CHEMISTRY

BOOKS - NARENDRA AWASTHI

ATOMIC STUCTURE

Exercise

1. Which of the following pair is isodiaphers?

A. C_6^{14} and Na_{11}^{23}

B. Mg_{12}^{24} and Na_{11}^{23}

C. He_2^4 and O_8^{16}

D. C_6^{12} and N_7^{15}

Answer: C

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2. Which of the following does not characterise X-rays?

A. The radiation can ionise the gas

B. It causes fluorescence effect on Zns

C. It is deflected by electric and magnetic fields

D. Its wavelength is shorter than ultraviolet rays

Answer: C

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3. The ratio of specific charge of a proton and an $\propto$ -particle is :

A. $2:1$

B. $1:2$

C. $1:4$

D. $1:1$

Answer:

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4. The increasing order of e/m values for electron, proton, neutron and alpha particle is

A. e,p,n,α

B. n,p,e,α

C. n,p,α,e

D. n,α,p,e

Answer: D

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5. The mass to charge ratio (m/e) for a cation of $1.5 \times 10^{-8}\ kg/C$. What is the mass of this cation?

A. 2.4×10^{-19} g

B. 2.4×10^{-27} g

C. 2.4×10^{-24}g

D. None of these

Answer: B

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6. Ruthford's expirement on scatterinf of α-particle showed for the first time that the atom has

A. electrons

B. protons

C. nucleus

D. neutrons

Answer: C

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7. $\propto$ -particles are represented by:

A. lithium atoms

B. helium nuclei

C. hydrogen nuclei

D. None of these

Answer: B

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8. In Bohr's stationary orbits:

A. electrons do not move

B. electrons move emitting radiations

C. energy of the electron remains constant

D. angular momentum of the electron is $h/2\pi$

Answer:

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9. One the basis of Bohr's model, the radius of the 3rd orbit is :

A. equal to the radius of first orbit

B. three times the radius of first orbit

C. five times the radius of first orbit

D. nine times the radius of first orbit

Answer: D

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10. The correct expression derived for the energy of an electron in the n^{th} energy level is for H-atom :

A. $E_n = \frac{2\pi^2 me^4 K^2}{n^2 h^2}$

B. $E_n = \frac{\pi^2 me^4 K^2}{2n^2 h^2}$

C. $E_n = \frac{2\pi^2 me^2 K^2}{n^2 h^2}$

D. $E_n = -\frac{2\pi^2 me^4 K^2}{n^2 h^2}$

Answer: D

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11. Ionization energy for hydrogen atom in ergs, Joules and eV respectively is :

A. $21.8 \times 10^{-12}, 218 \times 10^{-20}, 13.6$

B. $13.6 \times 218 \times 10^{-20}, 21.8 \times 10^{-13}$

C. $21.8 \times 10^{-20}, 13.6, 21.8 \times 10^{-13}$

D. $21.8 \times 10^{-13}, 13.6, 21.8 \times 10^{-20}$

Answer:

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12. For any H like system, the ratio of velocities of electron in I, II & III orbit e.e.,$V_1 : V_2 : V_3$ will be:

A. $1:2:3$

B. $1:1/2:1/3$

C. $3:2:1$

D. $1:1:1$

Answer:

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13. The volume of nucleus is about :

A. 10^{-4} times to that of an atom

B. 10^{-15} times to that of an atom

C. 10^{-5} times to that of an atom

D. 10^{-10} times to that of an atom

Answer: B

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14. An electron in an atom jumps in such a way that its kinetic energy changes from x to $\frac{x}{4}$. The change in potential energy will be:

A. $+\frac{3}{2}x$

B. $-\frac{3}{8}x$

C. $+\frac{3}{4}x$

D. $-\frac{3}{4}x$

Answer:

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15. The potential energy of an electron in the hydrogen atom is -6.8 eV. Indicate in which excited state, the electron is present ?

A. first

B. second

C. third

D. fourth

Answer:

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16. What is the potential energy of an electron present in $N-$ shell of the Be^{3+} ion ?

A. $-3.4eV$

B. $-6.8eV$

C. $-13.6eV$

D. $-27.2eV$

Answer:

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17. The kinetic and potential energy (in eV) of electron present in third Bohr's orbit of hydrogen atom are respectively :

A. $-1.51, \ -3.02$

B. $1.51, \ -3.02$

C. $-3.02, 1.51$

D. $1.51, \ -1.51$

Answer:

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18. The distance between $4th$ and $3rd$ Bohr orbits of He^+ is :

A. 2.645×10^{-10}m

B. 1.322×10^{-10}m

C. 1.851×10^{-10}m

D. None of these

Answer:

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19. What atomic number of an element "X" would have to become so that the 4th orbit around X would fit inside the I Bohr orbit of H atom ?

A. 3

B. 4

C. 16

D. 25

Answer:

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20. The radius or second stationary orbit in Bohr's atom is R. The radius of the third orbit in the same atom will be

A. $R/3$

B. $9R$

C. $R/9$

D. $2.25R$

Answer:

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21. Which state of the triply ionized Beryllium $\left(Be^{3+}\right)$ has the same orbit radius as that of the ground state of hydrogen atom?

A. 3

B. 2

C. 4

D. 5

Answer:

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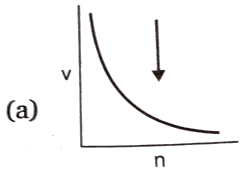
22. Select the incorrect graph for velocity of e^- in an orbit vs. Z, $\frac{1}{n}$ and n :

A.



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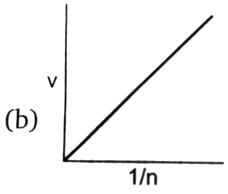

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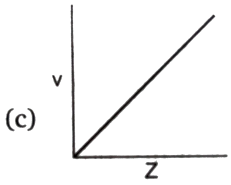
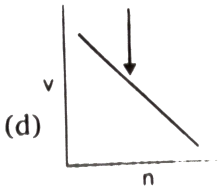


D.



Answer: D

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23. What is the frequency of revolution of electron present in $2nd$ Bohr's orbit of $H-$ atom ?

A. $1.016 \times 10^{16} s^{-1}$

B. $4.065 \times 10^{16} s^{-1}$

C. $1.626 \times 10^{15} s^{-1}$

D. $8.2 \times 10^{14} s^{-1}$

Answer:

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24. According to Bohr's atomic theory, which of the following is correct ?

A. Potential energy of electron $\propto \frac{Z^2}{n^2}$

B. The product of velocity of electron and principal quantum number (n) $\propto -Z^2$

C. Frequency fo revolution of electron in an orbit $\propto \frac{Z^2}{n^3}$

D. Coulombic force of attraction on the electron $\propto \frac{Z^2}{n^2}$

Answer:

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25. Number of waves produced by an electron in one complete revolution in n^{th} orbit is :

A. n

B. n^2

C. $(n+1)$

D. $(2n+1)$

Answer:

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26. Which of the following statement does not form part of Bohr's model of the hydrogen atomn?

A. Energy of the electrons in the orbit is quantized

B. The electron in the orbit which is nearest to the nucleus has the lowest energy

C. Electrons revolve in different orbits around the nucleus

D. The position and velocity of the electrons in the orbit cannot be detemined simulatneously

Answer:

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27. If in Bohr's model, for unielectronic atom, time period of revolution is represented as $T_{n,z}$ where n represents shell no. and Z represents atomic number then the value of $T_{1,2}:T_{2,1}$, will be :

A. $8:1$

B. $1:8$

C. $1:1$

D. $1:32$

Answer:

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28. Which of the following is discreted in Bohr's theory?

A. Potential energy

B. Kinetic energy

C. velocity

D. Angular momentum

Answer:

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29. What is the ratio of time periods (T_1 / T_2) in second orbit of hydrogen atom to third orbit of He^+ ion?

A. $8 / 27$

B. $32 / 27$

C. $27/32$

D. None of these

Answer:

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30. The mass of an electron is m, charge is e and it is accelerated form rest through a potential difference of V volts. The velocity acquired by electron will be :

A. $\sqrt{\frac{V}{m}}$

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

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

D. zero

Answer:

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31. If the ionization energy of He^+ is $19.6 \times 10^{-18} J$ per atom then the energy of Be^{3+} ion in the second stationary state is :

A. $-4.9 \times 10^{-18} J$

B. $-44.1 \times 10^{-18} J$

C. $-11.025 \times 10^{-18} J$

D. None of these

Answer:

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32. The energy of the second Bohr orbit in the hydrogen atom is $-3.41eV$. The energy of the second Bohr orbit of He^+ ion would be :

A. -0.85 eV

B. -13.64 eV

C. -1.70 eV

D. -6.82 eV

Answer:

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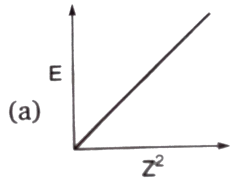
33. The energy of an electron moving in n^{th} Bohr's orbit of an element is given by $E_n = \frac{-13.6}{n^2} Z^2$ eV/ atom (Z=atomic number). The graph of E vs. Z^2 (keeping "n" constant) will be :

A.



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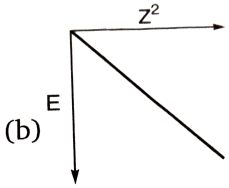

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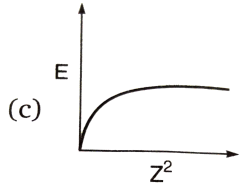
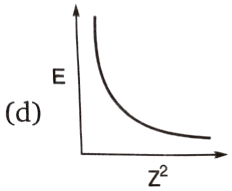


D.



Answer: B

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34. If ε_0 be the permittivity of vacuum and r be the radius of orbit of H-atom in which electron is revolving, then velocity of electron is given by :

A. $v = \dfrac{e}{\sqrt{4\pi\varepsilon_0 rm}}$

B. $v = e \times \sqrt{4\pi\varepsilon_0 rm}$

C. $v = \dfrac{4\pi\varepsilon_0 rm}{e}$

D. $v = \dfrac{4\pi\varepsilon_0 rm}{e^2}$

Answer:

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35. Which of the following statement(s) is/are consistent with the Bohr's theory of the atom (and no others)?

A) An electron can remain in a praticular orbit as long as it continuously absorbs radiation of a definite frequency.

B) The lowest energy orbits are those closest to the nucleus.

C) All electrons can jump from the K shell to the M shell by emitting ratiation of a definite frequency.

A. 1,2,3,

B. 2 only

C. 3 only

D. 1,2

Answer:

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36. The ionization potential for the electron in the ground state of the hydrogen atom is 13.6 eV atom^{-1}. What would be the ionization potential for the electron in the first excited state of Li^{+} ?

A. 3.4 eV

B. 10.2 eV

C. 30.6 eV

D. 6.8 eV

Answer: C

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37. What is the energy content per photon (J) for light of frequency 4.2×10^{14} Hz?

A. 2.8×10^{-21}

B. 2.5×10^{-19}

C. 2.8×10^{-19}

D. 2.5×10^{-18}

Answer:

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38. Wavelength for high energy EMR transition in H-atom is 91 nm. What energy is needed for this transition?

A. 1.36 eV

B. 1240 eV

C. 13 eV

D. 13.6 eV

Answer:

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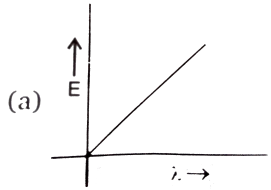
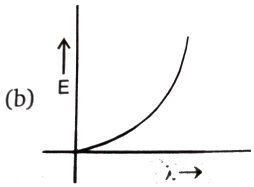
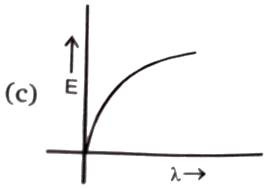
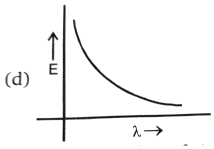
39. Which graph shows how the energy E of a photon of light is related to its wavelengths (λ)?

