

Package Title: Test Bank
Course Title: Trefil 7e
Chapter Number: 2

Question Type: Multiple Choice

1) What did the builders of Stonehenge accomplish?

- a) They demonstrated that some natural events are predictable.
- b) They figured out the structure and mechanics of the Solar System.
- c) They established contact with ancient astronauts.
- d) They maintained written records of natural events, which are carved in stone.
- e) They made a gathering place for sale of their crops.

Answer: a

Difficulty: Easy

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

2) Ockham's razor is a(n):

- a) instrument used in medical studies.
- b) philosophy advocating that the simplest solutions have a higher probability of being correct.
- c) constellation in the southern hemisphere.
- d) example of pseudoscience.
- e) tool used in raising Stonehenge's giant stones.

Answer: b

Difficulty: Easy

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

3) Dr. John Snow's research and observations improved the lives of London's citizens in the 1800s by:

- a) improving the quality of the drinking water.
- b) finding a cure for cholera.
- c) diagnosing tuberculosis in the Royal family.

- d) associating disease with polluted water.
- e) identifying the bacterium, *Vibrio cholerae*.

Answer: d

Difficulty: Easy

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

4) The first widely accepted explanation for complex celestial motions is credited to:

- a) Tycho Brahe.
- b) Johannes Kepler.
- c) Nicolas Copernicus.
- d) Claudius Ptolemy.
- e) Galileo Galilei.

Answer: d

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

5) The Ptolemaic theory of the universe includes

- a) an unmoving Earth at the center.
- b) an unmoving Sun at the center.
- c) elliptical orbits.
- d) stationary planets.
- e) a correct view of the solar system.

Answer: a

Difficulty: Easy

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

6) Copernicus hypothesized that the Universe is built exactly like Ptolemy suggested except:

- a) the Sun is at the center of the universe.

- b) the Earth is at the center of the universe.
- c) the planets move in the same direction as the stars.
- d) the planets have elliptical orbits
- e) there are no rotating spheres but instead a solar system.

Answer: a

Difficulty: Easy

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

7) Which of these statements is not true about Copernicus?

- a) He hypothesized that planetary orbits were circular.
- b) He thought that Ptolemy's ideas about the shape of orbits were correct.
- c) He provided the first serious alternative to Ptolemy's system.
- d) His model of the universe placed the Sun, rather than the Earth, at the center.
- e) He used telescopic observations to confirm his theories.

Answer: e

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

8) The 17th century laws of planetary motion stated that:

- a) all planets orbit in circular paths.
- b) the Earth is the center of the universe.
- c) all planets orbit in elliptical paths.
- d) solar system bodies are structured as spheres within spheres.
- e) a planet's velocity is constant during its orbit around the Sun.

Answer: c

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

9) Which scientist would have been most likely to use mathematics and was the first to plot the

elliptical orbits of planets?

- a) Tycho Brahe
- b) Johannes Kepler
- c) Nicolas Copernicus
- d) Claudius Ptolemy
- e) Galileo Galilei

Answer: b

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

10) The astronomical model placing the Sun at the center of the solar system was resisted for hundreds of years because

- a) a way to measure astronomical distances with great accuracy had not been invented.
- b) errors in calculations of data analysis went undetected.
- c) most scholarly texts were written in Latin.
- d) the Catholic Church banned all discussions of Copernican ideas.
- e) all scientists used the great calendar at Stonehenge and looked no further.

Answer: a

Difficulty: Easy

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

11) The first three natural laws of nature were devised by:

- a) Isaac Newton.
- b) Johannes Kepler.
- c) Galileo Galilei.
- d) Claudius Ptolemy.
- e) Nicholas Copernicus.

Answer: b

Difficulty: Hard

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

12) The first person to record observations using a telescope was:

- a) Isaac Newton.
- b) Johannes Kepler.
- c) Galileo Galilei.
- d) Claudius Ptolemy.
- e) Nicholas Copernicus.

