CHEMISTRY

BOOKS - CENGAGE CHEMISTRY (ENGLISH)

ATOMIC STRUCTURE

Solved Example

1. An oil drop has $6.39 \times 10^{-19} C$ charge .How many electrons does this oil drop has ?

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2. In are oil drop experiment , the following charges (in arhitrary units)were found an a series of oil droplets .Calculate the magnitude of the charge on the elecron.

$3 \times 10^{-15}, 9 \times 10^{-15}, 12 \times 10^{-15}, 18 \times 10^{-15}$

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3. Calculate the number of electrons , protons and neatrons in the following species

a. $._6 C^{13}$ b. $._6 C^{12}$

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4. Gives an isobar,isotone , and isotope of $\_(6)C^{14}$

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5. Write the complete symbol

a. The nucleus with atomic number 16 and mass number 82

b. The nucleus with atomic number 35 and mass number 80

c. The nucleus with atomic number 4 and mass number 9

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6. If the atomic weight of Zn in 70 and its atomic number in 30, Then what be the atomic weight of Zn^{2+}?

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7. The mass numbers of three istopes of an element are $10, 12 \text{ and } 14$ units .Their precentage abundance is $80, 15 \text{ and } 5$ respectively .What is the atomic weight of the element ?

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8. A dispositive ion has 12 protons .What is the number of electrons in the tetrapositive ion ?

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9. The pair NH_3 and BH_3 is isoelectronic with

A. B_2H_4

B. C_2H_6

C. C_2H_4

D. CO_2

Answer: C_2H_6

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10. In retherford's scartering experiment which of the following does not happen ?

A. Most of the $\alpha - rays$ pass through without deflection

B. A few α-particles pass through the nucleus

C. A few a- pazrticle are defleted back

D. a- particle going near the nucleus are slighty defected

Answer: A few α-particles pass through the nucleus

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11. When alpha particle are sent through a thin metal foil ,most of them go straight through the foil because

A. alpha particle are much heavier than electron

B. alpha particle are positively charged

C. alpha particle move with high velocity

D. Most part of the atom is empty

Answer: Most part of the atom is empty

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12. Which of the following statement about proton is correct?

A. Proton is the nucleus of deuterium

B. Proton is an α- particle

C. Proton is an ionised hydrogen molecule

D. Proton is ionised hydrogen.

Answer: Proton is ionised hydrogen

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13. Rutherford's experiment , which established the nuclear of atom used a beam of

A. β-particles, which impinged on a metal foil and got absorbed

B. γ-Rays, which impinged on a metal foil and ejected electrons

C. Helium atoms, which impinged on a metal foil and got scattered

D. Helium nuclei, which impinged on a metal foil and got scattered. .

Answer: Helium nuclei , which inpinged on a metal foil and got scattered

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14. Which of the following shows an increasing value of e/m?

A. $n < \alpha < p < e$

B. $n < p < \alpha < e$

C. $n < p < e < \alpha$

D. $p < n < \alpha < e$

Answer: $n < \alpha < p < e$

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15. From the alpha - particle scattering experiment Rutherford concluded that

A. α- particle can come within a distance of the order of $10^{-14}m$ of the nucleus

B. The radius of the nucleus is less than $10^{-14}m$

C. Scattering follows coulomb's law

D. The positively charged parts of the atom move with extremely high velocities

Answer: α- particle can come within a distance of the order of $10^{-14}m$ of the nucleus.
The radius of the nucleus is less than $10^{-14}m$
Scattering follows coulomb's law

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16. Which of the following statement regarding cathode rays is not correct ?

A. Cathode rays originate from the cathode

B. The charge and mass of the particle constituting cathode rays depends upon the the nature of the gas

C. The charge and mass of the particles present does not depend upon the the material of the cathode

D. The charge and mass of the particle is much greater than that of anode rays

Answer: The charge and mass of the particle constituting cathode rays depends upon the the nature of the gas

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17. Oxygen consists of isotopes O^{16}, O^{17} and O^{16} and carbon consists of isotopes C^{12} and C^{13} .How many types of CO_2 molecules can be formed ? Also repart their molecular weights

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18. The atomic masses of two isotopes of O are 15.9936 and 17.0036

Calculate in each atom

A. Number of neutrons

B. Number of protons

C. Number of electrons

D. Mass Number

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19. Naturally occurring boron consists of two isotopes whose atomic weight are 10.01 and 11.01The atomic weight of natural boron is 10.81

Calculate the percentage of each isotope in natural boron

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20. What will be the differents in the mass number the number is halved and the number of electrons is doubled in $\_(8)O^{16}$?

A. 25% decreases

B. 90% increases

C. 150% increases

D. No difference

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21. The mass of a mole of electrons is: 0.008 g 0.184 g 0.55 mg 1.673

A. $0.55mg$

B. $1.0008g$

C. $1.000g$

D. $0.184g$

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22. The number of atoms presents in $20g$ of calcium will equal to the number of atoms presents in

A. $12gC$

B. $12.15gMg$

C. $24.0gC$

D. $24.3gMg$

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23. In two element $._{Z1}A^{M1}$ and $._{Z2}B^{M2}$

$M_1 = M_2$ and $Z_1 = Z_2$ but $M_1 - Z_1 = M_2 - Z_2$. These elements are

A. Isotonic

B. `Isobaric

C. Isotople

D. Isoprotonic

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24. Two nuclides A and B are isotonic .Their mass number are 76 and 77 respectively .If the atomic number of A is 32 then the atomic number of B will be

A. 33

B. 34

C. 32

D. 30

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25. What is the percentage of duterium in heavy water ?

A. 20%

B. 80%

C. 60%

D. 40%

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26. Which of the following pairs consists of molecular having the same molecular mass?

A. H_2O and D_2O

B. H_2O and HTO

C. D_2O and HTO

D. D_2O and HCl

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27. The mass number of three isotopes of an element are $11, 12$ and 13 .Their percentage ohandances $80, 15$ and 5, respectively .What is the atomic weight of the element ?

A. 11.25

B. 20

C. 16

D. 10

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28. If two neutrons are added to an element X then it will get converted to its

A. `Isotope

B. Isotone

C. Isobar

D. None of the above

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29. The isoelectronic pair of 32 electrons is

A. BO_3^{3-} and CO_3^{2-}

B. N_2 and CO

C. PO_4^{2-} and CO_3^{2-}

D. All of the above

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30. Which of the following is a one electron species ?

A. He

B. N

C. H_2

D. N_2

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31. The molecular weight of an oxide of nitrogen is 30 .What is the number of electron is it ?

A. 15

B. 30

C. 45

D. 20

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32. A dispositive ion 16 protons what is the number of electron is its tetrapositive ion?

A. 16

B. 14

C. 12

D. 10

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33. If the atomic weight of C and Si are 12 and 28 respectively , then what is the ratio of the number of neutrons in them?

A. $1 : 2$

B. $2:3$

C. $3:4$

D. $3:7$

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34. Calculate the density of fluorine nucleus supposing that the shape of the nucleus is spherical and its radius is 5×10^{-13} (Mass of $f = 19$ ams)

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35. Calculate

a. The number of electrons which will together weight i.g.

b. The mass of 1 mol of electron

c. The charge of 1 mol of electrons

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36. how many neutrons and protons are there in the following nuclei ?

$._{6}^{13}C,_{8}^{16}O,_{12}^{24}Mg,_{26}^{56}Fe,_{38}^{88}Sr$

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37. Write the complete symbol of:

a. The nucleus with atomic number 56 and mass number 138

The nucleus with atomic number 26 and mass number 55

c. The nuleus with atomic number 4 and mass number 9

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38. Nitrogen atom has atomic number 7 And oxygen has atomic number 8

calculate the total number of electrons in nitrate ion

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39. A mixture contains F and Cl atoms . The removal of an electron form each atom of the sample requires $284kJ$ while addition of an electron to each atom of mixture releases $68.8kJ$ energy .Calculate the % composition of mixture .Given IE per atoms for F and Cl are $27.91 \times 10^{-22} kJ$ and $20.77 \times 10^{-22} kJ.$

Electron gain enthalpy for F and Cl are $-5.53 \times 10^{-22} kJ$ and $-5.78 \times 10^{22} kJ$ respectively.

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40. Calculate the frequency and wave number of a radiation having wavelength $600nm$

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41. Yellow light emitted from a sodium lamp has eavelenght (i) of $500nm$ .Find the frequency (v) wavelength $(\bar{v})$ of the yellow light

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42. A radio station is broadcasting programmes as 100 MHz frequency if the distance between the radio station and the received set is 300 km .How long the signal would take in reaching the set from the radiostation ? Also calculate the wavelength and wave number of radio waves

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43. Calculate the wavelength of an ultraviolet wave , if its frequency is 12×10^{16} cycles per second and $c = 3 \times 10^{8} \mathrm{m}s^{-1}$?

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44. A photon in X region is move emergetic than in the visible region X is

A. infrared rays

B. UV rays

C. Microwaves

D. Radiowaves

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45. The coloured radition with lowest energy is

A. Red

B. Blue

C. Green

D. Yellow

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46. Meseley's aquation for the determination of wavelength of X rays is $(v =$ frequency of wave $Z =$ nuclear charge, a and b are constants)

A. $\sqrt{v} = (Z - ab)$

B. $v = a(Z - b)$

C. $\sqrt{v} = a(Z - b)$

D. $v = (Z - ab)$

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47. The wavelength of the chartacristic Ka X - rays of iron and potassium are 1.931×10^{-8} and 3.737×10^{-8} respectively .What is the atomic number of an element for which the characteristic Ka wavelength is $2.289 \times 10^{-8} cm$?

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48. Of the following the radition having the maximum wavelength is

A. UV rays

B. Radiowaves

C. X-rays

D. IR rays

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49. Out of the following the radiation with lowest frequency is

A. IR rays

B. γ Rays

C. Cosmic rays

D. Microwaves

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50. Which of the following statement about the electromagnetic spectrum is not correct ?

A. IR raditions have larger wavelength than cosmic rays

B. The frequency of microwave is less than of UV rays

C. X-rays have large wavelength than microwaves

D. The velocity of X- rays is more than of microwaves

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

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52. Atomic radius is of the order of $10^{-8} cm$ and nuclear radius is of the order of $10^{-13} cm$ .What fraction of an atom is occupied by nucleus ?

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53. Atomic radius is of the order of $10^{-8} cm$ and nuclear radius is of the order of $10^{-13} cm$ .What fraction of an atom is occupied by nucleus ?

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54. The ratio e/m i.e. specific , for a cathode ray

A. has the smallest value when the discharge, tube is filled with H_2

B. is constant

C. Varies with the atomic number of gas in the discharge tube

D. Varies with the atomic number of an element forming the cathode

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55. Compare the energies of two radiations E_1 with wavelength 800 nm and E_2 with wavelength 400 nm.

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56. what is the number of photons of light with a wavelength of 4000 pm that provide 1 J of energy ?

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57. A 100 W bulb is emitting light of wavelength 300 nm .Calculate the number of photon emitted by the bulb in 1 min?

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58. Calculate the number of proton emitted in 10 hours by a $60W$ sodium lamp (λ of photon $= 5893\text{Å}$)

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59. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom. What is the ionisation energy of sodium per atom?

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60. The value of Planck's constant in SI unit is

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61. AIR service on vividh bharti is transmitted on 219 m band what is its transition frequency is hertz?

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62. The electron energy in hydrogen atom is given by $E = \left(-21.7 \times 10^{-12}\right) \ln^2$ ergs. Calculate the energy required to remove an electron completely from the n=2 orbit. What is the longest wavelength in cm of light that can be used to cause this transition?

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63. find energy of each of the photons which

(i) correspond to light of frequency $3 \times 10^{15} Hz$.

(ii) have wavelength of 0.50 A.

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64. A blue lamp mainly emits light of wavelength $4500\tilde{A}...$. The lamp is rated at 150 W and 8% of the energy is emitted as visible light. The number of photons number of photons emitted by the lamp per second is

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65. Electronic energy is negative because:

A. Electron carries negative charge

B. Energy is zero near the nucless and decreases as the distance from the nucless increases

C. Energy is zero at infinite distance from the nucless and decreases as the electron comes to the nucless

D. There are interelectronic repulsions

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66. Which of the following is not a charcleristic both as an motion and as a stream of particles?

A. Interference

B. $E = mc^2$

C. Diffraction

D. $E = hv$

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67. Which of the following is not acharacteristic of plack's quentum theory of radiation ?

A. Energy is not absorbed or emitted in whole number maltiples of quentum

B. Radiation is associated with energy

C. Radiation is associated with energy emitted or obserbed continously but in the form of small packets called quanta

D. The magnitude of energy associted with quantum proporthional to frequency.

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68. The frequency of the strong yellow line in the spectrum of sodium in $5.09 \times 10^{14} s^{-1}$ .Calculate the wavelength of the light nanometres

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69. What is the wavelength of light emitted when the electron of a hydrogen atom undergoes a transition from an energy level with $n = 4$ to an energy level with $n = 2$? .What is the colour corresponding to this wavelength ?

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70. One of the spectral lines of caesium has a wavelength of 456nm. Calculate the frequency of this line.

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71. In a photoelectric effect experiment irradiation of a metal with light of frequency $5.2 \times 10^{14} s^{-1}$ yields elctrons with maximum kinetic ennergy $1.3 \times 10^{-19} J$.Calculate the threshold frequency (v_0) for the metal

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72. Light of wavelenght $5000Å$ fall on a metal surface of work function $1.9 eV$ Find

a. The energy of photon

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73. Electromegnetic radiation of wavelength 500 nm is just safficient to ionic a sodium atom .Calculate the energy corresponding to this wavelength the ionisation potential of Na

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74. A photon of $300nm$ is absorbed by a gas which then re-emits photon .One re-emited photon has a wavelength of $400nm$ .Calculate the energy of the other photon re-emitted not

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75. Calculate the velocity of electron ejected from a platium surface when radiation of 200nm falls on it .The work function of platinum is $5eV\left(1eV = 1.6 \times 10^{-19}J\right)$

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76. The energy required to stop ejection of electrons from a Cu plate is $0.24eV$ .Calculate the work function Cu when a radiation of wavelength $\lambda = 250$ nm strikes the plate

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77. When a certain metal was irradiated with light of frequency $4.0 \times 10^{19} s^{-1}$ the photoelectrons emitted had three times the kinetic energy as the kinetic energy of photoelectrons emitted when the metal was irradited with light of frequency $2.0 \times 10^{16} s^{-1}$ .Calculate the critical frequency (v_0) of the metal

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78. With what velocity should an α- particle travel toward the nucleus of a copper atom at a distance of $10^{-13} m$ from the nucleus of the copper atom ?

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79. Photochemical dissociation of oxygen result in the production of two oxygen atoms one in the ground state and in the excited state

$O_2 \xrightarrow{hv} O + O^{\cdot}$

The maximum wavelength (1) needed for this is 17.4 nm .If the exchation energy $O \rightarrow O^{\cdot} is 3.15 \times 10^{-19} J$ How much energy in kJ mol^{-1} is needed for the dissociation of 1 mole of oxygen into normal atoms in the ground state

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80. A photon of frequency n causes photoelectric emmission from a surface with threshold frequency n_0 .The de Broglie wavelength λ of the photoelectron emitted is given as

A. $\Delta n = \frac{h}{2m\lambda}$

B. $\Delta n = \frac{h}{\lambda}$

C. $\left[\frac{1}{v_0} - \frac{1}{v}\right] = \frac{mc^2}{n}$

D. $\lambda = \sqrt{\frac{h}{2m\Delta V}}$

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81. Calculate the velocity of electron ejected from a platinum surface when radiation of 200nm falls on it . The work function of platinum is $5eV\left(1eV = 1.6 \times 10^{-19}J\right)$

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82. A photon iof light with $\lambda = 470nm$ falls on a metal surface .As a result photoelectron are ejected with a velocity of $6.4 \times 10^4 ms^{-1}$ .Find

a. The kinetic energy of emited photonelectron

b. The work function (in eV) of the metal surface

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83. If the threshold frequency of a metal for photoelectric effect is v_0 then which of the following will not happen ?

A. (1) If the frequency of the incident radiation in v_0, then the kinetic energy of the electrons ejected is zero

B. (2) If the frequency of the incident radiation in v, then the kinetic energy of the electrons ejected will be $hv - hv_0$

C. (3) If the frequency is kept same at v but intesity is increased, then the number of electrons ejected will increases

D. (4) If the frequency of the incident radiation is further increasesed, then the number of photoelectrons ejected will increases

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

A. $8.56\ \%$

B. $2.33\ \%$

C. $1.3\ \%$

D. `90%

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85. Light of wavelength λ shines on a metal surface with intensity X and the metal emit Y electron per second of average energy Z what will happen to Y and Z if X is doubled ?

A. Y will be doubled and Z will become half

B. Y will remain same and Z will be doubled

C. Both Y and Z will be doubled

D. Y will be doubled but Z will be remain same

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86. The threshold wavelength of a metal is $230nm$ calculate the KE of the electrons from that metal surface by using UV radiation of wavelength $180nm$

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87. A photon of wavelength 5000λ strikes a metal surface with work function $2.20eV$ calculate

aTHe energy of the photon in eV

b. The kinetic energy of the emitted photo electron

c. The velocity of the photoelectron

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88. Photoelectron are liberated by altra voilet light of wavelength 3000Å from a metallic surface for which the photoelectron thershold is 4000Å calculate de broglic wavelength of electron with maximum kinetic energy

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89. What a certain was metal was irradiatiobn with light of frequency $1.6 \times 10^{16} Hz$ the photoelectron emitted but the kinetic energy as the photoelectron emitted when the same metal was irradiation with light of frequency $1.0 \times 10^{16} Hz$ .Calculate the threslold frequency (v_0) for the metal

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90. An iodine dissociates into atom after absorting light of wave length 4500Å If quantum of radition is absorbed by each molecule calculate the kinetic energy of iodine (Bood energy of $I_2 is 240 kJ(mol))$

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91. Calculate the energy in kilojoules per mole of electronic charge accelerated by a potential of $1V$

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92. An electron beam can undergo defraction by crystals .Through what potential should a beam of electrons beb acceleration so that its wavelength becomkes equal to 1.54Å

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93. The eyes of a reptille pass a visual signal to the brain when the visual receptors are struck by photons of wavelength 850nm. If a total energy of 3.15×10 −14 J is required to trip the signal, what is minimum number of photons that must strike the receptor $(h = 6.6 \times 10^{-34})$?

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94. O_2 undergoes photochemical dissocia tion into one normal oxygen atom one oxygen atom $1.967eV$ more energetic than normal .The dissociation of O_2 into two bnormal atoms of oxygen required $498kJmol^{-1}$ what is the maximum wavelength effective for photochemical dissociation of O_2?

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95. A dye obsorbs light of $\lambda = 4530\text{Å}$ and then flaorescences light of 5000Å .Assuming that uinder given condition 47% of the obserbed energy is re-emited out so flaurescence , calculate the ratio of quants emitted out to the number of quanta obserbed

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96. Consider the hydrogen atom to be a proton embededded in a cavity of radius (Bohr radius) whose charge is neutralised by the addition of an electron to the cavity in a vacuum initially slowly .Estimate the average total energy of an electron in to ground state .Also if the magnitude of the average kinetic energy is half of the magnitude of the average energy ,find the average potential energy

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97. With what velocity should an α- particle travel towards the nucleus of a copper atom at a distance of $10^{-13}m$ from the nucleus of the copper atom?

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98. A stationary hydrogen atom emits photon corresponding to the first line of Lyman series. If R is the Rydberg constant and M is the mass of the atom, then the velocity acquired by the atom is

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99. When photon of energy $25eV$ strike the surface of a metal A, the ejected photelectron have the maximum kinetic energy photoelectrons have the maximum kinetic energy $T_A eV$ and de Brogle wavelength λ_A .The another kinetic energy of photoelectrons liberated from another metal B by photons of energy $4.76eV$ is $T_B = (T_A = 1.50)eV$ .If the de broglie wavelength of these photoelectrons is $\lambda_B = 2\lambda_A$ then

i.$(W_B)_A = 2.25eVII. (W_0)_B = 4.2eV$

III$T_A = 2.0eVIV. T_B = 3.5eV$

A. I,II

B. II,III,IV

C. I,II,III

D. I,II,III,IV

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100. In hydrogen atom an whit has a diameter of about 16.92Å .What in the maximum number of electron that can be accommodated ?

A. 8

B. 32

C. 50

D. 72

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101. For silver metal μ_0 is $1.13 \times 10^{17} s^{-1}$ .What is the maximum energy of the photoelectron produced by shining uatraviolet light wavelength 1.5 nm on the metal?

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102. Calculate the mass of a photon of sodium light wavelength 600 and velocity $3 \times 10^8 ms^{-1}$.

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103. A proton of mass $1.66 \times 10^{-27} kg$ is moving with kinetic energy $5 \times 10^{-27} J$ .What is the wavelength of proton ?

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104. The kinetic energy of an electron is $4.55 \times 10^{-25} J$ .The mass of electron is $9.1 \times 10^{-34} kg$. Calculate velocity of the electron.

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105. What will be the kinetic energy and total energy of an electron in H atom if the atom emit a photon of wavelength 4860Å ?

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106. Find the ratio of frequency of violet light $\left(\lambda_1 = 4.10 \times 10^{-5} cm\right)$ to that of red light $\left(\lambda_2 = 6.56 \times 10^{-5} cm\right)$ Also determine the ratio of energies carried by them

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107. A 100 W bulb is emitting light of wavelength 300 nm .Calculate the number of photon emitted by the bulb in 1 min?

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108. Show that the wavelength of a moving particle is relased to its kinetic energy $(E) as \lambda = \dfrac{h}{(2mE)^{1/2}}$

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109. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom . Calculate the ionisation the ionisation energy of sodium in KJmol^{-1} .

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110. Hydrogen when subjected to photon disocation, yieds one normal atom and atom possessing $1.97eV$ more energy than normal atom .The bond dissociation energy of hydrogen molecule into normal atom is 103 kcal mol^{-1} . Campate the wavelength of effective photon for photo dissociation of hydrogen molecule in the given case

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111. What is the wavelength of light emitted when the electron of a hydrogen atom undergoes a transition from an energy level with $n=4$ to an energy level with $n=2$? What is the colour corresponding to this wavelength?

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112. Calculate the wavelength of the first line in the Balmer series of hydrogen spectrum

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113. Calculate the shortest wavelength in H specitrum of lyman when $R_H = 109677cm^{-1}$.

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114. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4 \rightarrow n = 2 of He^{+}$ spectrum?

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115. Find the wavelength of radiation required to excite an electron in the ground levelll of $Li^{2+}(z=3)$ in the third energy level

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116. In the Balmer series spectra of hydrogen , there is a line corresponding to wavelength 4344Å Calculate the number of highest orbits from electron drops to greater other lines $\left(R \times c = 3.289 \times 10^{15}\right)$

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117. Calculate the short and long wavelength limits of Lyman series in the spectrum of hydrogen.

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118. What is the maximum number of emission lines when the excited electron of a hydrogen atom in n = 6 drops to ground state?

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119. The ionisation energy of H atom is $13.6 eV$ The inoisation energy of Li^{2+} law will be

A. 54.4 eV

B. 122.4 eV

C. 13.6 eV

D. 27.2 eV

Answer: 122.4 eV

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120. The ionisation energy of $He^{\oplus}$ is $19.6 \times 10^{-18} J\text{atom}^{-1}$ .The energy of the first stationary state of Li^{2+} will be

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

B. $84.10 \times 10^{-18} J\text{atom}^{-1}$

C. $63.2 \times 10^{-18} J\text{atom}^{-1}$

D. $21.2 \times 10^{-18J}\text{atom}^{-1}$

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121. The shortest wavelength in H spectrum of lyman series when $R_H = 109678 cm^{-1}$ is

A. 1002.7Å

B. 1215.67Å

C. 1127.30Å

D. 911.7Å

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122. The wavelength of the first line in the balmer series is $656nm$ .Calculate the wavelength of the second line and the limiting line in the balmer series

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123. A spectral line in the spectrum of H atom has a wave number of $1522.222cm^{-1}$ .The transition responsible for this radiation is (Rydberg constant $R = 10977cm^{-1}$

A. $2 \rightarrow 1$

B. $4 \rightarrow 2$

C. $5 \rightarrow 2$

D. $2 \rightarrow 3$

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124. Calculate the energy emitted when electrons of $1.0 g 1$ of hydrogen transition giving spectrum lines of the lowest in the visible regain of its atomic spectrum

$R_H = 1.1 \times 10^7 m^{-1}, c = 3 \times 10^8 ms^{-1}$ and $h = 6.62 \times 10^{-34} Js$

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125. Calculate the frequency of light amitted in an electron transition from the sixth to the second orbit of a hydrogen atom .In what region of the specturm does this frequency accur?

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126. Calculate the wavelength of the first line and the series limit for Lyman series for hydrogen.

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127. A photon of 3000Å is obserbed by a gas and then re-emmited as two photon .One photon in red (7600Å) what would be the wavelength of the other photon ?

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128. Positronium consists of an electron and a positron (same mass opposite charge) orbiting around their common center of mass .The spectrum is, therefore expected to be hydrogen like , the difference arising from the mass difference .Calculate the wavelength of the first three line of the balmer series of positronium.

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129. Calculate the wavelength emitted during the transition of an electron in between two levels of Li^{2+} ion whose sum is 4 and difference is 2

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130. Find the quantum number n corresponding to nth excited state of He^{++} ion if on transition to the ground state the ion emits two photons in succession with wavelength 108.5 nm and 30.4 nm. The ionization energy of the hydrogen atom is 13.6 eV.

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131. The Lyman series of the hydrogen spectrum can be represented by the equation

$$v = 3.2881 \times 10^{15} s^{-1} \left[\frac{1}{(1)^2} - \frac{1}{(n)^2}\right] [where n = 2, 3, \ldots\ldots)$$

Calculate the maximum and minimum frequencies of the lines in this series

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132. Two hydrogen atom collide head on and end up with zero kinetic energy .Each atom then emit a photon of wavelength $121.6nm$ .Which transition leads to the wavelength ?

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133. Which hydrogen ionic species has wavelength difference between the first line of the balmer and first line of the lyman series equal to 859.3×10^{-9} m ?Negative the reduced mass effect

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134. What is the highest frequency of a photon that can be emitted from a hydrogen atom ? What is the wavelength of this this photon ?

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

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136. The wavelength of the first line in the balmer series is $656nm$ .Calculate the wavelength of the second line and the limiting line in the balmer series

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137. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4 \rightarrow n = 2 of He^{+}$ spectrum?

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138. Calculate the wavelength of the spectral line when an electron jumps from n=7 to n=4 level in an atom of hydrogen.

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139. A hydrogen atom in the ground state is hit by a photon exctting electron to the thoird excerd state .The electron then drops to the second orbit. What is the frequency of radiation emitted and abserbed in the process ?

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140. A hydrogen like ion $He^{\oplus}(Z = 2)$ is exposed to electromagnetic waves of 256.4Å The excited electron gives out induced radiation .Find the wavelength of the induced radiation when the electron de-excites back to the ground state $\left(R = 109677cm^{-1}\right)$

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141. An electron in the first excited state of if atom obserbed a photon and further excited .The de broglie wavelength of the electron in this state is found to be 13.4Å Find the wavelength of the photon abserbed by the electron in angstroms Also find the longest and the shorted wavelength emitted when this electron de-excited back to the ground state

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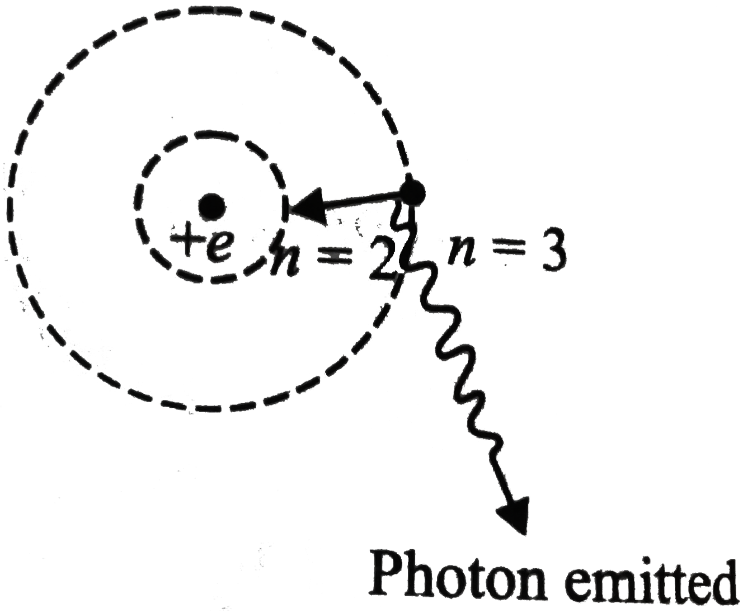
142. A single electron orbits around a stationary nucless of charge $+Ze$ where Z is a constant and e is the magnitude of electronic charge ,if respuires 47.2 e



is excite the electron from the second bohr orbit to the third bohr orbit

a. Find the value of Z

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143. The wavelength of series limit for lyman series for $He^{\oplus}$ would be

A. $911.7Å$

B. $227.9Å$

C. 1215.1Å

D. 363.8Å

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144. The binding energy of an electron in the ground state of He is equal to 24.6eV. The energy required to remove both the electron is

A. $59eV$0

B. $81eV$

C. $79eV$

D. $40eV$

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145. If v_1 is the frequency of the series limit of lyman seies, v_2 is the freqency of the first line of lyman series and v_3 is the fequecny of the series limit of the balmer series, then

A. ν_1 - ν_2 = ν_3

B. ν_2 - ν_1 = ν_3

C. ν_2 = $\frac{1}{2}(\nu_1 - \nu_3)$

D. $\nu_1 + \nu_2$ = ν_3

Answer: ν_1 **-** ν_2 **=** ν_3

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146. A certain transition is H spectrum from an excited state to the ground state in one or more steps gives a total of 10 lines .How many of these belong to the UV spectrum ?

A. 3

B. 4

C. 6

D. 5

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147. The transition from the state $n = 4$ to $n = 3$ in a hydrogen like atom results in ultraviolet radiation Infrared radiation will be obtained in the transition from

A. $n = 2 \rightarrow n = 1$

B. $n = 3 \rightarrow n = 2$

C. $n = 5 \rightarrow n = 4$

D. $n = 8 \rightarrow n = 6$

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148. An electron jumps from nth level to the first level .The correct statement(s) about H atomic is//are

A. Number of spectrum lines $= \frac{n(n-1)}{2}$

B. If $n = 4$number of spectrum lines $= 6$

C. Number of spectrum lines $= \frac{n(n+1)}{2}$

D. If $n = 4$ number of spectrum lines $= 10$

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149. The electron of H-atom in the ground state is excited to a higher energy level by monuchromatic light of energy $13.22 eV$ How many different photon are emitted when it return to the ground state?

A. 4

B. 10

C. 6

D. 15

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150. Ratio of frequency of revolution of electron in the second state of $He^{\oplus}$ revolution of electron in the second state He^{Θ} and second state of hydrogen is

A. $\frac{32}{27}$

B. $\frac{27}{32}$

C. $\frac{1}{34}$

D. $\frac{27}{2}$

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151. The wavelength of the first line of Lyman series for hydrogen is identical to that of the second line of Balmer series for some hydrogen like ion x. Calculate energies of the first four levels of x.

A. $-54.4eV$

B. $-328eV$ ~

C. $-13.6eV$

D. $-3.8eV$

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152. Which of the following is (are) correct for a H like species ?

A. The energy gap between the consecative energy orbit decreases in the value of "n" increases

B. The longest wavelength in any spectral series corresponding to α like in that series

C. Each spectral series is bounded by minimum and maximum wavelength and the rangy follow a contiaous distribution as given by bohr's theory

D. Kinetic energy of the electron decreases whereas the potential energy increases as the value of "n" increases

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153. Using Bohr's model , calculate the wavelength of the radiation emitted when an electron in a hydrogen atom make a transition from the fourth energy level to the second energy level

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154. Calculate the radius of bohr's third orbit of hydrogen atom

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155. Calculate the energy of an electron in the second Bohr's orbit of an excited hydrogen atom the energy of electron in the first Bohr orbit is $-2.18 \times 10^{-11} erg$

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156. The ionisation energy of H atom is $13.6 eV$. What will be the ionisation energy of $He^{\oplus}$ and Li^{2+} ions ?

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157. The angular momentum of electron in a Bohr's orbit of H atom is $4.2178 \times 10^{-34} kgm^2 s^{-1}$ Calculate the wavelength of the spectral line when the electrton falls from this level to the next lower level

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158. The velocity of electron in a certain bohr orbit bears the ration 1.275 to the velocity of light

a. What is the quentum (n) of orbit ?

b. Calculate the wave number of radiation emitted when the electron jumps from $(n+1)$ state to the ground state $(R) = 1.0987 \times 10^5 cm^{-1}$

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159. The first if of potassium is $100mol^{-1}$ Calculate the lower potasible frection of light that can ionise a potassium atom

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160. An electron in H atom jumps from the third energy level to the first energy .The charge in the potential energy of the electron is

A. $12.09eV$

B. $6.04eV$

C. $42.18eV$

D. None

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161. If the PE of an electron in the first Bohr orbit of H is zero , the total energy of the electron in second Bohr orbit is

A. $23.8eV$

B. $-23.8eV$

C. $-3.4eV$

D. $3.4eV$

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162. Find the energy relased (in junles) when a doubly ionised helium $\left(He^{2+}\right)$ taken up two electron in form a helium atom in the ground state .The first ionisation energy of a helium atom is $3.4 \times 10^{-19} J$

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163. Find the wavenumber corresponding to the longest wavelength photon to remove electron from the second excited state of $He^{\oplus}\text{ion}\left(R = 1.097 \times 10^{7} m^{-1}\right)$

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164. One mole of $He^{\oplus}$ ions is excited .An analysis showed that 50% of ions are in the third energy level 25% are in the second energy level and the remaining are in the first energy level .Calculate the energy emitted in kilojoules when all the ions return to the ground state

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165. An electron in the third energy level of an excited $He^{\oplus}$ ion return back to the ground sate .The photon emitted in the process is absorbed by a stationary hydrogen atom in the process is absermine by a stationary hydrogen atom in the ground state .Determine the velocity of the photoelectron ejected from the hydrogen atom in metre per second

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166. Find out the number of waves made by a bohr electron is one complete revolution in its third orbit

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167. The circumference of the second Bohr orbit of electron in the hydrogen atom is 600nm. Calculate the potential difference to which the electron has to be subjected so that the electron stops. The electron had the de Broglie wavelength corresponding to the circumference.

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168. An electron in a Bohr orbit of hydrogen atom with quantum number n has an angular momentum $4.2176 \times 10^{-34} kg - m^2 / \sec$.If the electron drops from this level to the next lower level , the wavelength of this lines is

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169. The circumference of the first Bohr orbit in H atom is $3.322 \times 10^{-10} m$ .What is the velocity of the electron of this orbit ?

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170. The number of waves in the fourth bohr orbit of hydrogen is

A. 3

B. 4

C. 9

D. 12

Answer: 4

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171. In hydrogen atom are excited in the fifth level .The number of line that appear in the spectrum will be

A. 4

B. 8

C. 10

D. 12

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172. Calculate the radius of bohr's third orbit of hydrogen atom

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173. Calculate the energy of an electron in the second Bohr's orbit of an excited hydrogen atom if the energy of electron in the first Bohr orbit is $-2.18 \times 10^{-11} erg$

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174. According to Bohr's theory,the electronic energy of a atom in the nth orbit is given by $E_n = \frac{-2.17 \times 10^{-18}}{n^2} J$

Calculate the longest wavelength of light that will be needed in remove an electron the third Bohr orbit of `He^(+)

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175. The angular momentum of electron in a Bohr's orbit of H atom is $4.2178 \times 10^{-34} kgm^2 s^{-1}$. Calculate the wavelength of the spectral line when the electrton falls from this level to the next lower level.

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176. The kinetic energy of an electron in H like atom is $6.04 eV$ Find the area of the third bohr orbit to which this electron belongs .Also report the atom

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177. The energy of an electron in the first Bohr orbit of H atom is $-13.6 eV$ The possible energy value (s) of excited state(s) for the electron in the Bohr orbit of hydrogen is//are

A. $-3.4 eV$

B. $-4.2 eV$

C. $6.8eV$

D. $+6.8eV$

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178. If an electron in H atom has energy of -76.4 kcal mol^{-1} .The orbit in which the electron is present is

A. Ist

B. 2nd

C. 3rd

D. 4th

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179. If the radius of the second Bohr of hydrogen atom is r_2 the radius of the third Bohr orbit will be

A. $\frac{4}{9}r_2$

B. $4r_2$

C. $\frac{9}{4}r_2$

D. $9r_2$

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180. Difference between nth and (n+1) the Bohr's radius of 'H' atom is equal ot it s (n-1) th Bohr's radius . The value of n is

A. 1

B. 2

C. 3

D. 4

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181. Determine the frequency of revolution of an electron in the second Bohr orbit in hydrogen atom

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182. An electron in a hydrogen like species makes a transition from the nth Bohr orbit to the next outer Bohr $(n+1)$ .Find an approximate relation between the dependence of the frequency of the photon absorbed as a function of n .Assume n its to have a large value $(n > > 1)$

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183. Which of the following are the limitation of Bohr's model ?

A. If could not explain the intersities of the fine spectron of the spectral lines

B. No justification was given fi=or the principle of the quantization of angular momentum

C. If could not explain why atom should combine to form bond

D. it could not be applied to single electron atom

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184. According to Bohr's theory

A. When an atom gets the required energy from outside it jumps from lower to higher orbit and remain there

B. When an atom gets the required energy from outside it jumps from lower to higher orbit and remain there for very short intervats of time and remain back to the lower orbit , radiation energy

C. Angular momentum of an electron is propartional to n

D. Angular momentum of an electron is propartional of n

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185. Chose the currect on the basis of Bohr's theory

A. velocity of electron $= 1/n$

B. Frequency of revolation $= 1/n^3$

C. Radius of orbit $= n^2 Z$

D. Force on electron $= 1/n^4$

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186. Find the energy required to excite $1L$ od hydrogen gas at 1.0 nm and $298K$ to the first excited state of atomic hydrogen .The energy required for the dissacitation of $H - H$ bond is $436kJmol^{-1}$

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187. Estimate the difference in energy between 1st and 2nd Bohr orbits for hydrogen atom. At what minimum atomic number, a transition from n = 2 to n=1 energy level would result in the emission of X-rays with $\lambda = 3 \times 10^{-8}m$? Which hydrogen atom like species does this atomic number correspond to?

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188. Bohr's orbit are called as stationary state because

A. Electron in them are stationary

B. Their orbits have fixed radil

C. The electron in them have fixed energy

D. The protons remain in the nuclei and are stationary

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189. Which of the following statement is (are) correct in reference to Bohr's model of hydrogen atom if the mass of an electron because 10 times its original mass ?

