

AST1002 - Section 2: Test 1

Date: 10/06/2009

Name:

Equations: $c = \lambda \cdot f$, $\lambda_{\text{peak}} = \frac{0.29 \text{ cm}}{T \text{ [in kelvins]}}$, $F = \frac{Gm_1m_2}{r^2}$, $\frac{\lambda'}{\lambda} = 1 + \frac{v}{c}$

Question 1: A star with a declination of +40.0 degrees will be

1. east of the vernal equinox.
2. west of the vernal equinox.
3. north of the celestial equator. (!)
4. south of the celestial equator.
5. None of these answers are correct.

Question 2: How much stronger is the gravitational pull of the Sun on Earth, at 1 AU, than it is on Saturn at 10 AU? (*gravitational pull* refers to the acceleration due to gravity on the planet)

1. 5 times
2. 10 times
3. 25 times
4. 100 times (!) → Review Question
5. 250 times

Question 3: Which of these is NOT a form of electromagnetic radiation?

1. gamma rays
2. infrared
3. sound (!) → Quiz 4, Question 1
4. visible light
5. radio

Question 4: Newton's law of gravity states that the force between two objects

1. increases with distance.
2. depends on the state of matter (solid, liquid, or gas).
3. can be attractive or repulsive.
4. increases with mass. (!) → Quiz 1, Question 5

Question 5: Planetary orbits (in our solar system)

1. are evenly spaced throughout the solar system.
2. are highly inclined to the ecliptic.
3. are spaced more closely together as they get further from the Sun.
4. have the Sun at their exact center.
5. are almost circular, with low eccentricities. (!)

Question 6: At what phase(s) would you expect to find extremely high and low tides?

1. New Moon
2. First and third quarter
3. Full Moon
4. Both new and full Moons (!) → Assignment 4
5. Moon phases are not impacting the tides.

Question 7: If the Earth were in an orbit farther from the Sun than it is now,

1. the day would be longer.
2. the day would be shorter.
3. the year would be longer. (!)
4. the year would be shorter.
5. Two of the above are correct.

Question 8: Which answer has these colors in order from the longest wavelength to the shortest?

1. Blue, green, red
2. Red, blue, green
3. Blue, red, green
4. Red, green, blue (!)

Question 9: What is the resolution of a telescope?

1. Its ability to see very faint objects
2. Its ability to distinguish two adjacent objects close together in the sky (!)
3. Its ability to make distant objects appear much closer to us
4. Its ability to separate light into its component colors for analysis
5. Its ability to focus more than just visible light for imaging

Question 10: A blackbody has a temperature of 1,000 K and emits mostly

1. infrared light. (!) → Review
2. visible light.
3. ultraviolet light.
4. γ -rays.
5. X-rays.

Question 11: If an electric field wave oscillates north and south (horizontally), and the electromagnetic wave is traveling vertically straight up, then what direction does the magnetic field wave oscillate?

1. It does not oscillate: the situation is impossible.
2. North and south (horizontally)
3. East and west (horizontally) (!) → Review
4. Up and down (vertically)

Question 12: When a thin crescent of the Moon is visible just before sunrise, the Moon is in its

1. waxing phase.
2. new phase.
3. waning phase. (!) → Review, Assignment 1
4. quarter phase.
5. full phase.

Question 13: Which of the following stellar properties can you estimate simply by looking at a star on a clear night?

1. Distance
2. Brightness
3. Surface temperature
4. Both distance and brightness
5. Both brightness and surface temperature (!) → Assignment 5

Question 14: Which of the following are the Terrestrial Planets?

1. Only Earth
2. Earth, Moon, and Venus
3. Mercury, Venus, Earth, and Mars (!) → Quiz 4, Question 1
4. Mercury, Venus, Earth, Mars, Moon, and Pluto
5. Mercury, Venus, Earth, Moon, Mars, and Ceres

Question 15: Kepler's first law worked, where Copernicus' original heliocentric model failed, because Kepler described the orbits as

1. elliptical, not circular. (!)
2. much larger than Copernicus had envisioned.
3. around the Sun, not the Earth.
4. being on equants instead of epicycles.
5. complex, with epicycles to account for retrograde motion.

Question 16: A meteor is

1. a chunk of space debris that has struck the ground.
2. a streak of light in the atmosphere. (!)
3. an icy body with a long tail extending from it.
4. a chunk of space debris orbiting the Earth.
5. an irregularly shaped body, mostly found orbiting between Mars and Jupiter.