Answer: c

Difficulty: Easy

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

13) "Eighty miles per hour toward the northeast" is an example of:

- a) acceleration.
- b) uniform motion.
- c) rate.
- d) velocity.
- e) speed.

Answer: d

Difficulty: Easy

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

14) Who is known as the founder or father of experimental science?

- a) Isaac Newton.
- b) Johannes Kepler.
- c) Galileo Galilei.
- d) Claudius Ptolemy.
- e) Nicholas Copernicus.

Answer: c

Difficulty: Easy

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

15) A truck is traveling at 30 m/s and comes to rest in 10 seconds. Its acceleration is:

- a) 30 m/s^2
- b) -3 m/s^2
- c) 3 m/s
- d) -30 m/s^2
- e) -3 m/s

Answer: b

Difficulty: Medium

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

16) A rock is propelled upward from the earth with an initial velocity of 60 m/s. It will return to earth in approximately

- a) 6 s.
- b) 12 s.
- c) 3 s.
- d) 9 s.
- e) 24 s.

Answer: b

Difficulty: Hard

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

17) Which of the following is most likely to happen to an astronaut during liftoff?

- a) Bones and muscles collapse.
- b) Nerve damage occurs.
- c) Body fluids are replenished.
- d) Blood is drained from the brain.
- e) Old wounds heal miraculously.

Answer: d

Difficulty: Easy

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

18) Which of the following is in uniform motion?

- a) a kite dancing on the wind
- b) a jet as it takes off from an airport
- c) an Olympic skier winding through a slalom course
- d) a high diver spinning in the air
- e) a train traveling west at 70 mph

Answer: e

Difficulty: Medium

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

19) What is the acceleration of a car that reaches a speed of three meters per second from rest in ten seconds?

- a) 3 meters per second
- b) 3 m/s^2
- c) 0.15 meter per second
- d) 0.3 meters per second squared
- e) 30 m/s^2

Answer: d

Difficulty: Medium

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

20) Newton's three laws of motion include the statement that:

- a) for every action there is an equal and opposite reaction.
- b) the less massive an object, the more force is required to overcome inertia.
- c) every falling object falls at different and constantly changing rates.
- d) the acceleration produced on a body by a force is inversely proportional to the amount of force applied to the body.
- e) there is no gravity in most of the vast space between stars.

Answer: a

Difficulty: Easy

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

21) A rock held by a person above the floor, but not dropped, is an example of which of Newton's Laws?

1. The velocity is constant in the absence of a net force.
2. The acceleration of an object is directly proportional to and in the same direction as the net force acting on the object.
3. When one object exerts a force on a second object, the second object exerts an equal force in the opposite direction on the first object.

- a) 1
- b) 2
- c) 3
- d) Both 1 and 2
- e) Both 1 and 3

Answer: e

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

22) If you weigh 150 pounds and are standing on the earth without moving, how much force is the ground exerting on you?

- a) No force
- b) More than 150 pounds
- c) Less than 150 pounds
- d) 150 pounds
- e) Cannot be determined with the given information

Answer: d

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

23) Linear momentum is a quantity that is equal to the:

- a) difference between an object's mass and velocity.
- b) sum of an object's mass multiplied by velocity.
- c) product of an object's mass multiplied by velocity.
- d) gravitational force multiplied by velocity.
- e) the reciprocal of an object's mass multiplied by velocity.

Answer: c

Difficulty: Easy

Learning Objective: LO 2.5 Apply the laws of conservation of linear momentum and conservation of angular momentum to problem solving.

Section Reference: Section 2.5 Momentum

24) If you were in a spacecraft moving away from the earth:

- a) your mass would be increasing.
- b) your weight would be decreasing.
- c) your weight would be increasing.
- d) your mass would be decreasing.
- e) your weight would not change.

Answer: b

Difficulty: Medium

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

25) Which of the following does not demonstrate angular momentum?

- a) navigation equipment on airplanes
- b) the hubcap and tire system on an automobile
- c) a figure skater's spin
- d) an apple falling from a tree
- e) a satellite in outer space

Answer: d

Difficulty: Medium

Learning Objective: LO 2.5 Apply the laws of conservation of linear momentum and conservation of angular momentum to problem solving.

