Physics 12 Final Exam Review

1. List all vectors and scalars studied in this course.

2. A motorcycle accelerates uniformly through a tunnel that is 150 m long. If the motorcycle entered the tunnel at 20 m/s and exited the tunnel 5.5 seconds later, at what speed did the motorcycle exit the tunnel?

3. Draw a graph with a constant slope that represents acceleration.

4. An object experiences several forces at once, determine the net force acting on the object: 25 N East, 45 N South, 75 N West, and 50 N North. What is the magnitude of the resultant force?

5. Draw a free body diagram of an box being pulled at a constant velocity across the floor. Label all the forces and make sure the vectors are in proportion with each other.

6. The gravitational field strength on planet Z is 6.0 N/kg. An astronaut of mass 75 kg leaves Earth to visit planet Z. What will her mass and weight be when she is on the surface of the planet?

7. A 150 N force is applied to a 45 kg box at an angle of 30° above horizontal. The friction force acting on the box is 45 N. What will be the horizontal acceleration of the box?

8. What is the net force acting on an object travelling at a constant speed in a circular path?

9. A 1000 kg car can travel without slipping at a maximum speed of 25 m/s in a circular path of radius 65m on a dry horizontal surface. When it rains, the coefficient of friction is reduced to one quarter its original value. What is the maximum speed under this wet condition?

10. Draw a free body diagram for a tetherball moving with uniform circular motion at an angle of 20^{o} to the vertical.

11. A 60 kg student is in a car travelling at 30 m/s on a hill of radius 100 m. When the car is at the top of the hill, what normal force is exerted on the student?

12. A 5.0 kg block accelerates down a 30° slope at 3.0 m/s^2. Find the coefficient of friction between the block and the slope.

13. A net force of 30 N acts for 2.0 s on a 2.0 kg object initially at rest. What is the final kinetic energy of the object?

14. Draw a force versus distance graph for a gravitational field.

15. A 5.5 x 10^3 kg spaceship is initially at rest on the surface of the earth. If 2.0 x 10^{11} J of work is done on this spaceship, what maximum altitude will the rocket reach?

16. What is the power output of an electric motor that lifts a 0.040 kg mass vertically through 1.0 m in 15 s?

17. What is the direction of the change of momentum for an object travelling due South and experiences an impulse due West?

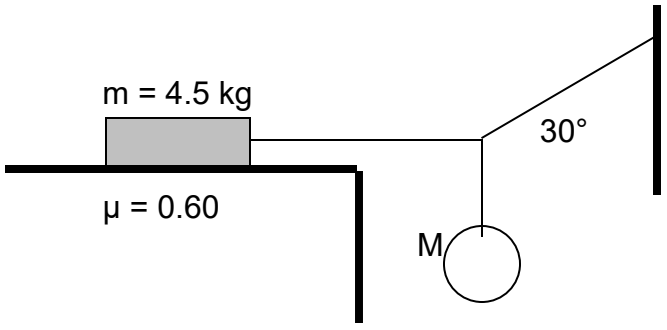
18. What is the magnitude and direction of impulse given to a 1.0 kg ball falling vertically strikes the floor with a speed of 10 m/s and rebounds upward with a speed of 6.0 m/s?

19. A 1000 kg car travelling at 12 m/s due west collides with a 550 kg car travelling at 24 m/s due South. As a result of the collision, the two cars lock together and move in what final direction?

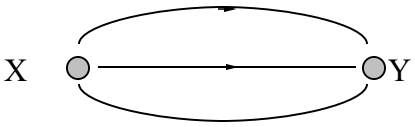
20. What are the SI units of measure for torque, impulse, momentum, force, power, work, and energy?

21. A 2.5m uniform 10 kg board is supported on the left by a block and on the right by another block 0.5m from the right end of the board. What force is applied to the right block?

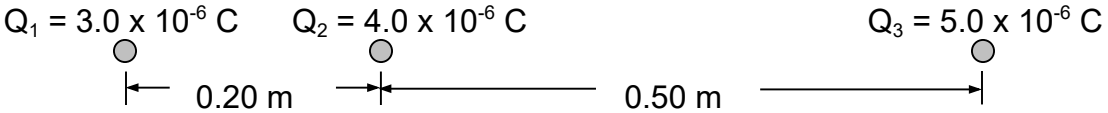
22. What is the largest mass M that can be used so that the 4.5 kg mass in the diagram below does not slide?



