MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A scientific statement that can never be changed is a scientific 1) _____

A) law.
B) theory.
C) principle.
D) hypothesis.
E) None of the above choices are correct.

2) As an object freely falls downward, its 2) _____

A) acceleration increases.
B) velocity increases.
C) both of these.
D) none of these.

3) The gain in speed each second for a freely-falling object is about 3) _____

A) 0.
B) 20 m/s.
C) 5 m/s.
D) 10 m/s.
E) depends on the initial speed

4) A package falls off a truck that is moving at 30 m/s. Neglecting air resistance, the horizontal speed of the package just before it hits the ground is 4) _____

A) more than 30 m/s.
B) less than 30 m/s but larger than zero.
C) 30 m/s.
D) zero.
E) More informationis needed for an estimate.

5) According to Newton's law of inertia, a rail road train in motion should continue going forever even if its engine is turned off. We never observe this because railroad trains 5) _____

A) are much too heavy.
B) must go up and down hills.
C) move too slowly.
D) always have forces that oppose their motion.

6) Whirl a rock at the end of a string and it follows a circular path. If the string breaks, the tendency of the rock is to 6) _____

A) increase its speed
B) follow a straight-line path.
C) continue to follow a circular path.
D) revolve in a smaller circle

7) The last instant just before an airplane crashes a passenger jumps out the door and falls only two feet to the ground. The passenger is 7) _____

A) lucky to have studied physics .
B) intelligent to think so fast.
C) unharmed.
D) probably hurt or killed.

8) Which of the following is not a vector quantity? 8) _____

A) speed B) acceleration

C) velocity D) All are vector quantities.

9) An airplane flies at 100 km/h in still air.. If it flies into a 10 km/h headwind, its groundspeed is 9) _____

A) 90 km/h. B) 110 km/h. C) 120 km/h. D) 100 km/h.

10) The two measurements necessary for calculating average speed are 10) _____

A) acceleration and time.

B) velocity and time.

C) distance and acceleration.

D) velocity and distance.

E) distance and time.

11) A car maintains a constant velocity of 100 km/hr for 10 seconds. During this interval it acceleration is 11) _____

A) zero. B) 110 km/hr. C) 1000 km/hr. D) 10 km/hr.

12) A hockey puck is set in motion across a frozen pond. If ice friction and air resistance are neglected, the force required to keep the puck sliding at constant velocity is 12) _____

A) equal to its weight.

B) equal to the product of its mass times its weight.

C) equal to its weight divided by its mass.

D) zero.

13) If a car accelerates from rest at 2 meters per second per second, its speed 3 seconds later will be about 13) _____

A) 3 m/s. B) 4 m/s. C) 2 m/s. D) 6 m/s.

14) If no external forces are acting on a moving object it will 14) _____

A) move slower and slower until it finally stops.

B) continue moving at the same speed.

C) continue moving at the same velocity.

15) Galileo's use of inclined planes allowed him to effectively 15) _____

A) slow down the acceleration of free fall.

B) increase the acceleration beyond that of free fall.

C) eliminate the acceleration of free fall.

D) eliminate friction.

16) While an object near the earth's surface is in free fall , its 16) _____

A) velocity increases. B) acceleration increases.

C) mass increases. D) mass decreases.

17) An object, at rest near the surface of a distant planet, starts to fall freely . If the acceleration there is twice that of the earth, its speed one second later would be 17) _____

A) 10 m/s. B) 20 m/s. C) 30 m/s. D) 40 m/s.

18) If an object falling freely were somehow equipped with an odometer to measure the distance it travels, then the amount of distance it travels each succeeding second would be 18) _____

A) constant. B) less and less each second.

C) greater than the second before. D) doubled.

19) While a car travels around a circular track at a constant speed its 19) _____

A) acceleration is zero. B) velocity is zero.

C) inertia is zero. D) none of the above

20) Compared to a 1-kg block of solid iron, a 2-kg block of solid iron has twice as much 20) _____

A) inertia.

B) mass.

C) volume.

D) all of these

E) none of these

21) If one object has twice as much mass as another object, it also has twice as much 21) _____

A) inertia.

B) velocity.

C) acceleration due to gravity.

D) volume.

E) all of these

22) Strange as it may seem, it is just as hard to accelerate a car on a level surface on the moon as it is here on the Earth. This is because 22) _____

A) the mass of the car is independent of gravity.

B) the weight of the car is independent of gravity.

C) Nonsense! A car is much more easily accelerated on the moon than on the Earth.

23) A rock weighs 30 N on Earth. A second rock weighs 30 N on the moon. Which of the two rocks has the greater mass? 23) _____

A) the one on Earth B) the one on the moon

C) They have the same mass. D) not enough information to say

24) A 10-kg brick and a 1-kg book are dropped in a vacuum. The force of gravity on the 10-kg brick is 24) _____

A) the same as the force on the 1-kg book. B) 10 times as much

C) one-tenth as much. D) zero.