A. Velocity of electron increases by 10times

B. Orbit radius decreases by 10 times

C. Energy of the electron increases by 10times

D. Wavelength of the electron will remain same

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190. The velocity of an electron in the second Bohr orbit of an element is $1.1 \times 10^6 ms^{-1}$ Its velocity in the third orbit is

A. $3.3 \times 10^6 ms^{-1}$

B. $2.2 \times 10^6 ms^{-1}$

C. $7.333 \times 10^5 ms^{-1}$

D. $3.66 \times 10^5 ms^{-1}$

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191. If the radius of first Bohr orbit of H atom is r, then find de Broglie wavelength of electron in 3 rd orbit

A. $2\pi r$

B. $\frac{2\pi r}{3}$

C. $\frac{3\pi r}{3}$

D. $6\pi r$

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

A. Energy of the electron in the orbit is quantized

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

C. Electron revolving in different orbit have different velocities

D. The position and velocity of the electron in the orbit cannot be determined simultaneously

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193. If the speed of electron in the first bohr orbit of hydrogen atom is x then the speed of the electron in the third Bohr orbit of hydrogen is

A. $\frac{x^2}{9}$

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

C. $3x$

D. $9x$

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194. The ratio of the differrence between the first and second Bohr orbit energies to that between second and third Bohr orbit energies is

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

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

C. $\frac{27}{3}$

D. $\frac{5}{27}$

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195. Which of the following parameters are the same for all hydrogen like atoms and ions in their ground state?

A. Radius of orbit

B. Speed of electron

C. Energy of the atom

D. Orbital angular momentum of electron

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196. If the radius of first, second, third and fourth orbit of hydrogen atom are r_1, r_2, r_3 and r_4 respectively .Then their correct increasing order will be:

A. (1) $r_4 < r_3 < r_2 < r_1$

B. (2) $r_1 < r_2 < r_3 < r_4$

C. (3) $r_4 < r_3 < r_2 > r_1$

D. (4) Equal in all

Answer: $r_1 < r_2 < r_3 < r_4$

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

A. $2:3$

B. $3:2$

C. $4:1$

D. $5:3$

Answer: $3:2$

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198. The radius of innermost electron orbit of a hydrogen atom is $5.3 \times 10^{-11} m$. What is the radius of orbit in the second excited state ?

A. K and L

B. L and N

C. m and N

D. a and b are correct

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199. If $a = \frac{h}{4\pi^2 me^2}$ then correct expression for calculate the circumference of the first orbit of hydrogen atom is

A. $\sqrt{4h^2}\pi a$

B. $2\pi r$

C. $\sqrt{4}\pi ha$

D. a and c are correct

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200. Prove that $u_n = \sqrt{\frac{Zn^2}{mr_n}}$ where n is the Z at distance r_(n) from the m and r mass and charge of electron

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201. Find out the energy of H atom in the first excitation state .The value of permittivity factor $4\pi\varepsilon_n = 1.11264 \times 10^{-10} C^2 N^{-1} m^{-1}$

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202. The velocity of electron in a certain bohr orbit of hydrogen bears the ratio $1:275$ to the velocity of light

a. What is the quantum number (n) of orbit?

b. Calculate the wave number of radiation emitted when the electron jumps from $(n+1)$ state to the ground state.$(R) = 1.0987 \times 10^5 cm^{-1}$

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203. Calculate the momentum of a moving particle which has a wavelength of $200nm$

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204. What is the de Broglie wavelength of the wave associated with an electron that has been accelerated through a potential difference of 50.0 V?

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205. What is the ratio of the velocities of CH_4 and O_2 molecules such that they are associated with de broglie waves of equal wavelength ?

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

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207. Derive the relation between the wavelength (λ) of the de broglie wave and kinetic energy (E) of a moving particle

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208. A moving electron has $5 \times 10^{-25} J$of kinetic energy .What is the de Broglie wavelength ?

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209. A golf ball has a mass of 40 g , and a speed of 45m/s. if the speed can be measured with in accuracy of 2 % . Calculate the uncertainty in the position .

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210. What is the minimum product of the uncertainty in position and the uncertainty in momentum of a moving electron ?

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211. If the electron is to be located within 5×10^{-5}Å what will be the uncertainty in the velocity ?

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212. State Heisenberg's uncertainty principle. If the uncertainties in the measurement of position and momentum of an electron are equal calculate the uncertainty in measuring the velocity.

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213. If the uncertainnty in the position of a moving electron is equal to its de Broglie wavelength then moving its velocity will be completely anertain Explain .

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214. The uncertainty in the momentum of a particle is $6.0 \times 10^{-2} kgms^{-1}$ .Calculate the uncertainty in the position

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215. Calculate the product of the uncertainty of the displacement and velocity of a electron having mass $9.1 \times 10^{-28} g$

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216. An electron with velocity v is found to have a certain value of de Brogle wavelength .The velocity that the muetron should process to have the same de Broglie wavelength is

A. v

B. $n/1840$

C. $1840v$

D. $1840/v$

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217. The sodium falme testhas a characteristic yellow colour due to the emission of a vavelength of $589 nm$ What is the mass equivalent of one photon of this wavelength of this wavelength

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218. What should be the ratio of the velocity of CH_4 and O_2 molecules so that they are associated with de Broglie wave of equal wavelegth ?

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219. State the expression for Heisenberg.s uncertainty principle.

A. $\Delta x \Delta p \geq \frac{h}{4\pi}$

B. $\Delta E \Delta r \geq \frac{h}{4\pi}$

C. $\Delta x \Delta p \geq \frac{h}{p}$

D. $\Delta E \Delta r \geq \frac{h}{p}$

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220. Calculate the uncertainty in position assuming necertainty is momentum aithin 0.1% for

a. A tennis ball weighing $0.2kg$ and moving with a velocity of $10ms^{-1}$

b. An electron moving in an atom with a velocity of $2 \times 10^6 ms^{-1}$

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221. An electron is accelerated through a potential difference of V volit .Find th e de Broglie wavelength associated with electron.

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222. If uncertainty in the measurement of position and momentum of an electron are equal then uncertainty in the measurement of its velocity is approximatly:

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223. Show that the wavelength of a $150g$ rubber at a velocity of $50ms^{-1}$ is short enough to be determine

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224. Calculate the uncertainty in the position of a dust particle with mass equal to $1mg$ if the uncertiainty in its velocity is $5.5 \times 10^{-20} ms^{-1}$

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225. The energy that should be added to an electron to reduce its de Broglie wavelength from one nm to 0.5 nm is

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226. Calculate the uncertainty in the position (Δx) of an electron if $\Delta v is 0.1\%$ .Take the velocity of electron $= 2.2 \times 10^6 ms^{-1}$ and mass of electron as $9.108 \times 10^{-31} kg$

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227. If a light of wavelength λ hits moving electron the uncertainty in measurement of its position will be

A. Greater than λ

B. Less than λ

C. Equal to λ

D. Any value

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228. If the uncertainty in the position of an electron is zero the uncertainty in its momentum be

A. Zero

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

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

D. Infinity

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229. If E_1, E_2 and E_3 represent respectively the kinetic energies of an electron, an $\alpha - partic \le$ and a proton each having same de-Broglie wavelength, then

A. $E_1 > E_3 > E_2$

B. $E_2 > E_3 > E_1$

C. $E_1 < E_3 < E_2$

D. $E_1 = E_2 = E_3$

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230. The uncertainty in position of an electron in equal to its de Broglie wavelength .The minimum percentage error in de measuremebnt of velocity under this circumstance will be approsimately

A. 4

B. 8

C. 22

D. 18

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231. If the enrgy of a frequency v is gives by $E = hv$ where h is plank's constant and the momentum of photon is $p = h / \lambda$ where λ is the wavelength of photon , then the velocity of light is equal to

A. $\sqrt{\frac{E}{p}}$

B. $\frac{E}{p}$

C. $E \times p$

D. $\left(\frac{E}{p}\right)^2$

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232. An electron is continuonsly accelerated in vacume tube by appliying potential difference if its de Brogle wavelength is decresed by 1% the change in the kinetic energy of the electron is nearly

A. Decreased by 1.0%

B. Increased by 2.0%

C. increased by 1.0%

D. Decreased by 2.0%

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233. Calculate the momentum of radiation of wavelength $0.33nm$

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234. On the basis of heisenhergs uncertainty principle show that the electron can not exist within the nucleus

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235. Calculate the uncertainty in the velocity of an electron of the uncertainty in its position is of the order of 1Å

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236. Calculate the uncertainty in the velocity of a cricket hall (mass $= 0.15kg$) uncertainty in position is of the order of 1Å

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237. In which of the following situations the heavier of the two particles has smaller de Broglie wavelength? The two particles

A. Move with the same speed

B. Move with the same linear momentum

C. Move with the same kinetic energuy

D. Have fallen through the same height

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238. A dust particle has mass equal to $10^{11}g$ dimeter equal to 10^{-4} cm and velocity equal to$10^{-4}cms^{-1}$ The error is the measurment of velocity is $0.1\,\%$ .Calculate the uncertiainty in its position

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239. A proton $(mass = 1.66 \times 10^{-27}kg)$ is moving with kinetic energy $5 \times 10^{-27}J$ calculate the de Broglie wavelength associated with it ? $(h = 6.6 \times 10^{-34}Js)$

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240. The ratio of the de Broglie wavelength of a proton and alpha particles will be $1:2$ if their

A. Velocity are in the ratio $1:8$

B. Velocity are in the ratio $8:1$

C. Kinetic energ are in the ratio $1:64$

D. Kinetic energ are in the ratio $1:256$

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241. If uncertainty in the measurement of position and momentum of an electron are equal then uncertainty in the measurement of its velocity is approximatly:

A. $8 \times 10^{12} ms^{-1}$

B. $6 \times 10^{12} ms^{-1}$

C. $4 \times 10^{12} ms^{-1}$

D. $2 \times 10^{12} ms^{-1}$

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242. (a) An atomic orbital has n=3. What are the possible values of l?

(b) An atomic orbital has l=3. What are the possible values of m?

(c) An atomic orbital has n=2. What are the possible values of l and m?

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243. Which quantum number denotes the subshell in an atom?

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244. How many sub-shell are there in N shell ? How many orbitals are there in d sub-shell ?

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245. Give the set of quantum number that describe an electron in a $3p$ orbital.

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246. What is the maximum number of electron that can be accommodated

In the sub-shell with $l = 3$?

In the shell-with $n = 3$?

In the orbital with $m_l = +3$?

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247. Which of the following orbital are and possible ?

$2d, 4f, 4g \text{ and } 6d$

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248. What is the lowest value of n that allows g orbital to exist?

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249. How many orbitals are possible in

5th energy level

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250. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)}\frac{h}{2\pi}$. The momentum for an s-electron will be given by

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251. Find angular momentum of an electron when it is in the second Bohr orbit of hydrogen atom.

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252. What should be the value of the spin quantum number of the last electron in d9 Configuration ?

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253. What is the orbit angular momentum of a D ELECTRON ?

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254. What is the total spin and magnetic moment of an atom with atomic number 7?

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255. What is the total number of orbitals and electron for $m=0$, it there are 30 proton in an atom ?

A. $7 \text{orbitals}, 14 \text{ electrons}$

B. $6 \text{orbitals}, 12 \quad \text{electrons}$

C. $5 \text{orbitals}, 10 \quad \text{electrons}$

D. $3 \text{orbitals}, 6 \quad \text{electrons}$

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256. Two values of spin quantum number i.e., +1/2 and -1/2 represent

A. Rotation of the electron in clockwise and enti closewise direction respectively

B. Rotation of the electron in anti clockwise and closewise directions respectively

C. Magnetic momentg of the electron pointing up and down respectively

D. Two quantum mechanical spin which have an classical analogne

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257. Which of the following statement is correct ?

A. $(n-1)d$ sub-shell has higher energy than np sub-shell

B. $(n-1)d$ sub-shell has lower energy than np sub-shell

C. $(n+1)s$ sub-shell has lower energy then of (n+1)d sub-shell

D. nf sub-shell has lower energy than (n + 1)d` sub-shell

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258. The radial probability is the probability of finding electron in a small spherical shell around the nucleus at a particular distance r. Hence radial probability is

A. $4\pi r^2 dr \Psi^2$

B. $(4/3)\pi r^2 dr \Psi^2$

C. $2\pi r^2 dr \Psi^2$

D. $4\pi r dr \Psi$

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259. The z-component of angular momentum of an electron in an atomic orbit is governed by the

A. Principal quantum number

B. Azamothal quantum number

C. Magnetic quantum number

D. Spin quantum number

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260. Which of the following sets of quantum numbers represents an impossible arrangement?

A. $n = 3, l = 3, m_1 = \ -2, m_1 1/2$

B. $n = 4, l = 0, m_1 = 0, m_1 1/2$

C. $n = 3, l = 2, m_1 = \ -2, m_1 1/2$

D. $n = 5, l = 3, m_1 = 8, m_1 1/2$

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261. The principal quantum number of an atom is related in the

A. Size of the orbital

B. Spin angular momentum

C. Orbital angular momentum

D. Orientation of the orbit in space

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262. Which of the following should be the posible sub-shell for $n+1=7$?

A. 7s 6p 5d 4f

B. 4f 5p 6s 4d

C. 7s 6p 5d 6d

D. 4s 5d 6p 7s

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263. What is the maximum number of electron in the posible sub-shell for $n+l=4$?

A. 8

B. 6

C. 12

D. 16

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264. The sub-shell $2d$ is not posible because

A. $n = 1$

B. $l > n$

C. $n < l$

D. None of these

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265. What is the maximum number of elements if the electrons above $n = 4$ do not exist in nature ?

A. 40

B. 60

C. 44

D. 100

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266. Give the values of all the four quantum numbers for $2p$ electron in nitrogen $(Z = 7)$

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267. For which of the following sets of quantum numbers, an electrons will have the highest energy ?

A. $n=4, l=0, m=0, s=+1/2$

B. $n=3, l=1, m=1, s=+1/2$

C. $n=3, l=2, m=0, s=+1/2$

D. $n=3, l=0, m=0, s=+1/2$

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268. Which of the following sets of quantum numbers represents an impossible arrangement?

A. $n=3, l=2, m=-2, s=+1/2$

B. $n=4, l=0, m=0, s=+1/2$

C. $n=3, l=2, m=-3, s=+1/2$

D. $n = 5, l = 3, m = 0, s = +1/2$

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269. Principal azimuthal , and magnetic quantum numbers are respetively related to

A. Size,orbital,and shape

B. size, shape, and orientation

C. shape, size and orientation

D. None of these

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270. Which of the following statement is //are wrong ?

A. If the value of $l = 0$, the electron distribution in spherical

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

C. The angular momentum of $1s2s$ and $3s$ electron are equal

D. In an atom all electron travel with the same velocity

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271. The sum of all the quantum number of hydrogen atom is

A. 1

B. 0

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

D. $\frac{3}{2}$

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272. The orbital angular momentum quantum number of the state S_2 is

A. 0

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

C. 1

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

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273. 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=1, 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. I and II

B. II and III

C. III and IV

D. IV and V

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274. What is the total number of part of electron at lead three same quantum number of Be ?

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275. The magnetic moment of M^{x+} (atomic number $= 25$ is $\sqrt{15}BM$ .The number of unpaired electron and the value of x respectively are

A. 4,3

B. 3,4

C. 3,2

D. 5,2

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276. Which of the following is(are) correct for H atom ?

$1s < 2s < 2p < 3s < 3p$

$1s < 2s = 2p < 3s = 3p$

$1s < 2p < 3d < 4s$

$1s < 2s < 4s < 3d$

The correct choice is

A. ii,iii

B. I,iv

C. I,iii

D. ii,iv

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277. The correct order of deteasing energies mergies of the electrons is :

		n	l	m	s
1.	Electron 1	3	1	1	$\frac{1}{2}$
2.	Electron 2	3	0	0	$\frac{1}{2}$
3.	Electron 3	4	0	0	$-\frac{1}{2}$
4.	Electron 4	3	2	2	$\frac{1}{2}$

A. $\text{Electron3} > \text{Electron4} > \text{Electron1} > \text{Electron2}$

B. $\text{Electron4} > \text{Electron3} > \text{Electron1} > \text{Electron2}$

C. $\text{Electron3} > \text{Electron4} > \text{Electron 2} > \text{Electron1}$

D. $\text{Electron3} > \text{Electron1} > \text{Electron4} > \text{Electron} \quad 2$

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278. The orbital having $m = -2$ should not be present in the following sub-shell

A. d

B. f

C. g

D. p

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279. What is the value of the spin quantum number of the last electron d^9 configuration ?

A. 0

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

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

D. 1

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280. All the energy levels are called excited state when the value of the principal quantum number is

A. $n = 1$

B. $n > 1$

C. $n < 1$

D. $n > \; - 1$

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281. If x is the number of electron is an atom the configuration should be expresent as

A. I_x

B. nl^x

C. mn^x

D. None of these

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282. What is the atomic number of an element if the quantum number of the highest energy electron of the element in the ground state are $n = 4, l = 1, m = -1, s = \frac{1}{2}$

A. 31

B. 35

C. 30

D. 32

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283. The orbital $n = 6, l = 2$ and $m = 0$ will be designated as

A. $6d_{z^2}$

B. $6d_{x^2-y^2}$

C. $6d_{sp}$

D. $6p_2$

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284. The orbital having $n = 2, l = 1$ and $n = 0$will be desigrated as

A. $2p_z$

B. $2p_x$

C. $2p_y$

D. $3d_z2$

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285. How many electron in a given atom can have the following quantum number

A. $n = 4, l = 2, m = 0$

B. $n = 3$

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

D. $n = 4, l = 1$

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286. Which of the following set of quantum number is are not permitted ?

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

B. $n = 3, l = 2, m = -1 s = 0$

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

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

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287. The probability of fiating the electron in p_s orbits is :

A. maximum on two apposite side of the nucless along x-axis

B. zero at the nucless

C. same on all the sides around the nucless

D. zero on the x-axis

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288. Which among the following electron will emit radiation of maximum wavelength ?

A. $n=4, l=1, m=0 \text{to} n=3, l=2, m=-2$

B. $n=3, l=2, , m=-2 \text{to} n=2, l=1, m=-1$

C. $n=3, l=2, , m=1 \text{to} n=2, l=0, m=0$

D. $n=3, l=1, , m=0 \text{to} n=2, l=1, m=1$

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289. Which of the following has maximum number of unpaired electrons ?

A. Mg^{2+}

B. Ti^{2+}

C. V^{3+}

D. Ve^{2+}

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290. The quantum number of electrons are given below: Arrange then in order of increasing energies

a.$n=4, l=2, m_1=-2, m_s=-\frac{1}{2}$

b.$n=3, l=2, m_1=1, m_s=+\frac{1}{2}$

c.$n=4, l=1, m_1=0, m_s=+\frac{1}{2}$

$e.\ n=3, l=2, m_1=-2, m_s=+\frac{1}{2}$

f.$n=4, l=1, m_1=+1, m_s=+\frac{1}{2}$

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291. Among the following pairs of orbitals which orbital will experience the larger effective nuclear charge? (i) 2s and 3s, (ii) 4d and 4f, (iii) 3d and 3p

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292. The bromine atom possesses 35 electrons. It contains 6 electrons in 2p orbital, 6 electrons in 3p orbital and 5 electrons in 4p orbital. Which of these electron experiences the lowest effective nuclear charge

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293. If the value of $n + l = 7$ then what should be the increasing order of energy of the possible sub -shells ?

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294. Calculate the total spin and magnitic moment for atom having atomic number 24

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295. The quantum number of the last electron of an element are below pralict the atomic number and following quantum number

$n = 3, l = 2, m = 0, s = -\frac{1}{2}$

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296. Which combination of quantum number $n, l, \text{ and } s$ the elctron in an atom does not provide a permisation solution to the wave equation ?

