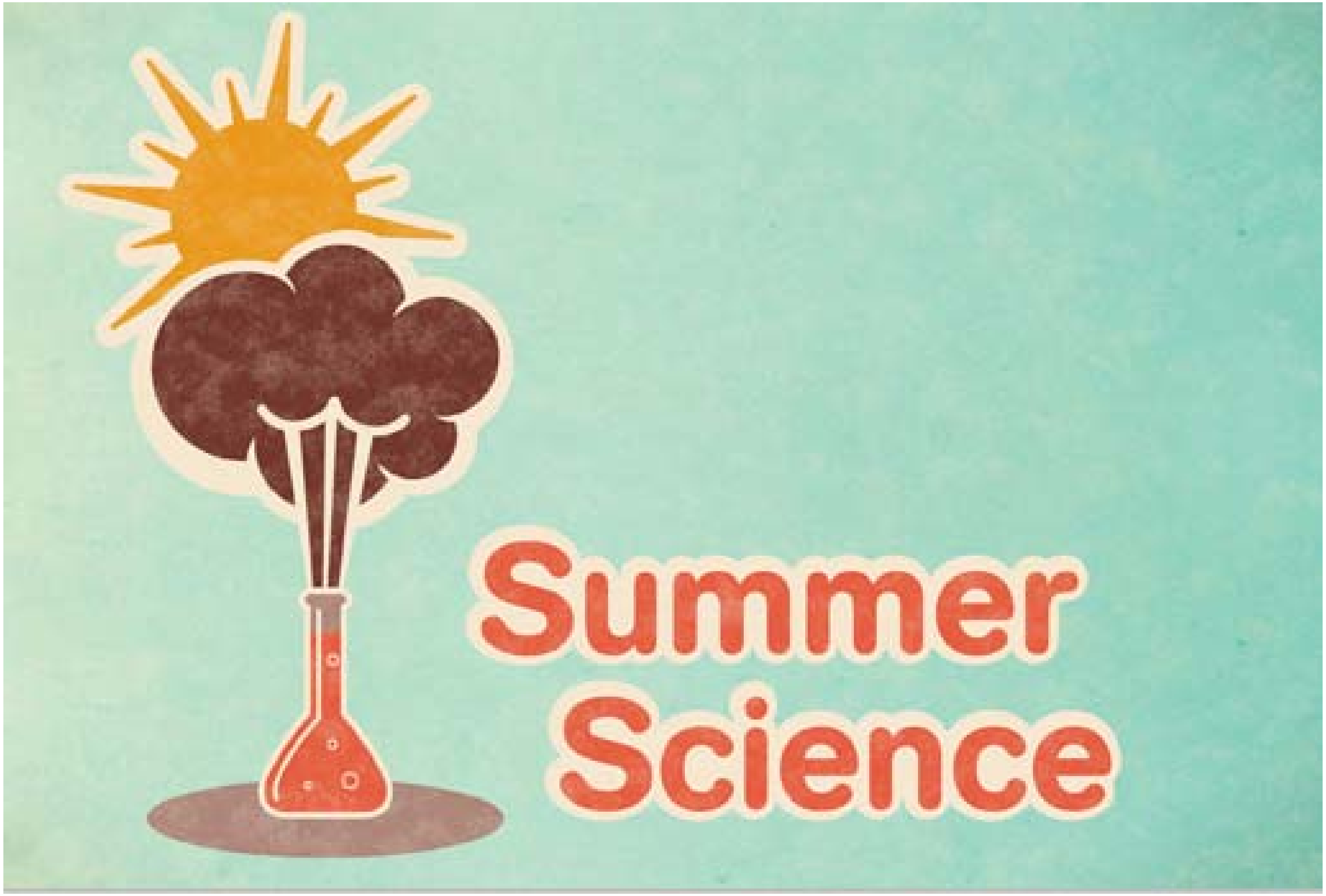

Summer
Science

Profile of a Scientist:

Scientist's name: by ____________

Picture:	What is the scientist famous for:
Life story:	Famous quotes:
Discoveries:	
Interesting facts:	
Other famous people related to this topic:	

Extension: The science behind the discoveries:
What else I would like to know about this scientist and their discoveries:

Instructions:

This sheet is to help you put your ideas into a sensible order but feel free to design your own format if you wish to. You could even make a poster or model to show the ideas.

The exemplar sheet shows the types of information you might include…

- Quotes
- Interesting facts
- Pictures
- Sources you have used

The key thing is to **research the topic** and **use your own words where possible**. You can cut and paste sections from the internet but you should show these as quotes.

Step 1: decide who you would like to research- this could be a male, a female, a living or a dead scientist.

Step 2: choose some key ideas that you would like to include in your work. Make these interesting.

Step 3: Write (or type) out the ideas in sections so that it tells a nice story.

Step 4: check that all quotes have speech marks and show the source from which they were taken.

Step 5: Read carefully over your work and correct any mistakes (ask someone else to help with 'proofing' the work.

<u>Summer Homework: Science</u>
Read the knowledge organisers then complete the tasks below:
Biology
Topic: Cells

1. Learn the 7 life processes.
2. Learn the different parts of a cell and what they do.
3. Write a list of the organs that make up the digestive system.

