Introductory Astronomy

Homework 2: The Sky Not to be handed in. Homework solutions are posted already.

1. In mythology and popular culture Venus has been identified with the:

   a) god of transits. b) devil of retrograde motion. c) imp of recession. d) monk of remonstrance. e) goddess of love.

2. Daytime is

   a) the time between sunrise and sunset. b) the time between sunset and sunrise. c) any time of the day or night. d) high noon. e) an optical illusion.

3. Why do all stars, except the Sun, look like twinkling points of light as seen from the Earth? They are:

   a) points of light, literal points of light, without extent or shape. b) the cause eclipses. c) too remote to be seen. d) too remote to resolve their shapes. e) too remote to detect their color.

4. Parallax is:

   a) the westward motion of a planet.
   b) the apparent change in position of an object due to the subjective nature of observations.
   c) the apparent change in position of an object due to the change in position of the observer.
   d) an optical illusion, but one that can be used to determine magnitude.
   e) the apparent change in position of an object due to the change in position of the observer. Parallax is completely useless in modern astronomy.

5. The celestial sphere is:

   a) an imaginary sphere (centered on the Earth) on which all the celestial bodies are located.
   b) a solid sphere (centered on the Earth) on which all the celestial bodies are located.
   c) an imaginary sphere (centered on the Sun) on which all the celestial bodies are located.
   d) the path of the Sun on the sky.
   e) cause of eclipses.

6. Briefly describe the celestial sphere.

   a) It is an imaginary sphere **CENTERED** on **EARTH**. All the heavenly bodies are located on it. It is **SO LARGE** that the size of the Earth is **INSIGNIFICANT** in comparison: this implies that every point on Earth is effectively exactly at the center of the celestial sphere. The axis of the celestial sphere is an extension of Earth's axis: the northern end of the axis is the north celestial pole and the southern end, the south celestial pole. The celestial equator is just a projection on the sky from the Earth's center of the Earth's equator. The celestial sphere rotates west once per day. The stars are carried with this motion, but are fixed to high approximation in relative orientation: they are called the fixed stars. The solar system bodies move on the celestial sphere relative to the fixed stars. The celestial sphere is a **USEFUL** description of the appearance of sky.
   b) It is an imaginary sphere **CENTERED** on **EARTH**. All the heavenly bodies are located on it. It is **SMALL ENOUGH** that the relative positions of the stars and planets **DEPEND ON** one's location on Earth. This agrees with actual appearance of the sky. The axis of the celestial sphere is an extension of Earth's axis: the northern end of the axis is the north celestial pole and the southern end, the south celestial pole. The celestial equator is just a projection on the sky from

the Earth's center of the Earth's equator. The celestial sphere rotates west once per day. The stars are carried with this motion, but are fixed to high approximation in relative orientation: they are called the fixed stars. The solar system bodies move on the celestial sphere relative to the fixed stars. The celestial sphere is a **USEFUL** description of the appearance of sky.

c) It is an imaginary sphere **CENTERED** on **EARTH**. All the heavenly bodies are located on it. It is **SO LARGE** that the size of the Earth is **INSIGNIFICANT** in comparison: this implies that every point on Earth is effectively exactly at the center of the celestial sphere. The axis of the celestial sphere is an extension of Earth's axis: the northern end of the axis is the north celestial pole and the southern end, the south celestial pole. The celestial equator is just a projection on the sky from the Earth's center of the Earth's equator. The celestial sphere rotates west once per day. The stars are carried with this motion, but are fixed to high approximation in relative orientation: they are called the fixed stars. The solar system bodies move on the celestial sphere relative to the fixed stars. Because the celestial sphere has no physical reality it is perfectly **USELESS**. It is just a relic of historical astronomy.

d) It is just a projection on the sky from the Earth's center of the Earth's equator.

e) It is just the extension of the Earth's axis into space.

7. What is the celestial equator?

a) The projection of the Earth's equator onto the celestial sphere. b) The Zodiac by another name. c) An ancient Chinese astronomical device. d) A circumpolar constellation. e) The belt of Orion.

8. What is declination?

a) The point directly below.
b) The point directly above.
c) The angular position of an object measured north or south from the celestial equator.
d) The angular position of an object measured east or west from the celestial equator.
e) The azimuthal angular position of an object measured east from the spring (or vernal) equinox.

9. What does "to transit the meridian" mean? It means that:

a) an object passes through the zenith.
b) an object crosses the meridian of **GREENWICH** due to the rotation of the Earth.
c) an object crosses the meridian (i.e., the **LOCAL MERIDIAN**) due to the rotation of the Earth.
d) an object is in conjunction with the Sun.
e) an object is in opposition (to the Sun).

10. What is zenith? What is nadir?

a) The point directly to the east; the point directly below.
b) The point directly above; the point directly below.
c) A kind of television; a kind of refrigerator.
d) The point directly above; the point directly west.
e) The name of the spring equinox point; the name of the fall equinox point.

11. Circumpolar stars are those stars that:

a) are located at the north celestial pole (NCP). b) never go below the horizon or never rise above it. c) are in the Zodiac constellations. d) circle the zenith. e) are below the horizon as seen from all latitudes.

12. How far in angle is Polaris (called alpha Ursa Minoris or α Ursa Minoris or some abbreviation thereof in tables) from the north celestial pole in Epoch 2000 coordinates? **Note:** Epoch 2000 coordinates are just the preferred modern astronomical latitude and longitude system for the celestial sphere. All the student needs to know is that declination is like latitude and the angle from the north celestial pole (NCP) is 90° minus declination. And by the way, arcminutes are indicated by prime symbols (e.g., 10′ is 10 arcminutes) and arcseconds by double prime symbols (e.g., 10″ is 10 arcseconds). **Hints:** Try the SEDS (Students for the Exploration and Development of Space) web site and click down through **constellations, 88 constellations, Ursa Minor,** and **stellar data.**

    a) 90°. b) 10°. c) 44 arcminutes, 9 arcseconds. d) 30 arcminutes, 45 arcseconds. e) 1°, 30 arcminutes, 45 arcseconds.

