**Elements of Modern physics** **SEM IV**

**SET I**  **F M 60**

**Group A Objective questions**

1. The Compton Shifts depends on: 15x2=30

a) Energy of incident light b) frequency of incident light c) angle of scattering d) material of target.

2. A photon is :

a) a quantum of lightb) a quantum of matter c) a positively charged particle d) an instrument to measure light intensity

3. An electron has a speed of 100m/s with an accuracy of 0.005%. The uncertainty in position will be:

a) 0.14m b) 1.4m c) 0.014 m d) 14m

4. The de-Broglie wavelength λ of a particle and its K.E (K) are related as:

a) λ α K b) λ α K1/2 c) λ α 1/ K1/2  d) λ α 1/K

5. Existence of matter waves was first experimentally demonstrated by:

a) Newton b) Planck c) de-Broglie d) Davisson and Germer

6. The exact statement of uncertainty principle for angular momentum and angular displacement is:

a) b) c) d)

7. The probability of finding the particle within an element of volume is

a) b) c) d) None of these

8.The term represents:

a) wave density b) probability density c) energy density d) particle density

9. A particle possesses discrete energy levels:

a) in free space b) in a box of rigid walls c) both a&b d) none of these

10. In a radioactive decay neither the atomic number nor the mass number changes. Which of the following is emitted in the decay process?

a) Proton b) neutron c) electron d) photon

11. When an alpha particle captures an electron, it becomes:

a) a hydrogen atom b) a helium atom c) a helium atom d) a β- particle

12. The rate of decay of radioactive element decreases:

a) Exponentially with time b) linearly with time c) parabolically with time d) None of the above

13. A laser beam is highly coherent, so it can be used in

a) Interference b) diffraction c) polarization d) Rutherford scattering

14. If coherence time is 10-8 sec then coherence length is:

a) 3cm b) 3 m c) 10cm d) 30m

15. Ruby laser gives:

a) Continuous wave output b) pulsed output c) both above d ) none

**Group B very short answer 4x5 = 20**

16. Define temporal coherence.

17. list the three most important features of nuclear forces.

18. write the fundamental laws of radioactivity.

19. Under what condition will the Eigen function ѱi  and ѱj be orthogonal?

**Group C Short Answer 1x10= 10**

20. What is meant by dual nature of energy and matter? Explain briefly.

21. Explain photoelectric effect and stopping potential.

**Set II**

**Elements of Modern physics** **SEM IV**

 **F M 60**

**Group A Objective questions**

1. The energy of a photon corresponding to the visible of maximum wavelength is nearly:

a)1eV b) 1.6 eV c) 3.2 eV d) 7eV

2. Ten photons each of energy 1 eV are incident on a metal surface of work function 2 eV. The number of photons emitted will be:

a) 10 b) 5 c) between 1 and 5 d)none

3. In Compton effect, the collision between the photon and electron is

a) elastic b) inelastic c) unknown d) perfectly elastic

4. Which of the following characteristics of hydrogen atom was most difficult for classical physics to interpret?

a) mass b) charge c) line spectra d) ionization

5. Laser beam is made of

a) electron b) highly coherent photons c) elastic particle d) excited atoms

6. What is the life time of electron in metastable state?

a) 10-3 s b) 10-5s c) 10-8 s d) 10-7 s

7. If the particle that starts a nuclear reaction is also one of the products, the process is a

a) chain reaction b) nuclear reaction c) neutron emission d) neutron bombardment.

8. The half-life of a radioactive substance depends upon

a) Nature of the substance b) pressure c) temperature d) all of the above

9. A free particle has

a) constant momentum and variable energy b) constant momentum andconstant energy b) variable momentum and constant energy d) variable momentum and variable energy

10. The uncertainty principle is appli9cable to

a) Macroscopic particle only b) microscopic particle only c) both macroscopic and microscopic particles d) particles moving with velocity of light

11. Which of the following is not a canonical conjugate pair?

a) Energy-time b) Position- momentum c) Angular displacement – angular momentum d) force - velocity

12. What is the reflection coefficient for a particle incident on a step potential with energy less then the step height?

a) **1** b)0 c) ½ d) 1/3

13. What is the momentum of a particle in a one dimensional box of length L?

a) b**)** c) d)

14. Nuclear force is

a) short range and charge dependent b) long range and charge dependent c) short range and charge independent d) long range and charge independent

15. Which particle has approximately the same mass as a proton?

a) Alpha b)Beta c) Neutron d) Electron

**Group B very short answer 4x5 = 20**

16. Why cannot the Compton Effect be observed with visible light?

17. What is wave packet?

18. What is the difference between the spontaneous and stimulated emission?

 19. What is the nuclear stability?

**Group C Short Answer 1x10= 10**

20. What is radioactivity? State the law of radioactive decay.

21. What is the wave function of a moving particle? Discuss its physical significance.