

- 1 The Copernican System was first advocated in print by
 - a. Tycho Brahe.
 - b. Johannes Kepler.
 - c. Galileo Galilei.
 - d. Ptolemy.
 - e. Michael Maestlin.

- 2 The wavelength of the sound waves that correspond to middle-C is about 4 feet. If you are standing 8 feet away from a piano that is playing that note, then between you and the piano there will usually be
 - a. maximum pressure every four seconds.
 - b. maximum pressure every two seconds.
 - c. three regions of maximum pressure.
 - d. two regions of maximum pressure.
 - e. one region of maximum pressure.

- 3 Suppose that a sound wave has a wavelength of 12 meters and a frequency of 100Hz. What is the speed of sound?
 - a. 1200 m/s
 - b. 12 m/s
 - c. 0.012 m/s
 - d. 8.34 m/s
 - e. 100 m/s

- 4 The changing phases of the Moon are caused by
 - a. the rotation of the earth on its axis.
 - b. the tilt of the Earth's axis.
 - c. the changing distance to the Moon.
 - d. the motion of the earth around the Sun.
 - e. the motion of the Moon around the Earth.

- 5 Light with an emission spectrum is usually generated by
 - a. a hot, rarefied gas.
 - b. light from hot dense material passing through a rarefied gas.
 - c. a cold, rarefied gas.
 - d. hot, dense material.

- 6 In comparison to Kepler's Laws of Planetary Motion, Newton's theory of Universal Gravitation predicted
 - a. almost the same motions but with corrections.
 - b. exactly the same motions.
 - c. the same motions interpreted differently.
 - d. a completely different set of motions.

- 7 Who discovered Newton's First Law of Motion?
 - a. Tycho Brahe
 - b. Aristotle.
 - c. Galileo
 - d. Newton
 - e. Kepler

- 8 The main reason that telescope mirrors can be much larger than lenses is that the mirrors
- can have holes in them.
 - are stronger because they are thicker.
 - are lighter because they are thinner.
 - can be made of metal.
- 9 Suppose that you try to lift an object by exerting an upward force of 5 Newtons on it. If gravity exerts a force of 10 Newtons downward on the object, what is the total force on the object?
- 5 Newtons downward
 - 15 Newtons upward
 - 5 Newtons upward
 - 10 Newtons downward
 - 15 Newtons downward
- 10 An ion rocket engine produces 5 Newtons of thrust. What acceleration can it give to a space probe with a mass of 1000kg?
- 5 m/s^2
 - 0.5 m/s^2
 - 0.05 m/s^2
 - 5000 m/s^2
 - 0.005 m/s^2
- 11 A total eclipse of the Sun can be seen
- Only near the Earth's equator.
 - Everywhere on the day side of Earth.
 - Only along a narrow path.
 - Everywhere on the night side of the Earth.
 - Only in the Northern Hemisphere.
- 12 Kepler found that planetary orbits are
- ellipses with the Sun at one focus.
 - circles with the Sun off-center.
 - circles with the Sun at the center.
 - ellipses with the Sun at the center.
- 13 Which of the following types of electromagnetic radiation has the shortest wavelength on this list?
- ultraviolet light.
 - infrared light.
 - red light.
 - green light.
 - microwaves.
- 14 When viewed looking down from above the Earth's South Pole, the Earth
- always rotates counterclockwise.
 - rotates clockwise in the fall and counterclockwise in the spring.
 - rotates clockwise in the spring and counterclockwise in the fall.
 - always rotates clockwise.
 - does not rotate.

- 15 What total force will cause an object with a mass of 1kg to gain 10 meters per second every second?
- 2.5 Newtons
 - 10 Newtons
 - 9.8 Newtons
 - 1 Newton
 - 5 Newtons
- 16 The winter solstice occurs when the Sun is
- closest to the Earth.
 - farthest North of the Celestial Equator.
 - on the Celestial Equator.
 - farthest South of the Celestial Equator.
 - farthest from the Earth.
- 17 Which of Kepler's Laws governs how a particular planet speeds up and slows down?
- The Law of Inertia.
 - Orbits are Ellipses.
 - The Period-Radius Relation.
 - The Law of Averages.
 - The Equal Area Law.
- 18 Polarized light consists of electromagnetic waves that all
- have the same frequency.
 - have electric fields in the same direction.
 - have the same wavefronts.
 - move in the same direction.
 - have passed through the same narrow slit.
- 19 Compared to a proton, an electron has
- about the same mass.
 - much less mass.
 - much more mass.
- 20 Which of the following is a scientific statement (as defined by Popper)?
- Isaac Newton was the greatest scientist.
 - There is cheese on the Moon.
 - There is intelligent life on other stars.
 - There is beauty in a sunset.
 - The Moon is made entirely of cheese.
- 21 We can use the pointer stars in the Big Dipper to locate a point in the sky near the
- Star Sirius.
 - East Celestial Pole.
 - Celestial Equator.
 - North Celestial Pole.
 - South Celestial Pole.

