TRUE/FALSE

1. All forces have specific directions associated with them.

   ANS: T PTS: 1

2. “Net force” means the vector sum of all the individual forces acting on a particular body.

   ANS: T PTS: 1

3. The weight of an object equals its mass times the acceleration of gravity.

   ANS: T PTS: 1

4. You are presently exerting a gravitational force on the earth.

   ANS: T PTS: 1

5. When a car goes around a curve of smaller and smaller radius, the centripetal force on it decreases.

   ANS: F PTS: 1

6. When a car goes around a curve at twice the speed, the centripetal force on the car doubles.

   ANS: F PTS: 1

7. You roll a ball off a table and at the same time drop a second ball straight down from the edge of the table. The second ball reaches the ground before the first ball.

   ANS: F PTS: 1

8. With a fixed force, you will impart the same acceleration to a body on the earth and on the moon.

   ANS: T PTS: 1

9. When a body moves with uniform acceleration, the net force on it is zero.

   ANS: F PTS: 1

10. You throw a ball straight up, it peaks out and then comes back down to you. During this motion, the velocity and acceleration always point in the same direction.

    ANS: F PTS: 1

11. During its entire motion, the acceleration of a projectile is always g.

    ANS: T PTS: 1

12. At the peak of its motion, the acceleration of a projectile is zero.

    ANS: F PTS: 1

13. As a projectile moves its speed stays constant while its direction changes.

    ANS: F PTS: 1

14. When an object reaches its terminal speed, its acceleration is zero.

    ANS: T PTS: 1

15. As an object moves faster through the air, its terminal speed increases.

    ANS: F PTS: 1

    NARRBEGIN: A body is oscillating up
    A body is oscillating up and down at the end of a spring. Let’s consider when the body is at the top of its up and down motion.
    NARREND

16. The net force on the body has its largest magnitude.

    ANS: T PTS: 1

17. The net force points downward.

    ANS: T PTS: 1

18. The acceleration is zero.

    ANS: F PTS: 1

19. The velocity points down.

    ANS: F PTS: 1

20. The displacement vector from the equilibrium position has its largest magnitude.

    ANS: T PTS: 1

21. The displacement vector from the equilibrium position points up.

    ANS: T PTS: 1

22. When a body moves in a straight line with increasing speed, the net force on it must be increasing.

ANS: F PTS: 1

23. To hold a 5 lb bag of sugar in your hand, you must push upwards on it with a force of 5 lb. This is an example of Newton's third law.

ANS: F PTS: 1

24. You push on a wall, and the wall pushes back on you with the same force. This is an example of Newton's third law.

ANS: T PTS: 1

25. When you jump, you accelerate upward because the floor exerts an upward force on you.

ANS: T PTS: 1

26. A newton is larger than a pound.

ANS: F PTS: 1

27. As you go higher and higher above the surface of the earth, the mass of a body stays constant.

ANS: T PTS: 1

28. A body on the surface of the earth weighs 400 lb. The radius of the earth is about 4,000 miles. If this same body were placed on a 4,000 mile high tower, its weight would be 200 lb.

ANS: F PTS: 1

29. If a body were in orbit very near the surface of the earth, its centripetal acceleration would be equal to g.

ANS: T PTS: 1

30. Planetary orbits are circles.

ANS: F PTS: 1

31. Just above the surface of the earth, the direction of the gravitational field is away from the earth.

ANS: F PTS: 1

32. The direction of a field line at a point in space shows the direction of the force that would act on a body placed at the point.

ANS: T PTS: 1

33. As you go from a point where a gravitational field is strong to a point where the gravitational field gets weaker, the gravitational field lines get farther apart.

ANS: T PTS: 1

34. Gravity acts over a limited distance range.

ANS: F PTS: 1

35. Tides are caused because different parts of the earth's oceans are at different distances from the moon.

ANS: T PTS: 1

36. As an artillery shell travels from the gun to the target, the projectile's vertical speed changes, but it's horizontal speed stays constant.

