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

1) In science, an educated guess is a
   A) theory. B) hypothesis. C) both of these

2) In science, facts
   A) are absolute. B) are more important than theories. C) may change. D) mean very little.

3) In science, a theory is
   A) an educated guess. B) a synthesis of a large body of well-tested knowledge. C) less than a fact. D) unchangeable.

4) Which of the following is a scientific statement?
   A) There are things we will never know about. B) The moon is made of green cheese. C) There are parts of the universe that will never be found by man. D) Matter is filled with undetectable particles. E) none of these

5) A sheet of paper can be withdrawn from under a container of milk without toppling it if the paper is jerked quickly. This best demonstrates that
   A) the milk carton has inertia. B) gravity tends to hold the milk carton secure. C) there is an action-reaction pair of forces. D) the milk carton has no acceleration. E) none of these

6) An object in mechanical equilibrium is an object
   A) having no acceleration. B) at rest. C) moving with constant velocity. D) all of these

7) A 300-kg bear grasping a vertical tree slides down at constant velocity. The friction force between the tree and the bear is
   A) 300 N. B) 30 N. C) 3000 N. D) more than 3000 N.

8) 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
   A) less than 30 m/s but larger than zero. B) more than 30 m/s. C) about 30 m/s. D) zero. E) More information is needed for an estimate.
9) According to Newton’s law of inertia, a railroad train in motion should continue going forever even if its engine is turned off. We never observe this because railroad trains
   A) are much too heavy.
   B) always have forces that oppose their motion.
   C) must go up and down hills.
   D) move too slowly.

10) 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
   A) increase its speed.
   B) follow a straight-line path.
   C) continue to follow a circular path.
   D) revolve in a smaller circle.

11) If no external forces are acting on a moving object, it will
   A) move slower and slower until it finally stops.
   B) continue moving at the same velocity.
   C) continue moving at the same speed.

12) A horse gallops a distance of 10 kilometers in a time of 30 minutes. Its average speed is
   A) 30 km/h.
   B) 15 km/h.
   C) 20 km/h.
   D) 40 km/h.

13) 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
   A) equal to its weight divided by its mass.
   B) equal to the product of its mass times its weight.
   C) zero.
   D) equal to its weight.

14) 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
   A) 40 m/s.
   B) 20 m/s.
   C) 30 m/s.
   D) 10 m/s.

15) Twelve seconds after starting from rest, an object falling freely will have a speed of
   A) 50 m/s.
   B) 100 m/s.
   C) 10 m/s.
   D) more than 100 m/s.

16) If a car increases its velocity from zero to 60 km/h in 10 seconds, its acceleration is
   A) 60 km/h/s.
   B) 3 km/h/s.
   C) 600 km/h/s.
   D) 6 km/h/s.
   E) 10 km/h/s.

17) An apple falls from a tree and hits the ground 5 meters below. It hits the ground with a speed of about
   A) 10 m/s.
   B) 20 m/s.
   C) 15 m/s.
   D) 5 m/s.
   E) not enough information given to estimate
18) It takes 6 seconds for a stone to fall to the bottom of a mine shaft. How deep is the shaft?
   A) about 120 m  B) about 180 m
   C) about 60 m  D) more than 200 m

19) A ball tossed vertically upward rises, reaches its highest point, and then falls back to its starting point. During this time the acceleration of the ball is always
   A) directed downward.  B) in the direction of motion.
   C) opposite its velocity.  D) directed upward.

20) While a car travels around a circular track at a constant speed, its
   A) inertia is zero.  B) velocity is zero.
   C) acceleration is zero.  D) none of the above

21) At one instant a heavy object in air is moving upward at 50 meters per second. One second later its speed is approximately
   A) 60 m/s.  B) 50 m/s.  C) 55 m/s.  D) 40 m/s.

22) A ball is thrown upwards and caught when it comes back down. In the presence of air resistance, the speed with which it is caught is always
   A) less than the speed it had when thrown upwards.
   B) more than the speed it had when thrown upwards.
   C) the same as the speed it had when thrown upwards.
   D) impossible to determine.