A. 

B. 

C. 

D. 

Answer:

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40. Assume that 10^{-17}J of light energy is needed by the interior of the human eye to see an object . How many photons of green light $(\lambda = 495nm)$ are needed to generate this minimum energy .

$[h = 6.6 \times 10^{-34} Js]$

A. 6

B. 30

C. 45

D. 60

Answer:

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41. Line spectra is characteristic of :

A. molecules

B. atoms

C. radicals

D. none of these

Answer: B

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42. The spectrum produced from an element is :

A. atomic spectrum

B. line spectrum

C. absorption spectrum

D. any one of the above

Answer:

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43. Electronic transition in He^+ ion takes from n_2 to n_1 shell such that :

$2n_2 + 3n_1 = 18$

$2n_2 + 3n_1 = 6$

What will be the total number of photons emitted when electrons transit to n_1 shell?

A. 21

B. 15

C. 20

D. 10

Answer:

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44. Which of the following expressions represents the spectrum of Balmer series (If n is the principal quantum number of higher energy

level) in Hydrogen atom?

A. $\bar{v} = \frac{R(n-1)(n+1)}{n^2}$

B. $\bar{v} = \frac{R(n-2)(n+2)}{4n^2}$

C. $\bar{v} = \frac{R(n-2)(n+2)}{n^2}$

D. $\bar{v} = \frac{R(n-1)(n+1)}{4n^2}$

Answer:

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45. Multiple or fine structure of spectral lines is due to :

A. presence of main energy levels

B. presence of sub-levels

C. presence of electronic configuration

D. is not a characteristics of the atom

Answer:

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46. Whith increasing principal quantum number, the energy difference between adjacent energy levels in H-atom:

A. decreases

B. increases

C. remains constant

D. decreases for low value of Z and increases for higher value of Z.

Answer: A

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47. Find the value of wave number $\left(\bar{v}\right)$ in terms of Rydberg's constant, when transition of electron takes place between two levels of He^{+} ion whose sum is 4 and difference is 2.

A. $\frac{8R}{9}$

B. $\frac{32R}{9}$

C. $\frac{3R}{4}$

D. none of these

Answer:

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48. What is the wavelength in nm of the spectral line associated with a transition from n=3 to n= 2 for the Li^{2+} ion?

A. 219

B. 656

C. 73.0

D. 486

Answer:

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49. What is the energy (kJ/mol) associated with the de-excitation of an electron from $n = 6$ to $n = 2$ in He^+ ion?

A. 1.36×10^6

B. 1.36×10^3

C. 1.16×10^3

D. 1.78×10^3

Answer:

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50. What is the shortest wavelength line in the Paschen series of Li^{2+} ion ?

A. $\frac{R}{9}$

B. $\frac{9}{R}$

C. $\frac{1}{R}$

D. $\frac{9R}{4}$

Answer:

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51. What is the maximum wavelength line in the Lyman series of He^+ ion?

A. 3R

B. $\frac{1}{3R}$

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

D. None of these

Answer:

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52. Which of the following electron transitions in a hydrogen atom will require the largest amount of energy?

A. from $n = 1$ to $n = 2$

B. from $n = 2$ to $n = 4$

C. from $n = 5$ to $n = 1$

D. from $n = 3$ to $n = 5$

Answer:

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53. Which electronic transition in a hydrogen atom, starting from the orbit n=7, will produce infrared light of wavelength 2170 nm?

$\left(Given: R_H = 1.09677 \times 10^7 M^{-1}\right)$

A. $n = 7$ to $n = 6$

B. from $n = 2$ to $n = 4$

C. from $n = 5$ to $n = 1$

D. from $n = 3$ to $n = 5$

Answer:

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54. A hydrogen atom in the ground state is excited by monochromatic ratiation of wavelength λÅ . The resulting spectrum consists of maximum 15 different lines. What is the wavelength λ ? $\left(R_H = 109677.8 cm^{-1}\right)$

A. 937.3Å

B. 1025Å

C. 1236Å

D. None of these

Answer:

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55. Electromagnetic radiation (photon) with highest wavelength result when an electron in the hydrogen atom falls from" $n = 6$ to :

A. $n = 1$

B. $n = 2$

C. $n = 3$

D. $n = 5$

Answer: D

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56. When an electron jumps from L to K shell -

A. energy is absorbed

B. energy is released

C. energy is neither absorbed nor released

D. energy is sometimes absorbed and some times released

Answer:

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57. How do the energy gaps between successive electron energy levels in an atom very from low to high n values ?

A. All energy gaps are the same

B. The energy gap decreases as n increases

C. The energy gap increases as n increases

D. the energy gap changes unpredictably as n increases

Answer:

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58. The H-spectrum confirms

A. Heisenberg's uncertainty principle

B. diffraction

C. polarization

D. presence of quantized energy level

Answer:

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59. bule coloure of the sky is due to :

A. absorption of light by atmospheric gases

B. transmission of light

C. wavelength of scattered light

D. all of the above

Answer:

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60. In photoelectric effect, the number of photoelectrons emitted is proportional to :

A. intensity of incident light

B. frequency of incident light

C. wavelength of incident light

D. all the above

Answer: A

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61. Slope of V_0 vs v curve is (where V_0= Stopping potential, v=subjected freqency)

A. e

B. $\frac{h}{e}$

C. ϕ

D. h

Answer:

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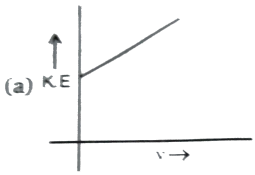
62. According to Einstein's photoelectric equation, the graph between kinetic energy of photoelectrons ejected and the frequency of the incident radiation is :

A.



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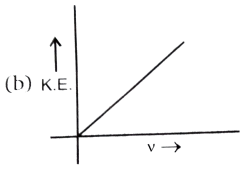
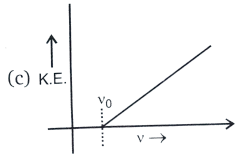
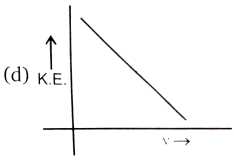


C. 

D. 

Answer:

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63. The photoelectric emission from a surface starts only when the light incident upon the surface has certain minimum:

A. intensity

B. wavelength

C. Frequency

D. velocity

Answer: C

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64. If λ_o and λ be the threshold wavelength and wavelength of incident light , the velocity of photoelectron ejected from the metal surface is :

A. $\sqrt{\frac{2h}{m}(\lambda_0 - \lambda)}$

B. $\sqrt{\frac{2hc}{m}(\lambda_0 - \lambda)}$

C. $\sqrt{\frac{2hc}{m}\left(\frac{\lambda_0 - \lambda}{\lambda\lambda_0}\right)}$

D. $\sqrt{\frac{2h}{m}\left(\frac{1}{\lambda_0} - \frac{1}{\lambda}\right)}$

Answer: C

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65. Electronmagnetic radiations having $\lambda = 310\text{Å}$are subjected to a metal sheet having work function $= 12.8eV$. What will be the velocity of photoelectrons with maximum Kinetic Energy....

A. 0, no emission will occur

B. 4.352×10^6 m/s

C. 3.09×10^6 m/s

D. 8.72×10^6 m/s

Answer: C

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66. The ratio of slopes of $K_{\max}$ vs. v and V_0 vs. v curves in the photoelectric effect gives (v= frequency , $K_{\max}$ = maximum kinetic energy , V_0 = stopping potential)

A. charge of electron

B. Planck's constant

C. work function

D. the ratio of Planck's constant and electronic charge

Answer: A

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67. Radiation corresponding to the transition n=4 to n=2 in hydrogen atoms falls on a certain metal (work function=2.5 eV). The maximum kinetic energy of the photo-electrons will be:

A. 0.55 eV

B. 2.55 eV

C. 4.45 eV

D. None of these

Answer:

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68. Select the incorrect statement

A. K.E. of photo-electron does not depend upon the wavelength of incident radiation

B. Photoelectric current depends on intensity of incident radiation and not on frequency

C. Stopping potentail depends on frequency of raditaion and not on intensity

D. None of these

Answer:

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69. Which is the de-Broglie equation?

A. $h = p\lambda$

B. $h = p\lambda^{-1}$

C. $h = \lambda p^{-1}$

D. $h = p + \lambda$

Answer:

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70. Which of the following has the largest de Broglie wavelength (all have eual velocity)?

A. CO_2 molecule

B. NH_3 molecule

C. Electron

D. Proton

Answer:

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71. The de-Broglie wavelength associated with a particle of mass $10^{-6}kg$ moving with a velocity of $10ms^{-1}$, is

A. 6.63×10^{-22}m

B. 6.63×10^{-29}m

C. 6.63×10^{-31}m

D. 6.63×10^{-34} m

Answer:

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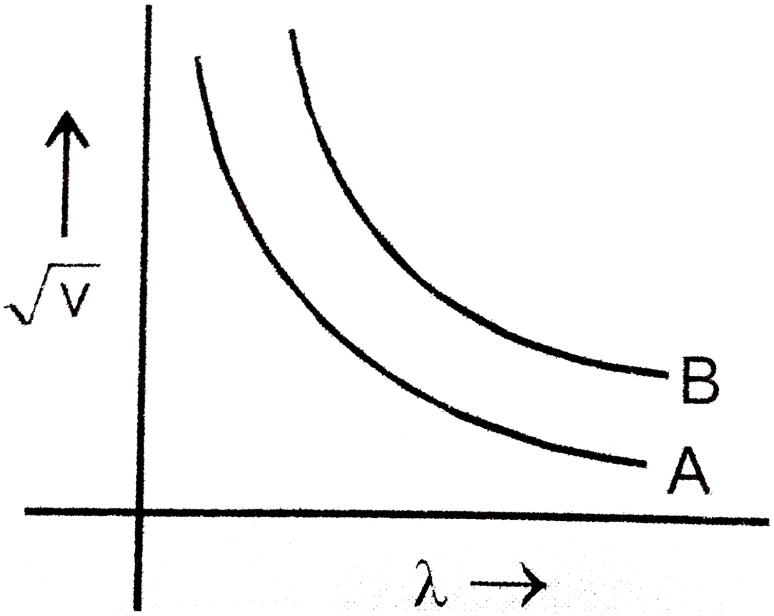
72. For two particles A and B, curves are plotted $\sqrt{V}$ against de-Broglie wavelengths, where V is the potential on the particles. Which of the

following relation is correct about the mass of particles?



A. $m_A = m_B$

B. $m_A > m_B$

C. $m_A < m_B$

D. $m_A$le m_(B)`

Answer: B

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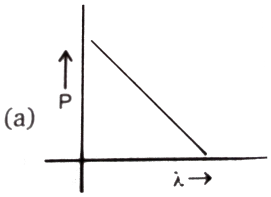
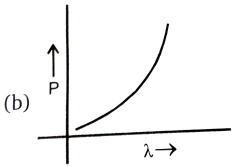
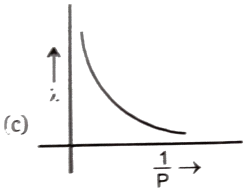
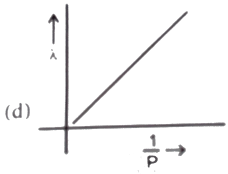
73. Which of following graphs correctly represents the variation of particle momentum with de-Broglie wavelength?

A. 

B. 

C. 

D. 

