Science

Q) Describe different methods to estimate the age of a universe

1. Universe:

universe is totally of everything that exists, containing matter and energy, stars, celestial bodies and intergalactic space contents.

2. Methods to estimate age of universe:

There are different methods to estimate age of universe. The commonly accepted age is 13.8 billion years old.

2a. Cosmic microwave background radiation:

This method determine age of universe by analyzing flunctuations in cosmic backgsound radiation.

By using model of cosmic radiation, with expansion rate of universe and dark energy and matter, Scientist that work backwards to determine the age of universe.

2b. Hubble's law and expansion rate of universe:

hubble law states that the speed at which galaxies are receeding away from us is directly proportional to it's distance.

hubble constant is rate at which galaxies are moving away from us. By using hubble constant and model of universe expansion the ~~sp~~ age of universe is calculated

2c. Stellar evolution and global clusters:
Scientists estimate the age of universe by estimating the time the oldest stars in global clusters are formed.
Being familiar with the time they are formed the age of universe can be determined

2d. Radioactive decay of elements:
the age of universe can be calculated by studying the radioactive elements like uranium-238.
By knowing their half lives, initial qualities and time since they were formed, the age of universe can be estimated

Q, **Define the terms dark energy and dark matter**

Dark energy:

Dark energy is ~~hypothesized~~ mysterious form of energy that is hypothesized to permeate all of space.

Role in universe:
It speeds up the expansion of a universe. It acts as an anti-gravity force, dominating the universe overall energy density.

Importance of Dark Energy:
Helps to explain why galaxies, despite gravity, are moving away and expanding at an accelerated speed.

Percentage of the universe:
It is believed to constitute 68% of total mass-energy content of universe.

Dark Matter:

Dark matter is a form of matter that doesnot emit, absorb or reflect light making it invisible to telescope.

Role in universe:
It has gravitational effects on the visible matter such as stars and galaxies in the universe.

Importance of Dark matter:
Crucial for explaining the rotational speed of galaxies and the motion of galaxy clusters.

Percentage of universe:
Dark matter makes up about 27% of total mass-energy content of universe

Q Define the term black hole. what's expected inside it?

Black hole:

Black hole is a region or object with greater density and higher gravitational pull that even lights cannot escape it

Formation of black hole:

Black hole is formed when a star collapses. The helium is unstable particle which reacts to gain stability. This slows the fusion reaction within star, resulting in decreasing internal pressure. As gravity becomes greater then internal pressure, the star collapses.

Key features of black hole:

Singularity: lies at the center of black hole
Event horizon: it surrounds the event horizon

Things expected inside black hole:
Things actually inside the black hole is still a mystery. However, a thing or two are expected inside it:
Extreme gravitational pull:
Extreme gravity is expected inside black hole. To illustrate it the famous phenomena 'Sphagettification' is used which means the gravity would stretch anything that enters black hole.
Unknown physics:
Known laws of physics, particularly general relativity and quantum physics does not apply inside a black hole which indicate presense of laws not known to scientists.

Q how can sun have strong gravitational feild if it's made of gasses?

Sun have a strong gravitational ~~pull~~ feild despite being made of matter. following concepts describes the reason behind sun's strong gravitational feild.

Mass, not matter, determine gravitational strength:

Gravitational feild strength $\propto$ Mass.

Sun is composed of gasses like hydrogen and helium but it has a mass of about 2×10^{30} kg.

which is 333,000 times mass of earth. this intense mass generates a strong gravitational feild

Gravitational force and mass :

the force of gravity depends on masses and distance. the Sun has massive amount of mass concentrated in a large but finite volume, which generates a strong gravitational pull

Density and Composition :

while gasses are not as dense as solid or liquid matter. The Sun's mass, size and internal preasure created by layers of gas compensate for this low density, making it's core extremely dense

Q: Diff b/w star && planet. what is a magnitude of star and how it's correlated w/ thier tempt ?

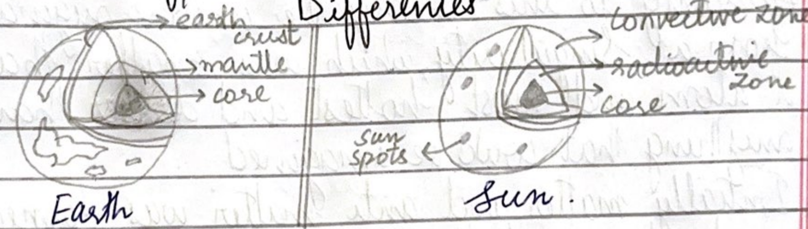
Planet	Star
Key differences	
Light Emissions	
• Planets does not emit light. infact they reflect light from star	• Star produce light through process of nuclear fusion and emits it
Orbits	
• Different artificial and natural satelliate	• Planets revolve around star

revolves around planet	
• planets revolve around stars	• stars revolve around center of gravity

Examples

• Sun, Antares, pistol	• Earth, Mars, Saturn

Typical Example of Structure Differences



Magnitude of a star:

Magnitude of a star refers to it's brightness as can be seen from the earth.

Color of stars and their temperatures:

The color of star is directly correlated with it's temperature due to blackbody radiations. Star emits light across spectrum of wavelength and this emission depends upon its temperature.

Example:

Blue Stars: These emit light of shorter wavelength, which are perceived as blue. These stars are the hottest. They have temperature above 10,000 K

Red stars: They appear as red as they emit light of longer wavelength. They are coolest with temperature below 4000 K.

Q Briefly describe the most popular and acepted theory about origin of universe

Popular and widely accepted theory:
The most popular and widely accepted theory about origin of universe is 'The Big Bang' theory.

Big Bang Theory:
According to this theory the universe originated from a Singularity, which was smaller than a atom and most hottest and denser than anything that could be imagined
Initially matter and anti matter was formed which largely destroyed each other.
After a second, the comparatively stable particles protons and neutrons begin to form
After 3 min temperature was cool enough for proton and neutron to form hydrogen and helium nuclei
After 300,000 years, there was significant drop in temperature and atoms begin to form.
The ~~dust~~ of clouds of dust of helium and hydrogen begin to form celestial bodies

Evidence of Big Bang theory:
Two scientist Penzias and Wilson ~~recorded~~ detected a cosmic microwave background radiation which is thought to be a heat left from the original big bang.

Q What are kepler laws related to motion of planets?

Kepler laws:

Kepler laws, formulated by Johannes Kepler, describe the motion of planets in their orbit around the sun

Kepler 1st Law:

Every planet moves in an eliptical Orbit. the distance between ~~earth~~ sun and planet changes as planet travels along it's orbit

Kepler 2nd Law:

A line segment connecting a planet to the sun sweeps out equal area during equal interval of time.

this implies that planet moves faster when it is closer to the sun and slower when it is farther from sun

Kepler 3rd Law:

the square of the orbital period of a planet is propostional to the cube of the semi-major axis of it's orbit

this can be expressed as.

$$T^2 \propto a^3$$

T= orbital period

a = semi-major axis