Dual nature of matter and radiation

Test Paper-I

MAX MARKS: 30   **TIME: 90Mts**

Sl. No.	QUESTION	ANSWER PAGE	MARKS

1 Plot a graph showing the variation of photoelectric current with collector plate potential for light of same intensity at various frequencies. Also give any two inferences from the graph.   **Page:391**   **3**

2 Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work-functions W1 and W2(W1>W2). On what factors does the   **2**

     i.   Slope and

     ii.   Intercept of the lines depend?   **Page:392**

3 Two monochromatic radiations of frequencies n1 and n2 (n1>n2) and having the same intensity are in turn, incident on a photosensitive surface to cause photoelectric emission. Explain giving reason in which case (i) more number of electrons will be emitted and (ii) maximum kinetic energy of the emitted photoelectrons will be more.   **Page:392**   **2**

4 Find the statement which is not true from the following   **Page:392**

     a. The stopping potential varies linearly with the frequency of incident radiation for a given photosensitive material.

     b. There exists a certain minimum cutoff frequency for which the stopping potential is zero.   **1**

     c. For a frequency v of incident radiation, lower than the cut-off frequency v_0, no photoelectric emission is possible even if the intensity is large.

     d. The maximum kinetic energy of the photoelectrons does not vary linearly with the frequency of incident radiation, but is independent of its intensity.

5 Find from the following which is not as per the experimental features and observations of photoelectric effect.   **Page:392**

     a. For a given photosensitive material and frequency of incident radiation, the photoelectric current is directly proportional to the intensity of incident light.   **1**

     b. For a given photosensitive material and frequency of incident radiation, saturation current is found to be proportional to the intensity of incident radiation

c. Stopping potential is dependent on intensity of the incident radiation

d. For a given photosensitive material, there exists a certain minimum frequency called threshold frequency below which no emission takes place.

6	a. Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons. **Page:393**	3
	b. Write the basic features of photon picture of Electromagnetic radiation on which Einstein's photoelectric equation is based.	
7	What is the expression to find the maximum kinetic energy of the electron emitted from the metal surface when a quantum of energy hν is incident on the metal surface? What do you call the equation? **Page:394**	1 +1
8	Give the factors on which maximum kinetic energy of the electron emitted in photoelectric effect depends upon. **Page:394**	1
9	Define threshold frequency. **Page:394**	1
10	Explain why for a frequency $v > v_0$, the threshold frequency Photoelectric current is proportional to intensity **Page:394**	1
11	What is the basic elementary process involved in photoelectric effect? What type of process it is? **Page:395**	1+1
12	How the frequency does varies with stopping potential. What type of graphical relation do you expect from the relation? **Page:395**	1+1
13	What are the properties of photon? **Page:395**	1
14	Which experiment confirms the particle nature of light **Page:395**	1
15	During which year Einstein was awarded Noble prize for his contribution to photoelectric effect. **Page:395**	1
16	Who is the other scientist awarded noble prize for the Photoelectric effect same and in which year? **Page:395**	1
17	Give any three points on the photon picture of Electromagnetic radiation. Page:396	3
18	Monochromatic light of frequency 6×10^{14} Hz is produced by a laser. The power emitted is 2×10^{-3} W. **Page:396**	2
	a. What is the energy of a photon in the light beam?	
	b. How many photons per second on an average, are emitted by the source?	