Name: _____ **Date:** _____

Cosmic Caverns and Quasars: A 9th Grade Galactic Quest

Challenge assumptions about cosmological expansion by analyzing spectroscopic shifts and the gravitational influence of unobservable mass.

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1. Spectroscopic analysis of the Andromeda Galaxy (M31) reveals a 'blueshift' rather than a redshift. What does this indicate about its motion within the Local Group?

A. It is moving away from the Milky Way due to cosmic expansion.
B. It is gravitationally bound to the Milky Way and moving toward us.
C. It is experiencing a massive burst of internal star formation.
D. Its orbital velocity has exceeded the speed of light.

2. The rotation curves of spiral galaxies like the Pinwheel Galaxy (M101) remain flat at large distances from the center, implying the presence of ___.

A. Dark Matter
B. Antimatter
C. Supermassive Black Holes
D. Cosmic Dust

3. The Sombrero Galaxy (M104) is classified as an irregular galaxy because of its thick dust lane and prominent central bulge.

A. True
B. False

4. How does the 'Cosmic Web' structure relate to the distribution of matter in the universe?

A. Matter is distributed perfectly evenly across all space.
B. Galaxies are found only in isolated bubbles surrounded by solid matter.
C. Matter clumps into filaments and clusters separated by massive voids.
D. The web structure is only visible in the infrared spectrum.

5. The active galactic nucleus of a distant galaxy that emits massive amounts of energy and outshines its host is called a(n) ___.

A. White Dwarf
B. Quasar
C. Nebula
D. Exoplanet

6. Observing a galaxy with a high redshift means we are seeing it as it existed in the distant past.

A. True
B. False

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7. What is the primary difference in star formation between elliptical galaxies and spiral galaxies?

A. Ellipticals have younger stars; spirals have older stars.
B. Spirals have abundant gas for new stars; ellipticals have very little.
C. Ellipticals rotate faster, preventing star formation.
D. Spirals lack the gravity required to form blue giants.

8. According to Hubble's Law, the velocity at which a galaxy recedes from us is directly proportional to its ___.

A. Mass
B. Brightness
C. Distance
D. Age

9. Edwin Hubble's observations of the Great Andromeda Nebula proved it was located within the boundaries of the Milky Way.

A. True
B. False

10. Which phenomenon suggests that the expansion of the universe is not slowing down, but actually accelerating?

A. Gravitational Lensing
B. Dark Energy
C. Planetary Precession
D. Solar Neutrinos