Memorial University of Newfoundland

Physics 1021

Final Examination **Name**_____

April 13, 2007 **MUN NO.**_____

Time 2 Hours

INSTRUCTIONS:

1. There are three parts to the exam. **ANSWER ALL QUESTIONS FROM PART A and PART B and 1 out of two from part C.**

2. Questions from part A are 2 marks each (Total 20). Questions from parts B and C are 10 marks each (Total 80)

3. Please use **THREE** significant figures in all calculations.

4. **Relax!** Good luck!

A	1	2	3	4	5	6	7	8	9	Total

Part A(Total 20 Marks)

1. A heavy mass A is attached to a vertical spring and a lighter mass B is attached to an identical vertical spring. Both systems oscillate in simple harmonic motion. The period of system A :
   a. is less than system B
   b. is greater than system B
   c. is equal to system B
   d. might be greater or less than system B depnding on other factors.

2. If the displacement of a simple harmonic oscillator is described by the function $x(t) = .24Cos(2\pi t)$ The oscillator is at x=.10 m at time:
   a. 0.18 s
   b. 10.4 s
   c. 5.0 s
   d. 0.56 s

3. An object floats in water so that 2/3 of it is above the water. The density of the object is:
   a. 667 kg/m^3
   b. 1500 kg/m^3
   c. 333 kg/m^3
   d. 1000 kg/m^3

4. At the ends of a tube open in air at both ends , there is:
   a. a displacement node and a pressure antinode
   b. a pressure node and a displacement antinode
   c. a pressure node and a displacement node
   d. a pressure antinode and a displacement antinode

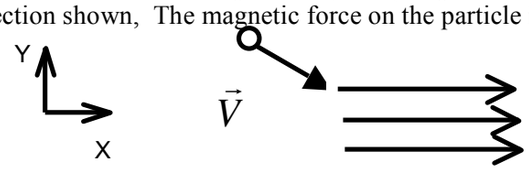
5. A source (S) and an observer (O) are moving in the same direction with the observer following the source. Put the correct signs into the Doppler equation.

$$f' = \left(\frac{1 \quad \frac{u_0}{v}}{1 \quad \frac{u_S}{v}}\right) f_0$$

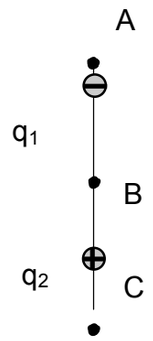
6. Which of the following statements is not true?
   a. Electric fields point in the direction of decreasing potential
   b. Electric fields do work on moving charges
   c. Electric fields point away from positive charges
   d. Positive charges will feel a force in the direction of the electric field
   e. Electric fields always point in the direction of decreasing potential energy

7. If the diameter of a current carrying wire is doubled, then it's resistance:
   a. is doubled
   b. is halved
   c. increases by 4 times
   d. decreases by 4 times

8. A magnetic field is directed in the x direction . A positively charged particle is moving in through the field, in the direction shown, The magnetic force on the particle is directed :
   a. in the +x direction
   b. in the -x direction
   c. in the +y direction
   d. in the -y direction
   e. into the paper
   f. out of the paper



9. Consider the two point charges q_1 and q_2 is shown in the picture, with the magnitude $q_1 > q_2$ .The point along the y axis where the electric field is most likely zero is:
   a. A
   b. B
   c. C
   d. no where on the y axis



10. Sound A has a sound level of 10 dB. Sound B has a sound level of 30 dB. To an observer sound B appears:
    a. twice as loud as sound A
    b. four times as loud as sound A
    c. 10 times as loud as sound A
    d. 100 times as loud as sound A
    e. three times as loud as sound A

f.

PART B- Do all 7 questions in this section

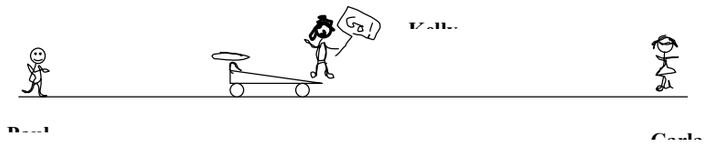
1. A 1.0-kg block, attached to a spring of force constant 201 N/m oscillates with an amplitude of 5.0 cm. Assume that at t=0 the block is at the maximum displacement position (x=A).
   a. How much time elapses before the block first returns to this position after it is first released?
   b. What are the position and velocity of the block 2.0 seconds after it is released?
   c. What is the speed of the block at x=2.0 cm?

2. An observer measures a sound level of 86.3 dB at a distance of 2.0 km from an explosion. Determine:
    i. the sound intensity of the explosion
    ii. the power produced by the explosion
    iii. the sound level that 4 such bombs would produce at a distance of 3.0 km from the explosion

3. A racing car travelling at 169 km/h drives down a stretch of road between two observers Paul and Carla. A third observer Kelly stands by the roadside and watches the car drive by.

   a. [8] If the car emits a constant tone of frequency 357 Hz, what frequency does each person hear, as the car passes directly in front of Kelly?

   b. [2] After the race, Paul claims to have heard a “Beat” frequency . Could Paul have been correct?