Question 17: Atoms have particular associated spectral lines because

1. electrons have only certain allowed orbits. (!)
2. light consists of waves.
3. light waves can show the Doppler effect.
4. photons have only certain allowed orbits.
5. the speed of light in vacuum is a constant.

Question 18: The best test of a scientific hypothesis is how

1. well it explains all known observations.
2. well it agrees with known theories.
3. simply it explains all known observations.
4. well it predicts new observations. (!)
5. easily it is transcribed into mathematical notation.

Question 19: The temperature scale that places zero at the point where all atomic and molecular motion ceases is

1. Centigrade.
2. Kelvin. (!)
3. Fahrenheit.
4. Celsius.
5. Ransom.

Question 20: The average rate of erosion on the Moon is far less than here because

1. the crust of the Moon is much denser than the Earth's crust.
2. the Moon is much younger than the Earth.
3. the Moon lacks wind, water, and an atmosphere. (!) → Assignment 4
4. the Moon's magnetic field protects it from the solar wind better than ours does.
5. the Moon's mare long ago dried up, so there is no more wave erosion there.

Question 21: The tail of a comet always points

1. toward the Sun and disappears at perihelion.
(**planet's perihelion:** its point of closest approach to the Sun)
2. toward Earth and never varies.
3. away from the Sun and disappears at perihelion.
4. away from the Sun and becomes longest and brightest at perihelion. (!)
5. in the direction of the comet's motion.

Question 22: Compared to optical photons

1. radio photons have a longer wavelength.
2. X-ray photons have a larger frequency.
3. infrared photons have a smaller energy.
4. None of the above.
5. All of the above. (!) → In-class question

Question 23: What force riveted the Moon's near side to constantly face Earth?

1. The Sun's gravity
2. Earth's magnetic field
3. Earth's tidal force (!) → Quiz 3, Question 3
4. The solar wind
5. The Moon's magnetic field

Question 24: The Kuiper Belt is found where in the solar system?

1. Beyond the orbit of Neptune (!)
2. Among the orbits of the terrestrial planets
3. Between the orbits of Mars and Jupiter
4. Between the orbits of Jupiter and Uranus
5. Sixty degrees ahead or behind Jupiter

Question 25: The presence of a magnetic field is a good indication that:

1. we have a liquid metal outer core, spinning rapidly as we rotate. (!) → Assignment 4
2. the Earth's interior must be completely molten to the center.
3. the Earth's interior has had time to solidify, with a rigid bar magnet created.
4. a huge iron meteorite lies somewhere high up in the mantle, not in the core.
5. the Earth's interior is similar to Mercury's, as both have fields.

Question 26: What effect does the greenhouse effect have on the surface environment of Venus?

1. Little or no effect
2. About the same as on Earth
3. It reduces the surface temperature by about 30° Celsius.
4. It raises the surface temperature by hundreds of degrees Celsius. (!) → Quiz 5, Question 4
5. It causes the surface temperature of Venus to become hotter than Jupiter.

Question 27: What will occur when the full Moon is on the ecliptic?

1. A partial lunar eclipse if the Moon is at perigee
2. A total solar eclipse
3. A partial solar eclipse
4. An annular lunar eclipse
5. A total lunar eclipse (!)

Question 28: Why do Mercury and the Moon have almost no atmosphere?

1. The gravity at their surfaces is low, so most gas molecules travel fast enough to escape the planet. (!)
2. The temperature at their surfaces is high, so most gas molecules travel fast enough to escape the planet.
3. The only gas molecules that they had originally were low in mass, so that they were immediately able to escape.
4. They are both highly reflective.
5. The reason for this is essentially unknown.

Question 29: The observed spectral lines of a star are all shifted towards the red end of the spectrum. Which statement is true?

1. This is an example of the photoelectric effect.
2. This is an example of the Doppler effect. (!) → Assignment 5
3. The second law of Kirchhoff explains this.
4. The star is not rotating.
5. The star has a radial velocity towards us.

Question 30: What would the days and seasons be like if the Earth still rotated at the same speed, but the Earth's axis were tilted nearly 80 degrees on its side instead of 23 degrees?

1. Both days and seasons would be half as long.
2. The days would be the same length, but the seasons would be half a year long.
3. There can be no seasons in this situation, but days would always be 24 hours long.
4. The days and seasons would be the same lengths as ours, but the seasons would have more extreme temperature changes. (!)