CHEMISTRY

BOOKS - DISHA PUBLICATION CHEMISTRY (HINGLISH)

STRUCTURE OF ATOM

Exercise

1. Which of the following statements is false?

A. Splitting of spectral lines in electrical field is called Stark effect

B. Frequency of emitted radiation from a black body goes from a lower wavelength to higher wavelength as the temperature increases.

C. Photon has momentum as well as wavelength

D. Rydberg constant has unit of energy.

Answer: D

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2. If the shortest wavelength in Lyman series of hydrogen atom is A, then the longest wavelength in Paschen series of He^+ is:

A. $\frac{5A}{9}$

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

C. $\frac{36A}{9}$

D. $\frac{36A}{7}$

Answer: B

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3. The radius of the second Bohr orbit for hydrogen atom is : (Plank'c const. $h = 6.6262 \times 10^{-34} Js$, mass electron $= 9.1091 \times 10^{-31}$ Kg , charge of electron $e = 1.60210 \times 10^{-19}$, permittivity of vaccum $\in_0 = 8.854185 \times 10^{-12} kg^{-1} m^{-3} A^2$)

A. $1.65Å$

B. $4.76Å$

C. $0.529Å$

D. $2.12Å$

Answer: A

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4. The total number of orbitals associated with the principal quantum number 5 is :

A. 20

B. 25

C. 10

D. 5

Answer: A

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5. A stream of electrons from a heated filament was passed between two charged plates kept at a potential difference V esu.

If c and m are charge and mass of an electron repectively, then the value of h/λ (where λ is wavelength associated with electron wave) is given by :

A. $\sqrt{meV}$

B. $\sqrt{2meV}$

C. meV

D. $2meV$

Answer: B

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6. If $n = 6$, the correct sequence for filling of electrons will be.

A. $ns \to (n-2)f \to np \to (n-1)d$

B. $ns \to (n-2)f \to (n-1)d \to np$

C. $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n=2)f$

D. $ns \rightarrow (n1)d \rightarrow (n-2)f \rightarrow np$

Answer: D

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7. At temperature T , the average kinetic energy of any particles is $\frac{3}{2}$ kT. The de Broglie wavelength follows the order :

A. Visible photon $\rightarrow$ Thermal neutron $>$ Thermal electron

B. Thermal proton $>$ Thermal electron $>$ Visible photon

C. Thermal proton $>$ Visible photon $>$ Thermal electron

D. Visible photon $\rightarrow$ Thermal electron $\rightarrow$ Thermal neutron

Answer: B

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8. Which of the following is the energy of a possible excited state of hydrogen?

A. $-3.4eV$,

B. $+6.8eV$

C. $+13.6eV$

D. $27.2eV$

Answer: B

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9. The energy of an electron in first Bohr's orbit of H atom is $-13.6eV$. The energy value of electron in the first excited state

of Li^{2+} is :

A. $-27.2eV$

B. $30.6ev$

C. $-30.6eV$

D. $27.2eV$

Answer: D

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10. Excited hydrogen atom emits light in the ultraviolet region at 2.47×10^{15} Hz. With this frequency, the energy of a single photon is:

A. $8.041 \times 10^{-40} j$

B. $2.680 \times 10^{-19} J$

C. $1.640 \times 10^{-18} J$

D. $6.111 \times 10^{-17} J$

Answer: C

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11. The de-Broglie wavelength of a particle of mass 6.63 g moving with a velocity of $100 ms^{-1}$ is:

A. $10^{-33} m$

B. $10^{-35} m$

C. $10^{-31} m$

D. $10^{-25} m$

Answer: A

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12. The correct set of four quantum numbers for valence electrons of rubidium atom (Z=37) is

A. $5, 0, 0 + \frac{1}{2}$

B. $5, 1, 0 + \frac{1}{2}$

C. $5, 1, 1 + \frac{1}{2}$

D. $5, 0, 1, + \frac{1}{2}$

Answer: D

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13. The number of neutrons in dipositive zinc ion with mass number 70 is.

A. 34

B. 36

C. 38

D. 40

Answer: D

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14. Which of the following pairs are isosters ?

