

- 1 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?
 - a. 15 Newtons upward
 - b. 10 Newtons downward
 - c. 5 Newtons upward
 - d. 15 Newtons downward
 - e. 5 Newtons downward

- 2 A problem that is peculiar to infrared telescopes is a need for
 - a. large reflector sizes.
 - b. grazing incidence mirrors.
 - c. very long exposure times.
 - d. cooling to low temperature.

- 3 When viewed looking down from above the Earth's South Pole, the Earth
 - a. rotates clockwise in the fall and counterclockwise in the spring.
 - b. always rotates clockwise.
 - c. rotates clockwise in the spring and counterclockwise in the fall.
 - d. always rotates counterclockwise.
 - e. does not rotate.

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

- 5 In comparison to the established, earth-centered theory, the Copernican Theory of planetary motion made predictions that were of
 - a. much less accuracy.
 - b. much higher accuracy.
 - c. about the same accuracy.

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

- 7 Adaptive optics is used to correct telescopes for
 - a. poor light collection ability.
 - b. the diffraction limit.
 - c. spherical aberration.
 - d. atmospheric turbulence.
 - e. chromatic aberration.

- 8 Mars is farther from the Sun than Earth. Which of the following statements is true?
- Mars takes longer to go around the Sun than Earth and moves more slowly than the Earth does.
 - 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 the Earth because it has farther to go, but actually moves at the same speed as the Earth.
- 9 Which of the following is a scientific statement (as defined by Popper)?
- There is beauty in a sunset.
 - There is intelligent life on other stars.
 - Isaac Newton was the greatest scientist.
 - The Moon is made entirely of cheese.
 - There is cheese on the Moon.
- 10 Which of Kepler's Laws governs how a particular planet speeds up and slows down?
- The Period-Radius Relation.
 - The Equal Area Law.
 - Orbits are Ellipses.
 - The Law of Averages.
 - The Law of Inertia.
- 11 The main reason that telescope mirrors can be much larger than lenses is that the mirrors
- can be made of metal.
 - are stronger because they are thicker.
 - are lighter because they are thinner.
 - can have holes in them.
- 12 Who discovered Newton's First Law of Motion?
- Newton
 - Galileo
 - Aristotle.
 - Tycho Brahe
 - Kepler
- 13 In comparison to Kepler's Laws of Planetary Motion, Newton's theory of Universal Gravitation predicted
- a completely different set of motions.
 - exactly the same motions.
 - the same motions interpreted differently.
 - almost the same motions but with corrections.

- 14 In addition to being accurate, Tycho Brahe's observations focused on measuring the positions of the planets
- during conjunctions.
 - when they were in retrograde motion.
 - during the solstices.
 - near the horizon.
 - all the time.
- 15 Kepler found that planetary orbits are
- circles with the Sun at the center.
 - ellipses with the Sun at the center.
 - circles with the Sun off-center.
 - ellipses with the Sun at one focus.
- 16 What total force will cause an object with a mass of 1kg to gain 10 meters per second every second?
- 9.8 Newtons
 - 10 Newtons
 - 1 Newton
 - 5 Newtons
 - 2.5 Newtons
- 17 The diffraction limit is a problem for radio telescopes because it makes it
- difficult to collect a strong signal.
 - difficult for radio telescopes to be large.
 - necessary to collect a strong signal.
 - necessary for radio telescopes to be large.
- 18 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?
- both.
 - the Roman Inquisition.
 - neither.
 - Galileo.
- 19 Compared to a proton, an electron has
- about the same mass.
 - much less mass.
 - much more mass.
- 20 Eclipses happen when the Full or New Moon occurs on the
- Ecliptic.
 - Vernal Equinox.
 - Winter Solstice.
 - Horizon.
 - Celestial Equator.

