



# Shahjalal University of Science and Technology, Sylhet

Department of Physics

B.Sc. Honours 2<sup>nd</sup> Year 1<sup>st</sup> Semester Examination, 2013 (Session 2011-2012)

PHY 205B 2.0 Cr. Physics for Biologists

Full Marks : 60 Time 2:00 Hours

[Answer any four questions, The figure on the right margin indicate full marks]

1. (a) Explain Coulomb's law in electrostatics. 3  
 (b) Define electric field and electric potential. 4  
 (c) Draw the electric field lines surrounding two, (i) negative, and (ii) positive electric charges a distance  $\ell$  apart. 4  
 (d) Two charged balls are 20.0 cm apart. They are moved, and the force on each of them is found to have been tripled. How far apart are they now? 4
2. (a) Define lines of force. Sketch lines of force for (i) a positive point charge (ii) a negative point charge, (iii) an electric dipole, and (iv) two positive point charges. 4  
 (b) How can uniform electric field be produced? A particle of mass  $m$  and charge  $q$  is placed at rest in a uniform electric field and released. Describe its motion. 6  
 (c) State Gauss's law for electrostatics. Show that the Coulomb's law can be deduced from the Gauss's law. 5
3. (a) Define electric potential. Find an expression for the electric potential due to a uniformly charged circular disk with charge density  $\sigma$ , at a point P on the axis, where P is located at a distance  $r$  from the centre of the disk. 10  
 (b) Define electric potential energy. What is the electric potential energy for the three charges ( $q_1 = +1.0 \times 10^{-7}$  C,  $q_2 = -4.0 \times 10^{-7}$  C,  $q_3 = +2.0 \times 10^{-7}$  C) located at the corners of a triangle with  $a=b=c=10$  cm. 5
4. (a) Define magnetic flux. Find an expression for the magnetic force, when a positive test charge is fired with velocity  $\vec{v}$  and discuss when it is maximum and minimum. 4  
 (b) Compare electric and magnetic force. 1  
 (c) Write short notes on (i) Lorentz relation, (ii) Ampere's law, (iii) Solenoid, (iv) Biot-Savart law (v) Faraday's law and (vi) Lenz's law. 10
5. (a) What is interference of light? 3  
 (b) What are coherent sources? Explain the importance of such sources in interference phenomenon. 3+2  
 (c) Show that the fringe width  $\beta$ , in Young's experiment is given by  $\beta = D\lambda/d$ , where  $d$  is the distance between two coherent sources,  $D$  is the distance between source and screen and  $\lambda$  is the wavelength of the source of light. 7
6. (a) Define diffraction of light. Discuss the basic difference between Fresnel and Fraunhofer diffraction. 3  
 (b) Define transmission grating. Find an expression for the transmission grating. 6  
 (c) Find an expression for the dispersive power of grating. A diffraction grating which has 400 lines to a cm is used at normal incidence. Calculate the dispersive power of the grating in the third order spectrum in the wavelength region 5000 Å. 6

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