



Shahjalal University of Science and Technology, Sylhet
Department of Physics
2nd Year 1st Semester Examination-2014
Course: PHY 205B, Credits: 2.0
Course Title: Physics for Biologists-II
Total Marks: 60, Time: 2 Hours



Answer any four (4) questions from the following

1. (a) Find the relation between phase difference and path difference of waves. 2
(b) What is interference of light? Describe the conditions of bright and dark fringes for the Young's double slit experiment. 8
(c) Light of wavelength 5500\AA from a narrow slit is incident on a double slit in the Young's experiment. The overall separation of 5 fringes on a screen 200 cm away is 1 cm, calculate (i) the slit separation (ii) the fringes width. 5
2. (a) What is meant by diffraction phenomena? 3
(b) Discuss Fraunhofer diffraction at a single slit and give the conditions of maximum and minimum intensity with diagram. 6
(c) In Fraunhofer diffraction due to a narrow slit, a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima lie 5 mm on either side of the central maxima, find the wavelength of light. 6
3. (a) Define plane diffraction grating. Find an expression for the maximum intensity and dispersive power due to plane diffraction grating. 8
(b) A diffraction grating of 4000 lines/cm is used at normal incidence. Calculate the dispersive power of the grating in the third order spectrum in the wavelength region 5000\AA . 4
(c) Define polarization of light. How can you prove that the light is a transverse wave? 3
4. (a) Define lines of force. Establish a relationship between the lines of force and the electric field strength. 5
(b) Define electric flux and state Gauss's law. 2
(c) Describe how you can set up a uniform electric field. Derive an expression for the electric field due to a point charge. 2+6
5. (a) Define Electric field strength and electric potential. 4
(b) Calculate the electric potential at the center of the square of length $a = 2.0$ meter. 4
Assume that $q_1 = +1.0 \times 10^{-8}\text{ C}$, $q_2 = -2.0 \times 10^{-8}\text{ C}$, $q_3 = +3.0 \times 10^{-8}\text{ C}$ and $q_4 = +2.0 \times 10^{-8}\text{ C}$.
(c) Calculate the electric potential due to a uniform circular disk at a point r on the central axis. Assuming that the charge density of the circular disk is σ and the radius is y . 7
6. (a) State and explain Coulomb's law of electrostatics. 5
(b) What is an electric dipole? Calculate the electric field due to an electric dipole at a point on the perpendicular bisector of the dipole. What is electric dipole moment? 6
(c) What repulsive Coulomb force exists between two protons in a nucleus of iron? Assume the separation of the two protons is $4.0 \times 10^{-15}\text{ m}$. 4

4.2.15.14

4.2.15.14

12.5.14.14