Use the space below to make any notes/answer questions:

Chemistry

Topic: Particle Model

1. Use the table to explain how particles are arranged in solids, liquids and gases.
2. Name the change of state for the following examples: Solid → Liquid, Liquid → Gas, Gas → Liquid, Liquid → Solid and Solid → Gas.
3. Learn the definition of diffusion given on the knowledge organiser and try and think of an example of when it might happen.

Use the space below to make any notes/answer questions:

Physics
Topic: Energy

1. Look at food labels (at home or in a shop) to find the amount of energy (in kJ) in five different foods. List them in order of highest to lowest energy.
2. Learn the 8 different types of energy stores including examples.
3. What is meant by conservation of energy?

Use the space below to make any notes/answer questions:

Living things have certain life processes in common. There are seven things that all living things do. The phrase **MRS GREN** is a way to remember them:

M	**Movement**	All living things move, even plants
R	**Respiration**	Getting energy from food
S	**Sensitivity**	Detecting changes in the surroundings
G	**Growth**	All living things grow
R	**Reproduction**	Making more living things of the same type
E	**Excretion**	Getting rid of waste
N	**Nutrition**	Taking in and using food

Living things are called **organisms.** Organisms are made of tiny subun called **cells. A cell is the basic building block of all living things.**

Eukaryotic cells (eu= true, Karyon= nucleus), so these **have a nucleus** . All the components of a cell are called **organelles** (like small organs).

Simple organisms may be **unicellular** (consist of one cell).

Complex organisms are **multicellular** (consist of many cells).

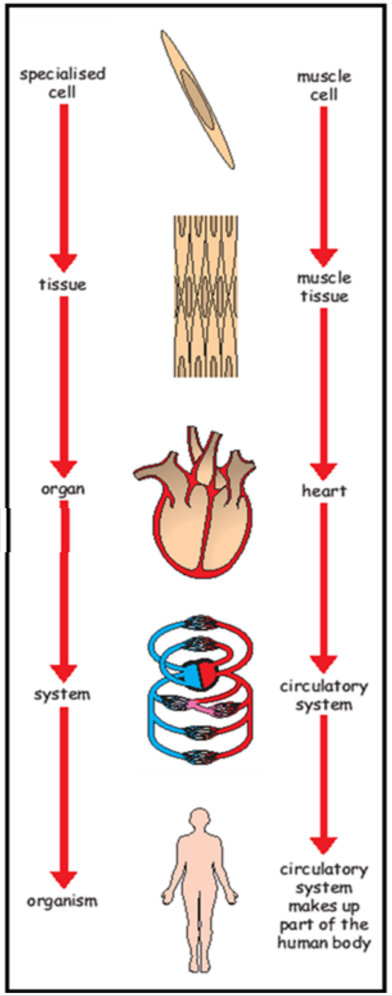
Cells –Tissue – Organ – Organ system

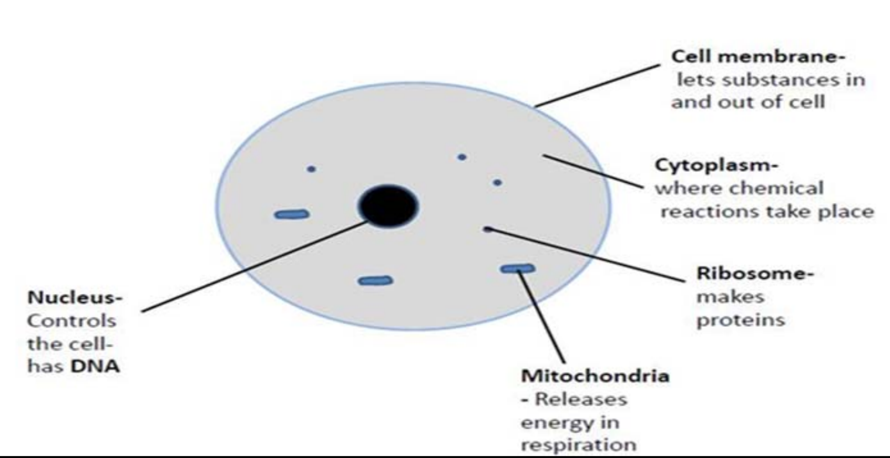
Cells are very small and can only be seen by magnification with a microscope.

Magnification is how large the image is compared to real life .
points of a specimen can still be seen
Magnification of slide = magnification of eyepiece lens x magnification of objective lens

