Name: _____ **Class:** _____ **Date:** _____ **ID: A**

AP Physics C Fall Final Web Review

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. On a position versus time graph, the slope of the straight line joining two points on the plotted curve that are separated in time by the interval Δt, is which of the following quantities?
   a. average steepness
   b. average velocity
   c. instantaneous velocity
   d. average acceleration
   e. instantaneous acceleration

____ 2. A 50-g ball traveling at 25.0 m/s is bounced off a brick wall and rebounds at 22.0 m/s. A high-speed camera records this event. If the ball is in contact with the wall for 3.50 ms, what is the average acceleration of the ball during this time interval?
   a. 13 400 m/s^2
   b. 6 720 m/s^2
   c. 857 m/s^2
   d. 20 m/s^2
   e. 15 m/s^2

____ 3. An object is dropped from a height. Once it is moving, which of the following statements is true, at least at one point?
   a. Its velocity is more than its acceleration.
   b. Its velocity is less than its acceleration.
   c. Its velocity is the same as its acceleration.
   d. Its velocity is never equal to its acceleration.
   e. Its velocity is constant.

____ 4. A strobe photograph shows equally spaced images of a car moving along a straight road. If the time intervals between images is constant, which of the following cannot be positive?
   a. the speed of the car
   b. the average velocity of the car
   c. the acceleration of the car
   d. the direction of motion of the car
   e. the instantaneous velocity of the car

____ 5. A strobe photograph of a car moving along a straight road shows the interval between each successive image to be diminishing. If the direction of motion of the car is taken as positive, which of the following are negative?
   a. the speed of the car
   b. the average velocity of the car
   c. the average acceleration of the car
   d. the instantaneous velocity of the car
   e. all of the above

____ 6. A ball is pushed with an initial velocity of 4.0 m/s. The ball rolls down a hill with a constant acceleration of 1.6 m/s^2. The ball reaches the bottom of the hill in 8.0 s. What is the ball's velocity at the bottom of the hill?
   a. 10 m/s
   b. 12 m/s
   c. 16 m/s
   d. 17 m/s
   e. 19 m/s

____ 7. A bird, accelerating from rest at a constant rate, experiences a displacement of 28 m in 11 s. What is the final velocity after 11 s?
   a. 1.8 m/s
   b. 3.2 m/s
   c. 5.1 m/s
   d. 6.7 m/s
   e. zero

____ 8. If the displacement of an object is given in SI units by $\Delta x = -3\ t + 4\ t^2$, at $t = 2$ s its velocity and acceleration are, respectively:
   a. positive, positive.
   b. positive, negative.
   c. negative, negative.
   d. negative, positive.
   e. negative, zero.

____ 9. In the case of constant acceleration, the average velocity equals the instantaneous velocity:
   a. at the beginning of the time interval.
   b. at the end of the time interval.
   c. half-way through the time interval.
   d. three-fourths of the way through the time interval.
   e. one-fourth of the way through the time interval.

____ 10. A rock is thrown straight down with an initial velocity of 14.5 m/s from a cliff. What is the rock's displacement after 2.0 s? (Acceleration due to gravity is 9.80 m/s^2.)
   a. 28 m
   b. 49 m
   c. 55 m
   d. 64 m
   e. 72 m

____ 11. A rock is thrown straight up with an initial velocity of 24.5 m/s. What maximum height will the rock reach before starting to fall downward? (Take acceleration due to gravity as 9.80 m/s^2.)
   a. 9.80 m
   b. 19.6 m
   c. 24.5 m
   d. 30.6 m
   e. 35.3 m

____ 12. A hiker walks 200 m west and then walks 100 m north. In what direction is her resulting displacement?
a. north
b. west
c. northwest
d. east
e. None of the answers is correct.

____ 13. Arvin the Ant is on a picnic table. He travels 30 cm eastward, then 25 cm northward, and finally 15 cm westward. What is the magnitude of Arvin's net displacement?
a. 70 cm
b. 57 cm
c. 52 cm
d. 29 cm
e. 18 cm

____ 14. A jogger runs halfway around a circular path with a radius of 60 m. What, respectively, are the magnitude of the displacement and the distance jogged?
a. 60 m, 188 m
b. 120 m, 188 m
c. 0 m, 377 m
d. 120 m, 377 m
e. 60 m, 377 m

____ 15. John throws a baseball from the outfield from shoulder height, at an initial velocity of 29.4 m/s at an initial angle of 30.0° with respect to the horizontal. The ball is in its trajectory for a total interval of 3.00 s before the third baseman catches it at an equal shoulder-height level. (Assume air resistance negligible.) What is the ball's horizontal displacement?
a. 76.4 m
b. 38.2 m
c. 57.3 m
d. 66.7 m
e. zero