ANS: T PTS: 1

37. An aircraft weighing 1,500 N is accelerated at 15 m/s^2 , the force acting on the aircraft is 2,295.9 N.

ANS: T
The mass of the aircraft is 1,500 N/9.8 m/s^2 = 153.061 kg; F = ma = 153.061kg x 15 m/s^2 = 2295.9 N

PTS: 1

38. An aircraft weighing 1,500 N has a mass of 153 kg..

ANS: T PTS: 1

39. A satellite orbiting the Earth in a circular orbit at 400 miles from the center of Earth is moved to a distance of 1,200 miles from the center of Earth. The gravitational force between the Earth and satellite changes by a factor of 3.

ANS: F
False, it changes by a factor of $3^2 = 9$.

PTS: 1

40. A ball on a string is being whirled around overhead when the string breaks. The ball will move in the direction of the centripetal force the moment the string breaks.

ANS: F
False, the ball will move in the direction of the velocity vector when the string breaks.

PTS: 1

MULTIPLE CHOICE

1. The acceleration of a body is
   a. always in the same direction as its velocity
   b. always in the same direction as the net force on the body
   c. in the direction that the body is moving
   d. equal to the net force on the body
   e. none of the above

   ANS: B PTS: 1

2. An example of an action at a distance force is
   a. tension
   b. weight
   c. static friction
   d. kinetic friction
   e. none of the above

   ANS: B PTS: 1

3. The SI units of velocity are
   a. mi/h
   b. km/h
   c. m/s^2
   d. m/s
   e. none of the above

   ANS: C PTS: 1

4. The SI units of acceleration are
   a. mi/h
   b. km/h
   c. m/s
   d. m/s^2
   e. none of the above

   ANS: D PTS: 1

5. The force needed to make an object move in a circle is
   a. centripetal force
   b. weight
   c. kinetic friction
   d. static friction
   e. none of the above

   ANS: A PTS: 1

6. The force that keeps your feet from sliding as you walk is
   a. centripetal force
   b. weight
   c. kinetic friction
   d. static friction
   e. none of the above

   ANS: D PTS: 1

7. If the net force on an object is zero,
   a. there must be no forces acting on the object
   b. the object must be at rest
   c. the object's acceleration must be zero
   d. there can be no friction acting on the object

   ANS: C PTS: 1

8. Which is larger, a newton or a pound?
   a. a newton
   b. a pound
   c. This question is nonsense—they don't measure the same physical quantity.
   d. They are the same size.

   ANS: B PTS: 1

9. You push on a block on frictionless ice with a force of 8 N, causing it to accelerate at 2 m/s^2. The mass of the block is
   a. 2 kg
   b. 4 kg
   c. 8 kg
   d. 16 kg
   e. 6 kg

   ANS: B PTS: 1

10. Starting from rest, a 2 kg body acquires a speed of 8 m/s in 2 seconds. The net force acting on the body is
    a. 2 N
    b. 4 N
    c. 8 N
    d. 16 N
    e. 6 N

    ANS: C PTS: 1

11. Two forces of 4 N and 12 N act on a body simultaneously. The net force on the body is
    a. 4 N
    b. 12 N
    c. 16 N
    d. 8 N

e. impossible to tell from the given information

ANS: E
The directions of the forces must be known.

PTS: 1

12. You whirl a 2 kg body attached to a 1 meter cord around your head in a nearly horizontal circle with a speed of 4 m/s. The tension in the cord is
    a. 2 N
    b. 4 N
    c. 8 N
    d. 16 N
    e. 32 N

    ANS: E PTS: 1

13. If object A has more mass than object B,
    a. A will weigh more than B.
    b. A will be harder to accelerate than B.
    c. A will be harder to keep moving in a circle.
    d. all of the above

    ANS: D PTS: 1

14. The frequency of a body oscillating from a spring on the moon is_____ the frequency of the same body oscillating from the same spring on earth.
    a. the same as
    b. larger than
    c. smaller than
    d. not related to
    e. depending on the mass, smaller or larger than

    ANS: A PTS: 1

15. Two identical cars are traveling around the same curve on a highway. One of them is moving at 60 mph, and the other is moving at 30 mph. The centripetal force acting on the car moving at 60 mph is _____ the value of the centripetal force acting on the car moving at 30 mph.
    a. one quarter
    b. one half
    c. the same as
    d. twice
    e. four times

    ANS: E PTS: 1

16. A car moving at a constant speed goes around a curve of 400 ft radius and then goes around a second curve of 200 ft radius. The centripetal force acting on the car as it goes around the 200 ft radius curve is _____ the value of the centripetal force acting on the car as it goes around the 400 ft radius curve.

