Name _____ date _____ period __
Physics Mid Term Exam Study Guide 2014.

Sample Questions

Unit 1 introduction

1. A hypothesis is
   a. the long side of a right triangle.
   b. an educated guess that has yet to be proven by experiment.
   c. close agreement by competent observers of observations of the same phenomena.
   d. a guess that has been tested over and over again and always found to be true.
   e. a synthesis of a large collection of information that includes guesses.

2. A scientific fact is
   a. something you believe is true because you have been taught it.
   b. a guess that has been tested over and over again and always found to be true.
   c. close agreement by competent observers of observations of the same phenomena.
   d. an educated guess that has yet to be proven by experiment.
   e. a synthesis of a collection of data that includes well-tested guesses.

3. A theory is
   a. an educated guess that has yet to be proven by experiment.
   b. a synthesis of a large collection of information including well-tested guesses.
   c. close agreement by competent observers of observations of the same phenomena.
   d. a guess that has been tested over and over again and always found to be true.
   e. a science story about atoms and molecules.

4. The difference between a hypothesis and a theory is that a hypothesis is
   a. never true whereas a theory is always true.
   b. true whereas a theory is not true.
   c. an isolated fact whereas a theory is a huge collections of facts.
   d. never true whereas a theory is sometimes true.
   e. an educated guess whereas a theory has been tested successfully many times in many ways.

Unit 2 Forces and Newton's First Law

1. A quantity that has both magnitude and direction is called a _____ quantity.

2. A quantity that has only magnitude is called a _____quantity.

3. Mass is a _____ quantity.

4. Any vector can be represented by two other vectors that are at _____ angles to each other.

5. When an unbalanced force acts on an object,
   a. the object's motion does not change.
   b. the object accelerates.
   c. the weight of the object decreases.
   d. the inertia of the object increases.

6. When a pair of balanced forces acts on an object, the net force that results is
   a. greater in size than both forces combined.
   b. greater in size than one of the forces.
   c. equal in size to one of the forces.
   d. equal to zero.

7. As you push a cereal box across a tabletop, the sliding friction acting on the cereal box
   a. acts in the direction of motion.
   b. equals the weight of the box.
   c. is usually greater than static friction.
   d. acts in the direction opposite of motion.

8. The forces acting on a falling leaf are
   a. air resistance and fluid friction.
   c. gravity and static friction.

b. gravity and air resistance. d. weight and rolling friction.

9. The property of matter that resists changes in motion is called
   a. friction. b. gravity. c. inertia. d. weight.

10. An orange might roll off your cafeteria tray when you stop suddenly because of
    a. the balanced forces acting on the orange. c. the friction forces acting on the orange.
    b. the centripetal force acting on the orange. d. the orange's inertia.

11. Your weight equals your
    a. mass. c. mass times the acceleration due to gravity.
    b. mass divided by the net force acting on you. d. mass times your speed.

12. The acceleration due to gravity on the surface of Mars is about one third the acceleration due to gravity on Earth's surface. The weight of a space probe on the surface of Mars is about
    a. nine times greater than its weight on Earth's surface.
    b. three times greater than its weight on Earth's surface.
    c. one third its weight on Earth's surface.
    d. the same as its weight on Earth's surface.

13. The gravitational force between two objects increases as mass
    a. decreases or distance decreases. c. increases or distance decreases.
    b. decreases or distance increases. d. increases or distance increases.

14. A 15-N force and a 45-N force act on an object in opposite directions. What is the net force on the object?
    a. 15 N b. 30 N c. 45 N d. 60 N e. none of the above

15. What is the maximum resultant possible when adding a 2-N force to an 8-N force?
    a. 2 N b. 6 N c. 8 N d. 10 N e. 16 N

16. A 5-N force and a 30-N force act in the same direction on an object. What is the net force on the object?
    a. 5 N b. 25 N c. 30 N d. 35 N e. none of the above

17. What is the minimum resultant possible when adding a 5-N force to an 8-N force?
    a. 5 N b. 3 N c. 8 N d. 13 N e. 40 N

18. Equilibrium occurs when
    a. all the forces acting on an object are balanced.
    b. the sum of the $+x$ forces on an object equals the sum of the $-x$ forces.
    c. the net force on the object is zero.
    d. the sum of the upward forces equals the sum of the downward forces.
    e. all of the above

19. A girl whose weight is 500 N hangs from the middle of a bar supported by two vertical strands of rope. What is the tension in each strand?
    a. 0 N. b. 250 N. c. 500 N. d. 750 N. e. 1000 N.

20. What would be the safest way to put up a clothesline?
    a. It doesn't make any difference which way the line is strung.
    b. With the line very tight
    c. With some slack in the line

21. A clothesline is stretched between two trees. A tire hangs in the middle of the line and the two halves of the line make equal angles with the horizontal. The tension in the line is
    a. half the tire's weight.
    b. is less than half the tire's weight.
    c. is more than half the tire's weight.

22. What is needed to describe a vector quantity?
    a. only magnitude
    b. only direction
    c. both magnitude and direction
    d. neither magnitude nor direction

23. A scalar quantity has
    a. only direction.
    b. only magnitude.
    c. both magnitude and direction.
    d. neither magnitude nor direction.

24. The sum of all the forces acting on an object is called the _____.

25. If the forces acting on an object produce a net force of zero, the forces are called _____.

26. The force that opposes the motion of objects that touch as they move past each other is called _____.

27. During a head-on auto collision, _____ causes a passenger in the front seat to continue moving _____.

28. The acceleration of an object is equal to the net _____ acting on the object divided by the object's _____.

29. The force of gravity acting on an object is the object's _____.

30. What is the magnitude of the resultant of a 6.0-N force acting vertically upward and a 4.0-N force acting horizontally?

31. Two forces of 10 N both act on an object. The angle between the forces is 90°. What is the magnitude of their resultant?

32. Galileo found that a ball rolling down one inclined plane would roll how far up another inclined plane?
    a. The ball would not roll up the other plane at all.
    b. To nearly its original height
    c. To about one quarter its original height
    d. To nearly twice its original height
    e. To nearly half its original height

33. Friction is a force that always acts
    a. perpendicular to an object's motion.
    b. opposite to an object's motion.
    c. in the same direction as an object's motion.

34. The law of inertia states that an object
    a. will continue moving at the same velocity unless an outside force acts on it.
    b. will continue moving in a straight line unless an outside force acts on it.
    c. that is not moving will never move unless a force acts on it.
    d. at rest will remain at rest unless acted on by an outside force.
    e. will do all of the above.

35. The law of inertia applies to
    a. objects at rest.
    b. moving objects.
    c. both moving and nonmoving objects.

36. After a cannonball is fired into frictionless space, the amount of force needed to keep it going equals
    a. zero, since no force is necessary to keep it moving.
    b. twice the force with which it was fired.
    c. one half the force with which it was fired.
    d. the same amount of force with which it was fired.
    e. one quarter the force with which it was fired.

37. If the force of gravity suddenly stopped acting on the planets, they would
    a. spiral slowly towards the sun.
    b. continue to orbit the sun.
    c. move in straight lines tangent to their orbits.
    d. spiral slowly away from the sun.
    e. fly straight away from the sun.