- 21 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 negative energy at all.
 - any positive energy at all.
 - only certain isolated positive energies.
- 22 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 left blood at the scene.
 - The suspect was not at the scene.
 - The suspect was at the scene.
 - The suspect is innocent.
 - The suspect did not leave blood at the scene.
- 23 The frequency of a wave is defined to be
- The distance from one crest to the next.
 - The time for a set of crests to pass divided by the number of crests.
 - The distance from a maximum to a minimum.
 - The number of seconds that it takes for a crest to pass.
 - The number of crests that pass in one second.
- 24 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.
- 25 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
 - 5000 m/s^2
 - 0.005 m/s^2
 - 0.05 m/s^2
 - 0.5 m/s^2
- 26 A sidereal day is
- several hours longer than a solar day.
 - just the same as 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.
- 27 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 descends and then rises again.
 - follow an ellipse that rises and then descends again.
 - coast up to a higher circular orbit.

- 28 Compared to stars of other colors, a blue star will have a surface temperature that is
- among the lowest.
 - in the middle of the range.
 - among the highest.
- 29 The first major failure of the Ptolemaic Theory to predict the results of observations was
- the precise observations of Tycho Brahe.
 - the mountains of the Moon.
 - the phases of Venus.
 - the Moons of Jupiter.
 - the retrograde motion of the planets.
- 30 Suppose that a sound wave has a wavelength of 12 meters and a frequency of 100Hz. What is the speed of sound?
- 0.012 m/s
 - 8.34 m/s
 - 1200 m/s
 - 100 m/s
 - 12 m/s
- 31 The winter solstice occurs when the Sun is
- closest to the Earth.
 - on the Celestial Equator.
 - farthest from the Earth.
 - farthest South of the Celestial Equator.
 - farthest North of the Celestial Equator.
- 32 A converging lens will send the light from a distant star through a point
- on the side of the lens opposite the star.
 - in the center of the lens.
 - on the same side of the lens as the star.
 - infinitely far away from the lens.
 - at one edge of the lens.
- 33 Freely falling objects with different masses fall with the same acceleration because
- gravity acts with the same force on both objects.
 - gravity acts with less force on more massive object.
 - they have the same amount of inertia.
 - there is no air resistance.
 - gravity acts more strongly on the more massive object.
- 34 X-Ray telescopes need to use mirrors that
- are extremely large.
 - are made of wire mesh.
 - are kept extremely cold.
 - use grazing angles of incidence.
 - are kept extremely hot.

- 35 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
- one region of maximum pressure.
 - three regions of maximum pressure.
 - two regions of maximum pressure.
 - maximum pressure every four seconds.
 - maximum pressure every two seconds.
- 36 Which of the following tasks would *require* a non-science discipline?
- Designing an airplane.
 - Sentencing a criminal.
 - Repairing a motorcycle.
 - Programming a computer.
 - Finding a cure for cancer.
- 37 As seen from North America, the constellation Ursa Major
- never sets.
 - sets in the south.
 - sets in the north.
 - sets in the east.
 - sets in the west.
- 38 Newton's explanation of Kepler's Laws relied upon a force that
- acts only on inorganic matter.
 - acts only on planets.
 - acts only on heavenly bodies.
 - acts on all objects.
 - acts on planets but not on comets.
- 39 Light with an emission spectrum is usually generated by
- a hot, rarefied gas.
 - light from hot dense material passing through a rarefied gas.
 - hot, dense material.
 - a cold, rarefied gas.
- 40 We can use the pointer stars in the Big Dipper to locate a point in the sky near the
- Celestial Equator.
 - South Celestial Pole.
 - Star Sirius.
 - North Celestial Pole.
 - East Celestial Pole.
- 41 Tycho Brahe's careful observations of the planets agreed, to within observational error, with
- the Tychonic System.
 - the Copernican System
 - the Ptolemaic System.
 - None of these systems.

