

DUAL NATURE OF RADIATION WORKSHEET CLASS XII PHYSICS

1) The theory, on the basis of Photoelectric effect can be explained:

(a) Corpuscular theory (b) Wave theory (c) Electromagnetic theory (d) Quantum theory

2) The photoelectric work function for a metal surface is 4.14 eV.

The cutoff wavelength for this is :

(a) 4125 Å (b) 2062.5 Å (c) 3000 Å (d) 6000 Å

3) If E_1, E_2, E_3 and E_4 are the respective kinetic energies of electron, deuteron, proton and neutron having same De- Broglie wavelength. Select the correct order in which those values would increase :

(a) E_1, E_2, E_4 and E_3 (b) E_2, E_4, E_3 and E_1 (c) E_2, E_3, E_1 and E_4 (d) E_1, E_3, E_2 and E_4

4) When radiation of given frequency is incident upon different metals, the maximum kinetic energy of electrons emitted –

(a) decrease with increase of work function (b) increase with increase of work function (c) remains same with the increase of work function (d) does not depend upon work function

5) A proton, a neutron, an electron and alpha particle have same kinetic energy, then their De-Broglie wavelengths compare as

(a) $\lambda_e = \lambda_p = \lambda_n = \lambda_\alpha$ (b) $\lambda_e > \lambda_p > \lambda_n > \lambda_\alpha$ (c) $\lambda_\alpha < \lambda_p < \lambda_n < \lambda_e$ (d) $\lambda_p = \lambda_n & \lambda_e > \lambda_\alpha$

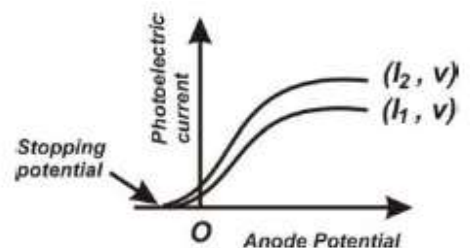
6) The monochromatic beams A and B of equal intensities I , hit a screen. The number of photons hitting the screen by beam A is twice that by beam B. The ratio of their frequencies will be –

(a) 1:2 (b) 2:1 (c) 1:1 (d) 1:3

Hint [$\Phi = nh\nu$]

7) Following graph shows the variation of photoelectric current with anode potential for two light beams of same wavelength but different intensity. Find the correct relation :

(a) $I_1 > I_2$ (b) $I_1 = I_2$ (c) $I_1 < I_2$ (d) $I_1 \leq I_2$



8) Which of the following has maximum stopping potential when metal is illuminated by visible light?

(a) Blue (b) Yellow (c) Violet (d) Red

9) The slope of frequency of incident ray and stopping potential for a given surface will be

(a) h (b) h/e (c) eh (d) e

10) The threshold wavelength for a metal having work function ϕ_0 is λ_0 , what is the threshold wavelength for a metal whose work function is $\phi_0/2$.

(a) $4\lambda_0$ (b) $2\lambda_0$ (c) $\lambda_0/2$ (d) $\lambda_0/4$

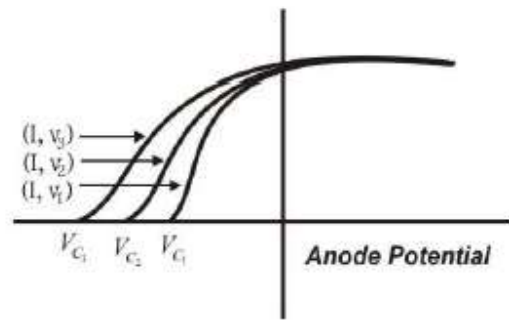
11) Maximum kinetic energy of emitted electron depends on the frequency of incident photon when frequency of incident photons is

(a) equal to the threshold frequency (b) half of threshold frequency (c) greater than threshold frequency (d) one third of threshold frequency

12) Two particles have equal momentum. What is the ratio of their de-Broglie wavelength?

(a) 2 (b) 1 (c) 3 (d) 0.5

13) Identify the correct relation for the given diagram for frequency



(a) $u_1 = u_2 = u_3$ (b) $u_1 > u_2 > u_3$ (c) $u_1 < u_2 < u_3$ (d) $u_1 = 2 u_2 = 3 u_3$

14) The minimum energy required by a free electron to just escape from the metal surface is called as -----.

15) The maximum kinetic energy of emitted photoelectrons depends on the ----- of incident radiation and the nature of material.

16) The maximum kinetic energy of emitted photoelectrons is independent of ----- of incident radiation.

17) The main aim of Davison- Germer experiment is to verify the ----- nature of moving electrons.

18) The expression for De-Broglie wavelength of an electron moving under a potential difference of V Volts is -----

19) The minimum frequency required to eject an electron from the surface of a metal surface is called----- Frequency.

20) In photoelectric effect, saturation current is not affected on decreasing theof incident radiation provided its intensity remains unchanged.

