Conceptual Physical Science, 6e **(Hewitt)**
Chapter 1 Patterns of Motion and Equilibrium

1.1 Aristotle on Motion

1) Aristotle treated motion by
A) comparing the distance traveled with the time of travel.
B) measurements of distance traveled.
C) dividing it into two classes.
D) all of the above
Answer: C
Diff: 1
Topic: Aristotle on Motion

2) Aristotle believed that natural laws could be understood by
A) experiment.
B) logic.
C) patterns.
D) mathematics.
Answer: B
Diff: 1
Topic: Aristotle on Motion

3) In contrast to Aristotle's way of explaining nature, Galileo relied on
A) experiment.
B) logic.
C) patterns.
D) mathematics.
Answer: A
Diff: 1
Topic: Aristotle on Motion

4) Galileo's demonstration at the Leaning Tower of Pisa
A) confirmed Aristotle's teachings.
B) refuted Aristotle's teachings.
C) failed in their purpose.
D) none of the above
Answer: B
Diff: 1
Topic: Aristotle on Motion

1.2 Galileo's Concept of Inertia

1) The scientist first credited for discovering the concept of inertia was
A) Aristotle.
B) Galileo.
C) Newton.
D) Copernicus.
Answer: B
Diff: 1
Topic: Galileo's Concept of Inertia

2) Science greatly advanced when Galileo favored
A) philosophical discussions.
B) experiment.
C) non-mathematical thinking.
D) none of the above
Answer: B
Diff: 1
Topic: Galileo's Concept of Inertia

3) Galileo said that if you rolled a ball along a level surface it would
A) slow down due to its natural tendency to come to rest.
B) keep rolling without slowing down if no friction acted upon it.
C) roll as long as its inertia nudged it along.
D) eventually roll in the opposite direction.
Answer: B
Diff: 1
Topic: Galileo's Concept of Inertia

4) When Galileo rolled a ball down an incline and up another incline, he found that the ball rolled nearly to
A) its initial height.
B) halfway its original height.
C) three-quarters its original height.
D) higher than its original height.
Answer: A
Diff: 1
Topic: Galileo's Concept of Inertia

5) According to Galileo, inertia is a
A) force like any other force.
B) special kind of force.
C) property of all matter.
D) concept opposite to force.
Answer: C
Diff: 1
Topic: Galileo's Concept of Inertia

6) According to Galileo, the test of scientific truth is
A) experiment.
B) philosophical discussion.
C) evident patterns in nature.
D) logic.
Answer: A
Diff: 1
Topic: Galileo's Concept of Inertia

7) According to Aristotle, a rolled ball eventually comes to a stop because
A) of friction.
B) of inertia.
C) it seeks its natural state of rest.
D) all of the above
Answer: C
Diff: 1
Topic: Galileo's Concept of Inertia

8) According to Galileo, a rolled ball eventually comes to a stop because
A) of friction.
B) of inertia.
C) it seeks its natural state of rest.
D) all of the above
Answer: A
Diff: 1
Topic: Galileo's Concept of Inertia

9) A probe in space continues in its motion due to
A) very low friction.
B) its own inertia.
C) it seeking a continued state of motion.
D) none of the above
Answer: B
Diff: 1
Topic: Galileo's Concept of Inertia

1.3 Mass—A Measure of Inertia

1) Which has the greatest mass?
A) a fluffed-up king-size pillow
B) a scrunched-up king-size pillow
C) an automobile battery
D) all about the same
Answer: C
Diff: 1
Topic: Mass - A Measure of Inertia

2) A kilogram is a measure of an object's
A) weight.
B) force.
C) mass.
D) gravity.
Answer: C
Diff: 1
Topic: Mass - A Measure of Inertia

3) Between mass and weight, the more fundamental quantity is
A) mass.
B) weight.
C) both the same.
D) none of the above
Answer: A
Diff: 1
Topic: Mass - A Measure of Inertia

4) A 1-kg block of iron weighs about
A) 1 N.
B) 5 N.
C) 10 N.
D) more than 10 N.
Answer: C
Diff: 1
Topic: Mass - A Measure of Inertia