38. A sheet of paper can be withdrawn from under a container of milk without toppling it if the paper is jerked quickly. The reason this can be done is that
    a. gravity pulls very hard on the milk carton.
    b. the milk carton has very little weight.
    c. the milk carton has inertia.
    d. none of the above

39. The force required to maintain an object at a constant speed in free space is equal to
    a. the mass of the object.
    b. the weight of the object.
    c. zero.
    d. the force required to stop it.
    e. none of the above

40. An object following a straight-line path at constant speed
    a. has no forces acting on it.
    b. has a net force acting on it in the direction of motion.
    c. has zero acceleration.
    d. must be moving in a vacuum.
    e. none of the above

41. Friction
    a. comes from microscopic bumps that act as obstructions to the object's motion.
    b. is the name given to the force acting between surfaces sliding past one another.
    c. acts in a direction that opposes the motion of an object.
    d. all of the above
    e. none of the above

42. One object has twice as much mass as another object. The first object also has twice as much
    a. velocity.
    b. gravitational acceleration.
    c. inertia.
    d. all of the above

43. Compared to its weight on Earth, a 10-kg object on the moon will weigh
    a. the same amount.
    b. less.
    c. more.

44. Compared to its mass on Earth, the mass of a 10-kg object on the moon is
    a. the same.
    b. more.
    c. less.

45. The mass of a lamb that weighs 110 N is about
    a. 1 kg.
    b. 11 kg.
    c. 110 kg.
    d. 1100 kg.
    e. none of the above

46. You would have the largest mass of gold if your chunk of gold weighed 1 N on
    a. Earth.
    b. Jupiter.
    c. the moon.

47. Which has more mass, a kilogram of feathers or a kilogram of iron?
    a. The feathers
    b. The iron
    c. Neither—they both have the same mass.

48. How much does a 3.0-kg bag of bolts weigh?
    a. 7.2 N b. 14.4 N c. 22.8 N d. 29.4 N e. 58.8 N

49. A bag of sports equipment has a mass of 10.0 kilograms and a weight of
    a. 0.98 N.
    b. 9.8 N.
    c. 98 N.
    d. 980 N.
    e. none of the above

50. How much (in newtons) does a 10.0-kg bag of grass seed weigh?

51. A person weighs 650 N. What is the mass of the person?

52. How much (in newtons) does 0.60 kg of salami weigh?

53. On the moon, the acceleration due to gravity is $\frac{1}{6}$ that on Earth. What would be the weight of 0.9 kg of bologna on the moon?

54. On the surface of Jupiter, the acceleration due to gravity is about 3 times that on Earth. How much would a 0.40-kg rock weigh on Jupiter?

Unit 3 Linear Motion

1. Speed is
   a. a measure of how fast something is moving.
   b. always measured in terms of a unit of distance divided by a unit of time.
   c. the distance covered per unit time.
   d. all of the above.
   e. none of the above.

2. When you look at the speedometer in a moving car, you can see the car's
   a. average distance traveled.
   b. instantaneous acceleration.
   c. average speed.
   d. instantaneous speed.
   e. average acceleration.

3. Acceleration is defined as the CHANGE in
   a. time it takes to move from one place to another place.
   b. velocity of an object.
   c. distance divided by the time interval.
   d. velocity divided by the time interval.
   e. time it takes to move from one speed to another speed.

4. Suppose you are in a car that is going around a curve. The speedometer reads a constant 30 miles per hour. Which of the following is NOT true?
   a. You and the car are accelerating.
   b. Your acceleration is constantly changing.
   c. Your velocity is constant.
   d. Your direction is constantly changing.
   e. Your speed is constant.

5. A train travels 6 meters in the first second of travel, 6 meters again during the second second of travel, and 6 meters again during the third second. Its acceleration is
   a. 0 m/s^2.
   b. 6 m/s^2.
   c. 12 m/s^2.
   d. 18 m/s^2.
   e. none of the above

6. A car starts from rest and after 7 seconds it is moving at 42 m/s. What is the car's average acceleration?
   a. 0.17 m/s^2
   b. 1.67 m/s^2
   c. 6 m/s^2
   d. 7 m/s^2
   e. none of the above

7. As an object falls freely in a vacuum, its
   a. velocity increases.
   b. acceleration increases.
   c. both A and B.
   d. none of the above.

8. In the absence of air resistance, objects fall at constant
   a. speed.
   b. velocity.
   c. acceleration.
   d. distances each successive second.
   e. all of the above

9. A ball is thrown upwards and caught when it comes back down. In the absence of air resistance, the speed of the ball when caught would be
   a. less than the speed it had when thrown upwards.
   b. more than the speed it had when thrown upwards.
   c. the same as the speed it had when thrown upwards.

10. Suppose an object is in free fall. Each second the object falls
    a. the same distance as in the second before.
    b. a larger distance than in the second before.
    c. with the same instantaneous speed.
    d. with the same average speed.
    e. none of the above

11. If you drop a feather and a coin at the same time in a tube filled with air, which will reach the bottom of the tube first?
    a. The feather
    b. Neither—they will both reach the bottom at the same time.
    c. The coin

12. Consider drops of water leaking from a water faucet. As the drops fall they
    a. remain at a relatively fixed distance from each other.
    b. get farther apart.
    c. get closer together.

13. A ball tossed vertically upward rises, reaches its highest point, and then falls back to its starting point. During this time the acceleration of the ball is always
    a. in the direction of motion.
    b. opposite its velocity.
    c. directed downward.
    d. directed upward.

14. When a basketball player jumps to make a shot, once the feet are off the floor, the jumper's acceleration
    a. varies with body orientation.
    b. depends on launch speed.
    c. is usually greater for taller players (but not always).
    d. depends on all the above.
    e. is *g*; no more, no less.

15. Suppose you take a trip that covers 180 km and takes 3 hours to make. Your average speed is
    a. 30 km/h. b. 60 km/h. c. 180 km/h. d. 360 km/h. e. 540 km/h.

16. Suppose a car is moving in a straight line and steadily increases its speed. It moves from 35 km/h to 40 km/h the first second and from 40 km/h to 45 km/h the next second. What is the car's acceleration?
    a. 5 km/h·s b. 10 km/h·s c. 35 km/h·s d. 40 km/h·s e. 45 km/h·s

17. A ball is thrown straight up. At the top of its path its instantaneous speed is
    a. 0 m/s.
    b. about 5 m/s.
    c. about 10 m/s.
    d. about 20 m/s.
    e. about 50 m/s.

18. A ball is thrown straight up. At the top of its path its acceleration is
    a. 0 m/s^2.
    b. about 5 m/s^2.
    c. about 10 m/s^2.
    d. about 20 m/s^2.
    e. about 50 m/s^2.

19. When something falls to the ground, it accelerates. This acceleration is called the acceleration due to gravity and is symbolized by the letter *g*. What is the value of *g* on Earth's surface?
    a. 0 m/s^2
    b. about 5 m/s^2
    c. about 10 m/s^2
    d. about 20 m/s^2
    e. about 50 m/s^2

20. A car accelerates at 2 m/s^2. Assuming the car starts from rest, how much time does it need to accelerate to a speed of 20 m/s?
    a. 2 seconds
    b. 10 seconds
    c. 20 seconds
    d. 40 seconds
    e. none of the above

21. If a freely falling object were somehow equipped with a speedometer, its speed reading would increase each second by
    a. about 5 m/s.
    b. about 10 m/s.
    c. about 15 m/s.
    d. a variable amount.
    e. a rate that depends on its initial speed.

22. A freely falling object starts from rest. After falling for 1 second, it will have a speed of about
    a. 5 m/s.
    b. 10 m/s.
    c. 20 m/s.
    d. 40 m/s.
    e. none of the above

23. If you drop a feather and a coin at the same time in a vacuum tube, which will reach the bottom of the tube first?
    a. Neither-they will both reach the bottom at the same time.
    b. The coin
    c. The feather

24. If a projectile is fired straight up at a speed of 30 m/s, the total time to return to its starting point is about
    a. 3 seconds.
    b. 6 seconds.
    c. 30 seconds.
    d. 60 seconds.
    e. not enough information to estimate.