____ 16. A baseball thrown from the outfield is released from shoulder height at an initial velocity of 29.4 m/s at an initial angle of 30.0° with respect to the horizontal. If it is in its trajectory for a total of 3.00 s before being caught by the third baseman at an equal shoulder-height level, what is the ball's net vertical displacement during its 3-s trajectory?
a. 11.0 m
b. 9.80 m
c. 22.1 m
d. zero
e. 44.1 m

____ 17. A ball is rolled horizontally off a table with an initial speed of 0.24 m/s. A stop watch measures the ball's trajectory time from table to the floor to be 0.30 s. How far away from the table does the ball land? (g = 9.8 m/s^2 and air resistance is negligible)
a. 0.055 m
b. 0.072 m
c. 1.2 m
d. 1.9 m
e. 2.5 m

____ 18. A stone is thrown at an angle of 30° above the horizontal from the top edge of a cliff with an initial speed of 12 m/s. A stop watch measures the stone's trajectory time from top of cliff to bottom to be 5.6 s. What is the height of the cliff? (g = 9.8 m/s^2 and air resistance is negligible)
a. 58 m
b. 154 m
c. 120 m
d. 197 m
e. 213 m

____ 19. A stone is thrown at an angle of 30° above the horizontal from the top edge of a cliff with an initial speed of 12 m/s. A stop watch measures the stone's trajectory time from top of cliff to bottom to be 5.6 s. How far out from the cliff's edge does the stone travel horizontally? (g = 9.8 m/s^2 and air resistance is negligible)
a. 58 m
b. 154 m
c. 120 m
d. 175 m
e. 197 m

____ 20. Two ropes are attached to a 40-kg object. The first rope applies a force of 25 N and the second, 40 N. If the two ropes are perpendicular to each other, what is the resultant acceleration of the object?
a. 1.2 m/s^2
b. 3.0 m/s^2
c. 5.0 m/ s^2
d. 25 m/s^2
e. 47 m/s^2

____ 21. The acceleration due to gravity on the Moon's surface is one-sixth that on Earth. What net force would be required to accelerate a 20-kg object at 6.0 m/s^2 on the moon?
a. 1.3 N
b. 20 N
c. 33 N
d. 120 N
e. 130 N

____ 22. A 2 000-kg sailboat experiences an eastward force of 3 000 N by the ocean tide and a wind force against its sails with magnitude of 6 000 N directed toward the northwest (45° N of W). What is the direction of the resultant acceleration?
a. 60° N of E
b. 30° N of W
c. 30° N of E
d. 74° N of W
e. 60° N of W

____ 23. Rita accelerates a 0.40-kg ball from rest to 9.0 m/s during the 0.15 s in which her foot is in contact with the ball. What average force does she apply to the ball during the kick?
a. 48 N
b. 72 N
c. 24 N
d. 60 N
e. 76 N

____ 24. A 10-kg mass and a 2.0-kg mass are connected by a light string over a massless, frictionless pulley. If $g = 9.8$ m/s^2, what is the acceleration of the system when released?
a. 2.5 m/s^2
b. 6.5 m/s^2
c. 7.8 m/s^2
d. 9.8 m/s^2
e. 9.9 m/s^2

____ 25. A 15-kg block rests on a level frictionless surface and is attached by a light string to a 5.0-kg hanging mass where the string passes over a massless frictionless pulley. If $g = 9.8$ m/s^2, what is the tension in the connecting string?
a. 65 N
b. 17 N
c. 49 N
d. 37 N
e. 26 N

____ 26. An elevator weighing 20 000 N is supported by a steel cable. What is the tension in the cable when the elevator is being accelerated upward at a rate of 3.00 m/s^2? ($g = 9.80$ m/s^2)
a. 13 900 N
b. 23 100 N
c. 20 000 N
d. 26 100 N
e. 17.800 N

____ 27. As a 3.0-kg bucket is being lowered into a 10-m-deep well, starting from the top, the tension in the rope is 9.8 N. The acceleration of the bucket will be:
a. 6.5 m/s^2 downward.
b. 9.8 m/s^2 downward.
c. zero.
d. 3.3 m/s^2 upward.
e. 5.6 m/s^2 upward.

____ 28. A worker pushes a wheelbarrow with a force of 40 N over a level distance of 6.0 m. If a frictional force of 24 N acts on the wheelbarrow in a direction opposite to that of the worker, what net work is done on the wheelbarrow?
a. 240 J
b. 216 J
c. 144 J
d. 96 J
e. 75 J

____ 29. I use a rope 2.00 m long to swing a 10.0-kg weight around my head. The tension in the rope is 20.0 N. In half a revolution how much work is done by the rope on the weight?
a. 40.0 J
b. 126 J
c. 251 J
d. 0
e. None of the above.

