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Physics 117 Exam I, Cover Page

A) GENERAL INSTRUCTIONS

This exam consists of 60 questions worth two points each for a maximum of 120 points.

ALL ANSWERS MUST BE ENTERED INTO THE NCS ANSWER SHEET BY MEANS OF HEAVY BLACK MARKS WITH A NUMBER 2 PENCIL. (Only a pencil mark will work; the optical scanner cannot read inked answers no matter what color or how dark.)

The questions are numbered from 1 to 60: make sure you enter your single letter answer into the answer line with the same number as the question you are answering.

Only the computer readable NCS answer sheet will be handed in. Keep this exam for you future use.

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B) PREPARE YOUR ANSWER SHEET IN ADVANCE:

1) SIGN YOUR PERSONAL SIGNATURE INTO THE TOP MARGIN ABOVE THE NAME BOX of the NCS SHEET.
2) PRINT YOUR NAME, **FAMILY NAME FIRST**, INTO THE BOXES PROVIDED AND DARKEN THE CIRCLE FOR THE CORRESPONDING LETTER BELOW EACH BOX
3) INSERT YOUR STUDENT ID NUMBER UNDER "IDENTIFICATION NUMBER" AND DARKEN THE CORRESPONDING CIRCLES BELOW EACH NUMBER.
4) MAKE NO STRAY MARKS ON THE ANSWER SHEET AND ERASE CLEANLY IF NECESSARY.

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C) GENERAL ADVICE

Many students will not have time to finish this exam if they proceed at a leisurely pace. Therefore it is probably advantageous to earmark time-consuming items for later attention and skip forward to questions that can be answered more easily. No subtractions will be made for wrong answers, so that last minute best guessing is probably an advantageous strategy.

IF YOU NEED HELP, ASK!.....AND ASK EARLY RATHER THAN LATE.

ALSO FOR FAIRNESS' SAKE, PLEASE STOP WRITING WHEN THE EXAM ENDS. A PENALTY OF 8% OF THE RAW SCORE MAY BE IMPOSED UPON STUDENTS WHO TRY TO TAKE UNFAIR ADVANTAGE OF THE COLLECTION PROCESS BY CONTINUING TO WRITE AFTER THE END HAS BEEN ANNOUNCED.

Multiple Choice

Insert the letter of the choice that best completes the statement or answers the question into your NCS answer sheet.

1. When you calculate the speed (in meters per second) in an experiment, your calculator display reads 12.666667. If you are asked to record your result to three significant figures, you should write
a. 12.6 m/s
b. 12.7 m/s
c. 12.666 m/s
d. 12.667 m/s
e. None of the above, because this result already has eight significant figures.

2. Given that the circumference of the moon's orbit is 4.0×10^4 km, which calculation shows the correct conversion of a speed of 1 orbit per 28.3 days to the same speed in m/s?
a. (1orbit/28.3day)(4.0X10^{4}km/orbit)(1day/24hr)(3600sec/1hr)(10^{3}m/1km)
b. (1orbit/28.3day) (4.0X10^{4}km/orbit)(24hr/1day)(1hr/3600sec)(1km/10^{3}m)
c. (1orbit/28.3day) (1orbit/4.0X10^{4}km)(1day/24hr)(1hr/3600sec)(10^{3}m/1km)
d. (1orbit/28.3day) (4.0X10^{4}km/orbit)(1day/24hr)(1hr/3600sec)(10^{3}m/1km)
e. (1orbit/28.3day) (4.0X10^{4}km/orbit)(1day/24hr)(1hr/3600sec)(1km/10^{3}m)

3. A speed of 50 m/s is equal to km/hr.
a. 8.3×10^{-4}
b. 1.4×10^{-2}
c. 1.4
d. 1.8×10^2
e. 1.1×10^4

4. A train covers 75 miles between 1 p.m. and 5 p.m. What was its speed at 3 p.m.?
a. 15 mph
b. More than 15 mph
c. Less than 15 mph
d. Not enough information is given to be able to say.
e. There is a definite answer, but none of the above is correct.