Answer:

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74. An excited state of H atom emits a photon of wavelength λ and returns in the ground state. The principal quantum number of excited state is given by:

A. $\sqrt{\lambda R(\lambda R-1)}$

B. $\sqrt{\frac{\lambda R}{(\lambda R-1)}}$

C. $\sqrt{\lambda R(\lambda R-1)}$

D. $\sqrt{\frac{\lambda R-1}{(\lambda R)}}$

Answer:

Watch Video Solution

75. A dye absorbs a photon of wavelength λ and re $-$ emits the same energy into two phorons of wavelengths λ_1 and λ_2 respectively. The wavelength λ is related with λ_1 and λ_2 as :

A. $\lambda=\frac{\lambda_1+\lambda_2}{\lambda_1\lambda_2}$

B. $\lambda = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

C. $\lambda = \frac{\lambda_1^2 \lambda_2^2}{\lambda_1 + \lambda_2}$

D. $\lambda = \frac{\lambda_1 \lambda_2}{(\lambda_1 + \lambda_2)^2}$

Answer:

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76. Be^{+3} and a proton are accelerated by the same potenatial, their de-Broglie wavelengths have the ratio (assume mass of proton = mass of neutron)

A. $1:2$

B. $1:4$

C. $1:1$

D. $1:3\sqrt{3}$

Answer:

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77. de Broglie wavelength of an electron after being accelerated by a potential difference of V volt from rest is :

A. $\lambda = \frac{1.23}{\sqrt{m}}$

B. $\lambda = \frac{1.23}{\sqrt{h}}m$

C. $\lambda = \frac{1.23}{\sqrt{V}}nm$

D. $\lambda = \frac{1.23}{V}$

Answer:

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78. An electron travels with a velocity of x ms^{-1}. For a proton to have the same de-Broglie wavelength, the velocity will be approximately:

A. $\frac{1840}{x}$

B. $\frac{x}{1840}$

C. $1840 \quad \mathrm{x}$

D. x

Answer: B

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79. The momentum $(\text{in} kg - m / s)$ of photon having 6 MeV energy is :

A. 3.2×10^{-21}

B. 2.0

C. 1.6×10^{-21}

D. none of these

Answer:

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80. The number of photons of light having wave number 'x' in 10 J of energy source is :

A. $10hcx$

B. $\frac{hc}{10x}$

C. $\frac{10}{hcx}$

D. none of these

Answer:

Watch Video Solution

81. Which of the following relates to photon both as wave motion and as a stream of particles ?

A. interference

B. $E = mc^2$

C. Diffraction

D. $E = hv$

Answer:

Watch Video Solution

82. If a_0 be the radius of first Bohr's orbit of H-atom, the de-Broglie's wavelength of an electron revolving in the second Bohr's orbit will be:

A. $6\pi a_0$

B. $4\pi a_0$

C. $2\pi a_0$

D. None of these

Answer:

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83. Energy required to ionise 2 mole of gaseous He^+ ion present in its ground state is :

A. 54.4 eV

B. $108.8N_A$ eV

C. $54.4N_A$ eV

D. 108.8eV

Answer:

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84. Which of the following is the most correct expression for Heisenberg's uncerainty principle?

A. $\triangle x.\ \triangle p = \frac{h}{4\pi}$

B. $\triangle x.\ \triangle p \geq \frac{h}{4\pi}$

C. $\triangle x.\ \triangle p \leq \frac{h}{4\pi}$

D. $\triangle x . \triangle v = \frac{h}{4\pi}$

Answer:

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85. The Heisenberg uncertainty principle can be applied to:

A. a cricket ball

B. a football

C. a jet aeroplane

D. an electron

Answer:

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86. The mass of a particle is $10^{-10}g$ and its radius is $2 \times 10^{-4}cm$. If its velocity is $10^{-6}cm\,\sec^{-1}$ with $0.0001\,\%$ uncertainty in measurement, the uncertainty in its position is :

A. $5.2XX10^{-8}$m

B. 5.2×10^{-7}m

C. 5.2×10^{-6}m

D. 5.2×10^{-9}

Answer:

Watch Video Solution

87. If an electron is travelling at 200 m/s within 1 m/s uncertainty, whtat is the theoretical uncertainty in its position in mum (micrometer)?

A. 14.5

B. 29

C. 58

D. 114

Answer:

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88. The wave character of moving electron was experimentally verified by :

A. de-Broglie

B. A-Einstein

C. Garmer

D. Schrodinger

Answer:

Watch Video Solution

89. "The exact path of electron in 2p-orbital cannot be determined." The above statement is based upon:

A. Hund's Rule

B. Bohr's Rule

C. uncertainty principle

D. aufbau principle

Answer:

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90. Which series of subshells is arranged in the order of increasing energy for multi-electron atoms?

A. 6s,4f,5d,6p

B. 4f,6s,5d,6p

C. 5d,4f,6s,6p

D. 4f,5d,6s,6p

Answer:

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91. The correct Schordinger.s wave equation for a electron with total energy E and potential energy V is not correctly given by

A. $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2}{mh^2}(E - V)\Psi = 0$

B. $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi m}{h^2}(E - V)\Psi = 0$

C. $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2}(E - V)\Psi = 0$

D. None of these

Answer:

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92. wave mechanical model of the atom depends upon:

A. de-Broglie concept of dual nature of electron

B. Heisenberg uncertainty principle

C. Schrodinger uncertainty princple

D. All of these

Answer:

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93. In Schrodinger wave mechanical model $\Psi^2(r, \theta, \phi)$ represents :

A. amplitude of electron wave

B. probability density of electron

C. total probaility of finding electron around nucleus

D. orbit

Answer:

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94. Radial amplitude of electron wave can be represented by:

A. $R(r)$

B. $R^2(r)$

C. $4\pi r^2$

D. $4\pi r^2 R^2(r)$

Answer:

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95. Arrange the following orbitals of H-atom in the increasing order of their energy.

$3p_x$, $2s$, $4d_{xy}$, $3s$, $4p_z$, $3p_y$, $4s$

A. $2s < 3s = 3p_x = 3p_y < 4s = 4p_z = 4d_{xy}$

B. $2s < 3s < 3p_x = 3p_y < 4s = 4p_z = 4d_{xy}$

C. $2s < 3s < 3p_x = 3p_y < 4s = 4p_z = 4d_{xy}$

D. $2s < 3s < 3p_x = 3p_y < 4s < 4p_z < 4d_{xy}$

Answer:

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96. In a hydrogen atom, which orbital is higher in energy than a 3s-orbital?

A. 2s

B. 3p

C. 3d

D. 4s

Answer:

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97. The radii of maximum probability for 3s, 3p and 3d electrons are in the order :

A. $(r_{\max})3d > (r_{\max})3p > (r_{\max})3s$

B. $(r_{\max})3d > (r_{\max})3s > (r_{\max})3p$

C. $(r_{\max})3s > (r_{\max})3p > (r_{\max})3d$

D. None of these

Answer:

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98. In a set of degenerate orbitals the electrons distribute themselves to retain similar spins as far as possible. This statement is attributed to

A. Pauli's exclusion principle

B. aufbau principles

C. Hund's Rule

D. Slater rule

Answer:

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99. Which of the following rules could explains the presence of three unpaired electrons in N-atoms ?

A. Hund's rule

B. aufbau's principles

C. Heisenberg's uncertainty principle

D. Pauli's exculsion principle

Answer:

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100. The maximum number of electrons in a subshell is given by the expression

A. $(2l + l)$

B. $2(2l + 1)$

C. $(2l + 1)^2$

D. $2(2l + 1)^2$

Answer:

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101. The orbital angular momentum of 3p electrons is :

A. $\sqrt{3}h$

B. $\sqrt{6}h$

C. zero

D. $\sqrt{2}\frac{h}{2\pi}$

Answer: D

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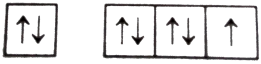
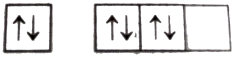
102. The orbital diagram in which both the Pauli.s exclusion principle and Hund.s rule are violated, is:

A. 

B. 

C. 

D. 

Answer:

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103. The ratio of magnetic moments of Fe(III) & Co(II) is

A. $\sqrt{5}:\sqrt{7}$

B. $\sqrt{35}:\sqrt{15}$

C. $7:3$

D. $\sqrt{24}:\sqrt{15}$

Answer:

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104. Select correct statement :

A. The lower the value of $(n+l)$ for an orbital, the higher is its energy.

B. If two orbitals have the same value of $(n+l)$ the orbital with higher value of n will have lower energy.

C. The energy of an electron in a multi-electron atom depends on quantum number n only

D. The energy of an electron in hudrogen atom depends on quantum number n only

Answer:

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105. The quantum numbers of four electrons $(e_1 \text{ to } e_4)$ are given below :

	n	l	m	s		n	l	m	s
e_1	3	0	0	$+1/2$	e_2	4	0	0	$+1/2$
e_3	3	2	2	$-1/2$	e_4	3	1	-1	$+1/2$

Correct order of decreasing energy of these electrons is

A. e4 gt e3 gt e2 gt e1

B. e2 gt e3 gt e4 gt e1

C. e3 gt e2 gt e4 gt e1

D. e1 gt e4 gt e2 gt e3

Answer:

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106. The energy of an electron of $2p_x$ orbital is :

A. greatern than $2p_y$orbital

B. less than $2p_z$ orbital

C. equal to 2s orbital

D. same as that of $2p_x \text{and} 2p_z$ orbital

Answer:

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107. In group 15 elements, the number of unpaired electrons in valence shell is___.

A. 0

B. 2

C. 3

D. 4

Answer:

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108. The orientation of an orbital is governed by the quantum number known as ..... and is represented by the symbol .....

A. principal quantum number (n)

B. angular momentum quantum number

C. magenetic quantum number (m_l)

D. spin quantum number (m_s)

Answer:

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109. What is the maximum number of electrons in a subshell that can have the quantum numbers n = 3 and l = 2 ?

A. 2

B. 5

C. 6

D. 10

Answer: D

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110. which of the following statements about an electron with $m_1 = +2$ is incorrect?

A. The electron could be in the third shell

B. The electron is in a non-spherical orbital

C. The electron may have $m_s = \frac{1}{2}$

D. The electron is not in a d-orbital

Answer:

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111. which of the following set of quantum numbers is impossible for an electron?

A. $n = 1, l = 0, m_l = 0, ms = +\frac{1}{2}$

B. $n = 9, l = 7, m_l = -6, m_s = -\frac{1}{2}$

C. $n = 2, l = 1, m_l = 0, m_s = +\frac{1}{2}$

D. $n = 3, l = 2, m_l = -3, m_s = +\frac{1}{2}$

Answer:

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112. In a 3d subshell, all the five oprbitals are degenerate. What does it mean?

A. All the orbitals have the same3 orientation.

B. All the orbitals have the same shape.

C. All the orbitals have the same energy.

D. All the orbitals are unoccupied.

Answer:

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113. which of the following subshell can accommodate as many as 10 electrons?

A. 2d

B. 3d

C. $3d_{xy}$

D. $3d_z2$

Answer:

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114. which of the following statements is correct for an electron having azimuthal quantum number l=2?

A. The electron may be in the lowest energy shell.

B. The electron is in a spherical orbital.

C. The electron must have spin $m_s = +\frac{1}{2}$

D. The electron may have a magnetic quantum number=-1

Answer:

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115. which of the following statements is incorrect?

A. The concepts of "penetration" and "shielding" are important in deciding the energetic ordering of orbitals in multi-electon atoms

B. A wave-funtion can have positive and negative values

C. "Radial nodes" can appear in radial probability distribution function.

D. The shape of an orbital is given by the principal quantum number.

Answer:

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116. For an $4p_y$ orbital, there are nodal plane..... and azimuthal quantum number l.....

