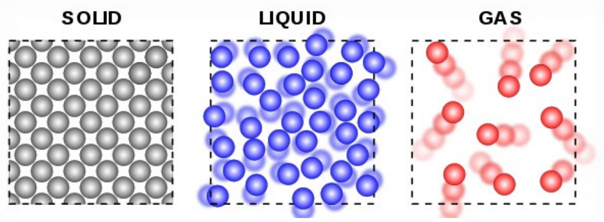
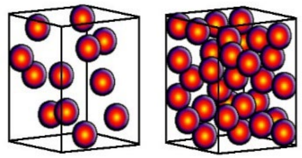
Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 1: States of Matter

The Particle Model



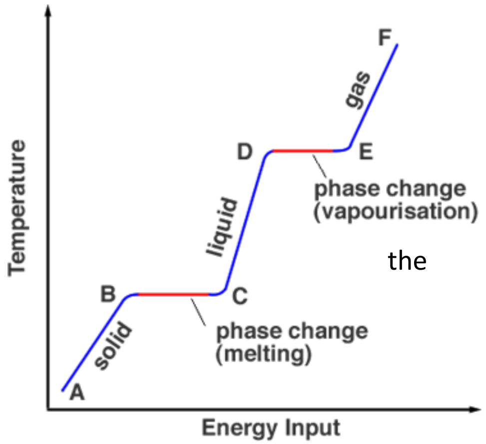
The three states of matter: **Solid**, **Liquid** and **Gas**, are represented by the **Particle Model**. The model shows in a **solid**, **particles** are close together and **vibrate** with little **kinetic energy**. In a **liquid**, **particles** are relatively close together, but have enough **kinetic energy** to move past each other resulting in flow. In a **gas**, **particles** have a high level of **kinetic energy** causing them to move rapidly away from other **gas particles**. The level of **kinetic energy particles** of a substance has, determines what **state** the substance exists as. During the state changes **melting**, **evaporation** and **sublimation**, **particles** gain **kinetic energy** due to an increase in the **environmental temperature**. During **freezing** and **condensation**, the **kinetic energy** of **particles** decreases. The **particle model** does have **limitations** in that it does not account for **variations** in **particle size** due to differences in **atomic structure**. The model also does not represent **intermolecular** or **intramolecular forces** acting on the **particles** (intermolecular – forces between different molecules, Intramolecular – forces within the molecule).



Density

Density refers to the amount of **particles** within a specified **volume**. Differences in **particle/molecule** size as well as the **intermolecular forces** present cause variation in **density** between substances. **Density** is calculated with the equation: **Density** (Kg/m^3) = **Mass** (Kg) ÷ **Volume** (m^3). This equation can also be represented as **$\rho = m/V$**. An object can float on water if it is less **dense** than the body of water directly beneath it. The diagram shows two boxes of the same **volume** with different numbers of **particles**. Assuming each **particle** has the same **mass**, the second box with more **particles** in the same amount of space would have a higher **density** than the first box with less **particles** in the same space.

Specic Heat Capacity and Specific Latent: HeatSpecific heat capacity refers to the level of **energy** in **Joules** required to change the temperature for 1kg of a susbtance by 1°C. Specific heat capacity is calculated using **Energy (J) = Mass (Kg) × Specific heat apacity (J/Kg/°C) × Temperature change (°C)**. This equation can also be represented as **$Q = m \times c \times \Delta T$** (Q = Energy, m = Mass, c = Specific heat capacity and ΔT = Temperature change). In order for a susbtance to change state, a specific amount of **energy** must be put into the substance to cause all **particles** to **transition state**. The **energy** required for this state change is known as the **specific latent heat** and can be calculated using **Energy = mass × Specific latent heat**, also represented as **$E = m \times L$**. The graph to the right shows how the temperature changes as the energy input increases. A phase change refers to a change of state and when this happens there is no increase in temperature. This is due to the **energy** being **transferred** to the **particles** to change state and temperature will continue to increase once the change in state has finished.



Gas Pressure : Gas pressure is caused by the **collision** of gas **particles** with the side of their container. By manipulating the temperature or volume of the container, gas pressure can be altered. Increasing the temperature increases the **kinetic energy transferred** to the **particles**. As the **kinetic energy** has increased, the **particles collide** with the sides of the container more **frequently**, increasing gas pressure. If the volume of the container is reduced, the gas **particles** will **collide** with the sides of the container more **frequently** as there is a smaller distance for particles to travel. Containers can burst if the gas pressure becomes too great, therefore pressurised containers are kept away from high temperatures and have a suitable volume for the amount of gas held.

Science

SoW Topic: Cells in animals and plants

Year 9
Term 1

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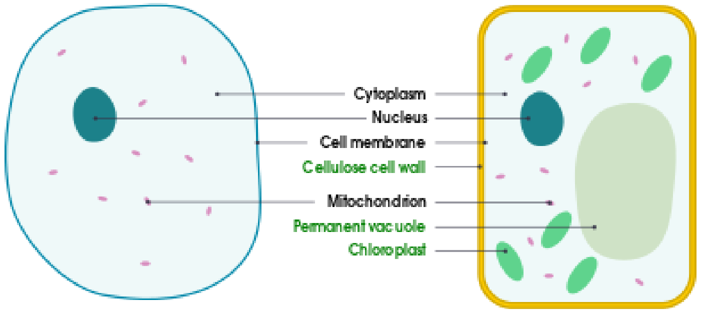
Topic 2: Cell Biology

Cell Types

Eukaryotes have a **nucleus** to contain their **genetic information** (E.g. Plant and Animal cells) whereas **Prokaryotes** do not possess a **nucleus** and **genetic information** is free floating (E.g. Bacteria – Bacterial chromosomes).

