

Name: _____ Date: _____

Answer Key: Cosmic Clues and Galactic Views: An 11th Grade Quiz

Examine redshift data and galactic morphology to assess understanding of the expanding universe and large-scale cosmic evolution.

1. Which transition in the Balmer series of hydrogen is most commonly used by astronomers to calculate the cosmological redshift (z) of a distant galaxy?

Answer: A) H-Alpha line

The H-Alpha line, part of the visible spectrum, is a primary indicator for measuring how much light has been stretched by the expansion of space.

2. According to the Hierarchical Model of galaxy formation, large elliptical galaxies are often the result of multiple mergers between smaller spiral galaxies.

Answer: A) True

The hierarchical model suggests galaxies grow through mergers; the collision of spirals can disrupt their disks and create an elliptical galaxy.

3. The Sombrero Galaxy (M104) is unique because it exhibits characteristics of both spiral and elliptical structures. What is the primary feature defining its 'disk' component?

Answer: B) An unusually thick dust lane

M104 features a prominent dark dust lane and a large central bulge, making it a classic example of an unbarred spiral galaxy viewed nearly edge-on.

4. The ____ Effect describes the process by which light from distant galaxies is distorted as it passes through the gravitational field of a massive foreground cluster.

Answer: C) Gravitational Lensing

Gravitational lensing occurs when mass curves spacetime, acting as a cosmic magnifying glass for background galaxies.

5. Active Galactic Nuclei (AGN), such as Quasars, are powered by the accretion of matter onto stellar-mass black holes residing in the spiral arms.

Answer: B) False

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AGN are powered by supermassive black holes located specifically at the galactic center, not stellar-mass black holes in the arms.

6. Evidence for Dark Matter was famously provided by Vera Rubin, who observed that the ____ of spiral galaxies remained constant even at large distances from the center.

Answer: B) Rotation Curves

Rubin found that stars far from the center move as fast as stars near the center, indicating a massive, invisible halo of dark matter.

7. The Great Attractor is a gravitational anomaly in intergalactic space that is currently pulling our Local Group and the Laniakea Supercluster toward it. Where is it located?

Answer: B) Near the Zone of Avoidance

The Great Attractor is located in the direction of the Centaurus constellation, partially obscured by the Milky Way's disk (the Zone of Avoidance).

8. Observations of Type Ia ____ in the late 1990s led to the Nobel-winning discovery that the expansion of the universe is accelerating due to dark energy.

Answer: C) Supernovae

Type Ia supernovae serve as 'standard candles' because they have a consistent peak luminosity, allowing astronomers to calculate precise distances.

9. The Cosmological Principle assumes that on a large enough scale, the universe is both homogeneous (the same in all places) and isotropic (the same in all directions).

Answer: A) True

This principle is a fundamental starting point for modern cosmology and the Friedmann–Lemaître–Robertson–Walker metric.

10. What is the primary difference between a 'Seyfert Galaxy' and a standard spiral galaxy?

Answer: B) A highly luminous, point-like core

Seyfert galaxies are a class of active galaxies with extremely bright nuclei produced by heated gas falling into a supermassive black hole.