QB365 Question Bank Software Study Materials

Dual Nature of Radiation and Matter 50 Important 1 Marks Questions With Answers (Book Back and Creative)

12th Standard

Physics

Total Marks : 50

Multiple Choice Question

50 x 1 = 50

1) The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by _____.

(a) $\lambda_p \propto \lambda_e$ (b) $\lambda_p \propto \sqrt{\lambda_e}$ (c) $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$ **(d)** $\lambda_p \propto \lambda_e^2$

2) In an electron microscope, the electrons are accelerated by a voltage of 14 kV. If the voltage is changed to 224 kV, then the de Broglie wavelength associated with the electrons would _____.

(a) increase by 2 times (b) decrease by 2 times **(c) decrease by 4 times** (d) increase by 4 times

3) The wave associated with a moving particle of mass 3 x 10^{-6} g has the same wavelength as an electron moving with a velocity 6 x 10^6 ms^{-1}. The velocity of the particle is _____.

(a) 1.82 x $10^{-18}ms^{-1}$ (b) 9 x $10^{-2}ms^{-1}$ (c) 3 x $10^{-31}ms^{-1}$ **(d) 1.82 x $10^{-15}ms^{-1}$**

4) When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is _____.

(a) 4λ (b) 5λ (c) $\frac{5}{2}\lambda$ **(d) 3λ**

5) If a light of wavelength 330 nm is incident on a metal with work function 3.55 eV, the electrons are emitted. Then the wavelength of the wave associated with the emitted electron is _____.(Take h = 6.6 x 10^{-34} Js)

(a) < 2.75 ×10^{-9}m (b) ≥ 2.75 × 10^{-9}m (c) ≤ 2.75 × 10^{-12}m (d) < 2.5 × 10^{-10}m

6) A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and λ /2. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the material is _____.

(a) $\frac{hc}{\lambda}$ (b) $\frac{2hc}{\lambda}$ (c) $\frac{hc}{3\lambda}$ **(d)** $\frac{hc}{2\lambda}$

7) In photoelectric emission, a radiation whose frequency is 4 times threshold frequency of a certain metal is incident on the metal. Then the maximum possible velocity of the emitted electron will be _____.

(a) $\sqrt{\frac{hv_o}{m}}$ **(b)** $\sqrt{\frac{6hv_o}{m}}$ (c) $2\sqrt{\frac{hv_o}{m}}$ (d) $\sqrt{\frac{hv_o}{2m}}$

8) Two radiations with photon energies 0.9 eV and 3.3 eV respectively are falling on a metallic surface successively. If the work function of the metal is 0.6 eV, then the ratio of maximum speeds of emitted electrons in the two cases will be _____.

(a) 1:4 **(b) 1:3** (c) 1:1 (d) 1:9

9) A light source of wavelength 520 nm emits 1.04 x 10^{15} photons per second while the second source of 460 nm produces 1.38 x 10^{15} photons per second. Then the ratio of power of second source to that of first source is _____.

(a) 1.00 (b) 1.02 **(c) 1.5** (d) 0.98

10) If the mean wavelength of light from sun is taken as 550 nm and its mean power as 3.8 x 10^{26} W, then the number of photons emitted per second from the sun is of the order of _____.

(a) 10^{45} (b) 10^{42} (c) 10^{54} (d) 10^{51}

11) The threshold wavelength for a metal surface whose photoelectric work function is 3.313 eV is _____.

(a) 4125 $\mathring{A}$ **(b) 3750$\mathring{A}$** (c) 6000$\mathring{A}$ (d) 2062.5$\mathring{A}$

12) A light of wavelength 500 nm is incident on a sensitive metal plate of photoelectric work function 1.235 eV. The kinetic energy of the photoelectrons emitted is_____. (Take h = 6.6 x 10^{-34} Js)

(a) 0.58 eV (b) 2.48 eV **(c) 1.24 eV** (d) 1.16 eV

13) Photons of wavelength λ are incident on a metal. The most energetic electrons ejected from the metal are bent into a circular arc of radius R by a perpendicular magnetic field having magnitude B. The work function of the metal is _____.

