**Newton’s Laws**

**Questions for Conceptual Course**

**Category 1: Inertia, First Law, Balanced and Unbalanced Forces**

**Question 1:**

aa. What property of an object describes its natural tendency to resist an acceleration?

a. Weight b. Unbalanced force

c. Inertia d. Shape

**Question 2:**

aa. When comparing **Object A** and **Object B**, it is observed that **Object A** has a greater tendency to resist changes in its state of motion. What does this observation indicate about **Object A** and **Object B**?

a. **Object A** is acted upon by more force than **Object B**.

b. **Object A** is a solid and **Object B** is either a liquid or a gas.

c. **Object A** has more inertia than **Object B**.

d. **Object A** experiences a lot more friction than **Object B**.

**Question 3:**

aa. Which two of the following statements about inertia are true?

a. Inertia is the force that keeps a moving object in motion.

b. Inertia is the force that keeps a stationary object at rest.

c. Inertia is the natural tendency of a stationary object to resist motion.

d. Inertia is the natural tendency of a moving object to resist a change in its velocity.

**Question 4:**

aa. Which one of the following quantities describes an object’s tendency to resist a change in its state of motion?

a. Volume of the object.

b. Mass of the object.

c. Force exerted by an object.

**Question 5:**

aa. When compared to a less massive object, a more massive object will always \_\_\_\_\_.

a. experience a greater unbalanced force

b. experience a smaller unbalanced force

c. have a greater tendency to resist changes in its state of motion

d. have a smaller tendency to resist changes in its state of motion

**Question 6:**

aa. **TRUE** or **FALSE**:

Inertia is a force that keeps stationary objects at rest and moving objects in motion at a constant velocity.

a. True b. False

**Question 7:**

aa. **TRUE** or **FALSE**:

Inertia is NOT a force. A rightward-moving object naturally maintains its state of rightward motion in the absence of forces. A rightward force is not required to keep such an object moving rightward.

a. True b. False

**Question 8:**

aa. **TRUE** or **FALSE**:

A rightward-moving object would naturally and ultimately come to rest in the absence of forces. A rightward force is required to keep such an object moving rightward. Inertia is the general name given to that force.

a. True b. False

**Question 9:**

aa. Suppose that an astronaut throws a rock in outer space at a location far from significant influences of gravity and air resistance. One would expect that the rock would \_\_\_\_.

a. eventually stop since all objects ultimately "lose their steam"

b. continue in motion with the same speed and direction

c. eventually stop as its inertia slowly becomes used up

d. either a, b, or c -- depending on whether the astronaut continues to push it

**Question 10:**

aa. When all individual forces acting on an object are balanced, it is the natural tendency of an object to \_\_\_\_\_.

a. eventually stop

b. accelerate

c. either stay at rest or come to a rest position

d. either speed up, slow down or keep the same speed

e. keep its velocity constant (either at a zero or non-zero value)

**Question 11:**

aa. Which of the following is ALWAYS true of an object that is acted upon by an unbalanced force?

a. The object is at rest.

b. The object is moving.

c. The object is accelerating.

d. The object has a constant velocity value.

**Question 12:**

aa. Which one of the following is known for certain to be true of an object that is at rest?

a. There are no forces acting upon the object.

b. The object does not have any mass.

c. The object is experiencing a lot of friction.

d. The object is experiencing a balance of forces.

**Question 13:**

aa. If the forces acting upon an object are balanced, then one can be certain that the object is \_\_\_\_\_.

a. at rest b. moving

c. not accelerating d. moving with a constant speed

**Question 14:**

aa. An object experiences a rightward force of 5 N, a leftward force of 3 N, an upward force of 10 N and a downward force of 10 N. Which one of the following conclusions can be made about the object’s motion?

a. It will accelerate.

b. If it is at rest, then it will stay at rest.

c. If it is moving, then it will slow down.

d. If it is moving, then it will continue moving.

**Question 15:**

aa. An object experiences a rightward force of 5 N, a leftward force of 5 N, an upward force of 10 N and a downward force of 10 N. Which one of the following conclusions can be made about the object’s motion?

a. It will accelerate.

b. If it is at rest, then it will stay at rest.

c. If it is moving, then it will slow down.

d. If it is moving, then it will speed up.

**Question 16:**

aa. An object experiences a rightward force of 3 N, a leftward force of 5 N, an upward force of 10 N and a downward force of 10 N. Which one of the following conclusions can be made about the object’s motion?

a. It will accelerate.

b. If it is at rest, then it will stay at rest.

c. If it is moving, then it will slow down.

d. If it is moving, then it will continue moving.

**Question 17:**

aa. An object experiences a rightward force of 5 N, a leftward force of 5 N, an upward force of 10 N and a downward force of 10 N. Which one of the following conclusions can be made about the object’s motion?

a. It will accelerate.

b. If it is at rest, then it will stay at rest.

c. If it is moving, then it will slow down.

d. If it is moving, then it will speed up.

**Question 18:**

aa. An object experiences a rightward force of 8 N, a leftward force of 8 N, an upward force of 10 N and a downward force of 10 N. Which one of the following conclusions can be made about the object’s motion?

a. It will accelerate.

b. If it is at rest, then it will stay at rest.

c. If it is moving, then it will slow down.

d. If it is moving, then it will speed up.

**Question 19:**

aa. How much force is required to keep a 2-kg object moving to the right with a constant speed of 6.0 m/s?

a. 0 N b. 0.33 N

c. 3.0 N d. 12.0 N

**Question 20:**

aa. How much force is required to keep a 3-kg object moving to the right with a constant speed of 6.0 m/s?

a. 0 N b. 0.5 N

c. 3.0 N d. 18.0 N

**Question 21:**

aa. How much force is required to keep a 4-kg object moving to the right with a constant speed of 8.0 m/s?

a. 0 N b. 0.5 N

c. 2.0 N d. 32.0 N

**Question 22:**

aa. Which of the following can be explained using Newton’s first law of motion?

a. It explains why a stationary object remains stationary.

b. It explains why every force is accompanied by a reaction force.

c. It explains why an object accelerates with a particular acceleration value.

**Question 23:**

aa. Which of the following can be explained using Newton’s first law of motion?

b. It explains why a moving object keeps the same velocity.

b. It explains why every force is accompanied by a reaction force.

c. It explains why an object accelerates with a particular acceleration value.

**Question 24:**

aa. Newton’s first law of motion applies to \_\_\_\_\_.

a. objects that are at rest.

b. objects that are moving with a constant velocity.

c. both objects that are at rest and those that move at constant velocity.