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

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

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

D. $3, 1, 1, -\frac{1}{2}$

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297. Prioduct the atomic number and element from the following quantum number

$$n = 2, l = 1, m = +1, s = -\frac{1}{2}$$

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298. For each of the following pairs of the hydrogen orbits indicate which is higher is energy

A. $1S, 2S$

B. $2p, 3p$

C. $3d_{xy}, 3d_{yz}$

D. $3s, 3d$

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299. Answer the following

A. How many electron can be filled in all the orbitals with $n + l = 5$?

B. Which of the two is paramagnetic : $V(IV)$ or $V(V)$ and why ?

C. How many unpaired electron are presents in $pd(Z = 46)$?

D. The ion of an element has configuration $[Ar]3d^4$ +3 oxidation state .What will be the electronic configuration of its atom ?

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300. For a d electron the orbital angular momentum is

A. $\sqrt{6}_R$

B. $\sqrt{2R}$

C. R

D. $2R$

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301. If nitrogen atoms had electronic configuration $1s^7$ It would have energy lower than that of the normal ground state configuration $1s^2 2s^2 2p^3$ because the electrons would be closer to the nucleus yet $1s^7$ is not observed because it violates ?

A. Heisenberg's uncertainty principal

B. Hand,'s rule

C. Pauill's exclusion principle

D. Bohr's postatate of stationary orbit

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302. The ground state electronic configeration of nitrogen atom can be represented by

a. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

b. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\uparrow}$

c. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

d. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

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303. For the energy levels in an atom , which one of the following statement is correct ?

A. There are seven principle electron energy levels

B. The second principal energy level can have four sub-shell energy level and contains a maximum of eight electrons

C. The M energy level can have a maximum energy than the $3d$ sub-energy level

D. The $4s$ sub-energy level is at a lower energy than the $3d$ sub-energy level

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304. Which of the following strtement is /are correct ?

A. The electeron configuration of Cr is $[Ar]3d^5 4s^1$(atomic number of$Cr = 24$)

B. The magnitic quantum number may have a negative value

C. In silver atom 23 electron have spin of one type and 24 of the opposite type (atomic number of $Ag = 47$)

D. The oxidation state of nitrogen in HN_3 is -3

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305. Many elements have non-integral atomic masses because

A. They have isotopes

B. Their isoptopes have non-integral masses

C. Their istopes have different masses

D. The contituent-neutrons protons and electron-combine to give radaonal messes

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306. Which of the fpllowing is not corrent for the electron distribation in the ground state ?

a. $Co = [Ar]\ \boxed{\uparrow\downarrow}\ \ \boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

b. $Ni = [Ar]\ \boxed{\uparrow\downarrow}\ \ \boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}$

c. $Cu = [Ar]\ \boxed{\uparrow\downarrow}\ \ \boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}$

d. $Zn = [Ar]\ \boxed{\uparrow\downarrow}\ \ \boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$

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307. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^4 3d^5 4s^1$

.This represents its

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

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308. Which of the following sets of quantum number is//are permitted?

A. $n = 3, l = 3, m = 0, s = \frac{1}{2}$

B. $n = 3, l = 2, m = 2, s = -\frac{1}{2}$

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

D. $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

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309. Which of the following pairs of ions have the same electronic configuration A)Cr^{+3}, Fe^{+3} B)Fe^{+3}, Mn^{+2} C)Fe^{+3}, Co^{+3} D) Sc^{+3}, Cr^{+3}

A. Cr^{3+}, Fe^{3+}

B. Fe^{3+}, Mn^{2+}

C. Fe^{3+}, Co^{3+}

D. Se^{3+}, Cr^{3+}

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310. Which of the following statement is correct ?

A. An orbital containing an electron having quantum number $n = 2, l = 0, m = 0, s = +1/2$ is spherical

B. All photon have the same energy

C. The frequency of X-rays is less than that of radiowaves

D. As intensity of light increases the frequency increases

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311. Which of the following statement is//are not correct ?

A. The shape of an atomic orbit depends on the azimuthal quantum number

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

C. The energy of an electron in an atomic orbit of a multi electron atom depends as on the principal quantum number

D. The number of atomic orbital of one type depends on the values of principal azimuthal and magnetic number

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

A. H

B. $H^{\oplus}$

C. $H^{\oplus}$

D. None of these

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313. Which of the following statement is /are true ?

A. One orbit can accommodate a maximum of two electron

B. One sub-shell can acocmmodate a maximum of two electron

C. One orbital can accommodate a maximum of two electron

D. None of these

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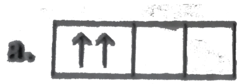
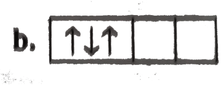
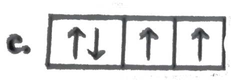
314. Which of the following is not according to the pauli exclusion principal ?

A. 

B. 

C. 

D. a and b both

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315. Supposing that the pauli exclusion principal is not correct orbital can accammodate three electrons when are the respective atomic number of the second number of alkali metal and the first number of halogen family ?

A. 16, 14

B. $11, 9$

C. $16, 9$

D. $34, 17$

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316. Supposing that the pauli exclusion principal is non-consistent .Which of the following is the most expected configuration of Li in the ground state ?

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

B. $1s^3$

C. $1s^1 2s^2$

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

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317. Which of the following should be correct according to hund's rule ?

a. $C^6 = 1s^2\ 2s^2\ \boxed{\uparrow\uparrow}\boxed{}\boxed{}$

b. $O^8 = 1s^2\ 2s^2\ \boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{}$

c. $N^7 = 1s^2\ 2s^2\ \boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{}$

d. $F^9 = 1s^2\ 2s^2\ \boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}$

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318. If the value of $n + 1 = 7$ then what should be the increasing order of energy of the posible sub-shells ?

A. $4f < 5d < 4p < 7s$

B. $7s < 6p < 5d < 4f$

C. $7s < 6p < 5d < 4p$

D. $4f < 5d < 6p < 7s$

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319. Which of the following sub-shell will be fifth by electron after the orbital of the third principal shell is completely filled ?

A. $4s$

B. $4f$

C. $4d$

D. $4p$

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320. Which of the following be the basis of entry of an electron is $4s$ orbital before $3d$ orbital ?

A. Energy level diagram

B. Hund's rule

C. Pauli's principle

D. Screening effect

Answer: A

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321. What will be the atomic number of an atom if its electronic configuration is $(n-2)s^2(n-1)s^a p^b ns^2 p^2$ where $n=3, a=2$ and $b=6$?

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322. What should be the number of electrons presents in X^{2+} on the basis of electronic configuiration if the ion X^{3+} has 14 protons ?

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323. An atom has $2K, 8L$ and $5M$ electron write its electronic configuration and answer the following:

A. Number of sub-shells

B. Number of orbitals

C. Number of unpaired electrons

D. Number of electron having $l = 1$

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324. Which atoms are indicated by the following configuration?

$[Ar]4s^2 3d^1$

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325. Write the electronic configuration of the following and report the number of unpaired electron in each case:

A. Mn^{3+}

B. Fe^{3+}

C. Cr^{2+}

D. Zn^{2+}

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326. The quantum number of the last electron of an element are below pralict the atomic number and following quantum number

$$n = 3, l = 2, m = 0, s = -\frac{1}{2}$$

A. $13, V$

B. $21, Se$

C. $29, Cu$

D. 28,Ni`

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327. Prodict the atomic number and element from the following quantum numbers $n = 2, l = 1, m = -1, s = -\frac{1}{2}$

A. (1) $5, B$

B. (2) $8, O$

C. (3) $6, C$

D. (4) $7, N$

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328. Write the electronic configuration of the following species Also and find the number of unpaired electron is each

$Fe, Fe^{2+}, Fe^{3+}(ZofFe = 26)$

b. $Br, Br^{\Theta}(ZofBr = 35)$

$V, V^{3+}(ZofV = 23)$

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329. A compound of vanadium has a magnetic moment of $1.73BM$ Work out the electronic configuration of vanadium in the compound

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330. Which of the following is the number of electron present in X^{2+} on the basis of electronic configuration if the ion X^{3-} has 14 protons ?

A. 12

B. 14

C. 16

D. 18

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331. Which of the following is the electronic configuration of an atom in its first excited state if that atom is isoelectronic with O_2 ?

A. $[Ne]3s^2 3p^4$

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

C. $[Ne]3s^1 3p^3$

D. None of these

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332. Which of the following is the electronic configuration of H_3PO_4 ?

A. $[Ne]$

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

C. $[Ne]3s^1 3p^3$

D. None of these

Answer: $[Ne]$

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333. A neutral atom of an element has $2K, 8L, 9M$, and $2N$ electons. Find and the following

a. Atomic number

b. Total number of s electron

c Total number of p electron

d. Total number of d electron

e. Valency of the element

f. Number of unpaired electrons

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334. Write the electronic configuration of the following and report the number of unpaired electron in each

a. Mn^{2+} b.Cr^{2+} cFe^{2+} d.Ni^{2+} e.CI^{2+} f.Zn^{2+} g.Fe^{2+} hNa i.Mg .j $Cr(3+)$

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335. Write the four quantum numbers for V and VI electron of carbon atom

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336. Given below are the sets of quantum numbers for given orbitals .Name these orbitals

a. n = 2 l = 1 m = -1b. n = 4 l = 2 m = 0c. n = 3 l = 1 m = +- 1d. n = 4 l = 0 m = 0

e. n = 3 l = 2 m = +- 2`

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337. $._4 Be^7$ captures a K electron into its nucleus .What is the mass number and atomic number of the nuclide formed ?

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338. (a) An atomic orbital has n=3. What are the possible values of l?

(b) An atomic orbital has l=3. What are the possible values of m?

(c) An atomic orbital has n=2. What are the possible values of l and m?

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339. Using s,p, d, f notations describe the orbitals with the following quantum numbers:

n=3, l= 0, m= 0

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340. Using the Aufbau principle , write the electronic configuration for the following atoms : boron $(Z=5)$, neon $(Z=10)$, aluminum $(Z=13)$, chlorine $(Z=17)$, calcium $(Z=20)$ and rubidium $(Z=37)$.

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341. The electronic configuration of an element is $1s^2 2s^2 2p^2 3s^2 3p^6 3d^5 4s^1$ This represents its

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

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342. The Schrodinger wave equation for hydrogen atom is

$$\Psi_{2s} = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2 - \frac{r}{a_0}\right)e^{-\sigma/a_0}$$

where a_0 is Bohr's radius. If the radial node in 2s be at r_0, then r_0 would be equal to :

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343. The nucleus of an atom is lecated at $x = y = z = 0$

a. If the probability of finding an s electron in a tiny volume around $x = a, y = z = 0$ is 1.0×10^{-5} what is the produbility of finding the electron in the same sized volume around $x = z = 0y = a$?

b. what will be the probility as the second size if the electrns is in p orbital ? Explain

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344. Which of the d orbitals lies in the xy-plane ?

A. d_{xz}

B. d_{xy}

C. $d_{x^2-y^2}$

D. d_{xy} and $d_{x^2-y^2}$

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345. The number of spherical nodes in 3p-orbital is/are

A. $3p$

B. $3d$

C. $2s$

D. $3s$

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346. For $3s$ orbital of hydrogen atom, the normalised wave function is

$$\Psi_{3s} = \frac{1}{(81)\sqrt{3\pi}}\left(\frac{1}{a_o}\right)^{3/2}\left[27 - \frac{18r}{a_o} + \frac{2r^2}{a_o^2}\right]e^{\frac{-r}{3a_o}}$$

If distance between the radial nodes is d, calculate rthe value of $\frac{d}{1.73a_o}$

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347. In the Schrodingers wave equation Ψ represents

A. Probability of the electron

B. Amplitade of the wave

C. Frequency of the wave

D. Speed of the wave

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348. Draw the radial prodabilirty distritation corve for $2p$ ans $2s$ elelctron orbitals and compare them

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349. How many nodal planes are these in the atomic orbitals for the principal quantum number n = 3 ?

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350. Choose the correct statement from among the following

A. A node is a point in space where the wave function (V) has zero amplitude

B. The number of peaks in radial distribution is $n-1$

C. Radial probability density $\pi_{n.1}(r)=4\pi r^2 R_m^2(r)$

D. v^2 represents the atomic orbital

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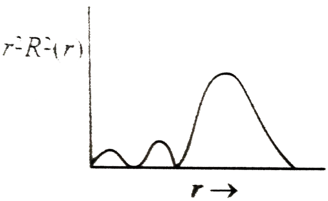
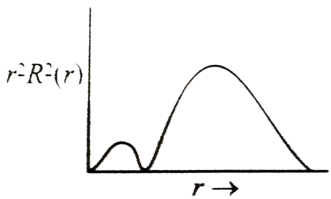
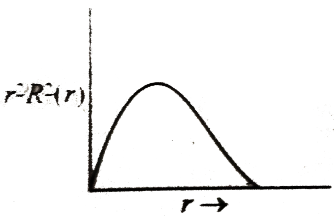
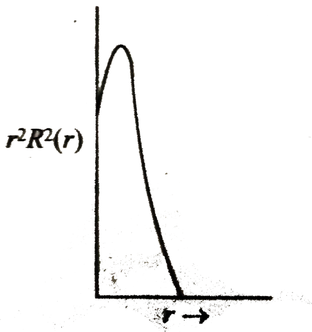
351. Which of the following radial probability density graph corresponds to $l=2$ for which the least value of $l=2$ is allowed ?

a. 

b. 

c. 

d. 

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352. For an electron in a hydrogen atom , the wave function Φ is proportional to e^(-r/a(0)) where a_0 is the Bohr's radius What is the radio of the probability of finding the electron at the nucleus to the probability of finding at a_0 ?

A. e

B. $1/e^2$

C. e^2

D. 0

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353. The wave function orbital of H-like atoms is given as order

$$\psi_{2s} = \frac{1}{4\sqrt{2\pi}} Z^{3/2}(2 - Zr)e^{Zr/2}$$

Given that the radius is in Å then which of the following is the radius for nodal surface for He^{Θ} ion ?

A. 1Å

B. 2Å

C. 2.5Å

D. 4Å

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354. The number of angular nodes and radical nodes in 3s orbital are

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355. The corrent schrodger wave equation for an electron with E as total energy and V as potential energy is

A. $\frac{d^2\psi}{dx^2} + \frac{d^2\psi}{dy^2} + \frac{d^2\psi}{dz^2} + \frac{8\pi^2}{mk^2}(E - V)\psi = 0$

B. $\frac{d^2\psi}{dx^2} + \frac{d^2\psi}{dy^2} + \frac{d^2\psi}{dz^2} + \frac{8\pi m}{h^2}(E - V)\psi = 0$

C. $\frac{d^2\psi}{dx^2}+\frac{d^2\psi}{dy^2}+\frac{d^2\psi}{dz^2}+\frac{8\pi^2 m}{h^2}(E-V)\psi=0$

D. $\frac{d^2\psi}{dx^2}+\frac{d^2\psi}{dy^2}+\frac{d^2\psi}{dz^2}+\frac{8\pi m^2}{h}(E-V)\psi=0$

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356. In an atomic orbital , the sign of lobes indicates the

A. Sign of the probability distribation

B. Sign of charge

C. Sign of the wave function

D. present or absence of electron

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357. The permissible solution to the schrodinger wave equation gives an idea of .... Quantum number(s)

A. 4

B. 2

C. 3

D. 1

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358. Which of the following d-orbitals has donut shape ?

A. d_{xy}

B. d_{yz}

C. $d_{x^2-y^2}$

D. d_{z^2}

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359. The number of radial nodes and angular nodes for d-orbital can be represented as

A. Zero

B. One

C. Two

D. Three

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360. The hydrogen -like species Li^{2+} is in a spherically symmetric state S_1 with one node. Upon absorbing light , the ion undergoes transition to a state S_2. The state S_2 has one radial node and its energy is equal is to the ground state energy of the hydrogen atom.

Energy of the state S_1 in units of the hydrogen atom ground state energy is

A. 0.75

B. 1.50

C. 2.25

D. 4.50

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361. a. What is the shape of i. s orbital ii. P orbital

b. Which of the following orbital are spherically symmerical ?

i. p_x ii. s iii. p_y

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362. From the following sets quantum number state which are possible. Explain why the other are not permitted ?

a. $n = 0, l = 0, m = 0, s = +1/2$

b. $n = 1, l = 0, m = 0, s = -1/2$

c. $n = 1, l = 1, m = 0, s = +1/2$

d. $n = 1, l = 0, m = +1, s = +1/2$

e. $n = 0, l = 1, m = -1, s = -1/2$

f. $n = 2, l = 2, m = 0, s = -1/2$

g. $n = 2, l = 1, m = 0, s = -1/2$

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363. What are the speed and de broglie wavelength of an electron that has been accelerated by a potent5ial difference of $500V$?

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364. When a certain metal was irradiated with light of frequency $3.2 \times 10^{16} s^{-1}$ the photoelectrons emitted had three twice the KE as did photoelectrons emitted when the same metal was irradited with light of frequency$2.0 \times 10^{16} s^{-1}$ .Calculate the thereshold frequency of the metal

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365. Calculate the IE (a) one Li^{2+} ion (b) one mole of Li^{2+} ion.Given Rydherg constant $= 1.0974 \times 10^7 m^{-1}$

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366. In an oil drop experiment , the following charge (in orbitary units) were found on a series of all droplets $2.30 \times 10^{-15}, 6.90 \times 10^{-15} \times 1.38 \times 10^{-14}, 5.75 \times 10^{-15}, 3.45 \times 10^{-15}, , 1$

.Calculate the magnitude of the charge on the electron

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367. The wave number of the first line in the balmer series of Be^{3+} ?

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368. a. What optical transition in the $He^{\oplus}$ spectrum would have the same λ as the first Lyman transition of hydrogen $(n = 2 \rightarrow n = 1)$?

b. What is the IP of He^{Θ}

What is the radius of the first Bohr orbit for He^{Θ} ?

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369. What accelerating potential is needed to product as electron beat with on effecive wavelength of 0.090Å

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370. $1.0g$ of $Mg\text{atom}(\text{atomic mass} = 24.0\text{amu})$ in the vapour phase absorbs $50.0kJ$ energy .Find the composition of the ions if the first and the second IE of Mg are $740kJ$ and $1450mol^{-1}$ respectively

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371. Calculate the velocity of an electron placed in third orbit of H atom .Also calculate of revolation per second round the nucleus

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372. The velocity of electron in a certain bohr orbit of hydrogen bears the ratio $1:275$ to the velocity of light

a. What is the quantum number (n) of orbit?

b. Calculate the wave number of radiation emitted when the electron jumps from $(n+1)$ state to the ground state.$(R) = 1.0987 \times 10^5 cm^{-1}$

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373. The ionisation energy of H atom is 13.6 eV. What will be the ionisation energy of $He^{\oplus}$ and Li^{2+} ions ?

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374. The ionisation energy of $He^{\oplus}$ is $19.6 \times 10^{-18} J \text{atom}^{-1}$ .The energy of the first stationary state of Li^{2+} will be

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375. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom. What is the ionisation energy of sodium per atom?

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376. Calculate the shortest wavelength in H specitrum of lyman when $R_H = 109677 cm^{-1}$.

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377. The λ of H_α line of the Balmer series is 6500Å What is the λ of H_β line of the Balmer series

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378. Calculate the longest wavelength that can remove an electron from the first bohr orbit. (Given :$E_1 = 13.6 eV$)

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379. Calculate the frequency of the spectrical line emitted when an electron in $n = 3$ in H de-excited to the ground state $R_H = 109737 cm^{-1}$

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380. Calculate the wavelength of radiation emitted producing a line in the Lyman series ,when as electron falls from fourth stationary in hydrogen atom $\left(R_H = 1.1 \times 10^7 m^{-1}\right.$

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381. The ionization energy of a hydrogen-like Bohr atom is 4 rydbergs.

a. What is the wavelength of radiation emitted when the electron jumps from the first excited state to the ground state ?

b. What is the radius of the first orbit for this atom ? Given that bohr radius of hydrogen atom $= 5 \times 10^{-11} m$ and 1 rydberg $= 2.2 \times 10^{-18 J}$.

