

Assignment -1

B.Sc. SEM-V

Paper CC-303

Unit- 1 (Electromagnetics)

- Q: 1 Derive maxwells equations for steady and time varying electromagnetic field and obtain corrected amperes law.
- Q:2 Obtain Lorentz gauge condition. Hence show that the scalar and vector potential satisfy same equations.
- Q:4 State and prove Poynting theorem.
- Q:5 In a non conducting media write plane wave field equations and obtain its solutions. From this solution, show that both \vec{E} and \vec{H} are perpendicular to the propagation vector.
- Q:7 Write the equations of plane wave in a conducting medium and using them show that a plane wave can not propagate in conducting medium without attenuation.
- Q: 8 Write not on Skin effect. In case of sea water why the radio communication with submarines become difficult at the depth of several meters.
- Q:9 Explain hysteresis loop by considering a torroidal coil wounded around an iron core in the form of a ring.

Unit-3 (Nuclear Physics)

• α Rays

- Q-1. Describe range of α particles in detail. State Geiger-Nuttall rule and draw graph of Geiger-Nuttall rule for α particle.
- Q-2. Discuss fine structure of α ray spectrum in detail.
- Q-3. Write a short note on long range α particles.
- Q-4. If kinetic energy of α particle is K_α then prove that disintegration energy of α emission is given as

$$Q_\alpha = K_\alpha \left(\frac{A}{A-4} \right)$$

Ex-1 ${}_{83}\text{Bi}^{212}$ decays with a half life time of 60.5 min. by emitting 5 groups of α particles with energy 6.08 MeV, 6.04 MeV, 5.76 MeV, 5.62 MeV and 5.60 MeV. Calculate the α disintegration energies. What is the daughter nucleus? Sketch its level scheme.

Ex-2 Show that ${}_{94}\text{Pu}^{236}$ is unable against α decay. (Given: $M_{\text{Pu}} = 236.04607$ u, $M_{\text{U}} = 232.03717$ u, $M_{\alpha} = 4.0260$ u).

- **β -rays**

Q-1. Write a note on characteristics of continuous spectrum of β -rays. Discuss the difficulties arises in understanding results of it.

Q-2. Discuss Pauli's neutrino hypothesis to explain β ray continuous spectrum.

Q-3. Derive an expression of Factor for Density of States $\rho(E)$ (Number of available energy states per unit energy range).

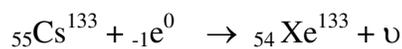
Q-4. Discuss Selection rules for nuclear transition β decay process.

Q-5. Discuss Cowan and Reines experiment to detect neutrino during β decay.

Ex-1 . Calculate the energy of γ rays emitted in the β decay of ${}_{13}\text{Al}^{28}$ (Given $E_{\text{max}} = 2.86$ MeV,

$$M_{\text{Al}}^{28} = 27.981908 \text{ u}, M_{\text{Si}}^{28} = 27.976929 \text{ u}).$$

Ex-2 . Find the energy of a neutrino in the following K-capture reaction:



The total energy released in this process is 355 keV and the binding energy of the K-electron in ${}_{54}\text{Xe}^{133}$ is 35 keV. Further the daughter nucleus is formed directly in the ground state.