A. 1,0

B. 0,1

C. 1,1

D. 2,1

Answer:

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117. which of the folowing statement is correct?

A. Number of angular nodes =n-l-1

B. Number of radial nodes=l

C. Total number of nodes=n-1

D. All of these

Answer:

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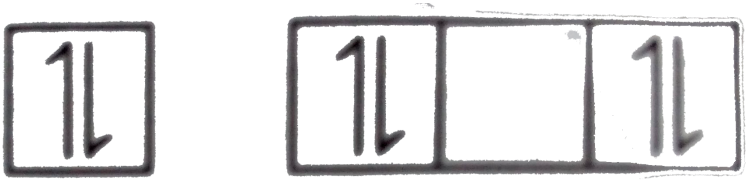
118. Give the correct order of initials T(true)F(false) for following satements. (I) If electron has zero quantum magnetic numbers, then it must be present in s-orbital

(II) In  orbital diagram, Pauli's exclusion principal is violated

(III) Bohr's model can explain spectrum of the hydrogen atom.

(IV) A d-orbital can accommodate maximum 10 electrons only.

A. (a) TTFF

B. (B) FFTF

C. (C)TFTT

D. (D) FFTT

Answer:

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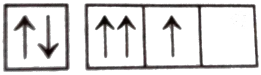
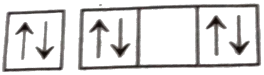
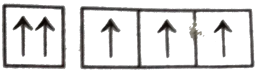
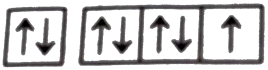
119. The orbital diagram in which both the Pauli.s exclusion principle and Hund.s rule are violated, is:

A. 

B. 

C. 

D. 

Answer:

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120. It is not possible to explain the Pauli's exclusion principal with the help of this atom.

A. B

B. Be

C. C

D. H

Answer:

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121. The subshell that rises after f subshell is called g subshell

What is the total number of orbitals in the shell in which the g subshell first occur?

A. 9

B. 16

C. 25

D. 36

Answer:

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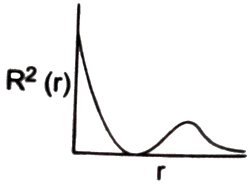
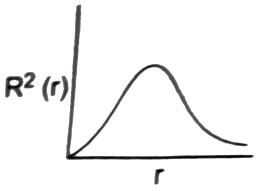
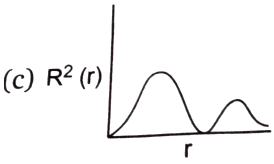
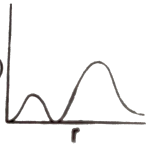
122. The variation of radial probability density R^2 (r) as a function of distance r of the electron from the nucleus for 3p orbital:

A. 

B. 

C. 

(d) $R^2(r)$



D.

Answer:

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123. The iron atom, how many electrons atom have n=3 and l= 2 ?

A. 2

B. 4

C. 6

D. 8

Answer:

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124. If n and l are respectively the principal and azimuthal quantum numbers , then the expression for calculating the total number of electrons in any energy level is :

A. $\sum_{l=0}^{l=n} 2(2l+1)$

B. $\sum_{l=1}^{l=n} 2(2l+1)$

C. $\sum_{l=0}^{l=n} 2(2l+1)$

D. $\sum_{l=0}^{l=n-1} 2(2l+1)$

Answer:

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125. Maximum number of nodes are present in :

A. 5s

B. 5p

C. 5d

D. All have same number of nodes

Answer:

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126. The correct set of quantum numbers for the unpaired electron of Cl atom is :

A. $2, 0, 0, +\frac{1}{2}$

B. $2, 1, -1, +\frac{1}{2}$

C. $3, 1, 1, +\frac{1}{2}$

D. $3, 0, \pm\frac{1}{2}$

Answer:

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127. The aufbau principle implies that a new electron will enter an orbital for which

A. n has a lower value

B. l has a lower value

C. (n+1) value is maximum

D. (n+1) value is minimum

Answer:

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128. In which of the following Aufbau principle is violated?

A. 

B. 

C. 

(d) 

D.

Answer:

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129. Consider the following six electronic configurations (remaining inner orbitals are completely filled) and mark the incorrect option

A. Stability order : II gt I gt IV gt III

B. Order of spin multiplicity : IV gt III = I gtII

C. V does not violate all the three rule of electronic configuration

D. If IV represents A than A^+ when kept near a maget, actsas paramagnetic substance.

Answer:

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130. Which of the following sets of quantum numbers represents the highest energy of an atom ?

A. n = 4, l = 0, m = 0, $s = +\frac{1}{2}$

B. n = 2, l = 0, m = 0, $s = +\frac{1}{2}$

C. n = 3, l = 1, m = 1, $s = +\frac{1}{2}$

D. n = 3, l = 2, m = 1, $s = +\frac{1}{2}$

Answer:

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131. A subshell n = 5, l = 3 can accommodate :

A. 10electrons

B. 14 electrons

C. 18 electrons

D. None of these

Answer:

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132. In H-atom energy of electron is datermined by :

A. only n

B. n, l

C. n, l, m

D. all the four quantum numbers.

Answer:

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133. The iron atom, how many electrons atom have n=3 and l= 2 ?

A. 1

B. 2

C. 5

D. 10

Answer:

Watch Video Solution

134. How many electrons in atom can have n =4, =2, m=-2 and $s = +\frac{1}{2}$?

A. 1

B. 2

C. 5

D. 10

Answer:

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135. The degencracy of 1st excited state of H atom is _____ (Ignore efffect of spin)

A. 2

B. 3

C. 4

D. 8

Answer:

Watch Video Solution

136. Which orbital has only positive value of wave function at all distances from the nucleus :

A. 1s

B. 2s

C. 3p

D. 3d

Answer:

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137. Four electrons in aan atom have the set of quantum numbers as given below. Which electron in at the highest energy leval ?

A. n = 4, l = 0, $m_l = 0, m_s = +\frac{1}{2}$

B. n = 3, l = 0, $m_l = 0, m_s = -\frac{1}{2}$

C. n = 3, l = 2, $m_l = 0, m_s = +\frac{1}{2}$

D. n =4, l = 1, $m_l = -1, m_s = -\frac{1}{2}$

Answer:

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138. The set of quantum numbers, n = 3, l = 2, $m_l = 0$

A. describes an electron in a 2s orbital

B. is not allowed

C. describes an electron in a 3p orbital

D. describes one of the five orbitals same energy

Answer: D

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139. The set of quantum numbers, n = 2, l = 2, m_l = 0 :

A. describes an electron in a 2s orbital

B. describes one of the five orbital of a similar type

C. describes an electron in a 2p orbitals

D. is not allowed

Answer:

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140. Consider the argon atom. For how many electrons does this atom have $m_l = 1$?

A. 1

B. 6

C. 4

D. 2

Answer: C

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141. An orbital is occupied by an electrons with the quantum numbers n = 4, l = 1. How many orbitals of this type are found in a multi- electron atom ?

A. 4p, 3

B. 4s, 1

C. 4d, 5

D. 4p, 6

Answer: A

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142. Which of the following sets of quantum numberrs discribes the elecron which is removed most easily from a potassium atom in its ground state ?

A. n = 3, l = 1, $m_l = 1, m_s = -\frac{1}{2}$

B. n = 2, l = 1, $m_l = 0, m_s = -\frac{1}{2}$

C. n = 4, l = 0, $m_l = 1, m_s = +\frac{1}{2}$

D. n = 4, l = 0, $m_l = 0, m_s = +\frac{1}{2}$

Answer:

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143. The subshell that arises after f is called the g subshell.How many electrons may occupy the g subshell?

A. 9

B. 7

C. 5

D. 18

Answer:

Watch Video Solution

144. Which of the following electron configurations is correct for iron, (atomic number26)?

A. [kr]$4s^1 3d^6$

B. [kr]$4s^1 3d^7$

C. [Ar]$4s^2 3d^6$

D. [kr]$4s^2 3d^6$

Answer:

Watch Video Solution

145. which of the following electron configurations is correct for copper, (atomic number29)

A. [Ar]$3d^{10} 4s^1$

B. [Kr]$3d^9 4s^1$

C. [Ar]$3d^9 4s^2$

D. [Kr]$3d^{10} 4s^1$

Answer:

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146. The electron configurations of 24cr and 29cu are abnormal

A. due to extra stability of exacly half filled and exactly fully filled sub shells

B. bacause they belong to d-block

C. both the above

D. None of the above

Answer:

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147. Among the following representations of excited states of atoms which is impossible ?

A. $1s^1 2s^1$

B. $[Ne]3s^2 3p^3 4s^1$

C. $[Ne]3s^2 3p^6 4s^1 3d^6$

D. $1s^2 2s^2 2p^7 3s^2$

Answer:

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148. Among the following representations of excited states of atoms which is impossible ?

A. $1s^1 2s^1$

B. $[Ne]3s^2 3p^3 4s^1$

C. $1s^2 2s^2 2p^4 3s^2$

D. $[Ne]3s^2 3p^6 4s^3 3d^2$

Answer:

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149. Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is (At. nos. Ti = 22, V = 23, Cr = 24, Mn = 25)

A. $Ti^{2+}, V^{3+}, Cr^{4+}, Mn^{5+}$

B. $Ti^{3+}, V^{2+}, Cr^{3+}, Mn^{4+}$

C. $Ti^{+}, V^{4+}, Cr^{6+}, Mn^{7+}$

D. $Ti^{4+}, V^{3+}, Cr^{2+}, Mn^{3+}$

Answer:

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150. Which of the following has the maximum number of unpaired electrons

A. Mn

B. Ti

C. V

D. Al

Answer:

Watch Video Solution

151. Which of the following orbitals has two spherical nodes?

A. 2s

B. 4s

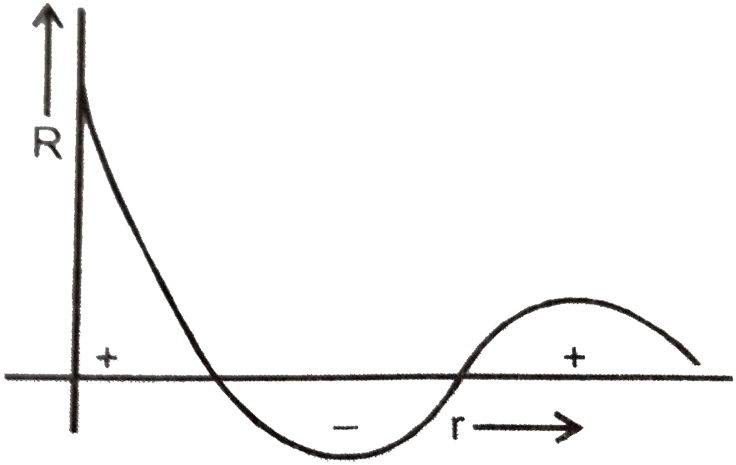
C. 3d

D. 6f

Answer:

Watch Video Solution

152. Wave function of an orbital is plotted against the distance from nucleus. The graphical representation is of :



A. 1s

B. 2s

C. 3s

D. 2p

Answer:

Watch Video Solution

153. The schrodinger wave equation for hydrogen atom is $\Psi_2 = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2 - \frac{r}{a_0}\right)e^{-r/a_0}$ where a_0 is Bohr.s radius. If the radial node in 2s be at r_0 would be equal to

A. $\frac{a_0}{2}$

B. $2a_0$

C. $\sqrt{2}a_0$

D. $\frac{a_0}{\sqrt{2}}$

Answer:

Watch Video Solution

154. The schrodinger wave equation for hydrogen atom is $\Psi_2 = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2-\frac{r}{a_0}\right)e^{-r/a_0}$ where a_0 is Bohr.s radius. If the radial node in 2s be at r_0 would be equal to

A. $\frac{a_0}{Z}, \frac{3a_0}{Z}$

B. $\frac{a_0}{2Z}, \frac{a_0}{Z}$

C. $\frac{a_0}{2Z}, \frac{3a_0}{Z}$

D. $\frac{a_0}{2Z}, \frac{4a_0}{Z}$

Answer:

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155. Potential energy of electrom present in He^+ is :

A. $\frac{e^2}{2\pi\varepsilon_0 r}$

B. $\frac{3e^2}{4\pi\varepsilon_0 r}$

C. $\frac{-2e^2}{4\pi\varepsilon_0 r}$

D. $\frac{-e^2}{4\pi\varepsilon_0 r^2}$

Answer:

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156. A single electron in an ion has ionization energy equal to $217.6eV$. What is the total number of neutrons present in one ion of it?

