***Conceptual Physical Science, 5e* (Hewitt/Suchocki/Hewitt)**
Chapter 2 Newton's Laws of Motion

2.1 Newton's First Law of Motion

1) A space probe in remote outer space continues moving
A) because a force acts on it.
B) in a curved path.
C) even though no force acts on it.
D) due to gravity.
Answer: C
Diff: 1
Topic: Newton's First Law of Motion

2) Whirl a rock at the end of a string and it follows a circular path. If the string breaks, the rock tends to
A) continue in a circular path.
B) follow a straight-line path.
C) spiral inward.
D) fall straight downward.
Answer: B
Diff: 1
Topic: Newton's First Law of Motion

3) If gravity between the Sun and Earth suddenly vanished, Earth would continue moving in
A) a curved path.
B) an outward spiral path.
C) an inward spiral path.
D) a straight-line path.
Answer: D
Diff: 1
Topic: Newton's First Law of Motion

4) An object in motion tends to remain in motion
A) because of a force inside the object.
B) only when an external force acts on it.
C) without the need of a force.
D) due to their nature.
Answer: C
Diff: 2
Topic: Newton's First Law of Motion

5) A sheet of paper can be pulled from beneath a box of cereal without toppling it if the paper is jerked quickly. This best demonstrates that
A) the box has no acceleration.
B) there is an action-reaction pair of forces.
C) gravity tends to hold the box secure.
D) the box has inertia.
Answer: D
Diff: 1
Topic: Newton's First Law of Motion

6) When dishes remain on a table when you yank the tablecloth beneath them, you're demonstrating
A) friction.
B) inertia.
C) constant motion.
D) $\Sigma F = 0$.
Answer: B
Diff: 1
Topic: Newton's First Law of Motion

7) A ball rests in the middle of a cart. When you quickly jerk the cart forward, the ball
A) hits the front of the cart.
B) hits the back of the cart.
C) remains in the middle of the cart.
D) all, depending on how quickly the cart is pulled.
Answer: B
Diff: 2
Topic: Newton's First Law of Motion

8) When you step off a bus moving at 10 m/s, your horizontal speed when you meet the ground is
A) zero.
B) less than 10 m/s but greater than zero.
C) about 10 m/s.
D) greater than 10 m/s.
Answer: C
Diff: 2
Topic: Newton's First Law of Motion

9) A hockey puck slides across a frozen pond. If ice friction and air resistance are neglected, the force needed to keep the puck sliding at constant velocity is
A) 0 N.
B) equal to the weight of the puck.
C) the weight of the puck divided by the mass of the puck.
D) the mass of the puck multiplied by 10 m/s^2.
E) none of the above
Answer: A
Diff: 2
Topic: Newton's First Law of Motion

10) The net force on any object moving at constant velocity is
A) zero.
B) 10 meters per second squared.
C) equal to its weight.
D) less than its weight.
Answer: A
Diff: 2
Topic: Newton's First Law of Motion

11) Earth moves about 30 km/s relative to the Sun. When you jump upward in front of a wall, the wall doesn't slam into you at 30 km/s because the wall
A) has too little gravity to influence you.
B) moves in the opposite direction to you.
C) and you move at the same horizontal speed, before, during, and after your jump.
D) has negligible inertia compared with the Sun.
Answer: C
Diff: 2
Topic: Newton's First Law of Motion

12) Inside the interior of a truck that moves at constant velocity is a package that drops from the midpoint of the ceiling. The package hits the floor
A) exactly below the midpoint of the ceiling.
B) ahead of the midpoint of the ceiling.
C) behind the midpoint of the ceiling.
D) more information is needed
E) none of the above
Answer: A
Diff: 2
Topic: Newton's First Law of Motion

13) If you are carrying a heavy bag of groceries and bang your hand against the wall, the concept that best explains why you are hurt is
A) inertia.
B) gravity.
C) acceleration.
D) resistance.
E) none of the above
Answer: A
Diff: 2
Topic: Newton's First Law of Motion

14) A roller coaster car at an amusement park carrying 1 passenger takes 3 min to make its ride from start to finish. Neglecting friction, a car with 5 passengers would take
A) less time.
B) the same time.
C) more time.
Answer: B
Diff: 3
Topic: Newton's First Law of Motion

