Physics 111 Exam 1
Spring 2026

Multiple Choice. Choose the one alternative that BEST completes the statement or answers the question, and mark your scan sheet. Only the scan sheet will be graded. Each question is equally weighted.

1) The light gathering power of an 8-meter telescope is _____ times that of a 2-meter telescope.
A) 16 B) 6 C) 8 D) 4

Answer: A

2) Which of the following wavelength regions *can* be studied with telescopes on the ground?
A) All light with wavelengths longer than ultraviolet wavelengths
B) All light with wavelengths shorter than infrared wavelengths
C) Radio, visible, and very limited portions of the infrared and ultraviolet regions
D) Infrared, visible, and ultraviolet light

Answer: C

3) Galileo observed all of the following. Which observation offered direct proof of a planet orbiting the Sun?
A) Patterns of shadow and sunlight near the dividing line between the light and dark portions of the Moon's face
B) Four moons of Jupiter
C) The Milky Way is composed of many individual stars.
D) Phases of Venus

Answer: D

4) The James Webb Space Telescope was launched in December 2021. Currently it is
A) near a stable equilibrium point beyond the orbit of the Moon.
B) in a low altitude orbit around the Moon.
C) in Earth orbit half-way to the orbit of the Moon.
D) in a low Earth orbit like that of the Hubble Space Telescope.
E) on its way to a solar orbit beyond the orbit of Mars.

Answer: A

5) Why is Newton's version of Kepler's third law so useful to astronomers?
A) It can be used to determine the masses of many distant objects.
B) It explains why objects spin faster when they shrink in size.
C) It tells us that more-distant planets orbit the Sun more slowly.
D) It allows us to calculate distances to distant objects.

Answer: A

6) According to the laws of thermal radiation, hotter objects emit photons with _____.
A) a higher average speed B) a shorter average wavelength
C) a lower average energy D) a lower average frequency

Answer: B

7) A *light-year* is _____.
A) the time it takes light to reach the nearest star B) about 300,000 kilometers per second
C) the time it takes light to travel around the Sun D) about 10 trillion kilometers

Answer: D

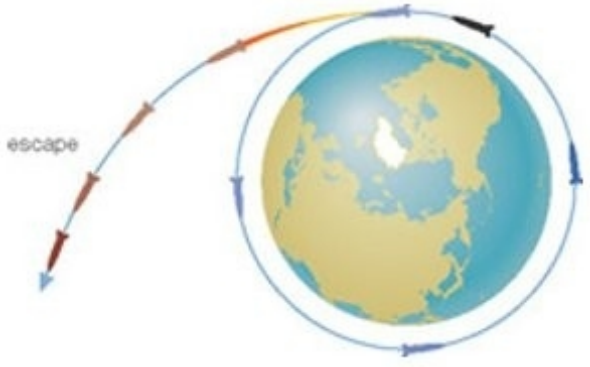
8) Newton showed that Kepler's laws are _____.
A) the key to proving that Earth orbits our Sun
B) natural consequences of the law of universal gravitation
C) actually only three of seven distinct laws of planetary motion
D) seriously in error

Answer: B

9) When Copernicus first created his Sun-centered model of the universe, it did not lead to substantially better predictions of planetary positions than the Ptolemaic model. Why not?
A) Copernicus misjudged the distances between the planets.
B) Copernicus used perfect circles for the orbits of the planets.
C) Copernicus placed the planets in the wrong order going outward from the Sun.
D) Copernicus placed the Sun at the center but did not realize that the Moon orbits the Earth.

Answer: B

10) Suppose you are aboard a rocket that is orbiting Earth in the low, circular orbit shown. If you want to escape from Earth and head to the Moon or Mars along the "escape" path shown, what do you need to do?



A) The only way to end up on the "escape" path is to first return to Earth, then launch your rocket with escape velocity.
B) Fire the rocket engine in your direction of travel, so that you gain speed.
C) Throw some excess supplies overboard, so that your rocket becomes less massive.
D) Turn the rocket around, and fire the engine so that you lose speed.

Answer: B

11) Which of the following statements about the force attracting these two galaxies is *true*?

A) The force will get weaker as time passes.
B) It is a mysterious force, whose nature remains completely unknown to scientists.
C) It is a force unlike any force that we ever experience on Earth.
D) It is the same force that causes an apple to fall to the ground.

Answer: D

12) What kinds of light are these telescopes designed to detect?