A. 2

B. 4

C. 5

D. 9

Answer:

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157. For a hypothetical hydrogen like atom, the potential energy of the system is given by U(r) = $\frac{-Ke^2}{r^3}$,where r is the distance between the two particles, If Bohr.s model of quantization of angular momentum is applicable then velocity of particle is given by:

A. $v = \frac{n^2h^3}{Ke^2 8\pi^3 m^2}$

B. $v = \frac{n^3h^3}{8Ke^2\pi^3 m^2}$

C. $v = \frac{n^3h^3}{24Ke^2\pi^3 m^2}$

D. $v = \frac{n^2h^3}{24Ke^2\pi^3 m^2}$

Answer:

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158. A beam of specific kind of particles of velocity 2.1×10^7 m/s is scattered by a gold (z = 79) nucleli, Find out specific charge (charge/mass) of this particle if the distance of closet approach is 2.5×10^{-14} m.

A. 4.84×10^{7} C/kg

B. 4.84×10^{-7} C/kg

C. 2.42×10^{7} C/kg

D. 3×10^{-12} C/kg

Answer:

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159. What is the angular momentum of electron in the second orbit of Bohr's model of hydrogen atom ?

A. $\frac{8\pi^3 me^4}{h^3} K^2$

B. $\frac{8\pi^3 me^4}{9h^3} K^2$

C. $\frac{64}{9} \times \frac{\pi^3 me^4}{h^3} K^2$

D. $\frac{9\pi^3 me^4}{h^3} K^2$

Answer:

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160. The ratio of the radius difference between 4^{th} and 3^{rd} orbit of H-atom and that of Li^{2+} ion is :

A. $1:1$

B. $3:1$

C. $3:4$

D. $9:1$

Answer:

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161. The velocity of an electron in excited state of H-atom is 1.093×10^6 m/s, what is the circumference of this orbit?

A. 3.32×10^{-10} m

B. 6.64×10^{-10} m

C. 13.30×10^{-10} m

D. 13.28×10^{-8} m

Answer:

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162. The angular momentum of an electron in a Bohr's orbit of He^{+} is 3.1652×10^{-34} kg-m^2/sec. What is the wave number in terms of Rydberg constant (R) of the sepectral line emitted when an electron falls from this level to the first excited state.l [Use h $= 6.626 \times 10^{-34}$) Js]

A. 3R

B. $\frac{5R}{9}$

C. $\frac{3R}{4}$

D. $\frac{8R}{9}$

Answer:

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163. If radiation correcsponding to second line of "Balmer series" of Li^{2+} ion, knocked out electron from first excited state of H-atom, then kinetic energy of ejected electron would be:

A. $2.55eV$

B. $4.25eV$

C. $11.25eV$

D. $19.55eV$

Answer:

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164. When an electron makes a transition from (n + 1) state to n^{th} state, the frequency of emitted radiations is related to 'n' according to $(n>>1)$

A. $v=\frac{2cRZ^2}{n^3}$

B. $v=\frac{cRZ^2}{n^4}$

C. $v=\frac{cRZ^2}{n^2}$

D. $v=\frac{2cRZ^2}{n^2}$

Answer:

Watch Video Solution

165. In a collection of H-atoms, all the elctrons jump from n = 5 to ground level finally (directly or indirectly), without emitting any line in Balmer series. The number of possible different photons are

A. 10

B. 8

C. 7

D. 6

Answer:

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166. An electron is allowed to move freely in a closed cubic box of length of side 10 cm. The uncertainty in its velocity will be :

A. 3.35×10^{-4} $\mathrm{m\ sec}^{-1}$

B. 5.8×10^{-4} $\mathrm{m\ sec}^{-1}$

C. 4×10^{-5} $\mathrm{m\ sec}^{-1}$

D. 4×10^{-6} $\mathrm{m\ sec}^{-1}$

Answer:

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167. An element undergoes a reaction as shown $sx + 2e^- \rightarrow x^{-2}$

Energy released $= 30.87$ ev/atom. If the energy released is used to dissociated $4g$ to H_2 molecules equally into H^+ and H^+ is excited state of H atoms where the electron travels in orbit whose circumference equal to four times its de -roglie's wavelength. Determine the minimum number of moles of x that would be required.

Given IE of $H = 13.6$ ev/atom, bond energy of $H_2 = 4.526$v/molecule

A. 1

B. 2

C. 3

D. 4

Answer:

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168. If the energy of H-atom in the ground state is -E, the velocity of photo-electron emitted when a photon having energy E_p strikes a stationary Li^{2+} ion in ground state, is given by:

A. $v = \sqrt{\frac{2(E_p - E)}{m}}$

B. $v = \sqrt{\frac{2(E_p + 9E)}{m}}$

C. $v = \sqrt{\frac{2(E_p - 9E)}{m}}$

D. $v = \sqrt{\frac{2(E_p - 3E)}{m}}$

Answer:

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169. At which temperature will the translational kinetic energy of H-atom equal to that for H-atom of first line Lyman transition? (Given $N_A = 6 \times 10^{23}$)

A. 780K

B. 1.32×10^{95}K

C. 7.84×10^{4}K

D. $1000K$

Answer:

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170. For a 3s - orbital, value of Ψ is given by following realation:

$$\Psi(3s) = \frac{1}{9\sqrt{3}}\left(\frac{1}{a_0}\right)^{3/2}(6 - 6\sigma + \sigma^2)e^{-\sigma/2}, \quad \text{where} \quad \sigma = \frac{2r.\,Z}{3a_0}$$

What is the maximum radial distance of node from nucleus?

A. $\frac{\left(3+\sqrt{3}\right)a_0}{Z}$

B. $\frac{a_0}{Z}$

C. $\frac{3}{2}\frac{\left(3+\sqrt{3}\right)a_0}{Z}$

D. $\frac{2a_0}{Z}$

Answer:

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171. Monochromatic radiation of specific wavelength is incident on H-atoms in ground state. H-atoms absorb energy and emit subsequently radiations of six different wavelength. Find wavelength of incident radiations:

A. 9.75nm

B. 50nm

C. 85.8nm

D. 97.25nm

Answer:

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172. The energy of a I, II and III energy levels of a certain atom are E, $\frac{4E}{3}$ and 2E respectively A photon of wavelength λ is emitted during a transition from III to I. What will be the wavelength of emission for transition II to I?

A. $\frac{\lambda}{2}$

B. λ

C. 2λ

D. 3λ

Answer:

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173. Calculate the minimum and maximum number of electrons which may have magnetic quantum number $m = +1$ and spin quantum number $s = -\frac{1}{2}$ in chromium (Cr)

A. 0,1

B. 1,2

C. 4,6

D. 2,3

Answer:

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174. An electron in a hydrogen atom in its ground state absorbs 1.5 times as much energy as the minimum required for it to escape from the atom. What is the velocity of the emitted electron?

A. 1.54×10^6 m/s

B. 1.54×10^8 m/s

C. 1.54×10^3 m/s

D. 1.54×10^4 m/s

Answer:

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175. In a measurement of quantum efficiency of photosynthesis in green plants, it was found that 10 quanta of red light of wavelength 6850 Å were needed to release one molecule of O_2. The average energy storage in this process for 1 mol O_2 evolved is 112 Kcal.

What is the energy conversion efficieny in this experiment?

Given: 1 cal =4.18 J, $N_A = 6 \times 10^{23}$, $h = 6.63 \times 10^{-34}$ J.s

A. 23.5

B. 26.9

C. 66.34

D. 73.1

Answer:

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176. A hydrogen-like atom (atomic number Z) is in a higher excited state of quantum number n. This excited atom can make a transition to the first excited state by successively emitting two photons of energies 10.20 eV and 17.00 eV respectively. Alternatively the atom from the same excited state can make a transition to the second excited state by snccessively emitting two photons of energies 4.25 eV and 5.95 eV respectively. Determine the values of n and Z (ionization energy of hydrogen atom = 13.6 eV)

A. 1

B. 2

C. 3

D. 4

Answer:

Watch Video Solution

177. H-atom is exposed to electromagnetic radiation of $\lambda = 1025.6$ Å and excited atom gives out induced radiation. What is the minimum wavelength of the induced radiation?

A. $102.6nm$

B. 12.09 nm

C. 121.6 nm

D. 810.8 nm

Answer:

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178. If the lowest energy X-rays have $\lambda = 3.055 \times 10^{-8}m$, estimate the minimum difference in energy between two Bohr.s orbits such that an electronic transition would correspond to emission of an X-ray. Assuming that the electrons in other shells exert no influence, at what Z(minimum) would a transition from the second energy level to the first result in the emission of an X-ray ?

A. 1

B. 2

C. 3

D. 4

Answer:

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179. An α – particle having kinetic energy 5 MeV falls on a Cu-foil. The shortest distance from the nucleus of Cu to which α - particle reaches is (Atomic no. of Cu = 29, K= $9 \times 10^9 Nm^2 / C^2$)

A. 2.35×10^{-13} m

B. 1.67×10^{-14} m

C. 5.98×10^{-15} m

D. none of these

Answer:

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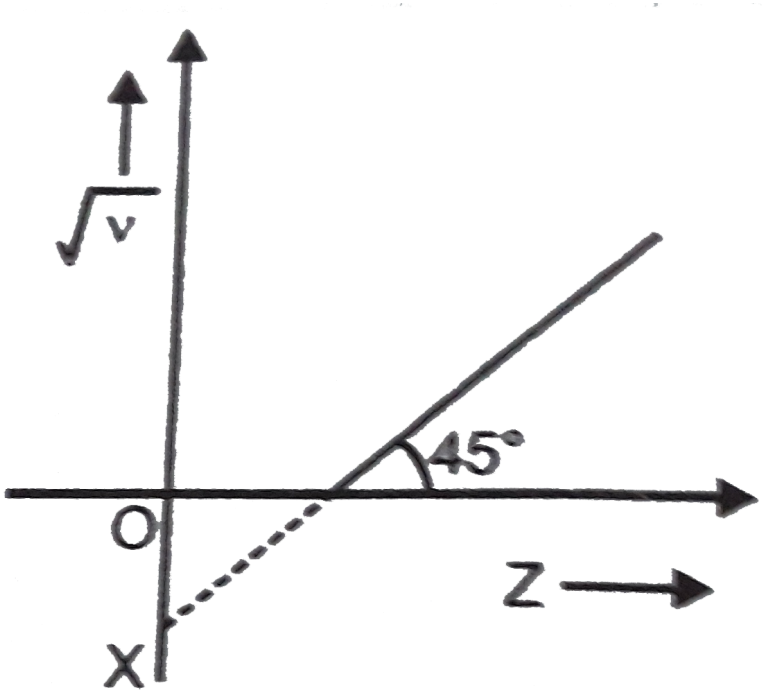
180. In the graph between $\sqrt{v}$ and Z for the Mosley's equation $\sqrt{v}$=a(Z-b), the intercept OX is -1 on $\sqrt{v}$ axis.