**Question 25:**

aa. Which one of the following statements is true of an object that is at rest?

a. There are no forces acting upon the object.

b. There is no gravity acting upon the object.

c. The individual forces acting upon the object are balanced.

d. The individual forces acting upon the object are NOT balanced.

**Question 26:**

aa. An object is at rest. What can be concluded about the forces acting upon the object?

a. There are no forces acting upon the object.

b. The forces that act upon the object have a strength of 0 Newton.

c. There are four forces acting upon the object; they are all equal.

d. The forces that act upon the object balance each other.

**Question 27:**

aa. An object is moving to the right with a constant speed. What can be concluded about the forces acting upon the object?

a. There is a rightward force but no leftward force.

b. There are only vertical forces acting upon the object.

c. There is a stronger rightward force than the leftward force.

d. All the individual forces acting upon the object are balanced.

**Question 28:**

aa. An object is moving to the left with a constant speed. What can be concluded about the forces acting upon the object?

a. There is a leftward force but no rightward force.

b. There are only vertical forces acting upon the object.

c. There is a stronger leftward force than the rightward force.

d. All the individual forces acting upon the object are balanced.

**Question 29:**

aa. The individual forces acting upon an object are balanced. What can be concluded about the object’s motion?

a. The object is not moving.

b. The object is slowing down.

c. The object is not accelerating.

**Question 30:**

aa. An object that is experiencing two horizontal forces – a rightward and a leftward force - is moving to the right with a constant speed. What can be concluded about the strength of these two forces?

a. The two forces have the same strength.

b. The rightward force is stronger than the leftward force.

c. The leftward force is stronger than the rightward force.

**Question 31:**

aa. An object that is experiencing two horizontal forces – a rightward and a leftward force - is moving to the left with a constant speed. What can be concluded about the strength of these two forces?

a. The two forces have the same strength.

b. The rightward force is stronger than the leftward force.

c. The leftward force is stronger than the rightward force.

**Question 32:**

aa. An object that is experiencing two vertical forces – an upward and a downward force - is moving upward with a constant speed. What can be concluded about the strength of these two forces?

a. The two forces have the same strength.

b. The upward force is stronger than the downward force.

c. The downward force is stronger than the upward force.

**Question 33:**

aa. An object that is experiencing two vertical forces – an upward and a downward force - is moving downward with a constant speed. What can be concluded about the strength of these two forces?

a. The two forces have the same strength.

b. The upward force is stronger than the downward force.

c. The downward force is stronger than the upward force.

**Question 34:**

aa. An elevator is supported by a cable and moving upward through the elevator shaft at a constant speed. How does the upward tension force compare to the downward force of gravity?

a. The upward tension force is stronger than the downward force of gravity.

b. The downward force of gravity is stronger than the upward tension force.

c. The tension force and the force of gravity are of equal strength.

**Question 35:**

aa. An elevator is supported by a cable and moving downward through the elevator shaft at a constant speed. How does the upward tension force compare to the downward force of gravity?

a. The upward tension force is stronger than the downward force of gravity.

b. The downward force of gravity is stronger than the upward tension force.

c. The tension force and the force of gravity are of equal strength.

**Question 36:**

aa. A sled slides down a hill, reaches the level surface and eventually comes to a stop. The fact that the sled ultimately stops is best explained by \_\_\_\_.

a. the presence of inertia causes it to stop

b. the natural tendency of any object is to ultimately stop

c. that fact that there was no force to keep the sled moving forward at a constant speed

d. the presence of an unbalanced force (e.g., friction) that causes a moving object to stop

**Question 37:**

aa. A ball is thrown vertically upwards. After the ball is released and is moving upwards towards its peak, it slows down. During this time, \_\_\_\_.

a. the ball is experiencing an unbalanced force; it is directed downwards.

b. the ball is experiencing an unbalanced force; it is directed upwards.

c. there are no forces whatsoever acting upon the ball.

d. the forces acting upon the ball are balanced.

e. none of these

**Question 38:**

aa. If you were in a spaceship and fired a cannonball into frictionless space, the amount of force needed to keep the cannonball in motion would be \_\_\_\_.

a. more than the force with which it was fired

b. less than the force with which it was fired

c. equal to the force with which it was fired

d. equal to the weight of the cannonball

e. zero, since no force is necessary to keep an object moving

**Question 39:**

aa. An object moving at a constant velocity MUST \_\_\_\_\_.

a. have a net force acting on it

b. eventually stop due to the force of gravity

c. be experiencing a balance of forces

d. not have a force of friction acting on it

e. not have any forces exerted upon it

**Question 40:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Based on this information, which objects could be moving to the right at a constant speed?



**Question 41:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Based on this information, which objects could be moving to the right at a constant speed?

**A. B. C. D.**

**Question 42:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Based on this information, which objects could be moving to the left at a constant speed?

**A. B. C. D.**

**Question 43:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Based on this information, which object could be moving to the right - either at a constant speed or a changing speed? Select all that apply.

**A. B. C. D.**

**Question 44:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Based on this information, which object could be moving to the left - either at a constant speed or a changing speed? Select all that apply.

**A. B. C. D.**

**Question 45:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Which arrow is consistent with the motion diagram that is shown?

*Motion Diagram:*

**A. B. C. D.**

**Question 46:**

aa. Mac and Tosh are arguing in the cafeteria. Tosh says that if he flings the jello with a greater speed it will have a greater inertia. Mac argues that inertia does NOT depend upon speed, but rather upon mass. Who is correct?

a. Mac b. Tosh

c. Neither are correct in the conception of inertia.

**Question 47:**

aa. An object will not have any inertia if it is \_\_\_\_\_.

a. in space b. at rest

c. accelerating d. acted upon by an unbalanced force

e. ...nonsense! All objects have inertia.

**Question 48:**

aa. The velocities and masses of four objects are shown. Which object has the greatest inertia?



**Question 49:**

aa. The velocities and masses of four objects are shown. Which object has the least inertia?



**Question 50:**

aa. The velocities and masses of four objects are shown. Which object has the greatest inertia?



**Question 51:**

aa. The velocities and masses of four objects are shown. Which object has the least inertia?