15) When you drop a pencil while riding on a smoothly riding bus, why does the pencil land at the same place it would if the bus were at rest?
Answer: In accord with Newton's first law, in both cases there is no horizontal force on the dropped pencil, so no change occurs horizontally. The dropped pencil in the moving bus simply keeps up with you as you move, not changing its velocity in the horizontal direction.
Diff: 1
Topic: Newton's First Law of Motion

16) How does the equilibrium rule, $\Sigma F = 0$, relate to Newton's first law of motion?
Answer: The equilibrium rule states Newton's first law of motion in equation form! So it relates very well. When no net force acts on an object, the motion of the object doesn't change.
Diff: 2
Topic: Newton's First Law of Motion

2.2 Newton's Second Law of Motion

1) Newton's second law directly involves
A) speed.
B) velocity.
C) acceleration.
D) none of the above
Answer: C
Diff: 1
Topic: Newton's Second Law of Motion

2) While a car travels around a circular track at constant speed, its
A) acceleration is zero.
B) velocity is zero.
C) both
D) none of the above
Answer: D
Diff: 2
Topic: Newton's Second Law of Motion

3) To steadily (constantly) increase the velocity of something requires a
A) steadily increasing force.
B) constant force.
C) decreasing force.
D) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

4) The force required to maintain an object at a constant velocity in free space is equal to
A) zero.
B) the mass of the object.
C) the weight of the object.
D) the force required to stop it.
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

5) If the mass of an object does not change, a constant net force on the object produces constant
A) velocity.
B) acceleration.
C) both
D) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

6) A given net force propels an object along a straight-line path. If the net force were doubled, its acceleration would
A) quadruple.
B) double.
C) stay the same.
D) be half.
E) none of the above
Answer: B
Diff: 1
Topic: Newton's Second Law of Motion

7) A given net force propels an object along a straight-line path by a force. If the mass were doubled, its acceleration would
A) quadruple.
B) double.
C) stay the same.
D) be half.
E) none of the above
Answer: D
Diff: 1
Topic: Newton's Second Law of Motion

8) If an object's mass decreases while a constant force acts on it, the acceleration
A) decreases.
B) remains the same.
C) increases.
D) will be zero.
Answer: C
Diff: 1
Topic: Newton's Second Law of Motion

9) A push on a 1-kg brick accelerates the brick. Neglecting friction, to equally accelerate a 10-kg brick requires the force to be
A) just as much.
B) 10 times as much.
C) 100 times as much.
D) one-tenth the amount.
E) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

10) A 10-N block and a 1-N block lie on a horizontal frictionless table. To push them with equal acceleration, we would have to push with
A) equal forces on each block.
B) 10 times as much force on the heavier block.
C) 10 squared or 100 times as much force on the heavier block.
D) one-tenth as much force on the heavier block.
E) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

11) A car has a mass of 1000 kg and accelerates at 2 m/s^2. What is the magnitude of the force exerted on the car?
A) 500 N
B) 1000 N
C) 1500 N
D) 2000 N
E) none of the above
Answer: D
Diff: 2
Topic: Newton's Second Law of Motion

12) A tow truck exerts a force of 3000 N on a car that accelerates at 2 m/s^2. The mass of the car must be
A) 500 kg.
B) 1000 kg.
C) 1500 kg.
D) 3000 kg.
E) none of the above
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

13) A force of 1 N accelerates a 1-kg mass at 1 m/s^2. The acceleration of a 2-kg mass acted upon by a force of 2 N is
A) half as much.
B) twice as much.
C) the same.
D) none of the above
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

14) A girl pulls on a 10-kg wagon with a constant force of 30 N. What is the wagon's acceleration?
A) 0.3 m/s^2
B) 3.0 m/s^2
C) 10 m/s^2
D) 30 m/s^2
E) 300 m/s^2
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

15) A block is dragged at constant velocity across a level surface by a force of 6 N. What is the force of friction between the block and the surface?
A) less than 6 N
B) more than 6 N
C) 6 N
D) not enough information
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

