COSMOLOGY:

The branch of science which deals with the study of the origin, evolution & nature of the Universe is called Cosmology.

Universe:

The unlimited space around us that contains everything like Galaxies, Stars, Solar system, Planets, Comets, Satellites etc. is called Universe.

Doppler effect of light: The change in wavelength of light received by the observer when the source of light is moving with respect to observer is called Doppler's effect.

RED SHIFT, BLUE SHIFT & EXPANDING UNIVERSE:

[How do you know that the universe is ever expanding?]

According to Doppler's effect of light, "*If a star is moving away from us, the wavelength of light emitted by the star will increase so that it shifts to the Red end of a visible spectrum which is known as Red shift."*

Similarly, "*If a star is moving towards us, the wavelength of light emitted by the star will decrease so that it shifts to the blue end of a visible spectrum which is known as Blue shift."*

The shift can be characterized by a dimensional quantity Z as

$$Z = \frac{\lambda_o - \lambda_e}{\lambda_e}$$

Here,

λ_o = observed wavelength &

λ_e = emitted wavelength

If Z becomes Positive then the object is moving away from us & reveals Red Shift.

If Z becomes negative then the object is approaching towards us & reveals Blue shift.

Note: when we observe a particular galaxy (or star) for a longer time, we observe the radiation (light) emitted from that galaxy moving towards reddish spectrum.

Hence all the galaxies are running from each other & therefore the Universe is expanding.

HUBBLE'S LAW:

According to Hubble's, "The speed with which the two galaxies move away from each other is directly proportional to the distance between them."

i.e. $v \propto r$

or, $v = H_0\, r$

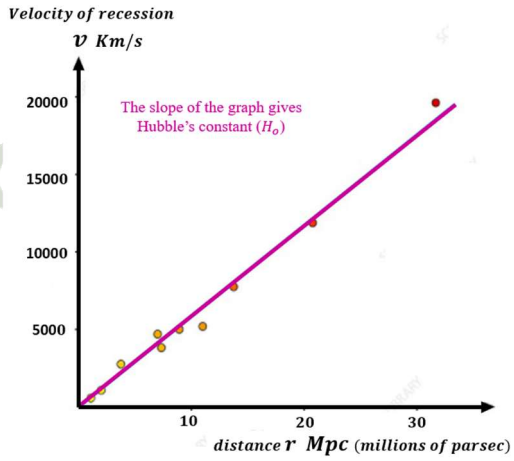
where,

v =speed with which the galaxies are moving away from each other.

r = distance between galaxies

H_0 *is Hubble's constant* $= 2.3 \times 10^{-18} sec^{-1}$.

[current value].



Significance of Hubble's law & Hubble's constant:

1. The reciprocal of Hubble's constant gives the age of the Universe.

   i.e., ***age of universe*** $= \frac{1}{H_0} = 14 \times 10^9$ ***years***.

   [current value]

2. It helps to estimate the distance & velocity of different galaxies.