

2012
B.Sc. (Hons.) Biotechnology
First Semester
BIOT-105T: Physics

Time allowed: 3 Hours

Max. Marks: 67

NOTE: Attempt five questions in all, including Question No. 9 (Unit-V) which is compulsory and selecting one question each from Unit I-IV.

x-x-x

Unit-I

1. (a) What do you mean by fundamental and derived units? Explain with suitable examples. (9)
(b) A physical quantity 'Z' depends directly on the mass of the object, square of the velocity and inversely on the radius of the circular path. Find the units of 'Z' in terms of basic S.I units. (4.4)
2. (a) Explain with example the important discoveries in physics which are useful in life sciences. (9)
(b) Express the power of a 100 W bulb in CGS units. (4.4)

Unit- II

3. (a) Derive an expression for the potential at a point along the axial line of a short electric dipole. (9)
(b) A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of $80.0 \mu\text{C}/\text{m}^2$.
i) Find the charge on the sphere.
ii) What is the total electric flux leaving the surface of the sphere (4.4)
4. (b) Using Gauss's law derive the expression for the electric field due to an infinite long line charge distribution (9)
(b) A point charge of $2.0 \mu\text{C}$ is kept at the centre of a cubic Gaussian surface of edge length 9cm. What is the Net electric flux through the surface? (4.4)

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(2)
UNIT - III

5. (a) What is meant by diffraction of light. Distinguish between Fresnel's and Fraunhofer's class of diffraction. (9)
(b) Explain how circular fringes are obtained in Michelson interferometer. (4.4)
6. (a) What are coherent sources? Why are they necessary for observing a sustained interference pattern? How are the two coherent sources obtained in the Young's double slit experiment? (9)
(b) Discuss the principle and construction of compound microscope. (4.4)

Unit- IV

7. (a) What is Heisenberg's uncertainty principle? Show that it does not allow the presence of electrons in the atomic nucleus. (8)
(b) Prove that group velocity of the waveform associated with the moving particle is equal to the velocity of the particle. (5.4)
8. (a) Describe the Compton effect? Derive the relation for the Compton shift and depict the condition in which Compton shift is maximum. (9)
(b) What is half life and mean life of a radioactive substance? Derive the expression between them. (4.4)

UNIT - V

9. Attempt the following questions.
- 1) Calculate the wavelength associated with an electron subjected to potential difference of 1.25 kV. (2)
 - 2) Define Conductivity of a Conductor. Write its S.I. unit. (2)
 - 3) Light waves can be polarized while sound waves cannot. Why? (2)
 - 4) On what factor does the resolving power of microscope depends? (2)
 - 5) The electric potential in space is given by $3x+4y-z$. Show that the electric field intensity is uniform everywhere. (2)
 - 6) A certain radioactive element disintegrates for an interval of time equal to its mean life. What fraction of the element has disintegrated? (2)
 - 7) Write the expression for the electric field inside a capacitor. How it varies with distance. (1.4)