13. Polaris is at zenith. You are:

    a) on the equator. b) in New York City. c) in Las Vegas. d) near the north pole. e) below the horizon.

14. The altitude of Polaris is 36°. (Recall altitude in astronomy is angle measured straight up from the horizon.) You are:

    a) on the equator. b) at the latitude of Fairbanks, Alaska. c) at the latitude of Las Vegas, Nevada. d) near the north pole. e) below the horizon.

15. The altitude of Polaris is 49°. (Recall altitude in astronomy is angle measured straight up from the horizon.) You are:

    a) on the equator. b) perhaps on the border of Canada. c) at the latitude of Las Vegas. d) near the north pole. e) in the southern hemisphere.

16. Las Vegas is at about:

    a) 36° north latitude. b) 36° north longitude. c) 36° south latitude. d) 72° north latitude. e) 49° north latitude.

17. Every day the Sun moves west in the sky. Relative to the fixed stars it is:

    a) not moving. b) moving mainly west. c) moving mainly east. d) moving mainly north. e) oblique.

18. The ecliptic is:

    a) the path of Pluto on the sky.
    b) a sphere (centered on the Earth) on which all the celestial bodies are located.
    c) an imaginary sphere (centered on the Sun) on which all the celestial bodies are located.
    d) the path of the Sun on the sky.
    e) the cause of eclipses.

19. An equinox is:

    a) the path of the Earth on the sky.
    b) a sphere (centered on the Earth) on which all the celestial bodies are located.
    c) an imaginary sphere (centered on the Sun) on which all the celestial bodies are located.
    d) the path of the Sun on the sky.
    e) a point where the ecliptic crosses the celestial equator.

20. In the summer of the northern hemisphere:

    a) the northern hemisphere day side is tilted toward the Sun.
    b) the northern hemisphere day side is tilted away from the Sun.
    c) the southern hemisphere day side is tilted toward the Sun
    d) the Earth is nearest the Sun.
    e) the Earth is at 0.7 astronomical units from the Sun.

21. Does the Sun rise north or south of east in the summer in northern latitudes?

    a) North. b) South. c) Neither. It rises due east always. d) Yes. e) No.

22. Say you are in the northern hemisphere and have a gnomon (a stick set in the ground and set perpendicular to the ground). It is the winter solstice and noon. It is sunny and clear.

    a) The shadow of the gnomon points due **SOUTH**.
    b) The gnomon has its shortest shadow for that day, but it has its **LONGEST** noon shadow of the year.
    c) The gnomon shadow points due **EAST** and it is the longest it can be for that day.
    d) The gnomon has no shadow.
    e) The gnomon has its shortest shadow for that day and it has its **SHORTEST** noon shadow of the year.

23. Venus is in inferior conjunction. But it is not transiting the Sun (i.e., crossing the face of the Sun). Why not?

    a) It is behind the Sun relative to Earth.
    b) It is in retrograde motion.
    c) It never transits the Sun.
    d) The tilt of the orbit of Venus from the ecliptic means that Venus is usually **WEST** of the Sun during inferior conjunction. This must be the case in the present example.
    e) The tilt of the orbit of Venus from the ecliptic means that Venus is usually **ABOVE OR BELOW** the Sun at conjunctions (using the ecliptic plane to establish up and down). Venus must be above or below in the present example.

24. A constellation is:

    a) a conventional grouping of **PLANETS** on the celestial sphere. b) a conventional grouping of **STARS** on the celestial sphere. c) a group of gravitationally bound **STARS**. d) the Moon at sunset. e) stars seen at sunset.

25. The stars in a constellation are:

    a) in orbit about the Earth. b) all about the same age. c) at about the same distance from the Earth. d) usually unrelated, except that they are close in angular position as seen from the Earth. e) members of the solar system.

26. Three IAU (International Astronomical Union) official constellations are:

    a) the Big Dipper, the Little Dipper, and the Tiny Dipper. b) the Big Dipper, Orion, and Callisto. c) Ursa Major (the Big Bear), Orion, and Cassiopeia. d) Ursa Major (the Big Bear), Orion, and Buffy. e) Ulysses, Euripides, and Federigo.

27. "Let's play *Jeopardy*! For $100, the answer is: Any traditionally recognized group of stars on the sky or

one of the 88 International Astronomical Union (IAU) recognized groups of stars and its defined region on the celestial sphere."

What is _____, Alex?

a) a star cluster b) a star party c) a constellation d) an astigmatism e) Asterix

28. All historical cultures eventually arrived independently at the same set of constellations.

a) Yes. b) For short periods of time. c) Every other Thursday. d) No. They all started with the same set of constellations, but as time passed they varied them to arrive at very different sets. e) No.

29. "Let's play *Jeopardy*! For $100, the answer is: He defined the 48 classical constellations (i.e., the 48 constellations passed on by the ancient Greco-Roman civilization)."

Who was _____, Alex?

a) Berossos, priest of Bel b) Aristotle c) Ptolemy d) King Ptolemy e) Cleopatra

30. A modern astronomer who wished to indicate that an astro-body X was located in the patch of sky belonging IAU defined constellation Taurus would say:

a) X is on Taurus. b) X is within Taurus. c) X is superimposed on Taurus. d) X is digested by Taurus. e) X is in Taurus.