____ 30. What is the kinetic energy of a 0.135-kg baseball thrown at 40.0 m/s (90.0 mph)?
a. 54.0 J
b. 87.0 J
c. 108 J
d. 216 J
e. 256 J

____ 31. A golf ball hits a wall and bounces back at 3/4 the original speed. What part of the original kinetic energy of the ball did it lose in the collision?
a. 1/4
b. 3/8
c. 7/16
d. 9/16
e. 11/16

____ 32. If both mass and velocity of a ball are tripled, the kinetic energy is increased by a factor of:
a. 3.
b. 6.
c. 9.
d. 27.
e. 81.

____ 33. A 1 200-kg automobile moving at 25 m/s has the brakes applied with a deceleration of 8.0 m/s^2. How far does the car travel before it stops?
a. 39 m
b. 47 m
c. 55 m
d. 63 m
e. 72 m

____ 34. A 7.00-kg bowling ball falls from a 2.00-m shelf. Just before hitting the floor, what will be its kinetic energy? (g = 9.80 m/s^2 and assume air resistance is negligible)
a. 14.0 J
b. 19.6 J
c. 29.4 J
d. 137 J
e. 156 J

____ 35. Samantha pushes a 50-N crate up a ramp 25.0 m in length and inclined at 10° with the horizontal. What potential energy change does the crate experience?
a. 13 J
b. 55 J
c. 120 J
d. 220 J
e. 280 J

____ 36. A simple pendulum, 2.0 m in length, is released with a push when the support string is at an angle of 25° from the vertical. If the initial speed of the suspended mass is 1.2 m/s when at the release point, what is its speed at the bottom of the swing? (g = 9.8 m/s^2)
a. 2.3 m/s
b. 2.6 m/s
c. 2.0 m/s
d. 1.8 m/s
e. 0.5 m/s

____ 37. An amount of work equal to 1.5 J is required to compress the spring in a spring-gun. What is the "launch speed" of a 15-g marble?
a. 14 m/s
b. 15 m/s
c. 18 m/s
d. 21 m/s
e. 23 m/s

____ 38. By how much is the energy stored in a Hooke's law spring increased when its stretch is increased from 8.00 cm to 16.0 cm?
a. 100%
b. 200%
c. 300 %
d. 400 %
e. The correct answer is not given.

____ 39. A Hooke's law spring is compressed 12.0 cm from equilibrium and the potential energy stored is 72.0 J. What is the spring constant in this case?
a. 10 000 N/m
b. 5 000 N/m
c. 1 200 N/m
d. 1 000 N/m
e. No answer is correct.

____ 40. A Hooke's law spring is mounted horizontally over a frictionless surface. The spring is then compressed a distance d and is used to launch a mass m along the frictionless surface. What compression of the spring would result in the mass attaining double the kinetic energy received in the above situation?
a. 1.41 d
b. 1.73 d
c. 2.00 d
d. 4.00 d
e. 5.35 d

____ 41. A Hooke's law spring is mounted horizontally over a frictionless surface. The spring is then compressed a distance d and is used to launch a mass m along the frictionless surface. What compression of the spring would result in the mass attaining double the speed received in the above situation?
a. 1.41 d
b. 1.73 d
c. 2.00 d
d. 4.00 d
e. 5.35 d

____ 42. Adisa pulls a 40-N crate up a 5.0-m long inclined plane at a constant velocity. If the plane is inclined at an angle of 37° to the horizontal and there is a constant force of friction of 10 N between the crate and the surface, what is the net change in potential energy of the crate?
a. 120 J
b. −120 J
c. 200 J
d. −200 J
e. 140 J

____ 43. A 20-N crate starting at rest slides down a rough 5.0-m long ramp, inclined at 25° with the horizontal. 20 J of energy is lost to friction. What will be the speed of the crate at the bottom of the incline?
a. 0.98 m/s
b. 1.9 m/s
c. 3.2 m/s
d. 4.7 m/s
e. 5.6 m/s

____ 44. Preston pushes a wheelbarrow weighing 500 N to the top of a 50.0-m ramp, inclined at 20.0° with the horizontal, and leaves it. Tamara accidentally bumps the wheelbarrow. It slides back down the ramp, during which an 80.0-N frictional force acts on it over the 50.0 m. What is the wheelbarrow's kinetic energy at the bottom at of the ramp? (g = 9.8 m/s^2)
a. 4 550 J
b. 6 550 J
c. 8 150 J
d. 13 100 J
e. 14 300 J

