4.1: WAVES: PROPERTIES OF WAVES

Wavelength (λ)

Measured in metres

Peak-peak or trough-trough distance often used!

Distance from one point to the same point on the adjacent wave

Velocity (v)

$v = f \lambda$

Determined by frequency and wavelength

The rate that the wave travels

Frequency (f)

1 Hz = 1 wave each second

Measured in Hertz (Hz)

Number of waves that pass a given point in a second

Period (T)

Time taken for a complete wave to pass a given point

$f = 1/T$

Frequency is the reciprocal of period

Wavefront

A line where all the oscillations of the wave are in phase (all at the same position in their cycle)

Amplitude

Maximum displacement of a wave from its rest position

For sound waves, amplitude determines the volume of the sound

Water Waves

A float on water will bob up and down when a wave passes

The wave is transferred but the medium is not!

Can have characteristics of both transverse and longitudinal waves

Waves transfer energy and information, not matter!

EDEXCEL

PMT
·resources·tuition·courses

4.2: WAVES: TYPES OF WAVES

EDEXCEL

Sound

Infrasound
- Sound with frequencies < 20 Hz

Ultrasound
- Sound with frequencies > 20,000 Hz

Foetal scanning
- Waves travel from emitter and are reflected at boundaries inside body
- Reflected waves are detected to form an image of the womb

Human hearing
- Sound causes vibrations in eardrum

- Seismic waves
- Earth's core
- Used to measure the depth of things underwater
- Uses sound waves that are within the audible range
- Sonar
- Audible range: 20 Hz – 20kHz

Transverse
- Oscillations perpendicular to energy transfer
- Peaks and troughs
- Electromagnetic radiation is a form of transverse wave!

Longitudinal
- Oscillations parallel to energy transfer
- Compressions and Rarefactions

Sound waves
- Require a medium to be transferred through
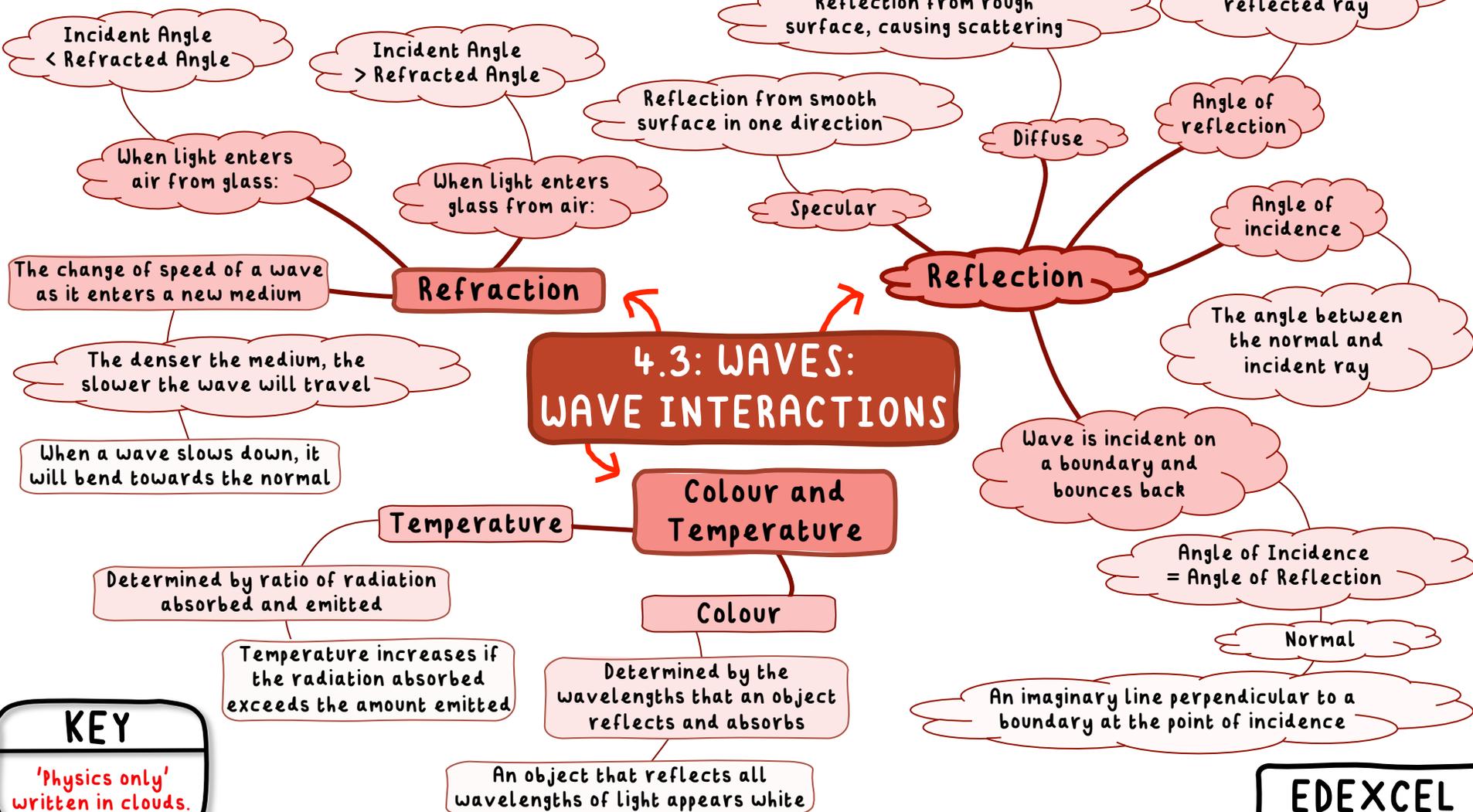- Particles in the medium vibrate
- Energy transferred on collisions to pass on vibrations
- Frequency of vibrations determines pitch of sound

KEY
'Higher tier only' written in green.
'Physics only' written in clouds.

PMT

4.3: WAVES: WAVE INTERACTIONS

Refraction

- Incident Angle < Refracted Angle
- Incident Angle > Refracted Angle
- When light enters air from glass:
- When light enters glass from air:
- The change of speed of a wave as it enters a new medium
- The denser the medium, the slower the wave will travel
- When a wave slows down, it will bend towards the normal

Reflection

- Reflection from rough surface, causing scattering
- Reflection from smooth surface in one direction
- The angle between normal and the reflected ray
- Diffuse
- Specular
- Angle of reflection
- Angle of incidence
- The angle between the normal and incident ray
- Wave is incident on a boundary and bounces back
- Angle of Incidence = Angle of Reflection
- Normal
- An imaginary line perpendicular to a boundary at the point of incidence

Colour and Temperature

- Temperature
  - Determined by ratio of radiation absorbed and emitted
  - Temperature increases if the radiation absorbed exceeds the amount emitted
- Colour
  - Determined by the wavelengths that an object reflects and absorbs
  - An object that reflects all wavelengths of light appears white

KEY

'Physics only' written in clouds.

EDEXCEL