**Name:** _____ **Date:** _____

# Answer Key: Blast Through the Hubble Flow: 10th Grade Cosmology Quiz

Synthesize data on galactic spectroscopy and cosmic topology. High schoolers move beyond basic classifications to evaluate the accelerating expansion of the universe.

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**1. An observer notes a galaxy with a high concentration of Population II stars, virtually no interstellar dust, and a high velocity dispersion of its components. This galaxy likely belongs to which category?**

**Answer:** B) Giant Elliptical (E0)

Elliptical galaxies are characterized by older, metal-poor Population II stars and a lack of active star-forming gas/dust, unlike spirals which contain younger Population I stars.

**2. The paradox which posits that if the universe were infinite, static, and eternal, the night sky should be uniformly bright, is known as _____ Paradox.**

**Answer:** C) Olbers'

Olbers' Paradox suggests that in an infinite, unchanging universe, every line of sight should end on a star, making the night sky as bright as the sun.

**3. Current cosmological consensus based on Type Ia Supernovae measurements suggests that the rate of expansion of the universe is actually increasing rather than slowing down.**

**Answer:** A) True

Observations of distant supernovae provide the primary evidence for Dark Energy, which acts as a repulsive force driving the accelerated expansion of the universe.

**4. Which transition in the early universe, occurring roughly 380,000 years after the Big Bang, allowed photons to travel freely and created the Cosmic Microwave Background?**

**Answer:** C) Recombination

Recombination is the period when electrons and protons combined to form neutral hydrogen atoms, making the universe transparent to radiation.

**5. The rotation curves of spiral galaxies, which show stars orbiting at high speeds even far from the luminous center, provide the strongest evidence for the existence of _____.**

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**Answer:** B) Dark Matter

Vera Rubin's observations showed that galaxies must contain significant invisible mass (dark matter) to maintain their rotation speeds at the edges.

**6. A galaxy showing a 'blueshift' in its spectral lines is moving toward the observer, according to the Doppler Effect.**

**Answer:** A) True

While most distant galaxies are redshifted (moving away), local galaxies like Andromeda are blueshifted as they are gravitionally bound to move toward us.

**7. Which of the following describes the Great Attractor, a gravitational anomaly in intergalactic space?**

**Answer:** B) A concentration of mass that is pulling the Laniakea Supercluster

The Great Attractor is a massive gravity anomaly in the Laniakea Supercluster, influencing the motion of the Milky Way and surrounding galaxies.

**8. The 'Cosmological Principle' states that on a large enough scale, the universe is both isotropic and _____.**

**Answer:** C) Homogeneous

Homogeneous means the universe looks roughly the same from every location; isotropic means it looks the same in every direction.

**9. If the Omega parameter (the ratio of actual density to critical density) of the universe is greater than 1, what is the predicted geometric shape and fate of the universe?**

**Answer:** C) Closed (Spherical); eventual 'Big Crunch'

A universe with density higher than critical density is 'closed,' having enough gravity to eventually halt expansion and collapse.

**10. Active Galactic Nuclei (AGN), such as Seyfert galaxies, derive their enormous energy from the collision of two spiral galaxies.**

**Answer:** B) False

While collisions can trigger activity, the actual energy of an AGN comes from matter accreting onto a supermassive black hole at the galaxy's center.

**Name: _____ Date: _____**