

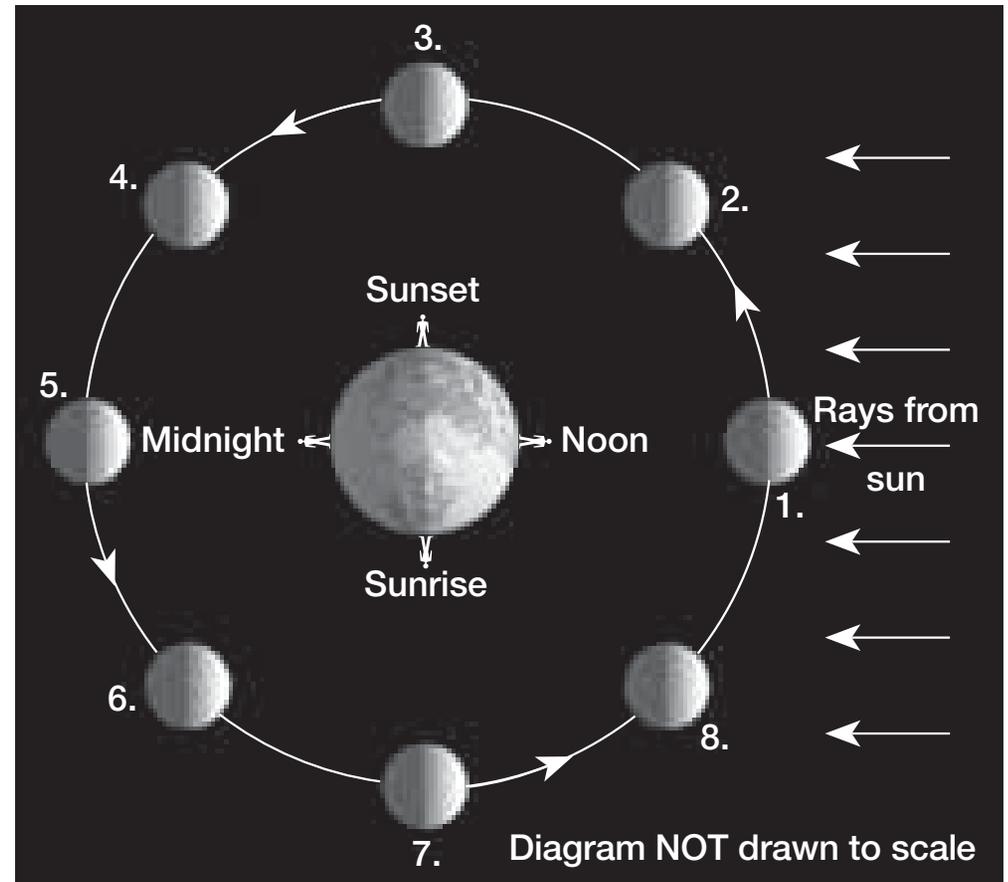
Name _____ Date _____

ASTRONOMY VOCABULARY

11. **Interpreting Graphics** Identify the phases at the following points in the figure.

- 1. _____
- 4. _____
- 5. _____
- 7. _____

12. Between phases 1 and 5, the moon is _____ because the amount of its lighted surface that is visible from Earth increases.



- _____ 1. refracting telescope
- _____ 2. rotation
- _____ 3. X rays
- _____ 4. solstice
- _____ 5. astronomy
- _____ 6. reflecting telescope
- _____ 7. electromagnetic spectrum
- _____ 8. equinox
- _____ 9. galaxy
- _____ 10. revolution

- a. a large collection of stars, dust, and gas held together by gravity
- b. the scientific study of the universe
- c. the spin of a body on its axis
- d. an instrument that uses a curved mirror to gather and focus light from distant objects
- e. the moment when the sun appears to cross the celestial equator
- f. one complete trip of a body along an orbit
- g. all the wavelengths of electromagnetic radiation
- h. an instrument that uses a set of lenses to gather and focus light from distant objects
- i. the point at which the sun is as far north or as far south of the equator as possible
- j. some invisible wavelengths of the electromagnetic spectrum

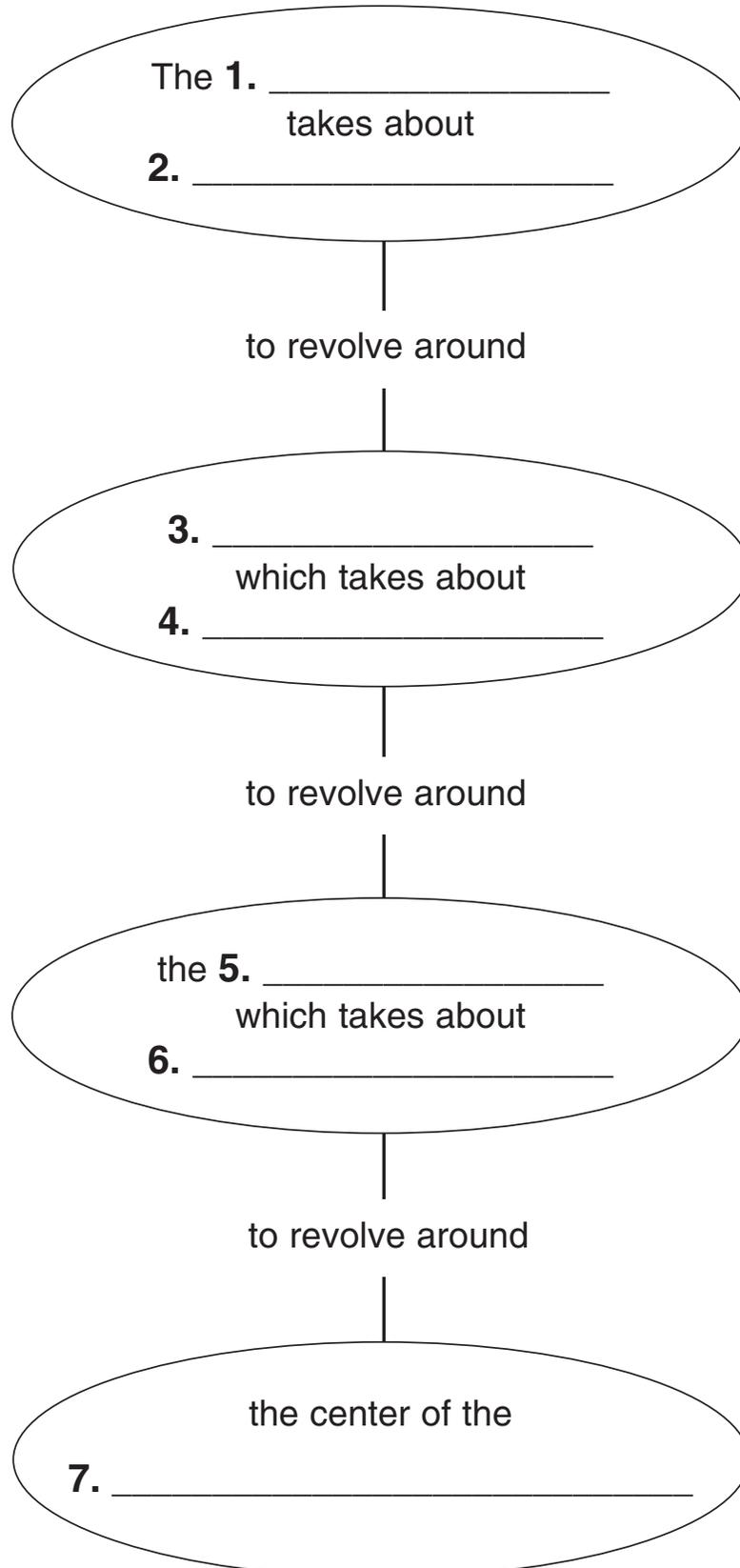
- _____ **1.** Motion of a planet moving in the opposite direction of the normal direction of planetary motion as observed from Earth
- _____ **2.** Point in a planet's orbit when it is farthest from the Sun
- _____ **3.** Nicolaus Copernicus's model of the solar system in which the planets orbit the Sun
- _____ **4.** Oval shape centered on two points instead of one point
- _____ **5.** Point in a planet's orbit when it is closest to the Sun
- _____ **6.** Defines a planet's elliptical orbit as the ratio of the distance between the foci and the length of the major axis
- _____ **7.** Unit of measure that is the average distance between the Sun and Earth (1.4960×10^8 km)
- a.** aphelion
- b.** astronomical unit
- c.** eccentricity
- d.** ellipse
- e.** heliocentric
- f.** perihelion
- g.** retrograde

