

QUESTIONS FOR UNDERSTANDING – 1993 Cosmic Times

Baby Universe's First Picture

1. What do the letters CMB stand for?
2. When this CMB radiation was first studied in 1965, was the radiation observed to be the same everywhere ...or were there slight variations?
3. In 1967, what did Rees and Sciama predict must be true about the CMB radiation?
4. What is the Cosmic Background Explorer (COBE) telescope capable of detecting?
5. How old was the light where “lumps” in the CMB radiation were detected?
6. What theory predicts these “lumps” should exist?

Inflation in the Universe

1. In addition to predicting a fairly uniform CMB radiation, what else does Inflation Theory predict?
2. Which region of space would have stronger gravity ... one with a dense distribution of matter, or one with a lower density of matter?

Dark Matter Hunt Heats Up

1. What type of radiation does the ROSAT satellite study?
2. What did ROSAT detect in the empty space between two galaxies?
What is needed to hold the gas there?
3. To create this strong gravity, how much more matter is needed than what can be seen?
4. What is this “unseen” matter called?
5. If there is enough “dark matter,” what could eventually happen to the Universe?
6. What are two ideas that try to explain what dark matter is?

Fool-Proofing Galactic ‘Candles’

1. What causes a Type Ia supernova?
2. What did astronomers believe should be true for all Type Ia supernovae?
3. Why might Type Ia supernovae be better than Cepheid variable stars for measuring distances to some galaxies?
4. In 1993, what did astronomer Mark Phillips discover about some Type Ia supernovae?
5. What do you think might be true about some of the distances to galaxies that were determined with Type Ia supernovae, *before* Phillips’ discovery?
6. In your own words, explain the meaning of the term “standard-candle.”

Pulsar Gravitational Waves Win Nobel Prize

1. For what did Hulse and Taylor win the Nobel Prize in physics in 1993?
2. What did they observe about the orbits of the pulsar and neutron star over a four-year period?

What caused this?

3. What does Einstein’s theory of general relativity predict will happen if two massive objects move in a strong gravitational field?
4. Hulse and Taylor did not directly observe gravitational waves. What did they observe that indicated they must exist?