1 Venus has
   a. an atmosphere of carbon dioxide with about 90 times the surface pressure of Earth’s.
   b. almost no atmosphere.
   c. an atmosphere whose temperature and pressure permit liquid water.
   d. an atmosphere whose temperature and pressure permit liquid methane.
   e. an atmosphere of carbon dioxide with about 1% the surface pressure of Earth’s.

2 The first space probe to land on Venus was
   b. Viking 1.
   c. Venera 7.
   d. Venera 9.
   e. Voyager 1.

3 The Law of Inertia says that if an object is not acted on by any outside force, its acceleration
   a. will be zero if the object is at rest and not zero if the object is moving.
   b. can have any value at all.
   c. will always be a constant.
   d. will always be zero.

4 Which of the following planets has a magnetic field whose intensity is about 1% of the intensity of the Earth’s
   magnetic field?
   a. Saturn
   b. Venus
   c. Mars
   d. Mercury
   e. Jupiter

5 If you are looking down over the north pole of the Earth, you will see the Earth rotate
   a. downward.
   b. upward.
   c. clockwise.
   d. counterclockwise.

6 If the planets are numbered from 1 to 8, going outward from the Sun, the planet Mars is number
   a. 1.
   b. 3.
   c. 4.
   d. 2.
   e. 5.

7 The thing that is useful about a scientific model of a physical system is that it
   a. predicts the results of observations on real systems.
   b. can be tested without observing the real system.
   c. provides the opportunity to make an artistic statement.
   d. reveals the true nature of the real system.
8 Which of the following phases of the Moon would be seen high in the south at dawn?
   a. waxing crescent.
   b. waxing quarter.
   c. waning quarter.
   d. waning crescent.
   e. full.

9 Aristarchus measured the angle between the Sun and the Moon when exactly half of the Moon was illuminated. He found this angle to be
   a. greater than 90 degrees.
   b. less than 90 degrees by an amount too small for him to measure.
   c. exactly 90 degrees.
   d. less than 90 degrees by an amount that was easy for him to measure.

10 Suppose that an object with a mass of one kilogram and an object with a mass of two kilograms are both in free fall near the Earth’s surface. As compared to the one kilogram object, the two kilogram object accelerates
   a. less because it has more inertia.
   b. less because gravity pulls on it less strongly and it has more inertia.
   c. the same because gravity pulls on it more strongly and it has more inertia.
   d. more because gravity pulls on it more strongly and it has less inertia.
   e. more because gravity pulls on it more strongly.

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

12 Mars’ orbit is currently (within the last few hundred years)
   a. elliptical enough to make the intensity of sunlight vary by 40 percent.
   b. elliptical enough to make the intensity of sunlight vary by 6 percent.
   c. exactly circular.
   d. slightly elliptical but not enough to affect the intensity of sunlight.

13 The first spacecraft to make detailed maps of the Galilean satellites of Jupiter was/were
   a. Pioneer 10 and 11.
   b. Ulysses.
   c. Cassini-Huygens.
   d. Voyager 1 and 2.
   e. Galileo.

14 Which of the following three systems is regarded as the most normal for a terrestrial planet?
   a. Earth, with a moon larger than the dwarf planet Pluto.
   b. Venus, with no moons at all.
   c. Mars, with two moons each the size of an asteroid.
15 The length of a sidereal month is 27 days. The time from one full Moon to the next is closest to
   a. 32 days.
   b. 27 days.
   c. 29.5 days.
   d. 24.5 days

16 The force that acts on a rocket because its engine is firing is exerted by
   a. the rocket itself.
   b. the air around the rocket.
   c. the inertia of the rocket.
   d. the exhaust from the rocket.
   e. gravity.

17 The Russian Venera 9 space probe was sent to Venus, where it
   a. went into orbit and mapped the surface.
   b. landed on the surface and took pictures.
   c. received a gravitational boost on its way to Mercury.
   d. crashed on the surface.

18 Relative to the distant stars, Venus
   a. completes 1.5 rotations each time it orbits the Sun.
   b. completes 2 rotations each time it orbits the Sun.
   c. does not rotate at all.
   d. completes just one full rotation each time it orbits the Sun.
   e. completes less than one full rotation each time it orbits the Sun.

19 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 that a rocket pushes it and quickly increases its speed to 6 miles per second. The ISS will then
   a. escape from the Earth.
   b. follow an ellipse that rises and then descends again.
   c. coast up to a higher circular orbit.
   d. follow an ellipse that descends and then rises again.

20 Ancient lava flows on the Moon are called Lunar
   a. craters.
   b. maria.
   c. valleys.
   d. terrae.
   e. planitia.