25. A pencil lies on your desk. If the Earth is moving around the sun at a speed of 30 km/s, how fast is the pencil moving *relative* to the desk? How fast is the pencil moving *relative* to the sun?
    a. 0 km/s; 0 km/s
    b. 0 km/s; 30 km/s
    c. 30 km/s; 30 km/s
    d. There is not enough information to answer these questions.

26. Acceleration is defined as
    a. the rate at which distance is covered
    b. the rate at which an object freely falls from rest
    c. the rate at which velocity itself changes
    d. the distance an object has fallen

27. The rate at which distance is covered is called speed.

28. Velocity is different from speed in that velocity is speed in a given direction.

29. The rate at which velocity changes with time is called acceleration.

30. What is the average speed of a cheetah that runs 88 m in 5 seconds?

31. A bicycle travels 15 km in 30 minutes. What is its average speed?

32. What is the average acceleration of a car that goes from rest to 60 km/h in 8 seconds?

33. A jet on an aircraft carrier can be launched from 0 to 40 m/s in 2 seconds. What is the acceleration of the jet?

34. A skateboarder starting from rest accelerates down a ramp at 2 m/s^2 for 2 s. What is the final speed of the skateboarder?

35. An apple falls from a tree and 0.5 second later hits the ground. How fast is the apple falling when it hits the ground?

36. What speed must you toss a ball straight up so that it takes 4 s to return to you?

37. You toss a ball at 5 m/s straight upward. How much time will the ball take to reach the top of its path?

38. How much time does a car with an acceleration of 5 m/s^2 take to go from 5 m/s to 40 m/s?

39. Starting from rest, a car undergoes a constant acceleration of 6 m/s^2. How far will the car travel in the first second?

40. A crate falls from an airplane flying horizontally at an altitude of 1250 m. Neglecting air drag, how long will the crate take to strike the ground?

41. If a projectile fired beneath the water, straight up, breaks through the surface at a speed of 13 m/s, to what height above the water will it ascend?

42. A stone is dropped from a cliff. After it has fallen 10 m, what is the stone's velocity?

Unit 4 Projectile Motion

1. When representing velocity as a vector,
    a. the direction of the arrow shows the direction of motion.
    b. the length of the arrow represents the speed.
    c. the length of the arrow is drawn to a suitable scale.
    d. all of the above
    e. none of the above

2. Which of the following would NOT be considered a projectile?
   a. A cannonball thrown straight up
   b. A cannonball rolling down a slope
   c. A cannonball rolling off the edge of a table
   d. A cannonball thrown through the air
   e. All of the above are projectiles.

3. The horizontal component of a projectile's velocity is independent of
   a. the range of the projectile.
   b. time.
   c. the vertical component of its velocity.

4. In the absence of air friction, the vertical component of a projectile's velocity doesn't change as the projectile moves.
   a. Always false
   b. Always true
   c. Sometimes true

5. In the absence of air friction, the horizontal component of a projectile's velocity doesn't change as the projectile moves.
   a. Sometimes true
   b. Always true
   c. Always false

6. At the instant a ball is thrown horizontally with a large force, an identical ball is dropped from the same height. Which ball hits the ground first?
   a. Neither. They both hit the ground at the same time.
   b. The dropped ball
   c. The horizontally thrown ball

7. A ball is thrown into the air at some angle. At the very top of the ball's path, its velocity is
   a. entirely vertical.
   b. There's not enough information given to determine.
   c. both vertical and horizontal.
   d. entirely horizontal.

8. In the absence of air resistance, the angle at which a thrown ball will go the farthest is
   a. 15 degrees. b. 30 degrees. c. 45 degrees. d. 60 degrees. e. 75 degrees.

9. A ball thrown in the air will never go as far as physics ideally would predict because
   a. one can never throw the ball fast enough.
   b. gravity is acting.
   c. air friction slows the ball.
   d. ideally the ball would never land.
   e. all of the above

10. A projectile launched horizontally hits the ground in 0.8 seconds. If it had been launched with a much higher speed in the same direction, it would have hit the ground (neglecting Earth's curvature and air resistance) in
    a. more than 0.8 s.
    b. 0.8 s.
    c. less than 0.8 s.

11. A projectile is fired horizontally in a vacuum. The projectile maintains its horizontal component of speed because it
    a. has no vertical component of speed to begin with.
    b. is not acted on by any forces.
    c. the net force acting on it is zero.
    d. is not acted on by any horizontal forces.
    e. none of the above

12. A cannonball is launched horizontally from a tower. If the cannon has a barrel velocity of 60 m/s, where will the cannonball be 1 second later? (Neglect air resistance.)
    a. 6 m downrange
    b. 30 m downrange
    c. 60 m downrange
    d. 300 m downrange
    e. none of the above

13. After a rock that is thrown straight up reaches the top of its path and is starting to fall back down, its acceleration is (neglecting air resistance)
    a. less than when it was at the top of its path.
    b. greater than when it was at the top of its path.
    c. the same as when it was at the top of its path.

14. An airplane flying into a head wind loses ground speed, and an airplane flying with the wind gains ground speed. If an airplane flies at right angles to the wind, then ground speed is
    a. more.
    b. unchanged.
    c. less.

15. Jose can jump vertically 1 meter from his skateboard when it is at rest. When the skateboard is moving horizontally, Jose can jump
    a. no higher.
    b. higher.

16. Suppose a small plane can fly at 170 km/h relative to the surrounding air. Suppose also that there is a 60 km/h tailwind. How fast does the plane's shadow move across the ground?
    a. 5 km/h b. 60 km/h c. 110 km/h d. 170 km/h e. 230 km/h

17. At the instant a ball is thrown horizontally with a large force, an identical ball is dropped from the same height. Which ball hits the ground first?
    a. Neither—they both hit the ground at the same time.
    b. The horizontally thrown ball
    c. The dropped ball

18. A cannonball is fired at some angle into the air. In the first second it moves 5 meters horizontally. Assuming it doesn't hit the ground and air resistance is negligible, how far does it move horizontally in the next second?
    a. More than 5 m
    b. Less than 5 m
    c. 5 m
    d. Not enough information.

19. A ball is thrown straight upward at 10 m/s. Ideally (no air resistance), the ball will return to the thrower's hand with a speed of
    a. 0 m/s.
    b. 5 m/s.
    c. 10 m/s.
    d. 20 m/s.
    e. There is not enough information to say.

20. A cannon with a barrel velocity of 140 m/s launches a cannonball horizontally from a tower. Neglecting air resistance, how far vertically will the cannonball have fallen after 4 seconds?
    a. 80 m
    b. 140 m
    c. 560 m
    d. 2240 m
    e. none of the above

21. A motorboat is driven across a river at 3.0 km/h at right angles to a current that is flowing at 10.0 km/h. What is the resulting speed of the motorboat?

22. A package falls out of a helicopter that is traveling horizontally at 70 m/s. It falls into the water below 8.0 seconds later. Assuming no air resistance, what is the horizontal distance it travels while falling?

23. A ball is thrown horizontally from the top of a tall cliff. Neglecting air drag, what vertical distance has the ball fallen 2.0 seconds later?

24. A snowball rolls off the edge of a horizontal roof at a velocity of 3.0 m/s. What is the speed of the snowball 1.0 s later?

