OPEN STUDENT FOUNDATION
Physics (Class 12)
PRACTICE SHEET DAY 11

CHAPTER 11 | Date : 27/02/24

Section A

● **Write the answer of the following questions. [Each carries 1 Mark]** **[10]**

1. The photoelectric cutoff voltage in a certain experiment is 1.5 V. What is the maximum kinetic energy of photoelectrons emitted ?
2. The work function of cesium is 2.14 eV. Find
   (a) the threshold frequency of cesium, and
   (b) the wavelength of the incident light if the photo current is brought to zero by a stopping potential of 0.86 V.
3. For photo electric effect explain effect of frequency of incident radiation on stopping potential.
4. (a) For what Kinetic Energy of a neutron will the associated de-Broglie wavelength be 1.40×10^{-10} m
   (b) Find the de-Broglie wavelength of a neutron in thermal equilibrium with matter, having an average Kinetic Energy of $\frac{3}{2}K_BT$ at 300 K. [$K_B = 1.38 \times 10^{-23}$ SI unit]
5. Calculate the :
   (a) Momentum and
   (b) de-Broglie wavelength of the electrons accelerated through potential difference of 56 V.
6. Write Einstein's explanation of photoelectric effect and derive Einstein's equation.
7. Light of wavelength 488 nm is produced by an argon laser which is used in the photoelectric effect. When light from this spectral line is incident on the emitter, the stopping (cutoff) potential of photoelectrons is 0.38 V. Find the work function of the material from which the emitter is made.
8. Which characteristics of photoelectric effect are not explained by the wave nature of light. Explain Einsteins' explanation.
9. Summarise the photon picture of electromagnetic radiation (any four).
10. Monochromatic light of wavelength 632.8 nm is produced by a helium-neon laser. The power emitted is 9.42 mW.
    (a) Find the energy and momentum of each photon in the light beam,
    (b) How many photons per second, on the average, arrive at a target irradiated by this beam ? (Assume the beam to have uniform cross-section which is less than the target area), and
    (c) How fast does a hydrogen atom have to travel in order to have the same momentum as that of the photon ?

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Section [A] : 1 Marks Questions					
No	Ans	Chap	Sec	Que	Universal_QueId
1.	-	Chap 11	S8	2	QP23P11B1211_P2C11S8Q2
2.	-	Chap 11	S8	3	QP23P11B1211_P2C11S8Q3
3.	-	Chap 11	S8	4.1	QP23P11B1211_P2C11S8Q4.1
4.	-	Chap 11	S8	5	QP23P11B1211_P2C11S8Q5
5.	-	Chap 11	S8	4.2	QP23P11B1211_P2C11S8Q4.2
6.	-	Chap 11	S9	21	QP23P11B1211_P2C11S9Q21
7.	-	Chap 11	S9	19	QP23P11B1211_P2C11S9Q19
8.	-	Chap 11	S8	6	QP23P11B1211_P2C11S8Q6
9.	-	Chap 11	S8	1.1	QP23P11B1211_P2C11S8Q1.1
10.	-	Chap 11	S10	20	QP23P11B1211_P2C11S10Q20

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Section A

● **Write the answer of the following questions.** [Each carries 1 Mark] **[10]**

1. The photoelectric cutoff voltage in a certain experiment is 1.5 V. What is the maximum kinetic energy of photoelectrons emitted ?

➠ K_{max} = 1.5 eV

2. The work function of cesium is 2.14 eV. Find
(a) the threshold frequency of cesium, and
(b) the wavelength of the incident light if the photo current is brought to zero by a stopping potential of 0.86 V.

➠ Try Yourself

3. For photo electric effect explain effect of frequency of incident radiation on stopping potential.

➠ Try Yourself

4. (a) For what Kinetic Energy of a neutron will the associated de-Broglie wavelength be 1.40×10^{-10} m
(b) Find the de-Broglie wavelength of a neutron in thermal equilibrium with matter, having an average Kinetic Energy of $\frac{3}{2}K_BT$ at 300 K. [$K_B = 1.38 \times 10^{-23}$ SI unit]

➠ Try Yourself1

5. Calculate the :
(a) Momentum and
(b) de-Broglie wavelength of the electrons accelerated through potential difference of 56 V.

➠ $P = 4.04 \times 10^{-24}$ kg ms^{-1}, $\lambda = 0.164$ nm

6. Write Einstein's explanation of photoelectric effect and derive Einstein's equation.

➠ Try Yourself

7. Light of wavelength 488 nm is produced by an argon laser which is used in the photoelectric effect. When light from this spectral line is incident on the emitter, the stopping (cutoff) potential of photoelectrons is 0.38 V. Find the work function of the material from which the emitter is made.

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8. Which characteristics of photoelectric effect are not explained by the wave nature of light. Explain Einsteins' explanation.

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9. Summarise the photon picture of electromagnetic radiation (any four).

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10. Monochromatic light of wavelength 632.8 nm is produced by a helium-neon laser. The power emitted is 9.42 mW.
(a) Find the energy and momentum of each photon in the light beam,
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