Sixth Grade "Astronomy: Gravity, Stars, and Galaxies" Assessment

1a. Who was the scientist who developed the Law of Universal Gravitation, which states that between any two objects in the universe, there is an attractive force that grows greater as the objects move closer to each other?

a. Isaac Newton
b. Galileo Galilei
c. Nicolas Copernicus

1b. Choose the best definition of Newton's Law of Universal Gravitation:

a. To any action there is an equal and opposite reaction
b. A body in motion will stay in motion unless acted upon by an outside force
c. Between any two objects in the universe, there is an attractive force that grows greater as the objects move closer to each other

1c. Explain Newton's Law of Universal Gravitation.

_____
_____
_____
_____
_____

2a. The kinetic energy of the planets circling the Sun is balanced with the Sun's gravitational energy, resulting in a stable movement and distance for each planet. This stable path around the sun is called:

a. a circle
b. an orbit
c. a flight path

2b. In order for the planet to maintain stable orbits:

a. Gravitational energy from the Sun must be greater than the kinetic energy of the planets
b. Kinetic energy of the planets must be greater than the gravitational energy of the Sun
c. The kinetic (orbital) and gravitational energies of the Sun and the planets must not interact
d. The kinetic (orbital) and gravitational energies of the Sun and the planets must be balanced

2c. Explain how gravity keeps the planets in orbit around the Sun:

_____
_____
_____
_____
_____

3a. Describe what makes a star different from other objects in space:
   a. It shines by generating its own light, radiating that light and other forms of energy out into space
   b. It is bigger than any other object
   c. It grants wishes

3b. Give the definition of a star:

_____
_____
_____
_____

3c. Identify the important distinction between a star and a planet:

_____
_____
_____
_____
_____

4a. Which of the following is not a classification of a star's size?
   a. dwarf
   b. pulsar
   c. giant

4b. Of the following, which is not a classification for a star's size?
dwarf, pulsar, giant, medium, supergiant

4c. Identify the largest and smallest types of stars that still produce their own light:

_____
_____
_____
_____
_____

5a. What is the name of the star we call the Sun?
   a. Antares
   b. Sol
   c. Luna

5b. What is the nearest star to Earth?

_____

5c. Other than Sol (the Sun), what is the nearest star to the Earth?

_____

6a. When a massive star can no longer produce enough energy to keep it in balance, it collapses and explodes. Sometimes, binary stars can send energy from one to the other and also cause an explosion. These powerful blasts are called:

a. comets
b. supernovas
c. black holes

6b. Match the supernova type to its description:

Type I _____
Type II _____

a. Two stars come closer together under a strong gravitational pull by one of them. When both stars come as close together as possible, one star transfers its matter to surround the other (a white dwarf), until the smaller white dwarf star becomes unstable, collapses, and explodes.
b. One massive star reaches a point when it can no longer maintain fusion. During its core collapse, different types of gases are emitted. All of these gases, when colliding with outer gases, produce a shockwave so huge that the entire star bursts.

6c. Distinguish between Type I and Type II supernovae:

_____
_____
_____

7a. When a star several times the mass of our sun collapses, the force is so great that nothing can stop it and it collapses forever, producing a gravity so intense that not even light can escape. This object is known as a:

a. black hole
b. pulsar
c. red giant

7b. Explain how a black hole is created:

_____
_____
_____
_____
_____

7c. Tell what would happen to light traveling very near, but not past, the event horizon of a supermassive black hole?

_____
_____
_____
_____
_____
_____

8a. The motion of stars across the sky is an illusion caused by the rotation of the Earth. What term is used to explain this apparent movement?

a. retrograde motion
b. hallucination
c. parallax

8b. Parallax is the term used to describe:

a. The apparent motion of stars in the sky caused by the changing position of an observer on Earth as the planet rotates.
b. Ptolemy's explanation of why the planets sometimes seem to move backward in the sky
c. How the universe originally came into being through a massive explosion from a central point
d. How a star balances its gravitational and nuclear energies

8c. Explain the term "parallax":

_____
_____
_____
_____
_____

9a. Some groupings of stars appear to form patterns or figures that different cultures have given names and stories. What do we call these groupings of stars?

a. galaxies
b. solar systems
c. constellations

9b. Name three important constellations:

1. _____
2. _____
3. _____

9c. Aside from their mythological and cultural importance, what purpose is served by organizing stars into constellations?

_____
_____
_____
_____
_____

10a. What is the most common unit of measure used to determine distances in space?

a. miles
b. light years
c. kilometers

10b. Explain what is meant by a light year:

_____
_____
_____
_____
_____

10c. Why do astronomers use light years instead of miles or kilometers to measure distances in space?