21 In the picture that we used in class, with the Sun above the top of the picture and the Earth shown with its North Pole facing you, the part of the Earth that is to the right of the North pole in the picture is experiencing
   a. noon.
   b. sunrise.
   c. midnight.
   d. sunset.
22 The distance from the Earth to the Sun is
   a. 1/10 of an astronomical unit.
   b. 1/100 of an astronomical unit.
   c. one astronomical unit.
   d. ten astronomical units.
   e. 100 astronomical units.

23 The fact that the International Space Station is above most of the Earth's atmosphere is important because it means that
   a. there is no air friction to slow the space station down.
   b. the space station can skim along the top of the atmosphere.
   c. there is no gravity to pull the space station down.

24 Which of the following temperatures would be most likely at noon on the hottest day of the year in the warmest part of Mars?
   a. 100F.
   b. -150F.
   c. 50F.
   d. -200F.

25 Just after sunset, you might find
   a. A waxing crescent Moon setting in the east.
   b. A waxing crescent Moon setting in the west.
   c. A waning crescent Moon setting in the north.
   d. A waxing crescent Moon rising in the west.
   e. A waxing crescent Moon rising in the east.

26 What total force will cause an object with a mass of 0.5kg to gain 100 meters per second every second?
   a. 9.8 Newtons.
   b. 100 Newtons.
   c. 50 Newtons.
   d. 490 Newtons.
   e. 5 Newtons.

27 In Newton's Theory of planetary motion,
   a. the Sun and Earth do not really move at all.
   b. the Sun and Earth move around each other.
   c. the Earth moves around the unmoving Sun.
   d. the Sun moves around the unmoving Earth.

28 The first human landing on the Moon was
   c. Surveyor 1 in 1969.
   e. Apollo 11 in 1969.
29 The first soft landing on Mars was by the
   a. Venera landers.
   b. Surveyor landers.
   c. Voyager landers.
   d. Viking landers.
   e. Mariner landers.

30 When you throw a baseball, the baseball keeps moving because
   a. the displaced air pushes it from behind.
   b. it is rotating.
   c. the force of your hand keeps acting on it.
   d. the force of its inertia pushes it.
   e. no force stops it.

31 The density of water is 1000kg/m$^3$, the density of rock is about 3000kg/m$^3$, and the density of iron is 7800kg/m$^3$.
Which of the following densities is closest to the average density of Jupiter?
   a. 1200kg/m$^3$
   b. 3900kg/m$^3$
   c. 5200kg/m$^3$
   d. 10,000kg/m$^3$
   e. 700kg/m$^3$

32 When Newton calculated the magnitude and direction of the acceleration for a planet that was following Kepler’s Laws, he found that the direction of the acceleration was
   a. between the direction of the planets motion and the direction from the planet to the Sun.
   b. toward the Sun.
   c. in the direction of the planets motion.
   d. opposite to the direction of the planets motion.
   e. away from the Sun.

33 The magnetic field of Mars is
   a. present globally at about 1% of the intensity of the Earth’s magnetic field.
   b. present only locally, near magnetized ore deposits.
   c. exactly zero everywhere on Mars.
   d. about 10 times the intensity of the Earth’s magnetic field.
   e. about 100 times the intensity of the Earth’s magnetic field.

34 A lunar crater is best described as
   a. a circular ring wall surrounding a flat area.
   b. any large flat area that is lower than the surrounding area.
   c. a mountain in the center of a flat area.
   d. a large, deep hole in the Moon.

35 Pluto is now regarded as
   a. a planet that happens to be in the Kuiper Belt.
   b. the largest dwarf planet in the Kuiper Belt.
   c. the smallest dwarf planet in the Kuiper Belt.
   d. one of the larger dwarf planets in the Kuiper Belt.
36 Which of these planets has a solar day that is very close to an Earth day in length?
   a. Saturn
   b. Mars
   c. Mercury
   d. Venus
   e. Jupiter

37 When Galileo dropped a wooden ball and a heavier iron ball at the same time, he was expecting that
   a. the iron ball would always hit long before the wooden one.
   b. both balls would always hit at exactly the same time.
   c. the wooden ball would always hit long before the iron one.
   d. sometimes the wooden ball would hit first, sometimes the iron one would hit first.

38 The ancient Greeks concluded that the Sun is farther from the Earth than the Moon because
   a. the Sun’s angular size is smaller than the angular size of the Moon.
   b. the Moon’s shadow falls on the Earth during a solar eclipse.
   c. the Earth’s shadow falls on the Moon during a lunar eclipse.
   d. the Earth’s shadow falls on the Moon during a solar eclipse.
   e. the Moon’s shadow falls on the Earth during a lunar eclipse.

