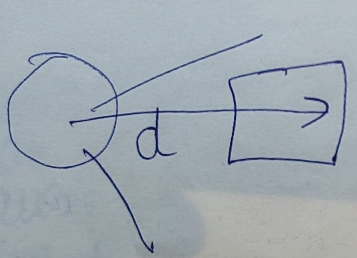
2.5

Astronomy & Cosmology

luminosity → The power of a star is its luminosity (L). It is also the total radiant energy emitted per unit time. Or total power emitted.

Radiant flux intensity



$$F = \frac{L}{4\pi d^2} \rightarrow \frac{mW}{m\,m}$$

$$F = W/m^2$$

d = distance b/w centre of lightsource to surface Area

standard candle → An object of known intensity is called standard candle

use of standard candles to determine distances to galaxies - (Pg 640)

eg cepheid Variable stars eg (Pg 640)

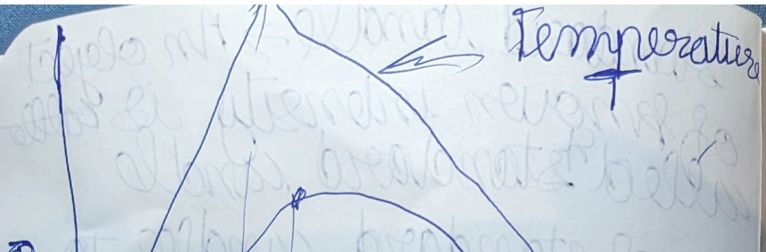
Type IA Super Nova - (Pg 640)

Wien's Displacement Law

$\lambda_{(max)} T(Kelvin) = constant$

$\lambda_{max} \propto \frac{1}{T}$

→ Black body



$T_1 < T_2 < T_3 < T_4$

Any hot body having a high temprature can be called a black body. This black body absorbs all incident radiation & gives out a characteristic emission spectrum & intensity that depends only on the thermo-dynamic temperature

The wavelength at which intensity is max for a given temp is called $\lambda_{(max)}$.

Stefan Boltzmann law

$$L = 4\pi \sigma r^2 T^4$$

$r \rightarrow$ radius of star.

$\sigma \rightarrow$ stefan Boltzmann constant $= 5.67 \times 10^{-8}$ ~~$Wm^{-2}K^{-4}$~~ $Wm^{-2}K^{-1}$

25.3

(1) Distant objects give us a spectrum in which frequency is decreasing, wavelength is rising

$$\frac{\Delta\lambda}{\lambda} = \frac{\Delta f}{f} \approx \frac{v}{c}$$

$\overrightarrow{\lambda}$ V → the in freq decreasing

→ Redshift as wavelength is rising ∴ universe is expanding

. when astronomers observes a distant star, they find that over a period of time, the frequency of radiation emitted decreases & moves towards red color

Hubble's Law
Recession speed (v) of a galaxy is directly proportional to its distance from earth

$v \propto d$
$v = H_0 d$

H_0 – Hubble constant
$\boxed{2.4 \times 10^{-18} s^{-1}}$

Using Wien's Displacement Law & the Stefan-Boltzmann Law to determine Stellar Radii → Pg 646

Expanding universe – Pg 646