PHYS 117- Exam I

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

____ 1. Car A travels from milepost 343 to milepost 349 in 5 minutes. Car B travels from milepost 493 to milepost 499 in 5 minutes. Which car has the greater average speed?
   a. Car A
   b. Car B
   c. Their average speeds are the same.
   d. There is not enough information to be able to say.

____ 2. Pat and Chris both travel from Los Angeles to New York along the same route. Pat rides a bicycle while Chris drives a fancy sports car. Unfortunately, Chris's car breaks down in Phoenix for over a week, causing the two to arrive in New York at exactly the same time. Which statement is true?
   a. Pat and Chris had the same average speed.
   b. Chris had the higher average speed.
   c. Pat had the higher average speed.
   d. Their average speeds cannot be compared.

____ 3. Which of the following strobe diagrams corresponds to the situation where a ball rolls from left to right and continually speeds up?
   a. ○ ○ ○ ○ ○ ○ ○
   b. ○ ○ ○ ○ ○
   c. ○ ○ ○ ○ ○ ○ ○ ○ ○
   d. ○ ○ ○ ○ ○ ○ ○ ○

____ 4. Which statement best describes the motion of the ball shown in the strobe diagram below? (Assume the ball moves from left to right.) The ball is
   ○. . . . . .○. . . . . .○. . . . . .○. . . . . .○. . . .○. .○○
   a. moving with constant speed.
   b. speeding up.
   c. accelerating.
   d. stopped

____ 5. We claimed that if the air resistance could be neglected, all objects on the moon would fall at
   a. the same constant speed.
   b. an increasing acceleration.
   c. the same constant acceleration.
   d. a decreasing acceleration.

____ 6. If we ignore air resistance, the acceleration of an object that is falling downward is constant. How do you suppose the acceleration would change if we do *not* ignore air resistance?
   a. The acceleration increases.
   b. The acceleration does not change.
   c. The acceleration decreases.
   d. Not enough information to say.

____ 7. A ball is thrown straight up into the air. If we do not ignore air resistance, the acceleration of the ball as it is traveling downward is
   a. 9.8 m/s^2.
   b. greater than 9.8 m/s^2.
   c. less than 9.8 m/s^2.
   d. zero.

____ 8. If the mass of an object in free fall is doubled, its acceleration
   a. doubles.
   b. increases by a factor of four.
   c. stays the same.
   d. is cut in half.

____ 9. The motion of a ball or cylinder rolling down a ramp is one with
   a. constant speed.
   b. increasing acceleration.
   c. constant acceleration.
   d. decreasing acceleration.

____ 10. If a ball is dropped from rest, it will fall 5 m during the first second. How far will it fall during the first 2 s?
   a. 10 m
   b. 15 m
   c. 20 m
   d. 25 m

____ 11. A golf ball is thrown vertically upward with a speed of 30 m/s. How long does it take to get to the top of its path?
   a. 1 s
   b. 2 s
   c. 3 s
   d. 4 s

____ 12. If we use plus and minus signs to indicate the directions of velocity and acceleration, in which of the following situations does the object speed up?
   a. positive velocity and negative acceleration
   b. negative velocity and positive acceleration
   c. positive velocity and zero acceleration
   d. negative velocity and negative acceleration

____ 13. If an object moves with a constant velocity, we can conclude that
   a. it is moving toward its natural place.
   b. there are no forces acting on it.
   c. there is no unbalanced (net) force acting on it.
   d. it has a very large inertia.

____ 14. If the force of friction on a child's wagon is 25 N, how much force must be applied to maintain a constant, non-zero velocity?
   a. 25 N
   b. 20 N
   c. 10 N
   d. zero

____ 15. There are three forces acting on an object: 6 N to the left, 5 N to the right, and 3 N to the left. What is the net force acting on the object?
   a. 4 N
   b. 4 N left
   c. 4 N right
   d. 6 N left

____ 16. What is the magnitude of the net force acting on an object which is under the influence of a 3 N force acting south and a 4 N force acting east?
   a. 3 N
   b. 4 N
   c. 5 N

d. 7 N

____ 17. Forces of 4 N and 6 N act on an object. What is the minimum value for the sum of these two forces?
a. zero
b. 2 N
c. 4 N
d. 10 N