a. one quarter
b. one half
c. the same as
d. twice
e. four times

ANS: D PTS: 1

17. You roll a ball off a table and at the same time drop a second ball straight down from the edge of table. The second ball reaches the ground _____ the first ball reaches the ground.
a. before
b. at the same time that
c. after
d. before or after, depending on the masses,
e. cannot be determined

ANS: B PTS: 1

18. When a freely falling object reaches its terminal speed,
a. it is still accelerating
b. its acceleration is zero
c. it is decelerating
d. its acceleration cannot be determined

ANS: B PTS: 1

NARRBEGIN: A 160 lb person has mass
A 160 lb person has a mass of 160/32 = 5 slugs. A 160 lb person steps into an elevator and stands on a bathroom scale. Determine the scale reading for the given scenarios.
NARREND

19. The elevator is accelerating upwards at 2 ft/s^2.
a. 150 lb
b. 160 lb
c. 170 lb
d. none of the above

ANS: C PTS: 1

20. The elevator accelerates upwards and is now moving at a constant speed.
a. 150 lb
b. 160 lb
c. 170 lb
d. none of the above

ANS: B PTS: 1

21. After moving upwards at constant speed, the elevator is slowing down at 2 m/s^2 as it is coming to rest.
a. 150 lb
b. 160 lb
c. 170 lb
d. none of the above

ANS: A PTS: 1

22. The elevator is accelerating downwards at 2 ft/s^2.
    a. 150 lb
    b. 160 lb
    c. 170 lb
    d. none of the above

    ANS: A PTS: 1

23. The elevator accelerates downwards and is now moving at a constant speed.
    a. 150 lb
    b. 160 lb
    c. 170 lb
    d. none of the above

    ANS: B PTS: 1

24. After moving downwards at constant speed, the elevator is slowing down at 2 m/s^2 as it is coming to rest.
    a. 150 lb
    b. 160 lb
    c. 170 lb
    d. none of the above

    ANS: C PTS: 1

25. The elevator cable breaks.
    a. 150 lb
    b. 160 lb
    c. 170 lb
    d. none of the above

    ANS: D PTS: 1

26. You throw a ball straight up, it peaks out, and then comes back down to you. During this motion, the velocity and acceleration
    a. always point in the same direction
    b. always point opposite to each other
    c. sometimes point in the same direction, and other times point opposite to each other
    d. depend on the way the ball is thrown
    e. depend on the mass of the ball

    ANS: C PTS: 1

27. The horizontal speed of a projectile
    a. is zero
    b. stays constant
    c. continuously increases
    d. continuously decreases
    e. sometimes decreases and sometimes increases

    ANS: B PTS: 1

28. The vertical speed of a projectile
    a. is zero
    b. stays constant
    c. continuously increases
    d. continuously decreases
    e. sometimes decreases and sometimes increases

    ANS: E PTS: 1

29. The horizontal acceleration of a projectile
    a. is zero
    b. stays constant
    c. continuously increases
    d. continuously decreases
    e. sometimes decreases and sometimes increases

    ANS: A PTS: 1

30. The vertical acceleration of a projectile
    a. equals *g* pointing downwards
    b. equals *g* pointing upwards
    c. equals *g* pointing sometimes upwards and other times downwards
    d. is zero
    e. continuously increases

    ANS: A PTS: 1

31. Planetary orbits are
    a. parabolas
    b. ellipses
    c. circles
    d. none of the above.

    ANS: B PTS: 1

32. Where is the sun located relative to a planet's orbit about it?
    a. at the center of the orbit, which is a circle
    b. at the center of the orbit, which is an ellipse
    c. at one focus of the ellipse which forms the orbit
    d. none of the above

    ANS: C PTS: 1

33. At the highest point on the path of a projectile, its vertical acceleration
    a. equals *g* pointing downwards
    b. equals *g* pointing upwards
    c. is zero
    d. is undetermined
    e. does not exist

    ANS: A PTS: 1

34. As a body falls through air starting from rest, its acceleration
    a. is zero
    b. stays constant
    c. continuously decreases
    d. continuously increases
    e. gets smaller and smaller, eventually approaching zero