- 22 A converging lens will send the light from a distant star through a point
- on the same side of the lens as the star.
 - in the center of the lens.
 - infinitely far away from the lens.
 - at one edge of the lens.
 - on the side of the lens opposite the star.
- 23 A problem that is peculiar to infrared telescopes is a need for
- cooling to low temperature.
 - very long exposure times.
 - large reflector sizes.
 - grazing incidence mirrors.
- 24 A sidereal day is
- just the same as a solar day.
 - several hours longer than a solar day.
 - a few minutes longer than a solar day.
 - a few minutes shorter than a solar day.
 - several hours shorter than a solar day.
- 25 Freely falling objects with different masses fall with the same acceleration because
- they have the same amount of inertia.
 - gravity acts with the same force on both objects.
 - there is no air resistance.
 - gravity acts more strongly on the more massive object.
 - gravity acts with less force on more massive object.
- 26 The frequency of a wave is defined to be
- The distance from one crest to the next.
 - The distance from a maximum to a minimum.
 - The time for a set of crests to pass divided by the number of crests.
 - The number of crests that pass in one second.
 - The number of seconds that it takes for a crest to pass.
- 27 Electrons that are bound to the nucleus of an atom (so that energy is needed to remove them) can have
- any negative energy at all.
 - only certain isolated positive energies.
 - only certain isolated negative energies.
 - any positive energy at all.
- 28 Copernicus said that the daily motions in the heavens were caused by the
- planets turning on their axes.
 - earth and the planets orbiting the Sun.
 - earth turning on its axis.
 - planets speeding up and slowing down.
 - planets moving on epicycles.

- 29 The retrograde motion that puzzled the ancients occurs when
- Venus is near Mars.
 - Mars is in the opposite direction from the Sun.
 - Venus is far from Mars.
 - Venus is in the opposite direction from the Sun.
 - Mars is near the Sun.
- 30 Which of the following can be seen everywhere on the night side of the Earth?
- A New Moon.
 - A total eclipse of the Sun.
 - A total eclipse of the Moon.
 - A waxing quarter Moon.
 - A partial eclipse of the Sun.
- 31 Tycho Brahe's careful observations of the planets agreed, to within observational error, with
- None of these systems.
 - the Copernican System
 - the Tychonic System.
 - the Ptolemaic System.
- 32 As compared to lower frequency electromagnetic radiation, higher frequency electromagnetic radiation will usually cause
- about the same damage.
 - more damage.
 - less damage.
- 33 As seen from North America, the constellation Ursa Major
- sets in the north.
 - never sets.
 - sets in the west.
 - sets in the east.
 - sets in the south.
- 34 X-Ray telescopes need to use mirrors that
- are extremely large.
 - are made of wire mesh.
 - are kept extremely cold.
 - are kept extremely hot.
 - use grazing angles of incidence.
- 35 Compared to ultraviolet light photons, the photons of visible light have
- about the same energy.
 - higher energy.
 - lower energy.
 - higher energy in some cases, lower in others.

- 36 Compared to stars of other colors, a blue star will have a surface temperature that is
- among the lowest.
 - among the highest.
 - in the middle of the range.
- 37 The first major failure of the Ptolemaic Theory to predict the results of observations was
- the phases of Venus.
 - the Moons of Jupiter.
 - the retrograde motion of the planets.
 - the precise observations of Tycho Brahe.
 - the mountains of the Moon.
- 38 Suppose that you drop two objects from the same height at the same time. Both objects are heavy enough to be unaffected by air resistance. If one object is twice as heavy as the other, Aristotle predicted that
- the lighter object would hit the ground long before the heavier one.
 - the heavier object would hit the ground long before the lighter one.
 - both objects would hit the ground at the same time.
- 39 Which of the following tasks would *require* a non-science discipline?
- Programming a computer.
 - Repairing a motorcycle.
 - Finding a cure for cancer.
 - Sentencing a criminal.
 - Designing an airplane.
- 40 The diffraction limit is a problem for radio telescopes because it makes it
- difficult for radio telescopes to be large.
 - necessary to collect a strong signal.
 - necessary for radio telescopes to be large.
 - difficult to collect a strong signal.
- 41 Compared to the frequency of photons emitted during a transition from a -4eV state to a -5eV state, transitions from a -1eV state to the -6eV state would emit photons whose frequency is
- 3 times as high.
 - 2 times as high.
 - 4 times as high.
 - the same.
 - 5 times as high.
- 42 In addition to being accurate, Tycho Brahe's observations focused on measuring the positions of the planets
- all the time.
 - during the solstices.
 - near the horizon.
 - when they were in retrograde motion.
 - during conjunctions.