5. Car A travels from milepost 323 to milepost 349 in 5 minutes. Car B travels from milepost 493 to milepost 498 in 1 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.
e. None of the above answers is correct.

6. The instantaneous speed of an object is defined to be the
a. distance it travels divided by the time it takes.
b. distance it travels multiplied by the time it takes.
c. average speed determined over an infinitesimally small time interval.
d. value of the average speed at the midpoint of the time interval.
e. The minimum speed plus one half the difference between the maximum speed and the minimum speed.

7. The average acceleration of an object during a certain time interval is defined to be
a. the distance it travels divided by the length of the time interval.
b. the change in its speed divided by the length of the time interval.
c. the change in its velocity divided by the length of the time interval.
d. the mean value of the maximum and the minimum accelerations during the time interval.
e. None of the above. Acceleration is about the rate of change of velocity.

8. An object is accelerating
a. only when its speed changes.
b. only when its direction changes.
c. whenever its speed or direction changes.
d. if its velocity is large.
e. even when its velocity is constant.

9. A pitcher requires about 0.08 second to throw a baseball. If the ball leaves his hand with a speed of 32 m/s, what is its acceleration?
a. 4 m/s/s
b. 25.6 m/s/s
c. 40 m/s/s
d. 400m/s/
e. 400 m/s/s

10. A child traveling 7 m/s on a sled passes her younger brother. If her acceleration on the sledding hill is 3 m/s^2 and constant, how fast is she traveling when she passes her older brother 3 s later?
a. 7 m/s
b. 10 m/s
c. 13 m/s
d. 16 m/s
e. 24m/s

11. In the strobe diagram below the ball is moving from left to right. Which statement best describes the motion? The ball is

a. moving with a constant speed.
b. speeding up.
c. slowing down.
d. not accelerating.
e. accelerating, not because of its speed, but because its direction is changing.

12. A ping-pong ball and a golf ball have approximately the same size but very different masses. Which hits the ground first if you drop them simultaneously while standing on the moon (which has no atmosphere)?
a. the ping-pong ball
b. the golf ball
c. They hit simultaneously.
d. We are not able to predict the results.
e. None of the above because it depends upon the strength of gravity there which was not provided.

13. A ball is thrown straight up into the air with an unspecified velocity. If we do not ignore air resistance, the acceleration of the ball as it is traveling upward has a magnitude
a. equal to 9.8 m/s^2.
b. greater than 9.8 m/s^2.
c. less than 9.8 m/s^2.
d. zero.
e. None of the above, because the acceleration depends upon the speed.

14. The motion of a block sliding down a frictionless ramp can be described as motion with
a. a constant speed.
b. a constant acceleration greater than 10 m/s/s.
c. a constant acceleration less than 10 m/s/s.
d. a constant speed that depends on the steepness of the ramp.
e. None of the above, since neither the speed nor the acceleration is constant.

15. Suppose that you look out a tenth-floor window and see a ball falling at 7 m/s. How fast will this ball be falling 2.5 s later?
a. 7 m/s
b. 9.5 m/s
c. 17 m/s
d. 27 m/s
e. 32 m/s

16. You throw a ball straight up at 50 m/s. How many seconds elapse before it is traveling downward at 10 m/s?
a. 2 s
b. 3 s
c. 4 s
d. 5 s
e. 6 s

17. 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
e. zero velocity and zero acceleration

18. A car traveling westward at 20 m/s turns around and travels eastward at 13 m/s. If this takes place in 7 s, what is the average acceleration of the car?
a. 1 m/s^2 west
b. 4.7 m/s^2 west
c. 7 m/s^2 west
d. 7 m/s^2 east
e. None of the above.

19. If there is no net force acting on an object, its motion will be one with acceleration.
a. zero
b. a constant, non-zero
c. an increasing
d. a decreasing
e. Not enough information to say.