225 million years
Sun

Earth
365 days

27.3 days

Moon
Milky Way galaxy

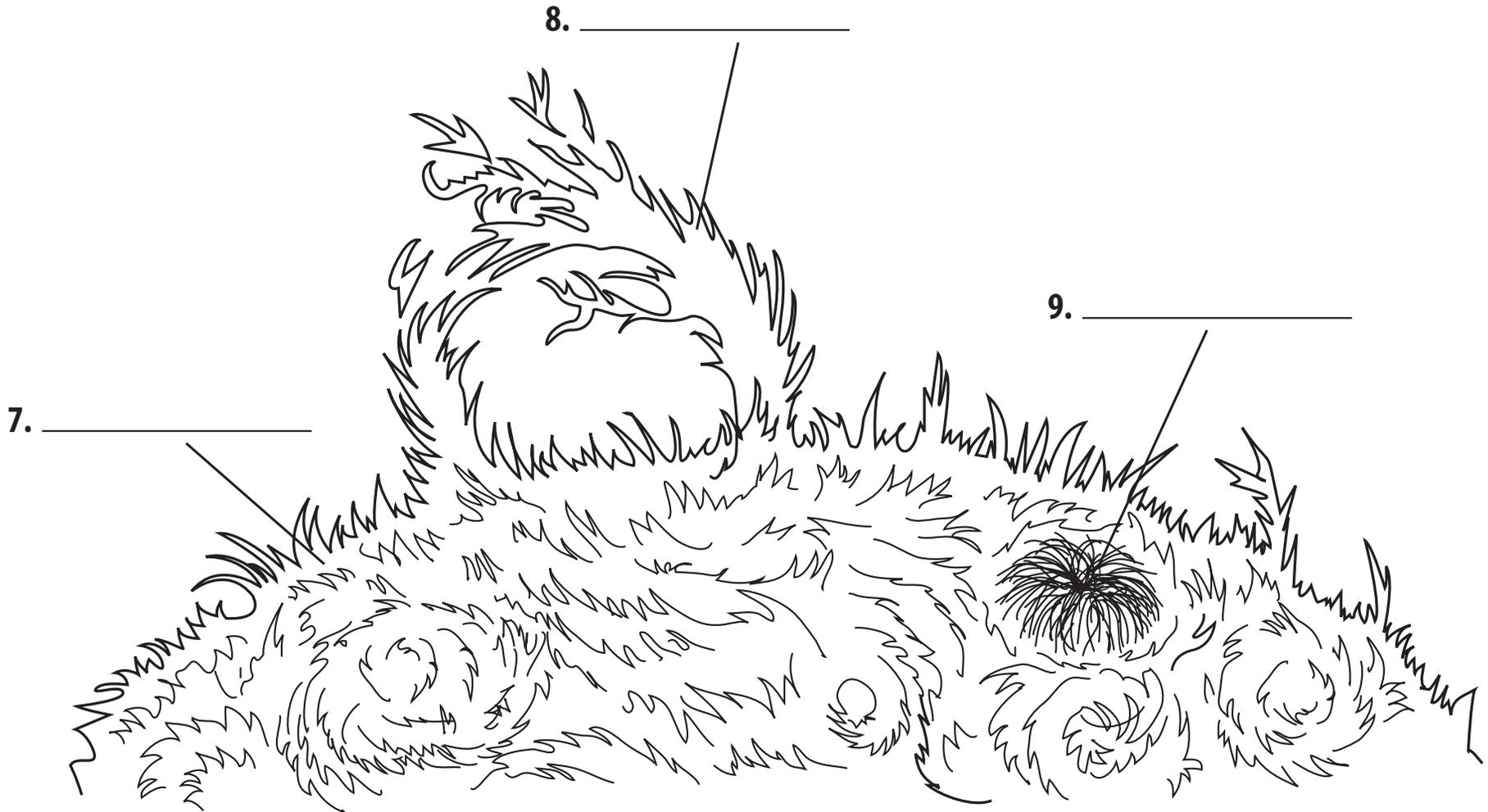


Directions: *Identify the following parts of the Sun in the spaces provided.*

prominence

surface

sunspot



salaxige
1. _____

are composed of

trass
2. _____

that can be

thiwe frawd
3. _____

nima quescnee
4. _____

antigs
5. _____

staruepings
6. _____

Description

Object

- | | | |
|-------|---|--------------|
| _____ | 8. small, solid particle from space that reaches Earth's surface | a. meteor |
| _____ | 9. small, solid particle from space that burns up in Earth's atmosphere | b. meteoroid |
| _____ | 10. small, solid particle that travels through space | c. meteorite |

Column I

- _____ 1. revolution of Earth around the Sun
- _____ 2. rotation of Earth
- _____ 3. tilt of Earth's axis
- _____ 4. position of Earth, the Sun, and the Moon
- _____ 5. new moon and half moon

Column II

- a. night and day
- b. eclipses
- c. Moon phases
- d. seasons
- e. years

- _____ 1. ultraviolet radiation
- _____ 2. galaxy
- _____ 3. rotation
- _____ 4. solstice
- _____ 5. calendar
- _____ 6. constellation
- _____ 7. revolution
- _____ 8. infrared radiation
- _____ 9. perihelion
- _____ 10. equinox
- a. a group of stars organized in a recognizable pattern
- b. the motion of a body around another body in space
- c. the point in time when the sun appears to cross the celestial equator
- d. part of the electromagnetic spectrum with waves longer than those of visible light
- e. the day on which the sun is as far north or as far south of the equator as possible
- f. the point in a planet's orbit at which the planet is closest to the sun
- g. wavelengths that are shorter than violet light
- h. the spin of a body on its axis
- i. a collection of stars, dust, and gas that are held together by gravity
- j. a system for measuring intervals of time by dividing it into days, weeks, months, and years

astronomical unit

meteorites

rotation

comet

revolution

solar system

light-year

supernova

constellations

eclipse

orbit

1. The spinning of Earth on its axis is called _____.
2. It takes a year for Earth to make one _____ around the Sun.
3. When the moon blocks all or part of the Sun, it is called a solar _____.
4. A(n) _____ is equal to 150 million km and is used to measure long distances.
5. Our _____ is made up of nine planets and numerous other objects that orbit the Sun.
6. Groups of stars that form patterns in our sky are _____.
7. A(n) _____ is the distance light travels in a year—about 9.5 trillion km.
8. Earth moves around the Sun in a regular, curved path called a(n) _____.
9. After a(n) _____ occurs, for a few days it might shine more brightly than a whole galaxy.
10. A large body of frozen ice and rock that travels toward the center of the solar system is a(n) _____.
11. Chunks of rock and metal from space that fall to Earth are known as _____.

acceleration

center of mass

distance

force

Isaac Newton

masses

Moon

universal gravitation

English scientist **(8)** _____ developed an understanding of gravity by observing the motion of the **(9)** _____, the orbits of the planets, and the **(10)** _____ of falling objects on Earth. He learned that two bodies attract each other with a **(11)** _____ that depends on their **(12)** _____ and the **(13)** _____ between the bodies. This is called the law of **(14)** _____. He also determined that each planet orbits a point between itself and the Sun. That point is called the **(15)** _____.

carbon	helium	hydrostatic equilibrium	iron
luminosity	magnesium	mass	neon
nuclear fusion	oxygen	silicon	temperature

For a star to be stable, it must have **(1)** _____, which is the balance between gravity squeezing inward and pressure from **(2)** _____ and radiation pushing outward. This balance is governed by the **(3)** _____ of the star. The **(4)** _____ inside a star determines the star's energy output, or **(5)** _____.

Stars on the main sequence produce energy by fusing hydrogen into **(6)** _____. Once a star's core has been converted into helium, it may react if the temperature is high enough. If the temperature is high enough, **(7)** _____ can react with helium to form **(8)** _____, then **(9)** _____, then **(10)** _____, and then **(11)** _____. Other types of reactions can produce even heavier elements, the heaviest being **(12)** _____.