____ 45. A girl and her bicycle have a total mass of 40.0 kg. At the top of the hill her speed is 5.0 m/s, and her speed doubles as she rides down the hill. The hill is 10.0 m high and 100 m long. How much kinetic energy and potential energy is lost to friction?
a. 2 420 J
b. 1 500 J
c. 2 000 J
d. 3 920 J
e. 4 280 J

____ 46. A 75-kg swimmer dives horizontally off a 500-kg raft. The diver's speed immediately after leaving the raft is 4.0 m/s. A micro-sensor system attached to the edge of the raft measures the time interval during which the diver applies an impulse to the raft just prior to leaving the raft surface. If the time interval is read as 0.20 s, what is the magnitude of the average horizontal force by diver on the raft?
a. 900 N
b. 450 N
c. 525 N
d. 1 500 N
e. 1 700 N

____ 47. Alex throws a 0.15-kg rubber ball down onto the floor. The ball's speed just before impact is 6.5 m/s, and just after is 3.5 m/s. What is the change in the magnitude of the ball's momentum?
a. 0.09 kg·m/s
b. 1.5 kg·m/s
c. 4.3 kg·m/s
d. 5.7 kg·m/s
e. 126 kg·m/s

____ 48. A crane drops a 0.30 kg steel ball onto a steel plate. The ball's speeds just before impact and after are 4.5 m/s and 4.2 m/s, respectively. If the ball is in contact with the plate for 0.030 s, what is the magnitude of the average force that the ball exerts on the plate during impact?
a. 87 N
b. 133 N
c. 3.0 N
d. 3.5 N
e. 60 N

____ 49. Jerome pitches a baseball of mass 0.20 kg. The ball arrives at home plate with a speed of 40 m/s and is batted straight back to Jerome with a return speed of 60 m/s. What is the magnitude of change in the ball's momentum?
a. 4.0 kg·m/s
b. 8.0 kg·m/s
c. 18 kg·m/s
d. 20 kg·m/s
e. 24 kg·m/s

____ 50. A 75-kg swimmer dives horizontally off a 500-kg raft. If the diver's speed immediately after leaving the raft is 4 m/s, what is the corresponding raft speed?
a. 0.2 m/s
b. 0.5 m/s
c. 0.6 m/s
d. 4.0 m/s
e. 5.0 m/s

____ 51. A cannon of mass 1 500 kg fires a 10-kg shell with a velocity of 200 m/s at an angle of 45° above the horizontal. Find the recoil velocity of the cannon across the level ground.
a. 1.33 m/s
b. 0.94 m/s
c. 2.41 m/s
d. 1.94 m/s
e. 0.87 m/s

____ 52. Ann the Astronaut weighs 60 kg. She is space walking outside the space shuttle and pushes a 350-kg satellite away from the shuttle at 0.90 m/s. What speed does this give Ann as she moves toward the shuttle?
a. 4.0 m/s
b. 5.3 m/s
c. 8.5 m/s
d. 9.0 m/s
e. 9.7 m/s

____ 53. If the momentum of an object is tripled, its kinetic energy will change by what factor?
a. zero
b. one-third
c. three
d. nine
e. None of the above.

____ 54. The kinetic energy of an object is quadrupled. Its momentum will change by what factor?
a. zero
b. two
c. eight
d. four
e. None of the above.

____ 55. A lump of clay is thrown at a wall. A rubber ball of identical mass is thrown with the same speed toward the same wall. Which statement is true?
a. The clay experiences a greater change in momentum than the ball.
b. The ball experiences a greater change in momentum than the clay.
c. The clay and the ball experience the same change in momentum.
d. It is not possible to know which object has the greater change in momentum.
e. The clay doesn't change its momentum.

____ 56. A high-diver of mass 70 kg jumps off a board 10 m above the water. If, 1.0 s after entering the water his downward motion is stopped, what average upward force did the water exert?
a. 100 N
b. 686 N
c. 980 N
d. 751 N
e. No answer is correct.

____ 57. Mitch throws a 100-g lump of clay at a 500-g target, which is at rest on a horizontal surface. After impact, the target, including the attached clay, slides 2.1 m before stopping. If the coefficient of friction is $\mu = 0.50$, find the speed of the clay before impact.
a. 4.5 m/s
b. 12 m/s
c. 27 m/s
d. 36 m/s
e. 42 m/s

AP Physics C Fall Final Web Review
Answer Section

MULTIPLE CHOICE

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

39. A
40. A
41. C
42. A
43. D
44. A
45. A
46. D
47. B
48. A
49. D
50. C
51. B
52. B
53. D
54. B
55. B
56. E
57. C