What is the frequency when atomic number (Z) is 51?

A. $50s^{-1}$

B. $100s^{-1}$

C. $2500s^{-1}$

D. None of these

Answer:

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181. Balmer gave an equation for wavelength of visible region of H-spectrum as $\bar{v} = \frac{n^2 - 4}{Kn^2}$ where n = principal quantum number of energy level, K = constant terms.of R (Rydberg constant). The value of K in terms of R is:

A. R

B. $\frac{R}{2}$

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

D. $\frac{5}{R}$

Answer:

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182. The engergy of separation of an electron in a Hydrogen like atom in excited state is 3.4 eV. The de-Broglie wave length (in A°) associated with the electron is:

A. 3.33

B. 6.66

C. 13.31

D. none of these

Answer:

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183. If I exciation energy for the H-like (hypothetical) sample is 24 eV, then binding energy in III excited state is :

A. 2 eV

B. 3 eV

C. 4 eV

D. 5 eV

Answer:

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184. Hiesenberg.s uricertainty principle states that it is impossible to determine simultaneously the position and momentum of a particle. He considered the limits of how precisely we can measure properties of an e^- (or)other microscopic particles like electron. The more accurately we measure the momentum of a particle, less accurately we can determine its position.

If uncertainty in measurement of position and momentuin are equal calculate the uncertainty in velocity

A. $\sqrt{\frac{h}{\pi}}$

B. $\sqrt{\frac{h}{2\pi}}$

C. $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$

D. none of these

Answer:

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185. Werner Heisenberg considered the limits of how precisely we can measure the properties of an electron or other microscopic particle. He determined that there is a fundamental limit to how closely we can measure both position and momentum. The more accurately we measure the momentum of a particle, the less accurately we can determine its position. The converse also true. This is summed up in what we now call the Heisenberg uncertainty principle.

The equation si $\delta x.\ \delta(mv) \geq \frac{h}{4\pi}$

The uncertainty in the position or in the momentum of a marcroscopic object like a baseball is too small to observe. However, the mass of microscopic object such as an electon is small enough for the uncertainty to be relatively large and significant.

If the uncertainty in velocity and position is same, then the uncertainty in momentum will be :

A. $\sqrt{\frac{hm}{4\pi}}$

B. $m\sqrt{\frac{h}{4\pi}}$

C. $\sqrt{\frac{h}{4\pi m}}$

D. $\frac{1}{m}\sqrt{\frac{h}{4\pi}}$

Answer:

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186. Werner Heisenberg considered the limits of how precisely we can measure the properties of an electron or other microscopic particle. He

determined that there is a fundamental limit to how closely we can measure both position and momentum. The more accurately we measure the momentum of a particle, the less accurately we can determine its position. The converse also true. This is summed up in what we now call the Heisenberg uncertainty principle.

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What would be the minimum uncetaintty in de-Broglie wavelength of a moving electron accelerated by potential difference of 6 volt and whose uncetainty in position is $\frac{7}{22}$ nm?

A. 6.25Å

B. 6Å

C. 0.625Å

D. 0.3125Å

Answer:

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187. One of the fundamental laws of physics is that matter is most stable with the lowest possible energy. Thus, the electron in a hydrogen atom usually moves in the n=1 orbit, the orbit in which it has the lowest energy. When the electon is in this lowest energy orbit, the atom is said to be in its ground electronic state. If the atom receives energy from an outside source, it is possible for the electron to move ot an orbit with a higher n value, in which case the atoms is in an excited state with a higher energy. The law of conservation of energy says that we cannot create or destroy energy. Thus, if a certain amount of external energy is required to excite an electron from one energy level to another, then that same amount of energy will be liberated when the electron returns to its initial state.

Lyman series is observed when the electron returns to the lowest orbit while Balmer series is formed when the electron returns returns to second orbit. Similarly, Paschen, Brackett and Pfund series are formed when electrons returns to the third, fourth and fifth orbits from higher

energy orbits respectively.

When electrons return form $n_2 \ \text{to} \ n_1$ state, the number of lines in the spectrum will equal to

$$\frac{(n_2 - n_1)(n_2 - n_1 + 1)}{2}$$

If the electon comes back from energy level having energy E_2 to energy level having energy E_1, then the difference may be expressed in terms of energy of photon as :

$$E_2 - E_1 = \Delta E, \delta E \Rightarrow \frac{hc}{\lambda}$$

Since, h and c are constant, δE corresponds to definite energy. Thus, each transition from one energy level to another will produce a radiatiob of definite wavelength. This is actually Wave number of a spectral line is given by the formula

$$\bar{v} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right).$$

where R is a Rydberg's constant $\left(R = 1.1 \times 10^7 m^{-1}\right)$

If the wavelength of series limit of Lyman series for He^+ ion is x Å, then what will be the wavelength of series limit of Balmer series for Li^{2+} ion?

A. $\frac{9x}{4}$Å

B. $\frac{16x}{9}$Å

C. $\frac{5x}{4}$ Å

D. $\frac{4x}{7}$ Å

Answer:

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where R is a Rydberg's constant $\left(R = 1.1 \times 10^7 m^{-1}\right)$

The emission spectra is observed by the consequence of transition of electrons from higher energy state to ground state of He^+ ion. Six

different photons are observed during the emission spectra, then what will be the minimum wavelength during the transition?

A. $\frac{4}{27R_H}$

B. $\frac{4}{15R_H}$

C. $\lambda = \frac{15}{16R_H}$

D. $\frac{16}{15R_H}$

Answer:

Watch Video Solution

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$$\bar{v} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right).$$

where R is a Rydberg's constant $\left(R = 1.1 \times 10^7 m^{-1}\right)$

What transition in the hydrogen spectrum would have the same wavelength as Balmer transitio, $n = 4 \text{ to } n = 2$ in the He^+ spectrum?

A. n=3 to n=1

B. n=3 to n=2

C. n=4 to n=1

D. n=2 to n=1

Answer:

Watch Video Solution

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where R is a Rydberg's constant $\left(R = 1.1 \times 10^7 m^{-1}\right)$

An electron in H-atom in M-shell on de-excitation to ground state gives maximum ..... spectrum lines.

A. 10

B. 6

C. 3

D. 1

Answer:

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191. The behaviour of an electron in an atom is described mathematically by a wave function, or orbital. Spin of the electron produce angular momentum equal to $S = \sqrt{s(s+1)}\frac{h}{2\pi}$ where$S = +\frac{1}{2}$. Total spin of an atom $= +\frac{n}{2}$ or $\frac{h}{2}$ Where n is the number of unpaired electron.

The substance which contain species with unpaired electrons in their orbitals behave as paramagnetic substances. The paramagnetism is expressed in terms of magnetic moment the magnetic moment of an atom

$\mu_s\sqrt{s(s+1)}\frac{eh}{2\pi mc} = \sqrt{\left(\frac{n}{2}\right)\left(\frac{n}{2}+1\right)}\frac{eh}{2\pi mc}s = \frac{n}{2} \Rightarrow \mu_s = \sqrt{n(n+2)}$

n = number of unpaired electrons

1 B.M. (Bohr magneton) = $\frac{eh}{4\pi mc}$

If magnetic moment is zero the substances is di-magnetic.

Which of the following ion has lowest magnetic moement.

A. Fe^{2+}

B. Mn^{2+}

C. Cr^{3+}

D. V^{3+}

Answer:

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192. The behaviour of an electron in an atom is described mathematically by a wave function, or orbital. Spin of the electron produce angular momentum equal to $S = \sqrt{s(s+1)}\frac{h}{2\pi}$ where$S = +\frac{1}{2}$. Total spin of an atom $= +\frac{n}{2}$ or $\frac{h}{2}$ Where n is the number of unpaired electron.

The substance which contain species with unpaired electrons in their orbitals behave as paramagnetic substances. The paramagnetism is expressed in terms of magnetic moment the magnetic moment of an atom

$\mu_s\sqrt{s(s+1)}\frac{eh}{2\pi mc} = \sqrt{\left(\frac{n}{2}\right)\left(\frac{n}{2}+1\right)}\frac{eh}{2\pi mc}s = \frac{n}{2} \Rightarrow \mu_s = \sqrt{n(n+2)}$

n = number of unpaired electrons

1 B.M. (Bohr magneton) = $\frac{eh}{4\pi mc}$

If magnetic moment is zero the substances is di-magnetic.

If an ion of $_{25}Mn$ has a magnetic of 3.873 B.M. Then Mn is in which state.

A. 2

B. 3

C. 4

D. 5

Answer:

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193. Ozone in the upper atmoshphere absorbs ultraviolet radiation which induces the following chemical reaction

$O_3(g) \rightarrow O_2(g) + O(g)$

O_2 produced in the above photochemical dissociation undergoes further dissociation into one normal oxygen atom (O) and more energetic oxygen atom $O*$.

$O_2(g) \rightarrow O + O*$

$(O*)$ has 1 eV more energy than(O) and normal dissociation energy of O_2 is 480 kJ mol^{-1}.

[1 eV/Photon =96 kJ mol^{-1}]

What is the maximum wavelength effective for the photochemical dissociation of O_2 molecule

A. 2440 Å

B. 2066.67 Å

C. 1000 Å

D. 155 Å

Answer:

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[1 eV/Photon =96 kJ mol^{-1}]

If dissociation of O_3 into O_2 and O requires 400kJ mol^{-1} and O_(2) produced in this reaction is further dissociated to O and $O*$ then the total energy required to for the dissociation of O_3 into O and $O*$ is :

A. 1168kJ/mol

B. 976kJ/mol

C. 880kJ/mol

D. None of these

Answer:

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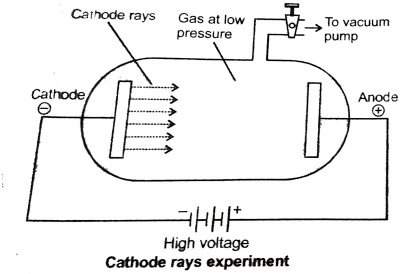
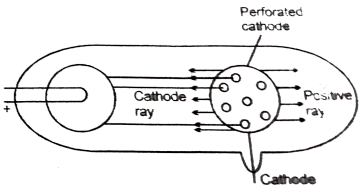
195. The existence of negatively charged particle in an atom was shown by J.J. Thomson as a result of the studies of the passage of electricity through gases at extremely low pressure known as discharge tube

experiments. When a high voltage of the order of 10,000 volts or more was impressed across the electrodes, some sort of invisible rays moved from the negative electrode to the positive electrode these rays are called as cathode rays.



Cathode rays experiment



Anode rays experiment

Cathode rays travel in straight path in absence of electrical and magnetic field . Cathode rays consist of material part and charged particles? Cathode rays produce X-rays and light is emitted when they strike on ZnS screen. Cathode rays penetrate through thin sheets of aluminium and other metals . They affect the photogenic plate and passes heating effect when they strike on metal foil. The raito of charge to mass i.e charge/mass is same for all the cathode rays irrespective of the gas used in the tube.

The existence of positively charged particle in an atom was shown be E. Goldstein. He repeated the same discharge tube experiments by using a perforated cathode. It was observed that when a high potential

difference was applied between the electrodes, not only cathode rays were produced but also a new type of rays were produced simultaneoulsy from anode moving towards cathode and passes through the holes or canal of the cathode. These termed as canal rays or anode rays.

These rays travel in straight lines and consists of positively charged particles. These rays have kinetic energy and produces heating effect also. The e/m ratio of these rays is smaller than that of electrons. Unlike cathode rays, their e/m value is dependent upon the nature of the gas taken in the tube. These rays produced flashes of light on ZnS screen and can pass throughs thin metal foils. They can produce physical and chemical changes and are capable to produce ionisation in gases.