A. CO_2 and N_2O

B. CaO and KF

C. OF_2 and HCIO

D. All of these

Answer: D

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15. Let m_p be the mass of a poton , M_1 the mass of a $_{}(10)^{20}Ne$ nucleus and M_2 the mass of a $_{}(20)^{40}Ca$ nucleus . Then

A. $M_2 = 2M_1$

B. $M_1 < 10(m_p + m_n)$

C. $M_2 > 2M_1$

D. $M_1 = M_2$

Answer: A

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16. The ratio of specific charge of a proton and an alpha-particle is :

A. $2:1$

B. $1:2$

C. $1:4$

D. $1:1$

Answer: A

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17. Which one of the following sets of ions represents the collection of isoelectronic species?

A. $K^+, Cl^-, Mg^{2+}, Sc^{3+}$

B. $Na^+, Ca^{2+}, Sc^{3+}, F^-$

C. $K^+, Ca^{2+}, Sc^{3+}, Cl$

D. $Na^+, Mg^{2+}, Al^{3+}, Cl^-$

Answer: C

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18. The increasing order (lowest first) for the values of e/m (charge//mass) for electron (e), proton (p), neutron (n), and alpha particle (α) 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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19. Which of the following pairs of nucleides are isodiaphers ?

A. ${}_{13}^{6}C$ and ${}_{8}^{16}O$

B. ${}_{1}^{1}H$ and ${}_{1}^{2}H$

C. ${}_{1}^{3}H$ and ${}_{2}^{4}H$

D. ${}^{25}\_(55)Mn$ and ${}_{30}^{65}Zn$

Answer: D

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20. The discovery of neutron becomes very late because.

A. aneutrons are present in nucleus

B. neutrons are chargeles

C. neutrons are fundamental particles

D. all of the above

Answer: B

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21. Of the following sets ,which one does not contain isoeletronic species ?

A. $BO_3^{3-}, CO_3^{2-}, NO_3^-$

B. $SO_3^{2-}, CO_3^{2-}, NO_3^-$

C. CN^-, N_2, C_2^2

D. $PO_4^{3-}, SO_4^{2-}, ClO_4^{2-}$

Answer: B

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22. The pair NH_3 and BH_3 is isoelectronic with

A. B_2H_6

B. C_2H_6

C. C_2H_4

D. CO_2

Answer: B

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23. The energy of an electron in the nth Bohr orbit of hydrogen atom is

A. $-\frac{13.6}{n^4}eV$

B. $-\frac{13.6}{n^3}eV$

C. $-\frac{13.6}{n^2}eV$

D. $-\frac{13.6}{n}eV$

Answer: C

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

A. Energy of the electrons in the orbits are quantized

B. The electron(s) in the orbit 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 determined simultaneously.

Answer: D

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25. When an electron of charge , e and mass , m moves with velocity v around the nuclear charge 'Ze' describing the circular orbit, the potential energy of the electron is

A. Ze^2/r

B. $-Ze^2/r$

C. Ze^2/r

D. mv^2/r

Answer: B

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26. Bohr's radius for the H-atom (n =1) is approximately 0.53 Ã....

The radius of the first excited state (n=2) is :

A. 0.13

B. 1.06

C. 4.77

D. 2.12

Answer: D

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27. According to Boohr's theory the angular momentum of an electron in 5th orbit is :

A. 10h/a

B. 2.5 h/π

C. 25 h/π

D. 1.0 h/π

Answer: B

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28. An electron from one Bohr stationary orbit can go to next higher orbit:

A. by emission of electromagnetic radiation

B. by absorption of any electromagnetic radiation

C. by absorption of electromagnetic radiation of particular frequency.

D. without emission or absorption of electromagnetic radiation.

Answer: C

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29. The potential energy of the electron present in the ground state of Li^{2+} ion is represented by :

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

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

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

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

Answer: D

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30. The angular speed of electron in the nth orbit of hydrogen atom is

A. directly proportional to n

B. nversely proportional of $\sqrt{n}$

C. inversely proportional to n^2

D. inversely proportional ton^3

Answer: D

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31. The radius of 1^{st} Bohr's orbit for hydrogen atom is 'r'. The radius of second Bohr's orbit is

A. 4r

B. r^3

C. $4r^2$

D. $r^{1/3}$

Answer: A

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32. Energy of an electron is givem by $E = -2.178 \times 10^{-18} J\left(\frac{Z^2}{n^2}\right)$. Wavelength of light required to

excited an electron in an hydrogen atom from level $n = 1$ to $n = 2$ will be

$(h = 6.62 \times 10^{-34} Js$ and $c = 3.0 \times 10^{8} ms^{-1})$.

