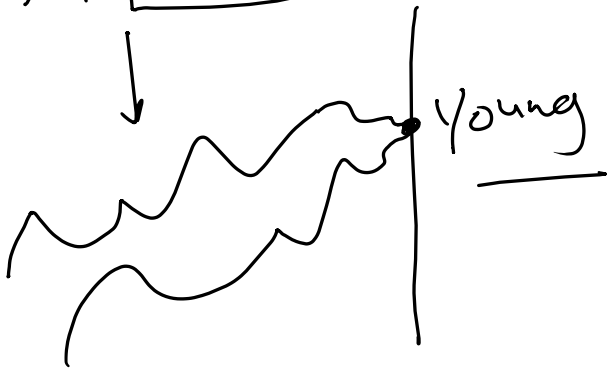
Light

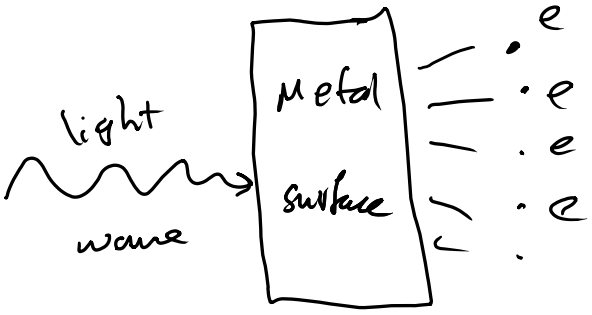
EM wave



(photons) particles

↓ Newton

photoelectric effect



λ : wavelength

$$\lambda = \frac{c}{f}$$ → speed of light

quantized energy

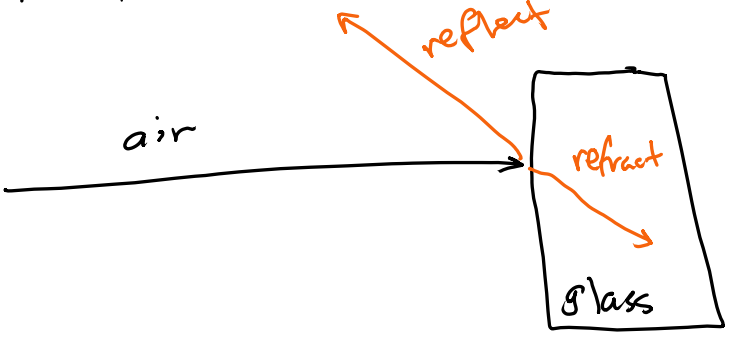
$$E = hf$$

↓

blank's constant

$= 6 \times 10^{-34}$ J.s

Light travels in a straight line as long as it travels in the same medium



Reflection

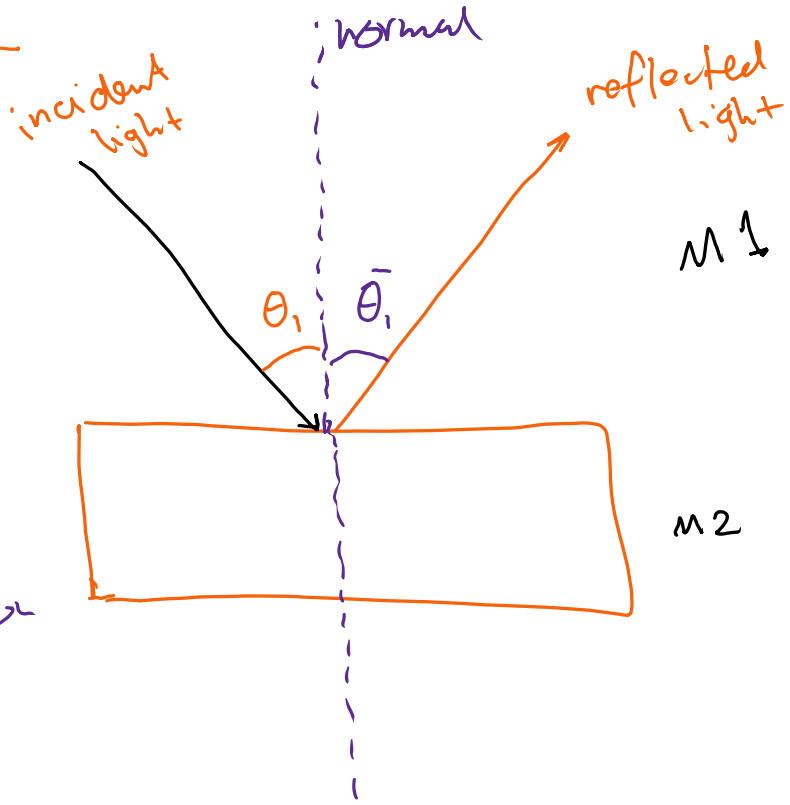
Refraction

Reflection:

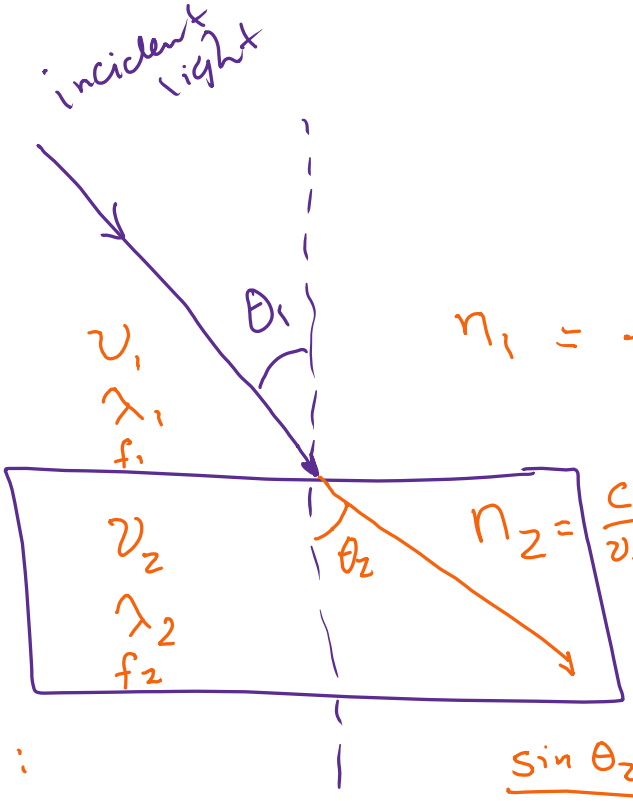
Law of reflection

$$\theta_1 = \bar{\theta}_1$$

angle of incidence
= angle of reflection



Refraction:



n = index of refraction ≥ 1

$= \frac{c}{v}$ → c → speed of light
v → speed of light in this medium

medium 1

$$n_1 = \frac{c}{v_1} \; ; \; \lambda_1 = \frac{v_1}{f_1}$$

medium 2

$$\lambda_2 = \frac{v_2}{f_2}$$

Shell's Law:

$$\frac{\sin\theta_2}{\sin\theta_1} = \frac{n_1}{n_2} = \frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1}$$

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

$$\theta_2 = \sin^{-1}\left[\frac{n_1}{n_2}\sin\theta_1\right]$$

$$\boxed{f_1 = f_2}$$

$n_1 > n_2 \Rightarrow \theta_2 > \theta_1$

$n_1 < n_2 \Rightarrow \theta_2 < \theta_1$