20. If an object moves in a straight line with a constant speed, we can conclude that
a. the object has inertia.
b. there are no forces acting on the object.
c. there must be at least two forces acting on the object.
d. there can be no more than two forces acting on the object.
e. None of the above.

21. The motion of a block sliding across a horizontal, frictionless surface can be described as one with
a. a decreasing speed.
b. an increasing speed.
c. a constant speed.
d. a constant, non-zero acceleration.
e. None of the above.

22. What is the magnitude of the net force acting on an object which is under the influence of a 8 N force acting south and a 6 N force acting east?
a. 2 N
b. 6 N
c. 8 N
d. 10 N
e None of the above.

23. A subway train is moving with constant velocity along a level section of track. The net force on the first subway car is _____ the net force on the last subway car.
a. Finite, butequal and opposite to
b. much greater than
c. slightly greater than
d. less than
e. None of the above.

24. Forces of 7 N and 11 N act on an object. What is the minimum value for the sum of these two forces?
a. zero
b. 4 N
c. 7 N
d. 11 N
e. 18 N

25. You are applying a 400-newton force to a freezer full of chocolate chip ice cream in an attempt to move it across the basement, but it will not budge. The weight of the freezer (including ice cream) is 1000 N, and $\mu = 0.6$. The frictional force exerted by the floor on the freezer is
a. 400 N
b. greater than 400 N but less than 600 N
c. greater than 600 N but less than 1000 N
d. 600 N
e. 1000 N.

26. What is the mass, most nearly, of a cart that has an acceleration of 3 m/s/s when a net force of 21,000 N is applied to it?
a. 24,000 kg
b. 21,000 kg
c. 7000 kg
d. 700 kg
e. None of the above.

27. What acceleration, most nearly, is produced by a force of 120 N acting on a mass of 90 kg if its velocity is 12 m/s and the frictional force is 30 N?
a. 13 m/s/s
b. 10 m/s/s
c. 8 m/s/s
d. 1.3 m/s/s
e. 1 m/s/s

28. Which of the following is not a vector quantity?
a. force
b. acceleration
c. weight
d. mass
e. velocity

29. An astronaut on a strange planet has a mass of 60 kg and a weight of 100 N. What is the value of the acceleration due to gravity on this planet?
a. 0.16 m/s/s
b. 0.60 m/s/s
c. 1.67 m/s/s
d. 6.0 m/s/s
e. None of the above.

30. A ball with a weight of 20 N is thrown vertically upward. What are the size and direction of the force on the ball just as it reaches the top of its path?
a. zero
b. 10 N upward
c. 10 N downward
d. 20 N upward
e. None of the above.

31. A ball falling from a great height will reach terminal speed when its goes to zero.
a. inertia
b. gravity force
c. weight
d. speed
e. acceleration

32. When a snowflake falls, it quickly reaches a terminal velocity. This happens because
a. the mass of the snowflake is too small for gravity to have any effect.
b. the net force acting on it is zero.
c. the snowflake has no weight.
d. the mass of the snowflake is smaller than its weight.
e. None of the above.

33. Two steel balls have the same size and shape, but one is hollow. They are dropped in air and their terminal speeds are measured. Which of the following statements is correct?
a. The hollow ball has a smaller terminal speed because it requires a smaller air resistance to cancel the gravitational force on it.
b. The hollow ball has a larger terminal speed because it requires a smaller air resistance to cancel the gravitational force on it.
c. The terminal speeds are the same because the acceleration of gravity doesn't depend on mass.
d. The solid ball has the smaller terminal speed, because its inertia is larger.
e. None of the above can be asserted with certainty.

34. You leap from a bridge with a bungee cord tied around your ankles. As you approach the river below, the bungee cord begins to stretch and you begin to slow down. The force of the cord on your ankles to slow you is _____ the force of your ankles on the cord to stretch it ,_____
a. less than..... and increasing
b. equal to.....exactly
c. greater than.....and decreasing
d. less than.....and decreasing
e. None of the above statements is true.