Unit 5 Newton's 2nd and 3rd Laws

1. Accelerations are produced by
    a. forces.
    b. velocities.
    c. accelerations.
    d. masses.
    e. none of the above

2. How does acceleration of an object change in relation to its mass? It is
    a. directly proportional.
    b. Acceleration doesn't depend on mass at all.
    c. inversely proportional.

3. The acceleration produced by a net force on an object is
    a. inversely proportional to the mass of the object.
    b. directly proportional to the magnitude of the net force.
    c. in the same direction as the net force.
    d. all of the above
    e. none of the above

4. When an object reaches terminal velocity its acceleration is
   a. 0 m/s^2. b. 4.9 m/s^2. c. 9.8 m/s^2.

5. A heavy person and a light person parachute together and wear the same size parachutes. Assuming they open their parachutes at the same time, which person reaches the ground first?
   a. the light person
   b. the heavy person
   c. Neither -- they both reach the ground together.

6. A 10-kg brick and a 1-kg book are dropped in a vacuum. The force of gravity on the 10-kg brick is
   a. 10 times as much as the force on the 1-kg book.
   b. zero.
   c. the same as the force on the 1-kg book.

7. When a woman stands with two feet on a scale, the scale reads 280 N. When she lifts one foot, the scale reads
   a. less than 280 N. b. more than 280 N. c. 280 N.

8. Suppose the force of friction on a sliding object is 25 N. The force needed to maintain a constant velocity is
   a. more than 25 N. b. 25 N c. less than 25 N.

9. A book weighs 4 N. When held at rest in your hands, the net force on the book is
   a. 0 N.
   b. 0.4 N.
   c. 4 N.
   d. 39 N.
   e. none of the above

10. An apple weighs 1 N. The net force on the apple when it is in free fall is
    a. 0 N.
    b. 0.1 N.
    c. 1 N.
    d. 9.8 N.
    e. none of the above

11. A girl pulls on a 10-kg wagon with a constant force of 20 N. What is the wagon's acceleration?
    a. 0.5 m/s^2 b. 2 m/s^2 c. 10 m/s^2 d. 20 m/s^2 e. 200 m/s^2

12. An object has a constant mass. A constant force on the object produces constant
    a. velocity.
    b. acceleration.
    c. both A and B
    d. none of the above

13. A force of 3 N accelerates a mass of 3 kg at the rate of 1 m/s^2. The acceleration of a mass of 6 kg acted upon by a force of 6 N is
    a. twice as much.
    b. half as much.
    c. the same.
    d. none of the above

14. A push on a 1-kilogram brick accelerates the brick. Neglecting friction, to equally accelerate a 10-kilogram brick, one would have to push
    a. with 100 times as much force.
    b. with 10 times as much force.
    c. with just as much force.
    d. with $\frac{1}{10}$ the amount of force.
    e. none of the above

15. A rock is thrown vertically into the air. At the very top of its trajectory the net force on it is
    a. its weight. b. less than its weight. c. more than its weight.

16. A box is dragged without acceleration in a straight-line path across a level surface by a force of 13 N. What is the frictional force between the box and the surface?
    a. 13 N
    b. Less than 13 N
    c. More than 13 N
    d. Need more information to say.

17. Which of the following would exert the most pressure on the ground?
    a. A woman standing in running shoes
    b. A woman standing on skis
    c. A woman standing in high-heel shoes

18. A tennis ball and a solid steel ball with the same diameter are dropped at the same time. Which ball has the greater force acting on it?
    a. The steel ball
    b. The tennis ball
    c. They both have the same force acting on them.

19. A tennis ball and a solid steel ball with the same diameter are dropped at the same time. In the absence of air resistance, which ball has the greater acceleration?
    a. The steel ball
    b. The tennis ball
    c. They both have the same acceleration.

20. The reason a tennis ball and a solid steel ball will accelerate at the same rate, in the absence of air resistance, is that
    a. they have the same mass.
    b. the ball with the larger force has the smaller mass.
    c. the ball with the larger force also has the larger mass.
    d. the force acting on them is the same.
    e. none of the above

21. Aunt Minnie throws a rock downward, and air resistance is negligible. Compared to a rock that is dropped, the acceleration of the rock after it is thrown is
    a. less.
    b. the same.
    c. more.

22. As a care package falls from a high-flying stationary helicopter, its velocity increases and its acceleration
    a. remains the same.
    b. decreases.
    c. increases.

23. If you pull horizontally on a desk with a force of 150 N and the desk doesn't move, the friction force must be 150 N. Now if you pull with 250 N so the desk slides at constant velocity, the friction force is
    a. more than 150 N but less than 250 N.
    b. 250 N.
    c. more than 250.

24. A speeding truck locks it brakes and it skids to a stop. If the truck's total mass were doubled, its skidding distance would be
    a. half as far.
    b. nearly as far, but not quite.
    c. the same.
    d. twice as far.
    e. four times as far.

25. If the force acting on a cart doubles, what happens to the cart's acceleration?
    a. It quarters.
    b. It halves.
    c. It stays the same.
    d. It doubles.
    e. It quadruples.

26. Suppose a cart is being moved by a force. If suddenly a load is dumped into the cart so that the cart's mass doubles, what happens to the cart's acceleration?
    a. It quarters.
    b. It halves.
    c. It stays the same.
    d. It doubles.
    e. It quadruples.

27. You are on a frozen pond, and the ice starts to crack. If you lie down on the ice and begin to crawl, this will
    a. increase the pressure on the ice.
    b. decrease the pressure on the ice.
    c. increase the total force on the ice.
    d. decrease the total force on the ice.

28. A 20-N falling object encounters 4 N of air resistance. The magnitude of the net force on the object is
    a. 0 N.
    b. 4 N.
    c. 16 N.
    d. 20 N.
    e. none of the above

29. A sportscar has a mass of 1500 kg and accelerates at 5 meters per second squared. What is the magnitude of the force acting on the sportscar?
    a. 300 N.
    b. 1500 N.
    c. 2250 N.
    d. 7500 N.
    e. none of the above

30. A tow truck exerts a force of 2000 N on a car, accelerating it at 1 m/s/s. What is the mass of the car?
    a. 667 kg
    b. 1000 kg
    c. 2000 kg
    d. 8000 kg
    e. none of the above

31. A jet has a mass of 40,000 kg. The thrust for each of four engines is 20,000 N. What is the jet's acceleration when taking off?
    a. 0.3 m/s^2
    b. 0.5 m/s^2
    c. 1 m/s^2
    d. 2 m/s^2
    e. none of the above

32. You pull horizontally on a 50-kg crate with a force of 450 N and the friction force on the crate is 250 N. The acceleration of the crate is
    a. 2 m/s^2.
    b. 4 m/s^2.
    c. 9 m/s^2.
    d. 14 m/s^2.

33. How much force is needed to accelerate a 4.0-kg physics book to an acceleration of 2.0 m/s^2?
    a. 0 N
    b. 2.0 N
    c. 0.5 N
    d. 8.0 N
    e. 24.0 N

34. A jumbo jet cruises at a constant velocity when the total thrust of the engines on the jet is 50,000 N. How much air resistance acts on the jet?
    a. 0 N
    b. 25,000 N
    c. 50,000 N
    d. 75,000 N
    e. 100,000 N

35. A 6-N falling object encounters 6 N of air resistance. The magnitude of the net force on the object is
    a. 0 N.
    b. 6 N.
    c. 12 N.
    d. none of the above

36. Whenever an object exerts a force on another object, the second object exerts a force of the same magnitude, but in the opposite direction to that of the first object.
    a. Sometimes true
    b. Always true
    c. Always false

37. Forces always occur
    a. as single quantities.
    b. by themselves.
    c. in pairs.
    d. in triplets.

38. An archer shoots an arrow. Consider the action force to be the bowstring against the arrow. The reaction to this force is the
    a. arrow's push against the bowstring.
    b. weight of the arrow.
    c. friction of the ground against the archer's feet.
    d. air resistance against the bow.
    e. grip of the archer's hand on the bow.

