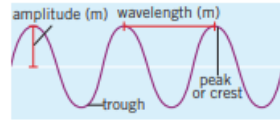


Properties of waves

- A **wave** is an **oscillation** or **vibration** which transfers energy from one place to another
- Amplitude** – the distance from the middle to the top or bottom of the wave
- Wavelength** – the distance between a point on the wave to the same point on the next wave
- Trough** – The bottom of the wave
- Peak** – The top of the wave
- Frequency** – How many waves pass a fixed point per second, measured in Hertz (Hz)



There are two main types of waves:

Transverse waves, e.g. light

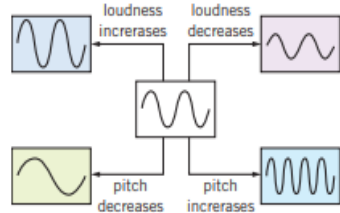
- Travel at 90° direction of energy transfer
- Do not need a medium to travel through

Longitudinal waves, e.g. sound

- Travel in the direction of energy transfer
- Need a medium to travel through

Sound waves

- Sound waves are caused by the vibration of particles, sound travels quicker in a solid than a gas as the particles are closer together
- Oscilloscopes** display sound waves on a screen
- Humans can hear between 20–20 000 **hertz** (Hz), but other animals have different ranges of hearing
- Sound waves above 20 000 Hz are known as **ultrasound**, these sound waves are too high pitched for humans to hear



Hearing

- The **pinna** directs sound along the **auditory canal** to the **eardrum** which will vibrate
- The vibration from the ear drum moves onto the ossicles which amplifies the sound
- This passes the sound to the cochlea where tiny hairs detect the vibrations and passes this along to the **auditory nerve** as electrical signals for our brain

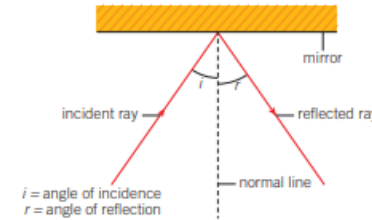
Colour

- Light can be split using a prism and is made up from different colours of light
- Primary colours** can be mixed in order to form **secondary colours**
- Objects appear a certain colour as they absorb all other colours of light, but reflect the colour of light which they appear.

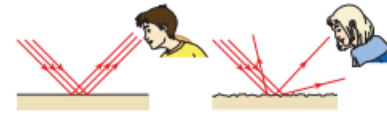


Reflection

- The **law of reflection** states that the **angle of incidence** will be equal to the **angle of reflection**

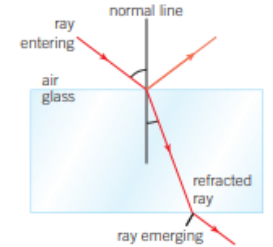


- For light reflecting off a **smooth** surface will form an image is called **specular reflection**
- Reflection off of a **rough** surface will not form an image and is known as **diffuse scattering**



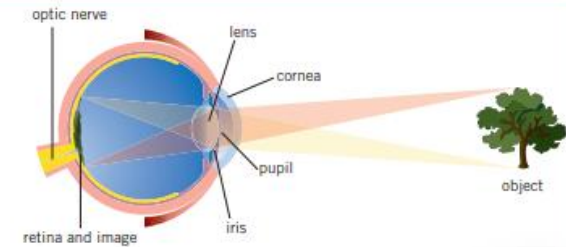
Refraction

- Refraction** occurs when a wave passes between two different substances
- This happens as the wave will travel at different speeds in the different materials
- When the wave passes into a more dense material from a less dense material it will bend towards the **normal**, e.g. air into glass
- When the wave passes into a less dense material from a more dense material it bends away from the normal e.g. glass to air



Light and the eye

- Light entering your eye is refracted by the **lens**, focusing it on the retina and creating an inverted image
- Photoreceptors** detect the light hitting your retina and send an electrical impulse to your brain
- If the light is not focussed on the retina or the eye, people cannot see properly
- Long sighted people have the light focus behind the eye, short sighted people have the light focus in front of the retina.
- Lenses can be used to refract the light in a way in which it will focus on the retina.



