

Name: _____ Date: _____

Cosmic Forensics: High School Astrometry & Galactic Evolution Quiz

Examine Friedmann equations, quasar redshift distributions, and nucleosynthesis ratios to reconstruct the billion-year history of the observable universe.

1. Which piece of evidence suggests that galactic rotation curves do not follow the standard Keplerian decline, necessitating the existence of a non-baryonic matter halo?

- A. The Tully-Fisher relationship regarding luminous mass
- B. Flatness of orbital velocities in external disk regions
- C. The abundance of Population II stars in the galactic bulge
- D. Synchrotron radiation from Active Galactic Nuclei (AGN)

2. The observation of ____, highly energetic active nuclei of distant young galaxies, provides evidence that the early universe was significantly more dense and chaotic than it is today.

- A. Quasars
- B. Magnetars
- C. Brown Dwarfs
- D. Planetary Nebulae

3. The 'Great Attractor' is a massive gravitational anomaly in intergalactic space that suggests the motion of the Laniakea Supercluster is influenced by structures beyond our immediate observation.

- A. True
- B. False

4. What is the primary implication of the High-Z Supernova Search Team's discovery regarding the current expansion rate of the universe?

- A. The universe will eventually collapse in a 'Big Crunch'
- B. Expansion is decelerating due to dark matter gravitational pull
- C. The expansion rate is accelerating, fueled by dark energy
- D. Hubble's Constant is actually a variable dependent on iron opacity

5. When analyzing the Cosmic Microwave Background (CMB), the degree of ____ in temperature fluctuations allows cosmologists to calculate the precise geometry of the universe.

- A. Isotropy
- B. Refraction
- C. Anisotropy
- D. Luminosity

6. How does the 'Bottom-Up' (hierarchical) model of galaxy formation differ from the 'Top-Down' model?

- A. It suggests galaxies formed from the fragmentation of giant gas sheets
- B. It posits that small protogalactic fragments merged to form larger systems

Name: _____ Date: _____

- C. It claims elliptical galaxies are older than the universe itself
- D. It requires the absence of dark matter during the Reionization epoch

7. The 'Heat Death' of the universe theory posits that the universe will continue to expand until it reaches a state of maximum entropy where no more work can be performed.

- A. True
- B. False

8. In the context of the cosmic distance ladder, why are Cepheid variables critical for determining the distance to relatively nearby galaxies like M31?

- A. Their distance is always the same regardless of luminosity
- B. They exhibit a direct period-luminosity relationship
- C. They are the only stars that undergo supernova at a specific mass
- D. They emit radio pulses at the exact frequency of hydrogen

9. According to Big Bang Nucleosynthesis, the ratio of ____ to hydrogen provides a strict constraint on the density of ordinary baryonic matter in the early universe.

- A. Carbon
- B. Deuterium
- C. Iron
- D. Silicon

10. The Sloan Digital Sky Survey (SDSS) mapping of the 'Great Wall' confirmed that galaxies are distributed uniformly and randomly throughout space at all scales.

- A. True
- B. False