4.2 PROPERTIES OF VISIBLE LIGHT

Name:
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(Refer to BC Science 8 pp. 144 – 151)

WAVE MODEL OF LIGHT

- The wave model of light is a model of light behavior that represents light travelling as a wave.
- In this model, light is a type of wave that travels through empty space and transfers energy from one location to another, such as from the Sun to the Earth.
  - visible light is electromagnetic radiation (light energy) you can see.

wavelengths
750 nm – 400 nm

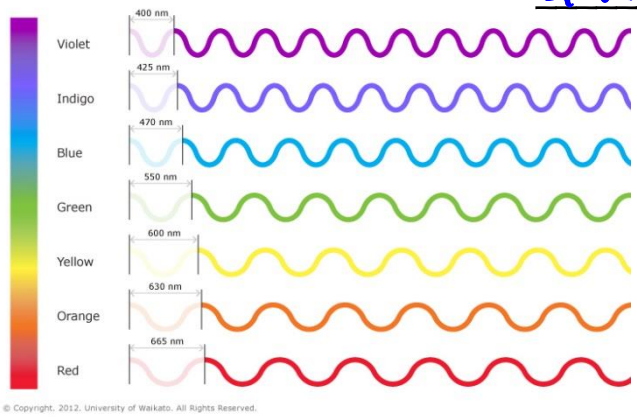
REFRACTION OF LIGHT

- **refraction:** the bending or changing direction of a wave as it passes from one material to another.
  - This occurs due to a change in the wave's speed.
    - Waves travel at different speeds in different mediums.
- Light waves refract when they pass from one material to another.
  - For example, when a light wave passes from air into water.
  - A light wave also refracts when it passes through a prism.

nano → billionth

speed of light → 300 000 km/s

- White light, such as sunlight is made up of waves having different wavelengths and frequencies.
- When a light wave passes through a prism the different wavelengths are refracted by different amounts.



- Longer wavelengths are refracted less than shorter wavelengths.
  - This causes different colours to be separated when they come out of the prism.

COLOURS OF THE RAINBOW

- water droplets also refract light.
- When white light is separated into its different colours, this band of colour is called the visible spectrum.
  - The range of frequencies of visible light.

- The seven most visible colours of the spectrum are:

Red, Orange, Yellow, Green, Blue, Indigo, Violet

R O Y G B I V

- The colour red has the longest wavelength and lowest frequency. ↳ 700 nm
- The colour violet has the shortest wavelength and highest frequency. ↳ 400 nm

PRODUCING THE VISIBLE SPECTRUM

- In the 17th century, Sir Isaac Newton did an experiment to prove that light contains colours.
- He used a prism to separate white light into a spectrum of colours and a reverse prism to recombine the colours into white light again.

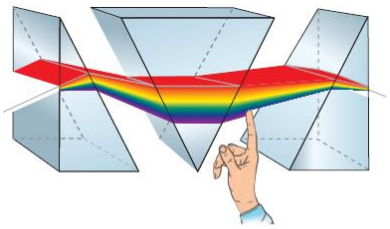
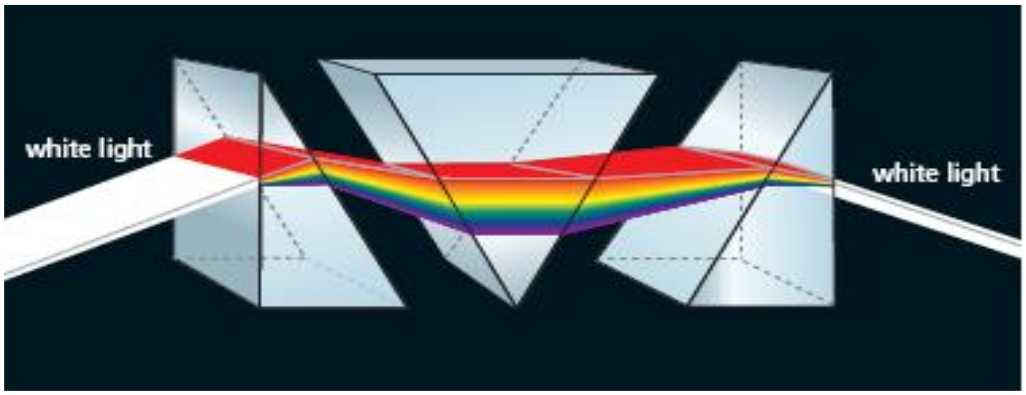


Figure 4.15 If one colour is removed from the spectrum, the recombined light is no longer white.



- He showed that colour was a property of visible light.
  - He proposed that white light, such as sunlight, is the result of mixing together all the different colours of light.

COLOUR AND REFLECTION

- **Reflection:** when a light wave strikes a surface and bounces off.

- When white light strikes an object, some colours are reflected and some are absorbed.
  - Only the reflected colours can be seen.
    - For example, yellow cloth reflects yellow and absorbs all the other colours (red, orange, green, blue, indigo, violet).
- Only three colours of light are needed to produce all the colours of the rainbow: red, blue, and green.
  - They are called the three additive primary colours because adding all three together in proper amounts will make white light.

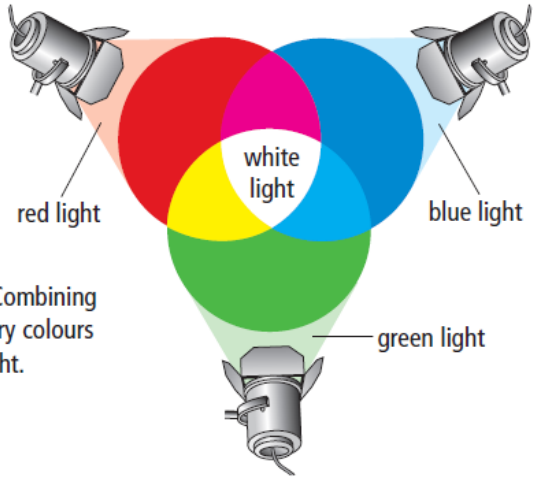
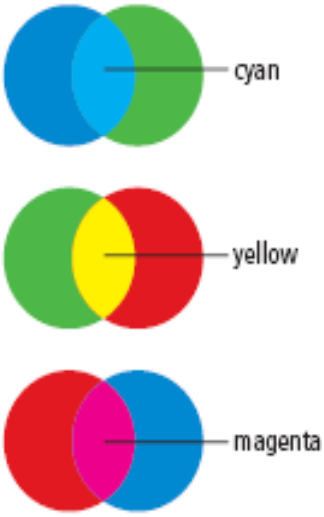


Figure 4.17(A) Combining the additive primary colours produces white light.



  - The light of two additive primary colours will produce a secondary colour.
    - The three secondary colours are yellow, cyan, and magenta.