

Chapter 6 Study Questions Name: _____ **Class:** _____

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. A feather and a rock dropped at the same time from the same height would land at the same time when dropped
- a. by Galileo in Italy
 - b. by Newton in England.
 - c. by an astronaut on the moon.
 - d. by an astronaut on the space shuttle.
- _____ 2. An object is in projectile motion if
- a. it is thrown with a horizontal push.
 - b. it is accelerated downward by gravity.
 - c. it does not accelerate horizontally.
 - d. All of the above
- _____ 3. When a soccer ball is kicked, the action and reaction forces do NOT cancel each other out because
- a. the force of the foot on the ball is bigger than the force of the ball on the foot.
 - b. the forces act on two different objects.
 - c. the forces act at different times.
 - d. All of the above
- _____ 4. Newton's first law of motion applies
- a. to moving objects.
 - b. to objects that are not moving.
 - c. to objects that are accelerating.
 - d. Both (a) and (b)
- _____ 5. Acceleration of an object
- a. decreases as the mass of the object increases.
 - b. increases as the force on the object increases.
 - c. is in the same direction as the force on the object.
 - d. All of the above
- _____ 6. A golf ball and a bowling ball are moving at the same velocity. Which has more momentum?
- a. the golf ball, because it has less mass
 - b. the bowling ball, because it has more mass
 - c. They both have the same momentum because they have the same velocity.
 - d. There is no way to know without additional information.
- _____ 7. If three balls of different materials were dropped at the same time from the same height, which would hit the ground first? (Assume there is no air resistance.)
- a. a tennis ball
 - b. a solid rubber ball
 - c. a solid steel ball
 - d. They would all hit at the same time.
- _____ 8. Orbital motion is a combination of forward motion and
- a. frictional resistance.
 - b. free fall.
 - c. horizontal acceleration.
 - d. weightlessness.
- _____ 9. A 5 kg object has less inertia than a _____ object. (1 kg = 1,000 g)
- a. 4 kg
 - b. 6,000 g
 - c. 2 kg
 - d. 1,500 g
- _____ 10. According to Newton's first law of motion, a moving object that is not acted on by an unbalanced force will
- a. remain in motion.
 - b. eventually come to a stop.
 - c. transfer its energy to another object.
 - d. accelerate in the absence of friction.
- _____ 11. An astronaut uses a jet of nitrogen to maneuver in space. As the nitrogen is expelled, it
- a. exerts a reaction force on its container.
 - b. causes the astronaut to accelerate.
 - c. illustrates Newton's third law.
 - d. All of the above
- _____ 12. Imagine that you are holding a 6 N book motionless in your hand. Which of the following is true?
- a. The book has a mass of 6 N.

- b. The total downward force on the book is 12 N.
 - c. Your hand exerts an upward force of 6 N on the book.
 - d. This situation illustrates unbalanced forces.
- ___ 13. Galileo proved that the rate at which an object falls
- a. increases with an increase in mass.
 - b. decreases with an increase in mass.
 - c. is not affected by the mass.
 - d. increases with a decrease in mass.
- ___ 14. All objects accelerate toward the Earth at a rate of 9.8 m/s/s. This means that for every second that an object falls, its downward velocity
- a. increases by 9.8 m/s.
 - b. decreases by 9.8 m/s.
 - c. stays at 9.8 m/s.
 - d. None of the above
- ___ 15. A ball is dropped from a rooftop. What is the ball's velocity after 3 s? (Assume that there is no air resistance.)
- a. 0 m/s
 - b. 9.8 m/s
 - c. 19.6 m/s
 - d. 29.4 m/s
- ___ 16. Air resistance is
- a. sliding friction.
 - b. rolling friction.
 - c. fluid friction.
 - d. static friction.
- ___ 17. The amount of air resistance acting on an object depends on the object's
- a. size and shape.
 - b. mass and weight.
 - c. density and mass.
 - d. None of the above
- ___ 18. An apple falls from a tree. The gravitational force on the apple is 1 N. If air resistance is 0.1 N, what is the net force on the apple?
- a. 0.1 N
 - b. 0.9 N
 - c. 1.0 N
 - d. 1.1 N
- ___ 19. As long as the net force on a falling object is NOT zero, the object
- a. falls at a constant velocity.
 - b. accelerates downward.
 - c. is pushed back up.
 - d. does not move.
- ___ 20. Terminal velocity is reached when the net force on a falling object reaches
- a. -1 N.
 - b. 0 N.
 - c. 1 N.
 - d. 9.8 N.
- ___ 21. Parachutes slow skydivers to a safer terminal velocity because parachutes
- a. increase air resistance.
 - b. decrease air resistance.
 - c. increase gravitational pull.
 - d. decrease gravitational pull.
- ___ 22. Astronauts float inside the space shuttle because they
- a. are massless.
 - b. have no gravitational force acting on them.
 - c. are in free fall.
 - d. are weightless.
- ___ 23. An orbit is formed when the shuttle
- a. moves forward.
 - b. is in free fall.
 - c. is pulled down by gravity.
 - d. All of the above
- ___ 24. The shuttle traveling in space around the Earth is an example of
- a. orbiting.
 - b. centripetal force.
 - c. projectile motion.
 - d. All of the above
- ___ 25. An example of an object in projectile motion is
- a. a leaping frog.
 - b. a game of billiards.
 - c. riding a bicycle.
 - d. pushing a shopping cart.
- ___ 26. ___ is a measure of inertia.
- a. Distance
 - c. Speed

