Name **Deep Space** Date Period

Base your answers to questions 1 through 4 on the table below, which shows eight inferred stages describing the formation of the universe from its beginning to the present time.

Data Table

Stage	Description of the Universe	Average Temperature of the Universe (°C)	Time From the Beginning of Universe
1	the size of an atom	?	0 second
2	the size of a grapefruit	?	10^{-43} second
3	"hot soup" of electrons	10^{27}	10^{-32} second
4	Cooling allows protons and neutrons to form.	10^{13}	10^{-6} second
5	still too hot to allow the forming of atoms	10^{8}	3 minutes
6	Electrons combine with protons and neutrons, forming hydrogen and helium atoms. Light emission begins.	10,000	300,000 years
7	Hydrogen and helium form giant clouds (nebulae) that will become galaxies. First stars form.	–200	1 billion years
8	Galaxy clusters form and first stars die. Heavy elements are thrown into space, forming new stars and planets.	–270	13.7 billion years

1. Between which two stages did our solar system form?
   (1) 1 and 3 (2) 3 and 5 (3) 6 and 7 (4) 7 and 8

2. According to this table, the average temperature of the universe since stage 3 has
   (1) decreased, only
   (2) increased, only
   (3) remained the same
   (4) increased, then decreased

3. What is the most appropriate title for this table?
   (1) The Big Bang Theory
   (2) The Theory of Plate Tectonics
   (3) The Law of Superposition
   (4) The Laws of Planetary Motion

4. How soon did protons and neutrons form after the beginning of the universe?
   (1) 10^{-43} second
   (2) 10^{-32} second
   (3) 10^{-6} second
   (4) 13.7 billion years

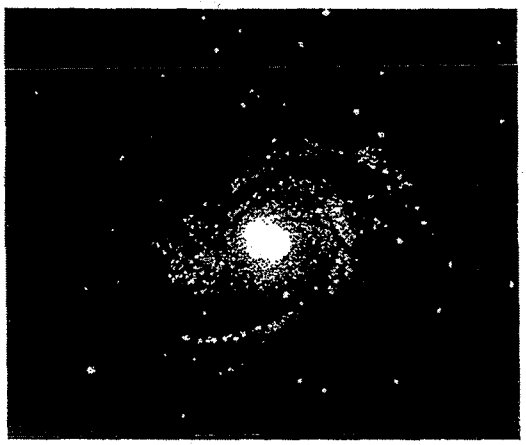
5. Compared to Earth's solar system, the universe is inferred to be
   (1) younger and larger (3) older and larger
   (2) younger and smaller (4) older and smaller

6. Billions of stars in the same region of the universe are called
   (1) solar systems (3) constellations
   (2) asteroid belts (4) galaxies

7. Most scientists believe the Milky Way Galaxy is
   (1) spherical in shape
   (2) 4.6 billion years old
   (3) composed of stars revolving around Earth
   (4) one of billions of galaxies in the universe

8. Which sequence correctly lists the relative sizes from smallest to largest?
   (1) our solar system, universe, Milky Way Galaxy
   (2) our solar system, Milky Way Galaxy, universe
   (3) Milky Way Galaxy, our solar system, universe
   (4) Milky Way Galaxy, universe, our solar system

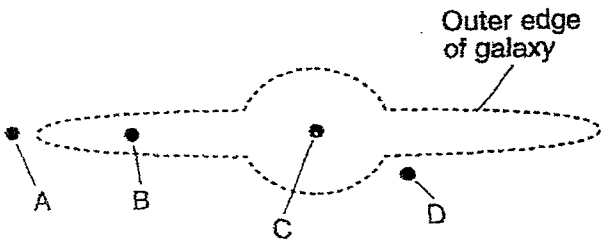
9. The diagram below represents the shape of the Milky Way Galaxy.