A. $1.325 \times 10^{-7} m$

B. $1.325 \times 10^{-10} m$

C. $2.650 \times 10^{-7} m$

D. $5.300 \times 10^{-10} m$

Answer: D

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33. The total energy of the electron revolving round the nucleus is

A. $\frac{1}{2}\frac{e^2}{r}$

B. $-\frac{e^2}{r}$

C. $\frac{me^2}{r}$

D. $-\frac{1}{2}\frac{e^2}{r}$

Answer: D

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34. Energy of an electron in a one-electron system can be calculated as

$$E_n = \frac{-2.18 \times 10^{-18} Z^2}{n^2}$$

Which of the following correctly states the relationship between the n=2 level of He^+ atom (Z=2) and n=2 level of Li^{2+} ion (Z=3)?

A. $E_{He^+} = \frac{9}{4} E_{Li^{2+}}$

B. $E_{He^+} = \frac{4}{9} E_{Li^{2+}}$

C. $E_{He^+} = \frac{9}{2} E_{Li^{2+}}$

D. $E_{He^+} = \frac{2}{9} E_{Li^{2+}}$

Answer: B

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35. A small particle of mass m move in such a way the potential energy $\left(U = \frac{1}{2} m^2 \omega^2 r^2\right)$ when 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 , show that radius of the nth allowed orbit is proportional to in

A. n^2

B. n

C. $\sqrt{n}$

D. None of these

Answer: C

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36. The velocity of an e in excited state of H-atom is $1.093 \times 10^6 m/s$, what is the circumference of this orbit?

A. $3.32 \times 10^{-10} m$

B. $6.64 \times 10^{-10} m$

C. $13.32 \times 10^{-10} m$

D. $13.28 \times 10^{-8} m$

Answer: C

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37. 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. 9.75 nm

B. 50nm

C. 85.8nm

D. 97.25nm

Answer: D

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38. 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. 4eV

D. 5eV

Answer: A

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39. The energy of seperation of an electron in a hydrogen like atom in excited state is 3.4eV. The de-Broglie wave length (in Å) associtated with the electron is :

A. 3.33

B. 6.66

C. 13.31

D. None of these

Answer: B

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40. If an electron undergoes transition from n = 2 to n =1 in Li^{2+} ion , the energy of photon radiated will be best given by

A. hv

B. $hv_1 + hv_2$

C. $hv_1 + hv_2 + hv_3$

D. All of these

Answer: A

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41. The strength of the photoelectric current depends upon

A. the intensity of the source of light is decreased

B. the frequency of incident radiation decreases below threshold frequency.

C. the exposure time decreases

D. none of these

Answer: A

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42. 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. $\sqrt{\frac{2h}{m}(\lambda_o - \lambda)}$

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

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

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

Answer: C

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43. The work function of a photoelectric material is 3.3 eV. The thershold frequency will be equal to

A. $8 \times 10^{14} Hz$

B. $5 \times 10^{33} Hz$

C. $8 \times 10^{10} Hz$

D. $4 \times 10^{11} Hz$

Answer: A

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44. Zeeman effect refers to the

A. splitting up of the lines in an emission spectrum in pressece of an external electronstatic field

B. random scattering of light by colloidal particles

C. splitting up of the lines in an emission specturm in a magnetif field

D. emission of electrons from metals when light falls upon them.

Answer: C

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45. 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: B

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46. The electron in the hydrogen atom undergoes transition from higher orbitals to orbital of radius 211.6 pm. This transition is associated with:

A. Lyman series

B. Balmer series

C. Paschen series

D. Bracket series

Answer: B

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47. 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: D

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48. 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: D

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

A. 44070

B. 32/27

C. 27/32

D. None of these

Answer: B

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50. Which experimental observation correctly account for the phenomenon ?

A.

	Experimental observation	Phenomenom
(a)	X-ray spectra	p.Charge on nucleus

B.

	Experimental observation	Phenomenom
(b)	α-particle scattering	q.Quantised electron orbit

C.

	Experimental observation	Phenomenom
(c)	-Photoelectric effecct	r.The nuclear atom

D.

	Experimental observation	Phenomenom
(d)	Emission spectra	s.Quantisation of energy

Answer: D

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51. The energy of a photon is given as, ΔE/atom $= 3.03 \times 10^{-19} J \text{atom}^{-1}$ then, the wavelength (λ) of the photon is

A. 6.56nm

B. 65.6nm

C. 656nm

D. 0.656nm

Answer: C

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52. The value of Planck's constant is $6.63 \times 10^{-34} Js$. The velocity of light is $3.0 \times 10^{8} ms^{-1}$. Which value is closest to the

wavelength in nanometers of a quantum of light with frequency $8 \times 10^{15} s^{-1}$?