- b. Mass d. Velocity
- ___ 27. Newton's second law of motion states that an object's acceleration
- increases as its mass decreases and as the force acting on it increases.
 - decreases as its mass decreases and as the force acting on it increases.
 - increases as its mass increases and as the force acting on it increases.
 - decreases as its mass increases and as the force acting on it increases.
- ___ 28. The acceleration of an object
- is not related to the direction that the force was applied.
 - is always in the direction opposite to the direction that the force was applied.
 - is always in the same direction as the force.
 - None of the above
- ___ 29. Use Newton's second law of motion to calculate the acceleration of a 7 kg mass if a force of 68.6 N acts on it?
- 0.1 m/s/s c. 68.6 m/s/s
 - 9.8 m/s/s d. 480.2 m/s/s
- ___ 30. What force is necessary to accelerate a 1,250 kg car at a rate of 40 m/s/s?
- 31.25 N c. 1,250 N
 - 40.0 N d. 50,000 N
- ___ 31. Use Newton's second law of motion to calculate the mass of an object when a force of 34 N accelerates the object 4 m/s/s?
- 0.12 kg c. 38.0 kg
 - 8.5 kg d. 136 kg
- ___ 32. How much force is needed to accelerate a 70 kg rider and her 200 kg motor scooter at 4 m/s/s?
- 270 N c. 800 N
 - 280 N d. 1,080 N
- ___ 33. Newton's third law of motion states that whenever one object exerts a force on a second object,
- the second object exerts an equal and opposite force on a third object.
 - the first object is unaffected by that force.
 - the second object exerts an equal and opposite force on the first object.
 - the second object exerts a less powerful force on the first object.
- ___ 34. Newton's third law of motion states that if a force is exerted on an object, another force occurs that
- is equal in size and opposite in direction.
 - is in the same direction and size.
 - is equal in speed and opposite in direction.
 - is in the same direction and speed.
- ___ 35. When a swimmer swims through water,
- the action force could be the swimmer's hands and feet pushing on the water.
 - the reaction force could be the water pushing on the hands and feet.
 - the reaction force is what moves the swimmer forward.
 - All of the above
- ___ 36. Action and reaction force pairs occur
- only when there is motion. c. whether there is motion or not.
 - only when there is no motion. d. only when the forces are unbalanced.
- ___ 37. You sitting in a chair is an example of Newton's
- second law. c. second and third laws.
 - first and third laws. d. first and fourth laws.
- ___ 38. ___ do NOT act on the same object.
- Force pairs c. Centripetal forces
 - Gravitational forces d. Inertial forces

- ___ 39. The net force of unbalanced force pairs is ____.
- a. positive.
 - b. negative.
 - c. either positive or negative.
 - d. zero.
- ___ 40. Which of the following is NOT an example of Newton's third law of motion?
- a. hitting a baseball with a bat
 - b. sitting in a chair
 - c. an apple falling from a tree
 - d. none of the above

You have four vehicles, all driving at the same velocity side-by-side on a four-lane highway. They are a fully-loaded truck, an empty truck, a midsize van, and a small car.