16) A commercial jet has a mass of 5,000 kg and the thrust of its engine is 10,000 N. The acceleration of the jet when taking off is
A) 0.5 m/s^2.
B) 1 m/s^2.
C) 2 m/s^2.
D) 4 m/s^2.
E) none of the above
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

17) A jumbo jet has a mass of 100,000 kg. The thrust for *each* of its *four* engines is 50,000 N. The acceleration of the jet when taking off is
A) 0.5 m/s^2.
B) 1 m/s^2.
C) 2 m/s^2.
D) 4 m/s^2.
E) none of the above
Answer: C
Diff: 3
Topic: Newton's Second Law of Motion

18) A particle is being accelerated through space by a 10-N force. Suddenly the particle encounters a head-on second force of 10 N in the opposite direction. The particle with both forces acting on it
A) is brought to a rapid halt.
B) decelerates gradually to a halt.
C) continues at the speed it had when it encountered the second force.
D) theoretically tends to accelerate toward the speed of light.
E) none of the above
Answer: C
Diff: 3
Topic: Newton's Second Law of Motion

19) A 10-kg block is pushed across a friction-free horizontal surface with a horizontal force of 20 N. The acceleration of the block is
A) 1 m/s^2.
B) 2 m/s^2.
C) 5 m/s^2.
D) 10 m/s^2.
E) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

20) A 10-kg block is pushed across a horizontal surface with a horizontal force of 20 N against a friction force of 10 N. The acceleration of the block is
A) 1 m/s^2.
B) 2 m/s^2.
C) 5 m/s^2.
D) 10 m/s^2.
E) none of the above
Answer: A
Diff: 3
Topic: Newton's Second Law of Motion

21) A 10-kg block is pushed across a horizontal surface with a horizontal force of 30 N against a friction force of 10 N. The acceleration of the block is
A) 1 m/s^2.
B) 2 m/s^2.
C) 5 m/s^2.
D) 10 m/s^2.
E) none of the above
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

22) A car has a certain maximum acceleration. When it tows another twice-as-massive car its maximum acceleration is
A) one-half.
B) one-third.
C) one-fourth.
D) the same.
E) none of the above
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

23) Suppose you're coasting in a car at 60 km/h and apply the brakes until you slow to 40 km/h. When you suddenly release the brake, the car tends to
A) momentarily regain its higher initial speed.
B) continue moving at 40 km/h in the absence of forces.
C) decrease in speed whether other forces act or not.
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

24) What applied horizontal force will accelerate a 400-kg crate at 1 m/s^2 across a factory floor against a friction force half its weight?
A) 600 N
B) 1600 N
C) 2000 N
D) 2400 N
E) none of the above
Answer: D
Diff: 3
Topic: Newton's Second Law of Motion

25) A heavy block at rest is suspended by a vertical rope. When the block is accelerated upward by the rope, the rope tension
A) increases.
B) decreases.
C) remains the same.
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

26) A math book and a science book are tied together with a length of string. With the string taut, one book is pushed off the edge of a table. As it falls, the other book is dragged horizontally across the table surface. With no friction, acceleration of the books is
A) zero.
B) $g/2$.
C) g.
D) a value between zero and g.
E) a value that could be greater than g.
Answer: D
Diff: 3
Topic: Newton's Second Law of Motion

27) 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) the same as the force on the 1-kg book.
B) 5 times as much as the force on the 1-kg book.
C) 10 times as much as the force on the 1-kg book.
D) zero.
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

28) A 10-kg brick and a 1-kg book are dropped in a vacuum. The acceleration of the 10-kg brick is
A) the same as that of the 1-kg book.
B) 5 times as much as for the 1-kg book.
C) 10 times as much as for the 1-kg book.
D) zero.
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

29) A heavy object and a light object in a vacuum are dropped at the same time from rest. The heavier object reaches the ground
A) sooner than the lighter object.
B) at the same time as the lighter object.
C) later than the lighter object.
Answer: B
Diff: 1
Topic: Newton's Second Law of Motion

30) A heavy rock and a light rock in free fall have the same acceleration. Both rocks have the same acceleration because
A) force due to gravity is the same on each.
B) air resistance is always zero in free fall.
C) inertia of each is the same.
D) ratio of force to mass is the same.
E) none of the above
Answer: D
Diff: 3
Topic: Newton's Second Law of Motion

31) How many forces act on an upwardly tossed coin when it gets to the top of its path?
A) one; the force due to gravity
B) two; gravity and the force in the coin itself
C) three; gravity, the coin's internal force, and a turnaround force
D) none of the above
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

32) When you toss a coin straight up, it moves upward, turns around, and drops. During this time the acceleration of the coin is
A) upward and constant.
B) downward and constant.
C) first decreasing, then increasing.
D) zero throughout its up and down motion.
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

33) After a ball tossed upward leaves your hand, the force of gravity on it
A) no longer acts.
B) gradually diminishes.
C) gradually increases.
D) remains constant.
E) changes direction.
Answer: D
Diff: 2
Topic: Newton's Second Law of Motion

34) When you toss a ball upward, after the ball leaves your hand
A) the force of your hand moves it up and gradually changes direction.
B) the upward force changes direction at the top of the path.
C) we see that force and velocity are essentially the same thing.
D) none of the above
Answer: D
Diff: 3
Topic: Newton's Second Law of Motion

35) If you are learning to juggle it would be good to slow the ball's acceleration. You can do this by using
A) lighter balls.
B) heavier balls.
C) more balls.
D) none of the above
Answer: D
Diff: 2
Topic: Newton's Second Law of Motion

36) 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.
E) none of the above
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

37) 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.
E) none of the above
Answer: A
Diff: 1
Topic: Newton's Second Law of Motion

38) A ball is thrown upward and caught when it comes back down. When air resistance affects the ball, compared with the initial upward speed, the speed when caught is
A) less.
B) the same.
C) more.
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

39) Drop a rock from a 5-m height and it accelerates at 10 m/s^2 and strikes the ground in
A) 1/5 s.
B) 1/2 s.
C) 1 s.
D) 2 s.
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

40) A ball tossed vertically upward reaches its highest point and then falls back to its starting point. During this up-and-down motion the acceleration of the ball is always
A) in the direction of motion.
B) opposite its velocity.
C) directed upward.
D) directed downward.
Answer: D
Diff: 2
Topic: Newton's Second Law of Motion

41) A rock is thrown vertically upward. At the top of its straight-line path, its velocity is
A) 0 m/s.
B) 10 m/s.
C) between 0 m/s^2 and 10 m/s^2.
D) greater than 10 m/s.
E) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

42) A rock is thrown vertically upward. At the top of its straight-line path the force acting on it is
A) zero.
B) only the force due to gravity.
C) due to air resistance.
D) both due to gravity and air resistance.
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

43) If an object falls with constant acceleration, the velocity of the object must
A) be constant also.
B) continually change by the same amount each second.
C) continually change by varying amounts, depending on its speed.
D) continually decrease.
E) none of the above
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

44) A rock is thrown vertically into the air. At the top of its path, its acceleration is
A) 0 m/s^2.
B) 10 m/s^2.
C) between 0 m/s^2 and 10 m/s^2.
D) greater than 10 m/s^2.
E) none of the above
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

45) When a rock thrown straight up reaches the exact top of its path, its velocity is
A) zero and its acceleration is zero.
B) zero and its acceleration is 10 m/s^2.
C) about 10 m/s and its acceleration is zero.
D) about 10 m/s and its acceleration is 10 m/s^2.
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

46) A ball is thrown vertically into the air. Because of air resistance, its time coming down compared to its time going up is
A) less.
B) the same.
C) more.
Answer: C
Diff: 3
Topic: Newton's Second Law of Motion

47) A ball thrown straight up takes 10 s to go up and return to the ground. Because of air resistance, the time taken for the ball just to go up is
A) less than 5 s.
B) more than 5 s.
C) 5 s.
Answer: A
Diff: 3
Topic: Newton's Second Law of Motion

48) The acceleration of a rocket increases as it travels upward from the ground mainly because
A) gravity becomes weaker with increased distance.
B) the applied force on the rocket increases as fuel is burned.
C) the mass of the rocket decreases as fuel is burned.
Answer: C
Diff: 3
Topic: Newton's Second Law of Motion

49) An elephant and a feather fall from a tree through the air to the ground below. The force of air resistance is greater on the
A) elephant.
B) feather.
C) same on each.
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