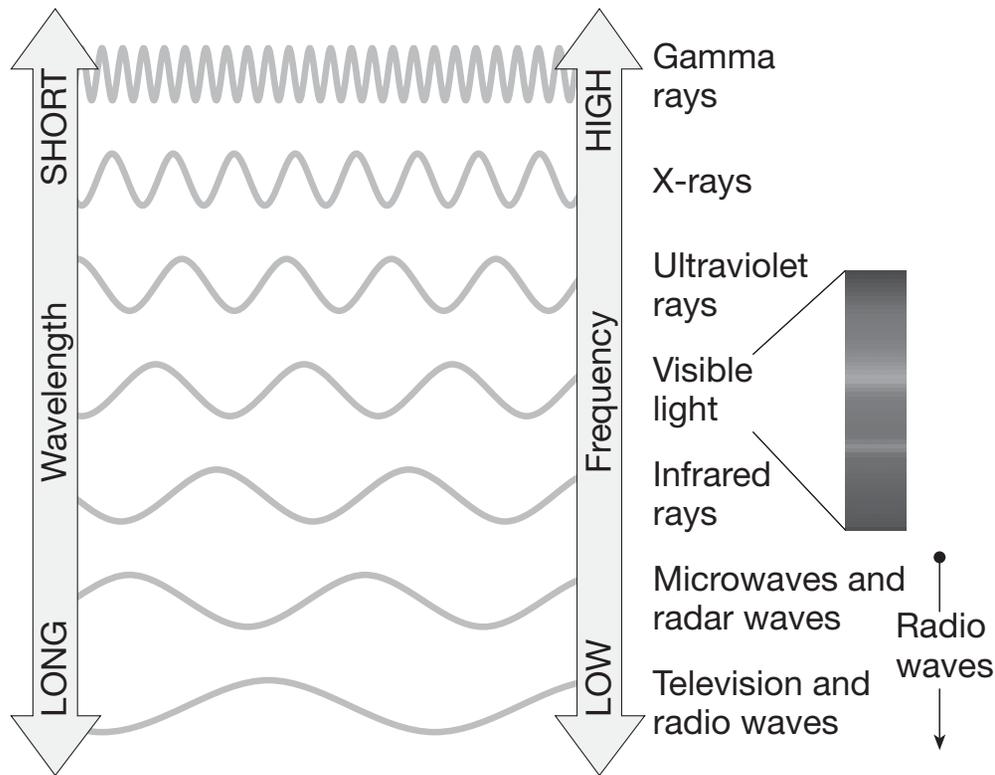


Figure 2

2. Interpreting Graphics How are wavelength and frequency related in electromagnetic radiation?

3. Which type of radiation has a wavelength slightly longer than that of visible light?

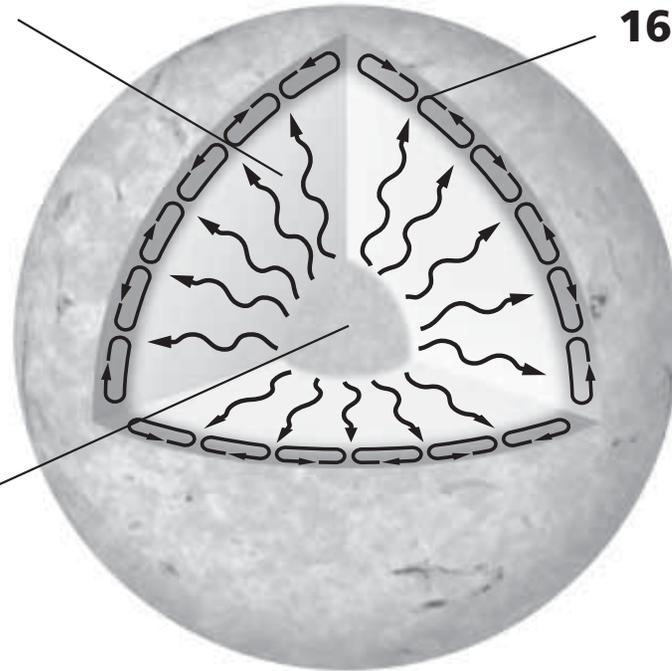
Use the terms below to label the diagram.

convective zone radiative zone core

15. _____

16. _____

17. _____



THE SUN

- _____ 1. gravity
 - _____ 2. orbital period
 - _____ 3. eccentricity
 - _____ 4. inertia
 - _____ 5. retrograde motion
- a. the degree of elongation of an elliptical orbit
 - b. the time required for a body to complete a single orbit
 - c. a pattern that makes planets appear to be moving backward in the sky
 - d. the force that exists between any two bodies in the universe
 - e. the tendency of a stationary body to remain at rest unless acted upon by an outside source

2.6 million **100 billion** **center** **dark matter** **galaxy**
gas clouds **stellar remnants** **halo** **supermassive black hole**

The mass located within the circle of the Sun's orbit through the galaxy is about **(14)** _____ times the mass of the Sun. Because the Sun is of average mass, astronomers have concluded there are about 100 billion stars within the disk of the **(15)** _____.

Astronomers have found evidence that much more mass exists in the outer galaxy. The stars and **(16)** _____ that orbit in the outer disk are moving faster than they would if the galaxy's mass were concentrated near the **(17)** _____ of the disk. Evidence indicates that as much as 90 percent of the galaxy's mass is contained in the **(18)** _____. This mass is not observed in the form of normal stars, and astronomers hypothesize that some of this unseen matter is in the form of dim **(19)** _____, such as white dwarfs, neutron stars, and black holes. The remainder of this mass, usually called **(20)** _____, is a mystery.

Studies of the motion of stars that orbit close to Sagittarius A* indicate that this area has about **(21)** _____ times the mass of the Sun, but is smaller than our solar system. Astronomers believe that Sagittarius A* is a **(22)** _____ that glows brightly because of the hot gas surrounding it and spiraling into it.

- | | | |
|-------|---------------------------------|---|
| _____ | 1. outer planets | a. planets characterized by solid rock with a metallic core, zero to two moons, and impact craters |
| _____ | 2. Ptolemy | |
| _____ | 3. inner planets | b. principle stating that each planet orbits the sun in a closed curve whose shape is determined by two foci |
| _____ | 4. planetesimals | |
| _____ | 5. nebular hypothesis | c. small bodies from which planets formed in the early stages of the development of the solar system |
| _____ | 6. Kepler's law of ellipses | d. astronomer who believed that planets revolve around the sun at different speeds and distances from it |
| _____ | 7. Kepler's law of periods | e. planets characterized by massive size, relatively low density, a thick atmosphere of helium and hydrogen, and a rock and metal core |
| _____ | 8. differentiation | f. law that the cube of the average distance of a planet from the sun is proportional to the square of the orbital period of the planet |
| _____ | 9. Copernicus | g. principle stating that equal areas are covered in equal amounts of time as an object orbits the sun |
| _____ | 10. Kepler's law of equal areas | h. theory that the sun and the planets condensed at about the same time out of a rotating cloud of gas and dust |
| | | i. astronomer who believed that planets moved in epicycles as they moved in larger and larger circles around Earth |
| | | j. the process by which Earth formed three distinct layers: a dense core of iron and nickel, a thick layer of iron- and magnesium-rich rock, and a thin crust of silica-rich rock |

_____ 1. absolute magnitude

_____ 2. light-year

_____ 3. parallax

_____ 4. apparent
magnitude

_____ 5. Doppler effect

a. the apparent shift in wavelength of light as the source moves away from or toward an observer

b. an apparent shift in position of an object when viewed from different locations

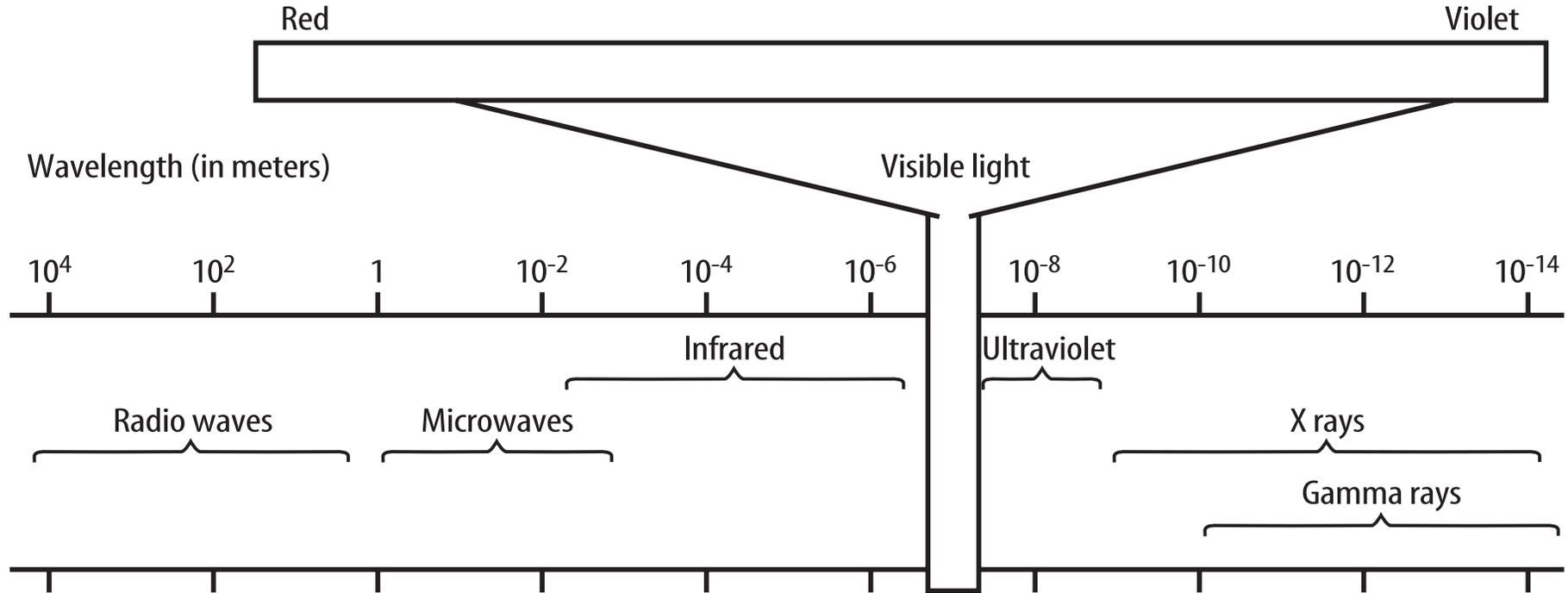
c. the brightness of a star as seen from Earth

d. the brightness of a star if all the stars were at a uniform distance from Earth

