

Name: (Answer Key)

Directions: Listed below are twenty (20) multiple-choice questions based on the material covered by the lectures this past week. Choose the correct response from those listed, **along with at least a one (1) sentence justification for your answer.** In the case of a question involving math, the calculation can serve as your justification. Each question is worth 5 points: 2 for the letter response and 3 for the justification. Collaboration with your peers is permitted, but all justifications must be in your own words. If you are unsure about a question, make an educated guess, and justify your guess (which can include why you can rule out certain choices from the list). If you get stuck, **please seek assistance from your peers, the TA, or the professor.** Note: It may be helpful to place your answers on a separate sheet of paper and staple it to this assignment sheet.

WARNING: Please **DO NOT** copy material word for word from sources such as textbooks, a peer's notes, online references (i.e. Google or Wikipedia), etc in any responses to homework, quiz, or exam questions. Ideas should be expressed in your own words. Not only does this protect you from illegal acts of plagiarism and/or accusations of cheating, but it also aids your future studying by having ideas expressed in a way that you, personally, can best understand. If for some reason you **MUST** quote text from a source in your answer, properly reference your quote.

1. In science, if new observations disagree with a well established theory then
 - A) this should be accepted as part of the overall incomprehensibility of the universe, and both the observations and the theory should be retained.
 - B) the theory must be discarded immediately.
 - C) the theory must be modified.
 - D) the observations must be discarded.

Answer: C

Ref: 1-5

2. The scientific method is a major force in science and has been developed to ensure that
 - A) theories about physical phenomena are so good and our confidence in them is so strong that we never need to test them against our observations.
 - B) theories about physical phenomena agree with the wisdom of the ancients.
 - C) results from experiments can be adjusted to agree with our carefully developed theories about physical phenomena.
 - D) theories about physical phenomena agree with what we find in experiments and observations.

Answer: D

Ref: 1-7

3. In following the principles of the scientific method, a theory proposed to explain a given phenomena must
 - A) explain all previous and reliable observations in a consistent manner but need not suggest new tests for the theory since a theory should be complete in itself.
 - B) explain all known and reliable observations and predict new experiments and observations.
 - C) agree with and build on previous theories but need not explain the observations since some of these may be erroneous.

- D) predict new and different experiments that will extend the scope of the theoretical understanding but need not explain all the previous and reliable observations.

Answer: B

Ref: 1-10

4. The average distance from the Earth to the Sun, 149,600,000 kilometers (km), can be written in scientific notation as
- A) 1.496×10^9 km.
 - B) $1,496 \times 10^5$ km.
 - C) 1.496×10^8 km.
 - D) 14.96×10^7 km.

Answer: C

Ref: 1-41

5. There are 1000 millimeters (mm) in one meter (m). This means that a distance of 5 mm is
- A) 5×10^3 m.
 - B) 5×10^{-3} m.
 - C) 2×10^{-4} m.
 - D) 5×10^{-2} m.

Answer: B

Ref: 1-44

6. By what approximate factor in scientific notation is a human being (height about 2 m) larger than the nucleus of a hydrogen atom, or proton (diameter about 10^{-15} m)? Note: A ratio of two like quantities (such as lengths in meters here) is an exception to the rule of always listing the units.
- Bonus Point:** Why is this so?
- A) 2×10^{30}
 - B) 2×10^{15}
 - C) 2×10^{13}
 - D) 2×10^{-15}

Answer: B

Ref: 1-61

Bonus: The like units in the numerator and denominator cancel out each other.

7. An astronomical unit or 1 AU is a unit of
- A) time, equal to 1 billion years
 - B) length, the average distance between the Sun and the Earth
 - C) length, defined as a certain wavelength of light
 - D) mass, equal to one solar mass

Answer: B

Ref: 1-67

8. One light-year (ly) is the
- A) distance that light travels in one year
 - B) time taken for the Earth to orbit the Sun once
 - C) distance between Earth and Sun
 - D) time taken for light to travel from the Sun to the Earth

Answer: A

Ref: 1-69

9. One arcsecond (arcsec) is equal to
- A) $1/3600$ degrees.
 - B) $1/60$ degrees.
 - C) $1/60$ of a full circle.
 - D) $1/3600$ of a full circle.

