PHYSICS

BOOKS - SARAS PUBLICATION

DUAL NATURE OF MATTER AND RADIATION

Example

1. The work function of a surface of a photosensitive material 6.2eV . The wavelength of

the incident radiation for which the stopping potentials is 5V lies in the:

A. Ultraviolet region

B. Visible region

C. Infrared region

D. X-ray region

Answer:

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2. The potential difference that must be applied to stop the fastest photoelectrons emitted by a nickel surface, having work function 5.01 eV , when ultraviolet light of 200nm falls on it, must be:

A. 2.4V

B. -1.2 V

C. -2.4 V

D. 1.2 V

Answer:

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3. In photoelectric emission process from a metal of work function 1.8eV , the kinetic energy of most energetic electrons is 0.5eV . The corresponding stopping potential is:

A. 2.3 V

B. 1.8 V

C. 1.3 V

D. 0.5 V

Answer:

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4. Electrons used in an electron microscope are accelerated by a voltage 25 kv. If the voltages increased to 100 kv then the'de-Broglie wavelength associated with the electrons would:

A. Increase by 4 times

B. Increase by 2 times

C. Decrease by 2 times

D. Decrease by 4 times

Answer:

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5. An α - particle moves in a circular path of radius 0.83cm in the presence of a magnetic field of $0.25Wb/m^2$ .The de-broglie wavelength associated with the particle will be:

A. $0.1\overset{\circ}{A}$

B. $10\overset{\circ}{A}$

C. $0.01\overset{\circ}{A}$

D. $1\overset{\circ}{A}$

Answer:

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6. Two sources of sound placed close to each othe , are emitting progressively waves given by $y_1 = 4\sin 600\pi t$ and $y_2 = 5\sin 608\pi t$. An observer located near these two source of sound will hear.

A. 8 beats per second with intemity ratio $25:16$ between waxing and waning

B. 8 beats per second with intensity ratio $81:1$ between waxing and waning

C. 4 beats per second with intensity ratio $81:1$ between waxing and waning

D. 4 beats per second with intensity ratio $25:16$ between waxing and waning

Answer:

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7. A certain mass of hydrogen is changed to Helium by the process of fusion . The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is (given 1u = 931 MeV)`

A. 2.36 Me V

B. 26.7 Me V

C. 6.675 MeV

D. 13.35 Me V

Answer:

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8. For photoelectric emission from certain metal the cut -off frequency is v . If radiation of frequency 2v impinges on the metal plate, the maximum possible velocity of the emitted electron will be(m is the electron mass).

A. $\sqrt{\frac{hv}{2m}}$

B. $\sqrt{\frac{hv}{m}}$

C. $\sqrt{\frac{2hv}{m}}$

D. $2\sqrt{\frac{hv}{m}}$

Answer:

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9. In young's double slit experiment , the slits are 2mm apart and are illuminated by photons of two wavelength $\lambda_1 = 12000\overset{\circ}{A}$ and $\lambda_2 = 10000\overset{\circ}{A}$. At what minimum distance from the slit will a bright

fringe from one interference pattern coincide with a bright fringe from the other?

A. 8 mm

B. 6 mm

C. 4 mm

D. 3 mm

Answer:

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10. A parallel beam of fast moving electron is incident normally on a narrow slit . A fluorescent screen is placed at a large distance from the slit . If the speed of the electrons is correct?

A. Diffraction pattern is not observed on the screen in the case of electrons

B. The angular width of the central maximum of the diffraction pattern will increase

C. The angular width of the central maximum will decrease

D. The angular width of the central maximum will be unaffected

Answer:

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11. An electron in hydrogen atom makes a transition $n_1 \to n_2$ Where n_1 and n_2 are principal quantum numbers of the two states . Assuming Bohr's model to be valid the time period of the electron in the intial state is eight times

that in the final state. The possible values of n_1 and n_2 are:

A. $n_1 = 1$ and $n_2 = 2$

B. $n_1 = 6$ and $n_2 = 2$

C. $n_1 = 8$ and $n_2 = 1$

D. $n_1 = 8$ and $n_2 = 2$

Answer:

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12. The de- Broglie wavelength of neutrons in thermal equilibrium at temperature T is:

A. $\frac{30.8}{\sqrt{T}} \overset{\circ}{A}$

B. $\frac{3.08}{\sqrt{T}} \overset{\circ}{A}$

C. $\frac{0.308}{\sqrt{T}} \overset{\circ}{A}$

D. $\frac{0.0308}{\sqrt{T}} \overset{\circ}{A}$

Answer:

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13. A certain number of spherical drops a liquid of radius r coalesce to form a a single drop of radius R and volume V . If 'T' is the surface tension of the liquid , then:

A. Energy = $4VT\left[\frac{1}{r}-\frac{1}{R}\right]$ is released

B. Energy = $3VT\left[\frac{1}{r}-\frac{1}{R}\right]$ is absorbed

C. Energy = $3VT\left[\frac{1}{r}-\frac{1}{R}\right]$ is released

D. Energy is neither released not absorbed.

Answer:

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14. The angle of a prism is A , One of its refracting surface is slivered . Light rays falling at an angle of incidence 2A on the first surface returns back through the same pathe after suffering reflection at the silvered surface. The refractive index μ of the prism is:

A. 2 sin A

B. 2 cos A

C. $\frac{1}{2}\cos A$

D. tan A

Answer:

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15. When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelctrons emitted from a metal surface increased from 0.5eV to 0.8eV . The work function of the metal is:

A. 0.65ev

B. 1.0eV

C. 1.3ev

D. 1.5ev

Answer:

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16. A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emmited photoelectrons in the second case is 3 times that in the first case the work function of the surface of the material is: (h= plank's constant , c=speed of light).