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382. The $IP_1$of H is $13.6 eV$ it is expoxed to electromagnetic waves of 1028A^@ and gives out induced radiation .Find the wavelength of these induced radiation

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383. Using Bohr's model , calculate the wavelength of the radiation emitted when an electron in a hydrogen atom makes a transition from the fourth energy level to the second energy level.

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384. The electron energy in hydrogen atom is given by $E = (-21.7 \times 10^{-12}) \ln^2$ ergs. Calculate the energy required to remove an electron completely from the n=2 orbit. What is the longest wavelength in cm of light that can be used to cause this transition?

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385. Calculate the energy emitted when electrons of $1.0g$ of hydrogen undergo transition giving spectrum lines of the lowest energy in the visible region of its atomic spectrum.

$R_H = 1.1 \times 10^7 m^{-1}, c = 3 \times 10^8 ms^{-1}$ and $h = 6.62 \times 10^{-34} Js$

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386. $1.8g$ hydrogen atoms are excited to radiation .The study of spectra indicate that 27% of the atom are in third energy level and 15% of atom in second energy level and the rest in ground state. IP of H is $13.6eV$. Calculate

a. Number of atom present in first and third energy levels

b. Total energy envolved when all the atom return to the ground state

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387. For He^{Θ} and Li^{2+}, the energies are relased to the quantum number n through an expression

$E_n = \frac{Z^2 B}{n^2}$ where Z is the atomic number species and

$B = 2.179 \times 10^{-19} J$

a.What is the energy of the lowest level of a He^{Θ} ion ?

b. .What is the energy of the third level of a Li^{2+} ion ?

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388. Which hydrogen ionic species has wavelength difference between the first line of the balmer and first line of the lyman series equal to 859.3×10^{-9} m? Neglect the reduced mass effect.

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389. To what series does the spectral lines of atomic hydrogen belong if its wavenumber is equal to the difference between the wavenumber of the following two lines of the Balmer series 486.1 and $419.2nm$? What is the wavelength of that line ?

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390. A series of linenes in the spectrum of atomic H lies at wavelength $656.46, 486.27, 434.17, 410.29 nm$ What is the wavelength of the line in this series ?

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391. A hydrogen like atom (atomic number Z) is in a higher excited state of quantum number n. The excited atom can make a transition to the first excited state by successively emitting two photons of energy 10.2 eV and 17.0 eV, respectively. Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting two photons of energies 4.25 eV and 5.95 eV, respectively Determine the values of n and Z. (Ionization energy of H-atom = 13.6 eV)

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392. Estimate the difference in energy between 1st and 2nd Bohr orbits for hydrogen atom. At what minimum atomic number, a transition from n = 2 to n=1 energy level would result in the emission of X-rays with $\lambda = 3 \times 10^{-8} m$? Which hydrogen atom like species does this atomic number correspond to?

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393. Calculate the wavelength emitted during the transition of an electron in between two levels of Li^{2+} ion whose sum is 4 and difference is 2

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394. The angular momentum of electron in a Bohr's orbit of H atom is $4.2178 \times 10^{-34} kgm^2 s^{-1}$. Calculate the wavelength of the spectral line when the electrton falls from this level to the next lower level.

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395. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.

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396. Find the quantum number n corresponding to nth excited state of He^{++} ion if on transition to the ground state the ion emits two photons in succession with wavelength 108.5 nm and 30.4 nm. The ionization energy of the hydrogen atom is 13.6 eV.

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397. Calculate the angular frequency of an electron occupying the second Bohr orbit of He^{+} ion

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398. A sample of hydrogen gas has same atom in out excited state and same atom in other excited state it emits three difference photon.When the sample was irradiated with radiation of energy $2.85eV$,it emits 10 different photon all having energy in or less than $13.6eV$ ltbrtgt a. Find the principal quantum number of initially excited electrons

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399. A base ball of mass $200g$ is moving with velocity of $3 \times 10^{3} cms^{-1}$ .If we can locte the base ball with an error equal to the magnitude of the wavelength of the light used (5000Å) how wil the uncertainty in momentum be used with the total momentum of the base ball?

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400. A hydrogen like atom (atomic number Z) is in a higher excited state of quantum number n. The excited atom can make a transition to the first excited state by successively emitting two photons of energy 10.2 eV and

17.0 eV, respectively. Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting two photons of energies 4.25 eV and 5.95 eV, respectively Determine the values of n and Z. (Ionization energy of H-atom = 13.6 eV)

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401. The critical wavelength for producing photoelectric effect in a metal is 2500Å What wavelength would be nuccesary be produce photoelectric effect from this metal , having twice the KE of these produced at 2000Å

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402. The second ionization potential of Be is $17.98 eV$ if the electron in Be is assumed to move in a spherical orbit with a central field of effective nuclear charge (Z_{eff}) consisting of the nucleus and other electron by haw many units of charge in the nucleus shielded by other electrons? (the energy of electrons in first Bohr of H is $-13.6 eV$) If the extent of shielding by the if electron of Li atom is the same as you have calculated above , find the ionization potential of Li

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403. Calculate the de Broglie wavelength of an electron travelling at 1% of the speed of the light

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404. A micorscope using suitable photons is employed an electron in an atom within a distance of $0.1A$. What is the uncetrancity involved in the measurment of its velcity ?

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Exercises (Subjective)

1. Calculate the frequency corresponding to the wavelength 4000Å

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2. What if the energy associated with a monochreomatic ultraviolet rediation with a wavelength of $10^{-3}m$?

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3. Calculate the wavelength of radiation emited when an electron in a hydrogen atom makes a transition from an energy level with $n = 3$ to a level with $n = 2$

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4. Differentiate between the terms orbits and orbitals

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5. The electronic configuration of the following elements K 19 , Mn 25 , Ca 20 are given. K 19 = 1s 2 2s 2 2p 6 3s 2 3p 6 4s x Mn 25 = 1s 2 2s 2 2p 6 3s 2 3p 6 3d 5 4s y Ca 20 = 1s 2 2s 2 2p 6 3s 2 3p 6 4s z The product of x, y, and z is:

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6. What is the maximum number of electrons that can be present in

a. $2d$ orbitals

b. All the orbitals with $n = 3$

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7. Give the number of identical orbitals in d subshell is a given energy level and the values for their m quantum numbers

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8. For $n = 3$ energy level ,haw many orbital of all kinds are possible ?

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9. If the principal quantum has a value of 3 what are the permited values of the quantum number l ?

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10. If the azimuthal quantum number has a value of 2 what are the permitted values of the magnetic quantum number m ?

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11. An tomic obital has n=3 , what are the possible values of l and m_l ?

(ii) List the quantum numbers $(m_l \text{ and } l)$ of electrons for 3d orbital .

(iii) which of the following orbitals are possible ?

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12. For which of the following sets of quantum numbers, an electrons will have the highest energy ?

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13. What is the electronic configuration of O^{2-} ion?

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14. Which of the following pairs are isoelectronic ?

F^{-}, O^{2-}

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15. If the energy difference between the electronic states is $214.68 kJmol^{-1}$ calculate the frequency of light emitted when an electron drop form the higher to the lower state planks constant , $h = 39.79 \times 10^{-14} kJmol^{-1}$

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16. A spectral line in the spectrum of H atom has a wave number of $1522.222 cm^{-1}$ .The transition responsible for this radiation is (Rydberg constant $R = 10977 cm^{-1}$

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17. What is the wavelength of the radiation emitted when the electron in a hydrogen atom jumps from $n = \rightarrow n = 2$?

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18. Calculate the momentum of a moving particle which has a wavelength of 200 nm.

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19. The binding energy of electron in a metal is $193 kJmol^{-1}$ .Find the threshold frequency of the metal

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20. Table-tennis ball has mass 10g and s peed of 90m/s. if speed can be measured within an accuracy of 4%. What will be the uncertainty in speed and position?

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21. What is the energy difference and the frequency of light emitted when the electron in a hydrogen atom undergoes transition from the energy level $n = 4$ to the energy $n = 3$ given that the value of Rydberg constant is $1.0974 \times 10^7 m^{-1}$?

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22. Calculate the apperomixmate of polonium 210 nucless

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23. With what velocity should an alpha (α)- particle travel towards the nucleus of a copper atom arrive at a distance of $10^{-13} m$ from the nucleus of the copper atom ?

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24. An electron experiment was performed with a beam of electron accelerated by a potential difference of $10.0 keV$ .What is the wavelength of the electron beam

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25. 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)?

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26. Write the expression for Bohr's radius in hydrogen atom.

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27. What is the velocity of electron present in first Bohr orbit of hydrogen atom?

Watch Video Solution

28. In a hydrogen atom, an electron jumps from the third orbit to the first orbit. Find out the frequency and wavelength of the spectral line.

Watch Video Solution

29. Using Bohr's model , calculate the wavelength of the radiation emitted when an electron in a hydrogen atom makes a transition from the fourth energy level to the second energy level.

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30. Calculate the wavelength and energy for radiation emitted for the electron transition from infinite (∞) to stationary state of the hydrogen atom

$R = 1.0967 \times 10^7 m^{-1}, h = 6.6256 \times 10^{-34} Js$ and $c = 2.979 \times 10^8 ms^{-1}$

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31. Calculate the wavelength in Angstroms of the photon that is emitted when an electron in the Bohr's orbit, n = 2 returns to the orbit, n = 1 in the hydrogen atom. The ionisation potential of the ground state hydrogen atom is 2.17 x 10^{-11} erg per atom.

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32. What is the wavelength of light emitted when the electron of a hydrogen atom undergoes a transition from an energy level with $n = 4$ to an energy level with $n = 2$? What is the colour corresponding to this wavelength?

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33. Calculate the wavelength of the first line in the Balmer series of hydrogen spectrum.

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34. In the Balmer series spectra of hydrogen , there is a line corresponding to wavelength 4344 Å. Calculate the number of highest orbits from which electron can drop to other greater lines. $(R \times c = 3.289 \times 10^{15})$

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35. According to Bohr's theory,the electronic energy of a atom in the nth orbit is given by $E_n = \dfrac{-2.17 \times 10^{-18}}{n^2} J$

Calculate the longest wavelength of light that will be needed in remove an electron the third Bohr orbit of `He^(+)

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36. Calculate the wavelength in Angstroms of the photon that is emitted when an electron in the Bohr's orbit, n = 2 returns to the orbit, n = 1 in the hydrogen atom. The ionisation potential of the ground state hydrogen atom is 2.17 x 10^{-11} erg per atom.

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37. The ionisation energy of H atom is $13.6eV$. What will be the ionisation energy of $He^{\oplus}$ and Li^{2+} ion?

Watch Video Solution

38. Calculate the wavelength and energy of radiation emitted for the electronic transition from infinity (∞) to stationary state one of the hydrogen atom $\left(\mathrm{R}=1.09678 \quad \times 10^{7} m^{-1}\right)$

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39. The ionisation energy of $He^{\oplus}$ is $19.6 \times 10^{-18} J\mathrm{atom}^{-1}$ .The energy of the first stationary state of Li^{2+} will be

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40. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom. What is the ionisation energy of sodium per atom?

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41. Show that the wavelength of a $150g$ rubber at a velocity of $50ms^{-1}$ is short enough to be determine

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42. Calculate wavelength of the radiation corresponding to the speciral line of the lowest frequency in lyman series in the spectrum of a hydrogen atom $\left(R_H = 109677cm^{-1}, c = 3 \times 10^8 ms^{-1}, Z = 1\right)$

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43. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise the sodium atom. What is the ionisation energy of sodium per atom?

Watch Video Solution

44. Find the accelerating potential (V) that must be imparted to a helium atom so that its wavelength is $5Å\left(1a.\ m.\ u.\ = 1.67 \times 10^{-24} g\right)$

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45. An electron in H-atom in its ground state absorbs 1.5 times as much energy as the minimum required for its escape (i. e., 13 . 6 eV) from the atom . Calculate the wavelength of emitted electron.

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46. Find the two longest wavelength $(\text{in}\text{Å})$ emitted when hydrogen atom make transition and the spectrum lines lie in the visible region $\left(R = 1.097 \times 10^7 m^{-1}\right)$

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47. Kinetic energy of an electron accelerated in a potential difference of 100 V is

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48. The de broglie wavelength of electron moving with kinetic energy of 144 eV is nearly

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49. An electron beam can undergo defraction by crystals. Through what potential should a beam of electrons be accelerated so that its wavelength becomes 1.54 Å?

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50. Find the energy required to excite $1L$ od hydrogen gas at 1.0 nm and $298K$ to the first excited state of atomic hydrogen .The energy required for the dissacitation of $H-H$ bond is $436kJmol^{-1}$

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51. An electron in the third energy level of an excited $He^{\oplus}$ ion returns back to the ground state.The photon emitted in the process is absorbed by a stationary hydrogen atom in the ground state. Determine the velocity of the photoelectron ejected from the hydrogen atom in metre per second.

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52. The Bohr of second energy level of $He^{\oplus}$ ion is ....nm.

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Exercises Linked Comprehension

1. The atomic number of chromium is 24 Its electronic coefigueration in ground state in $1s^2 2s^2 2p^6 3s^2 4s^1 3d^5$ .Chromium atom by using 3 electron from Cr^{3+} .A chromium atom contain 17% morte neutron than the proton. Now answer the following questions

The number of unpaired electron in Cr^{3+} ion is

A. 3

B. 6

C. 5

D. 1

Answer: A

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2. The atomic number of chromium is 24 Its electronic configuration in ground state in $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$ Now answer the following questions

The number of electron having $n = 3$ and $m_1 = 0$ in chromium atom is

A. 2

B. 5

C. 4

D. 1

Answer: B

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3. An atom has electronic configuration $1s^2, 2s^2, 2p^6, 3s^2, 3d^3, 4s^2$ you will place it in

A. 6 and 3

B. 5 and 3

C. 6 and 4

D. 5 and 4

Answer: D

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4. The atomic number of chromium is 24 .A chromium atom contain 17% more neutron than the proton. The element atom can be represented by the symbol

A. $._{24}Cr^{52}$

B. $._{24}Cr^{32}$

C. $\cdot_{32} Cr^{24}$

D. $\cdot_{50} Cr^{24}$

Answer: B

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5. The atomic number of chromium is 24 Its electronic coefigueration in ground state in $1s^2 2s^2 2p^6 3s^2 4s^1 3d^5$ .Chromium atom by using 3 electron from Cr^{2+} .A chromium atom contain 17% morte neutron than the proton. Now answer the following questions

The number of occupied sub- shell in Cr^{3+} ion is

A. 3

B. 4

C. 5

D. 6

Answer: D

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6. An atom has $2K, 8L$ and $5M$ electron write its electronic configuration and answer the following:

A. 20

B. 18

C. 15

D. 25

Answer: C

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7. A neutral atom of an element has $2K, 8L$ and $5M$ electron .Find out the following

Number of electron in valence shell

A. 5

B. 6

C. 7

D. 4

Answer: A

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8. A neutral atom of an element has $2K, 8L$ and $5M$ electron .Find out the following

Number of unpaired electrons

A. 2

B. 3

C. 4

D. 5

Answer: B

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9. An atom has $2K, 8L$ and $5M$ electron write its electronic configuration and answer the following:

A. 6

B. 8

C. 10

D. 4

Answer: B

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10. A neutral atom of an element has $2K, 8L$ and $5M$ electron .Find out the following

Maximum number of electron having same spin

A. 5

B. 8

C. 9

D. 3

Answer: C

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11. In a mixture of $H - He^{+} gas\left(He^{+}\right.$ is singly ionized He atom), H atom and He^{+} ion are excited to their repectve first excite states. Subsequently , H atoms transfer their total excitation energy to He^{+} ion (by collisitions). Assume that the Bohr model of atom is exctly valid.

$n = 4 \xrightarrow{Ha \to m}_{-} 0.85eV \xrightarrow{He^{+} a \to m} - 3.4eV$

$n = 3 \to - 1.51eV_{\to} - 6.04eV$

$n = 2 \to - 3.4eV \to - 13.6eV$

$n = 1 \rightarrow \; -13.6eV_{\rightarrow} \; \equiv 54.4eV$

The quamtum number n of the state finally populated in He^+ ions in

A. 1

B. 2

C. 4

D. 6

Answer: C

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12. In a mixture of He^{Θ} gas H atom and He^{Θ} ions Are excited to three respective first excited subsepuenly , H atom transfers its total excitation energy to He^{Θ} ions by collision .Assuming that Bohr model of an atom is applicable , answer the following question

The wavelength of the light amitted in the visible region by He^{Θ} ions qaafter collisions with He^{Θ} ion is

A. 6.0×10^7

B. 5×10^7

C. 4.8×10^7

D. 3×10^7

Answer: C

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13. In a mixture of $He^{\oplus}$ gas H atom and $He^{\oplus}$ ions Are excited to three respective first excited subsepuenly , H atom transfers its total excitation energy to $He^{\oplus}$ ions by collision .Assuming that Bohr model of an atom is applicable , answer the following question

The ratio of teh potential energy of the $n = 2$ electron for H atom to the of $He^{\oplus}$ ion is

A. $1/4$

B. $1/2$

C. 4

D. 3

Answer: A

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14. In a mixture of $He^{\oplus}$ gas H atom and $He^{\oplus}$ ions Are excited to three respective first excited subsepuenly , H atom transfers its total excitation energy to $He^{\oplus}$ ions by collision .Assuming that Bohr model of an atom is applicable , answer the following question

If each hydrogen atom in the ground state of $1.0 mol$ of H atom is excited by absorbing photon of energy $8.4 eV, 12.09 eV$ and $15.0 eV$ of energy then the number of spectral lines emitted is equal to

A. 5

B. 2

C. 3

D. 4

Answer: C

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15. In a mixture of $H - He^{+} gas\left(He^{+}\right.$ is singly ionized He atom), H atom and He^{+} ion are excited to their repectve first excite states. Subsequently , H atoms transfer their total excitation energy to He^{+} ion (by collisitions). Assume that the Bohr model of atom is exctly valid.

$n = 4 \xrightarrow[\_]{Ha \to m} 0.85eV \xrightarrow{He^{+} a \to m} -3.4eV$

$n = 3 \to - 1.51eV_{\to} - 6.04eV$

$n = 2 \to - 3.4eV \to - 13.6eV$

$n = 1 \to - 13.6eV_{\to} \equiv 54.4eV$

The ratio of the kinetic energy of the $n = 2$ electron for the H atom to that of He^{+} ion is

A. Its potential energy decreases

B. Its kinetic energy increases

C. Its angular momentum remain unchanged

D. Wavelength of de Broglie wave associated with the electron decrease

Answer: A::B::C

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16. Consider a system containing a negatively charge point $(\pi, m_{\pi} = 273 m_e)$ orbital around a stationary nucleus of atomic number Z .The total energy (E_n) of ion is half of its potential energy (PE_n) in nth stationary state .The motion of the point can be assumed to be in a uniform circular motion with centripetal force given by the force of attraction between the positive nucleus and the point .Assume that point revolves only in the stationary state defined by the quantization of its angular momentum about the nucleus as Bohr's model

The potential energy (PE_n) of ion follows:

A. $PE_n \propto m_{\pi}\left(\frac{n^2}{Z}\right)$

B. $PE_n \propto m_\pi \left(\frac{Z^2}{n^2}\right)$

C. $PE_n \propto \frac{1}{m_\pi}\left(\frac{n^2}{Z^2}\right)$

D. $PE_n \propto \frac{1}{m_\pi}\left(\frac{Z^2}{n^2}\right)$

Answer: B

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17. Consider a system containing a negatively charge point $(\pi, m_\pi = 273 m_e)$ orbital around a stationary nucleus of atomic number Z .The total energy (E_n) of ion is half of its potential energy (PE_n) in nth stationary state .The motion of the point can be assumed to be in a uniform circular motion with centripetal force given by the force of attraction between the positive nucleus and the point .Assume that point revolves only in the stationary state defined by the quantization of its angular momentum about the nucleus as Bohr's model

Number of waves made by the point when it orbits in third excitation state are

A. 3

B. 4

C. $3Z^2$

D. $4Z^2$

Answer: B

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18. Consider a system containing a negatively charge poin $(\pi, m_\pi = 273^\circ m_e)$ orbital around a staionary nucleus of atomic number Z .The total energy (E_n) of ion is half of its potential energy (PE_n) in nth sationary state .The motion of the poin can be assumed to be in a uniform circular notion with centripents force given by the force of attaraction between the positive uncless and the point .Assume that point revolves only in the stationary satte defined by the quantisation of its angular momentum about the nucless as Bohr's model

The longest wavelength radiation emitted in the emission spectrum when the pion de-excited from $n = 3$ to ground state lies which of the following region ?