39 Asteroids are
   a. usually found in the asteroid belt, between the orbits of Mars and Jupiter.
   b. always found in the asteroid belt, between the orbits of Jupiter and Saturn.
   c. always found in the asteroid belt, between the orbits of Mars and Jupiter.
   d. usually found in the asteroid belt, between the orbits of Jupiter and Saturn.

40 The statement that lunar material is much "dryer" than Earth material refers to the absence of
   a. liquid water.
   b. mud.
   c. hydrated minerals.
   d. ice.

41 Relative to the distant stars, Mercury
   a. completes 1.5 rotations each time it orbits the Sun.
   b. completes 2 rotations each time it orbits the Sun.
   c. does not rotate at all.
   d. completes just one full rotation each time it orbits the Sun.

42 Galileo’s observation that Venus goes through a full cycle of phases just like the Moon was significant mainly
because that is
   a. what the Ptolemaic Theory predicted.
   b. what the Copernican Theory predicted.
   c. not what the Ptolemaic Theory predicted.
   d. not what the Copernican Theory predicted.
43 Our Sun sends out intense streams of charged particle radiation. The radiation is prevented from hitting the Earth’s atmosphere by
   a. the Earth’s Moon.
   b. the tilt of the Earth’s rotation axis.
   c. the Earth’s magnetic field.
   d. the Earth’s gravitational field.

44 The patent for inventing the telescope was obtained by
   a. Newton.
   b. Galileo.
   c. nobody because it was too simple an idea to patent.
   d. someone in the Netherlands.

45 The Moon rotates on its axis relative to the distant stars
   a. once every sidereal month.
   b. once every sidereal day.
   c. not at all.
   d. once a year.

46 Galileo said that once an object is set in motion, it will keep moving at the same speed so long as
   a. a force is acting on it to keep it moving.
   b. no force is acting on it.
   c. it is following a straight path.
   d. it is rolling rather than sliding.

47 The number of moons of Venus is
   a. 2.
   b. 0.
   c. 4.
   d. 1.
   e. at least 62.

48 The ancient Greeks connected the force exerted on an object to the object’s
   a. distance travelled.
   b. acceleration.
   c. speed.
   d. time in motion.

49 You see a waning Gibbous Moon directly south. What time might it be?
   a. midnight.
   b. about 3am.
   c. sunrise.
   d. sunset.
   e. about 10pm.
When Newton’s Laws were applied to predict the exact motion of the planet Uranus, the prediction failed to agree with very precise measurements. This failure led to the discovery

a. that the Sun wobbles.
b. of the Planet Pluto.
c. that Newton’s Theory of Gravity is not correct.
d. an invisible moon of Uranus.
e. of the Planet Neptune.
Answer Key: Spring 2016 AHX2P1-s

1 Choice a. (an atmosphere of carbon dioxide with about 90 times the surface pressure of Earth’s.)
2 Choice c. (Venera 7.)
3 Choice d. (will always be zero.)
4 Choice d. (Mercury)
5 Choice d. (counterclockwise.)
6 Choice c. (4.)
7 Choice a. (predicts the results of observations on real systems.)
8 Choice c. (waning quarter.)
9 Choice b. (less than 90 degrees by an amount too small for him to measure.)
10 Choice c. (the same because gravity pulls on it more strongly and it has more inertia.)
11 Choice b. (the motion of the Moon around the Earth.)
12 Choice a. (elliptical enough to make the intensity of sunlight vary by 40 percent.)
13 Choice d. (Voyager 1 and 2.)
14 Choice b. (Venus, with no moons at all.)
15 Choice c. (29.5 days.)
16 Choice d. (the exhaust from the rocket.)
17 Choice b. (landed on the surface and took pictures.)
18 Choice e. (completes less than one full rotation each time it orbits the Sun.)
19 Choice b. (follow an ellipse that rises and then descends again.)
20 Choice b. (maria.)
21 Choice b. (sunrise.)
22 Choice c. (one astronomical unit.)
23 Choice a. (there is no air friction to slow the space station down.)
24 Choice c. (50F.)
25 Choice b. (A waxing crescent Moon setting in the west.)
26 Choice c. (50 Newtons.)
27 Choice b. (the Sun and Earth move around each other.)
28 Choice e. (Apollo 11 in 1969.)
29 Choice d. (Viking landers.)
30 Choice e. (no force stops it.)
31 Choice a. (1200kg/m$^3$)
32 Choice b. (toward the Sun.)
33 Choice b. (present only locally, near magnetized ore deposits.)
34 Choice a. (a circular ring wall surrounding a flat area.)
35 Choice b. (the largest dwarf planet in the Kuiper Belt.)
36 Choice b. (Mars)
Choice b. (both balls would always hit at exactly the same time.)
Choice b. (the Moon’s shadow falls on the Earth during a solar eclipse.)
Choice a. (usually found in the asteroid belt, between the orbits of Mars and Jupiter.)
Choice c. (hydrated minerals.)
Choice a. (completes 1.5 rotations each time it orbits the Sun.)
Choice c. (not what the Ptolemaic Theory predicted.)
Choice c. (the Earth’s magnetic field.)
Choice c. (nobody because it was too simple an idea to patent.)
Choice a. (once every sidereal month.)
Choice b. (no force is acting on it.)
Choice b. (0.)
Choice c. (speed.)
Choice b. (about 3am.)
Choice e. (of the Planet Neptune.)
Where to find these questions in the notes