5) Shake an object to and fro if you want to judge its
A) mass.
B) weight.
C) both the same
D) none of the above
Answer: A
Diff: 1
Topic: Mass - A Measure of Inertia

6) Lift an object against the force of gravity if you want to judge its
A) mass.
B) weight.
C) both the same
D) none of the above
Answer: B
Diff: 1
Topic: Mass - A Measure of Inertia

7) A kilogram is a unit of
A) mass.
B) weight.
C) both the same
D) none of the above
Answer: A
Diff: 1
Topic: Mass - A Measure of Inertia

8) The quantity that most relates to the size of an object is
A) mass.
B) weight.
C) volume.
D) none of the above
Answer: C
Diff: 1
Topic: Mass - A Measure of Inertia

9) A heavy ball hangs by a string, with a second string attached to its bottom (Figure 1.7 in your text). A quick pull on the bottom string breaks the
A) top string.
B) bottom string.
C) top or bottom string equally likely.
D) none of the above
Answer: B
Diff: 2
Topic: Mass - A Measure of Inertia

10) A heavy ball hangs by a string, with a second string attached to its bottom (Figure 1.7 in your text). A slow pull on the bottom string breaks the
A) top string.
B) bottom string.
C) top or bottom string equally likely.
D) none of the above
Answer: A
Diff: 2
Topic: Mass - A Measure of Inertia

11) When the bottom string is pulled slowly in the heavy-ball-and-strings demonstration (Figure 1.7 in your text), tension
A) in the top string is due to your pull plus the weight of the ball.
B) is about the same in both strings.
C) in the bottom string is zero.
D) none of the above
Answer: A
Diff: 2
Topic: Mass - A Measure of Inertia

12) Compared with a 1-kg block of solid iron, a 2-kg block of solid iron has twice as much
A) inertia.
B) mass.
C) volume.
D) all of the above
E) none of the above
Answer: D
Diff: 2
Topic: Mass - A Measure of Inertia

13) Compared with a 1-kg block of solid iron, a 2-kg block of solid iron has the same
A) mass.
B) volume.
C) weight.
D) all of the above
E) none of the above
Answer: E
Diff: 2
Topic: Mass - A Measure of Inertia

14) An object that has twice as much mass as another object also has twice as much
A) inertia.
B) velocity.
C) gravitational acceleration.
D) volume.
E) all of the above
Answer: A
Diff: 2
Topic: Mass - A Measure of Inertia

15) Compared with the mass of an apple on Earth, the mass of the same apple on the Moon is
A) less.
B) more.
C) the same.
Answer: C
Diff: 1
Topic: Mass - A Measure of Inertia

16) Your weight is
A) another word for your mass.
B) the gravitational attraction between you and Earth.
C) a property of mechanical equilibrium.
D) the same in all locations.
Answer: B
Diff: 1
Topic: Mass - A Measure of Inertia

17) A 10-kg mass at Earth's surface weighs about
A) 1 N.
B) 5 N.
C) 10 N.
D) 100 N.
E) 1000 N.
Answer: D
Diff: 2
Topic: Mass - A Measure of Inertia

18) A chunk of gold weighs 1 N on Earth. On the Moon its weight would be
A) less.
B) the same.
C) more.
Answer: A
Diff: 2
Topic: Mass - A Measure of Inertia

19) A chunk of metal has a mass of 1 kg on Earth. If the same chunk were on the Moon its mass would be
A) less.
B) the same.
C) more.
Answer: B
Diff: 2
Topic: Mass - A Measure of Inertia

20) A baseball weighs 1.5 N on Earth. Another type of ball weighs 1.5 N on the Moon. The ball with the greater mass is the
A) baseball.
B) other type of ball.
C) same for each.
D) not enough information
Answer: B
Diff: 3
Topic: Mass - A Measure of Inertia

1.4 Net Force

1) The net force on an object is
A) most often its weight.
B) the combination of all forces acting on it.
C) the force of friction acting on it.
Answer: B
Diff: 1
Topic: Net Force