A. 3×10^{7}

B. 2×10^{-25}

C. 5×10^{-18}

D. 4×10^{1}

Answer: D

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53. The uncertainty in the position of an electron $(mass = 9.1 \times 10^{-28} g)$ moving with a velocity of $3.0 \times 10^{4} cms^{-1}$ accurate up to $0.001\ \%$ will be

(Use $\frac{h}{4\pi}$ in the uncertainty expression, where $h = 6.626 \times 10^{-27} erg - s$)

A. 1.93 cm

B. 3.84 cm

C. 5.76 cm

D. 7.68 cm

Answer: A

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54. Wave length associated with electron motion

A. increases with increase in speed of electron.

B. remains same irrespective of speed of electron.

C. decreases with increase of speed of e (electron).

D. is zero

Answer: C

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

A. 6.3×10^{-22} m

B. 6.63×10^{-29}m

C. $6.63 \times 10^{-31}m$

D. 6.63×10^{-34}m

Answer: B

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

A. $3.2 \times 10^{-22} m$

B. 2.0

C. 1.6×10^{-21}

D. None of these

Answer: A

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57. When electronic transition occurs from higher energy state to lower energy state with energy difference equal to ΔE electron volts , the wavelength of the line emitted is approxmately equal to

A. $\frac{12395}{\Delta E} \times 10^{-10}$ m

B. $\frac{12395}{\Delta E} \times 10^{10} m$

C. $\frac{12395}{\Delta E} \times 10^{-10} cm$

D. $\frac{12395}{\Delta E} \times 10^{10}$ cm

Answer: A

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58. Which of the following statement concerning concerning probability density $\left(\Psi^2\right)$ and radial distribution function $\left(4\pi r^2 \Psi\right)$ for a s - orbit of H - like species is correct ?

A. Ψ^2 is minimum at nucleus but $4\pi r^2 \Psi^2$ is maximum at nucleus .

B. Ψ^2 is maximum at nucleus but $4\pi r^2\Psi^2$ is minimum at nucleus .

C. Both Ψ^2 and $4\pi r^2\Psi^2$ are maximum at nucleus .

D. Both Ψ^2 and $4\pi r^2\Psi^2$

Answer: B

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59. The angular momentum of d electron is

A. $\frac{h}{2\pi}\sqrt{6}$

B. $\frac{h}{2\pi}\sqrt{6}$

C. $\frac{h}{2\pi}\sqrt{6}$

D. $\frac{h}{2\pi}\sqrt{6}$

Answer: B

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60. The value of Planck's constant is $6.63 \times 10^{-34} Js$. The velocity of light is $3.0 \times 10^{8} ms^{-1}$. Which value is closest to the wavelength in nanometers of a quantum of light with frequency $8 \times 10^{15} s^{-1}$?

A. 3×10^{7}

B. 2×10^{25}

C. 5×10^{-18}

D. 4×10^{1}

Answer: D

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61. If uncertainty in position and momentum are equal then uncertainty in velocity is.

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

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

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

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

Answer: A

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62. Which of the following statement is worong about photon ?

A. Photon's energy is hv

B. Photo's rest mass is zero

C. Momentum of photon is $\frac{hv}{c}$

D. Photon exerts no pressure .

Answer: D

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63. Excited hydrogen atom emits light in the ultraviolet region at 2.47×10^{15} Hz. With this frequency, the energy of a single photon is: $\left(h = 6.63 \times 10^{-34} Js\right)$

A. $8.041 \times 10^{-40} J$

B. $2.680 \times 10^{-19} J$

C. $1.640 \times 10^{-18} J$

D. $6.111 \times 10^{-17} J$

Answer: C

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64. Photons of minimum energy $496k, J.\, mol^{-1}$ are needed to an atoms. Calculate the lowest frequency of light that will ionize a sodium atom.