A. $\frac{hc}{3\lambda}$

B. $\frac{hc}{2\lambda}$

C. $\frac{hc}{\lambda}$

D. $2\frac{hc}{\lambda}$

Answer:

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17. On observing light from three different stars P,Q and R , it was found that intensity of violet colour is maximum in the spectrum of P, the intensity of green colour is the maximum in the spectrum of R and the intensity or red colour is

maximum in the spectrum of Q. if T_P, T_Q and T_R are the respectively absolute temperatures of P,Q and R , then it can be concluded from the above observation that:

A. $T_P > T_R > T_Q$

B. $T_P < T_R < T_Q$

C. $T_P < T_Q < T_R$

D. $T_P > T_Q > T_R$

Answer:

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18. Consider 3rd orbit of He+ (Helium), using non-relativistic approach, the speed of electron in this orbit will be [given $K = 9 \times 10^9$ constant, $Z = 2$ and h (Planck's Constant)=$6.6 \times 10^{-34} Js$]

A. $1.46 \times 10^6 m/s$

B. $0.73 \times l0^6 m/s$

C. $3.0 \times l0^8 m/s$

D. $2.92 \times 10^6 m/s$

Answer:

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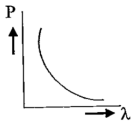
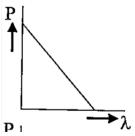
19. Which of the following figures represent the variation of particle momentum and the associated de-Broglie wavelength?

A.



B.



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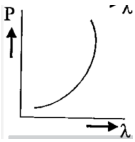
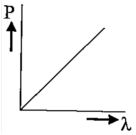


D.



Answer:

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20. A certain metallic surface is illuminated with manochromatic light of wavelength , λ. The stopping potential for photoelectric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ, the stopping

potential is V_0. The threshold wavelength for this surface for photoelectric effect is:

A. 4λ

B. $\frac{\lambda}{4}$

C. $\frac{\lambda}{4}$

D. 6λ

Answer:

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21. Electrons of mass m with de - Broglie wavelength , λfall on the target in an X-ray tube . The cutoff wavelength$(\lambda_0)$of the emitted X-ray is:

A. $\lambda_0 = \frac{2m^2c^2\lambda^2}{h^2}$

B. $\lambda_0 = \lambda$

C. $\lambda_0 = \frac{2mc\lambda^2}{h}$

D. $\lambda_0 = \frac{2h}{mc}$

Answer:

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22. Photons with energy 5eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV . When photons of energy 6eV are incident on C , no photoelectrons will reach the anodeA, if the stopping potential of A relative to C is:

A. $-1V$

B. $-3V$

C. $+3V$

D. $+4V$

Answer:

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23. When a metallic surface is illuminated with radiation of wavelength λ, the stopping potentials 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. 3λ

B. 4λ

C. 5λ

D. $\frac{5}{2}\lambda$

Answer:

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24. An electron of mass m and photon have same energy E. The ratio of de-Broglie wavelength associated with them is:

A. $\frac{1}{c}\left[\frac{2m}{E}\right]^{\frac{1}{2}}$

B. $\frac{1}{c}\left[\frac{E}{2m}\right]^{\frac{1}{2}}$

C. $\left[\frac{E}{2m}\right]^{\frac{1}{2}}$

D. $c(2mE)^{\frac{1}{2}}$

Answer:

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25. The de- Broglie wavelength of neutrons in thermal equilibrium at temperature T is:

A. $\frac{h}{\sqrt{3mKT}}$

B. $\frac{2h}{\sqrt{3mKT}}$

C. $\frac{2h}{\sqrt{mKT}}$

D. $\frac{h}{\sqrt{mkt}}$

Answer:

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26. The photoelectric threshold wavelength of silver is 3250×10^{-10}m . The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength 2356×10^{-10}m is: $\left(Givenh = 4.14 \times 10^{-15}eV \text{ and } c = 3 \times 10^{8}ms^{-1}\right)$.

A. $\approx 0.6 \times 10^{6}ms^{-1}$

B. $\approx 61 \times 10^{3}ms^{-1}$

C. $\approx 0.33x10^{6}ms^{-1}$

D. $\approx 6 \times 10^5 ms^{-1}$

Answer:

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27. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is :-

A. 1

B. 4

C. 0.5

D. 2

Answer: