

- 1 An ion rocket engine produces 5 Newtons of thrust. What acceleration can it give to a space probe with a mass of 1000kg?
 - a. 5 m/s^2
 - b. 0.5 m/s^2
 - c. 5000 m/s^2
 - d. 0.05 m/s^2
 - e. 0.005 m/s^2

- 2 As seen from North America, the constellation Ursa Major
 - a. sets in the north.
 - b. sets in the south.
 - c. sets in the west.
 - d. never sets.
 - e. sets in the east.

- 3 Which of the following types of electromagnetic radiation has the shortest wavelength on this list?
 - a. ultraviolet light.
 - b. infrared light.
 - c. green light.
 - d. microwaves.
 - e. red light.

- 4 Copernicus said that the daily motions in the heavens were caused by the
 - a. earth turning on its axis.
 - b. planets turning on their axes.
 - c. earth and the planets orbiting the Sun.
 - d. planets speeding up and slowing down.
 - e. planets moving on epicycles.

- 5 You see a telescope with a long tube and the eyepiece sticking out the side near the top. This telescope uses the
 - a. Cassegrain Focus.
 - b. Newtonian Focus.
 - c. Coudé Focus
 - d. Prime Focus.

- 6 Mars is farther from the Sun than Earth. Which of the following statements is true?
 - a. 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.
 - b. Mars takes less time to go around the Sun than the Earth does but moves slower because the Earth keeps making rest stops.
 - c. Mars takes less time to go around the Sun than the Earth and moves much faster.
 - d. Mars takes longer to go around the Sun than Earth and moves more slowly than the Earth does.
 - e. Mars takes longer to go around the Sun than the Earth because it has farther to go, but actually moves faster than the Earth.

- 7 Who discovered Newton's First Law of Motion?
- Galileo
 - Tycho Brahe
 - Kepler
 - Newton
 - Aristotle.
- 8 A sidereal day is
- a few minutes shorter than a solar day.
 - a few minutes longer than a solar day.
 - just the same as a solar day.
 - several hours longer than a solar day.
 - several hours shorter than a solar day.
- 9 Compared to ultraviolet light photons, the photons of visible light have
- higher energy.
 - about the same energy.
 - lower energy.
 - higher energy in some cases, lower in others.
- 10 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.
- 11 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
- three regions of maximum pressure.
 - two regions of maximum pressure.
 - maximum pressure every two seconds.
 - one region of maximum pressure.
 - maximum pressure every four seconds.
- 12 A converging lens will send the light from a distant star through a point
- at one edge of the lens.
 - in the center of the lens.
 - infinitely far away from the lens.
 - on the side of the lens opposite the star.
 - on the same side of the lens as the star.
- 13 What total force will cause an object with a mass of 1kg to gain 10 meters per second every second?
- 10 Newtons
 - 5 Newtons
 - 2.5 Newtons
 - 1 Newton
 - 9.8 Newtons

- 14 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?
- Galileo.
 - neither.
 - the Roman Inquisition.
 - both.
- 15 In addition to being accurate, Tycho Brahe's observations focused on measuring the positions of the planets
- all the time.
 - when they were in retrograde motion.
 - during the solstices.
 - during conjunctions.
 - near the horizon.
- 16 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.
 - the same.
 - 2 times as high.
 - 4 times as high.
 - 5 times as high.
- 17 X-Ray telescopes need to use mirrors that
- are extremely large.
 - are kept extremely hot.
 - are made of wire mesh.
 - use grazing angles of incidence.
 - are kept extremely cold.
- 18 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 left blood at the scene.
 - The suspect did not leave blood at the scene.
 - The suspect was at the scene.
- 19 The frequency of a wave is defined to be
- The number of crests that pass in one second.
 - The number of seconds that it takes for a crest to pass.
 - The distance from a maximum to a minimum.
 - The distance from one crest to the next.
 - The time for a set of crests to pass divided by the number of crests.