A. $7.50 \times 10^4 s^{-1}$

B. $4.76 \times 10^{14} s^{-1}$

C. $3.15 \times 10^{15} s^{-1}$

D. $1.24 \times 10^{15} s^{-1}$

Answer: D

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65. Which of the following sets of quantum numbers could represent the last electron added to complete the electron added to complete the electron configuation for a ground state atom of $Br(Z = 35)$ according to Aufbau principle,

A. 4, 0, 0, -1/2

B. 4, 1, 1, -1/2

C. 3, 1, 1, -1/2

D. 4, 1, 2, +1/2

Answer: B

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66. Suppose the universe were different than it is and that the electron spin quantum number could only have of a value of

$+\frac{1}{2}$. Assume that the Pauli's exclusion principle still holds and that the value of other quantum numbers were the same, which atomic number could correspond to the "noble gases" in this universe?

A. 1,5,9...

B. 2, 10, 18...

C. 3,27,54...

D. 1,4,8...

Answer: A

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67. Which orbital of the following is lower in energy in a many electron atom?

A. 2s

B. 3d

C. 4s

D. 5f

Answer: A

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68. 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: D

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69. The total number of electrons that can be accommodated in all orbitals having principal quantum number 2 and azimuthal in quantum number 1 is

A. 2

B. 4

C. 6

D. 8

Answer: D

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70. For which one of the following sets of four quantum numbers, an electron will have the highest energy?

A. $\begin{array}{cccc} n & l & m & s \\ 3 & 2 & 1 & 1/2 \end{array}$ (a)

B. $\begin{array}{cccc} n & l & m & s \\ 4 & 2 & -1 & 1/2 \end{array}$ (b)

C. $\begin{array}{cccc} n & l & m & s \\ 4 & 1 & 0 & 1/2 \end{array}$ (c)

D. $\begin{array}{cccc} n & l & m & s \\ 5 & 0 & 0 & -1/2 \end{array}$ (d)

Answer: B

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71. The five d-orbitals are designated as d_{xy}, d_{yz}, d_{xz}, $d_{x^2-y^2}$ and d_{z^2} . Choose the correct statement.

A. The shapes of the first three orbitals are similar but that of the fourth and fifth orbitals are different

B. The shapes of all five d-orbitals are similar.

C. The shapes of the first four orbitals are similar but that of the fifth orbital is different.

D. The shapes of all five d-orbitals are different

Answer: C

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72. Which one of the following set of quantum numbers is not possible for 4p electron?

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

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

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

D. $n = 4, l = 1, m = -1, m_2 = -\frac{1}{2}$

Answer: C

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73. If the magnetic quantum number of a given atom is represented by -3, then what will be its principal quantum number?

A. 1

B. 2

C. 3

D. 4

Answer: D

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74. For f-orbital, the values of m are

A. $-2,\ -1, 0,\ +1,\ +2$

B. $-3,\ -2,\ -1, 0,\ +1,\ +2, 3$

C. $-1, 0,\ +1$

D. $0,\ +1,\ +2,\ +3$

Answer: B

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75. How many nodes are there in 5f orbitals?

A. one node

B. two nodes

C. three nodes

D. four nodes.

Answer: A

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76. If an electron has spin quantum number of $-\frac{1}{2}$ and magnetic quantum number of -1 it cannot be present in:

A. d-orbital

B. f-orbital

C. p-orbital

D. s-orbital.

Answer: D

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77. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)}\frac{h}{2\pi}$. What is the momentum of an s-electron?

A. zero

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

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

D. $+\frac{1}{2}.\frac{h}{2\pi}$

Answer: A

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78. The energy of the electron in Be^{3+} ion depends on

A. the principal quantum number only.

B. the principal and azimuthal quantum numbers only.

C. the principal, azimuthal and magnetic quantum numbers

D. the principal, azimuthal, magnetic and spin quantum numbers.

Answer: A

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79. What are the component values in terms of $h/2\pi$) of the orbital angular momentum along the Z-direction for a 2p electron?

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

B. $+\frac{3}{2}, +\frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}$

C. $+2, +1, 0, -1, -2$

D. $+1, 0, -1$

Answer: D

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80. The total number of orbitals associated with the principal quantum number 5 is :

A. 20

B. 25

C. 10

D. 5

Answer: B

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81. The total spin and magnetic moment for the atom with atomic number 24 are

A. $\pm 3, \sqrt{48}BM$

B. $\pm 3, \sqrt{35}BM$

C. $\pm \frac{3}{2}, \sqrt{48}BM$

D. $\pm \frac{3}{2}\sqrt{35}BM$

Answer: A

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82. A principal shell having the highest energy subshell to be 'g'can accomodate electrons to a maximum of .

