



THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Briefly describe the following.

(15x2=30)

- (i)**- Is energy quantized in classical mechanics?
- (ii)**- Distinguish between photoelectric effect and Compton Effect.
- (iii)**- Why do not we observe Compton effect with visible light?
- (iv)**- If the particles listed below all have same wavelength, which has shortest wavelength; electron, alpha-particle, neutron and proton.
- (v)**- Does a photon have a de-Broglie wavelength? Explain.
- (vi)**- Considering electron and photon, as particles how are they different from each other?
- (vii)**- If a particle in a box is in n th energy level, what is average value of its x-component of momentum?
- (viii)**- Is energy conserved when an atom emits a photon of light?
- (ix)**- Why the X-rays cannot be produced from lighter atoms?
- (x)**- How can we become able to produce highly accelerated X-rays beam by using high potential alternating source?
- (xi)**- What is atomic mass unit (u)? Show that $1u = 1.66 \times 10^{-27} \text{kg}$
- (xii)**- Why U^{235} is fissionable, while others isotopes are not.
- (xiii)**- Is there any difference between beta particles and electrons emitted by photoelectric emission and thermionic emission?
- (xiv)**- In relativity the time and space coordinates are intertwined and treated on a more or less equivalent basis. Are times and space fundamentally of the same nature, or is there some essential difference between them that is preserved even in relativity?
- (xv)**- How many relativistic expressions can you think of in which the Lorentz factor γ enter as a simple multiplier?

Answer the following questions

- Q. 2: (a)**-Describe in brief Millikan's determination of Planck's constant from photoelectric effect.
(b)-What is de-Broglie hypothesis? Explain how Davison-Germer experimentally proved the de-Broglie hypothesis. (04 + 06)
- Q. 3:**-What is fission chain reaction? Discuss the three problems together with their solutions in working of nuclear reactor based on fission chain reaction. (10)
- Q. 4: (a)**-Show from Lorentz transformation equations that two events simultaneous at different positions in reference frame S are not generally simultaneous in reference frame S' moving with a velocity v relative to S . (05 + 05)
- (b)**-Establish mathematically Einstein mass energy relationship. Explain physical significance of this relation. Mention two nuclear phenomenons supporting this relation.