

GSA (2018)

Question - 02 (A)

Describe different methods to estimate the age of universe. (5 marks)

Ans: Universe:

The totality of everything that has existed or exists both in space and time, including all matter and energy, planet, stars and galaxies, is known as the universe.

Methods to measure the age of the universe
There are two methods scientists rely on for calculating the age of the universe which are the following:

1- Calculating the expansion rate of the universe

According to the scientists, the universe is approximately 14 billion years old. It is the age of the universe that is estimated from the big bang. According to this method, we assume that the universe is expanding at constant rate by using Hubble's Constant (H_0). Hubble noted that the distance of a galaxy is directly proportional to its speed and means. The further the galaxy was it was moving away

$$d = vt$$

$$t = \frac{d}{v}$$

where $v = H_0 d$

$$t = \frac{d}{H_0 d}$$

$$H_0 d$$

$$t = \frac{1}{H_0}$$

Hence scientist were able to use the Hubble constant to estimate the age of the universe by working backwards to Big Bang.

2- By determining the age of the oldest universe:

Scientists determining of the age of the universe from the following

a- Spectrum:

The star's spectrum helps determine the age of stars because blue star tend to die faster than red stars.

b- Luminosity

The brighter star will exhaust its energy faster than a less bright star. Therefore the star with less luminous intensity exists for a long time than with a more luminous intensity.

c- Mass

The amount of a star's mass also helps in finding the life of a star. If a star is dense, it tend to die quickly as compared to a less dense star. Thus the density factor also helps calculate a star's life.

d- Motion/speed.

The brighter star tend to have more energy; in turn, its speed will

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be greater than the comparatively less luminous star. Eventually, the brighter star will consume its energy quickly and die before the other less bright star thus, will have a short life and vice versa.