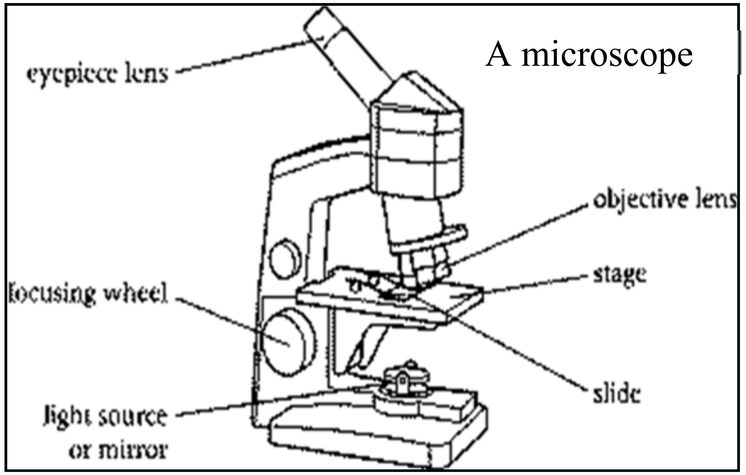
Remember *1cm =10mm*
1m = 100cm

Topic: Cells

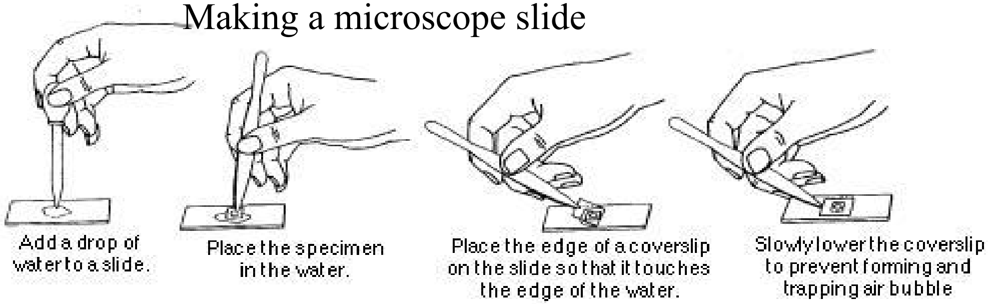




A microscope



Making a microscope slide



Tissues

A tissue is made from a group of cells with a similar structure and function, which all work together to do a particular job.

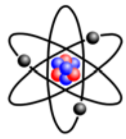
Organs

An organ is made from a group of different tissues, which all work together to do a particular job. E.g. Heart, lung, stomach, brain.

Organ systems

An organ system is made from a group of different organs, which all work together to do a particular job. E.g. digestive system, nervous system, reproductive system.

Summary Sheet Year 7 Particle Model:

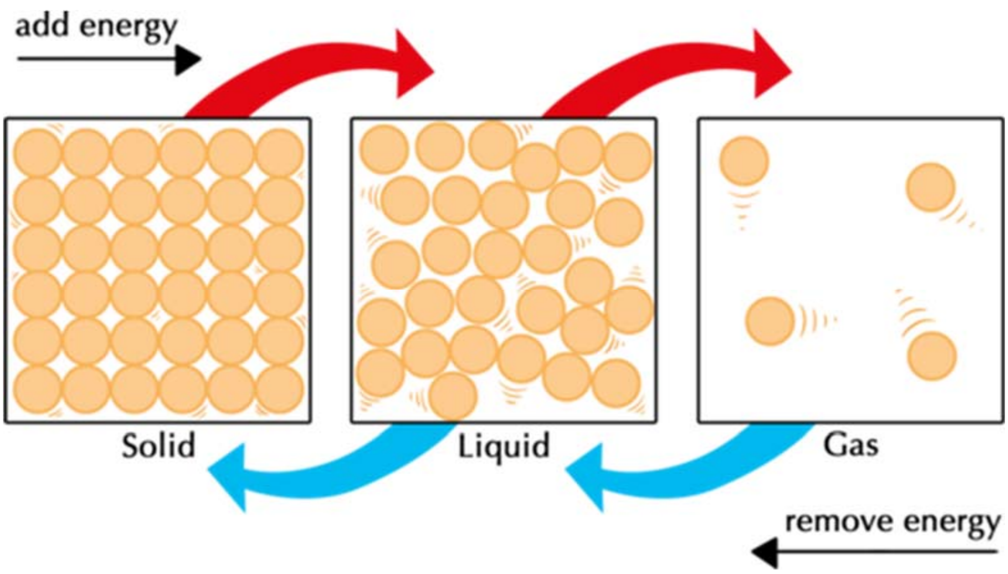


The particle theory
A theory is an idea that helps us to explain the world around us. A theory is tested many times and shown by evidence to be correct in explaining why something happens.

The different **properties** of solids, liquids and gases can be explained by the **particle theory** (or **particle model**).

Solids, liquids and gases (the three **states of matter**) need to be handled and stored differently because of these different properties.

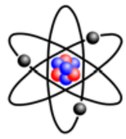
Particle Arrangement in Solids, Liquids and Gases



State	**Solid**	**Liquid**	**Gas**
Organisation	Particles in regular rows	Particles randomly arranged	Particles randomly arranged
Spacing	Very close together, touching. Can't be squashed	Very close together, some touching. Can't be squashed	Very spaced out. Can be compressed or squashed together
Energy	Lowest energy		Highest energy
Movement	Vibrate in fixed positions	Can move or slip and slide over each other	Move quickly in all directions

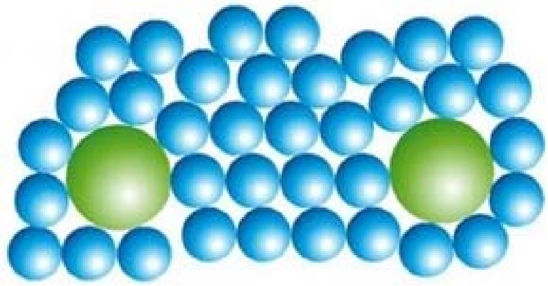
Extension - Alloys

Summary Sheet Year 7 Particle Model:



Alloys are special solids, made from two or more metals mixed together.