2) A girl pushes a cart to the left with a 100-N force. At the same time a boy pushes it to the right with a 50-N force. The net force exerted on the cart is
A) 50 N to the left.
B) 50 N to the right.
C) 100 N to the left.
D) 100 N to the right.
Answer: A
Diff: 1
Topic: Net Force

3) When a 10-kg block is simultaneously pushed toward the east with 20 N and toward the west with 15 N, the combination of these forces on the block is
A) 5 N west.
B) 5 N east.
C) 35 N east.
D) 35 N west.
Answer: B
Diff: 2
Topic: Net Force

4) An object is pulled with two forces, 10 N northward and 15 N southward. The magnitude of the net force is
A) 0 N.
B) 5 N.
C) 10 N.
D) 15 N.
E) none of the above
Answer: B
Diff: 2
Topic: Net Force

5) An object is pulled with two forces, 10 N northward and 15 N southward. The direction of the net force is to the
A) north.
B) south.
C) east.
D) west.
E) none of the above
Answer: B
Diff: 2
Topic: Net Force

6) An object is pulled with three forces: one at 20 N to the right, another at 40 N to the right, and the third at 30 N to the left. The net force is
A) 60 N to the right.
B) 60 N to the left.
C) 30 N to the left.
D) none of the above
Answer: D
Diff: 2
Topic: Net Force

7) A 50-N object falling in air experiences 30 N of air resistance. The net force on the falling object is
A) 0 N.
B) 20 N.
C) 50 N.
D) 80 N.
Answer: B
Diff: 2
Topic: Net Force

8) A 10-N falling object encounters 4 N of air resistance. The net force on it is
A) 0 N.
B) 4 N.
C) 6 N.
D) 10 N.
Answer: C
Diff: 2
Topic: Net Force

9) A 10-N falling object encounters 10 N of air resistance. The net force on it is
A) 0 N.
B) 4 N.
C) 6 N.
D) 10 N.
Answer: A
Diff: 2
Topic: Net Force

10) Given that two forces of 10 N and 15 N act horizontally on an object, the net force must
A) be 5 N.
B) be 25 N.
C) be either 5 N or 25 N.
D) lie between 0 N and 25 N.
Answer: C
Diff: 2
Topic: Net Force

1.5 The Equilibrium Rule

1) The equilibrium rule $\Sigma F = 0$ applies to
A) objects or systems at rest.
B) objects or systems in uniform motion in a straight line.
C) both of the above
D) neither of the above
Answer: C
Diff: 1
Topic: The Equilibrium Rule

2) Which has zero acceleration?
A) an object at rest
B) an object moving at constant velocity
C) an object in mechanical equilibrium
D) all of the above
E) none of the above
Answer: D
Diff: 1
Topic: The Equilibrium Rule

3) Whenever the net force on an object is zero, its acceleration
A) may be zero.
B) is zero.
C) and velocity are the same.
D) none of the above
Answer: B
Diff: 1
Topic: The Equilibrium Rule

4) The equilibrium rule states that the vector sum of all forces acting on a
A) body at rest is zero.
B) body in uniform motion is zero.
C) non-accelerating body is zero.
D) all of the above
Answer: D
Diff: 1
Topic: The Equilibrium Rule

5) When a 10-N object is suspended at rest by two equally-taut vertical strands of rope, the tension in each strand is
A) less than 5 N.
B) 5 N.
C) more than 5 N.
D) 10 N.
Answer: B
Diff: 1
Topic: The Equilibrium Rule

6) When sign painters Burl and Paul stand on opposite ends of a scaffold, the tensions in each of the two supporting ropes
A) are equal.
B) depend on the relative weights of Burl and Paul.
C) combine to equal zero.
D) none of the above
Answer: B
Diff: 2
Topic: The Equilibrium Rule

7) Burl and Paul on a sign-painting scaffold are in equilibrium, which means that the net upward supporting force of the vertical ropes is
A) equal to their weights.
B) greater than their weights.
C) equal and opposite to the combined weights of Burl, Paul, and the scaffold.
D) none of the above
Answer: C
Diff: 2
Topic: The Equilibrium Rule

8) If Burl carried Paul piggy-back while standing in the *middle* of a scaffold, the tensions in the two supporting ropes would
A) cancel to zero.
B) be equal.
C) be unequal.
D) more easily support Burl and Paul.
Answer: B
Diff: 2
Topic: The Equilibrium Rule