39. A player catches a ball. Consider the action force to be the impact of the ball against the player's glove. What is the reaction to this force?
    a. The muscular effort in the player's arms
    b. The force the glove exerts on the ball
    c. Friction of the ground against the player's shoes
    d. The player's grip on the glove
    e. none of the above

40. A player hits a ball with a bat. The action force is the impact of the bat against the ball. What is the reaction to this force?
    a. The force of the ball against the bat
    b. The weight of the ball
    c. Air resistance on the ball
    d. The grip of the player's hand against the bat
    e. none of the above

41. As a ball falls, the action force is the pull of Earth's mass on the ball. What is the reaction to this force?
    a. The pull of the ball's mass on Earth
    b. The acceleration of the ball
    c. Nonexistent in this case
    d. Air resistance acting against the ball
    e. none of the above

42. A person is attracted towards the center of Earth by a 440-N gravitational force. The force with which Earth is attracted toward the person is
    a. 440 N.
    b. very very small.
    c. very very large.

43. An unfortunate bug splatters against the windshield of a moving car. Compared to the force of the car on the bug, the force of the bug on the car is
    a. larger.
    b. the same.
    c. smaller.
    d. Need more information to say

44. An unfortunate bug splatters against the windshield of a moving car. Compared to the deceleration of the car, the deceleration of the bug is
    a. larger.
    b. the same.
    c. smaller.

45. If a horse pulls on a wagon at rest, the wagon pulls back equally on the horse. Can the wagon be set into motion?
    a. Yes, because there is a net force acting on the wagon.
    b. Yes, because there is a time delay between action and reaction.
    c. No, because the forces cancel each other.
    d. Yes, because the horse's pull on the wagon is larger than the wagon's pull on the horse.

46. A large truck and a small car traveling at the same speed have a head-on collision. The vehicle to undergo the greater change in velocity will be
    a. the small car.
    b. the large truck.
    c. neither—both are the same

47. According to Newton's third law, if you push gently on something, it will push
    a. gently on something else.
    b. on you only if you aren't moving.
    c. gently on you.
    d. on something only under the right conditions.

48. Nellie Newton holds an apple in her hand. If action is Earth pulling on the apple, then reaction is
    a. her hand providing a normal force on the apple.
    b. her hand pushing up on the apple.
    c. both A and B
    d. neither A nor B

49. Bronco the skydiver falls toward Earth. The attraction of Earth on Bronco pulls him down. The reaction to this force is
    a. Bronco finally pushing against Earth's surface.
    b. Bronco pulling up on Earth.
    c. Earth's surface finally pushing against Bronco.
    d. neither A, B, nor C

50. A force is exerted on the tires of a car to accelerate the car along the road. The force is exerted by the
    a. road.
    b. engine.
    c. tires.
    d. air.

51. A rocket is able to accelerate in the vacuum of space when it fires its engines. The force that propels the rocket is the force
    a. of the rocket on the exhaust gases.
    b. of the exhaust gases on the rocket.
    c. neither A nor B

52. A karate chop delivers a blow of 2300 N to a board that breaks. The force that acts on the hand during this feat
    a. is less than 2300 N.
    b. is 2300 N.
    c. is more than 2300 N.
    d. cannot be determined.

53. A woman weighing 550 N sits on the floor. She exerts a force on the floor of
    a. 5.5 N.
    b. 55 N.
    c. 550 N.
    d. 1100 N.
    e. 5500 N.

54. Two people pull on a rope in a tug-of-war. Each pulls with 400 N of force. What is the tension in the rope?
    a. 0 N
    b. 400 N
    c. 600 N
    d. 800 N
    e. none of the above

55. Suppose you accidentally drive into a tree. Which of the following correctly describes the interaction between your car and the tree?
    a. The car and the tree mutually exert equal forces in the same direction.
    b. The car and the tree mutually exert different forces in the same direction.
    c. The car and the tree mutually exert equal and opposite forces on each other.
    d. The car and the tree mutually exert different and opposite forces on each other.

56. You drive past a farm, and you see a cow pulling a plow to till a field. You have just learned about Newton's third law, and you wonder how the cow is able to move forward if the plow is exerting an equal and opposite force on the cow. Which of the following explains the movement of the cow and plow?
    a. The force exerted by the cow on the plow is equal to the force that the cow exerts on the ground to move forward.
    b. The force exerted by the cow on the plow is larger than the force that the cow exerts on the ground to move forward.
    c. The force exerted by the cow on the plow is smaller than the force that the cow exerts on the ground to move forward.
    d. More information is needed to answer this question.

57. If your car runs out of gas, why can't you push on the car's windshield from the inside to move it?
    a. In order for the car to move, a force must be exerted by you on the car's windshield.
    b. In order for the car to move, a force must be exerted by the car's windshield on you.
    c. In order for the car to move, an outside force must be exerted on the car.
    d. In order for the car to move, a force must be exerted by the car on the ground.

58. If you exert a force of 12,000 N on a 3,000 kg car and a 6,000 kg truck that are both originally at rest, what will be the resulting accelerations of the objects?
    a. The car and the truck will both accelerate 12,000 m/s^2.
    b. The car will accelerate 1/4 m/s^2 and the truck will accelerate 1/2 m/s^2.
    c. The car will accelerate 4 m/s^2 and the truck will accelerate 2 m/s^2.
    d. The car will accelerate 36,000,000 m/s^2 and the truck will accelerate 72,000,000 m/s^2.

59. You push with 10.0 N on a 5.0-kg block and there are no opposing forces. How fast will the block accelerate?

60. You push with 27 N on a 10-kg chest, and there is a 7-N force of friction. How fast will the chest accelerate?

61. A 400,000-kg airplane in takeoff uses the 40,000 N thrust of each one of its four engines. What is the acceleration of the plane during takeoff?

62. An unbalanced force of 30 N gives an object an acceleration of 6.0 m/s^2. What force would be needed to give it an acceleration of 1.0 m/s^2?

63. A certain unbalanced force gives a 20-kg object an acceleration of 2.0 m/s^2. What acceleration would the same force give a 30-kg object?

64. If you push off the ground with a force of 350 N when you jump upward, what force pushes Earth downward?

65. A pair of blocks, one 2 times as massive as the other, are connected by a compressed spring. When the spring is released, the blocks fly apart. Compared to the heavier block, how many times as fast does the lighter block accelerate?

66. A fighter punches a sheet of paper in midair, and brings it from rest up to a speed of 40 m/s in 0.08 s. What is the force of impact on the paper if the mass of the paper is 0.01 kg?