- 20 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.
 - gravity acts with less force on more massive object.
 - there is no air resistance.
 - gravity acts more strongly on the more massive object.
- 21 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?
- 10 Newtons downward
 - 15 Newtons downward
 - 5 Newtons downward
 - 5 Newtons upward
 - 15 Newtons upward
- 22 Which of Kepler's Laws governs how a particular planet speeds up and slows down?
- The Equal Area Law.
 - The Law of Inertia.
 - Orbits are Ellipses.
 - The Law of Averages.
 - The Period-Radius Relation.
- 23 Which of the following tasks would *require* a non-science discipline?
- Sentencing a criminal.
 - Repairing a motorcycle.
 - Finding a cure for cancer.
 - Programming a computer.
 - Designing an airplane.
- 24 A total eclipse of the Sun can be seen
- Everywhere on the night side of the Earth.
 - Everywhere on the day side of Earth.
 - Only along a narrow path.
 - Only in the Northern Hemisphere.
 - Only near the Earth's equator.
- 25 In comparison to Kepler's Laws of Planetary Motion, Newton's theory of Universal Gravitation predicted
- almost the same motions but with corrections.
 - exactly the same motions.
 - the same motions interpreted differently.
 - a completely different set of motions.

- 26 Adaptive optics is used to correct telescopes for
- poor light collection ability.
 - chromatic aberration.
 - spherical aberration.
 - the diffraction limit.
 - atmospheric turbulence.
- 27 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 heavier object would hit the ground long before the lighter one.
 - the lighter object would hit the ground long before the heavier one.
 - both objects would hit the ground at the same time.
- 28 The Copernican System was first advocated in print by
- Johannes Kepler.
 - Galileo Galilei.
 - Michael Maestlin.
 - Ptolemy.
 - Tycho Brahe.
- 29 In comparison to the established, earth-centered theory, the Copernican Theory of planetary motion made predictions that were of
- about the same accuracy.
 - much higher accuracy.
 - much less accuracy.
- 30 Polarized light consists of electromagnetic waves that all
- move in the same direction.
 - have the same frequency.
 - have passed through the same narrow slit.
 - have the same wavefronts.
 - have electric fields in the same direction.
- 31 Suppose that a sound wave has a wavelength of 12 meters and a frequency of 100Hz. What is the speed of sound?
- 12 m/s
 - 100 m/s
 - 8.34 m/s
 - 0.012 m/s
 - 1200 m/s
- 32 The first major failure of the Ptolemaic Theory to predict the results of observations was
- the precise observations of Tycho Brahe.
 - the Moons of Jupiter.
 - the retrograde motion of the planets.
 - the mountains of the Moon.
 - the phases of Venus.

- 33 We can use the pointer stars in the Big Dipper to locate a point in the sky near the
- Celestial Equator.
 - South Celestial Pole.
 - East Celestial Pole.
 - North Celestial Pole.
 - Star Sirius.
- 34 Compared to a proton, an electron has
- much less mass.
 - about the same mass.
 - much more mass.
- 35 The main reason that telescope mirrors can be much larger than lenses is that the mirrors
- can be made of metal.
 - are lighter because they are thinner.
 - can have holes in them.
 - are stronger because they are thicker.
- 36 Which of the following can be seen everywhere on the night side of the Earth?
- A partial eclipse of the Sun.
 - A total eclipse of the Moon.
 - A waxing quarter Moon.
 - A total eclipse of the Sun.
 - A New Moon.
- 37 Eclipses happen when the Full or New Moon occurs on the
- Winter Solstice.
 - Vernal Equinox.
 - Celestial Equator.
 - Horizon.
 - Ecliptic.
- 38 As compared to lower frequency electromagnetic radiation, higher frequency electromagnetic radiation will usually cause
- about the same damage.
 - more damage.
 - less damage.
- 39 Light with an emission spectrum is usually generated by
- a cold, rarefied gas.
 - a hot, rarefied gas.
 - hot, dense material.
 - light from hot dense material passing through a rarefied gas.
- 40 Compared to stars of other colors, a blue star will have a surface temperature that is
- among the highest.
 - among the lowest.
 - in the middle of the range.

