

Chapter 1

1. Our sun is the most massive and luminous star in the Milky Way. **False**
2. The word astronomy: **means “patterns among the stars.”**
3. If there are about 6000 stars in the entire sky that can be seen by the unaided human eye, about how many stars would be seen at a particular instant on a given dark night from a single location with an uninterrupted distant horizon? **3000**
4. If an event were to take place on the sun, how long would it take for the light to reach us? **8 minutes**
5. The distance to the nearest large spiral galaxy, Andromeda, is 2.5 million light-years. How long does it take light to travel from us to Andromeda? **2.5 million years**
6. The early universe was composed mainly of which two elements? **Hydrogen and Helium**
7. A light-year is measured in units of: **distance**
8. The cosmological principle states that: **the universe looks the same everywhere as long as you look on large enough spatial scales**
9. Classify the following descriptions as either true or false: True: A hypothesis is a statement constructed explain observations or experimental results; False: A scientific theory which has been proven to be true is no longer subject to testing is a fact; False: The general definition of the word “theory” is a fact.
10. The number 9.66×10^7 is equal to: **96600000**
11. Suppose you were writing to a pen pal in another universe. What address would you put on the envelope that included all the major structures in which we reside? Select the order from the list below in which you would put on you address, starting with your local location. **1: Earth; 2: The Solar System; 3: The Milky Way; 4: The Local Group 5: Virgo Supercluster; 6: The Universe**
12. The nightly motion of objects across our sky is caused by the: **rotation of Earth on its axis**
13. Which of the following statements best represents the overall rationale for scientific investigation? **Reality is comprehensible, and a limited number of fundamental principles governs the nature and behavior of the universe.**

Chapter 2

1. If you go out at exactly 9 P.M. each evening over the course of one month, the position of a given star will move westward by tens of degrees. What causes this motion? **The revolution of the earth around the sun**
2. Assume that the observer is in the continental United States. Match each statement with one of the terms at the top. (Some letters may be used more than once and some may not be used at all.) **D (Autumnal Equinox). The beginning of fall occurs on what date; B (Summer Solstice). The altitude of the sun at noon is greatest on what date; B (Summer Solstice). The**

- sun sets farthest north of west on what date? A (Winter Solstice). The shortest period of daylight occurs near which solstice or equinox?**
- For the following figure, label each box with its appropriate descriptor. **A: South celestial pole; B: Ecliptic; C: Celestial equator; D: North celestial pole.**
 - Assume that the observer is in the continental United States. Match each statement with one of the terms at the top. **D (Autumnal Equinox): The beginning of fall occurs on what date? B (Summer Solstice): The altitude of the sun at noon is greatest on what date? B (Summer Solstice): The sun sets farthest north of west on what date? A (Winter Solstice): The shortest period of daylight occurs near which solstice or equinox?**
 - When is the Earth closest to the sun? **In the winter in the northern hemisphere.**
 - The picture below shows the position of the Earth at four times of the year. For each position, identify the transition to the correct season. **When the earth is in position B, it is at the winter solstice (far right); when the earth is in position D, it is at the autumnal equinox (bottom); when the earth is in position C, it is at the summer solstice (far left); when the earth is in position A, it is at the vernal equinox (top).**
 - Earth experiences seasons due to the tilt of its axis. What are the consequences of this tilt that contribute to the seasons? **Variation in length of day & Variation in the directness of the Sun's rays**
 - If you were going to send a spacecraft to circle the Moon and photograph the entire far side (the side not visible from earth), during which lunar phase (as seen from earth) would you do the photography? **New Moon**
 - A total lunar eclipse is visible in principle (assuming clear skies everywhere) **to everyone in one hemisphere of earth.**
 - Approximately what time would each of the phase rise above your horizon? **9pm: Waning gibbous; Noon: First quarter; 9am: Waxing crescent; 3am: Waning crescent; 3pm: Waxing gibbous**
 - Why don't we have solar and lunar eclipses every month? **Because the Moon's orbit around Earth is tilted by about 5degrees out of the ecliptic**

Chapter 3 and 4

- Match each statement with the law. **C (Kepler's first law of planetary motion): This law describes the shape of planetary orbits as ellipses; A (Kepler's third law): According to this law if the semimajor axis of the orbit is 1 Au then the orbit period is 1 year; D (Kepler's second law of planetary motion): According to this law the speed of a planet would be greatest when closest to the sun; E (None of Kepler's laws): According to this law planetary orbits are always circles.**
- Match each description with the appropriate term from the top list. **A (Velocity): Distance divided by time with direction defines what term? D (Speed): Distance divided by time without direction defines what term? B (Force): This, if unbalanced, will cause an object to accelerate; C (Acceleration): an increase in speed is an example of this; E (Inertia):**

the property of an object which allows it to resist changes in its state of motion is called this.

3. Select the discoveries Galileo made by making astronomical observations through a telescope. **Sunspots, Jupiter's moons, and craters on the Moon**
4. Which of the following is true about a comet that is on an elliptical orbit around the sun? **The comet's speed is greatest when it is nearest the Sun.**
5. What two pieces of information do we need to know about the Earth in order to calculate the mass of the Sun? **The semimajor axis of the Earth's orbit is 1 AU and the Earth takes 1 year to orbit the sun.**
6. Two rocks (call them S and T) are a distance of 50 km from one another. Rock S has 20 times the mass of rock T. Which rock will move faster if the only force involved is their mutual gravitational attraction? **Rock T**
7. If the distance between the earth and the sun were cut in half, the gravitational force between these two objects would: **increase by 4**
8. The figure below, showing the motion of a ball near Earth's surface, depicts how gravity **causes the ball to accelerate downward.**
9. What is the wavelength of a 100-MHz ("FM 100") radio signal? **3.0- the speed of a wave is determined by speed of light $c = \text{frequency } f \times \text{wavelength}$, so wavelength = speed of light/frequency = $3 \times 10^8 \text{ m/s} / 100 \times 10^6 \text{ Hz}$**
10. What types of electromagnetic radiation from space will reach the surface of Earth without being significantly absorbed by the Earth's atmosphere? **Visible light and radio waves**
11. All forms of light have what property in common? (Light in this case refers to the whole spectrum, not just the visible range) **all forms of light are electromagnetic radiation**
12. What is one fundamental difference between X rays and radio waves? **The wavelengths of X rays and radio waves are very different**
13. By what factor is the amount of light gathered by the 10-m diameter Keck telescope on Mauna Kea, Hawaii, greater than that gathered by the 2.5-m diameter Mount Wilson telescope? **16**
14. Why was adaptive optics developed? **To compensate for image distortion caused by Earth's atmosphere**
15. The PRIMARY reason professional observatories are built on the highest mountaintops is to **reduce atmospheric blurring.**
16. Modern telescopes use mirrors rather than lenses for all of these reasons EXCEPT **reflecting telescopes aren't affected by the atmosphere as much.**
17. An advantage of CCDs over photographic film is **they don't require chemical development, CCD images can be developed faster, CCDs are more light sensitive than film, and digital data is easily stored and transmitted....all of the above.**
18. The *Hubble Space Telescope (HST)* offers sharper images than ground telescopes primarily because **HST orbits above the atmosphere.**
19. Which of the following photons carry the least amount of energy? **A microwave photon, whose wavelength is 10^{-2} m .**