AP Physics C **Fall Semester Review Sheet**

I will give you a scantron later for you to enter your answers on. It is due _____.
This will count as a quiz grade.

1. A baseball is thrown straight upward. What is the ball's acceleration at its highest point?
   a. 0 b. ½ g, downward c. g, downward d. ½ g, upward e. g, upward

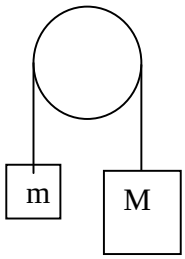
2. How long would it take a car, starting from rest and accelerating uniformly in a straight line at 5 m/s^2, to cover a distance of 200m?
   a. 9.0s b. 10.5s c. 12.0 s d. 15.5s e. 20.0s

3. A soccer ball, at rest on the ground, is kicked with an initial velocity of 10m/s at a launch angle of 30°. Calculate its total flight time, assuming that air resistance is negligible.
   a. 0.5s b. 1s c. 1.7s d. 2s e. 4s

4. A stone is thrown horizontally with an initial speed of 30m/s from a bridge. Find the stone's total speed with it enters the water 4 seconds later. (Ignore air resistance.)
   a. 30m/s b. 40m/s c. 50m/s d. 60m/s e. 70m/s

5. A person who weighs 800 N steps onto a scale that is on the floor of an elevator car. If the elevator accelerates upward at a rate of 4.9m/s^2, what will the scale read?
   a. 400N b. 800N c. 1000N d. 1200N e. 1600N

6. Assuming a frictionless, massless pulley, determine the acceleration of the blocks once they are released from rest.
   a. mg/(M+m) b. Mg/(M+m) c. Mg/m
   d. (M+m)g/(M-m) e. (M-m)g/(M+m)



7. A 20N block is being pushed across a horizontal table by an 18N force. If the coefficient of kinetic friction between the block and the table is 0.4, find the acceleration of the block.
   a. 0.5m/s^2 b. 1m/s^2 c. 5m/s^2 d. 7.5m/s^2 e. 9m/s^2

8. A 60cm rope is tied to the handle of a bucket with is then whirled in a vertical circle. The mass of the bucket is 3kg. At the lowest point in its path, the tension in the rope is 50N. What is the speed of the bucket?
   a. 1m/s b. 2m/s c. 3m/s d. 4m/s e. 5m/s

9. Under the influence of a force, an object of mass 4kg accelerates from 3m/s to 6m/s in 8s. How much work was done on the object during this time?
   a. 27J b. 54J c. 72J d. 96J e. cannot be determined from the information given

10. A block of mass 3.5kg slides down a frictionless inclined plane of length 6m that makes an angle of 30° with the horizontal. If the block is released from rest at the top of the incline, what is its speed at the bottom?
    a. 4.9m/s b. 5.2m/s c. 6.4m/s d. 7.7m/s e. 9.1m/s

11. A force of 200N is required to keep an object sliding at a constant speed of 2m/s across a rough floor. How much power is being expended to maintain this motion?
    a. 50W b. 100W c. 200W d. 400W e. Cannot be determined from the information given

12. An object of mass 2kg has a liner momentum of magnitude 6kg•m/s. What is this object's kinetic energy?
    a. 3J b. 6J c. 9J d. 12J e. 18J

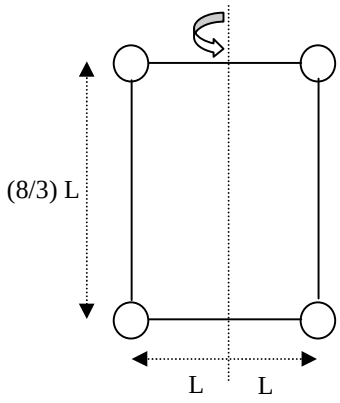
13. A box with a mass of 2kg accelerates in a straight line from 4m/s to 8m/s due to the application of a force whose duration is 0.5s. Find the average strength of this force.
    a. 2N b. 4N c. 8N d. 12N e. 16N

14. A compact disc has a radius of 6cm. If the disc rotates about its central axis at an angular speed of 5rev/s, what is the linear speed of a point on the rim of the disc?
    a. 0.3m/s b. 1.9m/s c. 7.4m/s d. 52m/s e. 83m/s

15. An object of mass 0.5kg, moving in a circular path of radius 0.25m, experiences a centripetal acceleration of constant magnitude $9 m/s^2$. What is the object's angular speed?
    a. 2.3rad/s b. 4.5rad/s c. 6rad/s d. 12rad/s e. Cannot be determined from the information given

