PHYSICS

RESONANCE ENGLISH

ATOMIC PHYSICS

Exercise

1. If first excitation potential of a hydrogen-like atom is V electron volt, then the ionization energy of this atom will be

A. V electron volt

B. $\frac{3V}{4}$ electron volt

C. $\frac{4V}{3}$ electron volt

D. cannot be calculated by given information

Answer: C

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2. Two hydrogen atoms are in excited state with electrons residing in n = 2. First one is moving towards left and emits a photon of energy E_1 towards right. Second one is moving towards left with same speed and emits a photon of energy E_2 towards left. Taking recoil of nucleus into account during emission process

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. information insufficient

Answer: B

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3. In a hydrogen atom following the Bohr's psotulates the product of linear momentum and angular momentum is proportional ot $(n)^x$ where 'n' is the orbit number. Find the valur of x.

A. 0

B. 2

C. -2

D. 1

Answer: A

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4. If the short wavelength limit of the continous spectrum coming out of a Coolidge tube is $10A$, then the de Broglie wavelength of the electrons reaching the target netal in the Coolidge tube is approximately

A. 0.3 Å

B. 3Å

C. 30Å

D. 10Å

Answer: A

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5. A charge particle q_0 of mass m_0 is projected along the y-axis at t = 0 from origin with a velocity V_0. If a uniform electric field E_0 also exists along the x-axis, then the time at which debroglie wavelength of the particle becomes half of the initial value is :

A. $\frac{m_0 v_0}{q_0 E_0}$

B. $2\frac{m_0 v_0}{q_0 E_0}$

C. $\sqrt{3}\frac{m_0 v_0}{q_0 E_0}$

D. $3\frac{m_0 v_0}{q_0 E_0}$

Answer: C

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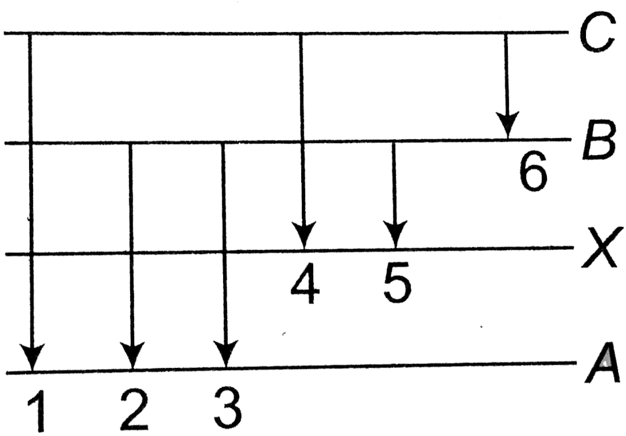
6. In the figure six lines of emission spectrum are shown. Which of them will be absent in the absorption spectrum.



A. 1,2,3

B. 1,4,6

C. 4,5,6

D. 1,2,3,4,5,6

Answer: A

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7. Consider atoms H, He^{+}, Li^{++} in their ground states. If L_1, L_2 and L_3 are magnitude of angular momentum of their electrons about the nucleus respectively then:

A. $L_1 = L_2 = L_3$

B. $L_1 > L_2 > L_3$

C. $L_1 < L_2 < L_3$

D. $L_1 = L_2 = L_3$

A. $L_1 = L_2 = L_3$

B. $L_1 > L_2 > L_3$

C. $L_1 < L_2 < L_3$

D. $L_1 = L_2 = L_3$

Answer: A

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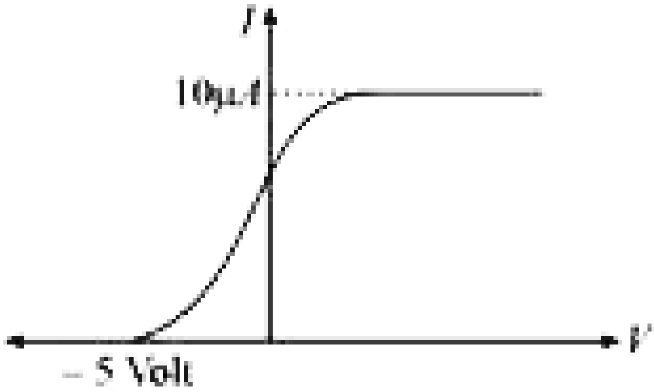
8. In the photoelectric experiment, if we use a monochromatic light, the I – V curve is as shown. If work function of the metal is 2 eV, estimate the power of light used. (Assume efficiency of photo emission $= 10^{-3}$ i.e. number of photoelectrons emitted are 10^{-3} times of number of photons incident on metal).



