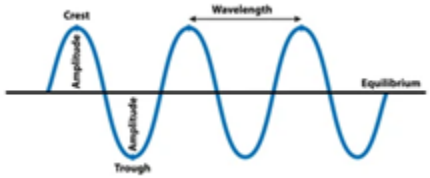
Year 8 - Combined Science - Cycle 1

Key vocabulary/content/ideas

- **Amplitude**: maximum distance of a point on a wave from its rest position.
- **Cell membrane:** a thin barrier surrounding the cell, that controls what enters and leaves.
- **Concentration:** mass of a substance in a given volume.
- **Eukaryote:** An organism composed of cells which contain a true nucleus.
- **Frequency, f:** number of waves passing a point each second, measured in Hertz, Hz.
- **Period:** time taken for a wave to pass a point.
- **Refraction:** A change in direction as a wave moves from one transparent material to another.
- **Reflection:** the change in direction of a wave when it meets a surface.
- **Wavelength:** distance (m) from one point on a wave to the same point on the next wave.

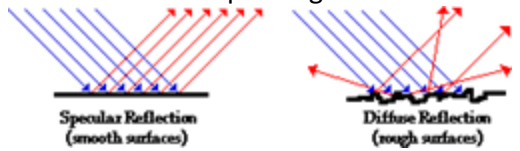
Week 1 - Describing waves

- **Waves** transfer energy without transferring matter. They can be either:
  - **Mechanical** - they need a medium to travel through e.g. sound waves or seismic waves.
  - **Electromagnetic** – disturbances in electric and magnetic fields E.g. Light or X-rays.
- Waves can be described in terms of their **Amplitude, Wavelength, Frequency** and **Period.**
- **Transverse waves:** the direction of energy transfer is perpendicular (at right angles) to the direction the particles oscillate.
- **Longitudinal waves:** the direction of energy transfer is parallel to (in line with) the direction the particles oscillate.



Week 2 - Wave speed

- When waves meet they can combine in a process called **superposition**.
  - If the peaks of 2 waves line up, it will produce a wave with a greater amplitude.
  - If a peak and trough line up, it will produce a wave with a smaller amplitude.
- Waves will **reflect** of a solid surface. Reflection can be **Specular** or **Diffuse** depending on the surface.



- Wave speed, v, can be calculated as:

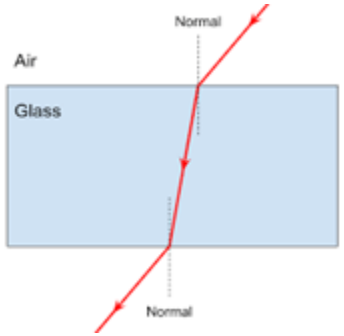
$$v\ (m/s) = \frac{\text{distance travelled by wave (m)}}{\text{time taken (s)}}$$

v (m/s) = wavelength, λ (m) x frequency, f (Hz)

- We can investigate the properties of a wave using a **ripple tank**.

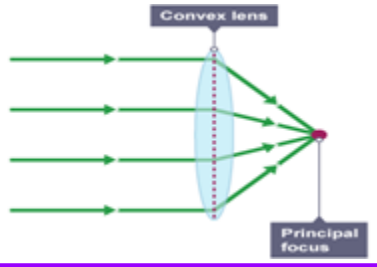
Week 4 - Sound waves

- **Sound waves** are caused by vibrating objects.
- The greater the **amplitude** of a sound **wave**, the greater **volume** of the sound.
- The greater the **frequency** of a sound wave, the higher the **pitch** of the sound.
- The range of human hearing is 20 Hz to 20 000 Hz. Frequencies above this range are called **Ultrasound**.
- Sound waves travel at different speeds depending on the medium. The **speed of sound** in air is **343 m/s.**
- **Refraction** is a change in direction of the path of a light ray.
- It occurs at the **boundary** between two mediums of different density as waves change speed.



Week 4 - Light waves

- Light is a form of wave that can transfer energy.
- It travels at **300 million m/s - the speed of light**.
- Light interacts with materials in different ways depending if the surface is:
  - **Transparent** - all light will pass through.
  - **Translucent** - some light will pass through.
  - **Opaque** - no light will pass through.
- **White light** is made up of all the colours of the **visible spectrum**. It can be split using a **prism**.
- Different colours of light have different wavelengths and frequencies.
- Light can be focused using lenses, such as those in cameras and your eyes.
- Ray diagrams are used to show the path of light rays.



Week 4 - Cell transport

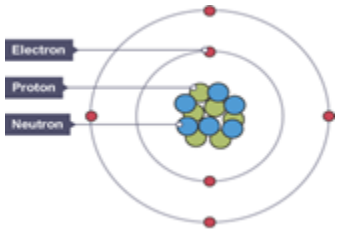
- Most **Eukaryotic** cells have the same **organelles**: nucleus, cytoplasm, cell membrane, mitochondria and ribosomes. Plant cells also have thick cell walls, chloroplasts and a permanent vacuole.
- Cells have a **partially permeable membrane** that allows some substances through it but not others.
- Dissolved substances move into and out of cells by **diffusion**.
- Substances will diffuse from an area of high concentration to an area of low concentration.
- A difference between two concentrations forms a **concentration gradient**.
- The greater the concentration gradient, the higher the rate of diffusion.
- Water moves in and out of cells by osmosis.
- During **osmosis,** water molecules move from where there are more of them (a higher concentration) to where there are fewer of them (a lower concentration).

