1. What are the dual natures of lights?

In some aspects, light behaves like waves and in others, it behaves like particles.

2. Write the relationship relating to velocity, wavelength and frequency of light. What is the velocity of light?

The velocity of light in vacuum, c, is one of the fundamental constants of nature.

$c = f\lambda$ ← wavelength in m.

m/s → ↑ frequency in Hz ($\frac{1}{s}$)

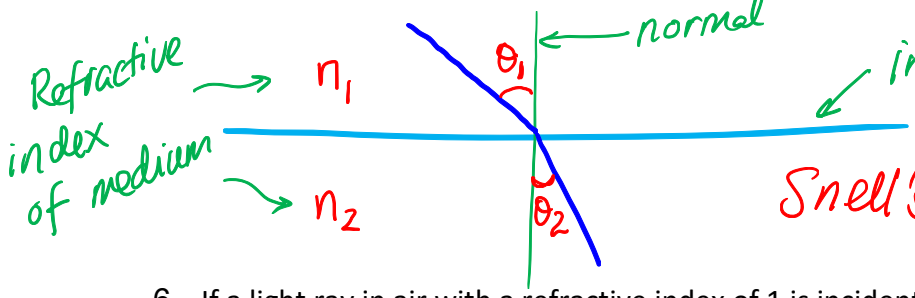
3. Fill in the blanks shown in Table 5.1.

Refer to notes. (no need to memorise).

4. Draw and briefly explain mirror, specular and diffuse reflections on surfaces.

Refer to notes figure 5.3

5. Draw and show the equation related to Snell's Law.



Snell's Law $n_1 \sin\theta_1 = n_2 \sin\theta_2$

6. If a light ray in air with a refractive index of 1 is incident upon a piece of glass with refractive index of =1.5 at an angle 25°, calculate the angle of refracted ray.

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

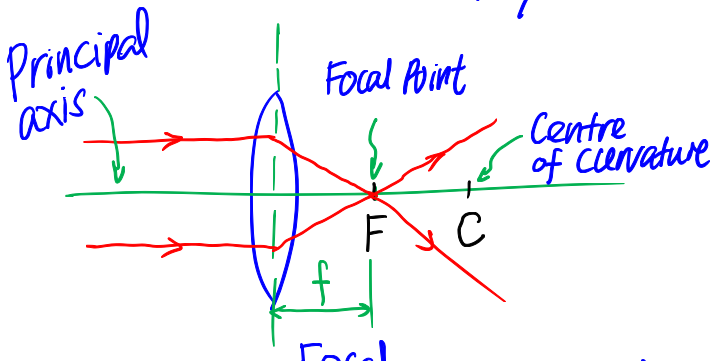
$1 \quad 25^\circ \quad 1.5$

$\sin\theta_2 = \frac{1 \times 0.423}{1.5} = 0.28$

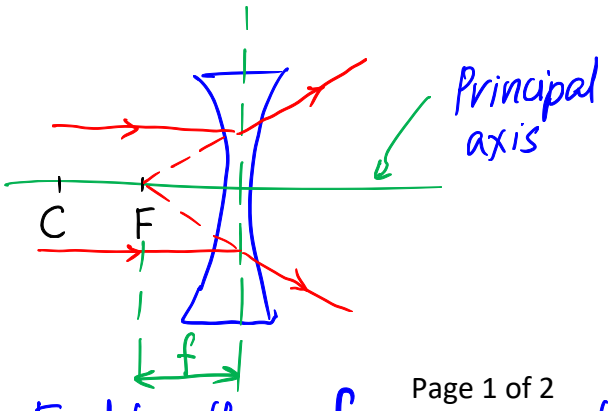
$\Rightarrow \theta_2 = 16.4^\circ$ //

7. Draw a concave and convex lens to show where the focal point and focal **lengths are. Indicate ~~where~~ what their lens power is.**

* Condition = The rays arriving at the lenses are parallel rays.