    ANS: E PTS: 1

35. As a body falls through air starting from rest, its velocity

a. stays constant
b. continuously decreases
c. continuously increases
d. gets larger and larger, eventually reaching a constant value
e. gets smaller and smaller, eventually approaching zero

ANS: D PTS: 1

NARRBEGIN: I push on a heavy chair
For this situation, I push on a heavy chair.
NARREND

36. Suppose I push lightly on the chair, and the chair doesn't move at all. Then the strength of the force the chair exerts on me is
a. less than the force I exert on the chair
b. equal to the force I exert on the chair
c. greater than the force I exert on the chair
d. zero

ANS: B PTS: 1

37. Suppose I push moderately on the chair, and this time the chair does move. Then the strength of the force the chair exerts on me is
a. less than the force I exert on the chair
b. equal to the force I exert on the chair
c. greater than the force I exert on the chair
d. zero

ANS: B PTS: 1

38. Suppose I push very hard on the chair, and this time the both the chair moves and I slip backward as well. Then the strength of the force the chair exerts on me is
a. less than the force I exert on the chair
b. equal to the force I exert on the chair
c. greater than the force I exert on the chair
d. zero

ANS: B PTS: 1

NARRBEGIN: A body is oscillating up
A body is oscillating up and down at the end of a spring. Let's consider when the body is at the top of its up and down motion.
NARREND

39. The velocity
a. is zero
b. has its largest magnitude
c. points up
d. points down

ANS: A PTS: 1

40. Two cars crash head on. At any given time during the crash, the magnitudes of the collision forces exerted on each car are exactly equal. This is an example of Newton's
    a. first law
    b. second law
    c. third law
    d. no law

    ANS: C PTS: 1

41. A heavy truck hits a small car. At any given time during the impact,
    a. the force the truck exerts on the car is larger than the force the car exerts on the truck
    b. the force the truck exerts on the car is smaller than the force the car exerts on the truck
    c. the force the truck exerts on the car is equal to the force the car exerts on the truck
    d. the only force present is the force of the truck on the car

    ANS: C PTS: 1

42. As a space shuttle is launched into orbit, the direction of its acceleration
    a. always points upward
    b. always points downward
    c. varies between pointing upward and pointing downward
    d. stays constant

    ANS: C PTS: 1

43. Which statement is incorrect? The gravitational force on an orbiting satellite due to the earth
    a. aims toward the center of the earth
    b. depends on the earth's mass
    c. depends on the satellite's mass
    d. depends on the distance between the earth and the satellite
    e. none of the above

    ANS: E
    A - D are all true.

    PTS: 1

44. A body on the surface of the earth weighs 400 lb. The radius of the earth is about 4,000 miles. If this same body were placed on a 4,000 mile high tower, its weight would be
    a. 100 lbs
    b. 200 lbs
    c. 400 lbs
    d. 800 lbs
    e. 16,000 lbs

    ANS: A PTS: 1

45. The symbol *G* is used to represent
    a. the acceleration of gravity
    b. the universal gravitational constant

c. grams
d. gravity
e. none of the above

ANS: B PTS: 1

46. How was the value of *G* first determined?
a. by Cavendish, using a torsion balance
b. by Eötvös, using a torsion balance
c. via a *gedanken* experiment
d. by Newton, watching an apple fall
e. none of the above

ANS: A PTS: 1

47. If a body were in orbit very near the surface of the earth, its centripetal acceleration would be
a. equal to *g*
b. smaller than *g*
c. larger than *g*
d. dependent on its mass
e. none of the above

ANS: A PTS: 1

48. During the period of one day, the number of high tides at a given point is about
a. one
b. two
c. three
d. four
e. none of the above

ANS: B PTS: 1

49. Tides are influenced by
a. the moon
b. the sun
c. the uneven surface of the earth
d. all of the above
e. none of the above

ANS: D PTS: 1

50. The sensitive dependence upon initial conditions of the evolution of some physical systems is a feature of
a. gravitation
b. fractals
c. air resistance
d. dynamical chaos
e. quantum mechanics

ANS: D PTS: 1

51. Isaac Newton's contributions to physics include
    a. the laws of motion
    b. the law of universal gravitation
    c. invention of the calculus
    d. the invention of the reflecting telescope
    e. all of the above