Answer: A

Ref: 1-22

10. The angle subtended at an observer's location by a city transit bus (length 9 m) at a distance of 1000 m is close to which quantity? (Note: please convert your chosen answer into units of degrees within your justification.)
- A) $1000/9$ arcsec
 - B) 9000 arcminutes (arcmin)
 - C) $9/1000$ arcsec
 - D) $9/1000$ radians (rad)

Answer: D

Conversion: ~ 0.5 degrees

Ref: 1-28

11. A nearby star 10 ly from Earth is suspected by astronomers to have a companion planet with an orbit of radius 6 AU (1 ly is about 6×10^4 AU). The maximum angular separation of this planet from the parent star as seen from the Earth is expected to be about
- A) 1.6 degrees.
 - B) 2 arcmin.
 - C) 2 arcsec.
 - D) 0.6 degrees.

Answer: C

Ref: 1-34

12. If you were able to travel out into space until the angular distance between the Earth and the Sun was 1 arcsec, how far would you be from the Sun? (Assume that you, the Sun, and the Earth make a right angle.)
- A) 1 ly
 - B) 1×10^6 km
 - C) 1 AU
 - D) 1 parsec (pc)

Answer: D

Ref: 1-70

13. The distance from Earth to the star Betelgeuse (in the constellation Orion) has been measured as 520 ly. Expressed in parsecs, this is approximately
- A) 160 pc.
 - B) 350 pc.
 - C) 520 Megaparsecs (Mpc).
 - D) 1700 pc.

Answer: A

Ref: 1-71

14. If an extraterrestrial being on another planet in the year 2001 A.D. detected the flash of light from a nuclear explosion on the Earth that occurred in 1945 A.D., and immediately sent a radio signal

- (traveling at the speed of light) to determine if our civilization had survived, when would we expect the signal to arrive at the Earth?
- A) 2018 A.D.
 - B) 2113 A.D.
 - C) 2002 A.D.
 - D) 2057 A.D.

Answer: D
Ref: 1-88

15. In modern astronomy, the constellations are
- A) clusters of stars that are held together by the mutual gravitational attractions of the individual stars in the cluster.
 - B) nearby galaxies to which astronomers have given specific names.
 - C) 12 regions of sky through which the Sun, Moon, and planets move as seen from the Earth.
 - D) 88 regions of sky, covering the entire sky.

Answer: D
Ref: 2-3

16. The daily (and nightly) motion of objects across our sky is caused by the
- A) revolution of Earth around the Sun.
 - B) rotation of the whole celestial sphere of stars around the fixed Earth.
 - C) rotation of the Earth on its axis.
 - D) motion of the solar system around the galaxy.

Answer: C
Ref: 2-11

17. When we watch the sky over the course of one night, we find that
- A) the stars and constellations remain fixed in our sky, not rising or setting in a time as short as one night because they are so far away.
 - B) stars and constellations slowly rise in the west, pass overhead, and set in the east.
 - C) all stars and constellations reach their highest point in the sky at midnight.
 - D) stars and constellations slowly rise in the east, pass overhead, and set in the west.

Answer: D
Ref: 2-18

18. The celestial equator is defined as the
- A) line in the sky that is perpendicular to the Earth's spin axis.
 - B) line traced in our sky by the Moon each month against the background stars.
 - C) line traced in our sky by the Sun over one year against the background stars.
 - D) band of constellations through which the Sun and Moon move in our sky.

Answer: A
Ref: 2-25

19. Which of the following lines or points is always directly over your head, no matter where on the Earth you go?
- A) zenith
 - B) celestial equator
 - C) ecliptic
 - D) north celestial pole

Answer: A

Ref: 2-26

20. Which of the following points remains fixed in the sky relative to an observer's horizon as long as the observer remains at the same latitude on the Earth?
- A) north celestial pole
 - B) direction to a distant star (e.g., Rigel, in Orion)
 - C) direction to the Sun
 - D) the center of our Milky Way galaxy

Answer: A

Ref: 2-30