For cathode rays the value of e/m:

A. is independent of the nature of the cathode and the gas filled in the discharge tube

B. is constant

C. is -1.7588×10^{8} coulombs/g

D. all of the above are correct

Answer:

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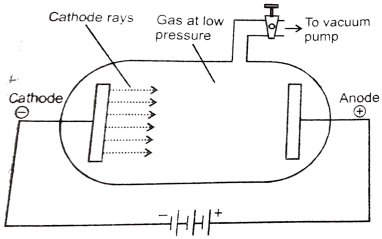

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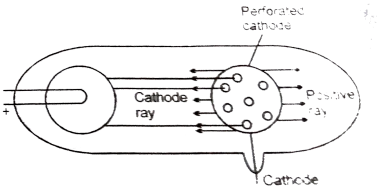

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chemical changes and are capable to produce ionisation in gases.

Which is not true with respect to cathode rays?

A. A stream of electrons

B. Charged particles

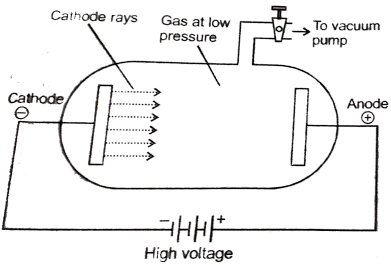
C. Move with same speed as that of light

D. can be deflected by the electric field

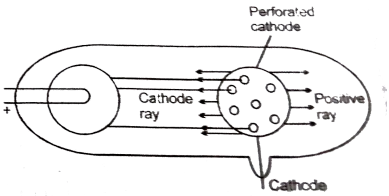
Answer:

Watch Video Solution

197. The existence of negatively charged particle in an atom was shown by J.J. Thomson as a result of the studies of the passage of electricity through gases at extremely low pressure known as discharge tube experiments. When a high voltage of the order of 10,000 volts or more was impressed across the electrodes, some sort of invisible rays moved from the negative electrode to the positive electrode these rays are called as cathode rays.



Cathode rays experiment



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Select the incorrect statement.

A. Cathode rays has charged only and no mass

B. Anode rays are deflected by electrical and magnetic field

C. Canal rays is named for beam of positive charged particle

D. Anode rays particle carrying positive charge

Answer:

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198. Select the correct statemtnt (s):

A. The phenomena of diffraction of light can only be explained by assuming that light behaves as waves

B. de- Broglie postulate the dual character existed with matter

C. In atomic model Bohr considered electron as a particle

D. Wave nature of electrons was proved when diffraction rings were observed photographically when a stream of protons was passed through a metal foil

Answer:

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199. The angular momentum of electron can have the value (s) :

A. $0.5\frac{h}{\pi}$

B. $\frac{h}{\pi}$

C. $\frac{h}{0.5\pi}$

D. $2.5\frac{h}{2\pi}$

Answer:

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200. Select incorrect statement (s) :

A. Only three quantum numbers n, l and m are needed to define an orbital

B. Four quantum numbers are needed for complete discription of an electron

C. Two qnantum numbers n and l are needed to identify6 subshell and shape of orbital

D. Splitting of spectrum lines in presence of electric field is known as Zeeman effect

Answer:

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201. Select theh correct statement (s) :

A. An electron near the nucleus is attracted by the nucleus and has a low potential energy

B. Accoriding to Bohr's theory, an electron contiunously radiate energy if it stays in one orbit

C. Bohr's model could not explain the spectra of multielectron atoms

D. Bohr's modell was the first atomic model based on quantisation of energy

Answer:

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202. Choose the correct statement (s) :

A. The shape of an atomic orbital depends upon azimuthal quantum number

B. The orientation of an atomic orbital depends upon the magnetic quantum number

C. The energy of an eolectron in an atomic orbitals of multi-electron atom depends upon principle quantum number only

D. The number of degenerate atomic arbitals of one type depends upon the value of azimuthal quantum number

Answer:

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203. For radial probability curves. Which of the following is/are correct ?

A. The number of maxima in $2s$ orbital are two

B. The number of spherical or radial nodes is equal to n $-l-1$

C. The number of angular nodes are 'l'

D. $3d_z{}^2$ has 3 angular nodes

Answer:

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204. Choose the incorrect statement (s) :

A. For a particlar orbital in hyderogen atom, the wave function may have negative value

B. Radial probability distribution function may have zero value but can never have nagative value

C. $3d_{x^2-y^2}$ orbital has two angular nodes and one radial node

D. yz and xz planes are nodal planes for d_{xy} orbital

Answer:

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205. Choose the correct statements among the following :

A. A node is a point in space where the wave-function Ψ has zero amplitude

B. The number of maxima (peaks) in radial probability distribution function is (n-l)

C. Radial probability density is $4\pi r^2 {R_n}^2{}_{,l}\,(r)$ vs are two

D. Ψ^2 represents probability of finding electron

Answer:

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206. Select the correct statement (s) regarding $3p_y$ orbitl :

A. Total number of nodes are 2

B. Number of maxima in the curve $4\pi r^2 R^2$ vs r are two

C. Wuantum number n, l and m for an orbital may be $3, 1, -1$ respectively

D. The magnetic quantum number may have a positive value

Answer:

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207. Select the correct statement (s) :

A. In wave mechanical model, the energy of electron in the orbital remains constant

B. d_{xy} orbital is lies in yz plane

C. Nodal planes are yz and xy in $d_{x^2-y^2}$ orbital

D. Rest mass of photon is zero and increases with its velocity

Answer:

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208. Hydrogen has :

A. half filled dubshell

B. half filled shell

C. one electron in valence sheel

D. half filled orbital

Answer:

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209. Select incorrect statement (s) :

A. If the value of $l = O$, the electron distribution is spherical

B. The shape of the orbital is given by magnetic quantum number

C. Angular momentum of $1s$, $2s$, $3s$ orbit electrons are equal

D. In an atom, all the electrons travel with the same velocity

Answer:

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210. Select the correct statement (s) :

A. An orbital with l=O is symmetrical about the nucleus

B. An orbital with l = 1 is spherically summetrical about the nucleus

C. $3d_{z^2}$ is spherically summetrical about the z-axis

D. All are correct

Answer:

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211. Select the correct curve (s) :

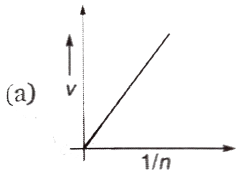
$If = V$ Velocituy of electron in Bohr's orbit

$r =$ Radius of electron in Bohar's orbit

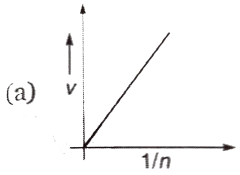
$P.E =$ Potential energy of electron in Bohr's orbit

$K.E. =$ Kinetic energy of electron in Bohr's orbit

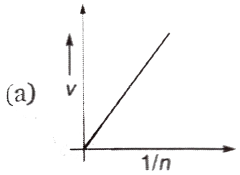
A.



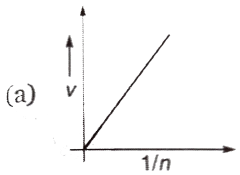
B.



C.



D.



Answer:

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212. Select the correct set (s) of quantum numbers

A. $n = 3, l = 0, m_l = -1$

B. $n = 3, l = 3, m_l = -2$

C. $n = 3, l = 2, m_l = -2$

D. $n = 3, l = 1, m_l = 0$

Answer: C, D

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213. Which is /are correct statement ?

A. Number of sushell present in M-shell $= 3$

B. Number of orbitals present in N-sheel $= 16$

C. $Cu^+ (z = 29)$ is paramagnetic

D. Zeeman effect explains splitting of spectral lines in magnetic field.

Answer:

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214. In a sample of H-atoms electrons are de-exicited from 4^{th} excited state to ground state. Which is/are correct statement ?

A. No line observed in P-fund series.

B. Total ten lines observed in spectrum.

C. 4 line in UV-region and 3 line in visible region observed.

D. One line observed in Brackett series.

Answer:

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215. Column-I and Column-II contains fore entries each. Entries of Column-I are to be matched with some enties of Column-II One or more than one entries of Column-I may have the matching with the same entries oc Column-II.

	ColumnI		ColumnII
(A)	Electron	(P)	Negetive charge
(B)	Proton	(Q)	Positive charge
(C)	Neutron	(R)	$1.6 \times 10^{-19} C$
(D)	Positron	(S)	Chargeless

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216.

	ColumnI		ColumnII
(A)	$\frac{K.E.}{P.E.}$	(P)	2
(B)	$P.E + 2K.E.$	(Q)	$-\frac{1}{2}$
(C)	$\frac{P.E.}{T.E.}$	(R)	1
(D)	$\frac{K.E.}{T.E.}$	(S)	0

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217.

	ColumnI		ColumnII
(A)	Lyman series	(P)	Visible region
(B)	Humphery series	(Q)	Ultraviolen region
(C)	Paschen series	(R)	Infrared region
(D)	Balmer series	(S)	Far infared region

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218. In case of hydrogen spectrum wave number is given by

$\bar{v} = R_H\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$ where $n_1 > n_2$

	ColumnI		ColumnII
(A)	Lyman series	(P)	$n_2 = 2$
(B)	Balmer series	(Q)	$n_2 = 3$
(C)	Pfund series	(R)	$n_2 = 6$
(D)	Brackett series	(S)	$n_2 = 5$

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219.

ColumnI	ColumnII
$(A) 2nd$	$(P) 1$
$(B) 3rd$	$(Q) 2$
$(C) 4th$	$(R) 3$
$(D) 1st$	$(S) 0$

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220.

	ColumnI		ColumnII
(A)	The d-orbital which has two angular nodes	(P)	$3d_{x^2-y^2}$
(B)	The d-orbitial with two nodal surfaced from conce	(Q)	$3d_{s^2}$
(C)	The orbital without angular node	(R)	$4f$
(D)	The orbital which has three angular nodes	(S)	$3s$

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221.

	ColumnI		ColumnII
(A)	Orbital angular momentum of an electron	(P)	$\sqrt{s(s+1)}\frac{h}{2\pi}$
(B)	Angular momentum of an electron in an orbit	(Q)	$\sqrt{(n(n+2))}$
(C)	Spin angular momentum of an electron	(R)	$\frac{nh}{2\pi}$
(D)	Magnetic moment of atom	(S)	$\sqrt{\left(l(l+1)\frac{h}{2\pi}\right)}$

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222.