9) Burl and Paul have a total weight of 1300 N. The tensions in the ropes that support the scaffold they stand on add to 1700 N. The weight of the scaffold itself must be
A) 400 N.
B) 500 N.
C) 600 N.
D) 800 N.
Answer: A
Diff: 3
Topic: The Equilibrium Rule

10) If a non-rotating object has no acceleration, then we can say for certain that it is
A) at rest.
B) moving at constant nonzero velocity.
C) in mechanical equilibrium.
D) all of the above
E) none of the above
Answer: C
Diff: 2
Topic: The Equilibrium Rule

11) The force of friction on a sliding object is 50 N. The applied force needed to maintain a constant velocity is
A) more than 50 N.
B) less than 50 N.
C) 50 N.
Answer: C
Diff: 1
Topic: The Equilibrium Rule

12) A bucket of cement is raised by a rope at constant speed at a construction site. Compared with the force of gravity on the bucket, the upward force supplied by the rope is
A) greater.
B) equal.
C) less.
Answer: B
Diff: 2
Topic: The Equilibrium Rule

13) When a crate slides down an incline at a constant velocity it is
A) in dynamic equilibrium.
B) not in dynamic equilibrium.
C) in a state of being in and out of dynamic equilibrium.
D) none of the above
Answer: A
Diff: 2
Topic: The Equilibrium Rule

14) A parachutist falling at constant velocity is in a state of
A) dynamic equilibrium.
B) non-dynamic equilibrium.
C) being in and out of dynamic equilibrium.
D) none of the above
Answer: A
Diff: 2
Topic: The Equilibrium Rule

1.6 Support Force

1) The support force on a 10-N book that rests on a horizontal surface is
A) less than 10 N.
B) 10 N.
C) greater than 10 N.
D) dependent on whether the book lies flat or stands upright.
Answer: B
Diff: 1
Topic: Support Force

2) Joshua stands on a floor that supports him. When Sydney rides piggy-back on Joshua, the support force by the floor beneath Joshua
A) decreases.
B) remains constant.
C) increases.
Answer: C
Diff: 1
Topic: Support Force

3) Daisy weighs 120 N and carries Trixie who weighs 40 N on her back. The support force on Daisy's feet is
A) 40 N.
B) 120 N.
C) 160 N.
D) more than 160 N.
Answer: C
Diff: 2
Topic: Support Force

4) An empty jug of weight *W* is at rest on a table. When water of weight *w* is poured into it, the amount of support force supplied by the table is
A) *W*.
B) *W* + *w*.
C) *W* - *w*.
D) none of the above
Answer: B
Diff: 2
Topic: Support Force

5) When you stand at rest on a pair of bathroom scales, the readings on the scales will *always*
A) each be half your weight.
B) each equal your weight.
C) add to equal your weight.
D) add up to more than your weight.
Answer: C
Diff: 2
Topic: Support Force

6) When Lillian hangs from a pair of gym rings, the upward support forces by the rings will *always*
A) each be half her weight.
B) each be equal to her weight.
C) add up to equal her weight.
D) add up to more than her weight.
Answer: C
Diff: 2
Topic: Support Force

7) An 800-N man stands at rest with his weight evenly distributed on two bathroom scales. The reading on each scale is
A) 200 N.
B) 400 N.
C) 800 N.
D) 1600 N.
E) none of the above
Answer: B
Diff: 2
Topic: Support Force

8) An 800-N woman stands at rest on two bathroom scales so that one scale shows a reading of 500 N. The reading on the other scale is
A) 200 N.
B) 300 N.
C) 400 N.
D) 800 N.
E) none of the above
Answer: B
Diff: 2
Topic: Support Force

9) As you jump up and down on a floor, the support force by the floor experiences
A) changes.
B) no changes.
C) none of the above.
Answer: A
Diff: 2
Topic: Support Force

1.7 The Force of Friction

1) When Marie pushes her desk to the right, friction between the floor and the desk acts toward
A) the left.
B) the right.
C) at right angles to her push.
D) none of the above
Answer: A
Diff: 1
Topic: The Force of Friction