A) Light with extremely short wavelengths
B) X-rays
C) Radio waves
D) Ultraviolet light
E) Infrared and visible light

Answer: C

13) The great contribution of Tycho Brahe was to _____.
A) offer the first detailed model of a Sun-centered solar system, thereby beginning the process of overturning the Earth-centered model of the Greeks
B) discover four moons orbiting Jupiter, thereby lending strong support to the idea that the Earth is not the center of the universe
C) observe planetary positions with sufficient accuracy so that Kepler could later use the data to discover the laws of planetary motion
D) discover that planets orbit the Sun in elliptical orbits with varying speed

Answer: C

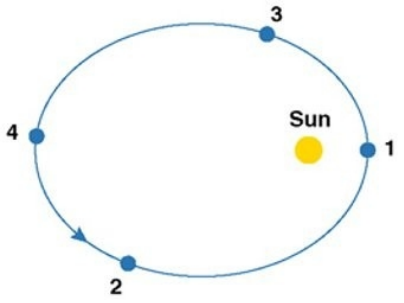
14) We cannot see a new moon in our sky because _____.
A) no sunlight is illuminating the Moon
B) a new moon is quite near the Sun in the sky
C) it is above the horizon during the daytime
D) it is obscured by Earth's shadow

Answer: B

15) The planets never travel in a straight line as they orbit the Sun. According to Newton's second law of motion, this must mean that _____.
A) the planets are always accelerating
B) the planets have angular momentum
C) a force is acting on the planets
D) the planets will eventually fall into the Sun

Answer: C

16) This diagram shows a planet at four points in its orbit around the Sun. At which of the points shown is it traveling *slowest* in its orbit? (The planet is not real, as all the planets of our solar system have orbits much more circular than the one shown.)



A) 1 B) 2 C) 3 D) 4

Answer: D

17) Why are planetary orbits ellipses?

A) The gravitational force between the Sun and the planets varies as 1/distance^2
B) They aren't; they're really circular.
C) Circular orbits don't agree with observations.
D) The gravitational force is weaker for more distant planets.
E) That's what Kepler showed they are.

Answer: A

18) In 1609, when Galileo first used his telescope to look at the heavens, who was with him?

A) Johaness Kepler
B) his wife
C) his daughter
D) the Pope
E) Dr. Alexander - yes, he is that old, but truth be told, he wasn't there!

Answer: C

19) How old was Isaac Newton when he discovered his three laws of motion and law of gravitation and invented Calculus?

A) in his 30's
B) in his 40's
C) in his 20's
D) in his 50's
E) an old man, just befor he died

Answer: C

20) What holds atoms together?

A) the strong nuclear force between the nucleus and the electrons
B) the weak nuclear force between the nucleus and the electrons
C) the gravitational force between the nucleus and the electrons
D) the electric force between the protons in the nucleus and the electrons
E) nothing, they just stay that way

Answer: D

21) Laboratory measurements show hydrogen produces a spectral line at a wavelength of 486.1 nanometers (nm). A particular star's spectrum shows the same hydrogen line at a wavelength of 486.0 nm. What can we conclude?

A) The star is moving toward us.
B) The star is getting colder.
C) The star is moving away from us.
D) The star is getting hotter.

Answer: A

22) This multiple exposure photograph shows the apparent retrograde motion of Mars. To make this picture, the photographer needed to combine individual photos of Mars taken over a period of _____.

A) about 3 nights
B) one full night
C) several months
D) about one hour

Answer: C

23) Which photo shows what we call a *gibbous moon*? (Note: Assume these photos were taken in the Northern Hemisphere.)

A) 1
B) 2
C) 3
D) 4

Answer: C

24) The Chandra X-ray Observatory must operate in space because _____.

A) it was built by NASA
B) X rays are too dangerous to be allowed on the ground
C) X rays do not penetrate Earth's atmosphere
D) X-ray telescopes require the use of grazing incidence mirrors

Answer: C

25) What do astronomers mean by a *constellation*?

A) A constellation is a region in the sky as seen from Earth.
B) A constellation is a group of stars that are all located in about the same place in space.
C) A constellation is any random grouping of stars in the sky.
D) A constellation is a group of stars related through an ancient story.