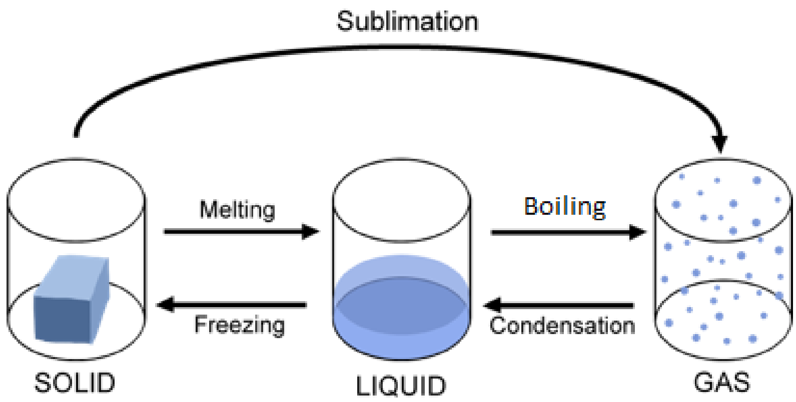
They are often harder and stronger than pure metals as the different sized atoms make it difficult for the atoms to move past each other when a force is applied.



Extension - Viscosity
Liquids and gases can be poured and will flow, as the particles can move past each other quite easily. Some liquids flow more easily than others. Resistance to flow is called **viscosity**.

A more viscous liquid has stronger forces holding the particles together and will flow less easily. e.g. treacle and syrup are viscous liquids.

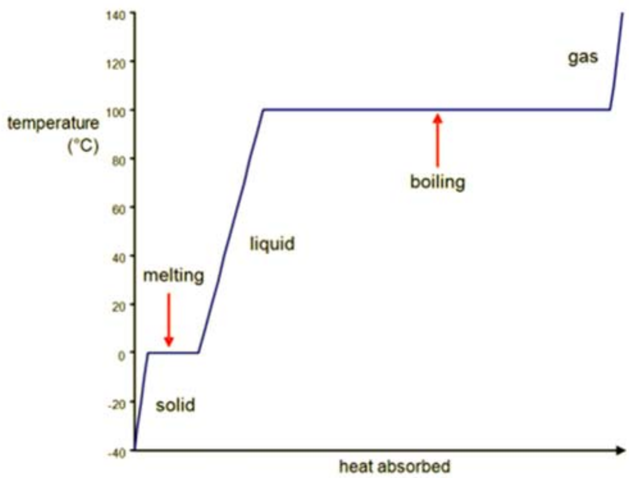
Changing States



Evaporation is a change from liquid to gas, but can occur well below a liquid's usual boiling temperature.

Some substances (carbon dioxide and iodine) can turn directly from a solid into a gas without melting. This is called **sublimation**.

Heating and Cooling Curves



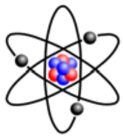
The graph opposite shows a **heating curve**. Ice is heated and the temperature is taken at regular time intervals.

Notice that when a substance such as ice is heated, the graph levels off where the substance is changing state.

The heat energy is being used to separate the particles and the substance will remain at the same temperature until all of it has changed state.

Melting and Boiling Points

Summary Sheet Year 7 Particle Model:

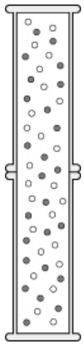


No substance has the same pair of melting and boiling points. Melting and boiling points can be used to identify the state that a substance is in, at any given temperature. Room temperature is normally 25 ^{o}C.

Element	Melting point (°C)	Boiling point (°C)	State at room temperature
Copper	1083	2567	Solid
Magnesium	650	1107	Solid
Oxygen	-218.4	-183	Gas
Carbon	3500	4827	Solid
Helium	-272	-268.6	Gas
Sulphur	112.8	444.6	Solid

Diffusion

Diffusion is said to have occurred when chemicals mix together without anything moving them. It is the process by which particles in liquids or gases spread out through random movement from a region where there are many particles to one where there are fewer, or from high to low concentration.



Diffusion occurs because particles in a substance are always moving around.

Diffusion is fastest in gases (as gas particles have higher energies so move faster), and slower in liquids.

Dilution

When you add water to orange squash you dilute it. The colour becomes paler because the orange coloured squash particles are **spread out more** among the water particles.

Pressure in gases

Pressure is a force caused by particles hitting the walls of the container they are in.

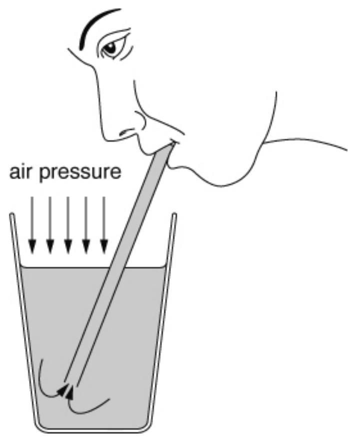
The pressure may increase because:

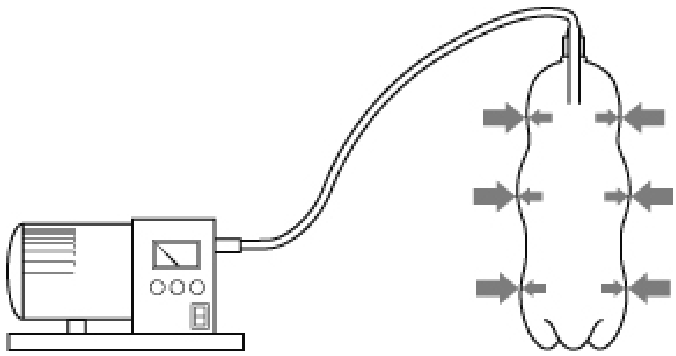
- the container has been squashed, making the volume smaller so that the particles will be hitting the walls more often.
- the number of particles has been increased, so that there are more particles moving around to hit the walls.