2) In general, the friction forces between one object and another act
A) in the same direction.
B) in opposite directions.
C) at right angles to each other.
D) none of the above
Answer: B
Diff: 1
Topic: The Force of Friction

3) The resistive force of friction occurs for
A) solids.
B) liquids.
C) gases.
D) all of the above
Answer: D
Diff: 1
Topic: The Force of Friction

4) The amount of friction that occurs when two blocks slide against each other depends on
A) how much they are pressed together.
B) the "stickiness" of atoms on their surfaces.
C) the kinds of material being pressed.
D) all of the above
Answer: D
Diff: 1
Topic: The Force of Friction

5) When you push a crate across a level floor at constant velocity, friction between the crate and the floor is
A) less than your pushing force.
B) the same amount as your pushing force.
C) more than your pushing force.
D) none of the above
Answer: B
Diff: 1
Topic: The Force of Friction

6) A 3000-N bear grasping a vertical tree slides down at constant velocity. The friction force between the tree and the bear is
A) 30 N.
B) 300 N.
C) 3000 N.
D) more than 3000 N.
Answer: C
Diff: 2
Topic: The Force of Friction

7) A crate is at rest on a horizontal floor, with nobody pushing. The friction force acting on the crate is
A) zero.
B) equal to the weight of the crate.
C) between zero and the weight of the crate.
D) none of the above
Answer: A
Diff: 3
Topic: The Force of Friction

8) Marie pushes horizontally on her desk, but not hard enough to get it moving. The friction force acting on the desk is
A) zero.
B) equal to the weight of the desk.
C) equal and opposite to her push.
D) none of the above
Answer: C
Diff: 3
Topic: The Force of Friction

1.8 Speed and Velocity

1) The two measurements necessary for calculating average speed are
A) acceleration and time.
B) velocity and time.
C) distance and time.
D) distance and acceleration.
E) velocity and distance.
Answer: C
Diff: 1
Topic: Speed and Velocity

2) What did Galileo incorporate in his study of motion that Aristotle overlooked?
A) the role of distance
B) the role of time
C) the role of space
D) none of the above
Answer: B
Diff: 1
Topic: Speed and Velocity

3) A glance at the speedometer on your vehicle will tell you your
A) average speed.
B) instantaneous speed.
C) overall speed.
D) acceleration.
Answer: B
Diff: 1
Topic: Speed and Velocity

4) Nellie runs the length of a 100-yard football field in a time of 20 seconds. Her average running speed is
A) 1/2 yard/second.
B) 5 yards/second.
C) 50 yards/second.
D) not enough information
Answer: B
Diff: 2
Topic: Speed and Velocity

5) A mosquito flying at 3 m/s encounters a 3-m/s breeze blowing in the same direction, which gives it a resulting speed over the ground of
A) 0 m/s.
B) 3 m/s.
C) 4 m/s.
D) 6 m/s.
Answer: D
Diff: 2
Topic: Speed and Velocity

6) A mosquito flying at 3 m/s encounters a 3-m/s breeze blowing in the opposite direction, which gives it a resulting speed over the ground of
A) 0 m/s.
B) 3 m/s.
C) 4 m/s.
D) 6 m/s.
Answer: A
Diff: 2
Topic: Speed and Velocity

7) You're at rest in a hammock when a hungry mosquito sees you as lunch, while a 2-m/s breeze is blowing. If the mosquito joins you for lunch, it should first hover over you by flying
A) against the breeze at 2 m/s.
B) with the breeze at 2 m/s.
C) a bit faster than wind speed.
D) none of the above
Answer: A
Diff: 2
Topic: Speed and Velocity

8) You're lying on the sand on a breezy day when a pesky fly wishes to join you. The breeze is blowing at a steady 1 m/s. If the fly wishes to land on you it should hover over you while flying
A) about 2 m/s relative to the breeze.
B) with the breeze at 1 m/s.
C) against the breeze at 1 m/s.
D) faster than 1 m/s but less than 2 m/s.
Answer: C
Diff: 2
Topic: Speed and Velocity