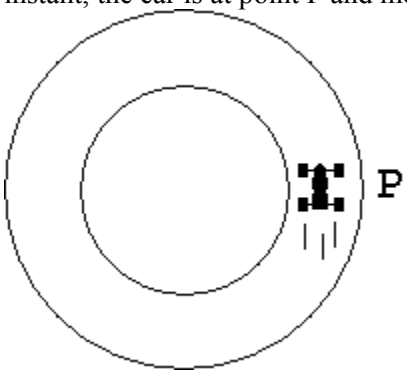
____ 18. What net force is needed to accelerate a 60-kg ice skater at 2 m/s^2?
a. zero
b. 30 N
c. 60 N
d. 120 N

____ 19. What acceleration is produced by a force of 100 N acting on a mass of 10 kg if its velocity is 20 m/s and the frictional force is 30 N?
a. 10 m/s/s
b. 9 m/s/s
c. 8 m/s/s
d. 7 m/s/s

____ 20. A ball falling from a great height will reach terminal speed when its _____ goes to zero.
a. inertia
b. net force
c. weight
d. speed

____ 21. Which of the following is the third-law force that accompanies the force that an apple exerts on a tree? It is the force that the
a. earth exerts on the apple.
b. apple exerts on the earth.
c. tree exerts on the apple.
d. air exerts on the apple.

Figure 4-1
A racecar is moving counterclockwise on a circular path as shown in the diagram above. Imagine that at this instant, the car is at point P and moving at a speed of 100 mph.



____ 22. Refer to **Figure 4-1**. In what direction does the net force point?
a. ↑
b. ↓
c. →
d. ←

____ 23. Refer to **Figure 4-1**. In what direction does the acceleration point?

a. ↑
b. ↓
c. →
d. ←

____ 24. A car is traveling south at 30 m/s. Later it is observed traveling west at 30 m/s. What is the car's change in velocity?
a. 42 m/s north
b. 42 m/s west
c. 42 m/s southwest
d. 42 m/s northwest

____ 25. A cyclist turns a corner with a radius of 50 m at a speed of 20 m/s. What is the magnitude of the cyclist's acceleration?
a. 0.4 m/s^2
b. 8 m/s^2
c. 10 m/s^2
d. 1000 m/s^2

Scenario 4-1
A gun is held horizontally and fired. At the same time the bullet leaves the gun's barrel an identical bullet is dropped from the same height. Neglect air resistance.

____ 26. Refer to **Scenario 4-1**. Which bullet will hit the ground with the greatest velocity?
a. The bullet that was fired.
b. The bullet that was dropped.
c. It will be a tie.
d. The question can't be answered with the information given.

____ 27. A red ball is thrown straight down from the edge of a tall cliff with a speed of 30 m/s. At the same time a green ball is thrown straight up with the same speed. If the green ball travels up, stops, and then drops to the bottom of the cliff, how many seconds later than the red ball will it land?
a. 3 s
b. 6 s
c. 10 s
d. There is not enough information to say.

____ 28. A red ball is thrown straight down from the edge of a tall cliff with a speed of 30 m/s. At the same time a green ball is thrown straight up with the same speed. If the green ball travels up, stops, and then drops to the bottom of the cliff, which ball (if either) will be traveling fastest when it reaches the ground below?
a. the red ball
b. the green ball
c. Both balls will be traveling just as fast.
d. There is not enough information to say.

____ 29. A football quarterback throws a long pass toward the end zone. Assume that you can neglect the effects of air resistance. At the instant the ball reaches its highest point, what is the acceleration of the ball?
a. zero
b. 10 m/s/s downward
c. 10 m/s/s upward
d. There is not enough information to say.

____ 30. A baseball is hit with a vertical speed of 10 m/s and a horizontal speed of 30 m/s. How long will the ball remain in the air?
a. 1 s

b. 2 s
c. 3 s
d. 6 s

____ 31. A rock is thrown off a tall cliff with a vertical speed of 25 m/s upward and a horizontal speed of 30 m/s. What will these speeds be 3 s later?
a. 25 m/s upward and 30 m/s horizontal
b. 5 m/s downward and 30 m/s horizontal
c. 25 m/s upward and 0 m/s horizontal
d. 30 m/s downward and 60 m/s horizontal

____ 32. Which of the following statements about the moon is <u>not</u> correct?
a. The acceleration due to gravity on the moon is weaker than on the earth.
b. The earth's gravitational pull on the moon equals the moon's gravitational pull on earth.
c. There is a net force acting on the moon.
d. The moon is not accelerating.

