science physics

Y7 Energy 1 – Energy Transfers

1) Energy Stores

Energy is defined as 'the ability to do work'
Energy is measured in **Joules** and can be stored.
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. **Gravitational potential** e.g. aeroplanes, kites
5. **Electrostatic** e.g. thunder clouds
6. **Elastic potential** (strain) e.g. elastic bands, compressed springs
7. **Nuclear** e.g. uranium nuclear reactors
8. **Magnetic** e.g. fridge magnets, compasses

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.

3) Sankey Diagrams

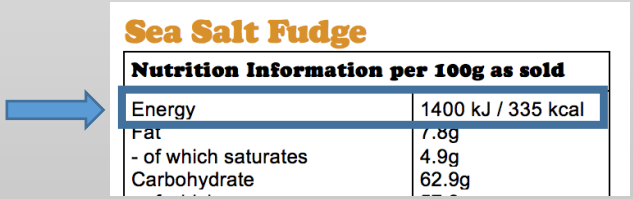
Some energy transfers are not always useful. A lamp also transfers heat energy into the surroundings. This is called waste energy.
Energy is often be **dissipated** to the surroundings.

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) Kinetic Energy

Anything that moves has kinetic energy. The faster an objects moves the more kinetic energy it has

6) Gravitational Potential Energy

Objects at a height have gravitational potential energy. As the fall (like a sky diver) the energy in their gravitational potential energy store is transferred to their kinetic energy store.

7) Elastic Potential Energy

Elastic materials such as rubber can be squashed or stretched. They will return to their original shape because of their elastic potential energy store.

8) Investigation Keywords

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

chaseterrace academy

science physics

Y7 Energy 1 – Energy Costs

1) Renewable and Non renewable

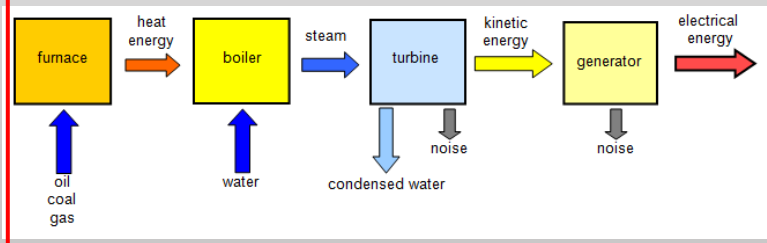
- Energy resources can be defined as renewable or non-renewable.
- Non-renewable resources are a resource that can't be replaced and can be used up
- Renewable can be replaced and won't run out

2) Non-renewable energy sources

- Fossil fuels (coal, oil and gas) are non-renewable energy sources.
- These are the main resources used to generate electricity.
- Nuclear power is also non-renewable.

3) How electricity is generated

Fossil fuels are burned to heat water to turn it into steam.
The steam is used to drive a turbine (moving blades like a water wheel) which is then used to power a generator (which generates the electricity.



4) Advantages and disadvantages of different energy sources

Energy resource	Disadvantages	Advantages
Wind	Needs wind, visual pollution, noisy, damage to bird life.	No air pollution, free once installed
Solar	Not always sunny, initial cost high.	No air pollution, free once installed
Hydroelectric	Damage to habitat when valleys are flooded, don't work in drought areas.	No fuel costs, reliable, good for quick high demand, no air pollution
Geothermal	Only able to use in volcanic areas – heat from Earth drives a turbine. Not good for large scale	No air pollution, no fuel costs
Biomass	Air pollution: CO_2 – greenhouse gas, visual pollution	Reliable, gets rid of landfill.
Tidal	Damage to water habitats & fish, visual pollution, expensive to install	Reliable – can predict tides, no air pollution, no fuel costs
Wave	Initial cost high, damage fish, visual pollution, not reliable,	No fuel costs, no air pollution
Nuclear	High decommissioning costs, dangerous, water pollution	No air pollution, reliable, generate large amounts of energy.
Coal/oil and gas	Will run out one day, air pollution: CO_2 – greenhouse gas.	Reliable, easy to transport

5) Power

Power is a measurement of how quickly energy is transferred from one store to another
Power is measured in **Watts (W)**
Energy is measured in **Joules (J)**
Time is measured in **Seconds (s)**

Power can be calculated using the equation

$$\textbf{Power} = \frac{\textit{Energy}}{\textit{Time}}$$

6) Paying for Electricity

To calculate the cost of using our electricity we need to know

- The power rating of the device being used in kilowatt **(kW)**
- Cost of the electricity in pence **(p)**
- Time device is used for in hours **(h)**

The cost is then calculated using the equation:

Total Cost = Power x time x price per kWh

e.g. A kettle with a power rating of **3 kW** is used for **1.5 h** a day. The electricity company charges **14p** per kWh.
Energy transferred in kettle = 3 kW x 1.5 h = 4.5 kWh
Cost of energy = 4.5 kWh x 14 = 63p = £0.63

chaseterrace academy