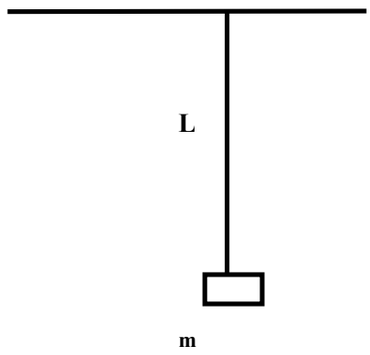


4.

a. A primitive musical instrument consists of a wire with a mass hanging from it.

i. Sketch the fundamental resonance for this instrument.

ii. If the string has a length of 1.2 m and mass 8.0 g, what must be the value of the mass so the fundamental resonance has a frequency of 56 Hz?



b. An organ pipe has two successive resonances of 204 Hz and 340 Hz.

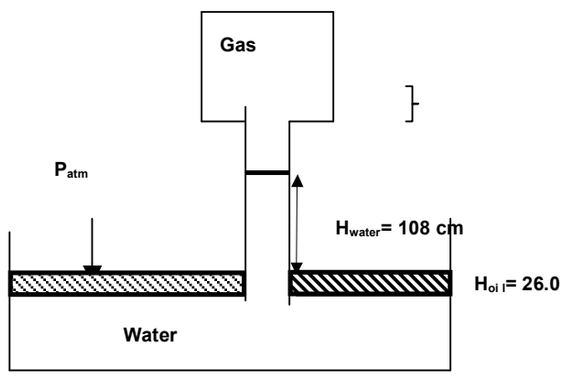
i. Is the pipe open at both ends or closed at one. Support your answer.

ii. How long is the pipe?

5.

a. Phil the Physics student is perplexed that a ring purchased at a streetside table on Young Street in Toronto has turned his finger green. The weight of the ring in air is 1.96 N and in water it is 1.84 N. Phil knows that the density of gold is 19.3 g/cm^3. Is his ring pure gold? Show calculations to support your answer.

b. In the manometer shown, water initially fills the tube. Oil of density 850 kg/m^3 is then added to the outer bowl so that the height of the oil is 26.0 cm. The water in the tube is 108 cm above the top of the oil. If the pressure of the gas is 92.6 kPa determine atmospheric pressure?



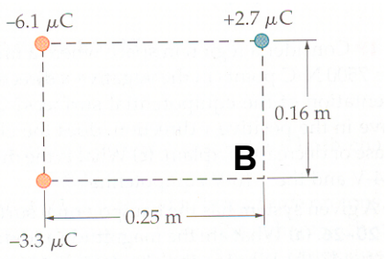
7.

a. In a line or two briefly discuss the difference between electric potential and electric potential energy.

b. Three charges are at the corners of a rectangle.

i. Find the electric potential at point B

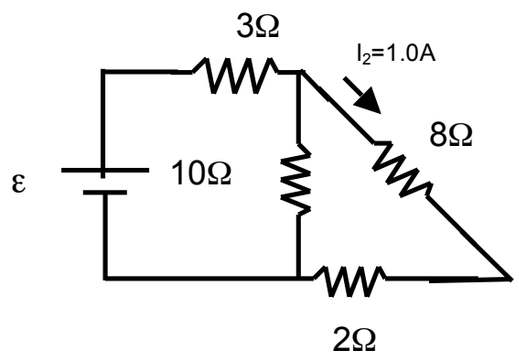
ii. How much work must be done to move a 3.5-μC charge from point B to very far away?



7.

a. If you plot a graph of voltage vs current for an ohmic material, what would you expect to get for the slope and intercept?

b. In the circuit shown , A current of 1.0 A flows through the 8Ω resistor, as shown. Determine:
    a. The equivalent resistance R_{eq} of the circuit
    b. the current through the 10Ω resistor
    c. The power supplied by the battery



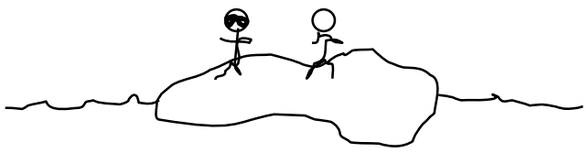
PART C- Do 1 of 2 questions in this section

8. Dr Goulding and Dr Demirov are afloat on a large flat block of ice of volume 2.1 m^3 in a very shallow pond. The two profs have a combined mass of 160 kg.

a. What is the buoyant force exerted upward on the ice?

b. By reaching into the water, Dr Goulding and Dr Demirov pick up rocks of mass 5.0 kg and place them on the ice. How many rocks must they bring onboard before the ice is just under water?

c. With their rocks on board, has the water in the pond risen or fallen? Support your answer.



7.

a. In a line or two **briefly** comment on where magnetic fields originate from.

b. A wire carrying a current of 10.0 A wire lies along the x axis, as shown.

i. Determine the magnetic field at the point (0,2.0) m on the y axis. Indicate the direction of the field on the diagram.

ii. A charge of q= -3.0x10^{-7} C is injected with a velocity of $\vec{v} = 4.0x10^{6}\frac{m}{s}\hat{x}$ at the point (0,2.0) m along the x axis. What is the magnetic force exerted on the charge?

iii. A uniform electric field is introduced in the region so that the particle passes undeflected through the region near the wire. Determine the magnitude and direction of this field.