35. You leap from a bridge with a bungee cord tied around your ankles. As you approach the river below, the bungee cord begins to stretch and you begin to slow down. The force of the cord on your ankles to slow you is _____ your weight and is _____.
a. less than.....increasing
b. equal to.....exactly
c. greater than.....decreasing
d. Less than.....decreasing
e None of the above statements is true.

36. Terry and Chris pull hand-over-hand on opposite ends of a rope while standing on a frictionless frozen pond. Terry's mass is 40 kg and Chris's mass is 20 kg. If Terry's acceleration is 2 m/s^2, what is Chris's acceleration?
a. 1 m/s^2
b. 2 m/s^2
c. 4 m/s^2
d. None of the above.

37. You are riding an elevator from your tenth-floor apartment to the parking garage in the basement. As you approach the garage, the elevator begins to slow. The net force acting on you is
a. equal to your weight
b. directed upward
c. directed downward
d. zero
e. It is not possible to day from the information given.

38. If you stand on a spring scale in your bathroom at home, it reads 400 N, which means your mass is 40 kg. If instead you stand on the scale while accelerating at 2 m/s^2 upward in an elevator, how many Newtons would it read?
a. 120 N
b. 480 N
c. 600 N
d. 720 N
e. None of the above.

39. Your instructor rides on a merry-go-round turning at a constant rate. In which direction does the net force on your instructor point?
a. tangent to the circular path
b. toward the center
c. away from the center
d. down
e. None of the above.

40. In straight line motion the
a. acceleration is parallel (or antiparallel) to the velocity.
b. acceleration is perpendicular to the velocity.
c. acceleration is vertical, while the velocity can be in any direction.
d. acceleration is vertical and the velocity is horizontal.
e. None of the above statements is valid for straight line motion.

41. In uniform circular motion
a. the acceleration is parallel (or antiparallel) to the velocity.
b. the acceleration is perpendicular to the velocity.
c. the acceleration is horizontal, while the velocity can be in any direction.
d. both the the acceleration and the velocity are horizontal.
e. None of the above is true.

42. A migrating bird is initially flying south at 9 m/s. To avoid hitting a high-rise building, the bird veers and changes its velocity to 12 m/s east over a period of 2 s. What is the magnitude of the bird's average acceleration during this 2-s interval?
a. 3.0 m/s^2
b. 7.5 m/s^2
c. 9.0 m/s^2
d. 21.0 m/s^2
e. None of the above is within 10% of the correct answer.

43. A fox is chasing a bunny. The bunny is initially hopping east at 7 m/s when it first sees the fox. Over the next half second, the bunny changes its velocity to west at 14 m/s and escapes. What was the magnitude of the bunny's average acceleration during this half-second interval?
a. 0 m/s^2
b. 7 m/s^2
c. 14 m/s^2
d. 21 m/s^2
e. None of the above is within 10% of the correct answer.

44. By what factor does the centripetal acceleration change if a car goes around a corner three times as fast?
a. 0.33
b. It stays the same.
c. 3
d. 6
e 9

45. What centripetal acceleration is required to follow a circular path with a radius of 45 m at a speed of 30 m/s?
a. 20 m/s/s
b. 30 m/s/s
c. 45 m/s/s
d. 60 m/s/s
e. 67.5 m/s/s

46. A 60-kg person on a merry-go-round is traveling without sliding in a circle with a radius of 4 m at a speed of 6 m/s. What is the magnitude of the net force experienced by this person?
a. zero
b. 2.67 N
c. 9 N
d. 160 N
e. 540 N

Scenario 47-48
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.

47. Refer to **Scenario 47-48**. 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, because both fall at the same rate
d. The question can't be answered with the information given.

48. Refer to **Scenario 47-48**. If the bullets were not identical, but rather the dropped bullet had twice the mass of the other, which bullet would hit the ground first?
a. The bullet that was fired.
b. The bullet that was dropped.
c. It will be a tie, because both bullets fall at the same rate.
d. The question can't be answered with the information given.