The Milky Way Galaxy is best described as
(1) elliptical (3) circular
(2) irregular (4) spiral

10. Most astronomers agree that at the present time universe is
    (1) contracting
    (2) expanding
    (3) staying the same size
    (4) expanding and contracting regularly

11. The diagram below represents a side view of the Milky Way Galaxy.



(Not drawn to scale)

At approximately which position is Earth's solar system located?
(1) *A* (3) *C*
(2) *B* (4) *D*

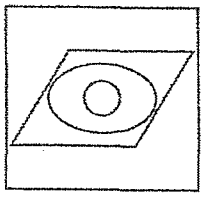
12. Astronomers viewing light from distant galaxies observe a shift of spectral lines toward the red end of the visible spectrum. This shift provides evidence that
    (1) orbital velocities of stars are decreasing
    (2) Earth's atmosphere is warming
    (3) the Sun is cooling
    (4) the universe is expanding

13. Starlight from distant galaxies provides evidence that the universe is expanding because this starlight shows a shift in wavelength toward the
    (1) red-light end of the visible spectrum
    (2) blue-light end of the visible spectrum
    (3) ultraviolet-ray end of the electromagnetic spectrum
    (4) gamma-ray end of the electromagnetic spectrum

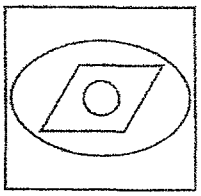
14. The symbols below are used to represent different regions of space.

Universe =  Earth =  Galaxy =  Solar system = 

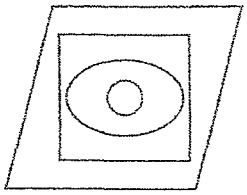
Which diagram shows the correct relationship between these four regions? [If one symbol is within another symbol, that means it is part of, or included in, that symbol.]



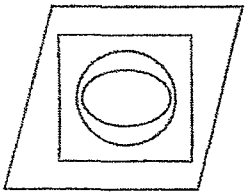
(1)



(2)

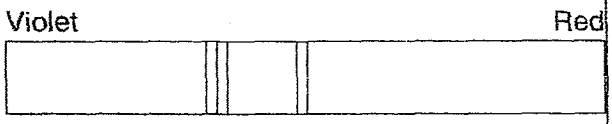


(3)



(4)

15. The diagram below shows the spectral lines for an element.



Which diagram best represents the spectral lines of this element when its light is observed coming from a star that is moving away from Earth?

(1) Violet Red

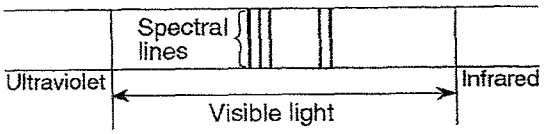
(2) Violet Red

(3) Violet Red

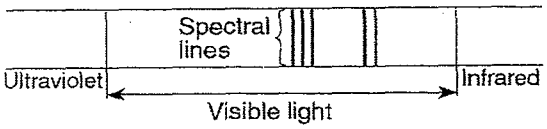
(4) Violet Red

16. The diagram below shows a standard spectrum compared to a spectrum produced from a distant star.

Standard Spectrum



Spectrum from Distant Star



Which conclusion can be made by comparing the standard spectrum to the spectrum produced from this distant star?

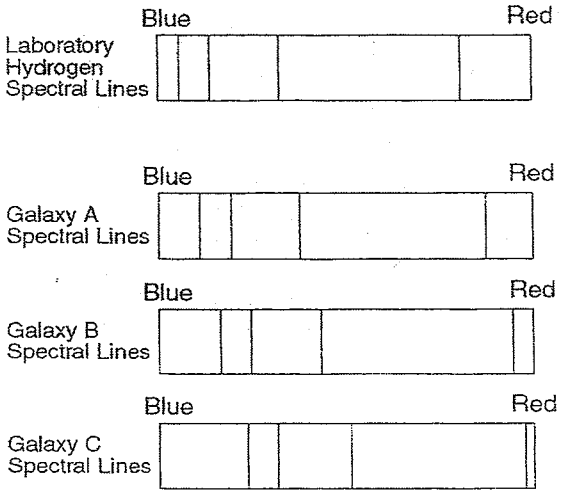
(1) The star's spectral lines have shifted toward the ultraviolet end of the spectrum and the star is moving toward Earth.

(2) The star's spectral lines have shifted toward the ultraviolet end of the spectrum and the star is moving away from Earth.

(3) The star's spectral lines have shifted toward the infrared end of the spectrum and the star is moving toward Earth.

(4) The star's spectral lines have shifted toward the infrared end of the spectrum and the star is moving away from Earth.

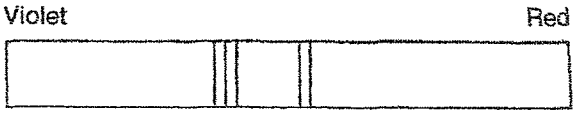
17. In the diagram below, the spectral lines of hydrogen gas from three galaxies, *A*, *B*, and *C*, are compared to the spectral lines of hydrogen gas observed in a laboratory.