50) A 1-kg ball is thrown straight up at 10 m/s. Neglecting air resistance, the net force that acts on the ball when it is half way to the top of its path is
A) 1/2 N.
B) 1 N.
C) 5 N.
D) 7.5 N.
E) 10 N.
Answer: E
Diff: 3
Topic: Newton's Second Law of Motion

51) When a skydiver of mass 100 kg experiences air resistance of 400 N, her acceleration is
A) 0.2*g*.
B) 0.4*g*.
C) 0.5*g*.
D) 0.6*g*.
E) more than 0.6*g*.
Answer: D
Diff: 3
Topic: Newton's Second Law of Motion

52) When an object falls *through the air* and gains velocity, the net force actually
A) increases.
B) decreases.
C) remains the same whether in air or in a vacuum.
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

53) When an object falls *through the air*, as velocity increases its acceleration
A) increases.
B) decreases.
C) remains the same whether in air or in a vacuum.
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

54) The air resistance of falling is greatly affected by an object's frontal area and
A) mass.
B) weight.
C) speed.
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

55) When a falling object has reached its terminal velocity, its acceleration is
A) constant.
B) zero.
C) *g*.
Answer: B
Diff: 1
Topic: Newton's Second Law of Motion

56) A falling object that has reached its terminal speed continues to gain
A) acceleration.
B) speed.
C) both
D) neither
Answer: D
Diff: 2
Topic: Newton's Second Law of Motion

57) Two objects of the same size but unequal weights are dropped from a tall tower. Taking air resistance into consideration, the object to hit the ground first will be the
A) lighter object.
B) heavier object.
C) both hit at the same time.
D) not enough information
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

58) A light woman and a heavy man jump from an airplane at the same time and open their same-size parachutes at the same time. Which person will get to a state of zero acceleration first?
A) the light woman
B) the heavy man
C) both should at the same time
D) not enough information
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

59) A large and a small person wish to parachute at equal terminal velocities. The large person should
A) jump first.
B) jump lightly.
C) pull upward on the supporting strands to decrease the downward net force.
D) get a larger parachute.
E) none of the above
Answer: D
Diff: 1
Topic: Newton's Second Law of Motion

60) A skydiver who weighs 500 N reaches terminal velocity at 90 km/h. The air resistance on the skydiver is
A) 90 N.
B) 250 N.
C) 410 N.
D) 500 N.
E) none of the above
Answer: D
Diff: 1
Topic: Newton's Second Law of Motion

61) A sack of potatoes weighing 200 N falls from an airplane. As the velocity of fall increases, air resistance also increases. When air resistance equals 200 N, the sack's acceleration is
A) 0 m/s^2.
B) 5 m/s^2.
C) 10 m/s^2.
D) infinite.
E) none of the above
Answer: A
Diff: 1
Topic: Newton's Second Law of Motion

62) A skydiver jumps from a high-flying plane. As her velocity of fall increases, her acceleration
A) increases.
B) decreases.
C) remains unchanged regardless of air resistance.
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

63) A skydiver steps from a helicopter and falls for 5 s before reaching terminal velocity. During this 5-s interval, her acceleration
A) is constant.
B) increases.
C) decreases.
D) is zero.
E) none of the above
Answer: C
Diff: 2
Topic: Newton's Second Law of Motion

64) When a 500-N parachutist opens his chute and experiences 800 N of air resistance, the net force on him is
A) 300 N downward.
B) 500 N downward.
C) 800 N downward.
D) 300 N upward.
E) 500 N upward.
Answer: D
Diff: 3
Topic: Newton's Second Law of Motion

65) If you drop an object, it will accelerate downward at a rate of 10 m/s^2. If you instead throw it downward, its acceleration (in the absence of air resistance) will be
A) less than 10 m/s^2.
B) 10 m/s^2.
C) greater than 10 m/s^2.
Answer: B
Diff: 2
Topic: Newton's Second Law of Motion

66) A ball is thrown vertically upward. Because of air resistance, its speed when returning to its starting level compared with its initial speed is
A) less.
B) the same.
C) more.
Answer: A
Diff: 2
Topic: Newton's Second Law of Motion