9) While in an airplane flying at 100 km/h you look down from the window and spot another airplane flying at the same speed in the opposite direction. Relative to you, the speed of the spotted plane is
A) zero.
B) 100 km/h.
C) 150 km/h.
D) 200 km/h.
Answer: D
Diff: 2
Topic: Speed and Velocity

10) You're driving in a car at 50 km/h and bump into a car ahead traveling at 48 km/h in the same direction. The speed of impact is
A) zero.
B) 2 km/h.
C) 48 km/h.
D) 50 km/h.
E) 98 km/h.
Answer: B
Diff: 2
Topic: Speed and Velocity

11) In a dream you're in a car traveling at 50 km/h and you bump into another car traveling toward you at 48 km/h. The speed of impact is
A) 48 km/h.
B) 50 km/h.
C) 98 km/h.
D) 2400 km/h.
Answer: C
Diff: 2
Topic: Speed and Velocity

12) Emily Easygo can paddle her canoe at 8 m/s in still water. With this speed she then paddles upstream in a river that runs downstream at 6 m/s. Her friend sitting on shore sees her speed as
A) 2 m/s.
B) 6 m/s.
C) 8 m/s.
D) 10 m/s.
Answer: A
Diff: 2
Topic: Speed and Velocity

13) The average speed of Daisy running a distance of 2 km in a time of one-half hour is
A) 1 km/h.
B) 2 km/h.
C) 4 km/h.
D) more than 4 km/h.
Answer: C
Diff: 3
Topic: Speed and Velocity

14) When Jean hikes a distance of 1 km in a time of one-half hour her average speed is
A) nearly 1 km/h.
B) 1 km/h.
C) slightly more than 1 km/h.
D) 2 km/h.
Answer: D
Diff: 3
Topic: Speed and Velocity

15) The average speed of a horse that gallops a distance of 10 km in a time of 30 min is
A) 10 km/h.
B) 20 km/h.
C) 30 km/h.
D) more than 30 km/h.
Answer: B
Diff: 3
Topic: Acceleration

1.9 Acceleration

1) Acceleration and velocity are
A) different names for the same idea.
B) very different from each other.
C) concepts developed by Aristotle.
D) none of the above
Answer: B
Diff: 1
Topic: Acceleration

2) A good tutor will be correct in saying that velocity and acceleration are
A) the same concept, but expressed differently.
B) rates of one another.
C) expressions for changing speeds.
D) different concepts.
Answer: D
Diff: 1
Topic: Acceleration

3) When a ball increases in speed by the same amount each second, its acceleration
A) also increases each second.
B) decreases each second.
C) is constant.
D) varies.
Answer: C
Diff: 1
Topic: Acceleration

4) If a ball rolls down an inclined plane and gains 4 m/s each second it rolls, its acceleration is
A) one half of 4 m/s.
B) one half of 4 m/s^2.
C) 4 m/s^2.
D) 10 m/s^2.
Answer: C
Diff: 2
Topic: Acceleration

5) The acceleration of a Tesla that maintains a constant velocity of 120 km/h over a time of one-half hour is
A) 60 km/h.
B) 120 km/h.
C) 240 km/h.
D) zero because of no change in velocity.
Answer: D
Diff: 2
Topic: Acceleration

6) A motor scooter undergoes acceleration when it
A) gains speed.
B) decreases speed.
C) changes direction.
D) all of the above
Answer: D
Diff: 2
Topic: Acceleration

7) As an object freely falls, its
A) velocity increases.
B) acceleration increases.
C) both of these
D) none of the above
Answer: A
Diff: 1
Topic: Acceleration

8) During each second of free fall, the speed of an object
A) increases by the same amount.
B) changes by increasing amounts each second.
C) remains constant.
D) doubles each second.
Answer: A
Diff: 2
Topic: Acceleration

9) The gain in speed each second for a freely-falling object is about
A) 0 m/s.
B) 5 m/s.
C) 10 m/s.
D) 20 m/s.
E) depends on the initial speed.
Answer: C
Diff: 2
Topic: Acceleration