e. the distance light travels in a year

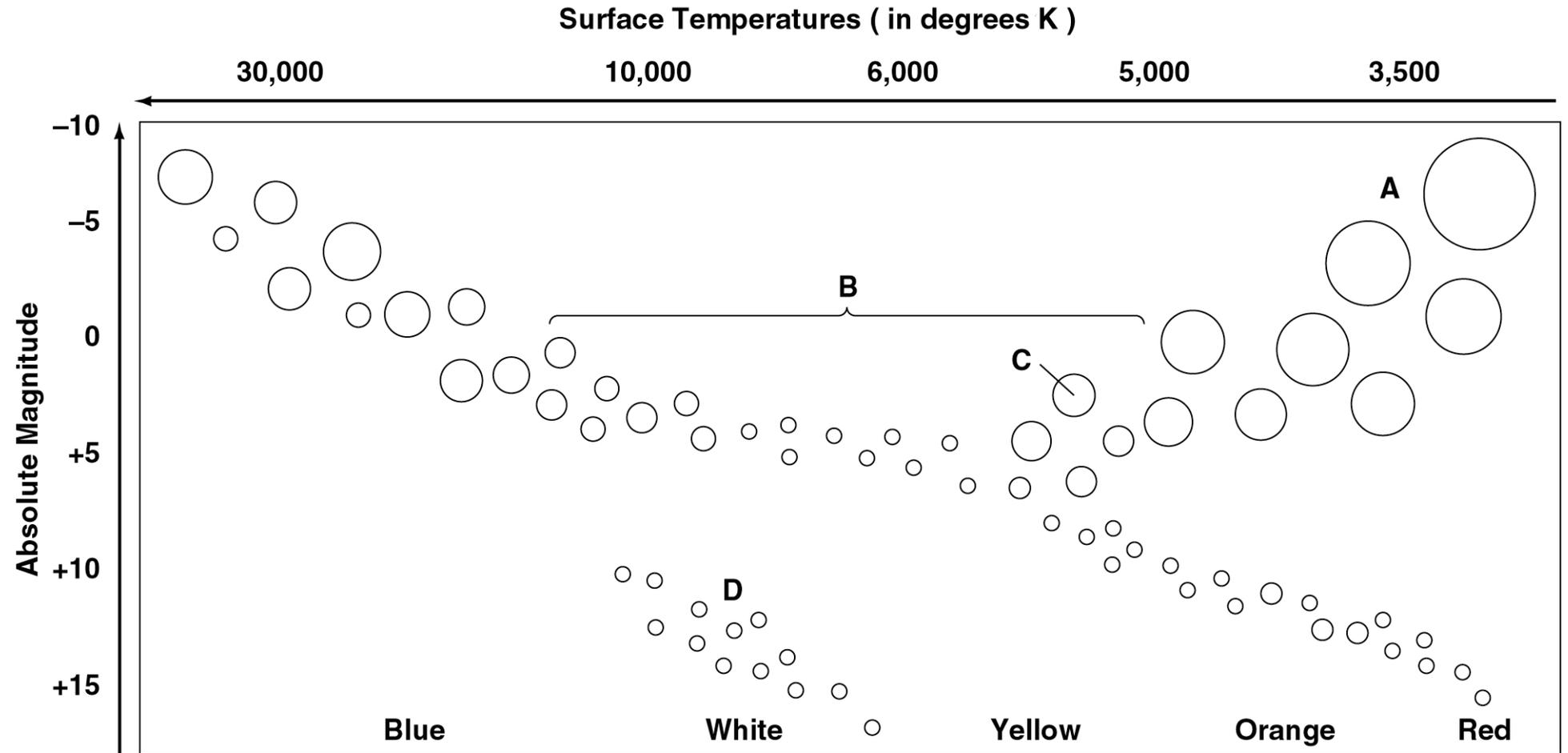
- _____ 1. quasar
 - _____ 2. irregular galaxy
 - _____ 3. constellation
 - _____ 4. spiral galaxy
 - _____ 5. elliptical galaxy
- a. has no particular shape
 - b. varies in shape from nearly spherical to very elongated
 - c. has a nucleus of bright stars with arms that circle around it
 - d. a luminous object producing energy at a high rate
 - e. a group of stars organized in a pattern, and the region of space around them

Directions: Use the figure to help you complete each statement. Write the term that completes each statement on the blank provided.



- Only X rays and gamma rays are shorter than _____ waves.
- The electromagnetic radiation with the longest wavelengths is _____.
- _____ waves are shorter than microwaves and longer than visible light.
- The electromagnetic radiation with the shortest wavelengths is _____.
- The wavelengths of visible light are _____ than those of X rays.

- _____ **23.** The closest point to Earth in the Moon's orbit
- _____ **24.** The inner portion of the shadow cast on Earth by the Moon
- _____ **25.** Blocking of the Sun's light by the Moon passing between Earth and the Sun
- _____ **26.** Farthest point from Earth in the Moon's orbit
- _____ **27.** State at which the Moon's orbital and rotational periods are equal
- _____ **28.** Occurs when the Moon passes through Earth's shadow
- _____ **29.** Length of time it takes for the Moon to go through a complete cycle of phases
- _____ **30.** The daily rise and fall of Earth's oceans caused by the gravitational pull of the Moon and the Sun
- _____ **31.** Outer portion of the shadow cast on Earth by the Moon
- a.** synchronous rotation
- b.** lunar month
- c.** tides
- d.** solar eclipse
- e.** umbra
- f.** penumbra
- g.** perigee
- h.** apogee
- i.** lunar eclipse



1. the Sun _____
2. red giants _____
3. white dwarfs _____
4. main sequence stars _____

Clues

1. apparent westward drift of a planet as seen from Earth
2. an oval-shaped path
3. average distance between Earth and the sun
4. spinning of a body on its axis
5. motion of a body along a path around some point in space
6. point at which Earth is farthest from the sun
7. point at which the moon is farthest from Earth
8. cycle of changes in the amount of the moon that appears lit
9. splash mark radiating outward from a crater

ellipse
ray
rotation
phases of the moon
retrograde motion
astronomical unit
aphelion
revolution
apogee

Vocabulary Terms

1. _ _ _ _ _ ○ _ _ _ _ _
2. _ _ _ _ _ ○ _
3. _ _ ○ _ _ _ _ _ _ _ _ _ _
4. ○ _ _ _ _ _ _ _
5. _ _ _ _ _ ○ _ _ _ _ _
6. _ _ _ _ _ _ _ _ _ _ ○
7. _ _ _ ○ _ _ _ _
8. _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ ○ _ _ _ _
9. _ _ _ ○

Hidden Word: _ _ _ _ _

- _____ 1. cosmology
 - _____ 2. dark matter
 - _____ 3. dark energy
 - _____ 4. big bang theory
 - _____ 5. cosmic background radiation
- a. a force that opposes gravity and is thought to be why the universe is expanding
 - b. the study of the origin, structure, and evolution of the universe
 - c. a remnant of the big bang
 - d. matter that does not give off light but has detectable gravity
 - e. the theory that all matter and energy was compressed into a small volume and then exploded and began expanding

