**Earth Science Standard 1, Objective 1 Assessment**

**Multiple Choice**

**b1.** How does light from stars support the Big Bang Theory? It shows that

A. most objects in space are moving away from one another

B. the universe is collapsing again

C. the Big Bang happened slowly over millions of years

D. the light from objects in space is “blue shifted”

**Use the following spectrographs of hydrogen to answer the next two questions.**

Spectrum of hydrogen on Earth

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Red Blue

Spectrum of hydrogen from a distant star

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| --- | --- | --- | --- | --- |
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Red Blue

**b2.** How would the spectrum of hydrogen on the distant star be described?

1. Reflected
2. Red-shifted
3. Offset
4. Refracted

**b3.** How would an astronomer explain the difference between the two spectra?

1. Hydrogen gives off light differently if star is more distant
2. Light traveling through space is warped by the vacuum
3. The star is traveling away from us, lengthening the light waves
4. The star is fusing a different kind of hydrogen than the sun.

**b4.** Which stars have the greatest red shift?

A. Stars closest to Earth where we can see them better.

B. Stars nearest the Sun where light is more plentiful.

C. Stars farthest from Earth with the greatest speed.

D. Stars in the nearest galaxy that are spinning.

**b5.** Which of the following is supported by evidence from red-shifted starlight?

A. Objects in the universe are not moving.

B. Objects in space are moving away from each other.

C. Objects in space are moving toward each other.

D. Objects in space do not give off blue wavelengths.

**b6.** According to scientific theory, what has been happening to the matter in the universe since the Big Bang occurred?

A. Matter has been stable and unmoving ever since.

B. Matter has moved outward and collected into galaxies.

C. Matter has moved from one end of the universe to another.

D. Matter is contracting and coming back together again.

**Use this diagram to answer the next two questions:**

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**b7.** How would the light of the star be described by the observer at X?

A. faster

B. brighter

C. shape-shifted

D. red-shifted

**b8.** What evidence does this star provide that supports the Big Bang theory?

A. it is moving away from other objects in the universe.

B. it is moving towards other objects in the universe.

C. it is giving off light and heat.

D. It fuses hydrogen and helium in the core to give off energy.

**b9.** Which of the following would be the best model of the “Big Bang” theory?

A. dropping a bag of oranges off of a tall building

B. launching a rocket engine

C. lighting a firecracker

D. throwing a ball

**b10.** Why do scientists accept the Big Bang theory?

A. it is a belief based on faith

B. they trust other scientists

C. it seems to make sense

D. evidence supports it

**b11.** How did the Big Bang start?

A. All matter in the universe burst from a tiny point.

B. All matter in the universe appeared in its current location

C. Light waves condensed in a single area and matter formed.

D. Several galaxies collided and exploded.

**c12.** How does the nebular theory describe the formation of the solar system?

1. A star exploded and created the individual planets we have today.
2. A cloud of spinning dust and gas condensed into the sun and planets.
3. A giant asteroid collision broke off parts that became the planets and sun.
4. Chunks of matter from the big bang were blasted into space and formed it.

**c13.** How do meteorites that fall to Earth support the nebular theory?

1. The meteorites are the same age and composition as Earth.
2. The meteorites have evidence of erosional processes on other planets.
3. The meteorites are made from the different elements than those found on Earth.
4. They are the same shape as Earth and the planets.

**c14.** What evidence supports the nebular theory of solar system formation?

1. recent formation of new planets inside our solar system.
2. Measurements of the speed and brightness of distant stars.
3. geologic evidence from the outer planets, Jupiter and Neptune.
4. direct observation of collapsing stars and the matter around them.

**c15.** How did the inner planets gain matter?

1. When heat in their cores expanded them.
2. Through the accretion of matter from space.
3. From the collision of one planet with another.
4. As atoms in the crusts underwent nuclear fusion.

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| **c16.** Which factor allowed the inner terrestrial planets to be formed from denser, rockier  material than the gaseous outer planets? |