- ___ 41. Which one has the MOST momentum?
- a. the fully-loaded truck
 - b. the empty truck
 - c. the midsize van
 - d. the small car
- ___ 42. If all the vehicles brake at the same time because there is a collision ahead, which one will come to a complete stop FIRST?
- a. the fully-loaded truck
 - b. the empty truck
 - c. the midsize van
 - d. the small car
- ___ 43. The momentum before a collision is
- a. less than the momentum after the collision.
 - b. equal to the momentum after the collision.
 - c. more than the momentum after the collision
 - d. completely lost after the collision.
- ___ 44. Which of the following games uses conservation of momentum?
- a. billiards
 - b. bowling
 - c. baseball
 - d. all of the above
- ___ 45. Conservation of momentum is explained by Newton's
- a. first law of motion.
 - b. second law of motion.
 - c. third law of motion.
 - d. fourth law of motion.
- ___ 46. Inertia is used when explaining Newton's
- a. first law of motion.
 - b. second law of motion.
 - c. third law of motion.
 - d. law of conservation of momentum.
- ___ 47. In billiards,
- a. an action force makes a billiard ball move.
 - b. an action force makes a cue ball move.
 - c. a reaction force stops the cue ball when it comes in contact with a billiard ball.
 - d. All of the above
- ___ 48. Jumping beans jump when a small insect larva inside the bean suddenly moves, hitting the inside of the shell. This is an exchange of
- a. velocity.
 - b. inertia.
 - c. momentum.
 - d. acceleration.
- ___ 49. After a motor pulls the roller coaster cars up the first hill, what keeps the cars moving up and over the following hills, turns, and loops?
- a. gravity
 - b. inertia
 - c. acceleration
 - d. all of the above
- ___ 50. Suppose you are playing a very unusual game of billiards. All the balls are different sizes. If the cue ball were to collide with a billiard ball twice its size, what would happen?
- a. The cue ball would stop and the billiard ball would not move.
 - b. The cue ball would roll backward and the billiard ball would not move.
 - c. The cue ball would roll backward and the billiard ball would move away from the cue ball

slower than the cue ball's initial speed.

d. The billiard ball would move away at twice the speed.

- ___ 51. Catapults create
- a. free fall.
 - b. orbiting.
 - c. projectile motion.
 - d. gravitational force.
- ___ 52. Terminal velocity
- a. is a constant velocity.
 - b. has a balanced net force.
 - c. is a result of air resistance.
 - d. All of the above
- ___ 53. Which of the following will have the greatest air resistance?
- a. an acorn
 - b. a crumpled-up sheet of paper
 - c. an 8 1/2" × 11" sheet of paper
 - d. an apple
- ___ 54. Because of projectile motion, when aiming at a target you should always aim
- a. above the bull's eye.
 - b. below the bull's eye.
 - c. to the left of the bull's eye.
 - d. to the right of the bull's eye.
- ___ 55. The downward acceleration of a thrown object in projectile motion is
- a. less than the acceleration of a vertically falling object because of the horizontal part of the projectile motion.
 - b. greater than the acceleration of a vertically falling object because of the horizontal part of the projectile motion.
 - c. identical to that of a vertically falling object regardless of the horizontal part of the projectile motion.
 - d. practically nonexistent because of the horizontal part of the projectile motion.
- ___ 56. Which of the following is the unbalanced force that maintains circular motion for an object in orbit?
- a. projectile motion
 - b. centripetal force
 - c. free fall
 - d. all of the above
- ___ 57. Is it just as hard to catch a thrown bowling ball as it is to throw it?
- a. The bowling ball has more inertia while in motion so it's harder to catch it.
 - b. The bowling ball has the same inertia whether it's standing still or moving, so throwing it and catching it are both equally difficult.
 - c. The bowling ball has less inertia while in motion, so it's easier to catch than it is to throw.
 - d. Inertia has nothing to do with how easy or hard it is to throw or catch a bowling ball. It just depends on how strong you are.
- ___ 58. If a car driver suddenly makes a sharp turn, the passenger slides to the side of the car because of
- a. inertia.
 - b. free fall.
 - c. gravity.
 - d. friction.
- ___ 59. When an airplane takes off, you tend to fall backward because of
- a. air resistance.
 - b. inertia.
 - c. gravity.
 - d. friction.
- ___ 60. When you bump into someone standing still, you can knock them over because of
- a. projectile motion.
 - b. momentum.
 - c. gravity.
 - d. friction.
- ___ 61. When two bumper cars collide, the force exerted on each car causes a change in the momentum for each car. The total ___ for both cars is the same before and after the collision.
- a. terminal velocity
 - b. inertia
 - c. gravity
 - d. momentum
- ___ 62. If you pull your hands back as you catch a fast ball, it tends to hurt less than if you keep your hands still. The momentum of the ball that is transferred to your hand is reduced because
- a. the velocity of your hand reduces the impact from the velocity of the ball because they

both move in the same direction.