If the particles are in a flexible container, like a balloon, an increase in pressure inside the container can make the volume increase. If the pressure becomes too great, the balloon will burst.

Air pressure is the pressure caused by air particles around us. Air pressure lets us suck things up using a straw and also causes a container to collapse if the air is sucked out. If all the air is sucked out of a container, you get a **vacuum** – nothingness.

Summary Sheet Year 7 Particle Model:





Extension - Brownian motion
When pollen grains in water are observed through a microscope they are seen to move jerkily in different directions. This is called **Brownian motion**. It is caused by water particles, which are moving all the time, hitting the pollen grains. The pollen grains are small enough so that when many water particles hit one side of the grain, the grain is moved in that direction.

Brownian motion provides evidence to support particle theory.

Density
Density is the **mass per unit volume**. It can be measured in several ways.

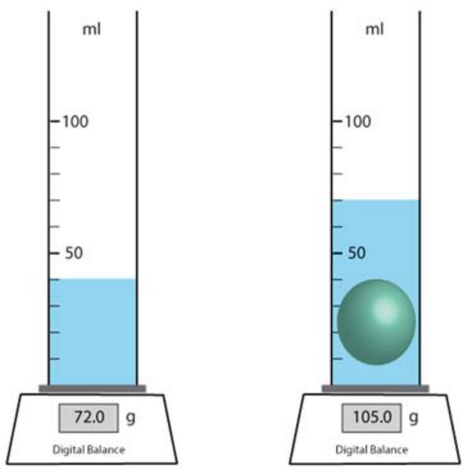
The most accurate way to calculate the density of any solid, liquid or gas is to divide its mass in grams (or kilograms) by its volume (length × width × height) in cubic centimetres, cm^3 (or cubic metres, m^3).

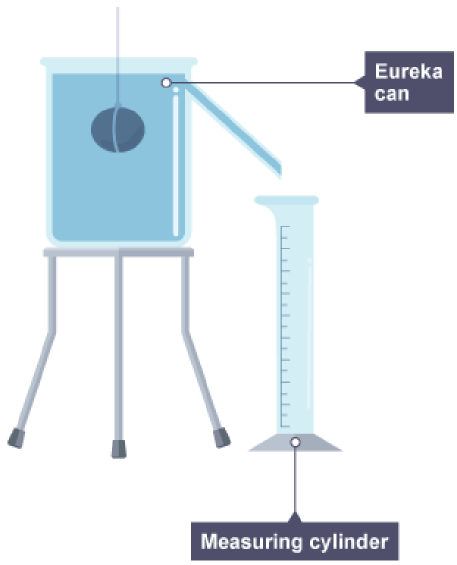
Density can be found using the equation:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

The unit for density is g/cm^3 (or kg/m^3).

The density of water is approximately 1 g/cm^3. If solid objects are placed in water and they sink, they have a density greater than water (1 g/cm^3). The reverse is also true. You should remember that 1 ml (millilitre) is the same as 1 cm^3.

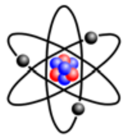




In the example above left, an object has been placed into a measuring cylinder of water, on a balance.

The volume has increased from 40 → 70 ml (increased by 30 ml or 30 cm^3)

Summary Sheet Year 7 Particle Model:



The mass has gone up from 72 → 105 g (increased by 33 g)

The density of the object is $\frac{33\text{ g}}{30\text{ cm}^3} = 1.1\text{ g/cm}^3$ (This answer is to **1 decimal place** or **2 significant figures**)

Alternatively, a eureka can is used. A eureka can is a container large enough to hold the object with a spout positioned near the top. The can is filled to the top with water and the object placed in it. The volume of the object is equal to the volume of the water that is forced through the spout and collected in the measuring cylinder. The object is weighed on a balance beforehand.

Eureka cans are named after a scientist called Archimedes who first recorded this idea. They are sometimes also called **displacement vessels**.

Densities of solids, liquids and gases
For most substances, the change from **a solid to a liquid state** does not mean a big change in volume. This is because the particles stay approximately the same distance apart. This means that the density of a substance, for example iron, does not change by much when it melts.

When a **liquid changes into a gas**, the spacing between the particles increases significantly. This means that the gas takes up a lot more space than the liquid, so its volume increases dramatically. Its density is a much lower value.

Y7 Energy Knowledge Organiser

Energy Units

Energy changes are measured in joules (J) or kilojoules (kJ).

1000 J = 1kJ

To convert from J to kJ, divide by 1000.

Example: Convert 3000J into kilojoules.

3000J ÷ 1000 = 3kJ

To convert from kJ to J, times by 1000.

Example: Convert 2kJ into joules.

