TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTICAL CHEMISTRY

APS 2102: PHYSICS II

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME:2HOURS

Instructions to Candidates

You should have the following for this examination
Answer Booklet
examination pass
mathematical table or calculator
student ID
This paper consists of **FIVE** questions.
Attempt question ONE (Compulsory) and any other TWO questions.
This paper consists of 6 printed pages

Do not write on the question paper.

Coulomb's constant. $F_e = 8.99\times10^9\ Nm^2/C^2$

$m_e = 9.11 \times 10^{-31}$ kg, $m_p = 1.67 \times 10^{-27}$ kg, $r = 5.3 \times 10^{-11}$

Question ONE (30mks)

a)State **three** factors that affect the capacitance of a parallel- plate capacitor. (3mks)

b)Other than temperature state any other **two** factors that affect the resistance of an ohmic conductor. (2mks)

c)i) Define conductivity and give its SI unit (2mks)

ii) A material is shaped to a make a wire 0.1m long, with a cross sectional area of $5x10^{-6}m^2$. When a voltage of 12V is applied, a current 0.8amps flows. Calculate the conductivity of the material (3mks)

d) State Lenz's law (1mk)

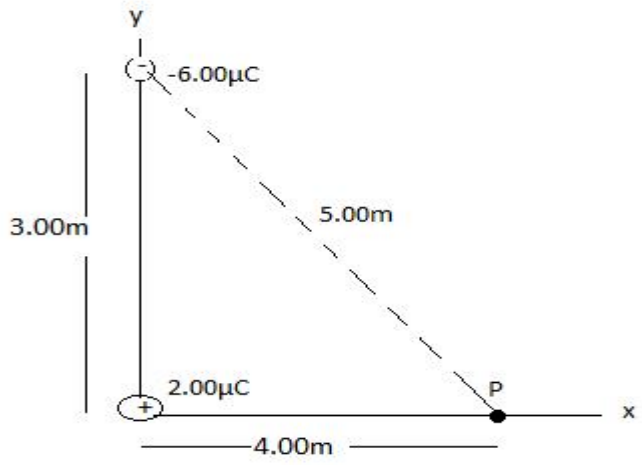
e) A force of 1.6×10^{-3} N exists between 2 charges; 1.3 μC and 3.5μC. How far apart are they? (3mks)

f) State the significant differences between electric force and gravity: (2mks)

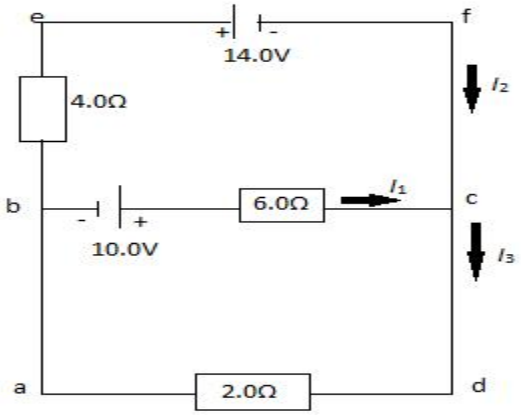
g) Draw diagrams showing a forward biased diode and reverse biased bias (3mks)

h) State Faraday's Law (1mk)

i)A charge $q_1 = 2.00\mu C$ is located at the origin and a charge $q_2 = -6.00\mu C$ is located at (0, 3.00)m. Find the electric potential due to these charges at point P whose coordinates are(4.00, 0)m (4mks)



j) Find the currents i_1 i_2 *and* i_3 in the circuit shown below (4mks)



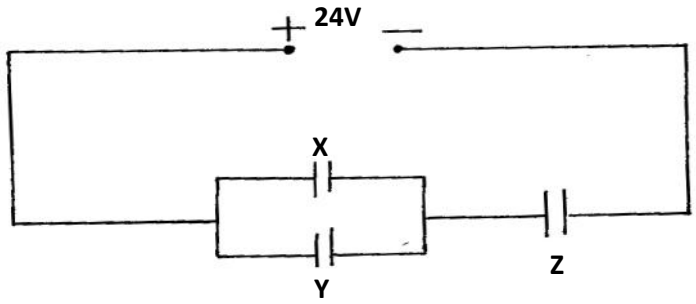
k) Define the following terms

i) Semiconductors: (1mk)

ii) Diode: (1mk)

Question TWO (15mks)

a)The figure below shows an electrical circuit with three capacitor **X, Y** and **Z** of Capacitance 8.0 µF 10.0 µF and 6.0 µf respectively connected to a 24V battery.