1. Module 011.201 The Terrestrial Planets Venus Surface
2. **Module 011.211-g01 The Terrestrial Planets Venus Space Probes (34%)**
3. Module 008.303 Science Models of Motion Acceleration
5. Module 007.401 Science Model Building Time and Compass Heading
6. Module 010.105-g01 Solar System Overview The Big Picture
7. Module 007.101-g01 Science Model Building Scientific Models
8. Module 007.506 Science Model Building Phases of the Moon (46%)
9. Module 007.303 Science Model Building the Sun
10. Module 009.406 Science Models of Gravity Unifying Physical Law
11. Module 007.501 Science Model Building Phases of the Moon
12. Module 011.509 The Terrestrial Planets Mars Orbit and Rotation
13. ****Module 012.125-g01 The Jovian Planets Jupiter Space Probes (11)
14. Module 010.204 Solar System Overview The Terrestrial Planets (42%)
15. Module 007.510-g01 Science Model Building Phases of the Moon
16. Module 008.603 Science Models of Motion Action and Reaction
17. Module 011.212 The Terrestrial Planets Venus Space Probes (42%)
18. ***Module 011.206 The Terrestrial Planets Venus Orbit and Rotation (28%)
19. Module 009.601 Science Models of Gravity Artificial Satellites
20. Module 011.402 The Terrestrial Planets Moon Surface Features
21. Module 007.404-g01 Science Model Building Time and Compass Heading
22. Module 010.101 Solar System Overview The Big Picture
23. Module 009.606 Science Models of Gravity Artificial Satellites
24. Module 011.504 The Terrestrial Planets Mars Surface (50%)
25. Module 007.504 Science Model Building Phases of the Moon
26. Module 008.507-g02 Science Models of Motion Force and Mass F=ma
27. **Module 009.501 Science Models of Gravity Making New Predictions (32%)**
28. Module 011.422 The Terrestrial Planets Moon Space Probes
29. Module 011.519 The Terrestrial Planets Mars Space Probes
30. EModule 008.504-g01 Science Models of Motion Force and Mass (F20113:60%,60%)
31. Module 010.302-g01 Solar System Overview The Jovian Planets
32. Module 009.101 Science Models of Gravity Explaining Kepler’s Laws
33. ***Module 011.511-g01 The Terrestrial Planets Mars Magnetic Field(22%)
34. **Module 011.406-g01 The Terrestrial Planets Moon Surface Features (32%)
35. Module 010.603 Solar System Overview The Kuiper Belt
36. Module 011.508 The Terrestrial Planets Mars Orbit and Rotation
Module 008.404 Science Models of Motion The Universality of Free Fall
Module 007.202-g01 Science Model Building Earth-Moon System
Module 010.404 Solar System Overview Asteroids
Module 011.416 The Terrestrial Planets Moon Oddities of the Moon Formation of the Moon
Module 011.106 The Terrestrial Planets Mercury Orbit and Rotation (47%)
*Module 007.602-g01 Science Model Building Phases of Venus (35%)
Module 011.308 The Terrestrial Planets Earth Magnetic Field
Module 007.604-g01 Science Model Building Phases of Venus (42%)
Module 011.408 The Terrestrial Planets Moon Orbit and Rotation
Module 008.201-g01 Science Models of Motion The Law of Inertia
Module 011.209 The Terrestrial Planets Venus Moons
Module 008.102-g01 Science Models of Motion Aristotle
Module 007.507-g01 Science Model Building Phases of the Moon
Module 009.504-g01 Science Models of Gravity Making New Predictions