Unit 6. Universal Gravitation and Circular Motion

1. A tin can whirled on the end of a string moves in a circle because
    a. there is an inward force acting on the can.
    b. once the can starts moving, that is its natural tendency.
    c. there is a force on the can pulling it outward.
    d. the can continually pulls on the string.
    e. all of the above

2. The gravitational force between two masses is 36 N. What is the gravitational force if the distance between them is tripled? ($G = 6.673 \times 10^{-11}$ N•m^2/kg^2)
   a. 18 N
   b. 4.0 N
   c. 27 N
   d. 9.0 N
3. Why did Newton think there was a force acting on the moon?
   a. Because the moon is moving
   b. Because there is no air on the moon
   c. Because the moon always keeps one side toward Earth
   d. Because the moon moves in a curved path
   e. all of the above

4. The speed of a satellite in an elliptical orbit is _____.
   a. constant
   b. independent of the height of the satellite
   c. not constant

5. If you whirl a tin can on the end of a string and the string suddenly breaks, the can will
   a. fly directly toward you.
   b. spiral in toward your hand.
   c. fly directly away from you.
   d. fly off, tangent to its circular path.
   e. spiral away from your hand.
6. Suppose the gravitational force between two spheres is 60 N. If the magnitude of each mass doubles, what is the force between the masses?
   a. 240 N
   b. 15 N
   c. 60 N
   d. 120 N
   e. 30 N
7. Suppose the gravitational force between two masses is 60 N. If the magnitude of one of the masses doubles, what is the force between the masses?
   a. 60 N
   b. 15 N
   c. 30 N
   d. 120 N
   e. 240 N
8. If the sun were to collapse to form a black hole (quite unlikely), Earth would _____.
   a. leave the solar system in the direction of its tangential velocity
   b. orbit the black hole just as it orbits the sun now
   c. spiral into the black hole
   d. immediately disappear
   e. be drawn into the black hole
9. Newton reasoned that the gravitational attraction between Earth and the moon must be _____.
   a. independent of distance
   b. the same at all distances
   c. reduced by distance
   d. directly proportional to distance
   e. all of the above
10. A very massive object A and a less massive object B move toward each other under the influence of mutual gravitation. Which force, if either, is greater?
   a. Both forces are the same.
   b. The force on B
   c. The force on A

11. A period of a satellite is defined as _____.
    a. the time for a satellite to make one complete revolution around Earth
    b. 90 seconds
    c. the time for a satellite to cross the United States
    d. 1 second
    e. 24 hours
12. The gravitational force between two massive spheres
    a. depends on how massive they are.
    b. depends inversely on the square of the distances between them.
    c. is always an attraction.
    d. all of the above
13. A 1.00-kg ball is attached to a string of 0.50 m and swung in a horizontal circle with a velocity of 2.00 m/s. Find the centripetal acceleration.
    a. $2.0\ m/s^2$
    b. $8.0\ m/s^2$
    c. $0.25\ m/s^2$
    d. $4.0\ m/s^2$
14. Suppose the gravitational force between two massive spheres is 40 N. If the distance between the spheres is doubled, what is the force between the masses?
    a. 10 N
    b. 80 N
    c. 40 N
    d. 160 N
    e. 20 N
15. If the mass of Earth increased, with no change in radius, your weight would _____.
    a. decrease
    b. stay the same
    c. increase also
16. If the radius of Earth decreased, with no change in mass, your weight would _____.
    a. not change
    b. increase
    c. decrease
17. A 0.50-kg ball is attached to a string of 0.50 m and swung in a horizontal circle with a velocity of 1.0 m/s. Find the centripetal force of the ball.
    a. 2.5 N
    b. 0.50 N
    c. 1.0 N
    d. 2.0 N
18. If Earth's mass decreased to one half its original mass, with no change in radius, then your weight would _____.
    a. decrease to one quarter your original weight
    b. stay the same
    c. decrease to one half your original weight
    d. none of the above
19. What is the gravitational force between two trucks, each with a mass of 2.0×10^4 kg, that are 2.0 m apart? ($G = 6.673 \times 10^{-11}\ N \bullet m^2/kg^2$)
    a. 6.7×10^{-3} N
    b. 1.3×10^{-2} N
    c. 5.7×10^{-2} N
    d. 1.2×10^{-7} N
20. Two small masses that are 10.0 cm apart attract each other with a force of 10.0 N. When they are 5.0 cm apart, these masses will attract each other with what force?
    ($G = 6.673 \times 10^{-11}\ N \bullet m^2/kg^2$)
    a. 20.0 N
    b. 5.0 N
    c. 2.5 N
    d. 40.0 N

21. Consider the gravitational force between Earth and a meteor in outer space. If the meteor moves so its distance from the Earth's center doubles, the gravitational force on the meteor will be _____.
    a. eight times greater
    b. quadruple
    c. double
    d. half
    e. one quarter
22. Two objects move toward each other because of gravitational attraction. As the objects get closer and closer, the force between them _____.
    a. remains constant
    b. increases
    c. decreases
23. When a star collapses to form a black hole, its mass _____.
    a. decreases
    b. remains the same
    c. increases
24. A ball is whirled in a horizontal circular path on the end of a string. Predict the path of the ball when the string breaks, and explain your answer.

25. An object in uniform circular motion moves at a constant speed around a circle with a fixed radius. Why is the object said to be accelerating though it has a constant speed?

26. On a planet with an unknown value of g, the period of a 0.65 m long pendulum is 2.8 s. What is the value of g?

27. A 61 kg student sits at a desk 1.25 m away from a 70.0 kg student. What is the magnitude of the gravitational force between the two students?
    ($G = 6.673 \times 10^{-11}$ N•m^2/kg^2)

28. Jupiter has radius 7.15×10^7 m and mass 1.90×10^{27} kg. Calculate the value of acceleration due to gravity on Jupiter's surface.

29. Calculate the force of gravitational attraction between two spheres of mass 10.6 kg and 47.4 kg that are 36.7 m apart.

Conceptual Physics Mid Term Exam Study Guide 2014 Key

Unit 1 introduction

1. ANS: B STA: SCSh1| SCSh1.b| SCSh8| SCSh8.a
2. ANS: C STA: SCSh7| SCSh7.e| SCSh8
3. ANS: B STA: SCSh7| SCSh7.e| SCSh8
4. ANS: E STA: SCSh7| SCSh7.e| SCSh8

Unit 2 Forces and Newton's First Law

1. ANS: F STA: SCSP1.b| SCSP1.f
2. ANS: F STA: SCSP1.b| SCSP1.f
3. ANS: F STA: SCSP1.b| SCSP1.f
4. ANS: T STA: SCSP1.b| SCSP1.f
5. ANS: B
6. ANS: D
7. ANS: D STA: SPS8.b.3
8. ANS: B STA: SPS8.
9. ANS: C STA: SPS8.c
10. ANS: D STA: SPS8.c
11. ANS: C STA: SPS8.b.2
12. ANS: C STA: SPS8.b.2
13. ANS: C STA: SPS8.
14. ANS: B STA: SCSP1
15. ANS: D STA: SCSP1
16. ANS: D STA: SCSP1
17. ANS: A STA: SCSP1
18. ANS: E
19. ANS: B
20. ANS: C
21. ANS: C
22. ANS: C STA: SCSP1.b| SCSP1.f
23. ANS: B STA: SCSP1.b| SCSP1.f
24. ANS: net force
25. ANS: balanced forces or balanced
26. ANS: friction STA: SPS8.b.3
27. ANS: inertia, forward STA: SPS8.c
28. ANS: force, mass STA: SPS8.b.1
29. ANS: weight STA: SPS8.b.2
30. ANS: 7.2 N STA: SCSP1
31. ANS: 14 N
32. ANS: B STA: SCSh1.c| SCSh7.e| SCSP1.d
33. ANS: B STA: SCSh1.c| SCSh7.e| SCSP1.d
34. ANS: E STA: SCSh7.e| SCSP1| SCSP1.d
35. ANS: C STA: SCSh7.e| SCSP1| SCSP1.d
36. ANS: A STA: SCSh7.e| SCSP1| SCSP1.d
37. ANS: C STA: SCSh7.e| SCSP1| SCSP1.d
38. ANS: C STA: SCSh7.e| SCSP1| SCSP1.d
39. ANS: C STA: SCSh7.e| SCSP1| SCSP1.d
40. ANS: C STA: SCSh7.e| SCSP1| SCSP1.d
41. ANS: D STA: SCSh7.e| SCSP1| SCSP1.d