**Question 52:**

aa. A 3-kg object is moving to the right at a constant velocity of 2 m/s. Which one of the following horizontal forces is required to maintain this state of motion?

a. 6 N b. 1.5 N

c. 0.667 N d. 0 N

e. none of these

**Question 53:**

aa. A 6-kg object is moving to the right at a constant velocity of 2 m/s. Which one of the following horizontal forces is required to maintain this state of motion?

a. 0 N b. 0.333 N

c. 3 N d. 12 N

e. none of these

**Question 54:**

aa. A 10-kg object is moving to the right at a constant velocity of 4 m/s. Which one of the following horizontal forces is required to maintain this state of motion?

a. 40 N b. 0 N

c. 2.5 N d. 0.4 N

e. none of these

**Question 55:**

aa. A 12-kg object is moving to the right at a constant velocity of 2 m/s. Which one of the following horizontal forces is required to maintain this state of motion?

a. 6 N b. 0.166 N

c. 0 N d. 24 N

e. none of these

**Question 56:**

aa. An object is moving along a level surface with a constant velocity. The net force acting upon the object is \_\_\_\_\_.

a. zero

b. in the direction of motion

c. opposite the direction of motion

d. ... none of these can be determined without further information.

**Category 2: Second Law, Free-Body Diagrams and Force-Acceleration Concepts**

**Question 57:**

aa. Which of the following can be explained using Newton’s second law of motion?

a. It explains why a stationary object remains stationary.

b. It explains why every force is accompanied by a reaction force.

c. It explains why an object accelerates with a particular acceleration value.

**Question 58:**

aa. Which of the following can be explained using Newton’s second law of motion?

b. It explains why a moving object keeps the same velocity.

b. It explains why every force is accompanied by a reaction force.

c. It explains why an object accelerates with a particular acceleration value.

**Question 59:**

aa. What can be concluded about the motion of an object if the individual forces acting upon an object are **NOT** balanced?

a. The object will accelerate.

b. The object will be stationary.

c. The object will move with a constant speed.

d. Two of the above statements could apply.

**Question 60:**

aa. An object is accelerating. What can be known for certain to be true of the object?

a. The object is not experiencing any force.

b. The individual forces acting upon the object are balanced.

c. There is a force acting in the direction of the object’s motion.

d. The individual forces that act upon the object are not balanced.

**Question 61:**

aa. A net force acts upon an object. What can be known for certain to be true of the object?

a. The object is stationary.

b. The object is accelerating.

c. The object is moving with a constant speed.

**Question 62:**

aa. What is a net force?

a. A net force describes how much an object weighs.

b. A net force is a force that entraps object in its motion.

c. A net force describes how much unbalanced force is present.

d. A net force is the acceleration that an object experiences.

**Question 63:**

aa. A student is looking at the free-body diagram for an object. Which one of the following statements describes how the student can determine if there is a net force?

a. If there is an applied force, then there must be a net force.

b. If there are less than four forces, then there must be a net force.

c. If there is no friction acting upon the object, then there must be a net force.

d. If oppositely-directed forces are unequal, then there must be a net force.

**Question 64:**

aa. A rightward moving object is speeding up. Which of the following statements correctly describes the forces acting upon the object?

a. The leftward force is stronger than the rightward force.

b. The rightward force is stronger than the leftward force.

c. The rightward force is equal in strength to the leftward force.

**Question 65:**

aa. A rightward moving object is slowing down. Which of the following statements correctly describes the forces acting upon the object?

a. The leftward force is stronger than the rightward force.

b. The rightward force is stronger than the leftward force.

c. The rightward force is equal in strength to the leftward force.

**Question 66:**

aa. A leftward moving object is speeding up. Which of the following statements correctly describes the forces acting upon the object?

a. The leftward force is stronger than the rightward force.

b. The rightward force is stronger than the leftward force.

c. The rightward force is equal in strength to the leftward force.

**Question 67:**

aa. A leftward moving object is slowing down. Which of the following statements correctly describes the forces acting upon the object?

a. The leftward force is stronger than the rightward force.

b. The rightward force is stronger than the leftward force.

c. The rightward force is equal in strength to the leftward force.

**Question 68:**

aa. An upward moving object is speeding up. Which of the following statements correctly describes the forces acting upon the object?

a. The downward force is stronger than the upward force.

b. The upward force is stronger than the downward force.

c. The upward force is equal in strength to the downward force.

**Question 69:**

aa. An upward moving object is slowing down. Which of the following statements correctly describes the forces acting upon the object?

a. The downward force is stronger than the upward force.

b. The upward force is stronger than the downward force.

c. The upward force is equal in strength to the downward force.

**Question 70:**

aa. A downward moving object is speeding up. Which of the following statements correctly describes the forces acting upon the object?

a. The downward force is stronger than the upward force.

b. The upward force is stronger than the downward force.

c. The upward force is equal in strength to the downward force.

**Question 71:**

aa. A downward moving object is slowing down. Which of the following statements correctly describes the forces acting upon the object?

a. The downward force is stronger than the upward force.

b. The upward force is stronger than the downward force.

c. The upward force is equal in strength to the downward force.

**Question 72:**

aa. A car is moving to the right and speeding up. Which one of the following statements correctly describes the forces acting upon the car?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

**Question 73:**

aa. A car is moving to the right and slowing down. Which one of the following statements correctly describes the forces acting upon the car?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

**Question 74:**

aa. A car is moving to the left and speeding up. Which one of the following statements correctly describes the forces acting upon the car?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

**Question 75:**

aa. A car is moving to the left and slowing down. Which one of the following statements correctly describes the forces acting upon the car?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

a

**Question 76:**

a. A sledder is moving to the right and speeding up. Which one of the following statements correctly describes the forces acting upon the sledder?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

**Question 77:**

aa. A sledder is moving to the right and slowing down. Which one of the following statements correctly describes the forces acting upon the sledder?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

**Question 78:**

aa. A sledder is moving to the left and speeding up. Which one of the following statements correctly describes the forces acting upon the sledder?

a. Leftward force(s) is(are) stronger than the rightward force(s).

a. Rightward force(s) is(are) stronger than the leftward force(s).

c. The rightward force(s) is equal in strength to the leftward force(s).

**Question 79:**

aa. An elevator is moving to the upward and speeding up. Which one of the following statements correctly describes the forces acting upon the elevator?

a. Upward force(s) is(are) stronger than the downward force(s).

a. Downward force(s) is(are) stronger than the upward force(s).

c. The upward force(s) is equal in strength to the downward force(s).