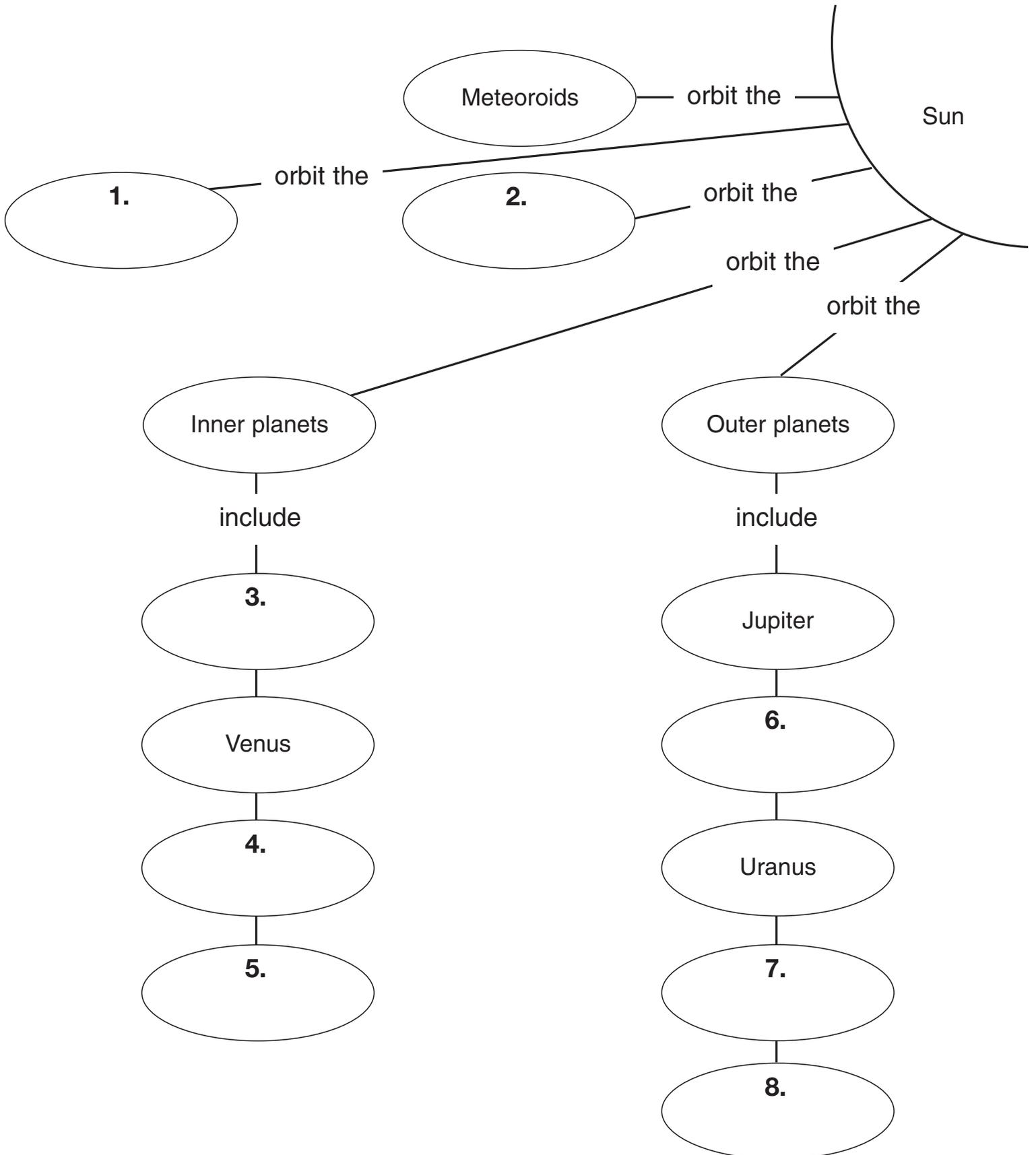
- | | | |
|-------|--------------------|--|
| _____ | 1. radiative zone | a. at the center of the sun |
| _____ | 2. photosphere | b. outermost layer of the sun's atmosphere |
| _____ | 3. aurora | c. region of the sun from which energy moves upward |
| _____ | 4. corona | d. dark, cooler area on the sun |
| _____ | 5. solar flare | e. glowing cloud of gas that arches over the sun's surface |
| _____ | 6. chromosphere | f. layer of sun's atmosphere that glows with a reddish color |
| _____ | 7. convective zone | g. area of the sun closest to the core |
| _____ | 8. core | h. visible surface of the sun; innermost layer of the sun's atmosphere |
| _____ | 9. sunspot | i. violent, explosive release of solar energy |
| _____ | 10. prominence | j. colored light resulting from solar wind interacting with Earth's atmosphere |

Pluto
Asteroids

Mars
Neptune

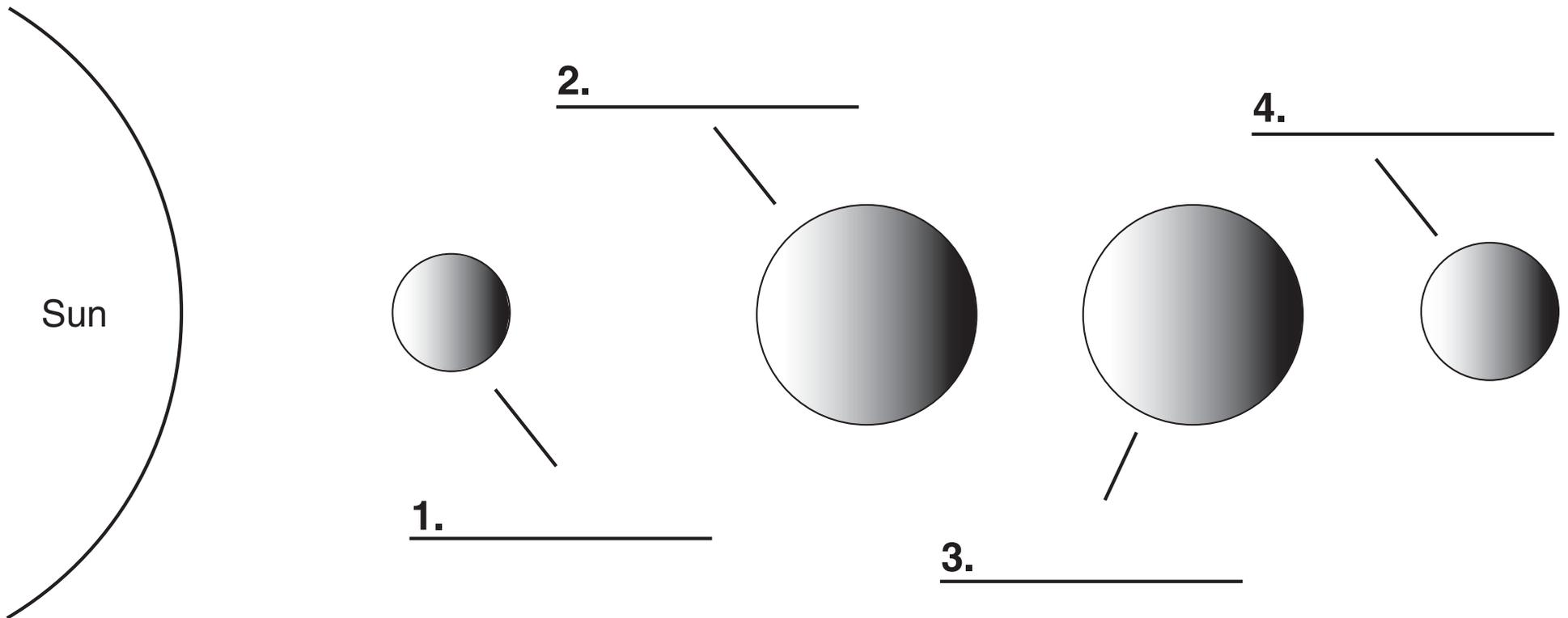
Saturn
Comets

Mercury
Earth



- _____ 1. nebula
- _____ 2. nova
- _____ 3. neutron
star
- _____ 4. protostar
- _____ 5. black hole
- a. a dense, collapsed star whose electrons and protons
smashed together to form neutrons
- b. a large cloud of gas and dust in space where stars
are born
- c. a shrinking, spinning region in space with a central
concentration of matter
- d. a large explosion on a star that makes it brighter
- e. an object so dense that even light cannot escape its
gravity

Directions: Study the following diagram. Then identify each inner planet by filling in the blanks.

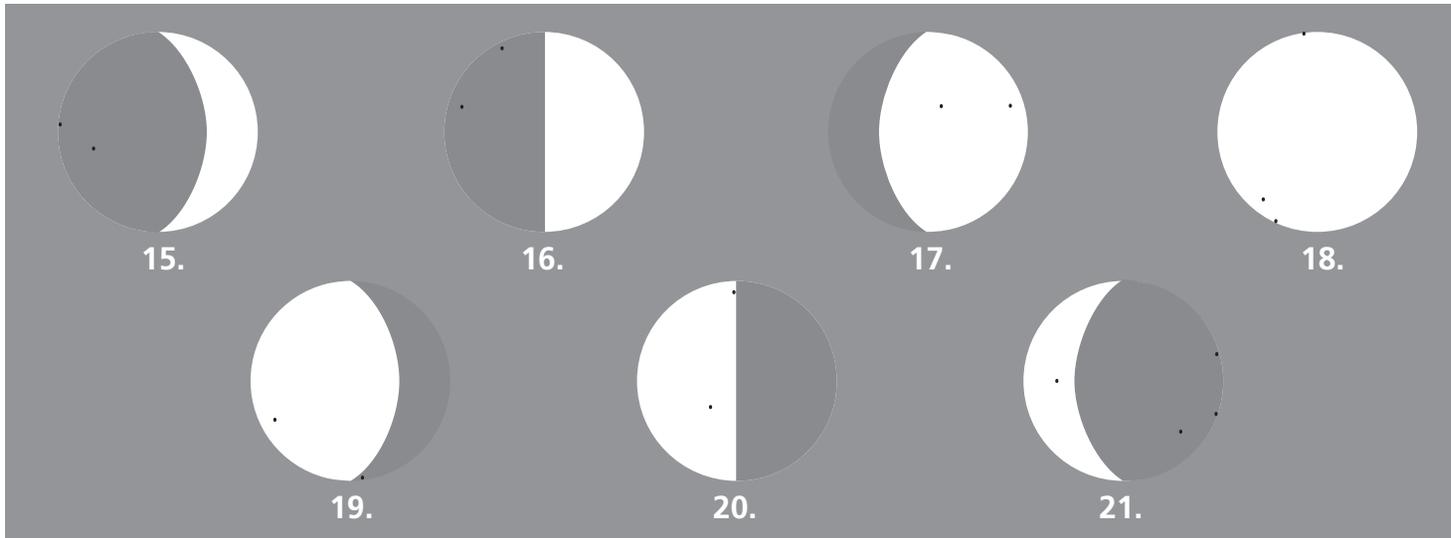


- 1. comet
- 2. meteor
- 3. asteroid
- 4. meteoroid
- 5. Oort cloud
- 6. Kuiper Belt
- 7. meteorite