- 43 The red line of a spectrum is normally at a wavelength of 656 nm. In the light of a star that is moving away from us, we might expect to see that red line at a wavelength of
- 660nm.
 - 650nm.
 - 656nm.
- 44 The DNA in some blood found at a crime scene is compared with the DNA of a suspect and is found to be different. Which of the following conclusions is correct?
- The suspect was not at the scene.
 - The suspect is innocent.
 - The suspect did not leave blood at the scene.
 - The suspect was at the scene.
 - The suspect left blood at the scene.
- 45 In comparison to the established, earth-centered theory, the Copernican Theory of planetary motion made predictions that were of
- much less accuracy.
 - much higher accuracy.
 - about the same accuracy.
- 46 Eclipses happen when the Full or New Moon occurs on the
- Vernal Equinox.
 - Ecliptic.
 - Winter Solstice.
 - Horizon.
 - Celestial Equator.
- 47 Adaptive optics is used to correct telescopes for
- chromatic aberration.
 - spherical aberration.
 - poor light collection ability.
 - the diffraction limit.
 - atmospheric turbulence.
- 48 Newton's explanation of Kepler's Laws relied upon a force that
- acts only on planets.
 - acts only on inorganic matter.
 - acts on all objects.
 - acts only on heavenly bodies.
 - acts on planets but not on comets.

- 49 Mars is farther from the Sun than Earth. Which of the following statements is true?
- Mars takes longer to go around the Sun than the Earth because it has farther to go, but actually moves at the same speed as the Earth.
 - Mars takes less time to go around the Sun than the Earth and moves much faster.
 - Mars takes longer to go around the Sun than the Earth because it has farther to go, but actually moves faster than the Earth.
 - Mars takes less time to go around the Sun than the Earth does but moves slower because the Earth keeps making rest stops.
 - Mars takes longer to go around the Sun than Earth and moves more slowly than the Earth does.
- 50 The International Space Station (ISS) is in a roughly circular orbit near the surface of the Earth, moving at around 5 miles per second. Suppose the Space Shuttle pushes it and quickly increases its speed to 6 miles per second. The ISS will then
- follow an ellipse that descends and then rises again.
 - coast up to a higher circular orbit.
 - escape from the Earth.
 - follow an ellipse that rises and then descends again.
- 51 Consider that a scientific statement is always vulnerable to being proven wrong. In the dispute between Galileo and the Inquisition, which one was treating the Copernican and Ptolemaic Systems as scientific statements?
- the Roman Inquisition.
 - Galileo.
 - neither.
 - both.
- 52 You see a telescope with a long tube and the eyepiece sticking out the side near the top. This telescope uses the
- Newtonian Focus.
 - Coudé Focus
 - Prime Focus.
 - Cassegrain Focus.

Answer Key: Fall 2007 AHX1B

- 1 Choice b. (Johannes Kepler.)
- 2 Choice d. (two regions of maximum pressure.)
- 3 Choice a. (1200 m/s)
- 4 Choice e. (the motion of the Moon around the Earth.)
- 5 Choice a. (a hot, rarefied gas.)
- 6 Choice a. (almost the same motions but with corrections.)
- 7 Choice c. (Galileo)
- 8 Choice c. (are lighter because they are thinner.)
- 9 Choice a. (5 Newtons downward)
- 10 Choice e. (0.005 m/s^2)
- 11 Choice c. (Only along a narrow path.)
- 12 Choice a. (ellipses with the Sun at one focus.)
- 13 Choice a. (ultraviolet light.)
- 14 Choice d. (always rotates clockwise.)
- 15 Choice b. (10 Newtons)
- 16 Choice d. (farthest South of the Celestial Equator.)
- 17 Choice e. (The Equal Area Law.)
- 18 Choice b. (have electric fields in the same direction.)
- 19 Choice b. (much less mass.)
- 20 Choice e. (The Moon is made entirely of cheese.)
- 21 Choice d. (North Celestial Pole.)
- 22 Choice e. (on the side of the lens opposite the star.)
- 23 Choice a. (cooling to low temperature.)
- 24 Choice d. (a few minutes shorter than a solar day.)
- 25 Choice d. (gravity acts more strongly on the more massive object.)
- 26 Choice d. (The number of crests that pass in one second.)
- 27 Choice c. (only certain isolated negative energies.)
- 28 Choice c. (earth turning on its axis.)
- 29 Choice b. (Mars is in the opposite direction from the Sun.)
- 30 Choice c. (A total eclipse of the Moon.)
- 31 Choice a. (None of these systems.)
- 32 Choice b. (more damage.)
- 33 Choice b. (never sets.)
- 34 Choice e. (use grazing angles of incidence.)
- 35 Choice c. (lower energy.)
- 36 Choice b. (among the highest.)