16. In an effort to tighten a bolt, a force F is applied perpendicular to the end of a wrench handle. If the distance from the end of the wrench to the center of the bolt is 20cm and F=20N, what is the magnitude of the torque produced by F?
    a. 0N•m b. 1N•m c. 2N•m d. 4N•m e. 10N•m

17. What is the rotational inertia of the body showed about the indicated rotation axis? Each mass has mass *m*. The connecting rods have the lengths shown. (The masses of the connecting rods are negligible.)
    a. $4mL^2$ b. $(32/3)\,mL^2$ c. $(64/9)mL^2$
    d. $(128/9)\,mL^2$ e. $(256/9)\,mL^2$



18. A uniform meter stick of mass 1kg is hanging from a thread attached at the stick's midpoint. One block of mass *m*=3kg hangs from the left end of the stick, and another block, of unknown mass *M*, hangs below the 80cm mark on the meter stick. If the stick remains at rest in the horizontal position, what is *M*?
    a. 4kg b. 5kg c. 6kg d. 8kg e. 9kg

19. Which of the following is/are characteristic of simple harmonic motion?
    I. The acceleration is constant.
    II. The restoring force is proportional to the displacement.
    III. The frequency is independent of the amplitude.
    a. II only b. I and II only c. I and III only d. II and III only e. I, II, and III

20. A student measures the maximum speed of a block undergoing simple harmonic oscillations of amplitude A on the end of an ideal spring. If the block is replaced by one with twice the mass but the amplitude of its oscillations remains the same, then the maximum speed of the block will
    a. decrease by a factor of 4 b. decrease by a factor of 2 c. decrease by a factor of $\sqrt{2}$
    d. remain the same e. increase by a factor of 2

21. A block of mass m=4kg on a frictionless, horizontal table is attached to one end of a spring of force constant k=400N/m and undergoes simple harmonic oscillations about its equilibrium position (x=0) with amplitude A=6cm. If the block is at x=6cm at time t=0, then which of the following equations (with x in centimeters and t in seconds) gives the block's position as a function of time?
    a. $x = 6 \sin(10t + 0.5\pi)$ b. $x = 6 \sin(10\pi t + 0.5\pi)$ c. $x = 6 \sin(10\pi t - 0.5\pi)$
    d. $x = 6 \sin(10t)$ e. $x = 6 \sin(10t - 0.5\pi)$

22. A block attached to an ideal spring undergoes simple harmonic motion about its equilibrium position with an amplitude A and angular frequency ω. What is the maximum magnitude of the block's velocity?
    a. $A\omega$ b. $A^2\omega$ c. $A\omega^2$ d. A/ω e. A/ω^2

23. A simple pendulum swings about the vertical equilibrium position with a maximum angular displacement of 5° and period T. If the same pendulum is given a maximum angular displacement of 10°, then which of the following best gives the period of the oscillations?
    a. T/2 b. $T/\sqrt{2}$ c. T d. $T\sqrt{2}$ e. 2T

24. The relationship between the velocity of a body moving along the x axis and time is given by $v = 3t^2 - 2t$, where the units are SI units. The total distance the body travels between the times t=2s and t=4s is
    a. 12m b. 60m c. 48m d. 34m e. 44m

25. A rescue airplane is diving at an angle of 37° below the horizontal with a speed of 250m/s. It releases a survival package when it is at an altitude of 600m. If air resistance is ignored, the horizontal distance of the point of impact from the plane at the moment of the package's release is
    a. 2.80×10^3 m b. 720m c. 6.80×10^3 m d. 420m e. 5.50×10^3 m

26. A net force of 64N acts on a mass of 16kg. The resulting acceleration is
    a. $16m/s^2$ b. $0.51m/s^2$ c. $64m/s^2$ d. $9.0m/s^2$ e. $4.0m/s^2$

27. Three forces **X**, **Y**, **Z**, act on a mass of 4.2kg. The forces are
    X = 2.0N acting to the east
    Y = 5.0N acting 45° to the north of east
    Z = 4.0N acting 30° to the north of west
    The magnitude of the net acceleration of the mass is
    a. $2.9m/s^2$ b. $5.3m/s^2$ c. $1.4m/s^2$ d. $0m/s^2$ e. $18m/s^2$

28. A block of mass m is at rest on an inclined plane that makes an angle of 30° with the horizontal. Which of the following statements about the force of static friction is true?
    a. $f_s > mg$ b. $f_s > mg \cos 30°$ c. $f_s = mg \cos 30°$ d. $f_s = mg \sin 30°$

29. A particle moving with uniform circular motion has a period of 0.24s and a speed of 4.2m/s. The radius of the path of the particle is
    a. 16cm b. 2.6cm c. 1.0m d. 0.062cm e. 1.4cm

30. A 6.0kg block slides from rest down a 1m tall frictionless curve onto a rough table. After the block reaches the bottom of the curve, a friction force opposes the motion of the block so it comes to a stop 2.5m from the bottom of the ramp. Calculate the coefficient of kinetic friction between the block and the table.
    a. 2.5 b. 0.40 c. >0.40 d. 0.40N e. 2.5N

31. A bullet with a mass of 10.0g and an initial speed of 800m/s penetrates 5.00cm in to a fixed block of wood before stopping. The average force exerted by the block on the bullet was
    a. 160N b. 1.3×10^5N c. 1.3×10^3N d. 6.4×10^4N e. 6.4×10^5N

32. A variable force is represented on an F vs. x graph. Which of the following is the work done by this force?
    a. the slope of the curve
    b. the area bounded by the curve and the x axis
    c. the area bounded by the curve and the F axis
    d. the F value multiplied by the x value
    e. the F value divided by the x value

33. What is the power output needed from a motor to lift, in the absence of friction, a mass of 1.5 x 10^4kg a height of 25m in 6.0s at a constant speed?
a. 2.0 x 10^6W b. 6.1 x 10^5W c. 2.2 x 10^4W d. 8.3 x 10^5W e. 3.1 x 10^5W

34. A body is acted upon by a force of 10N and undergoes displacement in the direction of the force in accordance with the relation ($s = 3t^2 + 2t$) where the units are SI. The rate at which the force is doing work at the instant t=2s is
a. 14W b. 12W c. 120W d. 140W e. 160W

35. A 75kg man climbs the stairs to the fifth floor of a building, a total height of 16m. his potential energy has increased by
a. 1.2 x 10^4J b. 5.9 x 10^4J c. 4.7 x 10^4J d. 3.8 x 10^4J e. 5.9 x 10^3J

36. Which of the following statements is true?
a. Friction is a conservative force and does negative work.
b. Potential energy may be defined by the equation $U(x) = -dF(x)/dx$
c. The work done by a conservative force between two points depends on the path taken between those points.
d. A conservative force cannot change a body's total energy.
e. The work done by a conservative force while a body moves at constant velocity must be 0.

37. A woman on a bicycle traveling at 10m/s on a horizontal road stops pedaling as she starts up a hill inclined at 3.0° to the horizontal. If friction forces are ignored, how far up the hill does she travel before stopping?
a. 5.1m b. 30m c. 97m d. 10m e. The answer depends on the mass of the woman

38. A child is sitting on the seat of a swing with ropes 10m long. her father pulls the swing back until the ropes make a 37° angle with the vertical and then releases the swing. If air resistance is neglected, what is the speed of the child at the bottom of the arc of the swing with the ropes are vertical?
a. 11m/s b. 8.8m/s c. 14m/s d. 6.3m/s e. 12m/s

39. The work done by a conservative force between two points is
a. always positive.
b. always dependent upon the time.
c. always independent of the path.
d. zero.
e. never completely recoverable.

40. The condition necessary for the conservation of momentum in a given system is that
a. energy is conserved
b. one body is at rest
c. the net external force is zero
d. internal forces equal external forces
e. None of these is correct

41. A toy car of mass 2.0kg moving to the right with a speed of 8.0m/s collides perfectly inelastically with another toy car of mass 3.0kg that is moving to the left with a speed of 2.0m/s. Immediately after the collision the velocity of the system is
a. 4.4m/s right b. 2.0m/s right c. 0m/s d. -2.0m/s right e. 10m/s right

42. A bullet, m=0.5kg, traveling with a velocity of 100m/s strikes and embeds itself in the bob of a ballistic pendulum, M=9.5kg. The combined masses rise to a height h=1.28m. The speed V_f of the combine masses immediately following impact is
a. 5.00m/s b. 5.26m/s c. 9.10m/s d. 10.0m/s e. 22.3m/s

43. The force exerted on a 10kg mass is given by ($F = 10 + 2t$) where the units are SI. If the mass starts from rest, its velocity after 2s is
    a. 14m/s b. 2.0m/s c. 2.4m/s d. 0.20m/s e. 0.24km/s

44. A turntable rotating at 8.0rad/s slows to a stop in 10s. If the acceleration is constant, the angle through which the turntable rotates in the 10s is
    a. 0.80rad b. 0.40rad c. 40rad d. 80rad e. 16rad

45. The angular acceleration of the flywheel of a generator is given by ($\alpha(t) = 6bt - 12ct^2$) where b and c are constants and α is in rad/s^2 provided t is in seconds. If the initial angular velocity is taken to be ω_0, the angular velocity at time t is given by
    a. $\omega_0 + 6bt^2 - 12ct^3$ b. $6b - 24ct$ c. $3bt^2 - 4ct^3 + \omega_0$ d. $3bt^2 - 4ct^3$

46. A disk with a radius of 1.5m whose moment of inertia is 34kg•m^2 is caused to rotate by a force of 160N tangent to the circumference. The angular acceleration of the disk is approximately
    a. 0.14rad/s^2 b. 0.23 rad/s^2 c. 4.4 rad/s^2 d. 7.1 rad/s^2 e. 23 rad/s^2

47. A bicycle wheel, a hollow sphere, and a solid sphere each have the same mass and radius. They each rotate about an axis through their centers. Which has the greatest moment of inertia and which has the least?
    a. The wheel has the greatest; the solid sphere has the least
    b. The wheel has the greatest; the hollow sphere has the least
    c. The hollow sphere has the greatest; the solid sphere has the least
    d. The hollow sphere has the greatest; the wheel has the least
    e. The solid sphere has the greatest; the hollow sphere has the least

48. The rotational inertia of an object about an axis depends on the
    a. angular velocity about the axis
    b. angular acceleration about the axis
    c. mass distribution about the axis
    d. torque about the axis
    e. linear acceleration about the axis

49. A disk rotates clockwise in the plane of the page. What is the direction of the angular momentum vector?
    a. clockwise b. counterclockwise c. into the page
    d. out of the page e. Angular momentum has no direction

50. A merry-go-round with a moment of inertia of 6.78 x 10^{3}kg•m^2 is coasting at 2.20 rad/s. When a 72.6kg man steps onto the rim, the angular velocity decreases to 2.0 rad/s. The radius of the marry-go-round is
    a. 3.06m b. 3.66m c. 4.27m d. 4.88m e. 5.49m

51. Halley's comet returns to the vicinity of the Sun (and the Earth) about once every 76 years. Its last appearance was in 1986. What is the average distance from Halley's comet to the sun, given that the average distance from the Earth to the Sun is 1.50 x 10^{11}m?
    a. 6.4 x 10^{11}m b. 1.8 x 10^{12}m c. 2.7 x 10^{12}m d. 1.1 x 10^{13}m e. 9.9 x 10^{13}m

52. Which of the following statements is one of Kepler's three laws of planetary motion?
    a. A line joining any planet to the sun sweeps out equal areas in equal times.
    b. Only an odd number of planets can orbit the sun.
    c. The period of any planet about the sun is proportional to the planet's distance from the sun.
    d. All planets move in elliptical orbits with the earth at one focus.
    e. $F = GMm/r^2$

53. What is the difference in the force of gravity on a 1.0kg mass at the bottom of the deepest ocean trench and that at the top of the highest mountain? Assume that $g=9.8m/s^2$ at sea level. The radius of the earth at sea level is 6.37×10^6m. The deepest trench has a depth of 1.103×10^4m below sea level. The highest mountain has a height of 8.847×10^3m above sea level. The difference is
a. 0.061N b. 0.0067N c. 0.027N d. 0.034N e. 0.0062N

54. If the mass of the earth is 6×10^{24}kg, the mass of the moon 7×10^{22}kg, and the radius of the moon's orbit 4×10^8m, the force between the earth and the moon is approximately
a. 5×10^4N b. 2×10^{20}N c. 3×10^{50}N d. 7×10^{30}N e. 3×10^{28}N

55. Suppose a rocket is fired vertically upward from the surface of the earth with one-half of the escape speed. How far from the center of the earth will it reach before it falls back? (Radius of earth is 6370km)
a. 1.3×10^4km b. 8.5×10^3km c. 9.6×10^3km 2.6×10^4km e. 1.9×10^4km

56. If F is the force, x the displacement, and k a particular constant, for simple harmonic motion we must have
a. $F=-k/x^2$ b. $F=k/x$ c. $F=\sqrt{(k/x^2)}$ d. $F=-kx^2$ e. None of these is correct