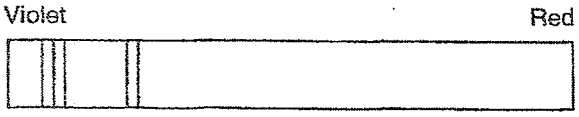
What is the best inference that can be made concerning the movement of galaxies *A*, *B*, and *C*?

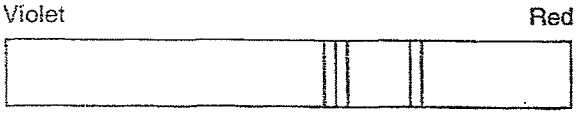
(1) Galaxy *A* is moving away from Earth, but galaxies *B* and *C* are moving toward Earth.
(2) Galaxy *B* is moving away from Earth, but galaxies *A* and *C* are moving toward Earth.
(3) Galaxies *A*, *B*, and *C* are all moving toward Earth.
(4) Galaxies *A*, *B*, and *C* are all moving away from Earth.

18. The diagram below represents a standard dark-line spectrum for an element.

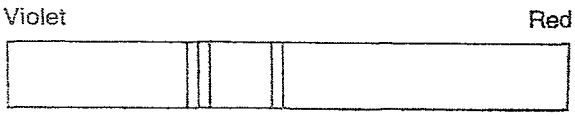


The spectral lines of this element are observed in light from a distant galaxy. Which diagram represents these spectral lines?

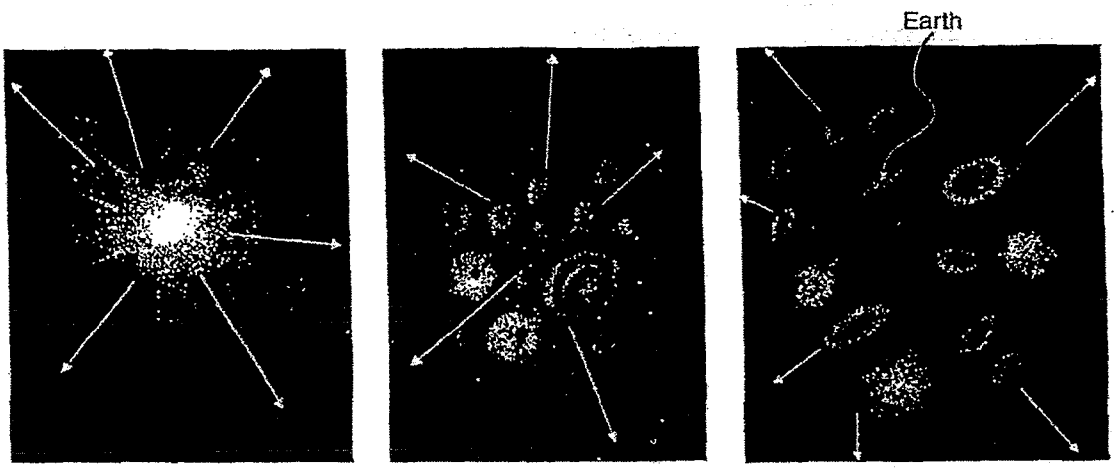
(1) 

(2) 

(3) 

(4) 

19. The diagram below illustrates three stages of a current theory of the formation of the universe.



Stage 1

A ball of hydrogen exploded.

Stage 2

A huge hydrogen cloud moved outward with cloud parts condensing to form galaxies.

Stage 3 (present)

The galaxies continue to move outward.

A major piece of scientific evidence supporting this theory is the fact that wavelengths of light from galaxies moving away from Earth in stage 3 are observed to be

(1) shorter than normal (a red shift)
(2) shorter than normal (a blue shift)
(3) longer than normal (a red shift)
(4) longer than normal (a blue shift)

20. The reaction below represents an energy-producing process.

Hydrogen (lighter element) + Hydrogen (lighter element) → Helium (heavier element) + Energy

The reaction represents how energy is produced

(1) in the Sun by fusion
(2) when water condenses in Earth's atmosphere
(3) from the movement of crustal plates
(4) during nuclear decay

Deep Space Answer Key

1) 4
2) 1
3) 1
4) 3
5) 3
6) 4
7) 4
8) 2
9) 4
10) 2
11) 2
12) 4
13) 1
14) 1
15) 2
16) 4
17) 4
18) 2
19) 3
20) 1