A. UV

B. Visible

C. Intire-Red

D. Cannot be calculated

Answer: D

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19. Consider a system containing a negatively charge poin $(\pi, m_{\pi} = 273^{\circ} m_e)$ orbital around a staionary nucleus of atomic number Z .The total energy (E_n) of ion is half of its potential energy (PE_n) in nth sationary state .The motion of the poin can be assumed to be in a uniform circular notion with centripents force given by the force of attaraction between the positive uncless and the point .Assume that point revolves only in the stationary satte defined by the quantisation of its angular momentum about the nucless as Bohr's model

The wavelength (λ_n) of the pion orbital in nth stationarry state is ggiven by :

A. $\lambda_\pi \propto \dfrac{n}{m_\pi z}$

B. $\lambda_\pi \propto \dfrac{m\pi n}{z}$

C. $\lambda_\pi \propto \dfrac{m\pi z}{n}$

D. $\lambda_\pi \alpha \dfrac{z}{m_\pi n}$

Answer: A

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20. A hydrogen like atom (atomic number Z) is in a higher excited state of quantum number n. The excited atom can make a transition to the first excited state by successively emitting two photons of energy 10.2 eV and 17.0 eV, respectively. Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting two photons of energies 4.25 eV and 5.95 eV, respectively Determine the values of n and Z. (Ionization energy of H-atom = 13.6 eV)

A. 2

B. 4

C. 6

D. 3

Answer: D

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21. A hydrogen like atom (atomic number Z) is in a higher excited state of quantum number n. The excited atom can make a transition to the first excited state by successively emitting two photons of energy 10.2 eV and 17.0 eV, respectively. Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting two photons of energies 4.25 eV and 5.95 eV, respectively Determine the values of n and Z. (Ionization energy of H-atom = 13.6 eV)

A. 4

B. 6

C. 8

D. 3

Answer: B

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22. A hydrogen like atom (atomic number Z) is in a higher excited satte of quantum number n .This excited atom can make a transition to the first excited state by succesively emitting two photon of energies $10.20eV$ and $17.00eV$ .Alternatively, the atom from the same excited state can make a transition to the second excited state by successively emitting twio photon of energy $4.25ev$ and $5.95eV$ Determine the followings:

The atom during transition from $n=1$ to $n=2$ emit radiation in the region of

A. Visible

B. Infira-red

C. UV

D. None

Answer: A

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23. A hydrogen like species (atomic number Z) is present in a higher excited state of quantum number n. This excited atom can make a transitionn to the first excited state by successive emission of two photons of energies 10.20 eV and 17.0 eV respectively. Altetnatively, the atom from the same excited state can make a transition to the second excited state by successive of two photons of energy 4.25 eV and 5.95 eVv respectively. Determine the value of Z.

A. Li^{2+}

B. He^{Θ}

C. H

D. None

Answer: A

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24. The characteristic X-rays for the lines of K_a series in element X and Y are 9.87Å and 14.6Å respectively .If Moseley's equation $\sqrt{v} = 4.9 \times 10^7 (Z - 0.75)$ is followed:

The atomic number of X is

A. 8

B. 10

C. 12

D. 16

Answer: C

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25. The characteristic X-rays for the lines of K_a series in element X and Y are $9.87Å$ and $14.6Å$ respectively .If Moseley's equation $\sqrt{v} = 4.9 \times 10^7(Z - 0.75)$ is followed:

The atomic number of Y is

A. 10

B. 6

C. 8

D. 12

Answer: A

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26. 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. $8 \times 10^{12} ms^{-1}$

B. $6 \times 10^{12} ms^{-1}$

C. $84 \times 10^{12} ms^{-1}$

D. $2 \times 10^{12} ms^{-1}$

Answer: A

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27. It is impossible to determine simultaneously the position of velocity of small microscopic particle such as electron , proton or neutron with accuracy .This is called Heisenberg's uncertainty principle. Mathematically, it is represented as $\Delta x.\ \Delta p \geq \frac{h}{4\pi}$, Δx is uncertainty in position Δp is uncertainty in momentum.

A. $5.28 \times 10^{-30} m$

B. $2.64 \times 10^{-30} m$

C. $1.30 \times 10^{-30} m$

D. $0.66 \times 10^{-30} m$

Answer: B

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28. The seqence of filling electgron in sub-shells of element with few exception in d-block and f-block element is govened by.Aufbau principle followed by Hund's rule and pauli's ecxclusion principal

a. The electron prefers to enter into sub-shell with lower $(n+l)$ values

The energy for any sub-shell of an element other than hydrogen is praportioanal to the sum of principal quantum number (n) and angular momentum quantum number

b. If $(n+l)$ value is same for many sub-shell with lowest n value

c. i. Fulfiling sub-shell is more stable

ii. Half filled sub-shell is more stable less than half filed

Which pair of sub-shell has same energy for above described excriptional element under rule (a) ?

A. $1s$, $2s$

B. $2s$, $2p$

C. $3d$, $4p$

D. $5p$, $4d$

Answer: B

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29. If Hund's rule is not obeyed by some element given below then which atom has maximum magnetic moment

A. Fe

B. Cu

C. Cr

D. Mn

Answer: C

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30. The sequence of filling electron in sub-shells of element with few exception in d-block and f-block element is governed by Aufbau principal followed by Hund's rule and pauli's exclusion principal

a. The electron prefers to enter into sub-shell with lower $(n+l)$ values

The energy for any sub-shell of an element other than hydrogen is proportional to the sum of principal quantum number (n) and angular momentum quantum number

b. If $(n+l)$ value is same for many sub-shell with lowest n value

c. i. Fulfilled sub-shell is most stable

ii. Half filled sub-shell is more stable less than half filed

Which pair of element follow rule (c) (ii) ?

A. $\_ (19)K$

B. $\_ (24)Cr$

C. $\_ (12)Na$

D. $\_ (29)Cu$

Answer: A

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31. The sequence of filling electron in sub-shells of element with few exception in d-block and f-block element is governed by Aufbau principal followed by Hund's rule and pauli's exclusion principal

a. The electron prefers to enter into sub-shell with lower $(n+l)$ values

The energy for any sub-shell of an element other than hydrogen is proportional to the sum of principal quantum number (n) and angular momentum quantum number

b. If $(n+l)$ value is same for many sub-shell with lowest n value

c. i. Fulfilled sub-shell is most stable

ii. Half filled sub-shell is more stable less than half filed

Which pair of element follow rule (c) (ii) ?

A. _ $(28)Cu$

B. _ $(24)Cr$

C. _ $(28)Fe$

D. _ $(23)Cu$

Answer: A

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32. The sepence of filling electgron in sub-shells of element with few exception in d-block and f-block element is govemed by.Aufhau principal followed by Hand's rule and palli's ecxcited principal

a. The electron prefers to unter into sub-shell with lower $(n+1)$ values The energy for any sub-shell of an element other than hydrogen is preportioanal to the sum of principal quantum number (n) and angular momentum quantum number

b. If $(n+1)$ value is same for many sub-shell with lowest n value

c. i. Fulfiling sub-shell is more stable

ii. Half filled sub-shell is more stable less than half filed

Which pair of element follow rulke (c) (ii) ?

A. Cr, Mo

B. Mo, Fe

C. Cu,Ag`

D. N, P

Answer: A

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33. The only element in the hydrogen atom resides under ordinary condition on the first orbit .When energy is supplied the element move to hjgher energy ornbit depending on the lower of energy absioerbed .When this electron to may of the electron return to any of the lower orbits, it emit energy Lyman series is formed when the electron to the lowest orbit white Balmer series ids formed when the electron returns to the second orbit similar Paschen Brackett, and Pfund series are formed when electron return to the third fourth , and fifth arbit from highest energy orbits, respectively

Maximum number of liner produced is equal when as electron jumps from nth level to ground level is equal to $\frac{n(n-1)}{2}$ If teh electron comes back from the energy level having energy E_2 to the energy level having energy E_1 then the difference may be expresent in terms of energy of photon as $E_2 - E_1 = \Delta E, \lambda = hc / \Delta E$ Since h and c are constants ΔE

coresponding to definite energy , thus , each transition from one energy level to unother will produce a light of definite wavelem=ngth .This isd actually observed as a line in the spectrum of hydrogen atom Wave number of line is given by the formula $\bar{v} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_{12}^2}\right)$Where R is a Rydherg constant

If the ionisation potential for hydrogen -like atom in a sample is $122.4V$ then the series limit of the paschen series for this atom is

A. R

B. $\frac{R}{3^2}$

C. $\frac{3^2R}{4^2}$

D. 3^2R

Answer: A

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34. The only element in the hydrogen atom resides under ordinary condition on the first orbit .When energy is supplied the element move to hjgher energy ornbit depending on the lower of energy absioerbed .When this electron to may of the electron return to any of the lower orbits, it emit energy Lyman series is formed when the electron to the lowest orbit white Balmer series ids formed when the electron returns to the second orbit similar Paschen Brackett, and Pfund series are formed when electron return to the third fourth , and fifth arbit from highest energy orbits, respectively

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Its a single isolated atom, an electrons make transition from fifth excited state is second thern maximum number of different type of photon observed is

A. 3

B. 4

C. 6

D. 15

Answer: A

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35. The only element in the hydrogen atom resides under ordinary condition on the first orbit .When energy is supplied the element move to hjgher energy ornbit depending on the lower of energy absioerbed .When this electron to may of the electron return to any of the lower orbits, it emit energy Lyman series is formed when the electron to the lowest orbit white Balmer series ids formed when the electron returns to the second orbit similar Paschen Brackett, and Pfund series are formed when electron return to the third fourth , and fifth arbit from highest energy orbits, respectively

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The difference in the wavelength of the second line is Lyman series and last line of breaker series is a hydrogen sample is

A. $\frac{119}{8R}$

B. $\frac{1271}{8R}$

C. $\frac{219}{8R}$

D. None of these

Answer: A

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36. The only element in the hydrogen atom resides under ordinary condition on the first orbit .When energy is supplied the element move to hjgher energy ornbit depending on the lower of energy absioerbed .When this electron to may of the electron return to any of the lower orbits, it emit energy Lyman series is formed when the electron to the lowest orbit white Balmer series ids formed when the electron returns to the second orbit similar Paschen Brackett, and Pfund series are formed when electron return to the third fourth , and fifth arbit from highest energy orbits, respectively

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The wave number of electromagnetic radiation emitted during the transition of electron in between the two levels of Li^{2+} ion whose pricipal quantum numbner sum is 4 and difference is 2 is

A. $3.5R_H$

B. $4R_H$

C. $8R_H$

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

Answer: C

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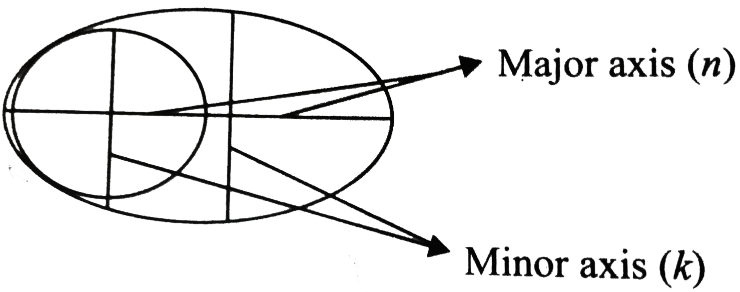
37. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ repectively upto minimum value



If n is the major axis and k is th e minor axis , then $n/k=1$ for circular shape white $n/k>1$ for elliptical shape

Which value of n and k suggest about the shape of $3s$ orbitsl?

A. 3,2

B. 1,1

C. 3,0

D. 3,3

Answer: D

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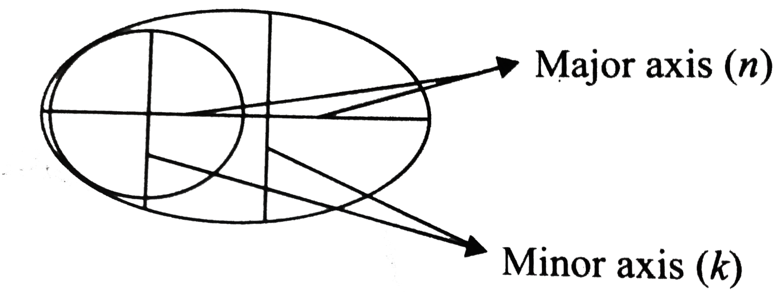
38. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ repectively upto minimum value



If n is the major axis and k is th e minor axis , then $n/k=1$ for circular shape white $n/k>1$ for elliptical shape

Which shape is used to be circular having n/k value

A. 2p

B. 4d

C. 6f

D. 2s

Answer: D

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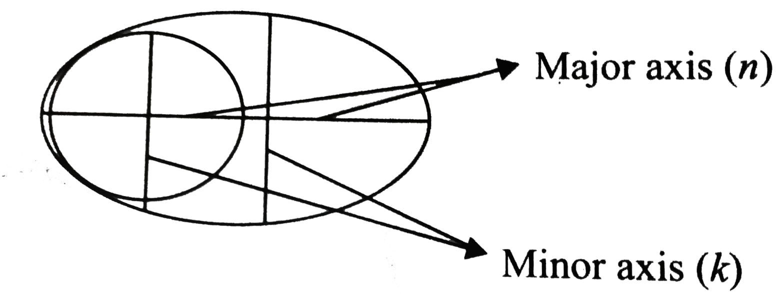
39. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ repectively upto minimum value



If n is the major axis and k is th e minor axis , then $n/k = 1$ for circular shape white $n/k > 1$ for elliptical shape

Which shape is used to be circular having n/k value

A. $3/3$

B. $4/3$

C. $3/2$

D. $1/2$

Answer: A

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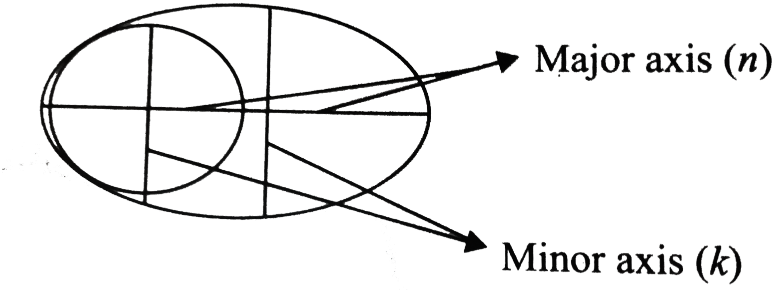
40. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ repectively upto minimum value



If n is the major axis and k is th e minor axis , then $n/k=1$ for circular

shape white $n/k>1$ for elliptical shape

Which orbit shape has highest $n/k> >1$ value?

A. 7s

B. 5p

C. 3d

D. 4d

Answer: C

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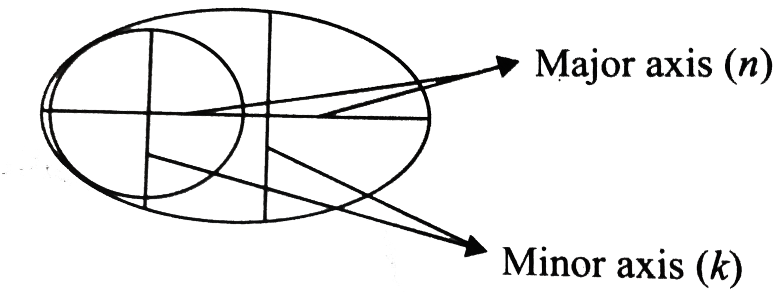
41. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ repectively upto minimum value



If n is the major axis and k is th e minor axis , then $n/k = 1$ for circular shape white $n/k > 1$ for elliptical shape

Which is correct according to the increasing elliptical number of sub-shell ?

A. $2s < 5p < 3p < 4d$

B. $4d < 2s < 5p < 3p$

C. $4d < 2s < 3p < 5p$

D. $3p < 4d < 2s < 5d$

Answer: A

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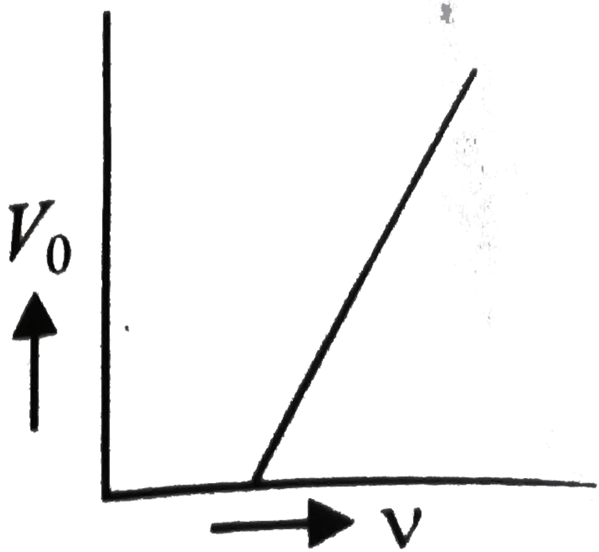
42. The emission of electrons from a metal surface exposed rto light radaition of appropriate wavelength is called photoelectric effect .The emmited electron are called photo=-weklectron work function of threshold energy may be defined as the minimum amount of energy required to ejected electron from a most surface .According to Einstein Maximum kinetic energy of ejected electron = Absorbed energy - Work function

$$\frac{1}{2}mv_{\max}^2 = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - \frac{1}{\lambda_n}\right]$$

Where v_n and λ_0 are thereshold frequency and threshold wavelength respectively

Sopping potential : it is the miximum potential at which the photoelectric current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

In the photoelectric currect effect the shape of strainght line graph between stopping potential (V_0) and frequency of incident light (V) gves



A. charge on electron

B. work function of emitter

C. planck's constant

D. ratio of plank's constant to charge on electron

Answer: D

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43. The emission of electrons from a metal surface exposed rto light radaition of appropriate wavelength is called photoelectroic effect .The emmited electron are called photo=-weklectron work function of threshold energy may be defined as the minimum amount of energy required to ejercted electron from a most surface .According to Einstein

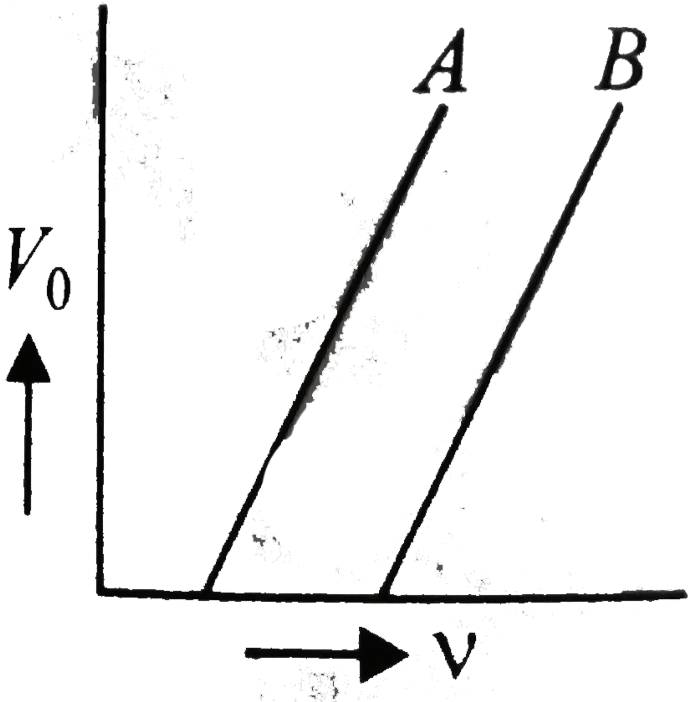
Maximum kinetic energy of ejected electron = Aborbed energy - Work function

$$\frac{1}{2}mv_{\max}^2 = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

Where v_n and λ_0 are thereshold frequency and threshold wavelength respectively

Sopping potential : it is the miximum potential at which the photoelectric current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

The stopping potential as a function on electron frtequency is plotted for two photoelectric surface A abd B The graph show that the work function of A is



A. Greater than that of B

B. Smaller than that of B

C. Same as that of B

D. Such that no comparison can be done from given graph

Answer: B

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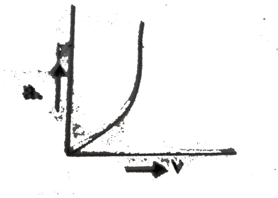
44. The emission of electrons from a metal surface exposed rto light radaition of appropriate wavelength is called photoelectroic effect .The emmited electron are called photo=-weklectron work function of threshold energy may be defined as the minimum amount of energy required to ejercted electron from a most surface .According to Einstein Maximum kinetic energy of ejected electron = Aborbed energy - Work function

$$\frac{1}{2}mv^2_{\max} = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

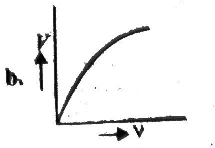
Where v_n and λ_0 are thereshold frequency and threshold wavelength respectively

Sopping potential : it is the miximum potential at which the photoelectric current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

Whaich of the following is the graph between the frequency (V) of the incident radiation and the stopping potential (v) ?