Answer: A

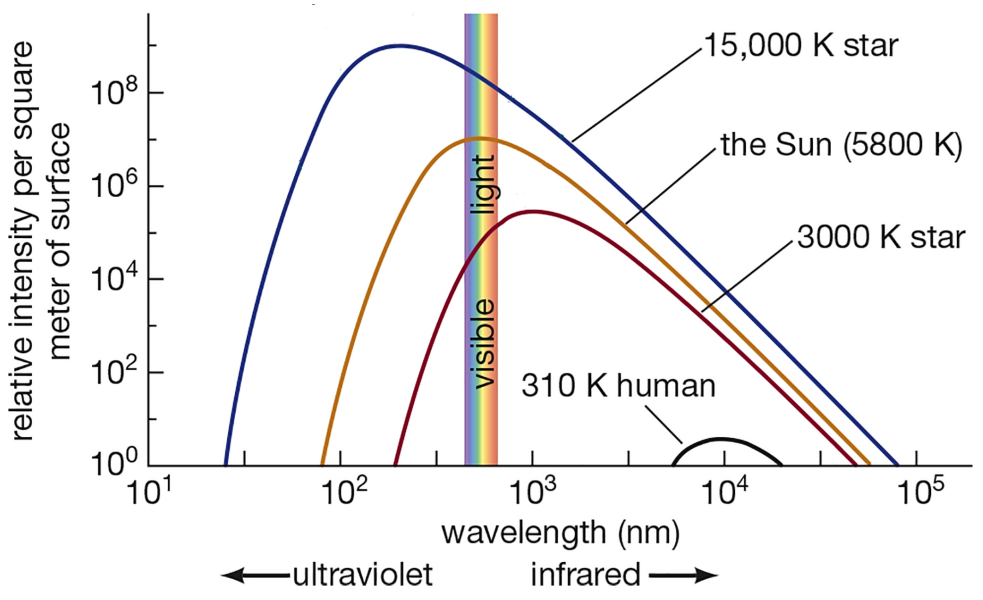
26) If I tell you to look for a star called "alpha - Sagittarii", you would look in the constellation Sagittarius for the
A) reddest star in Sagittarius
B) first star in Sagittarius to rise
C) brightest star in Sagittarius
D) last star in Sagittarius to set
E) faintest star in Sagittarius

Answer: C

27) In any particular place on Earth, certain constellations are visible in the evening only at certain times of the year because _____.
A) some constellations are circumpolar
B) our evening view of space depends on where Earth is located in its orbit around the Sun
C) during some times of year, some constellations drop below the southern horizon
D) on any particular night, we can only see stars that are directly opposite (180 degrees away from) the Sun in the sky

Answer: B

28) This figure shows idealized thermal radiation spectra from several stars and a human. Based on this graph, at about what wavelength does a 15,000 K star emit its most intense light?



A) About 100,000 nanometers
B) About 100 nanometers
C) About 1,000 nanometers
D) About 20 nanometers

Answer: B

29) At the Sun Dagger in New Mexico, a dagger-shaped beam of sunlight pierces a spiral carved into rock
A) at noon on the summer solstice.
B) at sunset on the spring equinox.
C) during the totality of a total solar eclipse.
D) at noon on the day of the full moon each month.
E) every day at noon.

Answer: A

30) Which of the following statements best describes the two principle advantages of telescopes over eyes?
A) Telescopes can collect far more light with far greater magnification.
B) Telescopes collect more light and are unaffected by twinkling.
C) Telescopes can collect far more light with far better angular resolution.
D) Telescopes have much more magnification and better angular resolution.

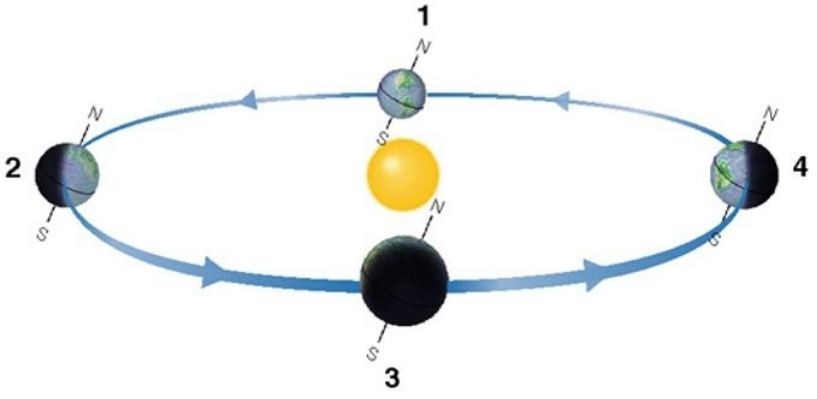
Answer: C

31) The great contribution of Nicholas Copernicus was to _____.
A) discover the law of gravity
B) create a detailed model of our solar system with the Sun at the center
C) prove that the Earth is not the center of the universe
D) discover the laws of planetary motion

