science physics

Y7 P1 – Energy

1) Energy Stores

There are 8 different stores of energy:

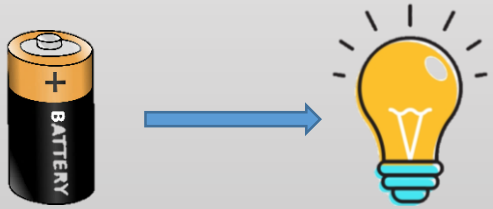
1. **Heat** (thermal) e.g. human bodies, hot drinks
2. **Chemical** e.g. food, batteries, petrol
3. **Kinetic** (movement) e.g. runners, motors
4. **Magnetic** e.g. fridge magnets, compasses
5. **Nuclear** e.g. uranium nuclear reactors
6. **Gravitational potential** e.g. aeroplanes, kites
7. **Electrostatic** e.g. thunder clouds
8. **Elastic potential** (strain) e.g. elastic bands, compressed springs

2) Energy Transfers

Energy can remain in the same store for millions of years or sometimes just for a fraction of a second. **Energy cannot be created or destroyed**. It can only be transferred from one store to another.

Energy is transferred by one of the following methods:

- **Mechanically** – a force moving an object
- **Electrically** – by moving charges
- **Radiation** – by light or sound
- **Heating** – energy moving from hot to cold places



E.g. chemical energy stored in the battery is transferred electrically by moving charges and then by radiation of light.

Some energy transfers are not useful to us. In the example above, the lamp also transfers heat energy into the surroundings. This is called waste energy.

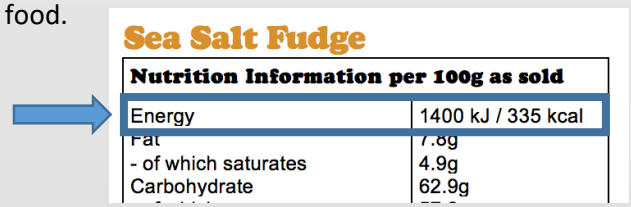
3) Sankey Diagrams

Sankey diagrams show how all of the energy in a system is transferred into different stores. They start off as one arrow that splits into two or more points.

The width of each arrow represents the amount of energy.

4) Energy in Food

Food is a store of **chemical energy**.
Labels on packets of food show how much energy is available from food.



Sea Salt Fudge

Nutrition Information per 100g as sold	
Energy	1400 kJ / 335 kcal
Fat	7.8g
- of which saturates	4.9g
Carbohydrate	62.9g

Energy in food is measured in calories (kcal) and the scientific unit of **joules** (**J**). A lot of energy is available from most foods, so food labels usually show kJ (kilojoules) instead of J.

1 kJ = 1000 J

5) Paying for Electricity

The amount of energy transferred is:

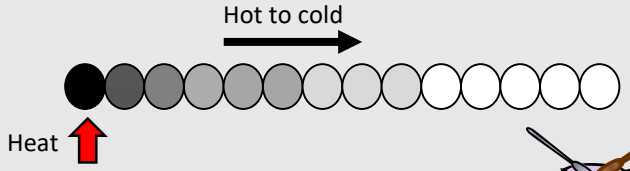
Energy transferred (kWh) = power (kW) x time (h)

Cost (£ or p) = Energy transferred (kWh) x price (£ or p)

e.g. A kettle with a power rating of **3 kW** is used for **1.5 h** a day. The electricity company charges **£0.14** per kWh.
Energy transferred in kettle = 3 kW x 1.5 h = 4.5 kWh
Cost of energy = 4.5 kWh x £0.14 = £0.63

6) Conduction

– When a substance is heated its particles gain thermal energy and **vibrate more**. The particles bump into adjacent particles and make them vibrate more. This passes the thermal energy through the substance.

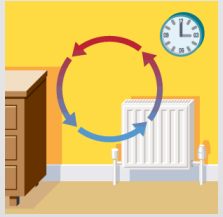


Some substances are better **conductors** than others (**insulators**) e.g. metal vs wooden spoons

7) Convection

– Particles with a lot of thermal energy in a liquid and gas move apart. The warmer liquid/gas becomes **less dense** and rises. The colder more dense liquid/gas falls to take their place.

E.g. Hot air above a radiator rises and then it pushes cooler air away from it. The cooler air eventually circulates back round to the radiator.

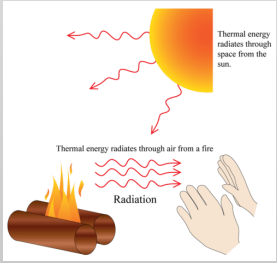


8) Radiation

- All objects transfer energy to their surroundings by **infrared** radiation (waves).

The hotter an object is, the more infrared radiation it gives off.

No particles are involved in radiation, unlike conduction and convection.



9) Investigation Keywords

Independent variable – what you **change**
Dependent variable – what you **measure**
Control variables – what you **keep the same**

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