- 42 You see a telescope with a long tube and the eyepiece sticking out the side near the top. This telescope uses the
- Newtonian Focus.
 - Cassegrain Focus.
 - Prime Focus.
 - Coudé Focus
- 43 The retrograde motion that puzzled the ancients occurs when
- Venus is near Mars.
 - Mars is in the opposite direction from the Sun.
 - Mars is near the Sun.
 - Venus is far from Mars.
 - Venus is in the opposite direction from the Sun.
- 44 Compared to ultraviolet light photons, the photons of visible light have
- lower energy.
 - higher energy.
 - higher energy in some cases, lower in others.
 - about the same energy.
- 45 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 changing distance to the Moon.
 - the motion of the Moon around the Earth.
 - the motion of the earth around the Sun.
- 46 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
- 650nm.
 - 660nm.
 - 656nm.
- 47 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.
 - planets speeding up and slowing down.
 - earth turning on its axis.
 - planets moving on epicycles.
- 48 As compared to lower frequency electromagnetic radiation, higher frequency electromagnetic radiation will usually cause
- less damage.
 - more damage.
 - about the same damage.

- 49 A total eclipse of the Sun can be seen
- Everywhere on the day side of Earth.
 - Everywhere on the night side of the Earth.
 - Only near the Earth's equator.
 - Only along a narrow path.
 - Only in the Northern Hemisphere.
- 50 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
- the same.
 - 2 times as high.
 - 3 times as high.
 - 5 times as high.
 - 4 times as high.
- 51 Which of the following can be seen everywhere on the night side of the Earth?
- A partial eclipse of the Sun.
 - A waxing quarter Moon.
 - A New Moon.
 - A total eclipse of the Sun.
 - A total eclipse of the Moon.
- 52 Polarized light consists of electromagnetic waves that all
- have passed through the same narrow slit.
 - have electric fields in the same direction.
 - have the same wavefronts.
 - have the same frequency.
 - move in the same direction.

Answer Key: Fall 2007 AHX1D

- 1 Choice e. (5 Newtons downward)
- 2 Choice d. (cooling to low temperature.)
- 3 Choice b. (always rotates clockwise.)
- 4 Choice a. (Johannes Kepler.)
- 5 Choice c. (about the same accuracy.)
- 6 Choice b. (ultraviolet light.)
- 7 Choice d. (atmospheric turbulence.)
- 8 Choice a. (Mars takes longer to go around the Sun than Earth and moves more slowly than the Earth does.)
- 9 Choice d. (The Moon is made entirely of cheese.)
- 10 Choice b. (The Equal Area Law.)
- 11 Choice c. (are lighter because they are thinner.)
- 12 Choice b. (Galileo)
- 13 Choice d. (almost the same motions but with corrections.)
- 14 Choice e. (all the time.)
- 15 Choice d. (ellipses with the Sun at one focus.)
- 16 Choice b. (10 Newtons)
- 17 Choice d. (necessary for radio telescopes to be large.)
- 18 Choice c. (neither.)
- 19 Choice b. (much less mass.)
- 20 Choice a. (Ecliptic.)
- 21 Choice a. (only certain isolated negative energies.)
- 22 Choice e. (The suspect did not leave blood at the scene.)
- 23 Choice e. (The number of crests that pass in one second.)
- 24 Choice b. (the heavier object would hit the ground long before the lighter one.)
- 25 Choice c. (0.005 m/s^2)
- 26 Choice d. (a few minutes shorter than a solar day.)
- 27 Choice c. (follow an ellipse that rises and then descends again.)
- 28 Choice c. (among the highest.)
- 29 Choice c. (the phases of Venus.)
- 30 Choice c. (1200 m/s)
- 31 Choice d. (farthest South of the Celestial Equator.)
- 32 Choice a. (on the side of the lens opposite the star.)
- 33 Choice e. (gravity acts more strongly on the more massive object.)
- 34 Choice d. (use grazing angles of incidence.)
- 35 Choice c. (two regions of maximum pressure.)
- 36 Choice b. (Sentencing a criminal.)