2kJ x 1000 = 2000J

Energy in food – Food Labels

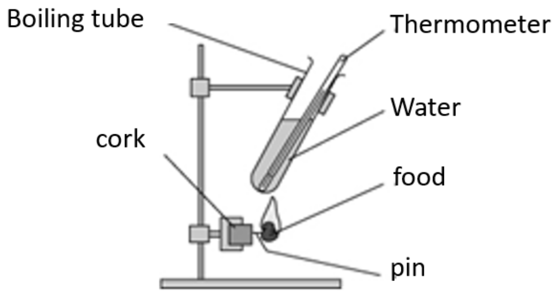
Energy stored in food can be released by combustion (burning) or by respiration in our cells. The labels on packets of food show how much energy is available from the food.

The amount of energy stored in food may be shown in a unit called the calorie (kcal), as in the photograph. However, the scientific unit for energy is the joule, which has the symbol J.

A lot of energy is stored in most foods, so food labels usually show kJ (kilojoules) instead of J.

Energy in food experiment

Equipment



Method

1. Choose three different types of food and draw a results table
2. Put one piece of food on the pin and find the mass of the cork, pin and food together. Write the name of your food in your table.
3. Use the measuring cylinder to measure 10cm^3 of water, and put it into the boiling tube. Record the temperature of the water.
4. Light the food using the Bunsen burner, and hold the burning food under the boiling tube. Make sure the flame is touching the boiling tube.
5. When the food has finished burning record the temperature of the water again. Let the food cool down and find the total mass of the cork, pin and food remaining on it.
6. Repeat for the other foods.

Example Results

Food	Temperature at the beginning (°C)	Temperature at the end (°C)	Temperature difference (°C)
salted peanuts	19	31	12
cashew nuts	20	33	13
raisins	21	27	6

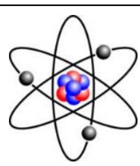
Temperature change = temperature at the end – temperature at the beginning

Conclusion

When the food is burned, the energy stored in it is transferred to the water and made it hotter.

The food that gave the highest temperature change was cashew nuts, this means it stored the most chemical energy.

Energy Stores

Key word	Description	Examples	Picture
Magnetic	The energy stored in two separated magnets that are attracting, or repelling	Fridge magnets, compasses.	
Thermal	The energy stored in a warm object.	Human bodies, hot coffees, stoves or hobs.	
Chemical	The energy stored in chemical bonds, such as those between molecules.	Food, muscles, electrical cells.	
Kinetic	The energy stored in a moving object	Runners, moving buses, moving cars.	
Electrostatic	The energy stored in two separated electric charges that are attracting, or repelling.	Thunderclouds, Van De Graaff generators.	
Elastic	The energy stored when an object is stretched or compressed.	Stretched elastic, compressed springs, inflated balloons.	
Gravitational	The energy stored when an object is moved higher.	Aeroplanes, kites, mugs on a table.	
Nuclear	The energy stored in atoms.	Nuclear fuel, radioactive material	

Energy Transfers

	Definition	Examples
Heating	Energy is transferred from a hotter object to a cooler one.	A radiator heating the air in a room. **Store** / **Transfer** / **Store** Thermal Radiator → Heating → Thermal Surrounding air
Force	Energy is transferred when a force moves through a distance.	A ball falling from a height. **Store** / **Transfer** / **Store** Gravitational Ball at a height → Force → Kinetic Ball falling
Sound	Energy transferred by the vibration of particles.	Hearing the sound of a drum being hit. **Store** / **Transfer** / **Store** Kinetic Drum skin → Sound → Kinetic Ear drum
Electrical	Energy is transferred when moving charges in a wire.	An electrical cell turning a motor. **Store** / **Transfer** / **Store** Chemical Electrical Cell → Electrical → Kinetic Motor
Light	Energy is transferred by light waves.	A bulb lighting up a room. **Store** / **Transfer** / **Store** Thermal Light → Light → Thermal Surroundings

Energy Conservation

Energy cannot be created or destroyed, just transferred from one store to another.

The total energy of a system stays the same. The idea that the total energy has the same value before and after a change is called conservation of energy.

Energy Dissipation

Any energy that is not transferred to useful energy stores is said to be dissipated (or wasted) because it is lost to the surroundings.

Once dissipated, energy can no longer be stored usefully as the energy has spread out.

Energy is usually lost by heating up the surroundings.

<u>Examples</u>

- Friction in mechanical systems, such as motors.
- Tumble dryers heating the surrounding air.
- Filament bulbs wasting energy as heat.

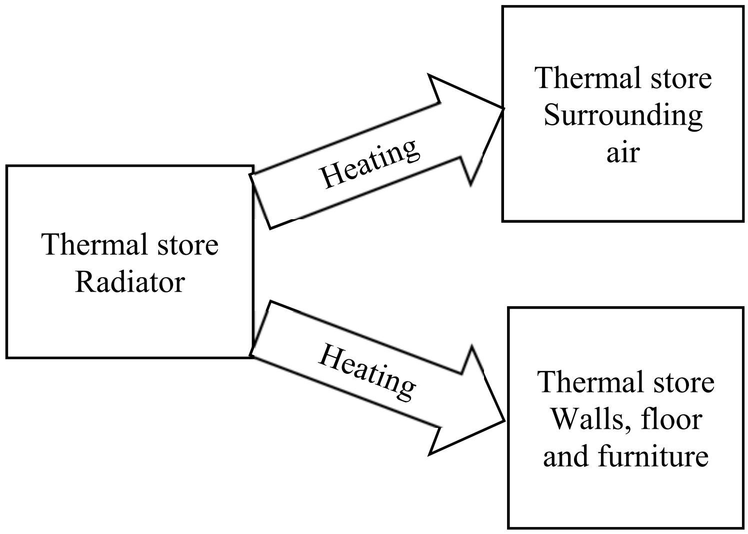
Filament bulb **Energy saving bulb**

Energy transfer diagrams

Energy transfer diagrams may be used to show the locations of energy stores and energy transfers.