____ 33. The size of the gravitational force that the earth exerts on the moon is _____ that the moon exerts on the earth.
a. greater than
b. the same as
c. smaller than

____ 34. The gravitational attraction of the sun for the earth is _____ that of the earth for the sun.
a. the same as
b. greater than
c. smaller than

____ 35. A future space traveler, Skip Parsec, lands on the planet MSU3, which has the same mass as Earth but twice the radius. If Skip weighs 800 newtons on Earth's surface, how much does he weigh on MSU3's surface?
a. 50 N
b. 100 N
c. 200 N
d. 400 N

____ 36. The gravitational force between two metal spheres in outer space is 1800 N. How large would the force be if the two spheres were twice as far apart?
a. 7200 N
b. 3600 N
c. 900 N
d. 450 N

____ 37. The numerical value of G, the gravitational constant, was determined
a. from knowledge of the earth's mass.
b. from the law of universal gravitation and the value of the acceleration due to gravity.
c. from the value of the moon's acceleration.
d. by measuring the force between masses in the laboratory.

____ 38. Which of the following would <u>not</u> cause the gravitational force on an object near the surface of the earth to increase?
a. an ore deposit just under the surface
b. a lower elevation
c. an increase in its mass
d. a horizontal velocity

____ 39. Which of the following celestial bodies has the greatest influence on the earth's tides?
a. moon
b. sun

c. Venus
d. Jupiter

____ 40. What is the magnitude of the earth's gravitational field at a distance equal to twice the earth's radius?
a. 20 N/kg
b. 10 N/kg
c. 5 N/kg
d. 2.5 N/kg

____ 41. If the mass of Earth were suddenly and magically reduced to half its present value, the magnitude of Earth's acceleration about the Sun would
a. reduce by a factor of 4
b. reduce by a factor of 2
c. remain the same
d. increase by a factor of 2

____ 42. The acceleration due to gravity on Titan, Saturn's largest moon, is about 1.4 m/s^2. What would a 60-kg scientific instrument weigh on Titan?
a. 43 N
b. 60 N
c. 84 N
d. 600 N

____ 43. Which has the greater momentum, a heavy truck at rest or a moving roller skate?
a. Cannot tell from the information given.
b. The heavy truck.
c. The roller skate.
d. They are equal.

____ 44. Newton's second law can be rearranged to show that the _____ is equal to the _____.
a. momentum ... impulse
b. change in momentum ... change in impulse
c. change in momentum ... impulse
d. momentum ... change in impulse

____ 45. The stunt person who is shot by a bandit and falls backwards from the balcony into an air bag rather than onto the ground will not be hurt because the
a. momentum change is less for the air bag.
b. momentum is less for the air bag.
c. impulse is less for the air bag.
d. increased stopping time means a smaller stopping force.

____ 46. Why is skiing into a wall of deep powder less hazardous to your health than skiing into a wall of bricks? Assume in both cases that you have the same initial speed and come to a complete stop.
a. The change in momentum is less in powder.
b. The impulse is less in powder.
c. The increased stopping time in powder means a smaller stopping force.
d. The decreased stopping time in powder means a larger stopping force.

____ 47. A tailgunner jumped from a Lancaster bomber but did not break any bones or die because he fell into the branches of a tree and then into a snow bank. Physics explains this because
a. the change in momentum was less than hitting the ground directly.
b. the impulse in less in trees and snow than ground.
c. the increased stopping time in the tree meant a smaller stopping force.
d. the decreased stopping time in the tree meant a smaller stopping force.

____ 48. What change in momentum occurs when a force of 20 N acts for 4 s?
a. 5 kg·m/s

b. 16 kg·m/s
c. 24 kg·m/s
d. 80 kg·m/s

____ 49. What impulse is need to stop a 1200-kg car traveling at 20 m/s?
a. 60 N·s
b. 240 N·s
c. 1200 N·s
d. 24,000 N·s

____ 50. If rockets are fired from an airplane in the forward direction, the momentum of the airplane will
a. decrease.
b. be unchanged.
c. increase.
d. There is not enough information to say.

PHYS 117- Exam I
Answer Section

MULTIPLE CHOICE

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

42. ANS: C DIF: 1
43. ANS: C DIF: 1
44. ANS: C DIF: 1
45. ANS: D DIF: 1
46. ANS: C DIF: 1
47. ANS: C DIF: 1
48. ANS: D DIF: 1
49. ANS: D DIF: 1
50. ANS: A DIF: 1