- a. the ring of icy bodies beyond Neptune's orbit that contains dwarf planets and other small bodies made mostly of ice
- b. a spherical region that surrounds the solar system and contains billions of comets
- c. a relatively small, rocky body that travels through space
- d. a small body made of ice, rock, and cosmic dust that follows an elliptical orbit around the sun
- e. a streak of light caused by a meteoroid burning up in Earth's atmosphere
- f. a small, rocky object that orbits the sun
- g. a meteoroid that hits Earth

- _____ 1. asteroid
- _____ 2. eclipse
- _____ 3. *Voyager*
- _____ 4. apogee
- _____ 5. crater
- _____ 6. Saturn
- _____ 7. crust
- _____ 8. phase
- _____ 9. Neptune
- _____ 10. comet
- a. the point at which the moon is farthest from Earth
- b. the change in the illuminated area of one celestial body as seen from another celestial body
- c. a planet that has a small number of clumpy rings
- d. spacecraft that first sent images of Io's volcanoes to Earth
- e. planet that has many thin complex rings, each with its own orbit
- f. surface layer of the moon; about 60 km thick on the near side and up to 100 km thick on the far side
- g. a bowl-shaped depression that forms on the surface of an object when a falling body strikes the object's surface
- h. a small, rocky object; orbits the sun
- i. an event in which the shadow of one celestial body falls on another
- j. a small body of rock, ice, and cosmic dust that follows an elliptical orbit around the sun

Label each phase of the Moon below. Choose from the following phases: *waning gibbous*, *waxing crescent*, *third quarter*, *first quarter*, *waxing gibbous*, *waning crescent*, *full moon*.



15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

21. _____

- _____ 1. prominence
 - _____ 2. solar flare
 - _____ 3. coronal mass ejection
 - _____ 4. sunspot
 - _____ 5. auroras
- a. cooler, dark area of the photosphere, with a strong magnetic field
 - b. colored light produced when charged particles from solar wind react with Earth's upper atmosphere
 - c. a sudden outward eruption of electrically charged particles
 - d. part of coronal gas thrown into space by the sun
 - e. loop of incandescent gas that extends above the photosphere

corona
photons
solar flares
sunspots
photosphere
Doppler effect

continuous spectrum
electromagnetic spectrum
radio telescope
spectroscopy
refracting telescope

Sunspots are associated with brief outbursts called _____.

_____ are dark regions on the surface of the photosphere.

The study of the properties of light that depend on wavelength is

_____.

A(n) _____ uses wire mesh as a reflector to collect radiation from space.

The siren from an ambulance that is approaching you seems louder because of the _____.

Galileo used a(n) _____ that had a lens to bend light.

The _____ is the outermost part of the sun's atmosphere.

Most of the sunlight we can see comes from the _____ of the sun.

The _____ is the arrangement of electromagnetic waves according to their wavelengths and frequencies.

_____ are particles of light.

An uninterrupted band of color produced by a prism is a(n)

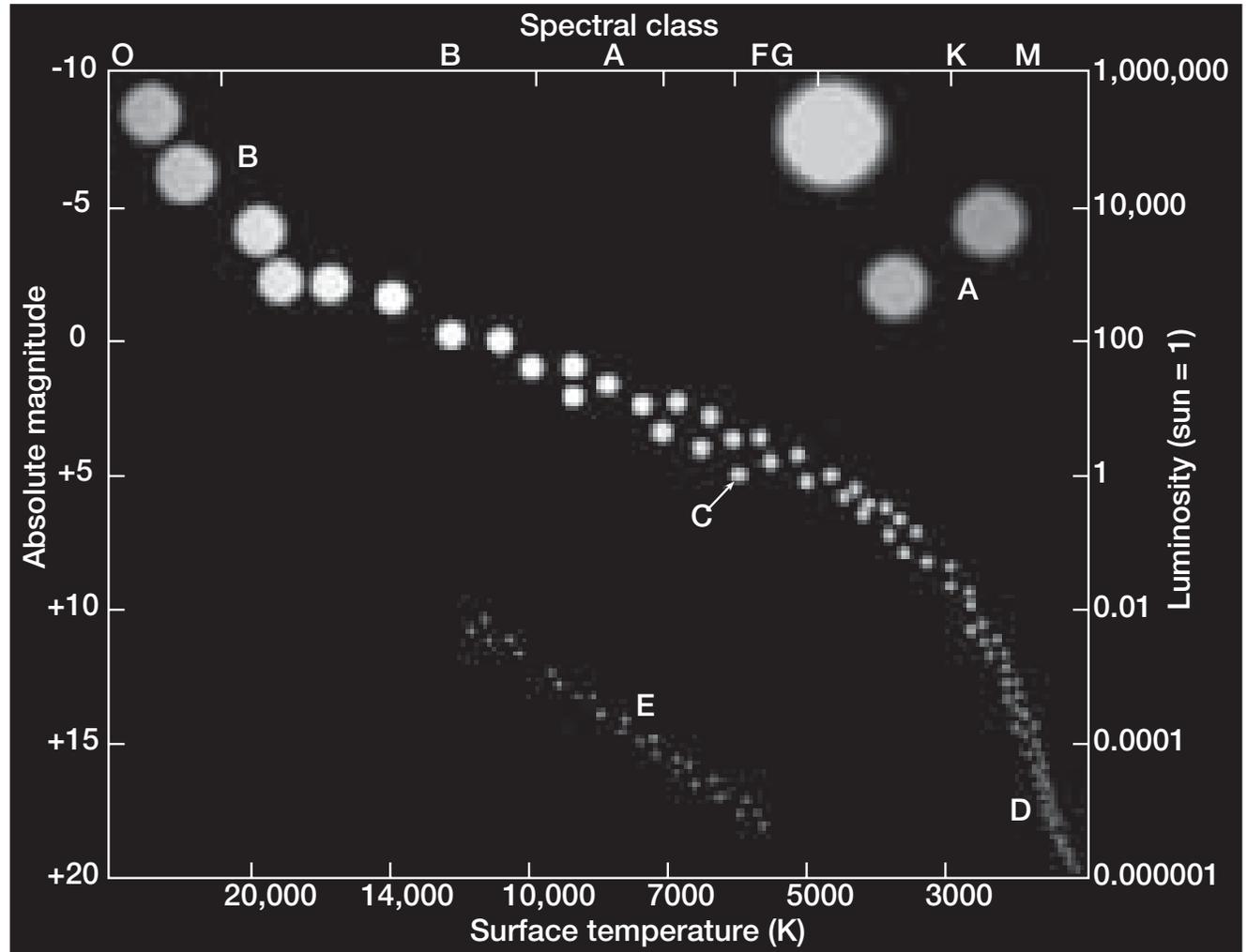
_____.

- _____ 1. astronomical unit
 - _____ 2. radio telescope
 - _____ 3. electromagnetic spectrum
 - _____ 4. astronomy
 - _____ 5. galaxy
- a. large collection of stars, dust, and gas bound together by gravity
 - b. an instrument that detects radio waves from objects in space
 - c. the average distance between Earth and the sun
 - d. the scientific study of the universe
 - e. all the frequencies or wavelengths of electromagnetic radiation

Select the appropriate letter in the figure that identifies each of the following features.

Idealized Hertzsprung-Russell Diagram

- _____ the sun
- _____ cool, small, red stars
- _____ white dwarfs (small faint stars)
- _____ red giants (bright cool stars)
- _____ hot, large, blue stars



- _____ 1. constellation
- _____ 2. elliptical galaxy
- _____ 3. the big bang
- _____ 4. cosmic
background
radiation
- _____ 5. spiral galaxy
- _____ 6. irregular galaxy
- _____ 7. quasar
- _____ 8. pulsar
- _____ 9. nova
- _____ 10. protostar
- a. object at the center of some galaxies that produces energy at a high rate
- b. a neutron star that emits radio waves
- c. a shrinking, spinning region of space with a central concentration of matter
- d. a group of stars in a recognizable pattern
- e. evidence of the big bang
- f. a star group elongated in shape
- g. a star group of no particular shape; rich in dust and gas
- h. a large explosion that causes a star to suddenly become bright
- i. the theory that all matter and energy exploded from a small compressed volume about 14 billion years ago
- j. a star group with a nucleus of bright stars and arms containing young stars

- _____ 1. mare
 - _____ 2. crater
 - _____ 3. moon
 - _____ 4. regolith
 - _____ 5. anorthosite
- a. layer of crushed rock and dust on the moon's surface
 - b. a rock composing the light, rough highland areas of the moon's surface
 - c. a bowl-shaped depression that forms on the surface of an object when a falling body strikes it
 - d. a smaller natural body that orbits a planet
 - e. a large, dark area of lunar basalt

Eclipses occur when

the moon comes
between Earth and the
sun.

a.

Such an event is called a

b.

c. lunar eclipse.