Section Reference: Section 2.5 Momentum

26) To calculate the gravitational force between two objects, we need all the following except:

- a) acceleration of both objects.
- b) mass of the first object.
- c) mass of the second object.
- d) gravitational constant.
- e) distance between the two objects.

Answer: a

Difficulty: Easy

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

27) Which of the following is true of the Law of Universal Gravitation?

- a) Weight is a special case of force due to gravity.
- b) Gravitational force of an object on earth is relative to its acceleration.
- c) Gravitational force between two objects can equal zero.
- d) Force = little g times mass squared.
- e) Force = mass times velocity.

Answer: a

Difficulty: Medium

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

28) If the Moon were positioned twice as far from the Earth as it is now, the gravitational attraction would be:

- a) twice as great.
- b) four times as great.
- c) one-fourth as great.
- d) the same as it is now.
- e) one-half as great.

Answer: c

Difficulty: Hard

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational

constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

29) Acceleration due to gravity:

- a) is a universal constant.
- b) is a fundamental property.
- c) decreases with increasing altitude.
- d) is different for different objects in free fall.
- e) only occurs on earth.

Answer: c

Difficulty: Medium

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

30) An example of a chaotic system is:

- a) turbulent flow of fluids.
- b) the trajectory of a missile.
- c) the orbit of the Moon and the Earth.
- d) a moving train.
- e) the variation of gravity on Earth.

Answer: a

Difficulty: Hard

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

Question Type: True/False

31) The flow of water through a river is controlled by gravity.

Answer: True

Difficulty: Easy

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

32) It is thought that Stonehenge served as a calendar.

Answer: True

Difficulty: Easy

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

33) We now have proof that aliens helped build Stonehenge.

Answer: False

Difficulty: Easy

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

34) John Snow proved that bacteria in human waste cause cholera.

Answer: False

Difficulty: Easy

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

35) Both Ptolemy and Copernicus thought the planets moved in circular orbits.

Answer: True

Difficulty: Easy

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

36) Tycho Brahe used a telescope to make measurements more accurately than any taken before him.

Answer: False

Difficulty: Easy

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

37) A penny dropped from a height equal to that of the Sears Tower would achieve a final velocity around 200 miles per hour only if the experiment were done in a vacuum.

Answer: True

Difficulty: Medium

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

38) Newton formulated his laws of motion by developing the idea of force.

Answer: True

Difficulty: Medium

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

39) If you kick a soccer ball with 2 N of force, in order for the ball to move it has to exert less than 2 N of force on your foot.

Answer: False

Difficulty: Easy

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

40) If you were standing on the moon, earth would no longer be exerting a pull of gravity on you.

Answer: False

Difficulty: Medium

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational

constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

Question Type: Essay

41) What is the main difference between velocity and speed?

Answer:

Difficulty: Easy

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: Velocity is a quantity that includes direction plus units of distance/time; speed is a quantity with only distance/time units.

42) What is the branch of science called mechanics?

Answer:

Difficulty: Easy

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: The science of mechanics includes the way things move.

43) If a pumpkin has the mass of 2 kg, how much does it weigh? Explain.

Answer:

Difficulty: Medium

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: Weight = mass (kg) X g; Weight = 2.0 kg X 9.8 m/s²; Weight = 19.6 kg m/s² (or 19.6 newtons). Weight is the force of gravity on an object. On the Earth's surface, that force is measured in newtons. The constant "g" is the value for acceleration of objects on the Earth's surface, 9.8 m/s².

44) Using Newton's laws, what do you need to know to predict the future anywhere in the universe?

Answer:

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

Solution: If you know the present state of the system and the forces acting on it, the laws of motion will allow you to make accurate predictions about the future of the system.

45) What was the role of Galileo's and Kepler's experiments in the formulation of Newton's laws?

Answer:

Difficulty: Medium

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

Solution: Newton's laws incorporated both Galileo's and Kepler's results.

