Unit 2 Practice Test: Newton's Laws

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. Which of the following is the cause of an acceleration or a change in an object’s motion?
   a. speed c. force
   b. inertia d. velocity

____ 2. What causes a moving object to change direction?
   a. acceleration c. inertia
   b. velocity d. force

____ 3. Which of the following forces arises from direct physical contact between two objects?
   a. gravitational force c. contact force
   b. fundamental force d. field force

____ 4. Which of the following forces exists between objects even in the absence of direct physical contact?
   a. frictional force c. contact force
   b. fundamental force d. field force

____ 5. Which of the following forces is an example of a contact force?
   a. gravitational force c. electric force
   b. magnetic force d. frictional force

____ 6. Which of the following forces is an example of a field force?
   a. gravitational force c. normal force
   b. frictional force d. tension

____ 7. A free-body diagram of a ball in free fall in the presence of air resistance would show
   a. a downward arrow to represent the force of air resistance.
   b. only a downward arrow to represent the force of gravity.
   c. a downward arrow to represent the force of gravity and an upward arrow to represent the
      force of air resistance.
   d. an upward arrow to represent the force of gravity and a downward arrow to represent the
      force of air resistance.

____ 8. In the free-body diagram shown above, which of the following is the gravitational force acting on the
   balloon?
   a. 1520 N c. 4050 N
   b. 950 N d. 5120 N

____ 9. Which of the following is the tendency of an object to maintain its state of motion?
   a. acceleration c. force
   b. inertia d. velocity
10. A late traveler rushes to catch a plane, pulling a suitcase with a force directed $30.0^\circ$ above the horizontal. If the horizontal component of the force on the suitcase is 60.6 N, what is the force exerted on the handle?
   a. 53.0 N  
   b. 70.0 N  
   c. 65.2 N  
   d. 95.6 N

11. A car goes forward along a level road at constant velocity. The additional force needed to bring the car into equilibrium is
   a. greater than the normal force times the coefficient of static friction.
   b. equal to the normal force times the coefficient of static friction.
   c. the normal force times the coefficient of kinetic friction.
   d. zero.

12. A sled is pulled at a constant velocity across a horizontal snow surface. If a force of $8.0 \times 10^1$ N is being applied to the sled rope at an angle of $53^\circ$ to the ground, what is the force of friction between the sled and the snow?
   a. 83 N  
   b. 64 N  
   c. 48 N  
   d. 42 N

13. If a nonzero net force is acting on an object, then the object is definitely
   a. at rest.
   b. moving with a constant velocity.
   c. being accelerated.
   d. losing mass.

14. A wagon with a weight of 300.0 N is accelerated across a level surface at 0.5 m/s$^2$. What net force acts on the wagon? ($g = 9.81$ m/s$^2$)
   a. 9.0 N  
   b. 15 N  
   c. 150 N  
   d. 610 N

15. A small force acting on a human-sized object causes
   a. a small acceleration.
   b. no acceleration.
   c. a large acceleration.
   d. equilibrium.

16. According to Newton’s second law, when the same force is applied to two objects of different masses,
   a. the object with greater mass will experience a great acceleration and the object with less mass will experience an even greater acceleration.
   b. the object with greater mass will experience a smaller acceleration and the object with less mass will experience a greater acceleration.
   c. the object with greater mass will experience a greater acceleration and the object with less mass will experience a smaller acceleration.
   d. the object with greater mass will experience a small acceleration and the object with less mass will experience an even smaller acceleration.

17. Two perpendicular forces, one of 45.0 N directed upward and the second of 60.0 N directed to the right, act simultaneously on an object with a mass of 35.0 kg. What is the magnitude of the resultant acceleration of the object?
   a. $2.14$ m/s$^2$  
   b. $3.00$ m/s$^2$  
   c. $5.25$ m/s$^2$  
   d. $1.41$ m/s$^2$

18. An airplane with a mass of $1.2 \times 10^4$ kg tows a glider with a mass of $0.60 \times 10^4$ kg. If the airplane propellers provide a net forward thrust of $3.6 \times 10^4$ N, what is the acceleration of the glider?
   a. $2.0$ m/s$^2$  
   b. $3.0$ m/s$^2$  
   c. $6.0$ m/s$^2$  
   d. $9.8$ m/s$^2$

19. A hammer drives a nail into a piece of wood. Identify an action-reaction pair, and compare the forces exerted by each object.
   a. The nail exerts a force on the hammer; the hammer exerts a force on the wood.
   b. The hammer exerts a force on the nail; the wood exerts a force on the nail.
   c. The hammer exerts a force on the nail; the nail exerts a force on the hammer.
   d. The hammer exerts a force on the nail; the hammer exerts a force on the wood.
20. The statement by Newton that for every action there is an equal but opposite reaction is which of his laws of motion?
   a. first    b. second    c. third    d. fourth

21. Which are simultaneous equal but opposite forces resulting from the interaction of two objects?
   a. net external forces    b. field forces
   c. gravitational forces    d. action-reaction pairs

22. A measure of the quantity of matter is
   a. density.    b. weight.
   c. force.    d. mass.

23. A change in the force of gravity acting on an object will affect the object’s
   a. mass.    b. frictional force.
   c. weight.    d. inertia.

24. There are six books in a stack, and each book weighs 5 N. The coefficient of friction between the books is 0.2.
   With what horizontal force must one push to start sliding the top five books off the bottom one?
   a. 1 N    b. 5 N
   c. 3 N    d. 7 N

25. An ice skater moving at 10.0 m/s coasts to a halt in $1.0 \times 10^2$ m on a smooth ice surface. What is the coefficient of friction between the ice and the skates?
   a. 0.025    b. 0.051
   c. 0.102    d. 0.205

Short Answer

26. Construct a free-body diagram of a car being towed.

27. What happens to an object in motion when it experiences a nonzero net external force?

28. What is the natural tendency of an object that is in motion? ________________________________

29. Describe the forces acting on a car as it moves along a level highway in still air at a constant speed.

30. A block of wood supported by two concrete blocks is chopped in half by a karate instructor. Identify an action-reaction pair, and compare the forces exerted by each object.

31. When a horse pulls on a cart, the cart pulls on the horse with an equal but opposite force. How is the horse able to pull the cart?

32. When a car is moving, what happens to the velocity and acceleration of the car if the air resistance becomes equal to the force acting in the opposite direction?
Unit 2 Practice Test: Newton's Laws
Answer Section

MULTIPLE CHOICE

2. D  15. A
3. C  16. B
4. D  17. A
5. D  18. A
6. A  19. C
7. C  20. C
9. B  22. D
11. D  24. B
13. C

SHORT ANSWER

26.
27. The object experiences a change in motion.
28. The natural condition for a moving object is to remain in motion once it has been set in motion.
29. Gravity exerts a downward force on the car that is balanced by the normal force of the road acting upward on the car. The car’s forward motion is opposed by the friction between the road and the tires and by the resistance of the air. The sum of these opposing forces is balanced by an equal and opposite force exerted by the engine and applied to the tires, where the road exerts a reaction force that is directed forward.
30. The hand exerts a force on the wood, and the wood exerts an equal force on the hand.
31. The horse and the cart are not necessarily at equilibrium. The forces in the action-reaction pair are each applied to different objects.
32. The acceleration is then zero, and the car moves at a constant speed.