Period 13 Exercise Answers

E.1 **Why did the condensation of the gravitational force 10^{-43} seconds after the Big Bang contribute to the cooling of the Universe?**

a) The gravitational force caused particles to expand rapidly in a process called the sudden expansion.

b) The gravitational force caused light from stars to be redshifted.

c) Energy going into the gravitational force reduced the energy of photons.

d) The condensation of the gravitational force meant that stars no longer emitted radiation.

e) None of the above answers is correct.

E.1 = c

E.2 **The Sun is 1.6×10^{-5} light years from the Earth. How many kilometers is the Sun from the Earth? (1 light year = 9.46×10^{12} km)**

a) 1.7×10^{6} km
b) 9.5×10^{7} km
c) 1.5×10^{8} km
d) 1.5×10^{11} km
e) 5.9×10^{17} km

$$1.6 \times 10^{-5} \text{ light yrs} \times \frac{9.46 \times 10^{12} \text{ km}}{1 \text{ light yr}} = 1.5 \times 10^{8} \text{ km}$$

E.2 = c

E.3 **Light from a star is observed to be redshifted. What does this tell about the star?**

a) The star is a supernova.
b) The star is cooler than most stars.
c) Cool gas has absorbed the blue light from the star.
d) The star is receding from the Earth.
e) The star has been observed at two points in time, six months apart.

E.3 = d

E.4 Which of the statements about the rotation curve of a spiral galaxy is FALSE?

a) Spiral galaxies rotate as if they were very much like solid disks of matter.

b) The rotation speed of matter in a galaxy is greatest at the galactic center and decreases gradually along the spiral arms.

c) Galaxies may contain undetected matter, known as dark matter.

d) Why galaxies rotate as they do is not well understood by scientists.

e) ALL of the statements are true.

E.4 = b

E.5 Which of the following statements about Einstein's general theory of relativity is FALSE?

a) **The Universe is a four-dimensional flat space.**

b) **The flat universe is bent by gravity; for example, light passing near a star is bent.**

c) **The cosmological constant is a term in the equation for general relativity.**

d) **The cosmological constant can indicate the age of the Universe.**

e) **ALL of the statements are correct.**

The inverse of the Hubble constant can indicate the age of the Universe.

E.5 = d

Period 13 Answers

E.1 = c

E.2 = c

E.3 = d

E.4 = b

E.5 = d