A. 2W

B. 5W

C. 7W

D. 10 W

Answer: C

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9. A parallel beam of uniform, monochromatic light of wavelength 6600 Å has an intensity of $900 Wm^{-2}$. The number of photons in $1 mm^2$ of this radiation are 1×10^X then find out value of X.

A. 4166

B. 3000

C. 5000

D. 2083

Answer: D

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10. Yellow light of 557 nm wavelength is incident on a cesium surface. It is found that no photo electrons flow in the circuit when the cathode-anode voltage drops below 0.25V. Then the threshold wavelength for photo electric effect from cesium is

A. 577 nm

B. 653 nm

C. 734 nm

D. 191 nm

Answer: B

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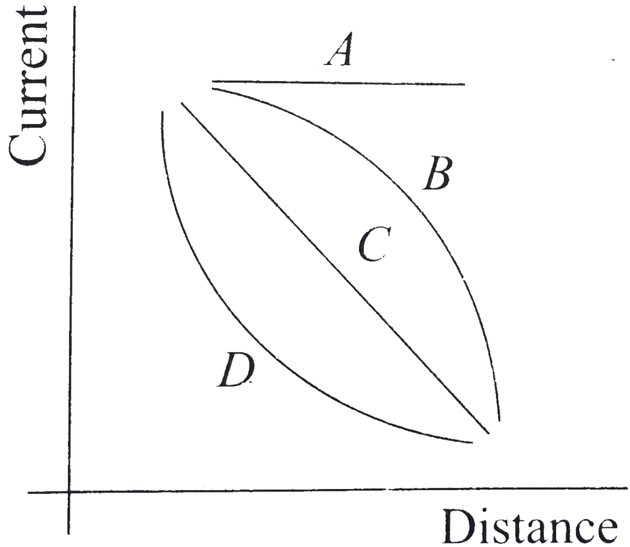
11.



A point source causes photoelectric effect from a small metal plate. Which of the curves in Fig. may represent the saturation photo-current as a function of the distance between the source and the metal?

A. A

B. B

C. C

D. D

Answer: D

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12. If n_r and n_b are respectively, the number of photons emitted by a red bulb and a blue of equal power in a given time, then

A. $n_r = n_0$

B. $n_r < n_0$

C. $n_r > n_0$

D. nothing can be predicted

Answer: C

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13. When light of intensity $1W/m^2$ and wavelength 5×10^{-7}m is incident on a surface, it is completely absorbed by the surface. If 100 photons emit one electron and area of the surface is $1cm^2$,then the photoelectric current will be

A. 2mA

B. $0.4\mu A$

C. 4.0 mA

D. $4\mu A$

Answer: B

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14. Light of wavelength 5000Å falls on a sensitive plate with photoelectric work function of $1.9eV$. The kinetic energy of the photoelectron emitted will be

A. 0.58 eV

B. 2.58 eV

C. 1.24 eV

D. 1.16 eV

Answer: A

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15. The photoelectric work function for a metal surface is $4.125 eV$. The cut-off wavelength for this surface is

A. 200 nm

B. 300 nm

C. 150 nm

D. 420 nm

Answer: B

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16. The wavelength of a photon and the deBroglie wavelength of an electron and uranium atom are identical. Which one of them will have highest kinetic energy

A. Photon

B. electron

C. U-atom

D. nothing can be predicted

Answer: A

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17. A proton and an α-particle are accelerated through the same potential difference. The ratio of Broglie wavelength λ_p to that of λ_α is

A. 2

B. $2\sqrt{2}$

C. $1/2\sqrt{2}$

D. $\sqrt{2}$

Answer: B

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18. Linear momenta of a proton and an electrons are euqal. Relative to an electron-