67) A pair of tennis balls fall *through the air* from a tall building. One ball is regular and the other is filled with lead pellets. The ball to reach the ground first is the
A) regular ball.
B) lead-filled ball.
C) same for both
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

68) A pair of tennis balls fall through the air from a tall building. One ball is regular and the other is filled with lead pellets. Air resistance just before they hit is actually greater for the
A) regular ball.
B) lead-filled ball.
C) same for both
Answer: B
Diff: 3
Topic: Newton's Second Law of Motion

69) When a boulder and a pebble are dropped, why does the pebble pick up speed as quickly as the boulder, even though less gravity acts on it? In other words, why do they accelerate equally?
Answer: Acceleration depends not only on the force of gravity, but also on the masses. If the boulder is fifty times heavier than the pebble, it also has fifty times as much mass. So in accord with Newton's second law, fifty times as much force on fifty times as much mass gives the same acceleration as one-fiftieth the force on one-fiftieth the mass on the pebble. If air resistance affects motion, then the accelerations won't be equal.
Diff: 3
Topic: Newton's Second Law of Motion

70) A falling boulder experiences a force, which is responsible for its acceleration. What is the reaction to this force? How can this question be better phrased?
Answer: The force that acts on the boulder is Earth pulling down on it. The reaction is the boulder pulling up on Earth. A better-phrased question would be: Earth exerts a downward force on a falling boulder; what is the reaction to this force? The answer follows the rule, "A acts on B, B reacts on A." Or, the boulder exerts an upward force on Earth.
Diff: 1
Topic: Newton's Second Law of Motion

2.3 Forces and Interactions

1) Action and reaction forces comprise the parts of
A) a single interaction.
B) two interactions.
C) multiple interactions.
Answer: A
Diff: 1
Topic: Forces and Interactions

2) A player hits a ball with a bat. If one part of the interaction is the bat against the ball, the other part is the
A) air resistance on the ball.
B) weight of the ball.
C) ball against the bat.
D) grip of the player's hand against the ball.
E) none of the above
Answer: C
Diff: 2
Topic: Forces and Interactions

3) A karate chop breaks a board with a blow of 3000 N. The force that acts on the hand during this event is
A) less than 3000 N.
B) 3000 N.
C) more than 3000 N.
D) not enough information
Answer: B
Diff: 3
Topic: Forces and Interactions

4) A person is attracted toward the center of Earth by a 500-N gravitational force. The force of attraction of Earth toward the person is
A) very, very small.
B) very, very large.
C) 500 N.
Answer: C
Diff: 2
Topic: Forces and Interactions

5) When a baseball player hits a ball with a force of 1000 N, the ball exerts force on the bat of
A) less than 1000 N.
B) more than 1000 N.
C) 1000 N.
Answer: C
Diff: 1
Topic: Forces and Interactions

6) A car traveling at 100 km/h strikes an unfortunate bug that splatters on the windshield. The force of impact is greater on the
A) bug.
B) car.
C) same for both
Answer: C
Diff: 2
Topic: Forces and Interactions

2.4 Newton's Third Law of Motion

1) An archer shoots an arrow. If the action force is the bowstring on the arrow, the reaction is the
A) weight of the arrow.
B) air resistance on the bow.
C) friction of the ground on the archer's feet.
D) grip of the archer's hand on the bow.
E) arrow's push on the bowstring.
Answer: E
Diff: 1
Topic: Newton's Third Law of Motion

2) A player catches a ball. Consider the action force to the ball against the player's glove. The reaction is the
A) player's grip on the glove.
B) force of the glove on the ball.
C) friction of the ground against the player's shoes.
D) muscular effort in the player's arms.
E) none of the above
Answer: B
Diff: 1
Topic: Newton's Third Law of Motion

3) As a ball falls, the action force is the pull of Earth's mass on the ball. The reaction force is the
A) air resistance acting against the ball.
B) acceleration of the ball.
C) pull of the ball's mass on Earth.
D) nonexistent.
E) none of the above
Answer: C
Diff: 2
Topic: Newton's Third Law of Motion

4) Earth pulls on the Moon. Similarly the Moon pulls on Earth, evidence that
A) Earth and Moon pull on each other.
B) Earth's and Moon's pulls comprise an action-reaction pair.
C) both
D) none of the above
Answer: C
Diff: 2
Topic: Newton's Third Law of Motion