42. ANS: C STA: SCSP1
43. ANS: B STA: SCSP1
44. ANS: A STA: SCSP1
45. ANS: B STA: SCSP1
46. ANS: C STA: SCSP1
47. ANS: C STA: SCSP1
48. ANS: D STA: SCSP1
49. ANS: C STA: SCSP1
50. ANS: 100 N STA: SCSP1
51. ANS: 65 kg STA: SCSP1
52. ANS: 6.0 N STA: SCSP1
53. ANS: 1.5 N STA: SCSP1
54. ANS: 12 N STA: SCSP1

Unit 3 Linear Motion

1. ANS: D STA: SCSP1.a| SCSP1.c
2. ANS: D STA: SCSP1.a| SCSP1.c
3. ANS: D STA: SCSP1.a| SCSP1.c
4. ANS: C
5. ANS: A STA: SCSP1.a| SCSP1.c
6. ANS: C STA: SCSP1.a| SCSP1.c
7. ANS: A STA: SCSP1.c
8. ANS: C STA: SCSP1.a| SCSP1.c
9. ANS: C STA: SCSP1.a| SCSP1.c
10. ANS: B STA: SCSP1.a| SCSP1.c
11. ANS: C STA: SCSP1.c
12. ANS: B STA: SCSP1.a| SCSP1.c
13. ANS: C STA: SCSP1.a| SCSP1.c
14. ANS: E STA: SCSP1.a| SCSP1.c
15. ANS: B STA: SCSP1.a| SCSP1.c
16. ANS: A STA: SCSP1.a| SCSP1.c
17. ANS: A STA: SCSP1.a| SCSP1.c
18. ANS: C STA: SCSP1.a| SCSP1.c
19. ANS: C STA: SCSP1.a| SCSP1.c
20. ANS: B STA: SCSP1.a| SCSP1.c
21. ANS: B STA: SCSP1.a| SCSP1.c
22. ANS: B STA: SCSP1.a| SCSP1.c
23. ANS: A STA: SCSP1.c
24. ANS: B STA: SCSP1.a| SCSP1.c
25. ANS: B STA: SCSh5.e| SCSP1.a| SCSP1.c
26. ANS: C STA: SCSP1.c
27. ANS: T STA: SCSP1.a| SCSP1.c
28. ANS: T
29. ANS: T STA: SCSP1.a| SCSP1.c
30. ANS: 17.6 m/s STA: SCSP1.a| SCSP1.c
31. ANS: 30 km/hr STA: SCSP1.a| SCSP1.c
32. ANS: 7.5 km/h·s STA: SCSP1.a| SCSP1.c
33. ANS: 20 m/s^2 STA: SCSP1.a| SCSP1.c
34. ANS: 4 m/s STA: SCSP1.a| SCSP1.c
35. ANS: 5 m/s STA: SCSP1.a| SCSP1.c
36. ANS: 20 m/s STA: SCSP1.a| SCSP1.c

37. ANS: 0.5 s STA: SCSP1.a| SCSP1.c
38. ANS: 7 s STA: SCSP1.a| SCSP1.c
39. ANS: 3 m STA: SCSP1.a| SCSP1.c
40. ANS: 15.8 s STA: SCSP1.c
41. ANS: 8.5 m STA: SCSP1.a| SCSP1.c
42. ANS: 14 m/s STA: SCSP1.a| SCSP1.c

Unit 4 Projectile Motion

1. ANS: D STA: SCSP1.b| SCSP1.f
2. ANS: B STA: SCSP1| SCSP1.f
3. ANS: C STA: SCSP1| SCSP1.f
4. ANS: A STA: SCSP1| SCSP1.f
5. ANS: B STA: SCSP1| SCSP1.f
6. ANS: A STA: SCSP1| SCSP1.f
7. ANS: D STA: SCSP1| SCSP1.f
8. ANS: C STA: SCSP1| SCSP1.f
9. ANS: C STA: SCSP1| SCSP1.f
10. ANS: B STA: SCSP1| SCSP1.f
11. ANS: D STA: SCSP1| SCSP1.f
12. ANS: C STA: SCSP1| SCSP1.f
13. ANS: C STA: SCSP1| SCSP1.f
14. ANS: A STA: SCSP1.b| SCSP1.f
15. ANS: A STA: SCSP1| SCSP1.f
16. ANS: E STA: SCSP1.b| SCSP1.f
17. ANS: A STA: SCSP1| SCSP1.f
18. ANS: C STA: SCSP1| SCSP1.f
19. ANS: C STA: SCSP1
20. ANS: A STA: SCSP1| SCSP1.f
21. ANS: 10.4 km/h STA: SCSP1.b| SCSP1.f
22. ANS: 560 m STA: SCSP1| SCSP1.f
23. ANS: 20 m STA: SCSP1
24. ANS: 10.4 m/s STA: SCSP1| SCSP1.f

Unit 5 Newton's 2nd and 3rd Laws

1. ANS: A
2. ANS: C STA: SCSP1
3. ANS: D
4. ANS: A STA: SCSh5.e| SCSP1| SCSP1.d
5. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
6. ANS: A STA: SCSh5.e| SCSP1
7. ANS: C STA: SCSP1.d| SCSP1.d
8. ANS: B STA: SCSh5.e| SCSh7.e
9. ANS: A
10. ANS: C STA: SCSh5.e| SCSP1
11. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
12. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
13. ANS: C STA: SCSh5.e| SCSP1| SCSP1.d
14. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
15. ANS: A STA: SCSh5.e| SCSP1

16. ANS: A STA: SCSh5.e| SCSh7.e
17. ANS: C STA: SCSP1.d| SCSP1.d
18. ANS: A STA: SCSh5.e| SCSP1
19. ANS: C STA: SCSh5.e| SCSP1| SCSP1.d
20. ANS: C STA: SCSh5.e| SCSP1
21. ANS: B STA: SCSh5.e| SCSP1
22. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
23. ANS: B STA: SCSh5.e| SCSh7.e
24. ANS: C STA: SCSh5.e| SCSP1| SCSP1.d
25. ANS: D STA: SCSh5.e| SCSP1| SCSP1.d
26. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
27. ANS: B STA: SCSP1.d| SCSP1.d
28. ANS: C STA: SCSh5.e| SCSP1| SCSP1.d
29. ANS: D STA: SCSh5.e| SCSP1| SCSP1.d
30. ANS: C STA: SCSh5.e| SCSP1| SCSP1.d
31. ANS: D STA: SCSh5.e| SCSP1| SCSP1.d
32. ANS: B STA: SCSh5.e| SCSP1| SCSP1.d
33. ANS: D STA: SCSh5.e| SCSP1| SCSP1.d
34. ANS: C STA: SCSh5.e| SCSP1| SCSP1.d
35. ANS: A STA: SCSh5.e| SCSP1| SCSP1.d
36. ANS: B STA: SCSP1
37. ANS: C STA: SCSP1
38. ANS: A STA: SCSP1| SCSP1.d
39. ANS: B STA: SCSP1| SCSP1.d
40. ANS: A STA: SCSP1| SCSP1.d
41. ANS: A STA: SCSP1| SCSP1.d
42. ANS: A STA: SCSP1| SCSP1.d
43. ANS: B STA: SCSP1| SCSP1.d
44. ANS: A STA: SCSP1| SCSP1.d
45. ANS: A STA: SCSh5.e| SCSP1
46. ANS: A STA: SCSP1| SCSP1.d
47. ANS: C STA: SCSP1
48. ANS: D STA: SCSP1| SCSP1.d
49. ANS: B STA: SCSP1| SCSP1.d
50. ANS: A STA: SCSP1| SCSP1.d
51. ANS: B STA: SCSP1| SCSP1.d
52. ANS: B STA: SCSP1| SCSP1.d
53. ANS: C STA: SCSP1
54. ANS: B
55. ANS: C STA: SCSP1.d
56. ANS: C STA: SCSP3.c
57. ANS: D STA: SCSP3.c
58. ANS: C
59. ANS: 2.0 m/s^2 STA: SCSh5.e| SCSP1| SCSP1.d
60. ANS: 2 m/s^2 STA: SCSh5.e| SCSP1| SCSP1.d
61. ANS: 0.4 m/s^2 STA: SCSh5.e| SCSP1| SCSP1.d
62. ANS: 5.0 N STA: SCSh5.e| SCSP1| SCSP1.d
63. ANS: 1.3 m/s^2 STA: SCSh5.e| SCSP1| SCSP1.d
64. ANS: 350 N STA: SCSP1| SCSP1.d
65. ANS: 2 times as fast STA: SCSP1| SCSP1.d
66. ANS: 5.0 N STA: SCSP1| SCSP1.d