- _____ 1. apogee
 - _____ 2. solar eclipse
 - _____ 3. perigee
 - _____ 4. barycenter
 - _____ 5. lunar eclipse
- a. the balance point of the Earth-moon system
 - b. the point at which a satellite is nearest to Earth in its orbit around Earth
 - c. an event in which the moon's shadow falls on Earth when the moon passes between Earth and the sun
 - d. the point at which a satellite is farthest from Earth in its orbit around Earth
 - e. the passing of the moon through Earth's shadow at full moon

- _____ 1. Galilean moon
 - a. a densely cratered moon
 - b. a moon known for volcanism
 - c. any of the four largest satellites of Jupiter
 - d. a moon covered with a thick crust of ice
 - e. a large moon with a strong magnetic field
- _____ 2. Io
- _____ 3. Ganymede
- _____ 4. Callisto
- _____ 5. Europa

Milky Way	one trillion	Andromeda
Local Group	Steady state theory	cluster
Doppler shift	Big Bang theory	spiral
elliptical	Clouds of Magellan	Oscillating model

1. The two types of _____ galaxies are barred and normal.
2. A _____ is a group of galaxies.
3. _____ galaxies have many different shapes and are usually smaller and less common than other types of galaxies.
4. An elliptical galaxy about 2.9 million light-years away is in the constellation of _____.
5. Galaxies shaped like footballs are _____ galaxies.
6. Two irregular galaxies called the _____ orbit the Milky Way.
7. A _____ is a large group of stars, gas, and dust held together by gravity.
8. The _____ is an explanation for the formation of the universe.
9. The solar system in which we live is in the _____ Galaxy.
10. The Milky Way Galaxy may contain _____.
11. The Andromeda Galaxy is a member of the _____.
12. The _____ causes changes in the light coming from distant stars and galaxies.
13. One model of the origin of the universe is the _____, which proposes that the universe was always as it is now.
14. Another model of the origin of the universe is the _____, which believes that the universe expands and contracts in a regular pattern.

- _____ 1. equinox
 - _____ 2. aphelion
 - _____ 3. Coriolis effect
 - _____ 4. perihelion
 - _____ 5. solstice
- a. curving of the path of wind belts and ocean currents
 - b. the moment when the sun appears to cross the celestial equator
 - c. the point in a planet's orbit at which the planet is farthest from the sun
 - d. the point at which the sun is as far north or as far south of the equator as possible
 - e. the point in a planet's orbit at which the planet is closest to the sun

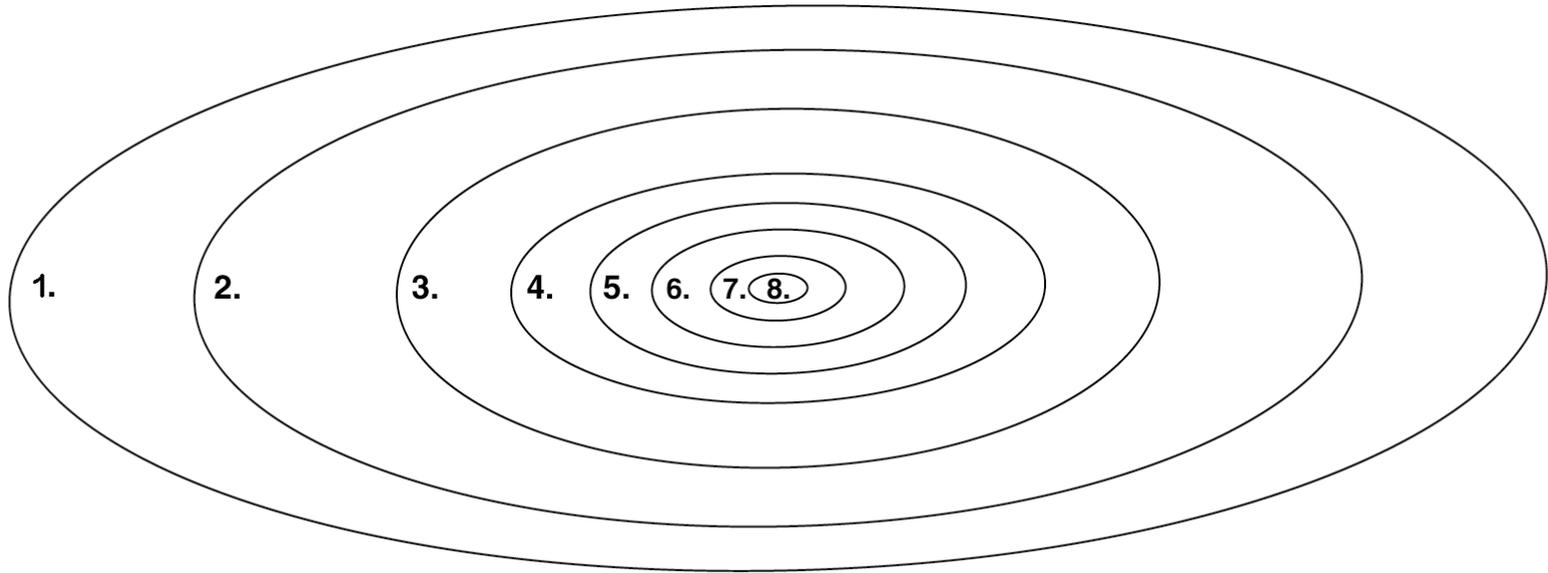
Column A

Column B

- | | | |
|-------|---|-----------------|
| _____ | 1. most common element in most stars | a. binary stars |
| _____ | 2. material in the center of a nebula that becomes a star | b. star cluster |
| _____ | 3. pair of stars that travel through space together | c. Sun |
| _____ | 4. cloud of hot gas and dust | d. hydrogen |
| _____ | 5. closest star to Earth | e. nebula |
| _____ | 6. large group of stars that move through space together | f. star |
| _____ | 7. ball of gases that gives off heat and light | g. protostar |
| _____ | 8. force that causes a nebula to contract | h. gravity |

- _____ 1. gas giant
 - _____ 2. Saturn
 - _____ 3. asteroid belt
 - _____ 4. Jupiter
 - _____ 5. Uranus
- a. a ring of debris that separates the inner planets from the outer planets
 - b. a planet with a complex ring system made of dust and icy debris
 - c. the largest planet in the solar system; has alternating light and dark bands
 - d. a planet whose atmosphere may contain a large amount of methane
 - e. a large planet that has a deep, massive gaseous atmosphere and is less dense than a terrestrial planet

In the spaces provided, label the orbit of each planet as shown in the diagram.



1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

chromosphere

corona

gaseous

ions

mass

photosphere

solar eclipse

solar system

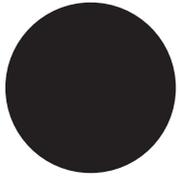
solar wind

The Sun is the largest object in our **(1)** _____. Its **(2)** _____ controls the motions of the planets. The center of the Sun is very dense. The high temperature at its center causes the solar interior to be **(3)** _____ throughout.

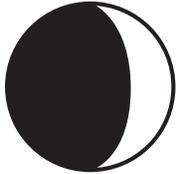
The visible surface of the Sun is called the **(4)** _____. It is the lowest layer of the Sun and is approximately 400 km in thickness. The average temperature is 5800 K.

Above the visible layer is the **(5)** _____. It is approximately 2500 km in thickness and has a temperature of nearly 30 000 K at the top. Without special filters, this layer is visible only during a **(6)** _____.

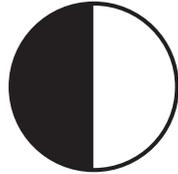
The top layer of the Sun's atmosphere is the **(7)** _____. It has a temperature range of 1 million to 2 million K. Gas flows outward from this layer at high speeds and forms the **(8)** _____. It is made up of charged particles, or **(9)** _____, which flow outward through the entire solar system.



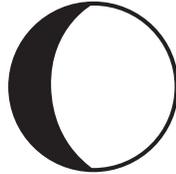
1



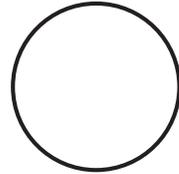
2



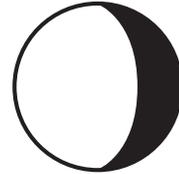
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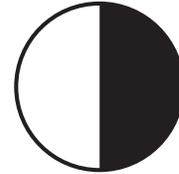
4



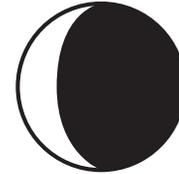
5



6



7



8

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

- _____ 1. convective zone
 - _____ 2. photosphere
 - _____ 3. corona
 - _____ 4. radiative zone
 - _____ 5. chromosphere
- a. the area between the core and the convective zone in which energy moves by radiation
 - b. the area between the radiative zone and the photosphere where energy is carried upward by the movement of gases
 - c. thin layer of gases, just above the photosphere
 - d. the outermost layer of the sun's atmosphere
 - e. the visible surface of the sun