_____
_____
_____
_____

11a. What do we call a system of stars, gases, and dust held together by gravity and separated from other such systems by huge amounts of space? (Examples: Andromeda, Milky Way.)

a. galaxy
b. constellation
c. solar system

11b. What is the nearest galaxy to our own Milky Way?

_____

11c. The Milky Way and its nearest galactic neighbor, Andromeda, are both what type of galaxies?

_____
_____
_____
_____
_____

12a. The brightest, most distant visible objects in space are quasars. What is a quasar?

a. a collapsed star
b. the very bright centers of some distant galaxies
c. moons of distant planets

12b. Tell what astronomers currently believe is the likely reason for the intense brightness of quasars:

_____
_____
_____
_____

12c. What is the full name and nature of a “quasar”?

_____
_____
_____
_____
_____
_____

The following Colorado Model Content Standards are addressed in this assessment by the questions indicated:

Questions10a, 10b, 10c: Standard 5-8 1e using appropriate tools, technologies, and measurement units to gather and organize data

Questions 3a, 3b, 3c, 4a, 4b, 4c, 6a, 6b, 6c Standard 5-8 2.1a examining, describing, comparing, measuring, and classifying objects based on common physical and chemical properties

Questions 6a, 6b, 6c, 7a, 6b, 6c, 8a, 8b, 8c Standard 5-8 2.3 a identifying and classifying factors causing change within a system

Questions 6a, 6b, 6c, 7a, 7b, 7c Standard 5-8 4.1d explaining the distribution and causes of natural of natural events

Questions 1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 3c, 5a, 5b, 5c, 8a, 8b, 8c Standard 5-8 4.4a describing the basic components, composition, size, and theories of origin of the solar system

Questions 1a, 1b, 1c, 2a, 2b, 2c, 8a, 8b, 8c Standard 5-8 4.4b explaining the effects of relative motion and positions of the Sun, Earth, and Moon

Questions 1a, 1b, 1c, 2a, 2b, 2c Standard 5-8 6b giving examples of how scientific knowledge changes as new knowledge is acquired and previous ideas are modified

Questions 1a, 1b, 1c Standard 5-8 6c describing contributions to the advancement of science made by people in different cultures and at different times in history
Questions 2a, 2b, 2c, 6a, 6b, 6c, 7a, 7b, 7c Standard 6d identifying and illustrating natural cycles within systems

Answer Key

1a. a. Isaac Newton
1b. c. Between any two objects in the universe, there is an attractive force that grows greater as the objects move closer to each other
1c. Between any two objects in the universe, there is an attractive force that grows greater as the objects move closer to each other

2a. b. an orbit
2b. d. The kinetic (orbital) and gravitational energies of the Sun and the planets must be balanced
2c. Acceptable answers could include:
-Answers may vary, but should explain how the kinetic (orbital) energy of the planets circling the Sun is balanced with the Sun's gravitational energy, resulting in a stable movement and distance for each planet.

3a. a. It shines by generating its own light, radiating that light and other forms of energy out into space
3b. It shines by generating its own light, radiating that light and other forms of energy out into space.
3c. Acceptable answers could include:
-Answers may vary, but should relate: A star generates its own light through nuclear fusion, while planets only reflect the light of their stars.

4a. b. pulsar
4b. pulsar
4c. Largest – (red or blue) Supergiant, smallest – white dwarf

5a. b. Sol
5b. Sol (The Sun)
5c. Proxima Centauri

6a. b. supernovas
6b. Type I = b, Type II = a
6c. Acceptable answers could include:
-Answers will vary, but should state that a Type I involves a binary star system, while a Type II involves only one massive star.

7a. a. black hole
7b. Acceptable answers could include:
-A star heavier than about 3-4 solar masses collapses when it can no longer produce enough fusion to keep it in balance with gravity.
-The gravitational attraction can't be stopped by nuclear forces and the collapse continues past the point that even light cannot escape.
7c. The light is bent

8a. c. parallax
8b. a. The apparent motion of stars in the sky caused by the changing position of an observer on Earth as the planet rotates.
8c. The apparent motion of stars in the sky caused by the changing position of an observer on Earth as the planet rotates.

9a. c. constellations
9b. Answers will vary with instruction and previous knowledge.
9c. As a navigational aid.

10a. b. light years
10b. The distance light can travel in one year (365 days x 186,000 miles per second = 5,865,696,000,000 miles)
10c. Because of the vast distances

11a. a. galaxy
11b. Andromeda
11c. Spiral

12a. b. the very bright centers of some distant galaxies
12b. Huge amounts of energy released as matter in a distant galaxy falls into a supermassive black hole at its center.
12c. "quasi-stellar radio source" - The very bright centers of some distant galaxies probably caused by huge amounts of energy released as matter in a distant galaxy falls into a supermassive black hole at its center.