Key vocabulary/content/ideas

- **Field:** An area around an object where it can exert o force on another object.
- **Magnetism:** a **non-contact force** which can affect certain metals.
- **Non-contact force:** a force that acts on an object with no physical contact.
- **Nucleus:** small, dense region consisting of protons and neutrons at the center of an atom.
- **Particle:** the smallest unit of matter that all materials are made up from.
- **Periodic table:** a chart in which the elements are arranged in order of increasing atomic number.
- **Physical Property:** Melting/boiling point, conductor/insulator, brittle/flexible.
- **Proton:** a positively charged particle found in the nucleus of an atom.
- **Reactivity**: a measure of how much a substance chemically reacts when it is mixed with another substance.

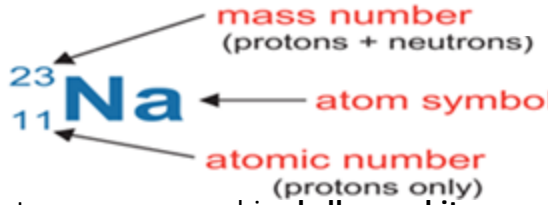
Week 6 - Atoms, elements and compounds

- All substances are made up of **atoms**. Different substances are made up of different types of atom.
- A substance composed of only one type of atom is known as an **element**. E.g. oxygen, carbon, iron, gold.
- Elements are found on the **periodic table of elements** and are represented by symbols. E.g. Carbon = C.
- A substance made up of 2 or more elements chemically combined is known as a **compound**. E.g. magnesium oxide is composed of magnesium and oxygen atoms.
- Atoms are made up of three smaller parts (called **subatomic particles**) : **protons**, **neutrons** and **electrons.**



Week 7 - Atomic structure

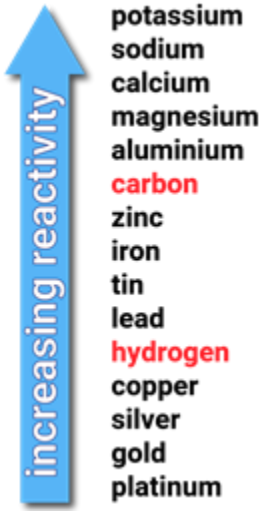
- You can use a **periodic table** to find the number of **subatomic particles** each element has.
- The **atomic mass number** = the number of **protons** and **neutrons**.
- To find the **number of neutrons** in an atom subtract the atomic number from the atomic mass.
- The **atomic number** = the number of protons and is also the same as the number of electrons. This is because all atoms have **no overall charge**.



- Electrons are arranged in **shells** or **orbits** around the nucleus.
- Each shell can hold a certain number of electrons.

Week 8 - Reactivity Series

- The **reactivity series** shows metals in order of their reactivity.



potassium
sodium
calcium
magnesium
aluminium
carbon
zinc
iron
tin
lead
hydrogen
copper
silver
gold
platinum

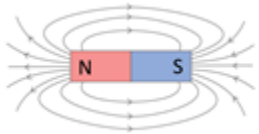
- **Displacement reactions** are when a more reactive element takes the place of a less reactive element in a compound

Week 9 - Extracting Metals

- Metals can be extracted from **ores** (compounds) found in the Earth's **crust**. Depending on their reactivity we can extract them in different ways.
- Metals that are **less reactive** than aluminium are extracted by heating them with carbon as a **displacement reaction**. This means the metal is removed from the compound and replaced with carbon.
- Metals that are **more reactive** than aluminium cannot be reacted with carbon so are extracted using **electrolysis**.
- **Unreactive metals** are found in the Earth's crust as the uncombined elements. Examples of unreactive metals are silver, gold and platinum.
- Different materials are useful due to their **properties**:
  - **Ceramics:** Hard-wearing, brittle, heat-resistant.
  - **Polymers:** Light weight, strong, can be moulded.
  - **Composites:** Relates to properties of components - High strength, waterproof, light weight

Week 10 Magnetism

- **Magnetic materials** include iron, cobalt and nickel.
- A **magnetic field** is an invisible force field which surrounds a magnet.
- All magnets have a **north** and **south pole**. The magnetic field is strongest at the poles of a magnet.



- Like poles (E.g. north and north) will **attract**.
- Opposite poles (E.g. north and south) will **repel**.
- It is possible to create a magnetic field by passing a current through a wire. This is called an **electromagnet**.
- Electromagnets are used in speakers and door locks.
- The Earth is surrounded by a magnetic field which can be used for Navigation with a **compass**.