46) What was the main contribution of Nicholas Copernicus and how did his work depend on other scientists?

Answer:

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

Solution: Copernicus retained some of Ptolemy's ideas about astronomy, such as a spherical universe and circular orbits of planets and stars, while using observations and calculations to establish that the Earth and nearby planets rotate around the Sun.

47) Compare the main contributions of Galileo Galilei and Isaac Newton. How did their work depend on other scientists?

Answer:

Difficulty: Medium

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: Answers should compare Newton's Laws to Galileo's support of Copernicus and the publication of his ideas in common language. Answers should also give examples of knowledge

that Newton and Galileo had to have before they could explain their observations.

48) What was the argument used in the Roman Catholic Church's case to retroactively acquit Galileo nearly 400 years after his original heresy trial? What tactic of Galileo's seems to have caused him problems during his trial?

Answer:

Difficulty: Medium

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: The grounds for reversal were that the original judges had not separated questions of faith from questions of scientific fact. Galileo was confrontational and this may have been a factor in his church prosecution.

49) In 1854, how did John Snow use scientific reasoning to solve the mystery of the source of cholera plaguing London?

Answer:

Difficulty: Medium

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

Solution: Snow showed a cause and effect relationship between source of water and disposal of human waste materials. He did not know why human waste might cause cholera, but he noted the cause and effect by looking at data related to the question.

50) Describe the philosophical and religious implications of the Copernican theory of the universe, compared to the Ptolemaic theory of the universe.

Answer:

Difficulty: Hard

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

Solution: Answers should include reference to the idea that man, as God's creation, was the center of the universe. This notion changed with the advent of Copernican theory.

51) Choose one of Isaac Newton's three laws of motion and describe how it applies to something

that happened to you recently.

Answer:

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

Solution: Answers will vary but must include the law and an accurate depiction of its application.

52) Describe the forces at work during a roller coaster ride. Compare the impact of these forces on human physiology with the forces felt by the astronauts during a space launch.

Answer:

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

Solution: Answers should include a discussion of the interactions of inertia, g-forces, and blood flow.

53) How does the concept of Ockham's razor apply to Kepler's model of the solar system?

Answer:

Difficulty: Hard

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

Solution: Not only was it a geometric match (and thus the most reasonable model), it was also a simpler explanation than previous models.

54) The position of the constellations (groups of stars) in the night sky changes through the year, as observed from Earth. Explain this shift using both the Ptolemaic and Copernican models of the solar system.

Answer:

Difficulty: Hard

Learning Objective: Section 2.3 The Birth of Modern Astronomy

Section Reference: LO 2.3 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Solution: Because the Earth goes around the Sun in an annual cycle and the Earth's axis is tilted as well, the perspective of astronomical observers changes during the year. In other words, the

position of the stars (at the same time each night) changes for this reason. In the Ptolemaic view, this would be the result of the moving crystal spheres where the stars existed. From the Copernican model, this has to do with the Earth going around the Sun.

55) It appears that Stonehenge was built to mark the passage of time, i.e., function as a giant calendar. How do we know this using scientific reasoning?

Answer:

Difficulty: Hard

Learning Objective: Section 2.2 The Night Sky

Section Reference: LO 2.2 Explain how the predictability of physical events underlies the scientific method.

Solution: Based on scientific (unbiased) observations of the positions of the key stones making up Stonehenge and the relationship of those observations to the position of such things as the rise of the Sun on the day of summer solstice, a correlation between these things suggests a “passage to time” function for Stonehenge.

56) Explain how evolving technology affected the acceptance of the Sun-centered model of our solar system.

Answer:

Difficulty: Hard

Learning Objective: Section 2.3 The Birth of Modern Astronomy

Section Reference: LO 2.3 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Solution: The development of telescopes, their use in making precise telescopic observations, and the use of observational data to study the validity of the Ptolemaic versus the Copernican models of the solar system helped promote the Sun-centered model. Analyses of data then showed how the observations made with the aid of a telescope supported the heliocentric model.