- 41 The retrograde motion that puzzled the ancients occurs when
- Mars is in the opposite direction from the Sun.
 - Venus is far from Mars.
 - Venus is near Mars.
 - Mars is near the Sun.
 - Venus is in the opposite direction from the Sun.
- 42 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
- escape from the Earth.
 - follow an ellipse that rises and then descends again.
 - coast up to a higher circular orbit.
 - follow an ellipse that descends and then rises again.
- 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.
 - 656nm.
 - 650nm.
- 44 Electrons that are bound to the nucleus of an atom (so that energy is needed to remove them) can have
- only certain isolated negative energies.
 - any positive energy at all.
 - only certain isolated positive energies.
 - any negative energy at all.
- 45 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 on planets but not on comets.
 - acts only on heavenly bodies.
- 46 Which of the following is a scientific statement (as defined by Popper)?
- The Moon is made entirely of cheese.
 - There is intelligent life on other stars.
 - There is beauty in a sunset.
 - There is cheese on the Moon.
 - Isaac Newton was the greatest scientist.
- 47 The diffraction limit is a problem for radio telescopes because it makes it
- necessary to collect a strong signal.
 - difficult to collect a strong signal.
 - difficult for radio telescopes to be large.
 - necessary for radio telescopes to be large.

- 48 A problem that is peculiar to infrared telescopes is a need for
- cooling to low temperature.
 - large reflector sizes.
 - grazing incidence mirrors.
 - very long exposure times.
- 49 The changing phases of the Moon are caused by
- the tilt of the Earth's axis.
 - the rotation of the earth on its axis.
 - the motion of the earth around the Sun.
 - the motion of the Moon around the Earth.
 - the changing distance to the Moon.
- 50 Tycho Brahe's careful observations of the planets agreed, to within observational error, with
- the Copernican System
 - the Tychoonic System.
 - None of these systems.
 - the Ptolemaic System.
- 51 When viewed looking down from above the Earth's South Pole, the Earth
- rotates clockwise in the fall and counterclockwise in the spring.
 - always rotates clockwise.
 - rotates clockwise in the spring and counterclockwise in the fall.
 - does not rotate.
 - always rotates counterclockwise.
- 52 The winter solstice occurs when the Sun is
- on the Celestial Equator.
 - farthest from the Earth.
 - closest to the Earth.
 - farthest South of the Celestial Equator.
 - farthest North of the Celestial Equator.

Answer Key: Fall 2007 AHX1C

- 1 Choice e. (0.005 m/s²)
- 2 Choice d. (never sets.)
- 3 Choice a. (ultraviolet light.)
- 4 Choice a. (earth turning on its axis.)
- 5 Choice b. (Newtonian Focus.)
- 6 Choice d. (Mars takes longer to go around the Sun than Earth and moves more slowly than the Earth does.)
- 7 Choice a. (Galileo)
- 8 Choice a. (a few minutes shorter than a solar day.)
- 9 Choice c. (lower energy.)
- 10 Choice a. (ellipses with the Sun at one focus.)
- 11 Choice b. (two regions of maximum pressure.)
- 12 Choice d. (on the side of the lens opposite the star.)
- 13 Choice a. (10 Newtons)
- 14 Choice b. (neither.)
- 15 Choice a. (all the time.)
- 16 Choice e. (5 times as high.)
- 17 Choice d. (use grazing angles of incidence.)
- 18 Choice d. (The suspect did not leave blood at the scene.)
- 19 Choice a. (The number of crests that pass in one second.)
- 20 Choice e. (gravity acts more strongly on the more massive object.)
- 21 Choice c. (5 Newtons downward)
- 22 Choice a. (The Equal Area Law.)
- 23 Choice a. (Sentencing a criminal.)
- 24 Choice c. (Only along a narrow path.)
- 25 Choice a. (almost the same motions but with corrections.)
- 26 Choice e. (atmospheric turbulence.)
- 27 Choice a. (the heavier object would hit the ground long before the lighter one.)
- 28 Choice a. (Johannes Kepler.)
- 29 Choice a. (about the same accuracy.)
- 30 Choice e. (have electric fields in the same direction.)
- 31 Choice e. (1200 m/s)
- 32 Choice e. (the phases of Venus.)
- 33 Choice d. (North Celestial Pole.)
- 34 Choice a. (much less mass.)
- 35 Choice b. (are lighter because they are thinner.)
- 36 Choice b. (A total eclipse of the Moon.)