10) Any falling object that gains a velocity of 10 m/s each second has an acceleration of
A) 10 m/s.
B) 10 m/s^2.
C) both of these
D) none of the above
Answer: B
Diff: 1
Topic: Acceleration

11) At the end of 1/2 second an apple freely falling from rest has a speed of
A) 1 m/s.
B) 5 m/s.
C) 10 m/s.
D) more than 10 m/s.
Answer: B
Diff: 2
Topic: Acceleration

12) At the end of 2 seconds an apple freely falling from rest has a speed of
A) 1 m/s.
B) 5 m/s.
C) 10 m/s.
D) more than 10 m/s.
Answer: D
Diff: 2
Topic: Acceleration

13) Ten seconds after starting from rest, a freely-falling baseball will have a speed of about
A) 10 m/s.
B) 50 m/s.
C) 100 m/s.
D) 500 m/s.
E) more than 500 m/s.
Answer: C
Diff: 1
Topic: Acceleration

14) Six seconds after starting from rest, a freely-falling baseball has a speed of
A) 10 m/s.
B) 30 m/s.
C) 60 m/s.
D) 70 m/s.
Answer: C
Diff: 2
Topic: Acceleration

15) An object in free fall has a speed of 60 m/s. One second later its speed is
A) 10 m/s.
B) 30 m/s.
C) 60 m/s.
D) 70 m/s.
Answer: D
Diff: 2
Topic: Acceleration

16) A freely-falling object has a speed of 30 m/s at one instant. Exactly 2 seconds later its speed will be
A) the same.
B) 40 m/s.
C) 50 m/s.
D) more than 50 m/s.
Answer: C
Diff: 2
Topic: Acceleration

17) If a freely-falling object were somehow equipped with a speedometer, its speed reading would increase each second by about
A) 5 m/s.
B) 10 m/s.
C) 15 m/s.
D) a variable amount.
Answer: B
Diff: 2
Topic: Acceleration

18) The acceleration of a cart rolling down an inclined plane (a ramp)
A) is approximately constant.
B) increases with time.
C) decreases with time.
Answer: A
Diff: 2
Topic: Acceleration

19) An object travels 8 m in the 1st second of travel, 8 m again during the 2nd second of travel, and 8 m again during the 3rd second. Its acceleration is
A) 0 m/s^2.
B) 5 m/s^2.
C) 8 m/s^2.
D) 10 m/s^2.
E) more than 10 m/s^2.
Answer: A
Diff: 2
Topic: Acceleration

20) The speed of a vertically-thrown ball at the top of its path is
A) zero.
B) 10 m/s^2.
C) between zero and 10 m/s^2.
D) dependent on the mass of the ball.
Answer: A
Diff: 1
Topic: Acceleration

21) The acceleration of a vertically-thrown ball at the top of its path is
A) zero.
B) 10 m/s^2.
C) between zero and 10 m/s^2.
D) dependent on the mass of the ball.
Answer: B
Diff: 3
Topic: Acceleration

22) What is the acceleration of a scooter that maintains a *constant velocity* of 15 m/s for 10 s?
A) 0 m/s^2
B) 0.15 m/s^2
C) 1.5 m/s^2
D) 15 m/s^2
Answer: A
Diff: 2
Topic: Acceleration

23) If you toss a ball straight upward at 40 m/s, with no air resistance it returns to you at a speed of
A) zero.
B) 10 m/s.
C) 40 m/s.
D) more than 40 m/s.
Answer: C
Diff: 2
Topic: Acceleration

24) If you toss a ball straight upward at 40 m/s with no air resistance, one second before it reaches the top of its path its speed is
A) zero.
B) 10 m/s.
C) 20 m/s.
D) 30 m/s
E) 40 m/s.
Answer: B
Diff: 3
Topic: Acceleration

25) If you toss a ball straight upward at 40 m/s with no air resistance, one second after it reaches the top of its path its speed is
A) zero.
B) 10 m/s.
C) 20 m/s.
D) 30 m/s
E) 40 m/s.
Answer: B
Diff: 2
Topic: Acceleration

26) If you toss a ball straight upward at 40 m/s with no air resistance, 6 seconds later its speed is
A) zero.
B) 10 m/s.
C) 20 m/s.
D) 30 m/s
E) 40 m/s.
Answer: C
Diff: 3
Topic: Acceleration