	ColumnI		ColumnII
(A)	Number of orbitials in thenn^{th}sheel	(P)	$2(2l+1)$
(B)	Maximum number of electrons in a subshell	(Q)	n
(C)	Number of subshell inn^{th}sheel	(R)	$2l+1$
(D)	Number of orbitals in a subshell	(S)	n^2

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223. Match the following columns

Column-I	Column-II
(A) Number of orbitals in the n^{th} shell	(P) $2(2l+1)$
(B) Maximum number of electrons in a subshell	(Q) n
(C) Number of subshells in n^{th} shell	(R) $2l+1$
(D) Number of orbitals in a subshell	(S) n^2

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224. Match the following columns

Column-I	Column-II
(A) 2s	(P) $n=4, l=2, m=0$
(B) $2p_z$	(Q) $n=4, l=2, m=-2$ or $+2$
(C) $4d_{x^2-y^2}$	(R) $n=2, l=1, m=0$
(D) $4d_{z^2}$	(S) $n=2, l=0, m=0$

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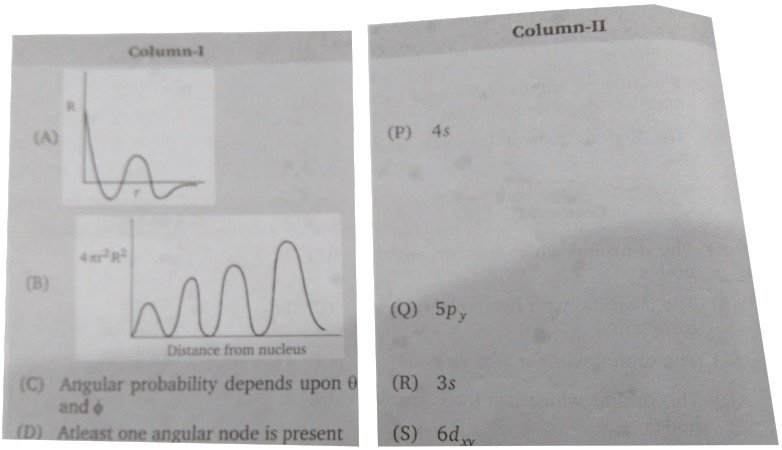
225. Match the following columns



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226. STATEMENT-1: The angular momentum of d-orbitals is $\sqrt{6}\frac{h}{2\pi}$

STATEMENT 2 : Angular momentum of electron in orbit is $mvr = \frac{nh}{2\pi}$

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

Watch Video Solution

227. STATEMENT-1: Angular momentum of the electron in the orbit which has four subshellis $\frac{2h}{\pi}$

STATEMENT-2: Angular momentum of electron is quantized.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

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228. STATEMENT-1: Line emission spectra useful in the study of atomic. Structure.

STATEMENT-2: Each element has a unique line emission spectrum.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

Watch Video Solution

229. STATEMENT-1: Emitted radiation will fall in visible range when an electron jump from $n = 4 \rightarrow n = 2$ H-atom.

STATEMENT-2: Balmer series radiations belong to visible for hydrogen atom only.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

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230. Assertion (A) Atoms with completely filled and half-filled subshells are stable.

Reason (R) Completely filled and half filled subshells have symmetrical distribution of electrons and have maximum exchange energy.

The correct answers is

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

Watch Video Solution

231. Statement-I : The ground state configuration of Cr is $3d^5 4s^1$.

Because

Statement-II : A set of exactly half filled orbitals containing parallel spin arrangement provide extra stability.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

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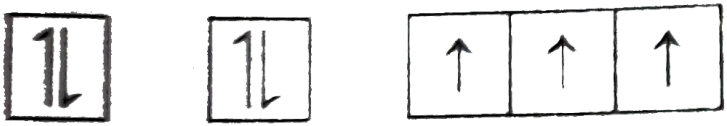
232. STATEMENT-1: The ground state electronic configuration of introgen



is

STATEMENT-2: Electronic are filled in orbitals as per aufbau principle, Hund's rule of maximum spin multiplicity and puli's principle.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

Watch Video Solution

233. STATEMENT-1: An orbital cannot have more then two electrons and they must have opposite spins.

STATEMENT-2: No two electrojns in an atom can have same set of all the four quantum numbers as per Pauli's exclusion principle.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

234. STATEMENT-1: Orbital having xz plane as nofe may be $3d_{xy}$

STATEMENT-2: $3d_{xy}$ has zero radial node.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

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235. STATEMENT-1: The kinetic energy of photo-electrons increases with increase in frequency of incident light were $v > v_o$.

STATEMENT-2: Whenever intensity of light is increased the number of photo-electron ejected always increases.

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

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236. Assertion : Cu^{2+} ion is a coloured ion .

Reason : Every ion with unpaired electron is coloured .

A. If both the statement are TRUE and STATEMENT-2 is the correct explanation of STATEMENT-1

B. If both the statements are TRUE but STATEMENT-2 is NOT the correct explanation of STATEMENT-1

C. If STATEMENT-1 is TRUE and STATEMENT-2 is FALSE

D. If STATEMENT-1 is FALSE and STATEMENT-2 is TRUE

Answer:

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237. Given $r_{n+1} - r_{n-1} = 2r_n$ where r_n, r_{n-1}, r_{n+1} are Bohr radius for hydrogen atom in n^{th} , $(n+1)^{th}$ and $(n-1)^{th}$ shell respectively . Calculate the value of n.

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238. The energy of separationof an of an electron is $30.6eV$ moving in an orbit of Li^{+2} Find out the number of waves made by the electron in one complete revolution in the orbit

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239. Calculate the number of waves made by a Bohr electyron in one complete revolution in n^{th} orbit of H-atom, if ratio of de-Broglie wavelength asssociated with electron moving in n^{th} orbit and 2^{nd} orbit is 1.5.

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240. A certain day absorbs lights of $\lambda = 400$ nm and then fluorescence light of wavelength 500 nm. Assuming that under given condition $40\,\%$ of the absorbed energy is re-emitted as fluorescence, calculate the ratio of quanta obsorbed to number of quanta emitted out.

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241. A photon of energy 4.5 eV strikes on a metal surface of work function $3.0eV$. If uncertainty in position is $\frac{25}{4\pi}\text{Å}$, find the uncertainty in measurment of deBroglie wavelength (inÅ).

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242. Find out the difference in number of angular nodes and number of radial nodes in the orbital to whichlast electron of chromium present.

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243. What is the total number of radial and angular nodes present in 5f orbital?

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244. Infrared lamps are used in restaurants to keep the food warm. The infrared radiation is strongly absorbed by water, raising its temperature and that of the food. If the wavelength of infrared radiationis assumed to be 1500 nm, and the number of quanta of infrared radiation produced per second by an infrared lamp (that consumes enregy at the rate of 100 W and is $12\,\%$ effcient only is $y \times 10^{19}$, then the value of y is :

$\left(Given: h = 6.665 \times 10^{-34} J - s\right)$

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245. When an electron makes a transition from (n + 1) state to n^{th} state, the frequency of emitted radiations is related to 'n' according to $(n > > 1)$

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246. For a 3s - orbital, value of Ψ is given by following realation:

$$\Psi(3s) = \frac{1}{9\sqrt{3}}\left(\frac{1}{a_0}\right)^{3/2}(6 - 6\sigma + \sigma^2)e^{-\sigma/2}, \quad \text{where} \quad \sigma = \frac{2r.\,Z}{3a_0}$$

What is the maximum radial distance of node from nucleus?

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247. Find the separation between two electron (in$\mathring{A}$) in vacuum, if electrostatic potential energy between these electrons in $7.67 \times 10^{-19})\,J.$

[Given: e= 1.6×10^{-19}C, in ε_o=$8.85 \times 10^{-12}\ J^{-1}\ C^2 m^{-1}$ pi=3.14]

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248. An α - particle moving with velocity $\frac{1}{30}$ th times of velvelocity of light. If unceratinty in position is $\frac{3.31}{\pi}$ pm, then minmum unceratinty in kinetic energy is $y \times 10^{-16}$ J. Calculate the value of y.

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249. In a sample of excited hydrogen atoms electrons make transition from $n = 2$ to $n = 1$. Emitted energy.

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250. Calculate the value of A.

$A = \frac{E_1, 2}{2E_{2,1}}$ Where $E_{n,z}$= Energy of electron in n^{th} orbit , Z = atomic number of hydrogen like specie.

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Level 1

1. For similar orbitals having different values of n:

A. the most probable distance increases with increases in n

B. the most probable distance decrease with increase in n

C. the most probable distance remains constant with increase in n

D. none of these

Answer:

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Level 2

1. A small particle of mass m moves in such a way that the potential energy U = ar^2 where a is a constant and r is the distance of the particle from the origin. Assuming Bohr's model of quantization of angular momentum and circular orbits, find the radius of n^{th} allowed orbit.

A. n^2

B. n

C. $\sqrt{n}$

D. none of these

Answer:

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Others

1. Select the correct statement (s) :

A. Lower value of quantum number l indicates that there is a higher probability of finding the $3s$ electron close to the nucleus than those of $3p$ and $3d$ prbitals

B. Energy of $3s$ orbital is les than for the $3p$ and $3d$ orbitals

C. At the node, the vAlue of the radial function change from positive to negative

D. The radial function upon the quantum numbers n and l

Answer:

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2. Select the correct statement (s) :

A. Heisenberg's principle is applicable to stationary electron

B. Pauli,s exclusion principle is not applicable to photons

C. For an electron the product of velocity and principle quantum number will be independent to principle quantum number

D. Quantum numbers l and m determine the value of angular wave function

Answer:

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3. The radial distribution function $[P(r)]$ is used to determine the most probble radius, which is used to find the electron in a given orbital. $\frac{dp(r)}{dr}$ for $1s$- orbital of hydrogen like atom having atomic number Z, is

$\frac{dp}{dr} = \frac{4Z^3}{{a_o}^3}\left(2r\frac{2Zr^2}{a_o}\right)e^{-2zr/a_o}$:

Then which of the following sttements is/are correct ?

A. At the point of maximum value of radial distribution function $\frac{dp(r)}{dr} = 0$, one antionde is present

B. Most probable radius of $Li^{2+} is \frac{a_o}{3}\text{pm}$

C. Most probable radus of $He^+ is \frac{a_o}{2}\text{pm}$

D. Most probable radius of hydrogen atom is a_o pm

Answer:

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4. Select the correct statement (s) :

A. Radial function $[R(r)]$ is a part of wave function which depends upon quantum number n the nucleus

B. Angular function depends only on the direction, and is independent to the distance form the nucleus

C. $\Psi^2(r, \theta, \Phi)$ is the probability density of finding the electronat a particular point in space

D. Radial distribution function $\left(4\pi r^2 R^2\right)$ gives the probability of the electrojn bering present at a distance r from the nucleus

Answer:

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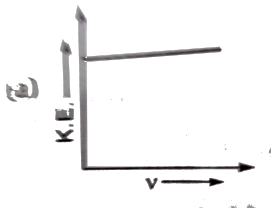
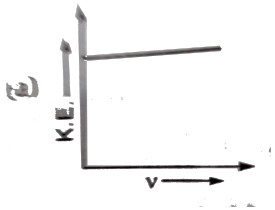
5. Which is/are correct graph ?

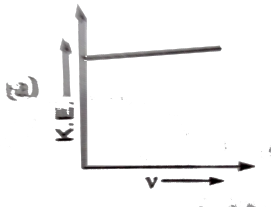
A.



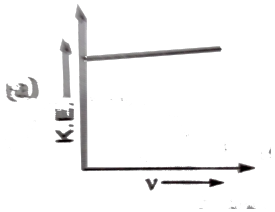
B.



C.



D.



Answer:

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6. If in Bohr.s model, for uni electronic atom following symbols are used :

$r_{n,Z} \rightarrow$ Radius of n^{th} orbit with atomic number z

$U_{n,Z} \rightarrow$ Potential energy of e^-

$K_{n,Z} \rightarrow$ Kinetic energy of e^-

$V_{n,Z} \rightarrow$ Velocity of e^-

$T_{n,Z} \rightarrow$ Time period of revolution

Column-I	Column-II
A) $U_{1,2} : K_{1,1}$	P) 1 : 8
B) $r_{2,1} : r_{1,2}$	Q) –8 : 1
C) $V_{1,3} : V_{3,1}$	R) 9 : 1
D) $T_{1,2} : T_{2,2}$	S) 8 : 1

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7. (A) : For n = 3, l may be 0,1,2 and .m. may be 0, (± 2, ± 1 and 0)

(R) : For each value of n there are 0 to (n-1) possible values of l and for each value of l values of .m. are -1....0....+1

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Answer:

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8. For $1s$ orbital of Hydrogen atom radial wave function is given as :

$$R(r) = \frac{1}{\sqrt{\pi}}\left(\frac{1}{a_o}\right)^{3/2} e^{-r/a_o} \left(where a_o = 0.529\text{Å}\right)$$

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