NAME: _____ **KP UiTM:** _____

Handphone #: _____

TEST 3-–– Oct 28th 2008

Answer ALL questions ON the paper provided to you. DO NOT USE ADDITIONAL PAPERS.

QUESTION 1

a) Figure 1a and Figure 1b show current loops in a magnetic field while Figure 1c shows a wire loop where current is induced due to the moving bar.
   (i) Draw the induced current in Figure 1a. Then label the high and low potential end on the resistor. Explain how you determined the current direction.
   (ii) Obtain the emf induced in the coil shown in Figure 1b. Then determine the amount of change of B in one second, $\Delta B / \Delta t$. If this change were a positive change (increasing), determine the direction of the induced current. Explain how you arrive at your answer.
   (iii) Draw or indicate the magnetic field direction, the polarity of the induced emf, the direction of the electric force and the direction of the magnetic force on the charges in the sliding bar shown in Figure 1c. Explain why the induced current is in the direction shown.

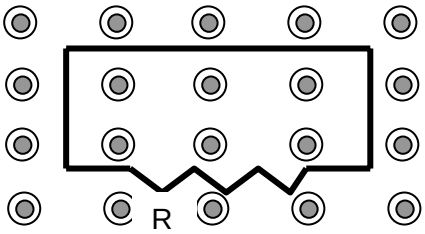

Figure 1a: A single turn conducting loop of resistance ***R*** in a magnetic field which is increasing at a steady rate.

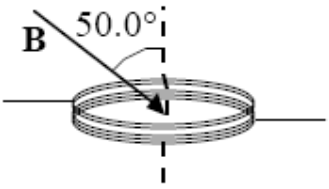

Figure 1b: A ***100-turns*** conducting coil with a surface area of ***8 x 10^{-4} m^2*** and resistance ***R = 10 Ω*** in a B field as shown produced an induced current of ***4 x 10^{-3} A***.

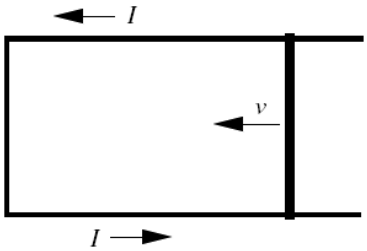

Figure 1c: Induced current ***I***, shown due to a conducting bar moves to the left at a constant speed ***v*** on two conducting rails.

(6+14+11 = 31 marks)

QUESTION 2 (Use Planck's constant ***h = 6.6 x 10^{-34} J.s***, speed of light is ***c = 3 x 10^{8} m/s*** and the charge of an electron ***e = 1.6 x 10^{-19} C*** wherever it is required)

a) Briefly, explain the following:
   i) wave-particle-duality,
   ii) Paschen series and
   iii) Heisenberg Uncertainty Principle
   iv) Rutherford's scattering

(4+4+4+4=16 marks)

b) A hydrogen atom is in its 3rd excited state. When the atom returns to its ground state (note that the ***ground state energy of a hydrogen atom is -13.6 eV***), it emits two photons.
   i) Draw the atomic states and label the states. Make sure you label the ground and the different excited sates.. (the n=1, n=2, n=3….)
   ii) Calculate the energy for each of the states and use E_0 to represent energy of the ground state and E_n (such as E_1 for energy of the first excited state) to represent energy of the excited states.
   iii) Draw the energy emission process you had chosen by showing the emitted photons
   iv) Determine the wavelength for each of the photons emitted.

(4+5+2+8 = 19 marks)

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