

CBS-2018
GSA

PART-II

Question no. 2:

Answer: Universe^(A): The totality of everything that exists or has existed both in space and time, including all matter and energy, planets, stars, and galaxies, is known as the Universe.

Methods to Measure Age of Universe: There are two methods scientists rely on for calculating the age of the Universe, which are the following:

1. Calculating Expansion Rate of Universe: According to 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 a 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.

$$d = vt$$

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

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

where, $v = Hd$

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

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

Hence, scientists were able to use the Hubble constant to estimate the age of the Universe by working backwards to Big Bang.

2. By Determining Age of Oldest Universe. Scientists determine the age of the Universe from the following:

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

★ **Luminosity:** A brighter star will exhaust its energy faster than a less bright star. Therefore, a star with less luminous intensity exists for a longer time than a star with more luminous intensity.

★ **Mass:** The amount of a star's mass also helps in finding the life of a star. If a star is dense, it tends to die quickly as compared to a less dense star. Thus, the density factor also helps in calculating a star's life.

★ **Motion/Speed:** The brighter star tends to have more energy; in turn, its speed will be greater than the comparatively less luminous star. Eventually, the brighter star will consume its energy quickly and die before the other less bright stars, thus, will have a short life and vice versa.