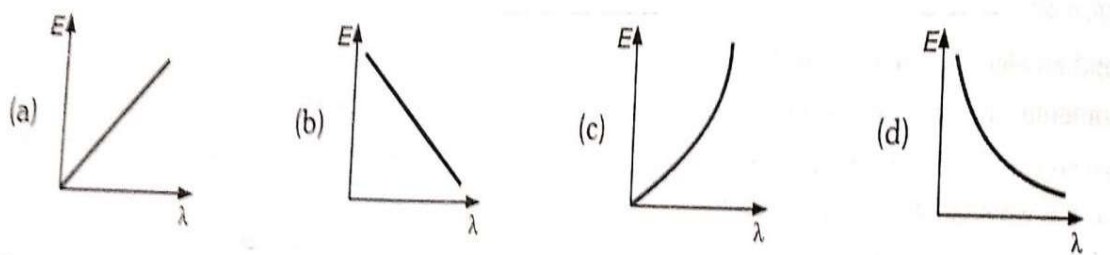
21) Matter wave are associated withparticle

22) Photoelectron are ejected with kinetic energy which ranges from ----- when frequency of incident photon is greater than threshold frequency of metal .

23) If we double the frequency of incident photon than stopping potential is -----

24) The ratio of De broglie wave length of proton and deuteron is ----- when accelerated by same potential

25) The correct graph depicting energy of a photon 'E' as the function of its wavelength ' λ ' is



26) The work function of a photo sensitive surface is 3.3 eV . If $h = 6.6 \times 10^{-34} \text{ Js}$, its threshold frequency will be:

A. 3×10^{14}

B. 8×10^{15}

C. 8×10^{14}

D. 2×10^{15}

27) Photons of energy 7.0 eV are incident on a surface of work function 2.0 eV . The maximum velocity of the emitted photoelectrons will be

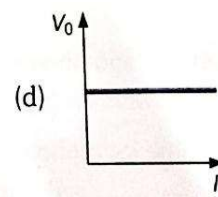
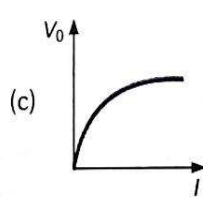
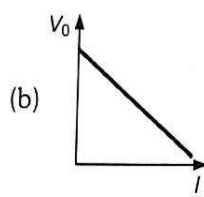
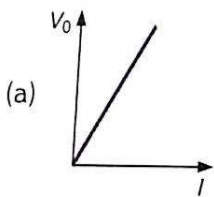
A. $1.33 \times 10^6 \text{ m/s}$

B. $5 \times 10^7 \text{ m/s}$

C. $9 \times 10^6 \text{ m/s}$

D. $1.4 \times 10^5 \text{ m/s}$

28) The correct curve between the stopping potential (V_0) and intensity of incident light (I) at constant frequency is



29) Consider electrons and photons of the same wavelength. Then, they will have the same

A. energy

B. velocity

C. momentum

D. angular momentum

30) A proton and an α -particle have the same de Broglie wavelength. What is same for both the them

A. time period

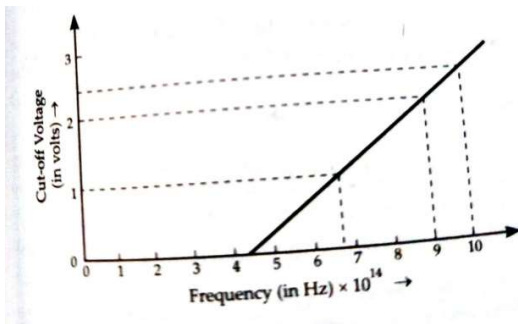
B. Energy

C. frequency

D. momentum

NUMERICALS

1. The diagram shows the plot of cut off voltage versus frequency of radiation incident on a metal. Calculate (i) threshold frequency (ii) Planck's constant.



2. A metal has threshold wavelength of 6000\AA . Calculate (i) threshold frequency (ii) work function of the metal eV

3. What is the de Broglie wavelength associated with an electron, accelerated through a potential difference of 100V.

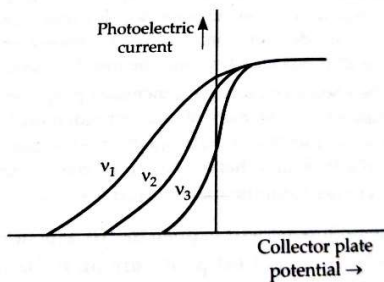
4. What potential difference must be applied to an electron microscope to produce an electron beam of wavelength 0.41\AA .

5. Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive material having work function W_1 and W_2

($W_1 > W_2$). On what factors does the slope and intercept of lines depend?

6. Draw a plot showing the variation of photoelectric current with collector plate potential for two different frequencies, $\nu_1 > \nu_2$, of incident radiation having the same intensity. In which case will the stopping potential be higher? Explain.

7. The graph shows variation of photo electric current with collector plate potential for different frequencies of incident radiations.



(i) Which physical parameter is kept constant for the three curves?

(ii) Which frequency is the highest?

8. An electron and a proton are accelerated through the same potential. Which one of the two has (i) greater value of de Broglie wavelength associated with it (ii) less momentum. Justify your answer.

9. If the frequency of incident radiation on cathode of photo cell is doubled how will the following change (i) KE of electrons (ii) Photo electric current (iii) stopping potential.

10. Calculate the ratio of the accelerating potential required to accelerate (i) proton (ii) α particle to have the same de Broglie wavelength associated with them.