(a) $\frac{hc}{\lambda} - m_e + \frac{e^2B^2R^2}{2m_e}$ (b) $\frac{hc}{\lambda} + 2m_e\left[\frac{eBR}{2m_e}\right]^2$ (c) $\frac{hc}{\lambda} - m_ec^2 - \frac{e^2B^2R^2}{2m_e}$ **(d)** $\frac{hc}{\lambda} - 2m_e\left[\frac{eBR}{2m_e}\right]^2$

14) The work functions for metals A, B and C are 1.92 eV, 2.0 eV and 5.0 eV respectively. The metal/metals which will emit photoelectrons for a radiation of wavelength 4100 Å is/are _____.

(a) A only **(b) both A and B** (c) all these metals (d) none

15) Emission of electrons by the absorption of heat energy is called _____ emission.

(a) photoelectric (b) field **(c) thermionic** (d) secondary

16) The work function of a metal is hv_0. Light of frequency v falls on this metal. The photoelectric effect will take place only if _____.

(a) $v \geq v_0$ (b) $v > 2v_o$ (c) v_o (d) $v > v_o/2$

17) When the intensity of a light source is increased?

(a) the number of photons emitted by the source in unit time increases (b) more energetic photons are emitted

(c) faster photons are emitted (d) total energy of the photons emitted per unit time decreases.

18) Photo electron effect supports quantum nature of light because _____.

(a) there is a minimum frequency which no photo electrons are emitted

(b) the maximum kinetic energy of photo electrons depends only one the frequency of light and not in intensity

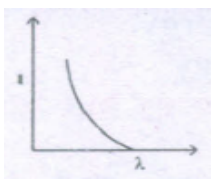
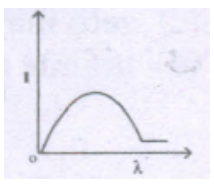
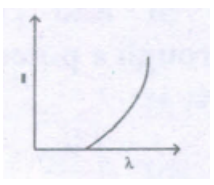
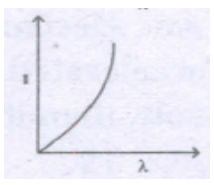
(c) even when the metal surface is faintly illuminated the photoelectrons leave the surface immedietly (d) All the above

19) According to Einstein's photoelectric equation the plot of the K.E of the emitted photoelectrons from a metal vs the frequency of incident radiation gives a straight line where slope _____.

(a) depends on the nature of the metal used (b) depends on the intensity of the radiation (c) both a & b

(d) Depends on neither a or b

20) The anode voltage of a photocell is kept fixed. The wavelength of the light falling on the cathode is gradually changed. The plate current I of the photocell varies as _____.

(a)  (b)  (c)  (d) 

21) The energy of a photon of light is 3eV. Then the wavelength of photon must be _____.

(a) 4125 nm (b) 41250 nm (c) 412.5 nm (d) 4 nm

22) If the radius of third Bohr orbit in a hydrogen atom is r, then the de-Broglie wavelength of an electron in this orbit is _____.

(a) $\frac{r}{3}$ (b) 3r **(c)** $\frac{2\pi r}{3}$ (d) 3(2πr)

23) When a material particle of rest mass m_0, attains the velocity of light its mass becomes _____.

(a) 0 (b) 2 m_0 (c) 4 m_0 **(d)** ∞

24) Electron microscope works on the principle of _____.

(a) photoelectron effect (b) particle nature of electron **(c) wave nature of moving electron** (d) dual nature of matter

25) A graph is drawn taking frequency of incident radiation (v) along the X-axis and its stopping potential (V_0) along the Y-axis. The nature of the graph is _____.

(a) straight line (b) a parabola (c) an ellipse (d) a circle

26) A photon of energy 2 E is incident on a photosensitive surface of photoelectric work function E. The maximum K.E. of photoelectron emitted is _____.

(a) E (b) 2E (c) 3E (d) 4E

27) Louis de Broglie proposed the theory of _____

(a) waves **(b) matter waves** (c) matter corpuscles (d) secondary wavelets

28) If m_e is the mass of the photoelectron emitted with a velocity of 2 m/s, then the kinetic energy associated with it is _____ units.

