Light is a wave, with speed $c = 3 \times 10^8 \text{ meters per second (m s}^{-1})$ in a vacuum.
\[ \lambda \times \nu = c \]

Wavelength, \( \lambda \)

Frequency, \( \nu \) (waves per second)
E = h x v

Planck’s constant, h = 6.63 x 10^{-34} J s
(J s is “Joules x seconds”)
The Electromagnetic Spectrum
The Electromagnetic Spectrum

Nanometer, or $10^{-9}$ m
(0.000000001)
The Electromagnetic Spectrum

\[ 10^2 \text{ or } 100 \text{ nm} = 10^2 \times 10^{-9} \text{ m} = 10^{-7} \text{ m} (= 0.0000001 \text{ m}) \]
The Electromagnetic Spectrum

$10^3$ or 100 nm = $10^3 \times 10^{-9}$ m

= $10^{-6}$ m = 1 micrometer (1 ‘micron’ = 0.000001 m = 1 µm)
The Electromagnetic Spectrum

Visible light is about 0.5-0.7 micrometers (or $\mu$m)
The Electromagnetic Spectrum

Visible light is about 0.5-0.7 micrometers (or μm)

Diameter of human hair about 50 μm
Flux of light means the amount of electromagnetic energy that passes through a prescribed area (perpendicular to that area) in unit time – i.e. “photons per second” or “Joules per second”

Fig 3.4
Inverse Square Law

\[ S = S_0 \left( \frac{r_0}{r} \right)^2 \]
Inverse Square Law

Because the surface area of a sphere, $SA = 4\pi r^2$

$S = S_0 \left( \frac{r_0}{r} \right)^2$
Upshot – the amount of solar radiation passing through a given area will decrease at the rate of $1/r^2$ (or $r^{-2}$). So if you are twice as far from the sun, you will receive $\frac{1}{4}$ the amount of solar ‘flux’

Example - The solar flux at Earth’s mean distance to the sun (93 million miles = $1.5 \times 10^8$ km) is 1370 Watts m$^{-2}$. What is the solar flux at the orbit of Saturn, which is $1.4 \times 10^9$ km from the sun?