- 37 Choice a. (never sets.)
- 38 Choice d. (acts on all objects.)
- 39 Choice a. (a hot, rarefied gas.)
- 40 Choice d. (North Celestial Pole.)
- 41 Choice d. (None of these systems.)
- 42 Choice a. (Newtonian Focus.)
- 43 Choice b. (Mars is in the opposite direction from the Sun.)
- 44 Choice a. (lower energy.)
- 45 Choice d. (the motion of the Moon around the Earth.)
- 46 Choice b. (660nm.)
- 47 Choice d. (earth turning on its axis.)
- 48 Choice b. (more damage.)
- 49 Choice d. (Only along a narrow path.)
- 50 Choice d. (5 times as high.)
- 51 Choice e. (A total eclipse of the Moon.)
- 52 Choice b. (have electric fields in the same direction.)

Solutions

- 1 Module 007 Definitions of Force and Mass: Question 007.33
- 2 Module 013 Infrared: Question 013.21
- 3 Module 001 Celestial Coordinates: Question 001.26
- 4 Module 005 Advocate for Copernicus: Question 005.32
- 5 Module 004 Why Copernicus Lost: Question 004.31
- 6 Module 010 The Electromagnetic Spectrum: Question 010.15
- 7 Module 012 Telescope Limitations: Question 012.44
- 8 Module 006 The Period-Radius Relation: Question 006.43
- 9 Module 003 How to test a statement : Question 003.21
- 10 Module 006 Equal Area Rule: Question 006.32
- 11 Module 012 Focal Point of a Mirror: Question 012.23
- 12 Module 007 The Law of Inertia: Question 007.11
- 13 Module 008 Making New Predictions: Question 008.33
- 14 Module 004 Tycho Brahe's Role: Question 004.43
- 15 Module 006 Orbits are Ellipses: Question 006.21
- 16 Module 007 Definitions of Force and Mass: Question 007.22
- 17 Module 013 Radio Telescopes: Question 013.12
- 18 Module 005 The Science Writer: Question 005.43
- 19 Module 011 The Building Blocks: Question 011.12
- 20 Module 002 Predicting Eclipses: Question 002.43
- 21 Module 011 Atomic Energy Levels: Question 011.31
- 22 Module 003 Scientific Proof: Question 003.14
- 23 Module 009 Frequency: Question 009.21
- 24 Module 005 The First Physicist: Question 005.14
- 25 Module 007 The Law of Force and Mass: Question 007.45
- 26 Module 001 Apparent Motion of the Sun: Question 001.44
- 27 Module 008 Artificial Satellites: Question 008.42
- 28 Module 010 Temperature and Color: Question 010.22
- 29 Module 005 The First Astrophysicist: Question 005.24
- 30 Module 009 Speed of a Wave: Question 009.34
- 31 Module 001 The Path of the Sun: Question 001.56
- 32 Module 012 Focal Point of a Lens: Question 012.11
- 33 Module 008 Unifying Physical Law: Question 008.23
- 34 Module 013 X-Rays: Question 013.41
- 35 Module 009 Wavelength: Question 009.12
- 36 Module 003 Non-science: Question 003.32

- 37 Module 001 Star Motions: Question 001.31
- 38 Module 008 Explaining Kepler's Laws: Question 008.12
- 39 Module 010 Spectra: Question 010.32
- 40 Module 001 The Celestial Sphere: Question 001.11
- 41 Module 006 Death of a Theory: Question 006.12
- 42 Module 012 Telescope Designs: Question 012.31
- 43 Module 004 Wandering Planets: Question 004.13
- 44 Module 013 Ultraviolet: Question 013.34
- 45 Module 002 Phases of the Moon: Question 002.11
- 46 Module 010 The Doppler Effect: Question 010.43
- 47 Module 004 The Copernican System: Question 004.23
- 48 Module 011 Photons: Question 011.22
- 49 Module 002 Solar Eclipses: Question 002.21
- 50 Module 011 The Reason for Spectra: Question 011.44
- 51 Module 002 Lunar Eclipses: Question 002.32
- 52 Module 009 Polarization: Question 009.42