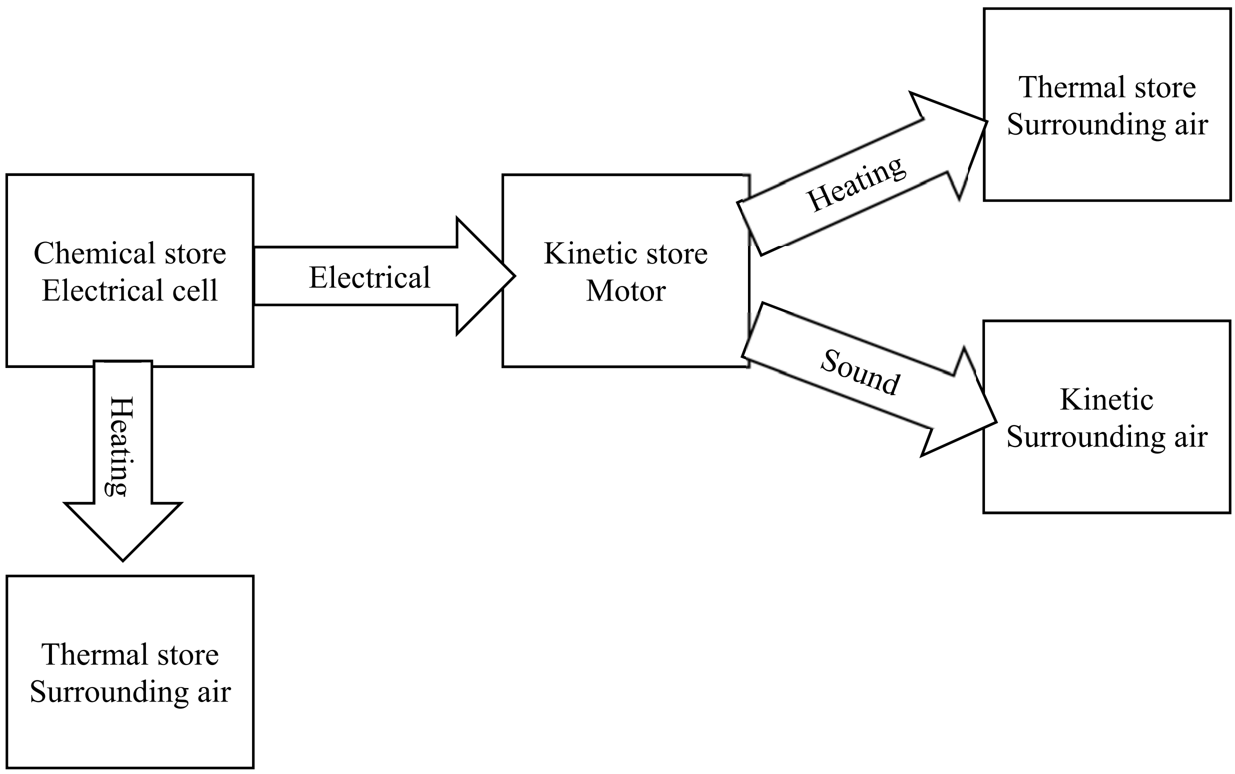
<u>Example 1</u>

When a radiator heats up the air in a room, some energy is used to heat the air in the room. However, some of the energy is also transferred to the walls, floor and furniture. This can be shown by adding more transfers to our earlier example.



