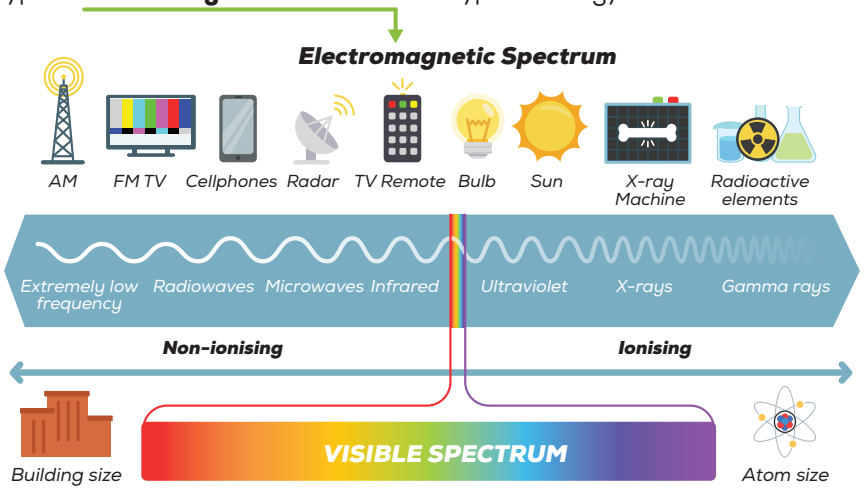
SECONDARY 1 SCIENCE WA3 CRASH COURSE

RAY MODEL OF LIGHT CHEATSHEET

Light is a type of **electromagnetic radiation** and type of energy.



How are we able to see different objects?

LUMINOUS OBJECTS

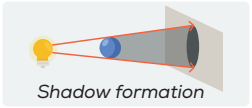
Light from object travels directly into our eyes

NON-LUMINOUS OBJECTS

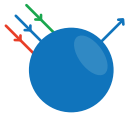
Light from the light source is reflected off the non-luminous object into our eyes

3 IMPORTANT PROPERTIES OF LIGHT

1. Light travels in straight lines



2. Light is reflected, transmitted or absorbed upon striking a surface

REFLECTED	TRANSMITTED	ABSORBED
 Bouncing of light ray	 Opaque Translucent Transparent	 Light is taken in by the object

3. Light travels at a speed of 3 x 10^8 m/s in a vacuum

REFLECTION

DEFINITION Bouncing of light rays when they hit a (opaque) surface

2 TYPES OF REFLECTION

TYPE OF REFLECTION	TYPE OF SURFACE	BEHAVIOUR OF LIGHT RAYS	CHARACTERISTICS OF THE IMAGE
REGULAR/ SPECULAR REFLECTION	Smooth (even) surface	Light rays that are parallel to each other remain parallel after bouncing off the smooth surface.	Clear and undistorted image formed
IRREGULAR/ DIFFUSE REFLECTION	Rough (uneven) surface	Light rays that are parallel to each other are reflected in many different directions by the uneven surface.	No image formed/ unclear and distorted image formed

TYPE OF MIRROR	PLANE MIRROR	CONVEX MIRROR	CONCAVE MIRROR
SURFACE	Flat	Curved outward	Curved inward
CHARACTERISTIC OF MIRROR IMAGE	Virtual		
	Upright		
	Laterally inverted		
	Same size as the object	**Smaller size** than the object	**Larger size** than the object
	Distance of object and image from the plane mirror is **equal**	**Distance** of object and image from the convex mirror is **not equal**	**Distance** of object and image from the concave mirror is **not equal**
FIELD OF VISION	Moderate	Wider	Narrower
EXAMPLE	• Periscope	• Blind corner mirror • Security mirror	• Dentist mirror • Cosmetic mirror

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RAY MODEL OF LIGHT CHEATSHEET