    ANS: E PTS: 1

52. Starting from rest, a 20,000 kg aircraft being launched from an aircraft carrier goes from 0 to 90 m/s in 2 seconds. The net force acting on the aircraft is
    a. 3,600,000N
    b. 1,800,000 N
    c. 900,000 N
    d. 450,000 N
    e. 275,000N

    ANS: C
    F = ma; a = change in velocity/change in time = 90 m/s / 2 seconds = 45 m/s^2
    F = 20,000 kg x 45 m/s^2 = 900,000 N

    PTS: 1

53. An aircraft weighs 1,500 N, its mass is
    a. 1,500 kg
    b. 750 kg
    c. 153 kg
    d. mass cannot be determined

    ANS: C
    m = w/g = 1500 kg m/s^2 / 9.8 m/s^2 = 153.06 kg

    PTS: 1

54. Two identical airplanes are executing identical turns around a pylon. One of them is moving at 200 mph, and the other is moving at 100 mph. The centripetal force acting on the airplane moving at 200 mph is _____ the value of the centripetal force acting on the airplane moving at 100 mph.
    a. one quarter
    b. one half
    c. the same as
    d. twice
    e. four times

    ANS: E
    Centripetal force = mv^2 / r; since $v_1 = 2v_2$; the force is $(2)^2$ or 4 times as great.

    PTS: 1

55. An astronaut in a space suit has a total mass of 143.5 kg and is standing on a scale that reads in newtons inside an elevator. If the elevator accelerates upward at the rate of 1.8 m/s^2 , what does the scale read?
    a. 703.2 N
    b. 1,406.3 N
    c. 882.3 N
    d. 1,664.6 N

    ANS: D

Fup = W + ma = (1,406.3 N) + (143.5 kg)(+1.8 m/s^2)

Fup = 1,664.6 N [rounded to one decimal place]

PTS: 1

56. A 188 pound astronaut in a training exercise experiences an acceleration of 7.2 g's. What is the net force (in Newtons) acting on the astronaut?
    a. 1,353.6 N
    b. 6,023.5 N
    c. 59,030.5 N
    d. 13,536 N

    ANS: B
    Three part problem. First convert lb to N

    W = mg = 188 x [1 lb] = 188 x [4.45 N] = 436.6 N

    Next change this weight to a mass.

    m = W/g = (436.6 N)/(9.8 m/s2) = 85.367 kg

    Finally, use Newton's 2nd Law.

    F = ma = (85.367 kg)(70.56 m/s2) = 6023.5 N [rounded to one decimal place]

    PTS: 1

MULTIPLE RESPONSE

1. Which of these are SI units?
    a. centimeters
    b. newtons
    c. pounds
    d. seconds
    e. none of the above

    ANS: B, D PTS: 1

    NARRBEGIN: A body is oscillating up

    A body is oscillating up and down at the end of a spring. Let's consider when the body is at the top of its up and down motion.

    NARREND

2. The net force on the body
    a. is zero
    b. has its largest magnitude
    c. points up
    d. points down

    ANS: B, D PTS: 1

3. The acceleration

a. is zero
b. has its largest magnitude
c. points up
d. points down

ANS: B, D PTS: 1

4. The displacement vector from the equilibrium position
   a. is zero
   b. has its largest magnitude
   c. points up
   d. points down

   ANS: B, C PTS: 1

5. If the earth's mass were suddenly made larger but the moon's mass stayed the same,
   a. the earth would exert a larger force on the moon
   b. the moon would exert a larger force on the earth
   c. the earth would exert a larger force on the moon but the moon would exert the same force on the earth as before
   d. none of the above

   ANS: A, B PTS: 1

6. A ball is thrown straight up, and reaches the top of its trajectory, the acceleration
   a. zero
   b. 9.8 m/s^2
   c. points down
   d. points up

   ANS: B, C PTS: 1

COMPLETION

1. The resistance to relative motion of two bodies in contact with each other is called _____.

   ANS: friction force

   PTS: 1

2. The mass of a body on the moon is _____ the mass of the same body on earth.

   ANS: the same as

   PTS: 1

3. The weight of a body on the moon is _____ the weight of the same body on earth.

   ANS: less than

   PTS: 1

4. You push on a block on frictionless ice with a force of 8 N, causing it to accelerate at 2 m/s^2. The mass of the block is _____.