5) The attraction of a person's body toward Earth is called weight. The reaction to this force is
A) the person's body pushing against Earth's surface.
B) Earth's surface pushing against the person's body.
C) the person's body pulling on Earth.
D) none of the above
Answer: C
Diff: 2
Topic: Newton's Third Law of Motion

6) The attraction of Earth on a skydiver pulls the diver downward. The reaction to this force is
A) air resistance the skydiver encounters while falling.
B) Earth pulling upward on the skydiver.
C) the attraction to the planets, stars, and every particle in the universe.
D) all of the above
E) none of the above
Answer: E
Diff: 3
Topic: Newton's Third Law of Motion

7) A Mack truck and a Mini Cooper traveling at the same speed collide head-on. The collision force is greatest on the
A) Mini Cooper.
B) Mack truck.
C) same
Answer: C
Diff: 2
Topic: Newton's Third Law of Motion

8) A Mack truck and a Mini Cooper traveling at the same speed collide head-on. The vehicle to undergo the greatest change in velocity will be the
A) Mini Cooper.
B) Mack truck.
C) same
Answer: A
Diff: 2
Topic: Newton's Third Law of Motion

9) The force exerted on the tires of a car to directly accelerate it along a road is exerted by the
A) engine.
B) tires.
C) air.
D) road.
E) none of the above
Answer: D
Diff: 2
Topic: Newton's Third Law of Motion

10) You toss a ball upward where air resistance is negligible. After the ball leaves your hand the force on it
A) gradually decreases until the ball reaches the top of its path.
B) first acts upward and then downward after it reaches the top.
C) is the single force due to gravity, always directed downward.
D) none of the above.
Answer: C
Diff: 3
Topic: Newton's Third Law of Motion

11) Arnold Strongman and Suzie Small each pull on opposite ends of a rope in a tug-of-war. The greatest force on the rope is exerted by
A) Arnold.
B) Suzie.
C) same
Answer: C
Diff: 2
Topic: Newton's Third Law of Motion

12) Arnold Strongman and Suzie Small have a tug-of-war on a polished floor. Arnold wears socks and Suzie wears gym shoes. The likely winner is
A) Arnold.
B) Suzie.
C) neither, a tied score
D) no basis for predicting
Answer: B
Diff: 3
Topic: Newton's Third Law of Motion

13) Both ends of a piece of rope are pulled by two people in a tug-of-war. If each pulls with a 400-N force, the tension in the rope is
A) 0 N.
B) 400 N.
C) 600 N.
D) 800 N.
E) none of the above
Answer: B
Diff: 3
Topic: Newton's Third Law of Motion

14) Two people, one twice as massive as the other, attempt a tug-of-war with 12 m of rope on frictionless ice. After a brief time, they meet. The heavier person slides a distance of
A) 3 m.
B) 4 m.
C) 5 m.
D) 6 m.
Answer: B
Diff: 3
Topic: Newton's Third Law of Motion

15) A friend says that the heavyweight champion of the world cannot exert a force of 50 N on a piece of tissue paper with his best punch. The tissue paper is held in midair, no wall, no tricks. You
A) agree that it can't be done.
B) have reservations about this assertion.
C) disagree, for a good punch easily delivers this much force.
Answer: A
Diff: 2
Topic: Newton's Third Law of Motion

16) On a smooth floor, why will girls wearing gym shoes win in a tug-of-war with boys wearing socks?
Answer: The tension on both ends of the rope is the same, so the team that wins is the team that exerts more force on the floor. Socks slip easily on a smooth floor, preventing the boys from pushing on and being pushed by the floor. Newton's third law!
Diff: 2
Topic: Newton's Third Law of Motion

17) A physicist says that a car moving along a level road is being propelled by the road. Defend this statement.
Answer: It's true. The tires are made to rotate by the engine, and the tire surface is the only point of contact with the road. The turning tires push backward on the road. The tires can only push on the road if the road simultaneously pushes forward on the tires. This forward force is the only force that propels the car along the road. Air resistance occurs also, but this counteracts the propulsion by the road.
Diff: 2
Topic: Newton's Third Law of Motion