Name: _____ **Date:** _____

Answer Key: Cosmic Command: Conquer this College Galactic Growth Quiz

Synthesize complex data on galactic nucleosynthesis, redline shifts, and dark matter halos to verify your mastery of large-scale cosmological evolution.

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1. The 'Lyman-alpha forest' observed in the spectra of distant quasars provides primary evidence for which aspect of the intergalactic medium?

Answer: A) The distribution of neutral hydrogen clouds in the early universe

The Lyman-alpha forest consists of numerous absorption lines caused by neutral hydrogen clouds at various redshifts between the observer and a distant light source, tracing the structure of the cosmic web.

2. According to the hierarchical model of galaxy formation, large elliptical galaxies are primarily the result of _____.

Answer: B) Major mergers between smaller spiral galaxies

Hierarchical clustering suggests that large systems, like ellipticals, form through the collision and merging of smaller systems over cosmic time.

3. The 'Baryon Tully-Fisher Relation' demonstrates a tight correlation between a spiral galaxy's total baryonic mass and its rotational velocity.

Answer: A) True

This relation connects the mass of stars and gas in a galaxy to its circular velocity, which is a proxy for the total mass (including dark matter) of the halo.

4. In the context of the cosmic distance ladder, Type Ia supernovae are uniquely valuable because they serve as 'standard candles.' This is due to which physical property?

Answer: C) The Chandrasekhar limit leads to a predictable peak luminosity

Because white dwarfs explode when they exceed the Chandrasekhar limit (~1.4 solar masses), the energy output is consistent, allowing for precise distance measurements.

5. The 'Bottom-Up' theory of structure formation posits that large galaxy superclusters formed before individual stars and galaxies.

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Answer: B) False

The 'Bottom-Up' or CDM (Cold Dark Matter) model states that small structures form first and then merge into larger ones; 'Top-Down' would imply clusters formed first.

6. The unexpected flatness of galactic rotation curves at large radii provides physical evidence for the existence of _____.

Answer: B) Dark Matter Halos

Since visible matter thins out at the edges, the high orbital speeds of outer stars necessitate a massive, invisible component (dark matter) to provide the required gravity.

7. Quasars are most commonly found at high redshifts (z > 2). What does this imply about the evolution of the universe?

Answer: B) Active Galactic Nuclei were more prevalent in the early universe

The high density and frequent mergers in the early universe provided the fuel (gas and dust) necessary to power supermassive black holes into luminous quasars.

8. The era in the early universe when the first stars re-ionized the surrounding neutral hydrogen gas is known as the _____.

Answer: B) Epoch of Reionization

The Epoch of Reionization marks the transition from the 'Dark Ages' to the structured universe we see today as high-energy photons stripped electrons from hydrogen atoms.

9. According to the Lambda-CDM model, Dark Energy currently accounts for approximately 68% of the total energy density of the universe.

Answer: A) True

The Lambda-CDM model uses observations of the CMB and supernovae to conclude that dark energy (Lambda) is the dominant component driving accelerated expansion.

10. What is the primary factor that prevents stars from forming in massive elliptical galaxies today?

Answer: C) AGN feedback and high-temperature virialized gas

Ellipticals are 'red and dead' because their gas is too hot to collapse into stars, often maintained by energy output from an active central black hole.

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