<u>Example 2</u>

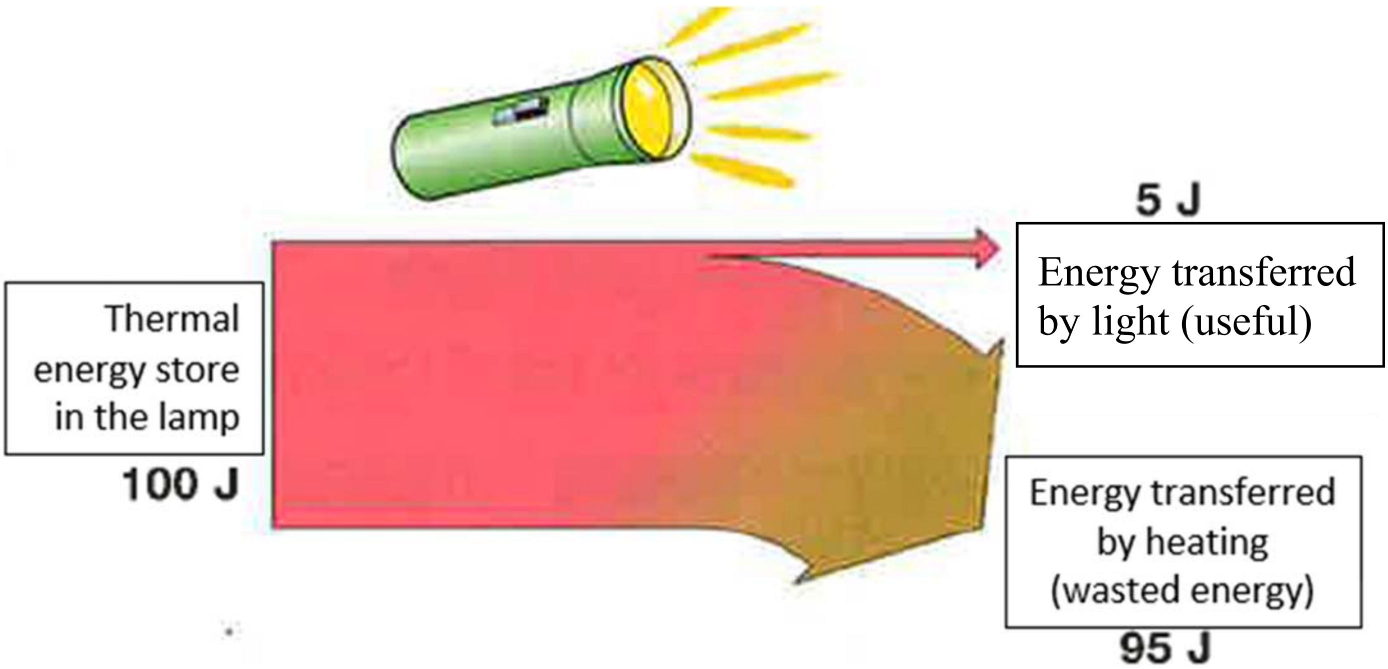
When an electrical cell turns a motor, some energy is used to turn the motor, but some energy is transferred by heating to the surroundings. As the motor turns some energy is transferred to the surroundings by heating and sound.



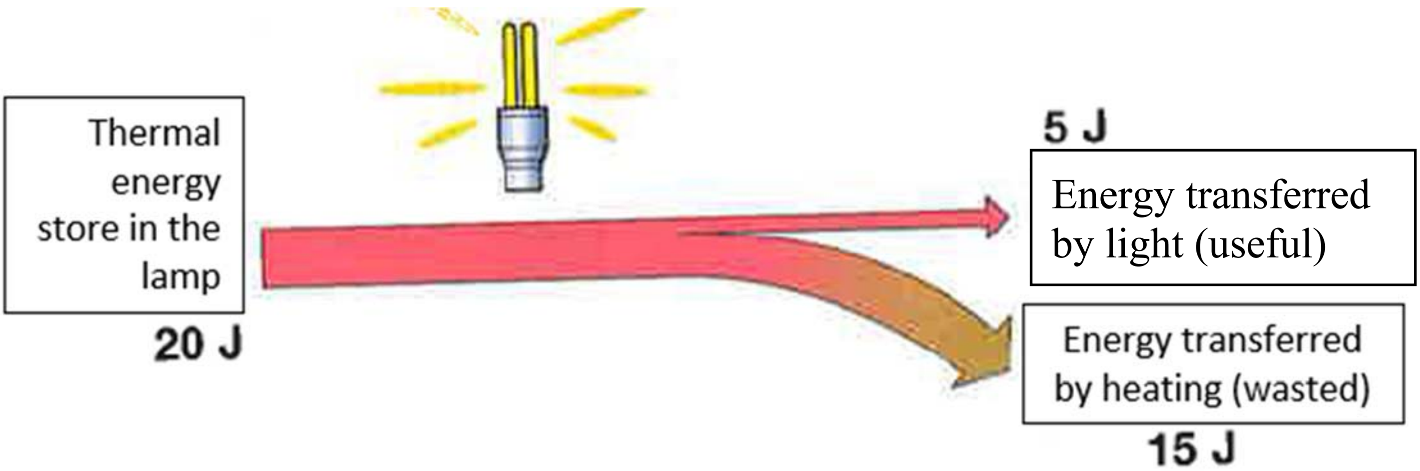
Sankey diagrams

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

Old filament bulbs transfer most of their energy by heating to the surroundings, but only a small amount is transferred as light.



New energy saving bulbs transfer most of their energy as light, and only a small amount is transferred by heating to the surroundings.



Energy Efficiency

Devices are designed to waste as little energy as possible. This means that as much of the input energy as possible should be transferred into useful energy stores.

How good a device is at transferring energy input to useful energy output is called efficiency.

A very efficient device will waste very little of its input energy.

A very inefficient device will waste most of its input energy.

$$\textbf{\textit{Efficiency}} = \frac{useful\ output\ energy}{total\ input\ energy}$$

$$\textbf{\textit{Percentage Efficiency}} = \frac{useful\ output\ energy}{total\ input\ energy} \textbf{\textit{ x100\%}}$$

Energy changes are measured in joules (J) or kilojoules (kJ).

There are no units for efficiency.

Example: The energy supplied to a light bulb is 200J. A total of 40J of this is usefully transferred as light. How efficient is the light bulb?

$$Efficiency = \frac{useful\ output\ energy}{total\ input\ energy} = \frac{40J}{200J} = 0.2$$

$$Percentage\ Efficiency = \frac{useful\ output\ energy}{total\ input\ energy}\ x100 = \frac{40J}{200J}\ x100 = 0.2\ x\ 100 = 20\%$$

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