frac{2KE}{m}}$

**Gravitational field strength	The strength of gravity. Different on different planets. On earth: 10 N/kg.
**Calculating gravitational potential energy	$GPE = mgh$ Where 'GPE' is gravitational potential energy in J, 'm' is mass in kg, 'g' is gravitational field strength in N/kg, 'h' is height change in m.

5. Non-renewable energy resources

*Fossil fuels	Coal, oil, natural gas. All are non-renewable.
*Non-renewable resource	A resource that will one day run out because it is being used faster than it is being made.
**Harm from burning fossil fuels	Carbon dioxide gas is released which causes global warming. Sulfur dioxide is released which causes acid rain.
*Renewable resource	A resource will not run out.
*Nuclear power	Electricity generated from nuclear fuels such as uranium.
**Nuclear power pros and cons	😊 Lasts a long time, releases no carbon dioxide ☹️ Produces very harmful waste, expensive to decommission, although rare, accidents are very dangerous.

6. Renewable energy resources

*Wind power	Large turbines spun by the wind. 😊 No CO ₂ ☹️ Lots needed, ugly?, no wind no power
*Solar power	Solar cells turn sunlight to electricity. 😊 No CO ₂ ☹️ No sun no power, need lots of space, not suitable for all countries
**Tidal power	Uses water movement from tides to spin turbines

**Tidal barrage	A damn built across an estuary that fills up when tide goes in. 😊 Huge amounts of energy, no CO ₂ ☹️ Destroys important mudflat habitats
**Hydroelectricity	A damn is built across a river valley, water released from the damn spins turbines. 😊 Lots of energy, no CO ₂ ☹️ Destroys habitat by flooding
*Biofuels	Fuels made from recently plant or animal matter, often waste. 😊 Carbon neutral ☹️ Needs a lot of land, increases food prices
**Carbon neutral	When burning a fuel releases the same CO ₂ it absorbed when it was growing, so there is no CO ₂ increase.