1. Greater speed
2. More gravity
3. Higher temperatures
4. Less available matter

**d17.** Which elements were formed in the big bang?

A. carbon, oxygen

B. hydrogen, helium

C. nitrogen, carbon dioxide

D. chlorine, argon

**d18.** Where did the heavy elements that make up Earth come from?

A. other planets

B. colliding asteroids

C. evolving stars

D. evaporating comets

**d19.** What happens the atoms of a star each time it goes through a life stage?

A. more atoms are formed

B. the atoms change places

C. the atoms become heavier

D. the weight of atoms decreases

**d20.** What does a star produce when it undergoes a “nova” or “supernova” explosion?

A. Extremely small, energetic particles

B. Huge quantities of hydrogen

C. Mostly uranium and other radioactive elements

D. All the heavier atoms found in the universe

**d21.** How do stars produce larger and heavier atoms during their lifespan?

A. The atoms fuse as the star goes through its life stages.

B. The atoms expand because they get hotter.

C. The atoms bond together in chemical reactions.

D. The atoms are attracted to each other electrically.

**d22.** A small star with a short lifespan will produce what types of elements?

A. elements with smaller atomic weights

B. elements that are mostly gases

C. elements that have large atomic weights

D. elements that are found on small planets

Use this information from the periodic table to answer the next three questions. Each box shows an element’s symbol (center) and its atomic number (upper left hand). The atomic number indicates how many protons are in the nucleus of the atom.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1**  **H** | **2**  **He** | **3**  **Li** | **4**  **Be** | **5**  **B** | **6**  **C** | **7**  **N** | **8**  **O** | **9**  **F** | **10**  **Ne** |

**d23.** What will the fusion of two hydrogen (H) atoms produce?

A. one half of a helium (He) atom

B. one helium atom

B. two helium atoms

C. one lithium (Li) atom

**d24**. What will the fusion of two helium atoms produce?

A. a lithium atom

B. a berillium (Be) atom

C. a boron (B) atom

D. a carbon (C ) atom

**d25.** All these elements are found on Earth. Where were they formed?

A. in the gas cloud that formed Earth.

B. in Earth’s core

C. in the Sun

D. in ancient stars

**d26.** Which of the following is evidence supporting the scientific explanation for heavy element formation?

A. supernova explosions that have been analyzed by scientists

B. samples of the matter found in our Sun show what it is made of

C. traveling outside Earth shows that stars look the same from space

D. tracing the elements found on Earth to see where they came from

**d27.** Bright new stars have been observed in the remains of exploded star systems. What are the new stars made from?

A. from empty space

B. from the energy of the exploded stars that has become matter

C. from the elements still remaining from the big bang explosion

D. from the elements produced by the exploded stars

**e28.** Centuries ago, people thought that Earth was the center of the universe and that the sun and moon went around it. Why did they think this was true?

A. they were not good at making observations

B. the planets were not visible to people then

C. the universe has changed since the early days

D. the sun and moon appear to go around Earth

**e29.** Galileo went to jail for publishing evidence that supported the sun-centered solar system theory. Why?

A. It appeared he had illegally stolen the work of others.

B. Scientists have often been sent to jail for new ideas they propose.

C. He did not follow the correct steps to have his work approved.

D. His ideas opposed the cultural and religious practices of his time.

**e30.** Most human cultures have explanations for the origin of the universe. How is the scientific explanation different?

A. All scientists agree on it and no further research is needed.

B. It cannot be changed unlike most other explanations

C. It relies on evidence from starlight and other types of radiation

D. It is widely accepted through stories by all cultures.

In 1929, Edwin Hubble made a series of measurements at Mount Wilson Observatory. Using Cepheid variable stars in a number of galaxies, Hubble found that the red shift was related to the distance a star was from Earth.

**f31.** How did technology help Hubble make his discovery?

A. He used telescopes that collected accurate data from space.

B. His work was published in the most recent scientific journals.

C. He used cell phone technology that was ahead of its time.

D. He was able to work on nights when the sky was clear of clouds.

**Use this information to answer the next two questions:**

In 1965, two Bell telephone engineers built a microwave receiver to receive radio transmissions but were unable to eliminate a persistent background noise that seemed to affect the receiver no matter where they pointed it in the sky, day or night. After cleaning the receiver and ruling out other possibilities, they realized their discovery was cosmic background radiation (like heat left over from an explosion) from the Big Bang. They eventually received the Nobel Prize for Physics in 1978.

# f32. How does Cosmic Microwave Background Radiation support the Big Bang theory?

A. It is part of the theory that has never been explained.

B. It is energy left behind from the Big Bang explosion in the form of radiation.

C. It is radiation in space that got moved out of the way during the Big Bang.

D. It is light from the Big Bang that has traveled to the edge of the universe.

**f33.** What does this story show about the development of scientific theory?

A. Scientific discoveries are rarely rewarded.

B. Accidents almost always happen in science.

C. Scientists compete with one another and rarely cooperate.

D. New technology can lead to new discoveries.

**f34.** What does much of the evidence for the Big Bang theory depend on?

A. accepting ideas you cannot understand.

B. understanding the data gathered with technology

C. reading the literature on space and understanding past discoveries

D. observations of the big bang occurring in other galaxies.

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| **f35.** Which of the following statements best describes how technology has contributed to our understanding of the solar system?   1. New technology allows the laws of the universe to change. 2. New technology allows scientists to limit their number of observations. 3. New technology allows scientists to travel to other planets. 4. New technology allows new types of data to be collected more quickly. | |
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# Essay

**1.** Describe the Big Bang theory and what evidence scientists have to support it.

2. Describe the steps in the formation of our solar system.