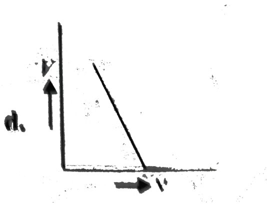


A.



B.

C.



D.

Answer: C

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45. The emission of electrons from a metal surface exposed rto light radaition of appropriate wavelength is called photoelectroic effect .The emmited electron are called photo=-weklectron work function of threshold energy may be defined as the minimum amount of energy required to ejercted electron from a most surface .According to Einstein

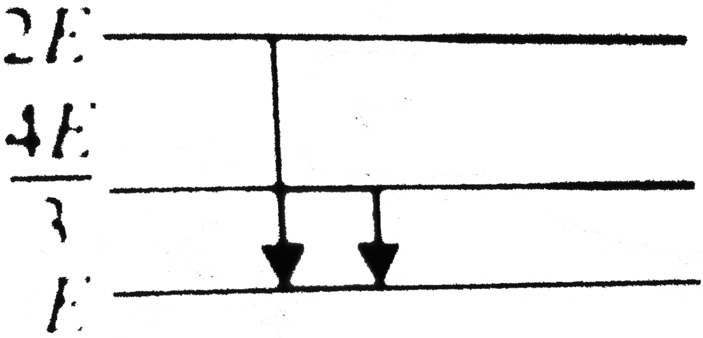
Maximum kinetic energy of ejected electron = Aborbed energy - Work function

$$\frac{1}{2}mv^2_{\max} = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

Where v_n and λ_0 are thereshold frequency and threshold wavelength respectively

Sopping potential : it is the miximum potential at which the photoelectric current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

The folloeing figure indicates the energy livels of a certain atom .When the system moves from $2E$ level to E lvel a photon of wavelength λ is emitted .The wavelength of the photon produced during the transition from level $4E/3$ to level E is



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

B. $\frac{3\lambda}{4}$

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

D. 3λ

Answer: D

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46. The emission of electrons from a metal surface exposed rto light radaition of appropriate wavelength is called photoelectroic effect .The emmited electron are called photo=-weklectron work function of threshold energy may be defined as the minimum amount of energy required to ejercted electron from a most surface .According to Einstein

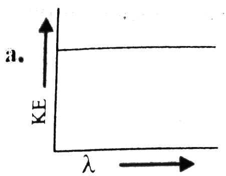
Maximum kinetic energy of ejected electron = Aborbed energy - Work function

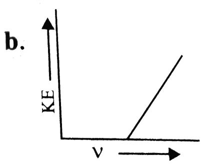
$$\frac{1}{2}mv_{\max}^{2} = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

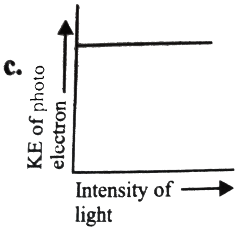
Where v_n and λ_0 are thereshold frequency and threshold wavelength respectively

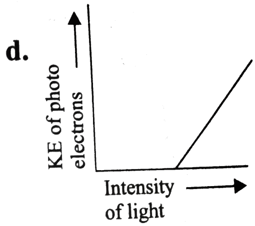
Sopping potential : it is the miximum potential at which the photoelectric current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

Which graph is correct ?

A. 

B. 

C. 

D. 

Answer: C

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47. It is tempting to think that all possible transition are permissible and that an atomic spectrum arises from the transition of an electron from any initial orbital to any other orbital .However this is not so because a photon a photon has as intrinsic spin angular momentum of $\sqrt{2}h / 2\pi$ corresponding to $S = 1$ although it has no charge and no rest mass

On the other hand , an electron has got two type of angular momentum: orbital angular momentum

$L = \left[\sqrt{l(l+1)}\right]h/2\pi$,and spin angular momentum $L_1 = \sqrt{s(s+1)}h/2\pi$ arising from orbital motion and spin motion of the electron during any electronic transition must compensate for the angular momentum carried away by the photon .To satisfy this condition the different between the azimuthal quantum number of the orbital within which the transition take place must differ by 1.thus, an electron in a d-orbital $(l = 2)$ cannot make a transition into as s-orbital $(l = 0)$ because the photon cannot carry away enough angular momentum

The maximum orbital angular momentum of an electron with $n = 5$ is

A. There will be no change in the orbital angular momentum of electron athough the emitted photon has angular momentum

B. There will be change in the orbital angular momentum whereas the emitte photon has to momentum

C. Δm_1valuee between $4s$1 and $3s$ is not zero , which is an important selection slection rule for allowed transition

D. In $4s$ and $3s$ orbitals the wavelength of the electeron wave $n = 5$ is

Answer: A

Watch Video Solution

48. It is teming to think that all possible transituion are permissible and that an atomic spectrum series from the transition of an electron from any intial orbital to any other .However this is not so because a photon a photon has as intrinsic spin angular momentum of $\sqrt{2}h/2\pi$ corresponding to $S=1$ although it has no charge and no rest mass

On the other hand , an electron has got two typwe of agular momentum orbit angular momentum $L=\left[\sqrt{l(l+1)}\right]h/2\pi$,and spin angular momentum $L_1=\sqrt{s(s+1)}h/2\pi$ arising from orbital motion and spin motion of the electronn during any electton transition must compentum for the angular momentum carried away by the photon .To salary this condition the different between the azisition quantum number of teh orbital witjhin which the transition $(l=2)$ cannot make a transition into as x-orbital $(l=0)$because the photon cannot carry away enough angular momentum

The maximum orbital angular momentum of an electon with $n = 5$ is

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

B. $\sqrt{12}\frac{h}{2\pi}$

C. $\sqrt{42}\frac{h}{2\pi}$

D. $\sqrt{20}\frac{h}{2\pi}$

Answer: D

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49. The energy of state s_1 in units of the hydrogen atom ground state energy in

A. 0.75

B. 1.50

C. 2.25

D. 4.50

Answer: C

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50. The hydrogen -like species Li^{2+} is in a spherically symmetric state S_1 with one node. Upon absorbing light , the ion undergoes transition to a state S_2. The state S_2 has one radial node and its energy is equal is to the ground state energy of the hydrogen atom.

The orbital angular momentum quantum number of the state S_2 is

A. 0

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

C. 1

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

Answer: B

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Exercises Multiple Correct

1. Which of the following statement are correct ?

A. The electronic configuration of Cr is $[Ar]3d^5, 4s^1$ (atomic number of Cs = 24)

B. The magnitic quantum number may have a negative value

C. In silver atom 23 electron have spin of one type and 24 of the opposite type .(Atomic number of $Ag = 47$)

D. The oxidation state of nitrogen in NH_3 is -3

Answer: A::B::C

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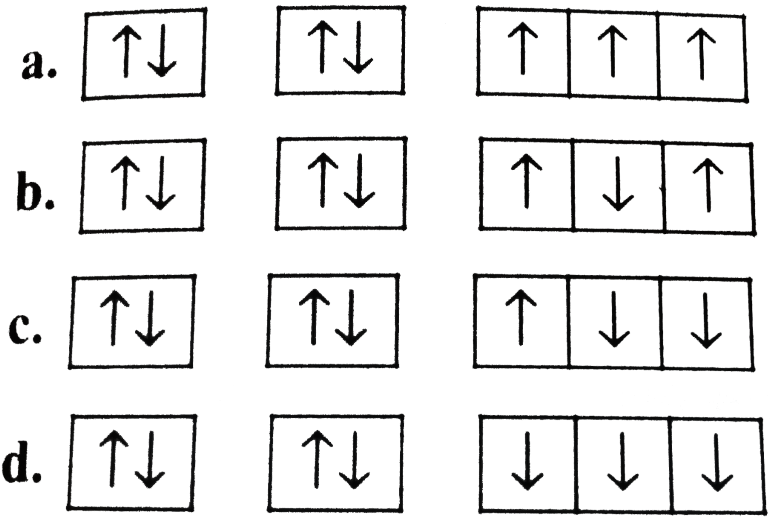
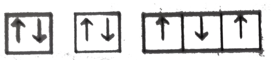
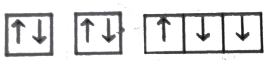
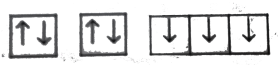
2. The ground state electronic configeration of nitrogen atom can be represented by



A. 

B. 

C. 

D. 

Answer: A::B

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3. Which of the following orbital has (have) one spherical node?

A. 1s

B. 2s

C. 2p

D. 3p

Answer: B::D

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4. The energy of an electron in the first level of H atom is $-13.6eV$ .The possible values of the excited states for electron in $He^{\oplus}$ is (are) :

A. $-54.4eV$

B. $-13.6eV$

C. $-3.4eV$

D. $-6.4eV$

Answer: B::D

Watch Video Solution

5. Which of the following species has (have) five unpaired electron ?

A. Cs

B. Mn

C. Mn^{2+}

D. Fe^{2+}

Answer: B::C

Watch Video Solution

6. Which of the following series in H-spectra occurs in IR region

A. Lyman

B. Paschen

C. Brackett

D. Balmer

Answer: B::C

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7. Which of the following elements are isotopes

A. C^{12}

B. C^{13}

C. C^{14}

D. N^{14}

Answer: A::B::C

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8. Which of the following properies by cathode ray?

A. Dual nature

B. Travel with speed of light

C. Have negative charge

D. Possess magnetic effect

Answer: A::B::C::D

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9. Which of the following are isotones ?

A. $._{18}Ar^{40}$

B. $._{20}Ca^{42}$

C. $._{21}Se^{43}$

D. $._{21}^{Se}\ \hat{}\ (41)$

Answer: A::B::C

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10. The energy of an electron in the first Bohr orbit of H atom is $-13.6eV$

The potential energy value (s) of exxcited state(s) for the electron in the Bohr orbit of hydrogen is//are

A. $-3.4eV$

B. $4.2eV$

C. $-6.8eV$

D. $+6.8eV$

Answer: A

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11. When alpha particle are sent through a thin metal foil ,most of them go straight through the foil because

A. α particle are much he avier than electron

B. $alpgha$particle are positively charged

C. Most part of the atom is empty space

D. α particle move with light speed

Answer: A::C

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12. Which of the following sets of quantum number is //are not perrmitted ?

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

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

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

D. $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

Answer: A::B::C

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13. The lightest particle is/are

A. Electron

B. Proton

C. Neutron

D. β- particle

Answer: A::D

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14. Which orbit of the following is lower in energy in a many electron atom ?

A. $2p$

B. $3d$

C. $4s$

D. $5f$

Answer: A

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15. Which of the following statement (s) is/are correct ?

A. Electrons behaves as a wave

B. s-orbital is non-directional

C. An orbital can accommodate a maximum of two electron with parallel spins

D. The energies of the various sub-shell in the same shell are in the order $s > p > d > f$

Answer: A::B

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16. The angular momentum of d electron is

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

B. $h\sqrt{6}$

C. $h\sqrt{2}$

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

Answer: A::B

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17. The angular momentum of p electron is

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

B. $h\sqrt{2}$

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

D. $h\sqrt{6}$

Answer: B::C

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18. Which of the following ie//are posssible ?

A. 3f

B. 4d

C. 2d

D. 3p

Answer: B::D

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19. If the value of$(n+l)$ is more than 3 and less than 6 , then what will be the possible number of orbitals ?

A. (1) 6

B. (2) 9

C. (3) 10

D. (4) 13

Answer: D

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20. Which of the following is//are not indicated by the sign of lobes in an atom ?

A. Sign of charges

B. Sign of probability -distribotion

C. Sigh of wave function

D. Presence or abence of electron

Answer: A::B::D

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21. Which of the following does not relate to photon both as wave motion and as stream of particle ?

A. $E = hv$

B. $E = mc^2$

C. Interference

D. Diffraction

Answer: B::C::D

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

A. $7 \rightarrow 5$

B. $6 \rightarrow 4$

C. $5 \rightarrow 3$

D. $4 \rightarrow 2$

Answer: B

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23. An electron has spin quantum number (s) $+1/2$ and magnetic quantum number is 1 it can be present in

A. s orbital

B. d orbital

C. p orbital

D. f orbital

Answer: B::C::D

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24. The ratidal part of wave function dependds on the quantum numbers

A. n

B. l

C. l, m_1

D. n only

Answer: A::B

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25. How many spherical nodes are present in $4s$ orbital in a hydrogen atom ?

A. 0

B. 2

C. 3

D. 4

Answer: C

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26. Which of the following statement about quantum number is correct ?

A. If the value of $l = 0$, the electron distribution in spherical

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

C. The Zeman's effect is explaited by magnetic quantum number

D. The spin quantum number the orientations of electrion cloul

Answer: A::B::C

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27. A hydrogen like atom in ground st6ate absebs n photon having the same energy and its emit exacity n photon when electron transition tekes placed .Then the energy of the absorbed photon may be

A. $91.8eV$

B. $40.8eV$

C. $48.4eV$

D. $54.4eV$

Answer: A::B

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28. Magnetic moment of $V(Z=23), Cr(Z=24), \text{ and } Mn(Z=25) are x, y, z$ repectively hence

A. $x=y=z$

B. $x<y<z$

C. $x<z<y$

D. $z<y<x$

Answer: C

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29. Consider the ground state Cr atom $(Z=24)$ The number of electron with the azimuthal number $l=1$ and 2 respectively are

A. $16 \text{ and } 5$

B. $12 \text{ and } 5$

C. $16 \text{ and } 5$

D. 12 and 4

Answer: B

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30. When an electron makes a transition from $(n+1)$ state to n state the frequency of emitted radiation is related to n according to $(n > > 1)$

A. $v \propto n^{-3}$

B. $v \propto n^2$

C. $v \propto n^3$

D. $v \propto n^{\frac{2}{3}}$

Answer: A

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31. In a sample of H atom , make transition from $n = 5 \rightarrow n = 1$ If all the spectral lines are observed , then the line having the third highest energy will corresponding to

A. $5 \rightarrow 3$

B. $4 \rightarrow 1$

C. $3 \rightarrow 1$

D. $5 \rightarrow 4$

Answer: C

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32. Rutherford's α scattering led to which of the following conclusions

A. Atom has a large empty space

B. The centre of the atom has positively charged nucleus

C. The size of the nucleus is very small as compared to the size of the atom

D. Electrons revolve around the nucleus

Answer: B::C::D

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33. The probability of finding the electron in p_x orbit is :

A. Maximum on two opposite side of the nucleus along x-axis

B. Zero at the nucleus

C. same on all sides around nucleus

D. zero on the z-axis

Answer: A::B::D

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34. Which of the following statement concerning Bohr's model is //are true ?

A. It predicts that probability of electron near nucless is more

B. Angular momentum of electron in H $= nh/2\pi$

C. It int introduces the idea of stationary states

D. It explains line spectrum of hydrogen

Answer: B::C::D

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35. Which sets of quantum number are consitent with the theory ?

A. $n = 2, l = 1, m = 0, s = -1/2$

B. $n = 4, l = 3, m = -2, s = -1/2$

C. $n = 3, l = 2, m = -3, s = +1/2$

D. $n = 4, l = 3, m = -3, s = +1/2$

Answer: A::B::C

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36. An electron is not deflected an through a certain region because

A. There is no magnetic field in that region

B. There is no magnetic field but velocity of the electron is parallel to the direction of magnetic field

C. The electron is a chargeless particle

D. None of the above

Answer: A::B::D

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37. Heisenberg uncertainty principle is not valid for :

A. (1) Moving electron

B. (2) Motor car

C. (3) Stationary particles

D. (4) Both (2) and (3)

Answer: B::C

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38. Which of the following statements are correct for an electron that has $n = 4$ and $m = -2$

A. (1) The electron may be present in a d-orbital

B. (2) The electron in the fourth principal electronic shell

C. (3) The electron may be in a p- orbital

D. (4) The electron must have the spin quantum number $= +1/2$

Answer: B::D

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39. The wave charaters of electron was experimenally verified by ....

A. De Broglie

B. Devision and germer

C. G.P Thomson

D. Rutherford

Answer: A::B

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40. Which of the following statement is //are correct ?

A. There is no probability of finding a p- electron right as the nucless

B. The orbital d_2^2 has two libes of electron density directed along the z-axis and a ring of electron density (called dought dough not) center is the xy- plajne

C. The oriention of p and d orbital minimies electron repalsion in many electron atom

D. None is correct

Answer: A::B::C

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41. Which of the following statement is//are correct ?

A. For all value of n the p orbital have the same shape but the overall size increases as n increases for a given atom

B. The fact then there is a particular direction along which each p orbit has maximum electron density plays an important rule in determining molecular grometries

C. The charge cloud of a single electron in $2p_x$ atomic orbitals consists of two lobes of electron density.

D. None is correct.

Answer: A::B::C

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42. The charge cloud of a single electron in a $2p$ atomic orbital has two lobes of electron density .This metans

A. There is a hight probability of locating the electron in the $2p_s$ atomic orbital at values of $s > 0$

B. There is a hight probability of locating it at value of $s > 0$ but no probability at all of the locating it any where in the yz palne along which $x = 0$

C. There is a greater probability of finding a p - right at the nucless

D. All are correct

Answer: A::B::C

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43. Which of the following statement is/are correct ?