Answer: B

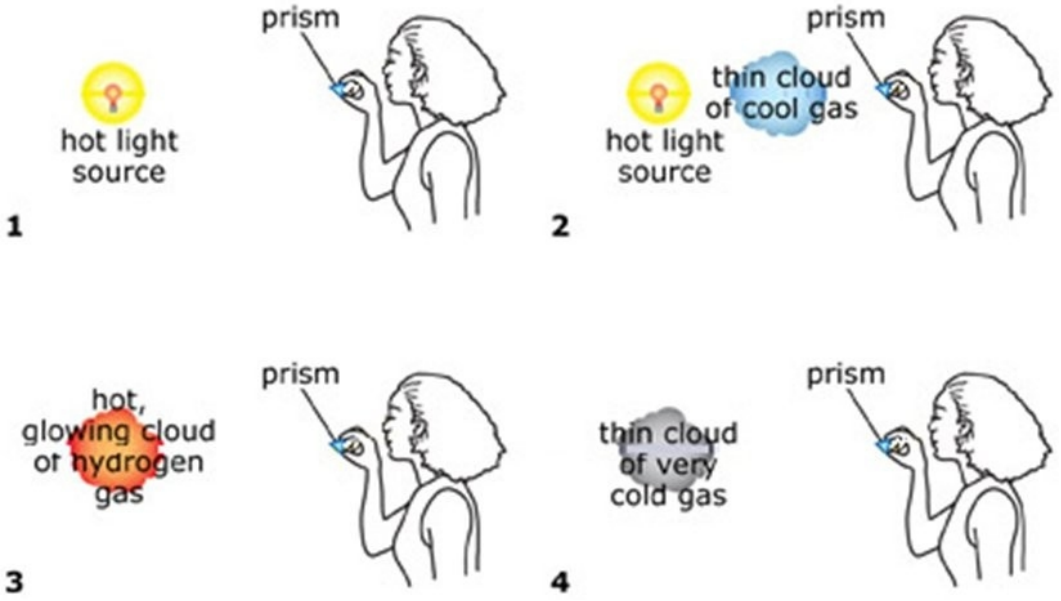
32) The person who was responsible for getting Newton to publish his work on motion and gravity in the Principia was
A) Robert Hooke
B) John Locke
C) King Charles II
D) Edmund Halley
E) Galileo

Answer: D



33) Which position in this diagram represents Earth on the day that we have the longest amount of daylight in the continental United States?
A) 1 B) 2 C) 3 D) 4

Answer: B



34) In which case will the woman see a rainbow of color interrupted by a few dark absorption lines?
A) Case 1 B) Case 2 C) Case 3 D) Case 4

Answer: B

35) An astronomical unit (AU) is _____.
A) any very large unit, such as a light-year
B) the average distance between any planet and the Sun
C) the *average* distance between Earth and the Sun
D) the *current* distance between Earth and the Sun

Answer: C

36) All the following statements are true. Which one explains the reason that there is *not* a solar eclipse at every new moon?
A) The nodes of the moon's orbit precess with an 18-year period.
B) The Moon is only about one-fourth as large as Earth in diameter.
C) The orbital plane of the Moon is tilted slightly (by about 5 degrees) to the ecliptic plane.
D) The Moon goes through a complete cycle of phases about every 29-1/2 days.

Answer: C

37) Ptolemy was important in the history of astronomy because he _____.
A) was the first to believe that all orbits are perfect circles
B) was the first to create a model of the solar system that placed the Sun rather than the Earth at the center
C) developed a model of the solar system that made sufficiently accurate predictions of planetary positions to remain in use for many centuries
D) developed the first scientific model of the universe

Answer: C

38) Which of the following best describes why we have seasons on Earth?
A) The Earth is closer to the Sun in summer and further away in winter.
B) The tilt of Earth's axis causes different portions of the Earth to receive more direct sunlight and more hours of sunlight at different times of year.
C) The varying speed of Earth in its orbit around the Sun gives us summer when we are moving fastest and winter when we are moving slowest.
D) The tilt of Earth's axis causes the northern hemisphere to be closer to the Sun than the southern hemisphere in summer, and vice versa in winter.
E) Earth's elliptical orbit means we are closer to the Sun and therefore receive more intense sunlight at some times of year than at others.

Answer: B

39) What is the purpose of *interferometry*?
A) It allows two or more small telescopes to achieve the angular resolution of a much larger telescope.
B) It is designed to prevent light pollution from interfering with astronomical observations.
C) It allows two or more small telescopes to achieve a larger light-collecting area than they would have independently.
D) It reduces the twinkling of stars caused by atmospheric turbulence.

Answer: A

40) Who said this:
"*What is a Man,*
If his chief good and market of his time
Be but to sleep and feed? A beast, no more.
Sure, he that made us with such large discourse,
Looking before and after, gave us not
That capability and god-like reason
To fust in us unused."
A) Galileo, in his response to the Vatican
B) Hamlet, in Shakespeare's play Hamlet
C) Johannes Kepler, in the Sidereal Messenger
D) Isaac Newton in the Principia
E) Julius Caesar, in Shakespeare's play Julius Caesar

Answer: B