A. 18

B. 32

C. 25

D. 50

Answer: D

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83. The energy of the electron in the first orbit of He^{+} is $-871.6 \times 10^{-20} J$. The energy of the electron in the first orbit of hydrogen would be.

A. $-871.6 \times 10^{-20} J$

B. $-435.8 \times 10^{-20} J$

C. $-217.9 \times 10^{-29} J$

D. $-108.9 \times 10^{-20} J$

Answer: C

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84. Based on equation $E = -2.178 \times 10^{-18} J \left(\frac{Z^2}{n^2} \right)$, certain conclusions are written. Which of them is not correct ?

A. Larger the value of n , the larger is the orbit radius

B. Equation can be used to calculate the change in energy when the electron changes orbit.

C. For n = 1, the electron has a more negative energy than it does for n = 6 which mean that the electron is more loosely bound in the smallest allowed orbit .

D. The negative sing in equaiton simply means that the enrgy or electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance form the nucleus .

Answer: C

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85. The ionization enthalpy of He^+ ion is 19.60×10^{-18} J atom^{-1} The ionization enthalpy of Li^{+2} ion will be.

A. $84.2 \times 10^{-18} J \text{atom}^{-1}$

B. $44 \times 10^{-18} J \text{atom}^{-1}$

C. $63.20 \times 10^{-18} J \text{atom}^{-1}$

D. $21.20 \times 10^{-18} J \text{atom}^{-1}$

Answer: B

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86. An electron in the ground state of hydrogen was excited to a higher energy level using monochromatic radiations of wave length $(\lambda) 975 \text{Å}$. The longest wave length that appears in the resulting spectrum is due to transition from:

A. $n_4 \rightarrow n_1$

B. $n_4 \rightarrow n_3$

C. $n_5 \rightarrow n_4$

D. $n_5 \rightarrow n_1$

Answer: B

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87. Arrange the wavelengths (a) of the following emission lines of H-atom in an increasing order.

(1) $n = 3 \xrightarrow{\lambda_1} n = 1$ (2) $n = 5 \xrightarrow{\lambda_2} n = 3$

(3) $n = 12 \xrightarrow{\lambda_3} n = 10$ (4) $n = 22 \xrightarrow{\lambda_4} n = 20$

A. $\lambda_4 < \lambda_3 < \lambda_2 < \lambda_1$

B. $\lambda_1 < \lambda_2 < \lambda_3 < \lambda_4$

C. $\lambda_1 < \lambda_2 < \lambda_4 < \lambda_3$

D. $\lambda_1 < \lambda_3 < \lambda_3 < \lambda_4\lambda_2$

Answer: B

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88. What transition in $He^{\oplus}$ ion shall have the same wave number as the first line in Balmer series of H atom ?

A. $7 \to 5$

B. $6 \to 4$

C. $5 \to 3$

D. $4 \to 2$

Answer: B

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89. 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. $v = \frac{n^2h^3}{ke^2 8\pi^3 m^{22}}$

Answer: C

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90. A beam of specific kind of particles of velocity $2.1 \times 10^7 m/s$ is scattered by a gold $(Z = 79)$ nuclei. Find out specific charge (charge/mass) of this particle if the distance of closest approach is $2.5 \times 10^{-14} m$.

A. $4.84 \times 10^{7} C / kg$

B. $4.84 \times 10^{-7} C / kg$

C. $2.42 \times 10^{7} C / kg$

D. $3 \times 10^{-12} C / Kg$

Answer: A

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91. 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. $1.54 \times 10^{6} m / s$

B. $1.54 \times 10^{8} m / s$

C. $1.54 \times 10^7 C / kg$

D. $1.54 \times 10^4 m / s$

Answer: A

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92. 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. 102.6 nm

B. 12.09nm

C. 121.6nm

D. 810.8 nm

Answer: A

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93. 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 the emission of an X-ray. Assuming that the electrons in other shells exert no influence, at what Z (minimum) would a transition form the second level to the first result in the emission of an X-ray?

A. 1

B. 2

C. 3

D. 4

Answer: B

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94. Balmer gave an equation for wavelegth of visible region of H-spectrum as `lambda=(Kn^(2))/(n^(2)-4).

Where n= pricipal quantum number of energy level, K=constant in terms of R (Rydberg constant).