**Question 80:**

aa. An elevator is moving to the upward and slowing down. Which one of the following statements correctly describes the forces acting upon the elevator?

a. Upward force(s) is(are) stronger than the downward force(s).

a. Downward force(s) is(are) stronger than the upward force(s).

c. The upward force(s) is equal in strength to the downward force(s).

**Question 81:**

aa. An elevator is moving to the downward and speeding up. Which one of the following statements correctly describes the forces acting upon the elevator?

a. Upward force(s) is(are) stronger than the downward force(s).

a. Downward force(s) is(are) stronger than the upward force(s).

c. The upward force(s) is equal in strength to the downward force(s).

**Question 82:**

aa. An elevator is moving to the downward and slowing down. Which one of the following statements correctly describes the forces acting upon the elevator?

a. Upward force(s) is(are) stronger than the downward force(s).

a. Downward force(s) is(are) stronger than the upward force(s).

c. The upward force(s) is equal in strength to the downward force(s).

**Question 83:**

aa. **TRUE** or **FALSE**?

If a moving object experiences an unbalanced force, then the object will have an acceleration that is in the same direction as the unbalanced force.

a. True b. False

**Question 84:**

aa. **TRUE** or **FALSE**?

If a rightward-moving object experiences an unbalanced force, then the object will have an acceleration that is in directed to the right.

a. True b. False

**Question 85:**

aa. **TRUE** or **FALSE**?

If a leftward-moving object experiences an unbalanced force, then the object will have an acceleration that is in directed to the left.

a. True b. False

**Question 86:**

aa. **TRUE** or **FALSE**?

If an upward-moving object experiences an unbalanced force, then the object will have an acceleration that is in directed upward.

a. True b. False

**Question 87:**

aa. A rightward moving object is coasting to a stop along a straight, level surface. The net force acting upon the object MUST be \_\_\_\_.

a. zero

b. directed rightward

c. directed leftward

d. ... impossible to answer without further information.

**Question 88:**

aa. A leftward moving object is coasting to a stop along a straight, level surface. The net force acting upon the object MUST be \_\_\_\_.

a. zero

b. directed rightward

c. directed leftward

d. ... impossible to answer without further information.

**Question 89:**

aa. An eastward-moving object is changing its speed. The net force on the object \_\_\_\_.

a. must be zero

b. could be directed eastward or westward or be zero

c. could be either be directed eastward or westward

d. must be directed westward

**Question 90:**

aa. A westward-moving object is changing its speed. The net force on the object \_\_\_\_.

a. must be zero

b. could be directed eastward or westward or be zero

c. could be either be directed eastward or westward

d. must be directed westward

**Question 91:**

aa. Determine the net force (Fnet) on an object that experiences the following four forces:

20 N of downward gravity force 20 N of upward normal force

15 N of rightward applied force 15 N of leftward friction force

a. Fnet = 0 N b. Fnet = 5 N

c. Fnet = 35 N d. Fnet = 70 N

**Question 92:**

aa. Determine the net force (Fnet) on an object that experiences the following four forces:

30 N of downward gravity force 30 N of upward normal force

20 N of rightward applied force 20 N of leftward friction force

a. Fnet = 0 N b. Fnet = 10 N

c. Fnet = 50 N d. Fnet = 100 N

**Question 93:**

aa. Determine the net force (Fnet) on an object that experiences the following four forces:

50 N of downward gravity force 50 N of upward normal force

30 N of rightward applied force 20 N of leftward friction force

a. Fnet = 0 N b. Fnet = 10 N

c. Fnet = 20 N d. Fnet = 25 N

e. Fnet = 30 N ab. Fnet = 50 N

**Question 94:**

aa. Determine the net force (Fnet) on an object that experiences the following four forces:

40 N of downward gravity force 40 N of upward normal force

25 N of rightward applied force 15 N of leftward friction force

a. Fnet = 0 N b. Fnet = 10 N

c. Fnet = 15 N d. Fnet = 20 N

e. Fnet = 40 N ab. Fnet = 120 N

**Question 95:**

aa. Determine the net force (Fnet) on an object that experiences the following four forces:

40 N of downward gravity force 40 N of upward normal force

20 N of rightward applied force 25 N of leftward friction force

a. Fnet = 0 N b. Fnet = 5 N

c. Fnet = 15 N d. Fnet = 20 N

e. Fnet = 40 N ab. Fnet = 45 N

**Question 96:**

aa. Determine the net force (Fnet) on an object that experiences the following four forces:

30 N of downward gravity force 30 N of upward normal force

15 N of rightward applied force 10 N of leftward friction force

a. Fnet = 0 N b. Fnet = 5 N

c. Fnet = 15 N d. Fnet = 20 N

e. Fnet = 30 N ab. Fnet = 85 N

**Question 97:**

aa. Determine the net force (Fnet) on an object that experiences the following three forces:

20 N of downward gravity force 20 N of upward normal force

35 N of rightward applied force

a. Fnet = 0 N b. Fnet = 15 N

c. Fnet = 20 N d. Fnet = 35 N

e. Fnet = 40 N ab. Fnet = 75 N

**Question 98:**

aa. Determine the net force (Fnet) on an object that experiences the following three forces:

30 N of downward gravity force 30 N of upward normal force

20 N of leftward friction force

a. Fnet = 0 N b. Fnet = 10 N

c. Fnet = 20 N d. Fnet = 30 N

e. Fnet = 80 N

**Question 99:**

aa. Determine the net force (Fnet) on an object that experiences the following three forces:

40 N of downward gravity force 40 N of upward normal force

15 N of leftward friction force

a. Fnet = 0 N b. Fnet = 15 N

c. Fnet = 25 N d. Fnet = 40 N

e. Fnet = 95 N

**Question 100:**

aa. Which one of the following must be true if the forces on an object are balanced?

a. There is no friction acting upon the object.

b. Gravity is the only force acting upon the object.

c. Oppositely directed forces are equal in magnitude.

d. All the forces acting upon the object are equal to one another.

**Question 101:**

aa. Which one of the following must be true if an object is experiencing a net force?

a. There is no friction acting upon the object.

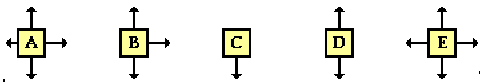
b. Gravity is the only force acting upon the object.

c. Oppositely directed forces are equal in magnitude.

d. All the forces acting upon the object are equal to one another.

**Question 102:**

aa. Consider the force diagrams below.

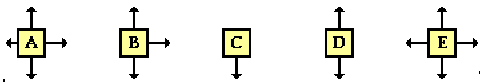


The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represent length of the arrows represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A flower pot falls freely from a windowsill. (Ignore air resistance.)*

**Question 103:**

aa. Consider the force diagrams below.