Key words and Vocabulary

Amplitude – angle of incidence – angle of reflection – auditory canal – auditory nerve – diffuse – scattering – eardrum – frequency – hertz – law of reflection – lens – longitudinal – normal – oscillation – oscilloscope – peak – photoreceptors – primary – colour – refraction – secondary colour – specular – reflection – transverse – trough – ultrasound – wave – wavelength



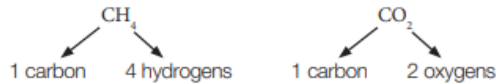
Elements and atoms

- An **element** is a substance that only contains one type of atom, it is found on the **Periodic Table**
- Each element has its own unique chemical symbol which is the same in every language, these are also found on the Periodic Table
- An **atom** is the smallest part of which an element can be broken down into
- As there are around 100 types of elements that can occur naturally, there are around 100 different atoms

Compounds

- Compounds** are formed when two or more different elements chemically bond together
- The compound will have different **physical properties** to the elements which make up the compound, for example water is a liquid, but it made from oxygen and hydrogen which are both gases
- Compounds are hard to separate and need a chemical reaction to do this

- When naming a compound, we always mention the metal first and the non metal second
- The name of the metal will not change but the name of the non metal will, for example oxygen can change to oxide
- Chemical formulae tells us how many atoms of each element are in the compound in relation to each other



- The small number tells us the number of each element which is in front of the number

Polymers

- Polymers** are long chains of groups of atoms which are repeated many times
- Natural polymers are not man-made and include wool, cotton, starch and rubber
- Synthetic polymers are man-made and include polythene, polystyrene and nylon

Groups and periods

- Groups** are the columns in the Periodic Table, they go downwards
- Periods** are the rows in the Periodic Table, they go sideways
- Elements in the same group normally follow the same trends in properties such as melting point, boiling point and reactivity
- By placing these elements into these groups, scientists can make predictions about their properties

												group number							0
1	2											3	4	5	6	7	He		
Li	Be											B	C	N	O	F	Ne		
Na	Mg											Al	Si	P	S	Cl	Ar		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
Fr	Ra																		

Group 0

- Group 0** elements are known as the **noble gases**
- They are all non metals with low melting and boiling points, meaning all are gases at room temperature
- The boiling point decreases going down the group
- All of the group 0 elements are unreactive
- When electricity is passed through the gas, they emit a brightly coloured light, this can be seen in neon signs

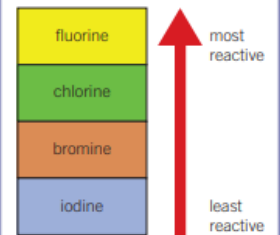
Group 1

- Group 1** elements are also known as the **alkali metals**
- They share similar properties with other metals such as:
 - Being shiny when freshly cut
 - Being good conductors of electricity and heat
- Group 1 metals are much softer than other metals and also have much lower melting and boiling points
- Group 1 elements react with water to form alkali solutions
 - $\text{lithium} + \text{water} \rightarrow \text{lithium hydroxide} + \text{hydrogen}$
 - $\text{metal} + \text{water} \rightarrow \text{metal hydroxide} + \text{hydrogen}$
- The further down the group that the metal is, the more vigorous the reaction will be. This is called a **trend**
- Another trend seen in Group 1 is with the boiling and melting points: the further down the group, the lower the boiling and melting points are

Group 7

- Group 7** elements are also known as the **halogens**
- They share similar properties with other non metals such as:
 - Having low melting and boiling points
 - Not conducting electricity
 - Moving down the groups the elements have an increased melting and boiling point
- The halogens also react in a similar way to one another, for example with iron:
 - $\text{iron} + \text{chlorine} \rightarrow \text{iron chloride}$
 - $\text{iron} + \text{bromine} \rightarrow \text{iron bromide}$
- Halogens can undergo **displacement reactions**, this is where a more reactive halogen will take the place of a less reactive halogen
- The most reactive halogens are at the top of the group, and the least reactive halogens are at the bottom of the group
- If the most reactive halogen is on its own, it will take the place of the less reactive halogen in a compound
 - $\text{calcium bromide} + \text{chlorine} \rightarrow \text{calcium chloride} + \text{bromine}$

Halogens



Key words and Vocabulary

Atom – alkali metals – compound – displacement reaction – element – group – Group 1 – Group 7 – Group 0 – halogen – noble gas – period – Periodic Table – physical – properties – polymer – trend