The value of K in term of R is :

A. R

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

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

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

Answer: C

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95. In hydrogen atomic spectrum , a series limit is found at $12186.3cm^{-1}$. Then it belong to :

A. Lyman series

B. Balmer series

C. Paschen series

D. Bracket series

Answer: C

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96. If the average life time of an excited state of hydrogen is of the order of $10^{-8}s$, estimate how many whits an alectron makes

when it is in the state $n = 2$ and before it suffers a transition to state$n = 1\left(Bohrrediusa_0 = 5.3 \times 10^{-11}m\right)$?

A. 2.28×10^6

B. 22.8×10^6

C. 8.23×10^6

D. 2.82×10^6

Answer: C

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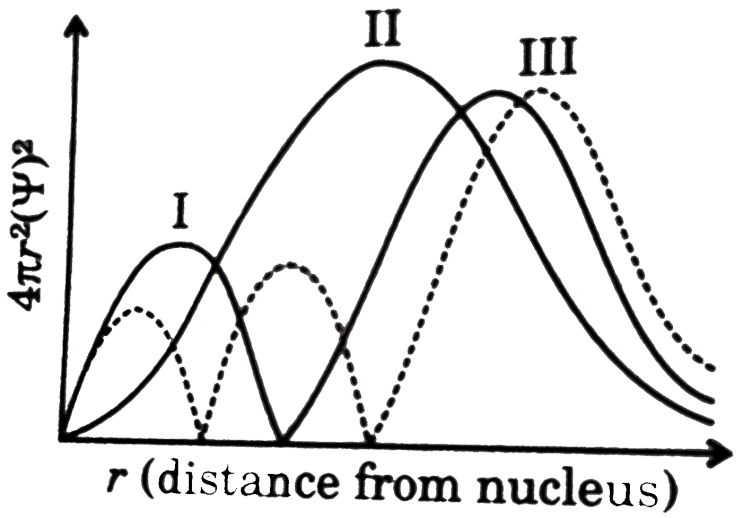
97. Consider the following radial distribution function diagrams. Which of the following has the correct matching of curve and

orbital ?



A. I (3s),II (3p) ,III(3d)

B. I(3d),II(3p),III(3s)

C. I(3p),II(3d) ,III(3s)

D. I(3s),II(3d),III(3p)

Answer: C

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98. Which statement (s) are correct ?

(1) A 3s sub - shell has a maximum of 8 electrons.

(2) An element with configuration of $1s^2 2s^2 3p^6 3s^2$ would be in the same group as beryllium.

(3) The general electronic configuration of the group containing N_2 is $ns^2 np^2$.

(4) A strontium atom has a filled outer shell if it loses tow electrons.

A. 1,2 and 3

B. 1 and 3

C. 2 and 4

D. Only 4

Answer: C

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99. In a multi - electron atom , which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric fields ?

(A) n=l, l=0,m=0 (B) n = 2, l =0 , m= 0

(C) n = 2 , l = 1 , m = 1 (D) n = 3, l =2 , m=1

(E) n=3,l=2,m=0.

A. (D) and (E)

B. (C) and (D)

C. (B) and (C)

D. (A) and (B)

Answer: A

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100. The numbers of radial nodes of $3s$ and $2p$ orbitals are respectively:

A. 2,0

B. 0,2

C. 1,2

D. 2,1

Answer: A

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101. The electronic, identified by quantum numbers n and l, (i) $n = 4, l = 1$, (ii) $n = 4, l = 0$, (iii) $n = 3, l = 2$, (iv) $n = 3, l = 1$ can be placed in order of increasing energy, from the lowest to highest, as

A. $(iv) < (ii) < (iii) < (i)$

B. $(ii) < (iv) < (i) < (iii)$

C. $(i) < (iii) < (ii) < (iv)$

D. $(iii) < (i) < (iv) < (ii)$

Answer: A

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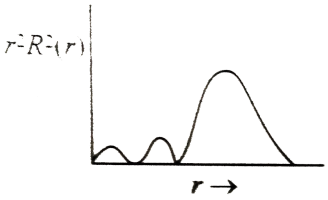
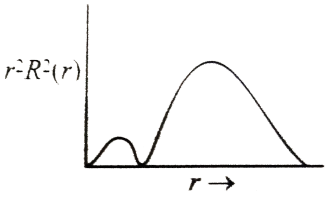
102. Which of the following radiation distribation graph coreesponds to $l = 2$ for the least value of a for which $l = 2$ is

allowed ?