1. ANS: A PTS: 1 DIF: L2
OBJ: 10.4 Centripetal and Centrifugal Forces STA: SCSP1.g
KEY: force |inward MSC: comprehension
2. ANS: B PTS: 1 DIF: IIIA OBJ: 7-3.3
3. ANS: D PTS: 1 DIF: L1 OBJ: 13.1 The Falling Apple
STA: SCSh7.b KEY: Newton | force MSC: knowledge
4. ANS: C PTS: 1 DIF: L1 OBJ: 14.2 Circular Orbits
STA: SCSP1 KEY: speed | satellite | orbit MSC: knowledge
5. ANS: D PTS: 1 DIF: L2
OBJ: 10.4 Centripetal and Centrifugal Forces STA: SCSP1.g
KEY: tangent | path MSC: comprehension
6. ANS: A PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: gravity | mass | force
MSC: application
7. ANS: D PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: gravity | mass | force
MSC: application
8. ANS: B PTS: 1 DIF: L2 OBJ: 13.8 Weight and Weightlessness
STA: SCSP1 KEY: sun | orbit MSC: comprehension
9. ANS: C PTS: 1 DIF: L1 OBJ: 13.2 The Falling Moon
STA: SCSh7.b| SCSh8.d| SCSP1.e KEY: Newton | gravity
MSC: knowledge
10. ANS: A PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: mass | gravity
MSC: application
11. ANS: A PTS: 1 DIF: L1 OBJ: 14.2 Circular Orbits
STA: SCSP1 KEY: period | satellite MSC: knowledge
12. ANS: D PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: gravity | sphere
MSC: comprehension
13. ANS: B
Substitute the value of velocity and radius in the equation for centripetal acceleration.

	Feedback
A	Did you include the value of radius in the formula?
B	Correct!
C	Divide the square of the velocity by the radius to get the centripetal acceleration.
D	Square the velocity in the formula.

PTS: 1 DIF: 2 REF: Page 154
OBJ: 6.2.2 Describe how centripetal acceleration depends upon the object's speed and the radius of the circle.
NAT: B.4
TOP: Describe how centripetal acceleration depends upon the object's speed and the radius of the circle.
KEY: Centripetal acceleration MSC: 2
NOT: /a/ Divide the square of the velocity by the radius to get the centripetal acceleration. /b/ Did you include the value of radius in the formula? /c/ Square the velocity in the formula. /d/ Correct!
14. ANS: A PTS: 1 DIF: L2

OBJ: 13.5 Gravity and Distance:The Inverse-Square Law STA: SCSh5.e| SCSP1| SCSP1.e
KEY: sphere | gravity MSC: application

15. ANS: C PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: mass | Earth | radius
MSC: comprehension

16. ANS: B PTS: 1 DIF: L2
OBJ: 13.5 Gravity and Distance:The Inverse-Square Law STA: SCSh5.e| SCSP1| SCSP1.e
KEY: mass | radius MSC: comprehension

17. ANS: C

Use Newton's second law, $F = \frac{mv^2}{r}$.

	Feedback
A	Multiply the mass with the square of the velocity and divide it by the radius.
B	Did you include the value of radius in the formula?
C	Correct!
D	Use Newton's second law.

PTS: 1 DIF: 2 REF: Page 154
OBJ: 6.2.3 Identify the force that causes centripetal acceleration.
NAT: B.4 TOP: Recognize the direction of the force that causes centripetal acceleration.
KEY: Centripetal force MSC: 2
NOT: /a/ Did you include the value of radius in the formula? /b/ Correct! /c/ Use Newton's second law. /d/ Multiply the mass with the square of the velocity and divide it by the radius.

18. ANS: C PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: mass | Earth | radius
MSC: comprehension

19. ANS: A PTS: 1 DIF: IIIB OBJ: 7-3.3

20. ANS: D PTS: 1 DIF: II OBJ: 7-3.3

21. ANS: E PTS: 1 DIF: L2
OBJ: 13.5 Gravity and Distance:The Inverse-Square Law STA: SCSh5.e| SCSP1| SCSP1.e
KEY: gravity | distance MSC: application

22. ANS: B PTS: 1 DIF: L2
OBJ: 13.4 Newton's Law of Universal Gravitation
STA: SCSh5.e| SCSh7.b| SCSP1| SCSP1.e KEY: force | gravity
MSC: application

23. ANS: B PTS: 1 DIF: L1 OBJ: 13.8 Weight and Weightlessness
STA: SCSP1 KEY: star | black hole MSC: knowledge

SHORT ANSWER

24. ANS:
Inertia causes the ball to move in a straight path tangent to the circle.

PTS: 1 DIF: I OBJ: 7-3.2

25. ANS:
An object in uniform circular motion has a constant speed, but its velocity keeps changing. Since velocity is a vector quantity, a change in direction indicates a change in velocity. Since the velocity changes, the object is said to be accelerating.

PTS: 1 DIF: 3 REF: Page 153

OBJ: 6.2.1 Explain why an object moving in a circle at constant speed is accelerated.
NAT: B.4 TOP: Explain why an object moving in a circle at constant speed is accelerated.
KEY: Uniform circular motion MSC: 2

PROBLEM

26. ANS:
3.3 m/s

PTS: 1

27. ANS:
1.8×10^{-7} N

PTS: 1 DIF: IIIB OBJ: 7-3.3

28. ANS:
24.8 m/s^2

PTS: 1 DIF: 3 REF: Page 177 | Page 178
OBJ: 7.1.3 Describe the importance of Cavendish's experiment.
NAT: B.4 TOP: Describe the importance of Cavendish's experiment.
KEY: Acceleration due to gravity MSC: 3
NOT: Acceleration due to gravity is directly proportional to the mass of the planet and inversely proportional to the square of the planet's radius.

29. ANS:
2.49×10^{-11} N

PTS: 1 DIF: 3 REF: Page 177 | Page 178
OBJ: 7.1.3 Describe the importance of Cavendish's experiment.
NAT: B.4 TOP: Describe the importance of Cavendish's experiment.
KEY: Gravitational force MSC: 3