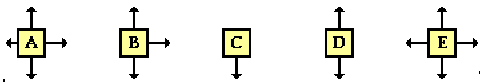


The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A skydiver falls downward through the air at a constant velocity.*

**Question 104:**

aa. Consider the force diagrams below.

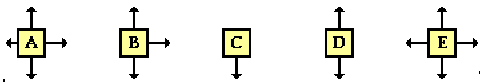


The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A cable pulls a crate rightward at a constant speed across a horizontal surface. The surface provides a force that resists the crate's motion.*

**Question 105:**

aa. Consider the force diagrams below.

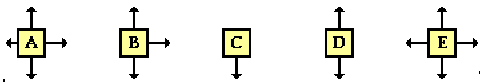


The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A rope lowers a bucket at a constant speed. (Ignore air resistance.)*

**Question 106:**

aa. Consider the force diagrams below.



The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A cable pulls a crate rightward with a rightward acceleration across a horizontal surface. The surface provides a force that resists the crate's motion. (Ignore air resistance.)*

**Question 107:**

aa. Consider the force diagrams below.

**A B C D E**



The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A book is sliding to the right across the floor and slowing down. (Ignore air resistance).*

**Question 108:**

aa. Consider the force diagrams below.

**A B C D**



The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A car is moving to the right at a constant speed.*

**Question 109:**

aa. Consider the force diagrams below.

**A B C D**



The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A car is moving to the right at a constant speed.*

**Question 110:**

aa. Consider the force diagrams below.

**A B C D E**



The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrow represents the strength of the force. Identify the diagram that is consistent with the following situation:

*A sledder is coasting to the left and slowing down.*

**Question 111:**

aa. Consider the force diagrams below.

**A B C D**



The arrows represent forces. The direction of the arrow represents the direction of the force. The length of the arrows represent the strength of the force. Identify the diagram that is consistent with the following situation:

*A car is moving to the left at a constant speed.*

**Question 112:**

aa. Consider the following situation:

*A leftward moving car is skidding to a stop.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Spring force

**Question 113:**

aa. Consider the following situation:

*A book is at rest upon the table.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Applied force

**Question 114:**

aa. Consider the following situation:

*A force is exerted to push an object to the right at constant speed*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Applied force

**Question 115:**

aa. Consider the following situation:

*A person is standing on the ground.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Spring force

**Question 116:**

aa. Consider the following situation:

*A sled is coasting across the snow and slowing down.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Applied force

**Question 117:**

aa. Consider the following situation:

*A dog is being dragged by his dog chain across the ground at constant speed.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Spring force

**Question 118:**

aa. Consider the following situation:

*A sign is suspended by steel wires.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Spring force

**Question 119:**

aa. Consider the following situation:

*A skydiver is falling with a constant speed.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Air resistance force d. Tension force

e. Friction force

**Question 120:**

aa. Consider the following situation:

*A football is traveling through the air and rising upward towards its highest point.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Applied force

**Question 121:**

aa. Consider the following situation:

*A large crate is being pushed across the floor at a constant velocity.*

Identify which of the listed forces are exerted upon the object. Select all that apply.

a. Force of gravity b. Normal force

c. Friction force d. Tension force

e. Applied force

**Question 122:**

aa. Different forces are applied to objects of varying mass. The resulting accelerations are listed (and represented by the arrow). Which object experiences the greatest net force?



**Question 123:**

aa. Different forces are applied to objects of varying mass. The resulting accelerations are listed (and represented by the arrow). Which object experiences the smallest net force?



**Question 124:**

aa. Different forces are applied to objects of varying mass. The resulting accelerations are listed (and represented by the arrow). Which object experiences the greatest net force?



**Question 125:**

aa. Different forces are applied to objects of varying mass. The resulting accelerations are listed (and represented by the arrow). Which object experiences the smallest net force?



**Question 126:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Which arrow is consistent with the motion diagram that is shown?

*Motion Diagram:*

**A. B. C. D.**

**Question 127:**

aa. The diagrams below depict the individual forces acting upon an object. Each arrow represents a force and the length of the arrow represents the size of the force. Which arrow is consistent with the motion diagram that is shown?

*Motion Diagram:*

**A. B. C. D.**

**Question 128:**

aa. A skydiver pulls the chord of his parachute. The forces acting upon the skydiver and his parachute are shown in the diagram at the right. From this diagram, one might infer that \_\_\_\_.

a. The skydiver will immediately stop.

b. The skydiver will begin moving upwards.

c. The skydiver will continue to fall, but now will slow down.

d. None of these will occur

**Question 129:**

aa. The acceleration of an object is \_\_\_\_\_\_ proportional to the net force and \_\_\_\_\_\_ proportional to its mass. Choose the two words that fill in the blanks in their respective order.

a. directly, directly b. inversely, inversely

c. directly, inversely d. inversely, directly

**Question 130:**

aa. Which two of the following statements correctly describe how acceleration depends upon net force and mass? Select two answers.

a. An object's acceleration is directly proportional to the net force it experiences.

b. An object's acceleration is inversely proportional to the net force it experiences.

c. An object's acceleration is directly proportional to the object's mass.

d. An object's acceleration is inversely proportional to the object's mass.

**Question 131:**

aa. The net force experienced by an object is increased. What affect does this have on the acceleration of the object?

a. The acceleration is increased.

b. The acceleration is decreased.

c. The acceleration is not affected by this change.

**Question 132:**

aa. The net force experienced by an object is decreased. What affect does this have on the acceleration of the object?

a. The acceleration is increased.

b. The acceleration is decreased.

c. The acceleration is not affected by this change.

**Question 133:**

aa. The mass of an object is increased. What affect does this have on the acceleration of the object?

a. The acceleration is increased.

b. The acceleration is decreased.

c. The acceleration is not affected by this change.

**Question 134:**

aa. The mass of an object is decreased. What affect does this have on the acceleration of the object?

a. The acceleration is increased.

b. The acceleration is decreased.

c. The acceleration is not affected by this change.