A. Kinetic energy of photon is more

B. De-broglie wavelength of proton is more

C. De-broglie wavelength of photon is less.

D. De-broglie wavelength of photon and electron are equal.

Answer: D

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19. Momentumof γ - ray proton of energy 3 keV in kg-m/s will be

A. 1.6×10^{-19}

B. 1.6×10^{-21}

C. 1.6×10^{-24}

D. 1.6×10^{-27}

Answer: C

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20. Wrong statement in connection with Davisson-Germer experiment is

A. The inter-atomic distance in nickel crystal of the order of the de-broglie wavelength.

B. Electrons of constant energy are obtained by the electron gun

C. Nickel crystal acts as a three dimensional diffracting grating.

D. Davission-Germer experimental is an inteference experiment.

Answer: D

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21. The correct relation betweeen the angle of diffraction ϕ and the glancing angle θ in the Davission-Germer experiment will be

A. $\theta = 90^\circ - \frac{\phi}{2}$

B. $\phi = 90^\circ \frac{\theta}{2}$

C. $\theta = 90^\circ - \phi$

D. $\phi = (90^\circ - \theta) / 2$

Answer: B

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22. Object are exposed to the X-rays in a dark room. They will appear

A. invisible

B. white

C. yellow

D. red

Answer: A

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23. The intensity of an X-ray beam reduces to $36.8\,\%$ of its initial intensity after traversing a gold film of thickness $5 \times 10^{-3} m$. Its absorption coefficient is

A. $50 m^{-1}$

B. $100 m^{-1}$

C. $150 m^{-1}$

D. $200 m^{-1}$

Answer: D

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24. An X-ray tube operating at 50kV converts 1% energy in the form of X-ray. If the amount of heat produced is 495 watt, then the number of electrons colliding with the target per second is

A. 6.25×10^{16}

B. 4.15×10^{16}

C. 3.2×10^{16}

D. 1.2×10^{16}

Answer: A

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25. A beam of electron accelerated by a large potential difference V is mode of strike a metal target of produce X-ray . For which of the following value of V , will the resulting X-ray have the lower minimum wavelength?

A. 10 kV

B. 20 kV

C. 30 kV

D. 40 kV

Answer: D

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26. Production of continuous X-rays is caused by

A. Transition of electrons from higher levels to lower levels in target atoms

B. Retardation of incident electron when it enters the target atom.

C. Transistor of electrons from lower levels to higher levels in target atoms.

D. Neutrasing the incident electron.

Answer: B

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27. The minimum wavelength $\lambda_{\min}$ in the continuous spectrum of X-rays is

A. Proportional to the potential difference V between the cathode and anode.

B. Inversely proportional to potential differece V between the cathode and anode

C. Proportional to the square root of the potential difference V between the cathode and the anode.

D. Inversely proportional to the square root of the potential difference V between the cathode and the anode.

Answer: B

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28. If λ_v, λ_X and λ_m represented the wavelenght of visible light, $X-rays$ and microwaves respectively, then

A. $\lambda_f > \lambda_y > \lambda_x$

B. $\lambda_x > \lambda_y > \lambda_f$

C. $\lambda_y > \lambda_r > \lambda_x$

D. none of these

Answer: A

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29. Characteristic X-rays of K-series are obtained when the electron transition is from higher orbits to-

A. K-orbit

B. L-orbit

C. M-orbit

D. N-orbit

Answer: A

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30. The wavelength of L_α line in X-ray spectrum of $._{76}Pt$ is 1.32Å. The wavelength of L_α line in X-ray spectrum of another unknown element is 4.17Å. If screening constant for L_α line is 7.4, then atomic number of the unknown element is

A. 78

B. 47

C. 40

D. 35

Answer: B

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31. Statement 1: In process of photoelectric emission, all emitted electrons do not have same kinetic energy.

Statement 2: If radiation falling on photosensitive surface of a metal consists of different wavelengths, then energy acquired by electrons absorbing photons of different wavelengths shall be different.

A. a.Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for Statement-1.

B. b.Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. c.Statement-1 is true but statement-2 is false

D. d.Statement-1 is false, Statement-2 is true

Answer: B

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32. Statement 1: When a beam of highly energetic neutrons is incident on a tungsten target, no X-rays will be produced.

Statement 2: Neutrons do not exert any electrostatic force on electrons or nucleus of an atom.

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: D

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