23. What are the polarities of the charges X and Y?



24. Three positive charges are fixed as shown in the diagram below.



Calculate the net force on Q_2 due to Q_1 and Q_3.

25. For a cathode ray tube, how is a straight ray deflected up?

26. What is the work required for a 8.0 μC charge to be moved from 5.0 m away to 2.0 m away from a stationary 50 μC?

27. In a DC circuit, what does the voltmeter measure when connected across a resistor?

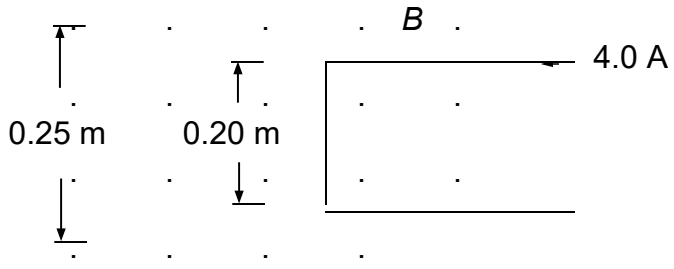
28. Draw and label a series circuit with one cell (+ and - signs) and one resistor. Also, label the conventional current and the electron flow.

29. An electric motor is running at a constant rotation. Comment on the current when the motor is first turned on and when it is running at a constant rotation. Also, comment on the back emf when the motor starts and when it is running at a constant rotation.

30. Your electrical bill is based on the amount of energy is used in your house not on the power consumed. Compare a 1.5kW heater on for 2.5 hours and 100W light bulb on for 15 hours and determine which one would cost the most to operate.

31. Two particles enter (at 90°)a magnetic field that is point into the page. One particle has a smaller radius than the other. The smaller radius is clockwise while the larger radius is counter clockwise. Determine the charge and the relative mass of each particle.

32. A wire carrying a current of 4.0 A is in a uniform 3.0 x 10^{-2} T magnetic field as shown. What is the force on the 0.20 m length of wire?



33. A single coil of wire of area 5.0 x 10^{-3} m^2 is positioned flat on a table in a uniform 0.20 T magnetic field pointing out of the table. The coil is rotated 90° about axis in 3.2 x 10^{-3} s. What average emf is induced by the coil?

34. A metallic sheet that is 3.0 m long and 0.75 m high is moved through a 0.98 T magnetic field to the right at a constant speed of 0.20 m/s. What will be the magnitude of the induced emf and which edge of the plate will become positively charged?

35. In a **step-down** transformer, how does the secondary voltage V_s compare with the primary voltage V_p, and the number of turns in the secondary N_s compare with the number of turns in the primary N_p?

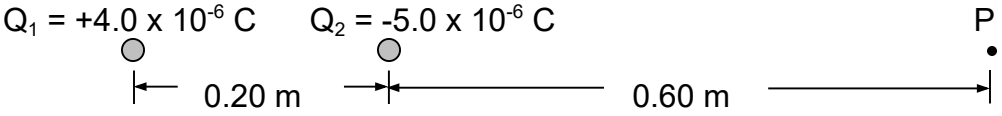
36. A ball rolls off of a 4.5 m high roof that is inclined at 25° at 12m/s. How far from the base will the ball land? And how long will it take to hit the ground once it clears the roof?

37. A 1.5m tetherball inclined at 25° to the vertical swings around at a constant velocity. Determine the velocity of the ball and the period of rotation.

38. An Atwood's machine has an unknown mass on one side and a 5.0kg mass on the other. The Atwood's machine accelerates down on the unknown mass side at 1.5m/s^2. Determine the unknown mass and the tension in the rope.

39. A 5.0m long uniform 30 kg pole is inclined at 50° to the horizontal has a sign hanging from the end of the pole. The pole has a cable going from the end of the pole straight back to the wall at 90° to the wall. What is the tension in the cable?

40. Two charges are fixed as shown in the diagram below.



Determine the magnitude and direction of the net electric field at point P due to Q_1 and Q_2. Also determine the electric potential at P due to Q_1 and Q_2.

41. Using the terminal voltage equation, sketch a plot of the EMF versus current. Which value is represented by the slope and the y-intercept?

42. Draw a 10 cm long solenoid with loop diameters of 2.0 cm. Attach a battery to the solenoid so that it produces a North pole on the left of the solenoid.

43. If the above solenoid has 10 ohms of resistance in the wires and is connected in series with a 9.0V battery then what would the magnetic field be inside the solenoid?