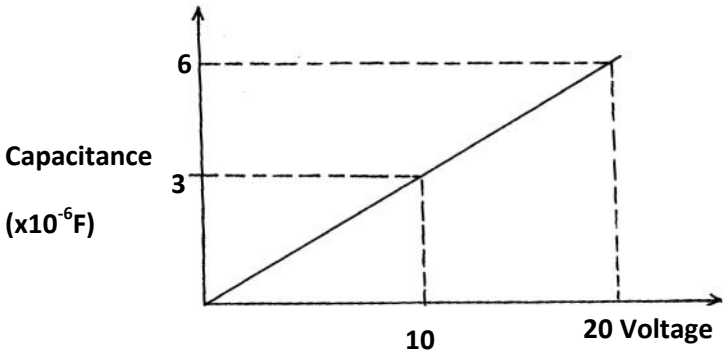


Determine;

(I) The combined capacitance of the three capacitors. (3mks)

(II) The charge on the capacitor **Z** (2mks)

(iii) The graph below shows the variation of capacitance of a capacitor with voltage supplied across it.



Use the graph to determine the quantity of charge stored in the capacitor. (3mks)

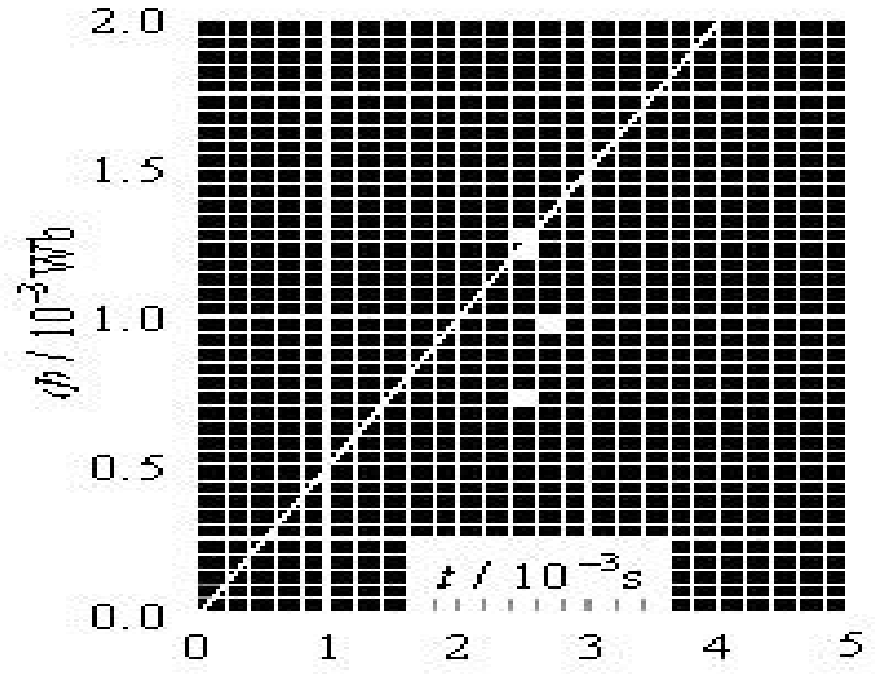
b) i) State Ohm's law (1mk)

ii) What is the resistance of an automobile headlight through which a 2.5A flows when 12.0v is applied onto it? (2mks)

c) Gold has a conductivity of 45 MS m^{-1}. What is the resistance of a 0.01m across gold connector, 0.05m long? (4mks)