ANS: 4 kg

PTS: 1

5. Starting from rest, a 2 kg body acquires a speed of 8 m/s in 2 seconds. The net force acting on the body is _____.

   ANS: 8 N

   PTS: 1

6. You whirl a 2 kg body attached to a 1 meter cord around your head in a nearly horizontal circle with a speed of 4 m/s. The tension in the cord is _____.

   ANS: 32 N

   PTS: 1

7. A car goes around a curve at 40 m/s. An accelerometer in the car measures the centripetal acceleration of a 2 kg body in the car to be 8 m/s^2. The radius of the curve is _____.

   ANS: 200 m

   PTS: 1

8. You stand on a bathroom scale at the equator and at the north pole. The scale reading at the equator is _____ the scale reading at the north pole.

   ANS: slightly smaller than

   PTS: 1

9. You drop a freely falling body at the equator and at the north pole. The acceleration of the freely falling body at the equator is _____ the acceleration of the freely falling body at the north pole.

   ANS: the same as

   PTS: 1

10. You throw a ball straight up. As the ball is going up, the direction of the velocity and acceleration point _____.

    ANS: opposite to each other

    PTS: 1

11. You can tell whether a projectile is going upwards or downwards from the sign of _____.

    ANS: the vertical component of velocity

    PTS: 1

12. You are holding your physics book, pushing upwards on it with the palm of your hand. The reaction to this force is the force on _____ by _____.

    ANS: your hand, the book

    PTS: 1

13. You are holding your physics book, pushing upwards on it with the palm of your hand. The reaction to the weight of the book is the force on _____ by _____.

    ANS: the earth, the book

    PTS: 1

14. As you go higher and higher above the surface of the earth, the weight of a body _____.

    ANS: decreases

    PTS: 1

15. As you go higher and higher above the surface of the earth, the mass of a body _____.

    ANS: stays constant

    PTS: 1

16. As you go higher and higher above the surface of the earth, the acceleration of a freely falling body _____.

    ANS: gets smaller and smaller

    PTS: 1

17. As the radius of the orbit of an artificial satellite increases, its orbital period _____.

    ANS: increases

    PTS: 1

18. The shapes of planetary orbits are _____.

ANS: ellipses

PTS: 1

19. A body on the surface of the earth weighs 400 lb. The radius of the earth is about 4,000 miles. If this same body were placed on a 4,000 mile high tower, its weight would be _____.

ANS: 100 lb

PTS: 1

20. During the period of one day, the number of high tides at a given location is about _____.

ANS: two

PTS: 1

21. The major influence on the tides is due to _____.

ANS: the moon

PTS: 1

22. The sensitive dependence upon initial conditions of the evolution of some physical systems is a feature of _____.

ANS: dynamical chaos

PTS: 1

23. A car and driver have a total mass of 945 kg. While rounding a curve on a flat road at a speed of 29 m/s, the net force acting on the car and driver is determined to be 56,767.5 N. The radius of the curve is_____.

ANS: 14.0 m

PTS: 1

24. An object is dropped from a tall building. The net force acting on the object is the difference between the object's _____ and the force of air resistance.

ANS: weight

PTS: 1

MATCHING

Match each item with the correct statement below.

a. centripetal force
b. circle
c. ellipse
d. field
e. kinetic friction
f. mass
g. parabola
h. SI
i. simple harmonic motion
j. static friction
k. terminal speed
l. tides
m. weight

1. needed to make an object move in a circle
2. keeps our feet from sliding as we walk
3. keeps our feet from sliding as we walk
4. caused by the moon's gravitational pull
5. shape of the path of a projectile
6. air resistance is one example
7. the force of air resistance leads to this
8. the force of gravity acting on a body
9. an object hanging from a spring can do this
10. a measure of an object's resistance to acceleration

1. ANS: A PTS: 1
2. ANS: J PTS: 1
3. ANS: H PTS: 1
4. ANS: L PTS: 1
5. ANS: G PTS: 1
6. ANS: E PTS: 1
7. ANS: K PTS: 1
8. ANS: M PTS: 1
9. ANS: I PTS: 1
10. ANS: F PTS: 1

