KS3 SCIENCE · PHYSICS

Energy revision sheet

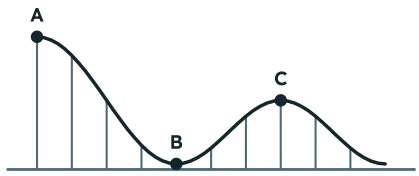
Name _____

1. Energy stores

STORE	WHAT CHANGES IT	EXAMPLES
Kinetic	Fills when an object speeds up.	A moving ball, a runner, a car on the road.
Gravitational potential	Fills when an object is raised.	A roller coaster car at the top of a hill, a book on a high shelf.
Elastic	Fills when a material is stretched or squashed.	A bent bow, a stretched rubber band, a squashed spring.
Chemical	Empties when a fuel burns, when your body uses food or when a battery drives a current.	Food, batteries, and fuels such as petrol and wood.
Thermal	Fills when an object is warmed up.	A hot toaster, a hot drink, a warm bath.

- Energy is measured in **joules (J)**. One object can have energy in several stores at once.

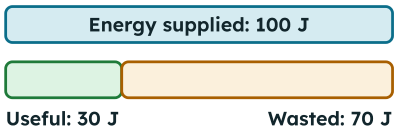
2. Energy transfers



A roller coaster that starts from rest at A

- When something happens, energy is **transferred** from one store to another. One store empties as another fills.
- **At A** the gravitational potential store is at its fullest. **Rolling down to B**, it empties and the kinetic store fills. **Climbing to C**, the kinetic store empties again.
- Friction and air resistance transfer some energy to the thermal store of the surroundings.
- Energy is transferred by forces, by heating, by an electric current, and by light and sound waves. These are not stores.

3. Conservation of energy



A lamp supplied with 100 J

- **Energy cannot be created or destroyed.** The total is the same before and after every change.
- Some energy is always **dissipated**. It spreads out into the thermal store of the surroundings, where it is much less useful. This is wasted energy.

wasted energy = total energy supplied − useful energy



4. Food and fuels

- Food and fuels are **chemical energy stores**.
- A food label gives the energy in **kilojoules (kJ)** in 100 g. **1 kJ = 1000 J.**
- 100 g of apple provides 220 kJ. 100 g of milk chocolate provides 2200 kJ: ten times as much.
- Burning 1 g of petrol transfers about 45 kJ.



5. Power and cost

- **Power** is how quickly energy is transferred, in **watts (W)**. 1 kW = 1000 W.
- Bills count energy in **kilowatt hours (kWh)**: the energy a 1 kW appliance transfers in one hour.
- A 2 kW heater on for 3 hours at 30p per kWh costs 2 × 3 × 30 = 180p.

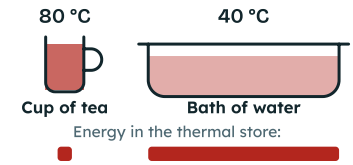
cost = power (kW) × time (hours) × price (per kWh)

Pictures are illustrations made for this sheet, not real photographs.

6. Energy resources

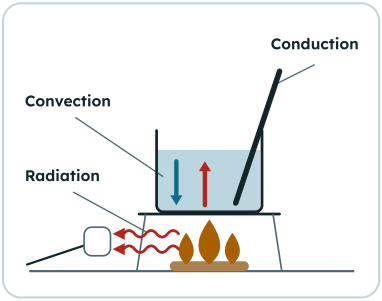
	EXAMPLES	ADVANTAGE	DISADVANTAGE
Non-renewable	Coal, crude oil and natural gas (the fossil fuels), nuclear fuel	Reliable: they can generate whenever electricity is needed	They will run out. Burning fossil fuels releases carbon dioxide, which adds to global warming
Renewable	Wind, solar, waves, tides, geothermal, biomass	They are replaced naturally, so they will not run out. Wind and solar release no carbon dioxide as they run	Wind and solar depend on the weather and the time of day

7. Heating and temperature



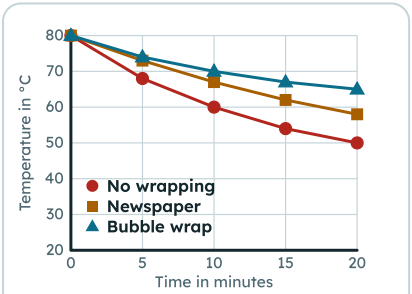
- **Temperature** is how hot something is, in °C. **Thermal energy** is the total energy in its thermal store, in joules. It depends on the temperature, the mass and the material.
- The tea is hotter, but the bath holds far more water, so it stores far more thermal energy.
- Energy is transferred **from hotter to colder**. The overall transfer stops when both are at the same temperature: **thermal equilibrium**.

8. Conduction, convection and radiation



- **Conduction** happens mainly in solids. Vibrating particles pass energy to their neighbours. Metals are good conductors. Wood, plastic and air are poor conductors: they are thermal insulators.
- **Convection** happens in liquids and gases. The heated part rises and the cooler part sinks.
- **Radiation** is energy carried by waves. It needs no particles, so it can cross empty space. This is how the Sun warms the Earth.

9. Insulation



Three cups of hot water cooling in a room at 20 °C

- A **thermal insulator** slows the transfer of energy from a hot place to a cold place.
- **Trapped air** is a very good insulator. Air is a poor conductor, and trapped air cannot flow to carry energy away by convection. Wool, feathers, foam and bubble wrap all trap air.
- **Shiny surfaces** reflect radiation.
- On a cooling graph, the best insulator gives the line that falls most slowly. Here it is the bubble wrap.

Key words

Joule: the unit of energy

Elastic store: filled when a material is stretched or squashed

Conservation of energy: energy cannot be created or destroyed

Kilowatt hour: the energy a 1 kW appliance transfers in one hour

Temperature: how hot something is, in degrees Celsius

Convection: a heated liquid or gas rises and carries energy with it

Kinetic store: filled when an object speeds up

Chemical store: the energy store in food, fuels and batteries

Dissipated: spread out wastefully into the surroundings

Fossil fuel: coal, crude oil or natural gas

Thermal equilibrium: when two objects are at the same temperature

Radiation: energy transferred by waves, even across empty space

Gravitational potential store: filled when an object is raised

Thermal store: filled when an object is warmed up

Power: how quickly energy is transferred, in watts

Renewable: a resource that is replaced, so it will not run out

Conduction: vibrating particles pass energy to their neighbours

Thermal insulator: a material that lets energy through only slowly