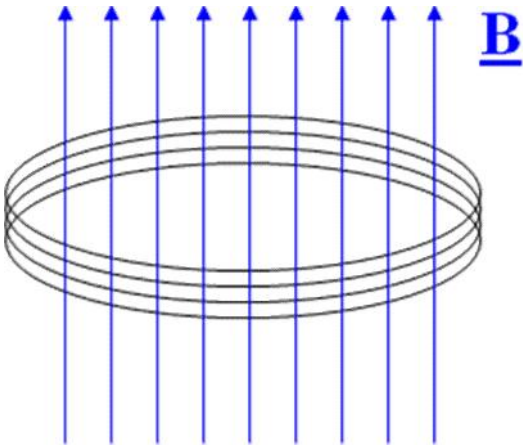
Question THREE (15mks)

a)The magnetic flux φ through a coil having 500 turns varies with time t as shown

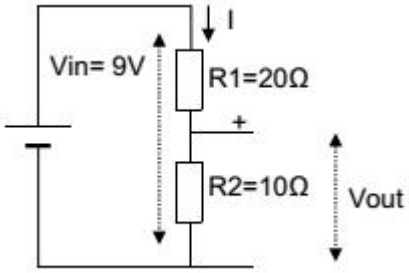


Calculate the magnitude of the induced emf (4mks)

b) Consider a coil of radius 5 cm with N = 250 turns. A magnetic field B, passing through it, changes in time: B (t) = 0.6 t [T] (t = time in seconds) The total resistance of the coil is 8 Ω. What is the induced current ? (5mks)



c) Calculate the V_{out} by applying the formula of a voltage divider. (3mks)



d) A strand of metal is stretched to twice its original length. What is its new resistance? State your assumptions. (3mks)

Question FOUR (15mks)

a)Calculate the strength and the direction of the electric field E due to a point charge of 2.00nC at a distance of 5.00mm from the charge (4mks)

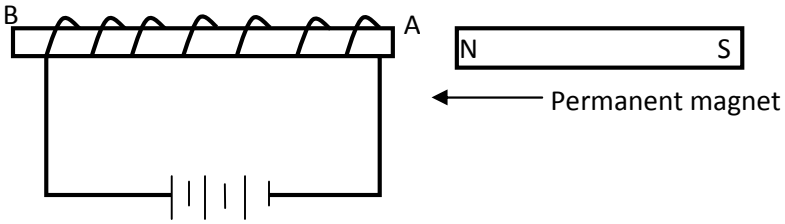
b) Compare the magnitude of the electrical and gravitational forces between the electron and proton in the hydrogen atom. $r = 5.3 \times 10^{-11}$ (4mks)

c) Explain the conduction in gases and state one application for it (4mks)

d) Explain what is meant by electrostatic equilibrium and state any two properties of a conductor in electrostatic equilibrium (3mks)

Question FIVE (15mks)

a)Figure 6 shows a permanent magnet placed near a solenoid connected to a source of e.m.f.



i) State and explain what is observed when the North – pole of the permanent magnet is brought to end A. (2mks)

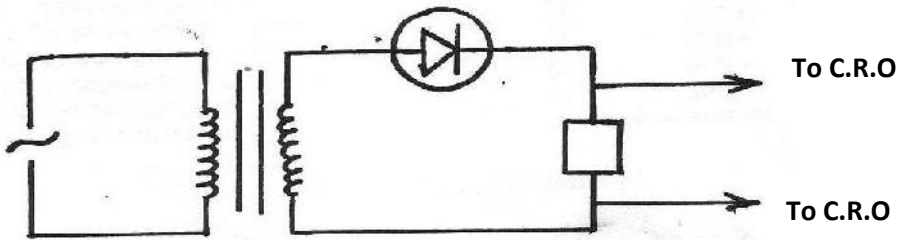
ii) State the law applied (1mk)

b) Extrinsic semiconductors are made through a process called doping. Explain how doping produces an n-type semi-conductor (2mks)

c) Distinguish between a semiconductor and a conductors (2mks)

d) Distinguish between intrinsic and extrinsic semi-conductor. (2mks)

e) Figure 9 shows a PN junction diode used in a reflection



(i) What type of rectification is shown? (1mk)

(ii) Describe how the rectification is achieved. (3mks)

(ii) sketch the output signal displayed on the CRO during the rectification process. (2mks)

THIS IS THE LAST PRINTED PAGE