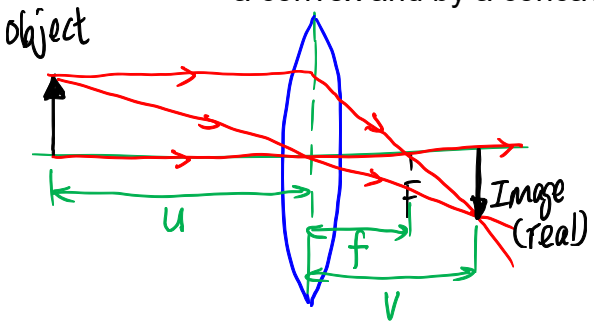


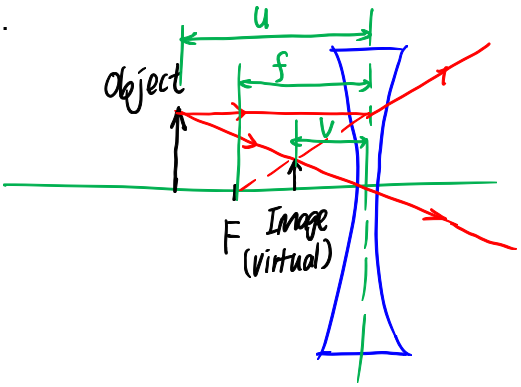
Focal length = f ⇒ $P = \frac{1}{f}$



Focal length = -f ⇒ $P = -\frac{1}{f}$

8. Draw and show the relationship between an object, image and focal length by a convex and by a concave lens.





9. Find the distance of the image from the centre of the concave lens if the focal point is 4cm and the object is 6 cm from centre of the lens.

* Convention ① Focal length of convex lens is +f
focal length of concave lens is -f
② Distances from lenses to real objects and real images are positive. Distances to virtual objects and virtual images are negative.

$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ (−4 → f, 6 → u)

$\frac{1}{v} = -\frac{1}{4} - \frac{1}{6} = -\frac{5}{12}$

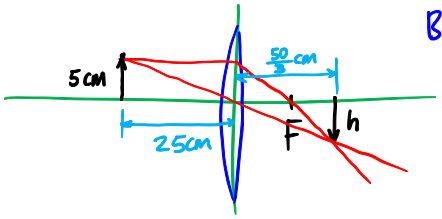
$v = -\frac{12}{5}$ or $-2.4\,cm$ //

↑ indicates virtual image.

10. An object of height 5 cm is placed 25 cm in front of a ~~bi~~-convex lens with a focal length of 10 cm. What is the height of the image?

$\frac{1}{f} = \frac{1}{u} + \frac{1}{v} \Rightarrow \frac{1}{v} = \frac{1}{10} - \frac{1}{25} = \frac{3}{50}$ (10 → f, 25 → u)

$v = \frac{50}{3}$ or $+16.7c$ (Image is real)



By similar triangle,

$\frac{5}{25} = \frac{h}{(\frac{50}{3})}$

$\Rightarrow h = \frac{50}{3} \times \frac{5}{25} = \frac{10}{3}$ or $3.3\,cm$ //

11. What is the main difference between mono and stereo visions?

Refer to 5.6 of notes.

12. List the advantages and disadvantages of optical fibre system.

Refer to 5.6.2 of notes.

13. Draw the fibre optic distribution system and explain the function of each hub or node.

Refer to 5.6.1 of notes.

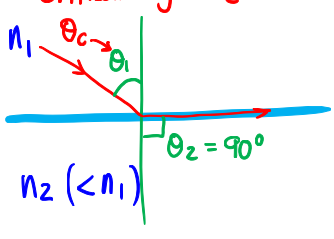
14. Draw 3 diagrams to explain reflection, critical angle and total internal reflection in a fibre optic system. Indicate all equations involved.

Refer to Figure 5.16 of notes.

* must go through these questions!

15. Find the critical angle when two media being glass and water. Given that the refractive index of glass and water is 1.5 and 1.33 respectively.

Critical angle θ_c



Applying Snell's law,

$n_1 \sin\theta_1 = n_2 \sin\theta_2$ (1.5, θ_c, 1.33, 90°)

$\sin\theta_c = \frac{1.33}{1.5} \times 1 = 0.887$

$\theta_c = 62.5°$ //