- | | | |
|-------|--------------------------|---|
| _____ | 1. corona | a. a dark, cooler area of the photosphere of the sun, with a strong magnetic field |
| _____ | 2. aurora | b. the most violent solar disturbance; an eruption of electrically charged particles |
| _____ | 3. photosphere | c. the sun's visible surface |
| _____ | 4. sunspot | d. the region of the sun's interior between the radiative zone and the photosphere |
| _____ | 5. coronal mass ejection | e. a loop of relatively cool incandescent gas that extends above the photosphere |
| _____ | 6. solar flare | f. the zone of the sun's interior between the core and the convective zone |
| _____ | 7. radiative zone | g. the outermost layer of the sun's atmosphere |
| _____ | 8. chromosphere | h. the thin layer of the sun's gases just above the photosphere |
| _____ | 9. convective zone | i. colored light caused by the reaction of solar wind particles with Earth's upper atmosphere |
| _____ | 10. prominence | j. a part of coronal gas thrown into space from the sun's corona |

- _____ 1. Earth
 - a. a planet that is similar to Earth in size, mass, and density
- _____ 2. Mercury
 - b. a planet with massive volcanoes and canyons; its seasons are similar to Earth's seasons
- _____ 3. Mars
 - c. the only planet with the proper combination of water, atmosphere, and temperature to support life
- _____ 4. *Magellan*
 - d. the planet that is closest to the sun; has a hot, heavily cratered surface
- _____ 5. Venus
 - e. the satellite that orbited Venus

Directions: *Identify the stages in the life cycle of an average star. Use the words below to fill in the blanks.*

white dwarf

nebula

giant

main sequence

1. Star begins in a clouds of gas and dust. _____
2. Star continues to use hydrogen for energy; heat from fusion causes pressure that balances the pull of gravity. _____
3. Star's core is exhausted of hydrogen; its outer layers expand and cool. _____
4. Star's core is exhausted of helium; its outer layers escape into space leaving only the core; the core contracts, or gets smaller. _____

- _____ 1. outgassing
 - _____ 2. solar nebula
 - _____ 3. planetesimal
 - _____ 4. differentiation
 - _____ 5. protoplanet
- a. the process that caused early Earth to form three distinct layers
 - b. a small body from which a planet originated in the solar system's early development
 - c. a rotating cloud of gas and dust that gave rise to Earth's solar system
 - d. a larger body that formed when planetesimals joined together
 - e. the process that was responsible for forming Earth's early atmosphere

2.735 K	background noise	Big Bang	<i>Cosmic Background Explorer</i>
compressed	radiation	Doppler	cosmic background radiation
cosmology	density	expanding	matter
			steady-state

The study of the universe, including its current nature, its origin, and its evolution is called **(1)** _____. The fact that the universe is **(2)** _____ implies that it had a beginning. The theory that the universe began as a point and has been expanding ever since is called the **(3)** _____ theory. Not all astronomers agree that the universe had a beginning. The **(4)** _____ theory proposes that the universe looks the same on large scales to all observers and that it has always looked that way. Supporters of this theory propose that new **(5)** _____ is created and added to the universe. Therefore, the overall **(6)** _____ of the universe doesn't change.

According to the more accepted theory, the Big Bang Theory, if the universe began in a highly **(7)** _____ state, it would have been very hot, and the high temperatures would have filled it with **(8)** _____. As the universe expanded and cooled, the radiation would have been shifted by the **(9)** _____ effect to lower energies and longer wavelengths. In 1965, scientists discovered a persistent **(10)** _____ in their radio antenna. The noise was caused by weak radiation called the **(11)** _____. It appeared to come from all directions in space and corresponded to an emitting object having a temperature of about **(12)** _____, which is close to the temperature predicted by the Big Bang theory. An orbiting observatory called the **(13)** _____, launched in 1989, mapped the radiation in detail.

solar system	Saturn	Mercury	comet	meteorite
Neptune	Venus	Pluto	Great Red Spot	asteroid
meteor	Earth	Jupiter	Mars	Uranus

1. After it hits Earth, a meteoroid is called a(n) _____.
2. The planet _____ is sometimes called Earth's twin.
3. The planet _____ and its moon may be a double planet.
4. The _____ is a giant storm on Jupiter.
5. A(n) _____ is made of dust and rock particles mixed with frozen water, methane, and ammonia.
6. The planet _____ apparently shrank in diameter.
7. The _____ belt lies between the orbits of Mars and Jupiter.
8. The _____ has nine planets.
9. Methane gives _____ its distinctive blue-green color.
10. Because its density is so low, the planet _____ would float in water.
11. The planet _____ is one astronomical unit from the Sun.
12. Io, Europa, Callisto, and Ganymede are all moons of _____.
13. The planet _____ is fourth from the Sun.
14. A meteoroid that burns up in Earth's atmosphere is called a(n) _____.
15. The axis of rotation of _____ is tilted on its side.

- | | | |
|-------|----------------|--|
| _____ | 1. asteroid | a. a feature of the lunar surface |
| _____ | 2. ellipse | b. a meteoroid that survives Earth's atmosphere and hits Earth's surface |
| _____ | 3. crust | c. the shape of the moon's orbit around Earth |
| _____ | 4. crater | d. a small orbiting body of rock, ice, and cosmic dust that has ion and dust tails |
| _____ | 5. meteorite | e. a moon of Mars |
| _____ | 6. comet | f. a layer of the moon |
| _____ | 7. Phobos | g. the flat region beyond Neptune's orbit that contains many short-period comets |
| _____ | 8. Kuiper Belt | h. a small, rocky body that travels through space |
| _____ | 9. meteor | i. a small object that orbits the sun, whose composition is similar to that of the inner planets |
| _____ | 10. meteoroid | j. a bright streak that occurs when a meteoroid burns up in Earth's atmosphere |

- _____ **1.** Gas and dust from which stars and planets form
- _____ **2.** Rotating disk of dust and gas that formed the Sun and planets
- _____ **3.** Solid bodies hundreds of kilometers in diameter that merged to form the planets
- _____ **4.** Believed to be the first large planet to develop
- _____ **5.** One of the first elements to condense in the early solar system
- _____ **6.** Lacking in satellites because of proximity to the Sun
- a.** inner planets
- b.** tungsten
- c.** planetesimals
- d.** solar nebula
- e.** interstellar cloud
- f.** Jupiter

larger electromagnetic radiation visible light wavelength
reflecting telescope frequency telescopes refracting telescope
interferometry electromagnetic spectrum

(1) _____ consists of electric and magnetic disturbances, or waves, that travel through space. Human eyes see one form of this energy, called **(2)** _____. All forms of electromagnetic radiation, including X rays and radio waves, make up the **(3)** _____. Each type of radiation can be classified in two ways. **(4)** _____ measures the distance between the peaks on a wave and **(5)** _____ is the number of waves that occurs each second. Scientists study radiation with **(6)** _____, which collect and focus light. The **(7)** _____ the opening that gathers light in a telescope, the more light that can be collected. A(n) **(8)** _____ uses lenses to bring light to a focus, and a(n) **(9)** _____ uses mirrors to do the same thing. The process of linking several telescopes together so that they can act as one is called **(10)** _____.

- | | | |
|-------|-----------------------|--|
| _____ | 1. Ptolemy | a. a large body made up of smaller bodies that joined together through collisions and gravity |
| _____ | 2. gas giant | b. an astronomer who believed that the planets moved in epicycles as they revolved in larger circles around Earth |
| _____ | 3. planetesimal | c. a rotating cloud of gas and dust from which Earth's solar system formed |
| _____ | 4. terrestrial planet | d. a type of planet that has a deep, massive atmosphere made mostly of gas and is denser than an inner planet |
| _____ | 5. protoplanet | e. a small body far from the sun; made of frozen methane, rock, and ice |
| _____ | 6. Copernicus | f. a small body from which a planet originated in the early stages of the solar system |
| _____ | 7. solar nebula | g. a planet that is made of solid rock and has impact craters and a metallic core; another name for <i>inner planet</i> |
| _____ | 8. Kuiper Belt | h. a scientist who hypothesized that a moving body will stay in motion and resist a change in speed or direction until an outside force acts on it |
| _____ | 9. Newton | i. a region that is just beyond the orbit of Neptune and contains many small bodies made mostly of ice |
| _____ | 10. Pluto | j. an astronomer who proposed a heliocentric model of the solar system |

- _____ 1. big bang theory
 - _____ 2. constellation
 - _____ 3. light-year
 - _____ 4. spiral galaxy
 - _____ 5. absolute magnitude
 - _____ 6. irregular galaxy
 - _____ 7. elliptical galaxy
 - _____ 8. main-sequence stage
 - _____ 9. apparent magnitude
 - _____ 10. quasar
- a. star group that can be elongated like a stretched-out football
 - b. the brightness a star would have at a distance of 32.6 light-years from Earth
 - c. the time in the life of a star when it generates energy by the fusion of hydrogen into helium in its core
 - d. an extremely bright area located in the center of some galaxies
 - e. the distance light travels in a single year
 - f. star group that has low mass, no particular shape, and is rich in dust and gas
 - g. the theory that all matter and energy was compressed into a small volume and then exploded billions of years ago
 - h. a fixed pattern of stars and the region of space around it
 - i. star group with a nucleus of bright stars and flattened arms that spiral around the nucleus
 - j. the brightness of a star as seen from Earth