- 37 Choice e. (Ecliptic.)
- 38 Choice b. (more damage.)
- 39 Choice b. (a hot, rarefied gas.)
- 40 Choice a. (among the highest.)
- 41 Choice a. (Mars is in the opposite direction from the Sun.)
- 42 Choice b. (follow an ellipse that rises and then descends again.)
- 43 Choice a. (660nm.)
- 44 Choice a. (only certain isolated negative energies.)
- 45 Choice c. (acts on all objects.)
- 46 Choice a. (The Moon is made entirely of cheese.)
- 47 Choice d. (necessary for radio telescopes to be large.)
- 48 Choice a. (cooling to low temperature.)
- 49 Choice d. (the motion of the Moon around the Earth.)
- 50 Choice c. (None of these systems.)
- 51 Choice b. (always rotates clockwise.)
- 52 Choice d. (farthest South of the Celestial Equator.)

Solutions

- 1 Module 007 The Law of Force and Mass: Question 007.45
- 2 Module 001 Star Motions: Question 001.31
- 3 Module 010 The Electromagnetic Spectrum: Question 010.15
- 4 Module 004 The Copernican System: Question 004.23
- 5 Module 012 Telescope Designs: Question 012.31
- 6 Module 006 The Period-Radius Relation: Question 006.43
- 7 Module 007 The Law of Inertia: Question 007.11
- 8 Module 001 Apparent Motion of the Sun: Question 001.44
- 9 Module 013 Ultraviolet: Question 013.34
- 10 Module 006 Orbits are Ellipses: Question 006.21
- 11 Module 009 Wavelength: Question 009.12
- 12 Module 012 Focal Point of a Lens: Question 012.11
- 13 Module 007 Definitions of Force and Mass: Question 007.22
- 14 Module 005 The Science Writer: Question 005.43
- 15 Module 004 Tycho Brahe's Role: Question 004.43
- 16 Module 011 The Reason for Spectra: Question 011.44
- 17 Module 013 X-Rays: Question 013.41
- 18 Module 003 Scientific Proof: Question 003.14
- 19 Module 009 Frequency: Question 009.21
- 20 Module 008 Unifying Physical Law: Question 008.23
- 21 Module 007 Definitions of Force and Mass: Question 007.33
- 22 Module 006 Equal Area Rule: Question 006.32
- 23 Module 003 Non-science: Question 003.32
- 24 Module 002 Solar Eclipses: Question 002.21
- 25 Module 008 Making New Predictions: Question 008.33
- 26 Module 012 Telescope Limitations: Question 012.44
- 27 Module 005 The First Physicist: Question 005.14
- 28 Module 005 Advocate for Copernicus: Question 005.32
- 29 Module 004 Why Copernicus Lost: Question 004.31
- 30 Module 009 Polarization: Question 009.42
- 31 Module 009 Speed of a Wave: Question 009.34
- 32 Module 005 The First Astrophysicist: Question 005.24
- 33 Module 001 The Celestial Sphere: Question 001.11
- 34 Module 011 The Building Blocks: Question 011.12
- 35 Module 012 Focal Point of a Mirror: Question 012.23
- 36 Module 002 Lunar Eclipses: Question 002.32

- 37 Module 002 Predicting Eclipses: Question 002.43
- 38 Module 011 Photons: Question 011.22
- 39 Module 010 Spectra: Question 010.32
- 40 Module 010 Temperature and Color: Question 010.22
- 41 Module 004 Wandering Planets: Question 004.13
- 42 Module 008 Artificial Satellites: Question 008.42
- 43 Module 010 The Doppler Effect: Question 010.43
- 44 Module 011 Atomic Energy Levels: Question 011.31
- 45 Module 008 Explaining Kepler's Laws: Question 008.12
- 46 Module 003 How to test a statement : Question 003.21
- 47 Module 013 Radio Telescopes: Question 013.12
- 48 Module 013 Infrared: Question 013.21
- 49 Module 002 Phases of the Moon: Question 002.11
- 50 Module 006 Death of a Theory: Question 006.12
- 51 Module 001 Celestial Coordinates: Question 001.26
- 52 Module 001 The Path of the Sun: Question 001.56