# Advanced Cosmological Principles

Cosmology · Answer Key · 8 Questions

**1. Which observation provided the most critical evidence against the Steady State theory by demonstrating that the universe was denser in the past?**

**A) The discovery of Quasars at high redshifts**
B) The detection of dark matter halos
C) The measurement of stellar parallax
D) The observation of blue-shifted galaxies

**2. What is the physical significance of the decoupling epoch occurring approximately 380,000 years after the Big Bang?**

A) The formation of the first heavy elements
**B) The transition of the universe from opaque to transparent**
C) The end of the inflationary expansion period
D) The collapse of the first protostellar clouds

**3. In the context of Friedmann-Lemaître-Robertson-Walker (FLRW) models, what does a density parameter (?) equal to exactly 1 imply about the geometry of the universe?**

A) The universe is hyperbolic and open
B) The universe is spherical and closed
**C) The universe is spatially flat**
D) The universe has a variable curvature over time

**4. What component of the cosmic energy density is currently theorized to be responsible for the observed acceleration of the universe's expansion?**

A) Cold Dark Matter
B) Baryonic pressure
**C) Cosmological Constant (Dark Energy)**
D) Neutrino kinetic energy

**5. The Cosmic Microwave Background (CMB) radiation exhibits a temperature fluctuation of approximately one part in 100,000. What do these fluctuations represent?**

A) Measurement errors in satellite instrumentation
**B) Primordial density perturbations in the early universe**
C) Interstellar dust interference
D) The rotation of the Local Group

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**6. Which cosmological distance ladder method relies on the period-luminosity relationship of pulsating variable stars?**

A) Type Ia Supernovae
**B) Cepheid variables**
C) Redshift-distance relation
D) Parallax

**7. What defines the 'Hubble Horizon' in the context of the expansion of the universe?**

**A) The distance at which the recession velocity of an object equals the speed of light**
B) The limit of the observable universe due to the age of the CMB
C) The boundary where gravitational lensing becomes negligible
D) The maximum distance light can travel before being redshifted to radio waves

**8. Why are Type Ia Supernovae classified as 'standard candles' in cosmological distance measurements?**

A) They always occur at the same distance from Earth
**B) They possess a consistent peak absolute magnitude due to the Chandrasekhar limit**
C) They appear in every galaxy at regular intervals
D) They emit light exclusively in the ultraviolet spectrum

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