49. A red ball is thrown straight down from the edge of a tall cliff with a speed of 20 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 does the green ball arrive at the bottom of the cliff?

a. 1 second
b. 2 seconds
c. 4 seconds
d. 8 seconds
e. Because the height of the cliff is unspecified, there is not enough information to say.

50. Which of the following statements best characterizes projectile motion?

a. The horizontal and vertical motions are independent.
b. The force on the projectile is constant throughout the flight.
c. The acceleration of the projectile is constant throughout the flight.
d. The horizontal velocity is constant.
e. All of the above statements are true.
f. None of the above statements is true

51. In projectile motion the

a. acceleration is parallel (or antiparallel) to the velocity.
b. acceleration is perpendicular to the velocity.
c. acceleration is vertical, while the velocity can be in any direction.
d. acceleration is vertical and the velocity is horizontal.
e. acceleration is zero at the top of the trajectory.

52. A baseball player throws a ball from left field toward home plate. Assume that you can neglect the effects of air resistance. At the instant the ball reaches its highest point, what is the direction of the ball's acceleration?

a. Up
b. Down
c. Horizontal
d. Because the acceleration is zero there, its direction is not well defined.
d. There is not enough information to say.

53. A rock is thrown off a tall cliff with a vertical speed of 30 m/s upward and a horizontal speed of 25 m/s. If the rock lands 8 s later, how far from the base of the cliff will it land?

a. 25 m
b. 30 m
c. 100 m
d. 200 m
e. 240 m

54. Angel Falls in southeastern Venezuela is the highest uninterrupted waterfall in the world, dropping 979 m (3212 ft). Ignoring air resistance, it would take 14 s for the water to fall from the lip of the falls to the river below. If the water lands 40 m from the base of the vertical cliff, what was its horizontal speed at the top?

a. 2.9 m/s
b. 3.6 m/s
c. 14 m/s
d. 50 m/s

The following problems may require more calculation than those above. Choose the single best answer for each question, and insert its letter into your NCS answer sheet.

55. You decide to launch a ball vertically so that a friend located 80 m above you can catch it. What is the minimum launch speed you can use?

a. 4 m/s
b. 8 m/s
c. 20 m/s
d. 40 m/s
e. None of the above is within 10% of the correct answer.

56. A car initially traveling westward at 16 m/s has a constant acceleration of 2 m/s^2 eastward. How far has the car traveled after 16 s?

a. 768 m
b. 512 m
c. 256 m
d. 0 m
e. None of the above is within 10% of the correct answer.

57. A 40-kg crate is being pushed across a horizontal floor by a horizontal applied force of 240 N. If the coefficient of sliding friction is 0.5, and the speed is 2m/s at time t = 0, how far does the crate move in the next ten seconds??

a. 20 m
b. 50 m
c. 70 m
d. 100 m
e. 620 m
f. None of the above is within 10% of the correct answer.

58. A man stands on a large platform merry-go-round turning at a constant angular speed, $\omega = 0.5$ radians/second. The normal force between his shoes and the platform is equal to his weight, 500 N, and the coefficient of static friction is $\mu = 0.4$. How far from the center can he stand without sliding off the platform, most nearly ?

a. 1 m
b. 2 m
c. 4 m
d. 8 m
e. 16 m
f. None of the above is within 10% of the correct answer.

59. A baseball is hit with a speed of 40 m/s at an angle 30° upward. How far has the ball traveled horizontally when it reaches its highest point, most nearly?

a. 30 m
b. 50 m
c. 70 m
d. 90 m
e. 110 m
f. None of the above is within 10% of the correct answer.

60. If Newton had attempted to launch his apple horizontally in order to make it travel in a circle around the Earth, what horizontal speed would it have to have to stay at the same small height above the earth's (presumed smooth for the present discussion) surface? (Take the radius of the earth to be $6.4X10^6$ m)

a. $6X10^2$ m/s
b. $8X10^3$ m/s
c. $6X10^4$ m/s
d. $8X\ 10^5$ m/s
e. $6X\ 10^6$ m/s
f. None of the above is within 10% of the correct answer.

END of EXAM