57) Explain how seatbelts are related to Newton's laws.

Answer:

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

Solution: Seatbelts, when used properly, make the person a part of the car. Therefore the forces such as inertia that are operating on the car apply the same forces in the same direction to the person. This keeps him or her from flying through the window when the car stops abruptly.

58) What's more fun on a roller coaster, Newton's 1st or 2nd law? Explain.

Answer:

Difficulty: Hard

Learning Objective: LO 2.4 Explain Newton's three laws of motion.

Section Reference: Section 2.4 Isaac Newton and the Universal Laws of Motion

Solution: There is no single correct answer. However, once you consider the statements of the first and second laws, their interactions, and how these apply to roller coaster rides, either of the laws could be justified as being "fun" depending on the point of view of the writer.

59) What evidence can you offer from personal experience that shows how gravity is a universal force?

Answer:

Difficulty: Medium

Learning Objective: LO 2.6 Apply Newton's law of universal gravitation and the gravitational constant to problem solving.

Section Reference: Section 2.6 The Universal Force of Gravity

Solution: Any of many thousands of daily experiences will do, including dropping something on the floor, playing a game with a ball, watching an airplane land, or diving into a pool.

60) What did astronomical observations mean to ancient people?

Answer:

Difficulty: Medium

Learning Objective: LO 2.1 Explain how the predictability of physical events underlies the scientific method.

Section Reference: Section 2.1 The Night Sky

Solution: Observing the night sky and the position on the horizon where the Sun and Moon set through the year provided a method of time keeping and determination of time within a yearly calendar. This related to agriculture (when to plant crops, for example) and other human cultural activities (when is festival time?) and how and where humans could hunt. Also, it allowed prediction of when warmer and cooler weather would return to the area.

61) What assumption of astronomers prior to Tycho and Kepler held back progress on understanding the place of Earth in the solar system and the nature of planetary orbits?

Answer:

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

Solution: Previous astronomers uniformly assumed that the Earth was the center of a spherical universe and that all planetary orbits must be perfectly circular.

62) What two things allowed Kepler, using Tycho's data, to break through centuries of mistaken interpretation of the solar system and discover the modern concept of how our solar system and the universe works?

Answer:

Difficulty: Medium

Learning Objective: LO 2.2 Compare the Ptolemaic, Copernican, Brahe, and Kepler models of the universe.

Section Reference: Section 2.2 The Birth of Modern Astronomy

Solution: The development of better instrumentation (and thus collection of better data) and use of mathematical approaches to answering scientific questions.

63) In Galileo's experiments, where the ball is falling freely, at what angle is it coming down to the ground? In computations regarding these experiments, acceleration of the ball is given what letter and what does that letter mean?

Answer:

Difficulty: Medium

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: The angle is 90 degrees. The acceleration is little g , the acceleration of gravity, which is 9.8 meters per second squared or 32 feet per second squared.

64) If a hammer falls from an airplane for 100 seconds what velocity might it ideally attain (express the answer in ft/s and mi/hr)? Falling in air, however, the hammer will not attain such a velocity. Why is that?

Answer:

Difficulty: Hard

Learning Objective: LO 2.3 Describe Galileo's experiments with the acceleration of falling objects both qualitatively and quantitatively.

Section Reference: Section 2.3 The Birth of Mechanics

Solution: Velocity = acceleration times time, so 32 ft/s times 100 seconds is 3200 ft/s (or 2181.8 mi/hr). However, the resistance of air will result in the hammer being limited in its falling velocity to terminal velocity, a constant velocity that is related to the hammer itself and how it moves through the air.

65) What is linear momentum and how is it computed?

Answer:

Difficulty: Medium

Learning Objective: LO 2.5 Apply the laws of conservation of linear momentum and conservation of angular momentum to problem solving.

Section Reference: Section 2.5 Momentum

Solution: Linear momentum is the tendency of an object moving in a straight line to continue doing so. It is computed by figuring the product of the mass in kilograms and the velocity in meters per second. The unit for linear momentum is kg m/s.