- 37 Choice a. (the phases of Venus.)
- 38 Choice b. (the heavier object would hit the ground long before the lighter one.)
- 39 Choice d. (Sentencing a criminal.)
- 40 Choice c. (necessary for radio telescopes to be large.)
- 41 Choice e. (5 times as high.)
- 42 Choice a. (all the time.)
- 43 Choice a. (660nm.)
- 44 Choice c. (The suspect did not leave blood at the scene.)
- 45 Choice c. (about the same accuracy.)
- 46 Choice b. (Ecliptic.)
- 47 Choice e. (atmospheric turbulence.)
- 48 Choice c. (acts on all objects.)
- 49 Choice e. (Mars takes longer to go around the Sun than Earth and moves more slowly than the Earth does.)
- 50 Choice d. (follow an ellipse that rises and then descends again.)
- 51 Choice c. (neither.)
- 52 Choice a. (Newtonian Focus.)

Solutions

- 1 Module 005 Advocate for Copernicus: Question 005.32
- 2 Module 009 Wavelength: Question 009.12
- 3 Module 009 Speed of a Wave: Question 009.34
- 4 Module 002 Phases of the Moon: Question 002.11
- 5 Module 010 Spectra: Question 010.32
- 6 Module 008 Making New Predictions: Question 008.33
- 7 Module 007 The Law of Inertia: Question 007.11
- 8 Module 012 Focal Point of a Mirror: Question 012.23
- 9 Module 007 Definitions of Force and Mass: Question 007.33
- 10 Module 007 The Law of Force and Mass: Question 007.45
- 11 Module 002 Solar Eclipses: Question 002.21
- 12 Module 006 Orbits are Ellipses: Question 006.21
- 13 Module 010 The Electromagnetic Spectrum: Question 010.15
- 14 Module 001 Celestial Coordinates: Question 001.26
- 15 Module 007 Definitions of Force and Mass: Question 007.22
- 16 Module 001 The Path of the Sun: Question 001.56
- 17 Module 006 Equal Area Rule: Question 006.32
- 18 Module 009 Polarization: Question 009.42
- 19 Module 011 The Building Blocks: Question 011.12
- 20 Module 003 How to test a statement : Question 003.21
- 21 Module 001 The Celestial Sphere: Question 001.11
- 22 Module 012 Focal Point of a Lens: Question 012.11
- 23 Module 013 Infrared: Question 013.21
- 24 Module 001 Apparent Motion of the Sun: Question 001.44
- 25 Module 008 Unifying Physical Law: Question 008.23
- 26 Module 009 Frequency: Question 009.21
- 27 Module 011 Atomic Energy Levels: Question 011.31
- 28 Module 004 The Copernican System: Question 004.23
- 29 Module 004 Wandering Planets: Question 004.13
- 30 Module 002 Lunar Eclipses: Question 002.32
- 31 Module 006 Death of a Theory: Question 006.12
- 32 Module 011 Photons: Question 011.22
- 33 Module 001 Star Motions: Question 001.31
- 34 Module 013 X-Rays: Question 013.41
- 35 Module 013 Ultraviolet: Question 013.34
- 36 Module 010 Temperature and Color: Question 010.22

- 37 Module 005 The First Astrophysicist: Question 005.24
- 38 Module 005 The First Physicist: Question 005.14
- 39 Module 003 Non-science: Question 003.32
- 40 Module 013 Radio Telescopes: Question 013.12
- 41 Module 011 The Reason for Spectra: Question 011.44
- 42 Module 004 Tycho Brahe's Role: Question 004.43
- 43 Module 010 The Doppler Effect: Question 010.43
- 44 Module 003 Scientific Proof: Question 003.14
- 45 Module 004 Why Copernicus Lost: Question 004.31
- 46 Module 002 Predicting Eclipses: Question 002.43
- 47 Module 012 Telescope Limitations: Question 012.44
- 48 Module 008 Explaining Kepler's Laws: Question 008.12
- 49 Module 006 The Period-Radius Relation: Question 006.43
- 50 Module 008 Artificial Satellites: Question 008.42
- 51 Module 005 The Science Writer: Question 005.43
- 52 Module 012 Telescope Designs: Question 012.31