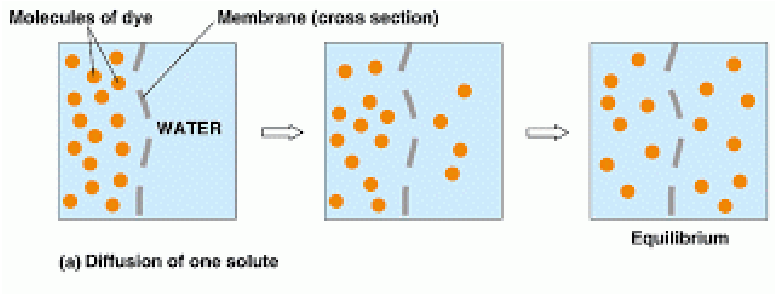


Cell Ultrastructure

Cell **ultrastructure** refers to the internal structure of a cell. The **ultrastructure** is made up of different **organelles**, each with their own function. The cell **ultrastructure** can vary between the different types of cells e.g. **Chloroplasts**, **Vacuoles** and **Cell walls** are not present in animal cells but are in plant cells. Cell **ultrastructure** can include the following **organelles**: **Nucleus** (Contains DNA and coordinates the cell), **Cell membrane** (Allows substances to enter and leave the cell), **Cytoplasm** (Site of cell reactions), **Cell wall** (Maintains cell shape), **Vacuole** (Stores water and minerals), **Chloroplasts** (Produces glucose via photosynthesis), **Mitochondria** (Releases energy in glucose by respiration) and **Ribosomes** (Protein synthesis).

Cell Transport

Cells transport molecules using three different methods: **Diffusion**, **Osmosis** and **Active Transport**. An example of **diffusion** is in the alveoli of the lungs; oxygen **diffuses** from the alveoli into the capillaries whereas carbon dioxide **diffuses** from the capillaries into the alveoli for exhalation. **Osmosis** is similar to **diffusion** but specifically refers to water molecules. An example of **osmosis** can be seen in root hair cells of plants, which have a **large surface area** to allow as much water as possible to pass through the **membrane** into the cell. **Active transport** is the active movement of molecules from a low concentration to a high concentration, against the **concentration gradient** through membrane channels. Active transport requires **energy** as it is causing molecules to move from where there are few of them to where there are many. Active transport can also be seen in root hair cells of plants where mineral nutrients from the soil such as magnesium are taken in by the cell.



Microscopy

Microscopy is the use of microscopes to view cells and tissues of organisms in greater detail. The cells are magnified to increase their size allowing us to see cell **ultrastructure**. There are two types of microscope: light and electron. Light microscopes are much cheaper and can view the general shape and structure of a cell. Electron microscopes are much more expensive and much larger than their light microscope counterparts. Electron microscopes can magnify the image to a much higher level, allowing scientists to view the smaller **organelles** within a cell that cannot be seen using the light microscopes. The actual size of cells and their organelles can be calculated using the equation: **Actual Size = Image Size ÷ Magnification**.

Enter subject
Support and application

Year 9
Term 1

Vocabulary	Wider Research	Apply
1. Eukaryotic **2. Prokaryotic** **3. Organelle** **4. Ultrastructure** **5. Ribosome** **6. Mitochondria** **7. Concentration** **8. Diffusion** **9. Osmosis** **10. Active transport** **11. Gradient** **12. Microscopy** **13. Particle** **14. Kinetic** **15. Energy** **16. Intermolecular forces** **17. Density** **18. Volume** **19. Transferred** **20. Joules** **21. Collision** **22. Gas pressure**	**Cell Biology–** https://www.bbc.co.uk/bitesize/topics/z2mttv4 **Cell transport–** https://www.youtube.com/watch?v=PRi6uHDKeW4 **Diffusion Simulation–** https://phet.colorado.edu/en/simulation/legacy/membrane-channels **Microscopy Required Practical–** https://www.youtube.com/watch?v=jBVxo5T-ZQM **States of matter–** **https://www.bbc.co.uk/bitesize/guides/z93jfcw/revision/1** **Density Simulation–** https://phet.colorado.edu/sims/density-and-buoyancy/density_en.html **Specific Heat Capacity Required Practical–** https://www.youtube.com/watch?v=HAPmwu7byGM **Gas Pressure–** https://www.youtube.com/watch?v=NzKAJWTmlwg	States of matter: 1. Recreate the graph representing temperature change over energy input. Explain why there is no temperature increase over points B-C and D-E when there is a temperature increase between points C-D. 2. The specific heat capacity of water is 4.18kj/kg/°C. If 10,000g of water is heated from 10°C to 55°C, how much energy has been transferred to the water. 3. Explain why steel ships are able to remain afloat on water when the density of steel is 8050Kg/m^3 and the density of water is 997Kg/m^3. 4. Explain why gas pressure increases with temperature- add into your answer examples where this is extremely dangerous. 5. Explain why the temperature of a substance determines it's state of matter- relate this to the effect of intermolecular forces. Cells: 1. Draw three diagrams to represent the following cells: Animal, Plant and Bacterial. 2. Create a Venn diagram to show the differences and similarities between plant cells and bacterial cells. 3. Calculate the magnification if the actual size of a cell is 0.015mm and the image size is 15mm. You will need to rearrange the equation. 4. Create a Venn diagram to show the differences and similarities between different types of transport in cells. 5. Explain why active transport is necessary across a cell membrane giving examples of how/when this happens- e.g. glucose moving in and out of cells.