27) If a freely-falling object were somehow equipped with a speedometer on a planet where the acceleration due to gravity is 20 m/s^2, then its speed reading would increase each second by
A) 10 m/s.
B) 20 m/s.
C) 30 m/s.
D) 40 m/s.
E) depends on its initial speed
Answer: B
Diff: 3
Topic: Acceleration

28) Phil Physiker standing at the edge of a cliff throws one ball straight up and another ball straight down, both with the same speed. Neglecting air resistance, which ball hits the ground below with the greater speed?
A) the one thrown upward
B) the one thrown downward
C) neither, both hit with the same speed
Answer: C
Diff: 3
Topic: Acceleration

29) Phil Physiker standing at the edge of a cliff throws one ball straight up and another ball straight down, both with the same speed. Both balls hit the ground at
A) different speeds.
B) the same speed in the same time.
C) the same speed in different times.
D) none of the above
Answer: C
Diff: 3
Topic: Acceleration

30) The vertical height attained by a basketball player who achieves a hang time of a full 1 s is about
A) 0.8 m.
B) 1 m.
C) 1.2 m.
D) 2.5 m.
E) more than 2.5 m.
Answer: C
Diff: 3
Topic: Acceleration

31) On the surface of the Moon where acceleration due to gravity is less, a person's hang time would be
A) longer.
B) shorter.
C) the same as on Earth.
Answer: A
Diff: 3
Topic: Acceleration

32) Once a basketball player's feet are off the floor in making a jump, the jumper's acceleration
A) depends on launch speed.
B) is usually greater for taller players.
C) varies with body orientation.
D) is *g*; no more, no less.
E) all of the above
Answer: D
Diff: 3
Topic: Acceleration

Written-Response Questions

1) Distinguish between the concepts of mass and weight. Which is more fundamental, and why?
Answer: Mass is the quantity of matter in an object while weight is the force due to gravity on the object. Mass is more fundamental than weight because it only involves the object itself, whereas weight may vary for the same object in different locations. For example, a block of matter on the Moon will have the same mass, but weigh less than on Earth.
Diff: 1
Topic: Mass - A Measure of Inertia

2) What is the meaning of the expression $\Sigma F = 0$?
Answer: This is the mathematical expression for the equilibrium rule, which states that the vector sum of the forces acting on an object is equal to zero if that object is in a state of rest, or a state of unchanging velocity. "Vector sum" tells us that direction is essential. For example, if an object that is pulled to the left doesn't move, then an equal and opposite force must be pulling on the right, causing the total pull to be zero. No change in the object's motion is evidence of this.
Diff: 1
Topic: The Equilibrium Rule

3) Give three examples of the equilibrium rule that are not cited in the textbook.
Answer: Open ended. Whatever the objects listed, they must be in a non-accelerated state (no changes in their states of motion). Examples are _____, _____, and _____.
Diff: 1
Topic: The Equilibrium Rule

4) What is the difference between speed, velocity, and instantaneous velocity? Give examples of each.
Answer: All describe motion, speed being the simplest. Speed is a ratio of distance traveled per unit of time. A car driving along a road, for example, may have a speed of 30 km/h. Velocity is speed but with direction stated or implied, and is therefore a vector quantity. The same car driving due north along a road has a velocity of 30 km/h north. Instantaneous velocity is the velocity at any instant. Its magnitude is shown by the reading on a speedometer. If you get a traffic ticket for speeding, it is your instantaneous velocity, not an overall average velocity, that may get you in trouble.
Diff: 1
Topic: Speed and Velocity

5) Distinguish between the concepts of velocity and acceleration, using a bowling ball's behavior as an example for each.
Answer: Velocity is a measure of how fast something moves, while acceleration is a measure of "how fast how-fast changes." A bowling ball rolling along a horizontal surface is an example of an object with constant velocity. It rolls without change. But if it rolls off the end of the supporting surface and falls, both its speed and direction change. It is then in a state of acceleration. Whenever an object changes its state of motion we say it accelerates.
Diff: 2
Topic: Acceleration