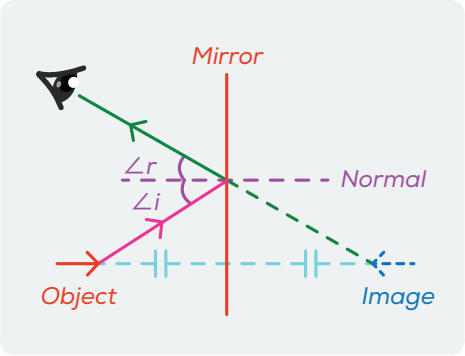
REFLECTION DIAGRAMS

3 STEPS

1 Image
- Drawn with dotted lines
- Follow plane mirror image rules

2 Ray from image to eye/observer
- Reflected ray (partially dotted)

3 Ray from object to plane
- Incident ray

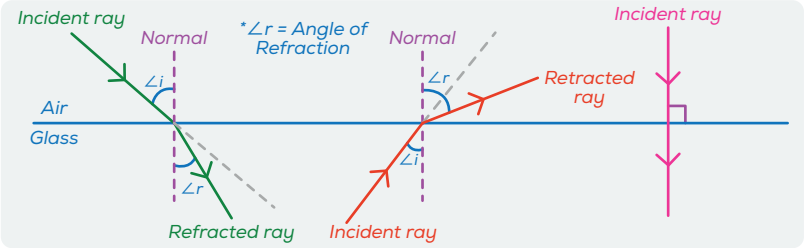


DRAW NORMAL In dotted lines and perpendicular to plane/mirror

RECALL Law of reflection: Angle of incidence = Angle of reflection ($\angle i = \angle r$)

REFRACTION

DEFINITION Bending of light as it travels from one medium to another of different optical density.



From optically less dense to optically denser medium [Air to glass]	From optically denser to optically less dense medium [Glass to air]
Speed of light decreases	Speed of light increases
Refracted ray bends more towards normal	Refracted ray bends more away from normal

SPECIAL CASE

Incident ray is perpendicular to boundary of medium

Since, $\angle i = 0°$, $\angle r = 0°$.

Thus, no refraction of light

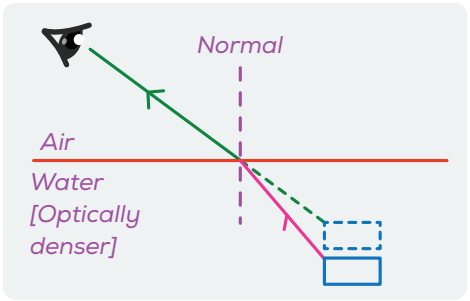
REFRACTION DIAGRAMS

3 STEPS

1 Image*
- Drawn with dotted lines
- Same size and shape as object

2 Ray from image to eye

3 Ray from object to boundary



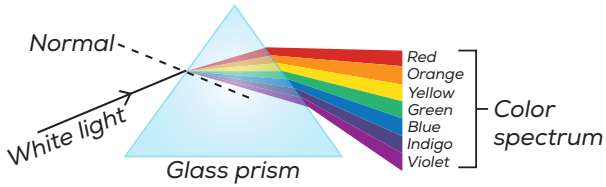
DRAW NORMAL In dotted lines and perpendicular to boundary

⚠ TAKE NOTE

*Observer in less dense medium → image appears above object but closer to boundary
Observer in denser medium → image appears above object but further from boundary

COLOUR SPECTRUM OF WHITE LIGHT

White light can split into its seven coloured components (**ROYGBIV**) by a glass prism. This splitting process is known as **dispersion**.



ANSWERING TECHNIQUE	
1 Compare Optical Density	Dispersion of light occurs when white light travels from an **optically less dense medium**, such as air, to an **optically denser medium**, such as glass prism.
2 Describe change in speed of light	The speed of each coloured component of light **decreases differently**,
3 How does the light ray bend?	causing each refracted coloured component of light to **bend differently towards the normal** due to refraction of light.

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