25) An object is propelled along a straight-line path by a force. If the net force were doubled, the object's acceleration would be 25) _____

A) half as much.

B) the same.

C) twice as much.

D) four times as much.

E) none of these.

26) An apple at rest weighs 1 N. The net force on the apple when it is in free fall is 26) _____

A) 0 N.

B) 0.1 N.

C) 1 N.

D) 9.8 N.

E) none of these

27) 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? 27) _____

A) the light woman B) the heavy man

C) Both should arrive at the same time D) not enough information

28) A coconut and a feather fall from a tree through the air to the ground below. The strength of the force of air-resistance is 28) _____

A) greater on the coconut. B) greater on the feather. C) the same on each.

29) A player catches a ball. Consider the action force to be the impact of the ball against the player's glove. The reaction to this force is the 29) _____

A) player's grip on the glove.

B) force the glove exerts on the ball.

C) friction of the ground against the player's shoes.

D) muscular effort in the player's arms.

E) none of these

30) A baseball player bats a ball with a force of 1000 N. The reaction force that the ball exerts on the bat is 30) _____

A) less than 1000 N. B) more than 1000 N.

C) 1000 N. D) impossible to determine.

31) A skydiver falls towards the Earth. The attraction of the Earth on the diver pulls the diver down. What is the reaction to this force? 31) _____

A) air resistance the diver encounters while falling

B) water resistance that will soon act upward on the diver

C) the attraction to the planets, stars, and every particle in the universe

D) all of these

E) none of these

32) A car traveling at 100 km/hr strikes an unfortunate bug and splatters it. The force of impact is 32) _____

A) greater on the bug. B) greater on the car. C) the same for both.

33) A Mack truck and a Volkswagen traveling at the same speed have a head-on collision. The vehicle that undergoes the greatest change in velocity will be the 33) _____

A) Volkswagen. B) Mack truck. C) same for both.

34) A karate chop delivers a blow of 3000 N to a board that breaks. The force that acts on the hand during this event is 34) _____

A) zero. B) 1500 N. C) 3000 N. D) 6000 N.

35) An object maintains a constant acceleration unless there is a change in 35) _____

A) its mass. B) the applied force.

C) the air resistance. D) any of the above

36) If an object of constant mass experiences a constant net force, it will have a constant 36) _____

A) velocity.

B) speed.

C) acceleration.

D) position.

E) more than one of the above

37) If more horizontal force is applied to a sliding object than is needed to maintain a constant velocity, 37) _____

A) the object accelerates in the direction of the applied force.

B) the object accelerates opposite the direction of the applied force.

C) the friction force increases.

D) two of the above

E) none of the above

38) The difference between impulse and impact force involves the 38) _____

A) distance the force acts.

B) time the force acts.

C) difference between acceleration and velocity.

D) mass and its effect on resisting a change in momentum.

39) Suppose that a tiny gun made of a strong but very light material fires a bullet that is more massive than the gun itself. For such a weapon 39) _____

A) the target would be safer than the shooter.

B) recoil problems would be lessened.

C) conservation of energy would not hold.

D) conservation of momentum would not hold.

E) both conservation of energy and momentum would not hold.

40) When you jump from an elevated position you usually bend your knees upon reaching the ground. By doing this, you make the time of the impact about 10 times as great as for a stiff-legged landing. In this way the average force your body experiences is 40) _____

A) less than 1/10 as great.
B) more than 1/10 as great.
C) about 1/10 as great.
D) about 10 times as great.

41) A car traveling along the highway needs a certain amount of force exerted on it to stop it in a certain distance. More stopping force is required when the car has 41) _____

A) more mass.
B) more momentum.
C) less stopping distance.
D) all of these
E) none of these

42) The force on an apple hitting the ground depends upon 42) _____

A) the speed of the apple just before it hits.
B) the time of impact with the ground.
C) whether or not the apple bounces.
D) all of these

43) A 1-kg chunk of putty moving at 1 m/s collides with and sticks to a 5-kg bowling ball initially at rest. The bowling ball and putty then move with a momentum of 43) _____

A) 0 kg m/s.
B) 1 kg m/s.
C) 2 kg m/s.
D) 5 kg m/s.
E) more than 5 kg m/s.

44) You're driving down the highway and a bug spatters into your windshield. Which undergoes the greater change in momentum during the time of contact? 44) _____

A) the bug
B) your car
C) both the same

45) An astronaut , floating alone in outer space, throws a baseball. If the ball floats away at a speed of 20 meters per second, the astronaut will 45) _____

A) move in the opposite direction at a speed of 20 m/s.
B) move in the opposite direction, but at a lower speed.
C) move in the opposite direction but at a higher speed.
D) not move as stated in any of the above choices.