23) If a projectile is fired straight up at a speed of 10 m/s, the total time to return to its starting position is about
   A) 2 seconds.  B) 1 second.
   C) 20 seconds.  D) 10 seconds.
   E) not enough information to estimate

24) An apple falls from a tree and hits the ground 5 meters below. It hits the ground with a speed of about
   A) 10 m/s.  B) 20 m/s.
   C) 5 m/s.  D) 15 m/s.
   E) not enough information given to estimate

25) Consider drops of water that leak at a steady rate from a dripping faucet. As the drops fall they
   A) get farther apart.
   B) remain at a relatively fixed distance from one another.
   C) get closer together.

26) A car accelerates from rest for 5 seconds until it reaches a speed of 20 m/s. What is the car's acceleration in meters per second per second?
   A) 2  B) 3  C) 5  D) 4  E) 1
27) When a rock thrown straight upwards gets to the exact top of its path, its
   A) velocity is about 10 m/s and its acceleration is zero.
   B) velocity is about 10 m/s and its acceleration is about 10 meters per second per second.
   C) velocity is zero and its acceleration is about 10 meters per second per second.
   D) velocity is zero and its acceleration is zero.
   E) none of these

28) Someone standing at the edge of a cliff throws one ball straight up and another ball straight down at the same initial speed. Neglecting air resistance, the ball to hit the ground below the cliff with the greater speed will be
   A) the one thrown downward.
   B) the one thrown upward.
   C) neither -- they will both hit with the same speed.

29) A ball is thrown upwards. Neglecting air resistance, what initial upward speed does the ball need to remain in the air for a total time of 10 seconds?
   A) about 110 m/s
   B) about 80 m/s
   C) about 100 m/s
   D) about 60 m/s
   E) about 50 m/s

30) A kilogram is a measure of an object's
   A) weight.
   B) mass.
   C) force.
   D) size.

31) Compared to the mass of a certain object on Earth, the mass of the same object on the moon is
   A) the same.
   B) zero.
   C) six times as much.
   D) one sixth as much.

32) The newton is a unit of
   A) force.
   B) mass.
   C) inertia.
   D) density.

33) In which case would you have the largest mass of gold? If your chunk of gold weighed 1 N on the
   A) moon.
   B) planet Jupiter.
   C) Earth.

34) A player hits a ball with a bat. The action force is the impact of the bat against the ball. The reaction to this force is the
   A) weight of the ball.
   B) grip of the player's hand against the ball.
   C) air resistance on the ball.
   D) weight of the bat.
   E) force that the ball exerts on the bat.

35) As a ball falls, the action force is the pull of Earth on the ball. The reaction force is the
   A) acceleration of the ball.
   B) air resistance acting against the ball.
   C) pull of the ball's mass on the Earth.
   D) none of these
36) Arnold Strongman and Suzie Small each pull very hard on opposite ends of a massless rope in a tug-of-war. The greater force on the rope is exerted by
   A) Arnold, of course.
   B) Suzie, surprisingly.
   C) both the same, interestingly enough.

37) Earth pulls on the moon. Similarly the moon pulls on Earth, evidence that
   A) larger objects pull harder.
   B) these two pulls comprise an action-reaction pair.
   C) the moon is smaller so its pull is smaller.
   D) Earth is larger so its pull is larger.

38) 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
   A) Mack truck.
   B) Volkswagen.
   C) same for both.

39) A piece of rope is pulled by two people in a tug-of-war. Each pulls with 400 N of force. What is the tension in the rope?
   A) 800 N
   B) 600 N
   C) 400 N
   D) zero
   E) none of these

40) Two factors that greatly affect air resistance on falling objects are the
   A) size and speed of the object.
   B) size and mass of the object.
   C) size and weight of the object.
Answer Key
Testname: UNTITLED1

1) B
2) C
3) B
4) B
5) A
6) D
7) C
8) C
9) B
10) B
11) B
12) C
13) C
14) B
15) D
16) D
17) A
18) B
19) A
20) D
21) D
22) A
23) A
24) A
25) A
26) D
27) C
28) C
29) E
30) B
31) A
32) A
33) A
34) E
35) C
36) C
37) B
38) B
39) C
40) A