

Name: _____ Date: _____

Answer Key: Stellar Scalpels: 10th Grade Galactic Anatomy Quiz

Examine galactic morphology and cosmic expansion to reinforce high school astrophysics concepts through evidence-based analysis.

1. The Sombrero Galaxy (M104) features a prominent dust lane and a massive central bulge. Based on the Hubble Tuning Fork, why is this classified as an Sa spiral rather than an Sc?

Answer: B) Its tightness of wound arms and dominant bulge size characterize early-type spirals.

In the Hubble sequence, Sa galaxies are defined by large bulges and tightly wound arms, whereas Sc galaxies have small bulges and loose, open arms.

2. The _____ describes the observed phenomenon where the velocity at which a galaxy recedes from an observer is proportional to its distance.

Answer: C) Hubble-Lemaître Law

The Hubble-Lemaître Law provides the observational basis for the expansion of the universe by linking redshift-derived velocity to distance.

3. True or False: According to the Λ CDM model, dark matter acts as the primary gravitational 'glue' that allowed the first large-scale structures to form.

Answer: A) True

Dark matter provided the initial gravitational potential wells that pulled in baryonic gas to form the first stars and galaxies.

4. Vesto Slipher's early 20th-century observations of 'nebulae' (later known as galaxies) were significant because they revealed:

Answer: C) Most distant galaxies exhibit high redshifts, indicating they are moving away.

Slipher was the first to measure the radial velocities of galaxies, finding that the majority were receding, which laid the groundwork for expansion theory.

5. The _____ Epoch refers to the period roughly 380,000 years after the Big Bang when photons could finally travel freely through space.

Answer: D) Recombination

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During Recombination, electrons bound to protons to form neutral hydrogen, making the universe transparent and creating the Cosmic Microwave Background.

6. True or False: Elliptical galaxies are generally characterized by active, ongoing star formation and a high abundance of interstellar gas.

Answer: B) False

Elliptical galaxies are usually 'red and dead,' containing older stars and very little of the cool gas required for new star formation.

7. What is the primary evidence for the existence of the 'Cosmic Web' at a 10th-grade analytical level?

Answer: B) The distribution of galaxies along filaments separated by vast cosmic voids.

Large-scale redshift surveys show that galaxies are not randomly scattered but are organized into a web-like structure of filaments and voids.

8. The Great Attractor is a gravitational anomaly in intergalactic space that is pulling the _____ and other clusters toward it.

Answer: A) Laniakea Supercluster

Laniakea is the massive supercluster that contains the Milky Way; its motion is influenced by the mass concentration known as the Great Attractor.

9. Why does the 'Heat Death' of the universe theory depend on the continued influence of dark energy?

Answer: C) It accelerates expansion, eventually isolating galaxies and exhausting usable energy.

If dark energy continues to accelerate expansion, galaxies will become unreachable to one another, and stars will run out of fuel, leading to a cold, state of maximum entropy.

10. True or False: Galactic cannibalism refers to the process where a larger galaxy consumes a smaller satellite galaxy through tidal forces.

Answer: A) True

This is a standard evolutionary process; for example, the Milky Way is currently 'consuming' the Sagittarius Dwarf Spheroidal Galaxy.