**Question 135:**

aa. An object has an acceleration of 12.0 m/s/s. The net force acting on the object is doubled while the mass of the object is held constant. What will be the new acceleration?

a. 2.0 m/s/s b. 6.0 m/s/s

c. 14.0 m/s/s d. 24.0 m/s/s

**Question 136:**

aa. An object has an acceleration of 12.0 m/s/s. The net force acting on the object is tripled while the mass of the object is held constant. What will be the new acceleration?

a. 3.0 m/s/s b. 4.0 m/s/s

c. 15.0 m/s/s d. 36.0 m/s/s

**Question 137:**

aa. An object has an acceleration of 12.0 m/s/s. The net force acting on the object is quadrupled (increased by a factor of four) while the mass of the object is held constant. What will be the new acceleration?

a. 3.0 m/s/s b. 4.0 m/s/s

c. 16.0 m/s/s d. 48.0 m/s/s

a

**Question 138:**

a. An object has an acceleration of 12.0 m/s/s. The net force acting on the object is halved (decreased to one-half its original value) while the mass of the object is held constant. What will be the new acceleration?

a. 0.5 m/s/s b. 6.0 m/s/s

c. 10.0 m/s/s d. 24.0 m/s/s

**Question 139:**

aa. An object has an acceleration of 12.0 m/s/s. The net force acting on the object is decreased to one-third of its value while the mass of the object is held constant. What will be the new acceleration?

a. 3.0 m/s/s b. 4.0 m/s/s

c. 8.0 m/s/s d. 36.0 m/s/s

**Question 140:**

aa. An object has an acceleration of 12.0 m/s/s. The net force acting on the object is decreased to one-fourth of its value while the mass of the object is held constant. What will be the new acceleration?

a. 2.5 m/s/s b. 3.0 m/s/s

c. 4.0 m/s/s d. 48.0 m/s/s

**Question 141:**

aa. An object has an acceleration of 12.0 m/s/s. The mass of the object is doubled while the net force on the object is held constant. What will be the new acceleration?

a. 2.0 m/s/s b. 6.0 m/s/s

c. 14.0 m/s/s d. 24.0 m/s/s

**Question 142:**

aa. An object has an acceleration of 12.0 m/s/s. The mass of the object is tripled while the net force on the object is held constant. What will be the new acceleration?

a. 3.0 m/s/s b. 4.0 m/s/s

c. 15.0 m/s/s d. 36.0 m/s/s

**Question 143:**

aa. An object has an acceleration of 12.0 m/s/s. The mass of the object is quadrupled (increased by a factor of four) while the net force on the object is held constant. What will be the new acceleration?

a. 3.0 m/s/s b. 4.0 m/s/s

c. 16.0 m/s/s d. 48.0 m/s/s

**Question 144:**

aa. An object has an acceleration of 12.0 m/s/s. The mass of the object is halved (decreased to one-half its original value) while the net force on the object is held constant. What will be the new acceleration?

a. 2.0 m/s/s b. 6.0 m/s/s

c. 18.0 m/s/s d. 24.0 m/s/s

**Question 145:**

aa. An object has an acceleration of 12.0 m/s/s. The mass of the object is decreased to one-third its original value while the net force on the object is held constant. What will be the new acceleration?

a. 3.0 m/s/s b. 4.0 m/s/s

c. 9.0 m/s/s d. 36.0 m/s/s

**Question 146:**

aa. An object has an acceleration of 12.0 m/s/s. The mass of the object is decreased to one-fourth its original value while the net force on the object is held constant. What will be the new acceleration?

a. 2.5 m/s/s b. 3.0 m/s/s

c. 4.0 m/s/s d. 48.0 m/s/s

**Question 147:**

aa. A rightward force of 30.0 N is applied to a 5.0-kg object to accelerate it across a horizontal surface. The object encounters 20.0 N of friction. What is the object's acceleration?

a. 2.0 m/s/s b. 4.0 m/s/s

c. 6.0 m/s/s d. 10.0 m/s/s

e. None of these are correct.

**Question 148:**

aa. A rightward force of 30.0 N is applied to a 5.0-kg object to accelerate it across a horizontal surface. The object encounters 10.0 N of friction. What is the object's acceleration?

a. 2.0 m/s/s b. 4.0 m/s/s

c. 6.0 m/s/s d. 8.0 m/s/s

e. None of these are correct.

**Question 149:**

aa. A rightward force of 40.0 N is applied to a 5.0-kg object to accelerate it across a horizontal surface. The object encounters 10.0 N of friction. What is the object's acceleration?

a. 2.0 m/s/s b. 6.0 m/s/s

c. 8.0 m/s/s d. 10.0 m/s/s

e. None of these are correct.

**Question 150:**

aa. A rightward force of 12.0 N is applied to a 2.0-kg object to accelerate it across a horizontal surface. The object encounters 8.0 N of friction. What is the object's acceleration?

a. 2.0 m/s/s b. 4.0 m/s/s

c. 6.0 m/s/s d. 10.0 m/s/s

e. None of these are correct.

**Question 151:**

aa. A rightward force of 24.0 N is applied to a 2.0-kg object to accelerate it across a horizontal surface. The object encounters 16.0 N of friction. What is the object's acceleration?

a. 4.0 m/s/s b. 8.0 m/s/s

c. 12.0 m/s/s d. 20.0 m/s/s

e. None of these are correct.

**Question 152:**

aa. A rightward force of 15.0 N is applied to a 5.0-kg object to accelerate it to the right across a rough surface. The object accelerates at 2.0 m/s/s. How much friction does the object experience?

a. 2.5 N b. 3.0 N

c. 5.0 N d. 10.0 N

e. None of these are correct.

**Question 153:**

aa. A rightward force of 18.0 N is applied to a 4.0-kg object to accelerate it to the right across a rough surface. The object accelerates at 3.0 m/s/s. How much friction does the object experience?

a. 4.5 N b. 6.0 N

c. 12.0 N d. 30.0 N

e. None of these are correct.

**Question 154:**

aa. A rightward force of 20.0 N is applied to a 4.0-kg object to accelerate it to the right across a rough surface. The object accelerates at 2.0 m/s/s. How much friction does the object experience?

a. 5.0 N b. 8.0 N

c. 10.0 N d. 12.0 N

e. None of these are correct.

**Question 155:**

aa. A rightward force of 24.0 N is applied to a 4.0-kg object to accelerate it to the right across a rough surface. The object accelerates at 2.0 m/s/s. How much friction does the object experience?

a. 6.0 N b. 8.0 N

c. 12.0 N d. 16.0 N

e. None of these are correct.

**Question 156:**

aa. A rightward force of 24.0 N is applied to a 3.0-kg object to accelerate it to the right across a rough surface. The object accelerates at 2.0 m/s/s. How much friction does the object experience?

a. 6.0 N b. 8.0 N

c. 12.0 N d. 18.0 N

e. None of these are correct.