(a) 2 m_e (b) 4 m_e (c) $\frac{m_e}{2}$ (d) $\frac{m_e}{4}$

29) The saturation current is proportional to the _____ of the radiation.

(a) intensity (b) time of travel (c) target material (d) frequency

30) _____ proposed quantum theory.

(a) Maxwell **(b) Max Planck** (c) Einstein (d) Huygens

31) The maximum kinetic energy of the photon electron is _____

(a) (hv+W) **(b) (hv-W)** (c) (hvW) (d) $\frac{hv}{W}$

32) Photoelectric cells are of _____ types.

(a) two **(b) three** (c) four (d) five

33) The cathode in a photo emissive cell is coated with _____ material.

(a) low work function (b) high work function (c) transparent (d) opaque

34) Photoelectric cells are used for _____ in cinematography.

(a) lighting purposes (b) mirrors **(c) reproducing sound** (d) switches

35) If E = eV is the kinetic energy associated with the electron, de-Broglie's equation becomes _____

(a) $\lambda = \frac{h}{eV}$ (b) λ=eVh **(c)** $\lambda = \frac{h}{\sqrt{2mE}}$ (d) $\lambda = \frac{\sqrt{2mE}}{h}$

36) de- Broglie's concept confirms _____ postulate.

(a) Bohr's (b) Newton's (c) Sommerfeld (d) Huygen's

37) Albert Einstein got his Nobel prize for his theory on _____

(a) General theory of relativity (b) Special theory of relativity (c) Universal constant **(d) Photoelectric effect**

38) A system of coordinate axes which defines the position of a particle in space is called _____

(a) base (b) basis vectors **(c) frame of reference** (d) 3-D space

39) The clocks in moving ships will appear to go _____ clocks on earth.

(a) faster than (b) slower than (c) the same as (d) stops after leaving earth

40) Electrons when accelerated in a cyclotron acquires _____

(a) zero mass **(b) higher mass** (c) zero velocity (d) uniform acceleration

41) Rest energy of a photon is _____

(a) infinite (b) 10^5 units **(c) zero** (d) 2.3 units

42) Nuclear fission and fusion processes are examples of _____

(a) Newton's laws **(b) mass-energy equivalence** (c) gravitational laws (d) Maxwell's laws

43) Find the kinetic energy of an electron in (eV) If the de-Broglie wavelength of the radiation produced is 112 Å.

(a) 150 eV **(b) 120 eV** (c) 12.2eV (d) 10 eV

44) A particle has mass of 10^{-27} kg. This is moving with a speed of 107 m/s. The wavelength associated with the particle is _____.

(a) 5 m **(b) 6.6×10^{-14} m** (c) 6.66 Å (d) 6 nm

45) Find the energy released when 5.5 g of matter is used.

(a) 1.6×10^{8} J (b) 49.5×10^{15} J **(c) 49.5×10^{15} J** (d) 1.6×10^{19}J

46) The length of a moving scale is 6 m, whose velocity is 2×10^{7} m/s. Find its rest length.

(a) 7.6 m (b) 15 m (c) 3 m **(d) 6.013 m**

47) The de Broglie wavelength of electron accelerated with a potential V is _____

(a) $\lambda = \frac{h}{\sqrt{Vem}}$ **(b)** $\lambda = \frac{h}{\sqrt{2Vem}}$ (c) $\lambda = \frac{h}{m\sqrt{2Vem}}$ (d) $\lambda = \frac{h}{m\sqrt{\frac{Ve}{m}}}$

48) The number of waves in a distance l is equal to _____.

(a) frequency **(b) 3×10^{8}** (c) wave number (d) 1

49) Electron microscope cannot be used for the study of _____.

(a) surface of metals (b) textile fibres (c) crystal structure **(d) living organism**

50) X- rays cannot be used in microscope since they _____.

(a) have low penetrating power (b) have lesser wavelength **(c) cannot be focused** (d) have greater wavelength