Match each item with the correct statement below.

a. m
b. m^2
c. m^3
d. s
e. Hz
f. m/s
g. m/s^2
h. N
i. kg

11. the area of the sheet of paper you are looking at
12. the reading on your watch
13. the speedometer reading on your car
14. your weight
15. the mass of a baseball
16. the force exerted on a baseball by a baseball bat
17. the distance between your school and your home
18. the quantity describing how the speed of your car changes
19. the pitch of a note when a piano key is struck
20. the frequency of a body vibrating at the end of a spring

21. the volume of a 5 lb bag of sugar
22. air resistance
23. static and kinetic friction
24. the quantity that measures the resistance of an object to being accelerated
25. the gravitational pull of the earth on the moon

11. ANS: B PTS: 1
12. ANS: D PTS: 1
13. ANS: F PTS: 1
14. ANS: H PTS: 1
15. ANS: I PTS: 1
16. ANS: H PTS: 1
17. ANS: A PTS: 1
18. ANS: G PTS: 1
19. ANS: E PTS: 1
20. ANS: E PTS: 1
21. ANS: C PTS: 1
22. ANS: H PTS: 1
23. ANS: H PTS: 1
24. ANS: I PTS: 1
25. ANS: H PTS: 1

Match each item with the correct statement below.

a. zero net force
b. constant net force in the same direction as velocity
c. constant net force opposite to velocity
d. constant net force perpendicular to velocity
e. net force decreasing with speed
f. restoring force proportional to displacement

26. motion in a straight line with decreasing speed
27. motion in a straight line with increasing speed
28. motion in a straight line at constant speed
29. motion in a circle
30. a body reaching a terminal velocity
31. a body not moving
32. simple harmonic motion
33. a body falling through air

26. ANS: C PTS: 1
27. ANS: B PTS: 1
28. ANS: A PTS: 1
29. ANS: D PTS: 1
30. ANS: A PTS: 1
31. ANS: A PTS: 1
32. ANS: F PTS: 1
33. ANS: E PTS: 1

Match each item with the correct statement below.

a. increases
b. decreases
c. stays the same

34. As an astronaut is being launched into space, the astronaut's mass
35. As a rocket is being launched into space with a constant force (F), the acceleration
36. As the distance between two objects increases, the gravitational force
37. As the radius of turn being made by an aircraft increases, the centripetal acceleration on the aircraft

34. ANS: C PTS: 1
35. ANS: A PTS: 1
36. ANS: B PTS: 1
37. ANS: B PTS: 1

PROBLEM

1. A steel ball has a mass equal to 5 kilograms. What is the ball's weight?

   ANS:
   49 N

   PTS: 1

2. Find your own weight in newtons.

   ANS:
   Answers will vary. My weight is about 900 N.

   PTS: 1

3. A ball rolling down a hill has a constant acceleration of 3 m/s^2. If the ball's mass is 2.5 kg, what is the net force acting on the ball?

   ANS:
   7.5 N

   PTS: 1

4. A 3,000 kg truck experiences a net force of 2,000 N. What is its acceleration?

   ANS:
   0.667 m/s^2

   PTS: 1

5. A certain speed boat weighs 4,900 N. It can accelerate from 0 to 20 m/s in 5 seconds.

(a) What is the mass of the boat?
(b) What is the acceleration?
(c) How large is the net force acting on the boat?

ANS:
(a) 500 kg, (b) 4 m/s^2, (c) 2,000 N

PTS: 1

6. A child on a merry-go-round is moving with speed 4 m/s in a circle with radius 2 m. If the child's mass is 30 kg, what is the centripetal force?

ANS:
240 N

PTS: 1

7. A satellite orbits the earth at a distance of 10,000 miles from the earth's center. At this distance the force of gravity on the satellite is 90 lbs.
(a) What would the force on the satellite be if the distance were 5,000 miles instead?
(b) At what distance from the earth's center would the force on the same satellite be 10 lbs?

ANS:
(a) 360 lbs, (b) 30,000 miles

PTS: 1

8. An aircraft starts at rest and is accelerated at 10 m/s^2 for 30 seconds, at which time the aircraft becomes airborne. What is the distance traveled during the 30 seconds? Assume the acceleration is constant.

ANS:
4,500 m

PTS: 1