**Question 157:**

aa. A rightward force of 24.0 N is applied to a 6.0-kg object to accelerate it to the right across a rough surface. The object accelerates at 3.0 m/s/s. How much friction does the object experience?

a. 2.0 N b. 4.0 N

c. 8.0 N d. 18.0 N

e. 42.0 N

**Category 3: Newton’s Third Law**

**Question 158:**

aa. Which of the following can be explained using Newton’s third law of motion?

a. It explains why a stationary object remains stationary.

b. It explains why every force is accompanied by a reaction force.

c. It explains why an object accelerates with a particular acceleration value.

**Question 159:**

aa. Which of the following can be explained using Newton’s third law of motion?

b. It explains why a moving object keeps the same velocity.

b. It explains why every force is accompanied by a reaction force.

c. It explains why an object accelerates with a particular acceleration value.

**Question 160:**

aa. **TRUE** or **FALSE**:

According to Newton’s third law, for any force that acts on Object A, there is always a second force that acts upon Object A that is equal in magnitude and opposite in direction. Thus, Object A can never experience a net force.

a. True b. False

**Question 161:**

aa. A large truck traveling at 40 mi/hr down Lake Avenue collides with a Monarch butterfly that is crossing the road. How do the forces acting upon these two objects compare to one another?

a. The truck experiences the greater force.

b. The butterfly experiences the greater force.

c. The butterfly and the truck experience the same amount of force.

**Question 162:**

aa. A small car is at rest at a stoplight. A large truck rear-ends the small car. How do the forces acting upon these two vehicles compare to one another?

a. The small car experiences the greater force.

b. The large truck experiences the greater force.

c. The car and the truck experience the same amount of force.

**Question 163:**

aa. A large truck is at rest at a stoplight. A small car rear-ends the large truck. How do the forces acting upon these two vehicles compare to one another?

a. The small car experiences the greater force.

b. The large truck experiences the greater force.

c. The car and the truck experience the same amount of force.

**Question 164:**

aa. A small car is at rest at a stoplight. A large truck rear-ends the small car. Why is the force experienced by the car greater than the force experienced by the truck?

a. The car has less mass; the less massive object experiences the greater force.

b. The car is at rest; the object with the smallest speed experiences the greater force.

c. Nonsense! The truck actually experiences a greater force than the car.

d. Nonsense! Both the car and the truck experience the same amount of force.

**Question 165:**

aa. A large truck is at rest at a stoplight. A small car rear-ends the large truck. Why is the force experienced by the car greater than the force experienced by the truck?

a. The car has less mass; the less massive object experiences the greater force.

b. The car is moving; the object with the greatest speed experiences the greater force.

c. Nonsense! The truck actually experiences a greater force than the car.

d. Nonsense! Both the car and the truck experience the same amount of force.

**Question 166:**

aa. A small car is at rest at a stoplight. A large truck rear-ends the small car. Why is the force experienced by the truck greater than the force experienced by the car?

a. The truck has more mass; the more massive object experiences the greater force.

b. The truck is moving; the object with the greatest speed experiences the greater force.

c. Nonsense! The car actually experiences a greater force than the truck.

d. Nonsense! Both the car and the truck experience the same amount of force.

**Question AAA:**

aa. A large truck is at rest at a stoplight. A small car rear-ends the large truck. Why is the force experienced by the truck greater than the force experienced by the car?

a. The truck has more mass; the more massive object experiences the greater force.

b. The truck is at rest; the object with the lowest speed experiences the greater force.

c. Nonsense! The car actually experiences a greater force than the truck.

d. Nonsense! Both the car and the truck experience the same amount of force.

**Question 167:**

aa. During a football game, a large lineman delivers a *vicious hit* to the opposing team’s quarterback. Why is the force experienced by the quarterback greater than the force experienced by the lineman?

a. The quarterback has less mass; the less massive object experiences the greater force.

b. The quarterback is stationary; an object at rest always experiences the greater force.

c. Nonsense! The lineman actually experiences a greater force than the quarterback.

d. Nonsense! The lineman and the quarterback experience the same amount of force.

**Question 168:**

aa. A physics student sits in a chair. The chair pushes up on the student's body. Identify the other force of the interaction force pair.

a. The student's body pushes down on the Earth.

b. The Earth pulls down on the student's body.

c. The student's body pulling up on the Earth.

d. The student's body pushing down on the chair.

**Question 169:**

aa. A physics student sits in a chair. The Earth pulls down upon the student's body. Identify the other force of the interaction force pair.

a. The student's body pulling up on the Earth.

b. The student's body pushing down on the chair.

c. The student's body pushes down on the Earth.

d. The student's body pulling up on the chair.

**Question 170:**

aa. Joel and Marissa are on skates on an icy pond. They are facing each other with their hands touching. They then push away from each other with their hands. The force of Joel pushing upon Marissa is equal to \_\_\_\_\_.

a. the force of the floor pushing upon Marissa

b. the force of air resistance (air drag) upon Joel

c. the force of the floor pushing upon Joel

d. the force of Marissa pushing upon Joel

e. Nonsense! None of these conclusions can be made.

**Question 171:**

aa. After missing a layup, Jonny expresses his anger by hitting the wall. The reaction force to the force of Jonny's palm hitting the wall is \_\_\_\_.

a. Jonny's palm stops

b. the wall forcing itself

c. Jonny's palm forcing itself

d. the wall forcing Johnny's palm

e. the loud sound that is produced

**Question 172:**

aa. A linebacker strikes a fullback with full force in a football game. The reaction force to the force of the linebacker striking the fullback is \_\_\_\_.

a. the linebacker applies a force to himself

b. the fullback falls backwards to the ground

c. the fullback applies a force to the linebacker

d. the force of the fullback colliding with the ground

e. there is a 3-yard loss and the linebacker is applauded

**Question 173:**

aa. In an Olympic boxing match, Ricardo delivers a sharp blow to Sonny's forehead. The reaction force to the force of Ricardo striking Sonny is \_\_\_\_.

a. Ricardo's glove recoils

b. Sonny applies a force Ricardo

c. Sonny falls backwards to the mat

d. the force of the Earth pulling Sonny downwards

e. Sonny falls over, gets up and then punches Ricardo

**Question 174:**

aa. A quiet moment during a test is interrupted as a physics book falls from a table and strikes the floor. The reaction force to the force of the Earth pulling the book downwards is \_\_\_\_.

a. the book hits the floor

b. the force of gravity on the book

c. the floor pushes up on the book

d. the sound of the impact with the floor

e. the book exerts an upward pull on the Earth

**Question 175:**

aa. A fish happily swims through the water due to the marvel of Newton's third law. Identify the two letters corresponding to the action-reaction FORCE pairs that are responsible for the fish's motion. Select two letters.

a. The water pushes forward upon the fish's fins.

b. The fins of the fish push backward on the water.

c. The water moves backward and out of the way of the fish.

d. The water pressure is greatest behind the fish than in front of it.

e. The muscular and internal pressure of the fish stabilizes its skeletal structure.