- b. the ball encounters more air resistance.
- c. the inertia of the ball decreases.
- d. the ball maintains projectile motion for a little longer, decreasing its velocity.

- _____ 63. In the Olympic sport of discus throwing, a discus thrower will spin around in a circle with the discus and suddenly stop spinning and let go of the discus. Instead of stopping with the thrower, the discus flies off into the air because of its
- a. gravitational force.
 - b. inertia.
 - c. mass.
 - d. centripetal force.
- _____ 64. The curved path traveled by a thrown baseball is known as
- a. orbiting.
 - b. centripetal acceleration.
 - c. projectile motion.
 - d. centripetal force.
- _____ 65. Using Newton's second law of motion, what is a skater's acceleration when a 50 kg skater pushes off from a wall with a force of 200 N?
- a. $\frac{1}{4}$ m/s/s
 - b. 4 m/s/s
 - c. 50 m/s/s
 - d. 10,000 m/s/s
- _____ 66. Which of the following has the most momentum?
- a. an ant moving at 1 m/s
 - b. a bird flying at 4 m/s
 - c. a cat moving at 13 m/s
 - d. you riding your bike at 12 m/s
- _____ 67. Orbiting objects appear to be weightless because they are
- a. in free fall.
 - b. weightless.
 - c. outside of Earth's atmosphere.
 - d. in space.
- _____ 68. A satellite orbits Earth because
- a. it is caught in Earth's gravitational pull, like a tractor beam.
 - b. it does not have enough fuel to start moving.
 - c. it is moving forward while it is in free fall toward Earth.
 - d. it is at rest.
- _____ 69. Which of the following is an example of free fall?
- a. a skydiver falling from an airplane
 - b. a floating astronaut in orbit around Earth
 - c. a ball falling from a rooftop
 - d. tossing a set of keys to a friend
- _____ 70. Although astronauts appear to be weightless, they are not because
- a. mass increases as distance increases.
 - b. they can only be weightless outside the solar system.
 - c. they are in orbit. If they were to leave orbit, they would be weightless.
 - d. their mass does not change, so the astronauts would always have some gravitational attraction to objects—and therefore, they have weight.
- _____ 71. The KC-135 Vomit Comet is able to simulate an astronaut's apparent weightlessness in space by diving toward the ground at a 45° angle because
- a. it combines the motions of free fall with moving forward.
 - b. gravitational force changes with angle.
 - c. gravitational force depends on speed.
 - d. gravitational force is zero when the distance changes quickly enough.
- _____ 72. Planets stay in orbit around the sun because
- a. unbalanced forces act on them.
 - b. two motions combine to cause orbiting.
 - c. the sun's gravitational force provides a centripetal force on the planets.

- d. All of the above
- ___ 73. Centripetal force on an object acts in the
- same direction as gravitational force.
 - direction opposite the direction of gravitational force.
 - same direction as the path of the object.
 - direction opposite the object's path.
- ___ 74. Any object in circular motion
- experiences free fall toward Earth.
 - constantly changes direction.
 - is weightless while in orbit.
 - is massless while in orbit.
- ___ 75. Projectile motion
- has one component—horizontal.
 - has one component—vertical.
 - has two components—horizontal and vertical.
 - cannot be broken down into directional components.
- ___ 76. The components of projectile motion
- depend greatly on each other.
 - have no effect on each other.
 - have a little effect on each other, but it is negligible.
 - cannot be combined.
- ___ 77. Quarterbacks must aim higher than their target because the ball's
- vertical velocity increases because gravity causes it to accelerate downward.
 - horizontal velocity increases because it is accelerating.
 - vertical velocity is constant.
 - horizontal velocity is constant.

Short Answer

78. The picture below shows a common desk toy. If you pull one ball up and release it, it hits the balls at the bottom and comes to a stop. In the same instant, the ball on the other side swings up and repeats the cycle. How does conservation of momentum explain how this toy works?