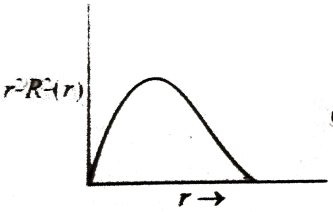
a.



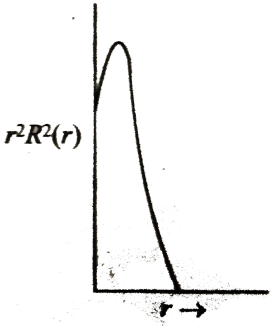
b.



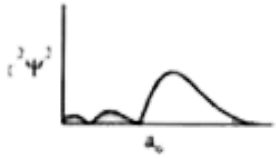
c.



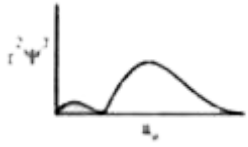
d.



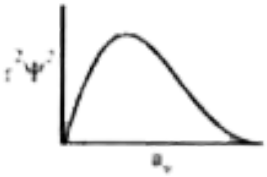
A.

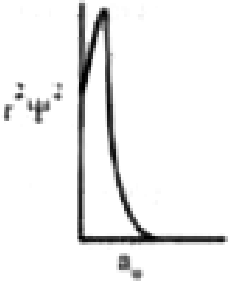


B.



C.



D. 

Answer: C

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103. If $n = 6$, the correct sequence for filling of electrons will be.

A. $ns \to (n-2)f \to (n-1)d \to np$

B. $ns \to (n-1)d \to (n-2)f \to np$

C. $nsot(n-2)f \to np \to (n-1)d$

D. $ns \to np(n-1)d \to (n-2)f$

Answer: A

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104. 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. $3.35 \times 10^{-4} m \sec^{-1}$

B. $5.8 \times 10^{-4} m \sec^{-1}$

C. $4 \times 10^{-5} m \sec^{-1}$

D. $4 \times 10^{-6} m \sec^{-1}$

Answer: A

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105. Ground state energy of H-atom is $(-E_1)$,t he velocity of photoelectrons emitted when photon of energy E_2 strikes

stationary Li^{2+} ion in ground state will be:

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

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: C

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106. The dissociation energy of H_2 is $430.53kJmol^{-1}$, If H_2 is of dissociated by illumination with radiation of wavelength $253.7nm$, the fraction of the radiant energy which will be converted into ikinetic energy is given by

A. $7.22\ \%$

B. $8.82\ \%$

C. $2.22\ \%$

D. $100\ \%$

Answer: B

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107. 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 II to I?

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

B. λ

C. 2λ

D. 3λ

Answer: D

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108. A 600 W mercury lamp emits monochromatic radiation of wavelength 331.3 nm. How many photons are emitted from the lamp per second?

$\left(h = 6.626 \times 10^{-34} \text{ Js, velocity of light } = 3 \times 10^{8} ms^{-1}\right)$

A. 1.0×10^{19}

B. 1.0×10^{23}

C. 1.0×10^{21}

D. 2.0×10^{23}

Answer: C

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109. The uncertainty in the position of an electron $(mass = 9.1 \times 10^{-28} g)$ moving with a velocity of $3.0 \times 10^4 cms^{-1}$ accurate up to $0.001\ \%$ will be

(Use $\frac{h}{4\pi}$ in the uncertainty expression, where $h = 6.626 \times 10^{-27} erg - s$)

A. 1.93 cm

B. 3.84 cm

C. 5.76 cm

D. 7.68cm

Answer: A

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110. The wavelength associated with a golf ball weighing 200 g and moving at a speed of 5m/h is of the order :

A. $10^{-10}m$

B. $10^{-20}m$

C. $10^{-30}m$

D. $10^{-40}m$

Answer: C

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111. The energies E_1 and E_2 of two radiations are $25eV$ and $50eV$ respectively. The relation between their wavelengths, i.e.,

λ_1 and λ_2 will be

A. $\lambda_1 = \lambda_2$

B. $\lambda_1 = 2\lambda_2$

C. $\lambda_1 = 4\lambda_2$

D. $\lambda_1 = \frac{1}{2}\lambda_2$

Answer: B

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112. If an element emits photon in its ground state due to electron transition , then its .

A. atomic number will increase

B. atomic number will remains unchaged

C. atomic number will decrease

D. mass number will decrease

Answer: C

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