**Question 176:**

aa. A bird is able to fly due to the marvels of Newton's third law. Identify the two letters corresponding to the action-reaction FORCE pairs that are responsible for the bird's flight. Select two letters.

a. The force of gravity pulls the bird downward.

b. The bird's wings push downward upon the air.

c. The air pushes upward on the birds wings.

d. The bird's wings move upward after every downward stroke.

e. Air moves out of the way of the bird making it easier to move forward.

**Question 177:**

aa. In baseball, the baseball strikes the catcher's mitt and is stopped due to the marvels of Newton's third law. Identify the two letters corresponding to the action-reaction FORCE pairs that are responsible for the stopping of the baseball. Select two letters.

a. The ball pushes upon itself.

b. The ball slows down as the mitt closes upon it.

c. The catcher's mitt pushes backward upon the ball.

d. There is a downward pull of the Earth upon the ball.

e. The ball applies a forward force to the catcher's mitt.

**Question 178:**

aa. A sprinter in track is able to progress towards the finish line due to the marvels of Newton's third law. Identify the two letters corresponding to the action-reaction FORCE pairs that are responsible for this running action. Select two letters.

a. The ground pushes forward upon the sprinter's shoes.

b. The sprinter pushes backward upon the ground with her shoes.

c. The force of gravity pulls the sprinter towards the track surface.

d. The ground pushes upward upon the sprinter and reduces her weight.

e. The left leg moves forward as the right leg moves backward; and vice versa.

**Category 4: Mass and Weight**

**Question 179:**

aa. Which of the following statements describe the essential difference between the mass and the weight of an object?

a. Mass is a metric quantity and weight is not a metric quantity.

b. Mass is measured in Newtons and weight is measured in pounds.

c. Mass refers to the size of an object and weight refers to the density of the object.

d. Mass refers to the amount of stuff an object possesses and weight is the force of gravity.

**Question 180:**

aa. The following statements were made about a 1-kilogram object. Which one is **INCORRECT**?

a. The object weighs 9.8 Newton.

b. The object has a mass of 1 kilogram.

c. The force of gravity on the object is 1 kilogram.

**Question 181:**

aa. The following statements were made about a 10-kilogram object. Which one is **INCORRECT**?

a. The object weighs 98 Newton.

b. The object has a mass of 10 kilogram.

c. The force of gravity on the object is 10 kilogram.

**Question 182:**

aa. The following statements were made about a 10-kilogram object. Which one is **CORRECT**?

a. The object weighs 98 Newton.

b. The object has a mass of 98 Newton.

c. The force of gravity on the object is 9.8 Newton.

**Question 183:**

aa. The following statements were made about a 5-kilogram object. Which one is **CORRECT**?

a. The object weighs 49 Newton.

b. The object has a mass of 49 kilogram.

c. The force of gravity on the object is 9.8 Newton.

**Question 184:**

aa. In the metric system, the mass of an object is expressed in \_\_\_\_\_ and the weight of an object is expressed in \_\_\_\_\_. Which two words fill in the blanks in their respective order?

a. kilograms, pounds b. Newtons, pounds

c. pounds, Newtons d. kilograms, Newtons

**Question 185:**

aa. Gravitational forces on the moon are approximately one-sixth of the value on Earth. What is the mass and what is the weight on the moon of a 60-kilogram student?

a. mass = approximately 10 kilograms; weight = approximately 600 Newton

b. mass = approximately 10 kilograms; weight = approximately 100 Newton

c. mass = approximately 60 kilograms; weight = approximately 10 Newton

d. mass = approximately 60 kilograms; weight = approximately 100 Newton

**Question 186:**

aa. The amount of matter or "stuff" in an object is referred to as the \_\_\_\_\_ of the object.

a. weight b. force

c. mass d. pressure

e. density

**Question 187:**

aa. The force of gravity that acts upon an object is referred to as the \_\_\_\_\_ of the object.

a. pressure b. weight

c. mass d. kilograms

e. inertia

**Question 188:**

aa. The force of gravity that acts upon an object is referred to as the \_\_\_\_\_ of the object.

a. pressure b. inertia

c. kilograms d. mass

e. weight

**Question 189:**

aa. **TRUE** or **FALSE**:

The mass and weight of an object are the same thing.

a. TRUE b. FALSE

**Question 190:**

aa. **TRUE** or **FALSE**:

The mass of an object is the force of gravity acting upon an object.

a. True b. False

**Question 191:**

aa. **TRUE** or **FALSE**:

The weight of an object is its mass multiplied by the force of gravity.

a. True b. False

**Question 192:**

aa. **TRUE** or **FALSE**:

The mass and weight of an object is the same thing.

a. True b. False

**Question 193:**

aa. **TRUE** or **FALSE**:

The weight of an object is its mass multiplied by the force of gravity.

a. True b. False

**Question 194:**

aa. **TRUE** or **FALSE**:

An object would have a different mass on Earth as it would have on the moon.

a. True b. False

**Question 195:**

aa. **TRUE** or **FALSE**:

An object would have a different weight on Earth as it would have on the moon.

a. True b. False

**Question 196:**

aa. The force of gravity of objects on the moon is approximately one-sixth of their value on Earth. Joe weighs 600 N on earth. Joe's mass on the moon will be approximately \_\_\_\_\_.

a. 60 kg b. 100 kg

c. 1000 kg d. 6000 kg

e. 60 N ab. 100 N

ac. 1000 N ad. 6000 N

**Question 197:**

aa. The force of gravity of objects on the moon is approximately one-sixth of their value on Earth. Joe's weight on the moon is 100 N. Joe's mass on the Earth will be approximately \_\_\_\_\_.

a. 60 kg b. 100 kg

c. 1000 kg d. 6000 kg

e. 60 N ab. 100 N

ac. 1000 N ad. 6000 N