A. The energy of an electron in a many electron atom generally increases with an increases in value of (n+l) but for a given value of (n+l) the lower the value of n the lower the energy

B. An electron close to the nucleus experiences a large electrostatic attraction

C. For a given value of n, an electron penetrates to the nucleus more than n p electron which penetrates more than a d-electron and so on

D. None of correct

Answer: A::B::C

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44. Which is correct statement in case of Hand's rule ?

A. It states that if more then one atomic orbital of the same energy is avalable with parallel will occupy different atomic orbital with parallel spins ,as far as possible in the configuration opf lowest energy

B. Total energy of many electron atom with more than one electronn occopying a set of degenerate orbital is lowest if as far as posibile, electron difference atomic orbital and have parallel spins

C. Hand's rule forbnid any conifiguration that does not violet the pauli's exclession principal

D. Hand's rule simply tells as which of the possible configuration are those of excited state higher in energy than the ground state

Answer: A::B::C::D

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45. Which of the following is true ?

A. A configuration will the maximum spin multipicity has the minimum energy and thus is most stable

B. The energy of $3d$ orbit may be greater than or losser then or equal to the of $4s$ orbital depending upon the atomic number of the atom

C. All p orbitals have the same type of angular dependence irrespective of the value of principal quantum numbe rn

D. Ina given electrical field β particle are effected more then α particle in spin of α particle having larger charge

Answer: A::B::C::D

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Exercises Single Correct

1. Atomic mass of an element is not neccessurity a whole number because

A. It contains electrons ,photons and neutrons

B. It excists in allotropic forms

C. It containts isotopes

D. Atom are no longer indivisible

Answer: C

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2. Which of the following properties of an element is a whole number ?

A. Atomic number

B. Atomic volume

C. Atomic radius

D. Mass number

Answer: D

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3. Which of the following sets of quantum number is allowable

A. $n = 2, l = 1, m = 0, s = +1/2$

B. $n = 2, l = 2, m = -1, s = -1/2$

C. $n = 2, l = -2, m = 1, s = +1/2$

D. $n = 2, l = 1, m = 0, s = 0$

Answer: A

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4. Which of the following is associated with the orbital designated by $n=2, l=1$?

A. Spherical

B. Tetrahedral

C. Dumb-shell

D. Pyramidal

Answer: C

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5. An isotone of $\_(32)Ge^{36}$ is

i. $\_(32)Ge^{77}$ ii. $\_(33)As^{77}$

iii. $_(34)Se^{77}$ iv. $_(34)Se^{78}$

A. Only (i) and (ii)

B. Only i(i) and (iii)

C. Only (ii) and (iv)

D. (ii),(iii) and (iv)

Answer: C

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6. The transition of electron in if atom that will emit maximum energy is

A. $n_3 \rightarrow n_2$

B. $n_4 \rightarrow n_3$

C. $n_2 \rightarrow n_4$

D. $n_6 \rightarrow n_5$

Answer: A

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7. The limiting line Balmer series will have a frequency of

A. $32.29 \times 10^{15} s^{-1}$

B. $3.65 \times 10^{15} s^{-1}$

C. $-8.22 \times 10^{15} s^{-1}$

D. $8.22 \times 10^{15} s^{-1}$

Answer: C

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8. The fundamental particle which are responsible for leping nucless togather is

A. Meson

B. Antiproton

C. Positron

D. Electron

Answer: A

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9. Which of the following is not acharacteristic of plack's quentum theory of radiation ?

A. Radiation are associated with energy

B. Magnitude of energy associtated with a quantum is equal to hv

C. Radiation energy is neither emitted nor absorhed no its

D. A body can emit less or more than a quantum of energy

Answer: D

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10. Which of the following configuration is incorrect ?

A. $1s^2 2s^2 2p_x^2 2p_y^2 2p_z^0$

B. $1s^2 2s^2 2p_x^1 2p_y^1$

C. $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^{1`}$

Answer: A

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11. Which of the following set of quantum numbers is an impossible arrangement ?

A. (1) $n = 3, m = -2, s = +1/2$

B. (2) $n = 4, m = 3, s = +1/2$

C. (3) $n = 5, m = 2, s = -1/2$

D. (4) $n = 3, m = -3, s = -1/2$

Answer: D

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12. Which of the following statement about quantum number is wrong ?

A. If the value of $l = 0$, the electron distribution in spherical

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

C. The Zeman's effect is explaited by magnetic quantum number

D. The spin quantum number the orientations of electrion clould

Answer: D

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13. Bohr's model of atom is not in agrement with

A. Line spectra hydrogen atom

B. Pauli's principle

C. Plank's theory

D. Heisenberg's principle

Answer: D

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14. If the energy of electron in H atom is given by expression $-1312n^2 kJ\text{mole}^{-1}$ then the energy required to excited the elcxtron from ground state to second orbit is

A. $328kJ$

B. $656kJ$

C. $984kJ$

D. $312kJ$

Answer: C

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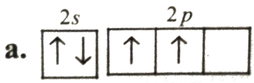
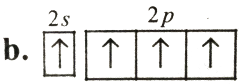
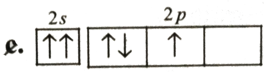
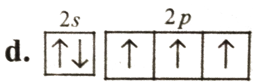
15. For which of the following electron distribution in ground state the Pauli's exclusion principle is violated ?

A. 

B. 

C. 

D. 

Answer: C

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16. Which of the following orbital does not make sense?

A. $3d$

B. $2f$

C. $5p$

D. $7s$

Answer: B

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17. Which of the following sets of quantum number is not possible

A. $n = 4, l = 1, m = 0, s = +1/2$

B. $n = 4, l = 3, m = -3, s = -1/2$

C. $n = 4, l = -1, m = +2, s =_1 /2$

D. $n = 4, l = 1, m = 0, s = -1/2$

Answer: C

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18. The possible sub-shell in $n = 3$ energy shell are

A. s,p,d

B. s,p,d,f

C. s,p

D. s Only

Answer: A

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19. In the Schrodingers wave equation $s\pi$ representts

A. Orbit

B. Wave function

C. Wave

D. Radial probability

Answer: B

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20. Heisenberg's uncertainty principal rules out the exact simultaneous measurement of

A. Probability and intensity

B. Energy and relocity

C. Charge density and radius

D. Position and velocity

Answer: D

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21. The two electron have the following sets of quantum number

X $3, 2-2, \ +1/2$

Y $3, 0, 0, +1/2$

What is true of the following

A. X and Y have same energy

B. X and Y have unequal energy

C. X and Y have represent same orbital

D. None of the statement is correct

Answer: B

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22. 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 approximately equal to

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

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

C. $\dfrac{12395}{\Delta E} \times 10^{-10} m$

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

Answer: A

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23. Which of the following statement concerning Bohr's model is false ?

A. It predicts that probability of electron near nucless is more

B. The angular momentum of electron in H atom = $nh/2\pi$

C. It introduces the idea of statinary state

D. It explains line spectrum of hydrogen

Answer: A

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24. Which of the following gave the idea of nucless of the atom ?

A. Oil drop experiment

B. Devision and germer's experiment

C. α rays acatering experiment

D. Aston's mass spectrogram experiment

Answer: C

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25. A body of mass 10 g is moving with a velocity of $100ms^{-1}$. The wavelength associated with it is

A. $1/100cm$

B. $66 \times 10^{-34}m$

C. $1.32 \times 10^{-35}m$

D. $6.6 \times 10^{--26}m$

Answer: C

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26. Name a series of lines of hydrogen spectrum which lies in : (1) Visible region

(2) Ultraviolet region

(ii) Write Bohr.s formula to calculate Wavelength (λ) of visible light, emitted by hydrogen, and explain the meaning of each and every symbol used.

A. Balmer lines

B. Lyman lines

C. Pfund lines

D. Brackett line

Answer: B

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27. The transitionis $He^{\oplus}$ ion that would have the same wavelength as the first Lyman line in hydtrogen spectrum is

A. $2 \rightarrow 1$

B. $5 \rightarrow 3$

C. $4 \rightarrow 2$

D. $6 \rightarrow 4$

Answer: C

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28. The photoelectric work - function of potassium is 2.3 eV. If light having a wavelength of 2800Å falls on potassium, find

(a) the kinetic energy in electron volts of the most energetic electrons ejected.

(b) the stopping potential in volts.

A. $1.6 \times 10^{-19} J$

B. $16 \times 10^{10} J$

C. $3.2 \times 10^{-19} J$

D. $6.4 \times 10^{-10} J$

Answer: C

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29. A certain metal when irradiated by light $\left(v = 3.2 \times 10^{16} Hz\right)$ emits photoelectrons with twice of K.E. as did photoelectrons when the same metal is irradiated by light $\left(v = 2.0 \times 10^{16} Hz\right)$. The v_0 of the metal is

A. $12 \times 10^{14} Hz$

B. $8 \times 10^{15} Hz$

C. $1.2 \times 10^{16} Hz$

D. $4 \times 10^{12} Hz$

Answer: D

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30. The number of spherical nodes in 3p-orbital is/are

A. 4

B. 1

C. 2

D. 3

Answer: D

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31. Which of the following orbitals does not have the angular node ?

A. P_x orbital

B. d_{x^2} orbital

C. P_y orbital

D. $1s$ orbital

Answer: D

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32. The ratio of the first three Bohr orbit radii is

A. 1:4:9

B. $1:2:3$

C. $3:4:5$

D. $1:8:27$

Answer: C

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33. How many electron in an atom with atomic number 105 can have $(n + l) = 8$?

A. 30

B. 17

C. 15

D. Unpredictable

Answer: B

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34. If the threshold wavelength (λ_0) for ejection of electron from metal is $350nm$then work function for the photoelectric emission is

A. (1) $1.2 \times 10^{-18} J$

B. (2) $1.2 \times 10^{-20} J$

C. (3) $6 \times 10^{-19} J$

D. (4) $6 \times 10^{-12} J$

Answer: B

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35. The heaviest subatomic particle is

A. Neutron

B. Positron

C. Electron

D. Proton

Answer: A

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36. The line spectrum of two elements is not identical because :

A. (1) They do not have same number of neutrons

B. (2) They have dissimilar mass number

C. (3) They have different energy level schemes

D. (4) They have different number of valence electron

Answer: C

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37. Bohr's atomic model can expalin the spectrum of

A. Hydrogen atomic only

B. Atoms or ions which are unielectron

C. Atoms or ions which have only two electrons

D. Hydrogen molecule

Answer: B

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38. The electronic configuration of a dipositive ion M2+ is 2,8,14 and its mass number is 56. What is the number of neutrons present?

A. 32

B. 42

C. 30

D. 34

Answer: C

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39. The kinetic energy of the photo electrons does not depends upon

A. Intensity of incident radiation

B. Frequency of incident radiation

C. Wavelengthof incident radiation

D. Wave number of incident radiation

Answer: A

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40. The experimental evidence for dual nature of matter come from

A. Plank's experiment

B. de Broglie's experiment

C. Devision and Germer'sexperiment

D. Ratherford's experiment

Answer: C

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41. In excited H atom when electron drop from $n = 4, 5, 6$ to $n = 1$, there is emission of

A. UV light

B. Visible light

C. IR light

D. Radio waves

Answer: A

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42. When two electron are placed in two degenerate orbitals of the atom , the energy is lower of their spin is parallel .The statement is based spin

A. Pauli's exclusion

B. Bohr's rule

C. Hund's rule

D. Aufbau principal

Answer: C

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43. The wave mechanical model of an atom is based upon which of the following equations ?

A. Schrodinger's equation

B. de Broglie's equation

C. Heisenberg's uncertainity principle

D. All the above

Answer: D

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44. An orbital with $l = 0$ is

A. Symmetrical about X axis only

B. Symmetrical about Y axis only

C. Spherically symmetrical

D. Unsymmetrical

Answer: C

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45. For a given principal level $n = 4$ the energy of its subshells is of the order

A. $s < d < f < p$

B. $s < p < d < f$

C. $d < f < p < s$

D. $s < p < f < d$

Answer: B

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46. Sodium chloride gives a golden yellow colour to the bunsen flame, which is due to

A. Low ionisation energy of sodium

B. Sublmation of metails sodium to give yellow vapour

C. Emission of excess energy absorted as a radiation in the visible region

D. Photosensitivity of sodium

Answer: C

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47. The correct order of number of unpaired electrons is

A. 0

B. 2

C. 4

D. 8

Answer: B

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48. The exact path of electron $2p$ orbital cannot be determined the above statement is based upon

A. Hund's rule

B. Bohr's rule

C. Uncertainty principle

D. Auftau principle

Answer: C

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49. For the energy levels in an atom , which of the following statement is correct ?

A. There are seven principle electron energy levels

B. The second principle energy levels has four sub-energy levels and contain a maximum of eight electron

C. The principle energy level 3 can have a maximum of 32 electrons

D. The 4s sub energy level has high energy than $3d$ sub energy level

Answer: C

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50. A p-orbital can accommodate

A. Four electron

B. Two electron with parallel spin

C. Six electron

D. Two electron with upposite spin

Answer: D

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51. The magnetic quantum number of an atom is related to the

A. Size of the orbital

B. Spin angular momentum

C. Orbital angular momentum

D. Orientation of the orbital in space

Answer: D

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52. Rutherford's alpha-scattering experiment

A. Nucleus

B. Atom

C. Electron

D. Neutron

Answer: A

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53. The number of spherical nodes in 3p-orbital is/are

A. One

B. Three

C. None

D. Two

Answer: A

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54. The ratio of energy of photon of $\lambda = 2000\text{Å}$ to that of $\lambda = 4000\text{Å}$ is

A. 2

B. $1/4$

C. 4

D. $1/2$

Answer: A

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55. If r is radius of first orbit , the radius of nth orbit of the H atom will be

A. rn^2

B. rn

C. rin

D. r^2n^2

Answer: A

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56. The energy of a hydrogen atom in its ground state is $-13.6eV$. The energy of the level corresponding to the quantum number n=5 is

A. $-0.54eV$

B. $-0.50eV$

C. $-0.85eV$

D. $-2.72eV$

Answer: A

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57. A 200 g cricket ball is thrown with a speed of 3×10^3 cm/sec, what will be its de-Broglie wavelength?

A. 1Å

B. 1000Å

C. 100Å

D. 10Å

Answer: A

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58. Which combination of quantum number $n, l, \text{ and } s$ the elctron in an atom does not provide a permisation solution to the wave equation ?

A. $3, 2, -2, 1/2$

B. $3, 3, 1, -1/2$

C. $3, 2, 1, 1/2$

D. $3, 1, 1, -1/2$

Answer: B

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59. The wave number of the first line of Balmer series of hydrogen is $15200 cm^{-1}$ The wave number of the first Balmer line of Li^{2+} ion is

A. $15200 cm^{-1}$

B. $60800 cm^{-1}$

C. $76000 cm^{-1}$

D. $136800 cm^{-1}$

Answer: D

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60. In terms of Bohr radius a_0, the radius of the second Bohr orbit of a hydrogen atom is given by

A. $0.053nm$

B. $\frac{0.053}{4}nm$

C. $0.053 \times 4nm$

D. $0.053 \times 20nm$

Answer: C

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

A. $1, 1, 1 + 1/2$

B. $1, 0, 0, \ + 1/2$

C. $1, 0, 0, \ - 1/2$

D. $2, 0, 0, +1/2$

Answer: A

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62. Number of spectral lines orbitals in Bohr spectrum of hydrogen atom when an electron is excited from ground level is 5th orbit is

A. 10

B. 5

C. 8

D. 15

Answer: A

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63. Number of spectral lines orbitals in Bohr spectrum of hydrogen atom when an electron is excited from ground level is 5th orbit is

A. 3

B. 6

C. 10

D. 5

Answer: B

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64. Among the following transition in hydrogen and hydrogen-like spectrum, which one emits light of longest wavelength ?

A. $n = 2$ "to" $n = 1$ "for" H

B. $n = 4$ "to"$n = 3$ "for"Li^{2+}

C. $n = 4$ "to" $n = 3$ "for" $He^{\oplus}$

D. $n=5$ "to" $n=2$ "for" H

Answer: C

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65. A photon of frequency v cause photoelectric emission from a surface with thresbold frequency v_p .The de wavelength (λ) of the photoelectron emited is given by

A. $Delatn=\frac{h}{2m\lambda}$

B. $Delatn=\frac{h}{\lambda}$

C. $\left[\frac{1}{v_0}-\frac{1}{v}\right]=\frac{mc^2}{h}$

D. $\lambda=\sqrt{\frac{h}{2m\Delta n}}$

Answer: D

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66. The important principals that do not help in assigning electronic configguration to atoms are

A. Aufbau rule

B. Hund's rule

C. Heisenberg's uncertainity principle

D. Pauil's exciasion principle

Answer: C

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67. What is the total spin and magnetic moment of an atom with atomic number 7?

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

B. $\pm 1, \sqrt{8}BM$

C. $\pm \frac{2}{3}\sqrt{15}BM$

D. $\pm 0, \sqrt{8}BM$

Answer: C

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68. What is the total spin and magnetic moment of an atom with atomic number 7?

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

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

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

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

Answer: A

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69. A neutral atom of an element has $2K, 8L, 9M$, and $2N$ electon .Find and the following

a. Atomic number

b. Total number of s electron

c Total number of p electron

d.Total number of d electron

e.Valency of the element

f.Number of unpaired electrons

A. 20

B. 21

C. 22

D. 23

Answer: B

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70. A neutral atom of an element has $2K, 8L, 9M$, and $2N$ electon .Find and the following

a. Atomic number

b. Total number of s electron

c Total number of p electron

d.Total number of d electron

e.Valency of the element

f.Number of unpaired electrons

A. 8

B. 6

C. 4

D. 10

Answer: B

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71. A neutral atom of an element has $2K, 8L, 9M$, and $2N$ electon .Find and the following

a. Atomic number

b. Total number of s electron

c Total number of p electron

d.Total number of d electron

e.Valency of the element

f.Number of unpaired electrons

A. 6

B. 12

C. 18

D. 24

Answer: B::D

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72. A neutral atom of an element has $2K, 8L, 9M$, and $2N$ electon .Find and the following

a. Atomic number

b. Total number of s electron

c Total number of p electron

d.Total number of d electron

e.Valency of the element

f.Number of unpaired electrons

A. 1

B. 2

C. 3

D. 4

Answer: A

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73. A neutral atom of an element has $2K, 8L, 9M$, and $2N$ electon .Find and the following

a. Atomic number

b. Total number of s electron

c Total number of p electron

d.Total number of d electron

e.Valency of the element

f.Number of unpaired electrons

A. 1

B. 2

C. 3

D. 4

Answer: A

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74. A neutral atom of an element has $2K, 8L$ and $5M$ electron .Find out the following

Number of electron in valence shell

A. $+2$

B. $+3$

C. $Both+2 \text{ and } +3$

D. -1

Answer: C

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75. An oxide of N has vapor density of 23. Find the total number of electrons in its 92 g.(N_(A) = ` Avogadro's number)

A. $46N_A$

B. $38N_A$

C. $54N_A$

D. $30N_A$

Answer: A

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76. The angular momentum of an electron in $4s$ orbital, $3p$ orbitals and $4th$ orbit are

A. $0, \frac{1}{\sqrt{2}}\frac{h}{\pi}, \frac{2h}{\pi}$

B. $\frac{1}{\sqrt{2}}\frac{h}{2}, \frac{2h}{\pi}, 0$

C. $0, \frac{\sqrt{2}h}{\pi}, \frac{4h}{\pi}$

D. $\frac{\sqrt{2h}}{\pi}, \frac{4h}{\pi}, 0$

Answer: A

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77. The decrerasing order of energy for the electrons represented by the following sets of quantum number is :

1.$n = 4, l = 0, m = 0, s = \pm 1/2$

2.$n = 3, l = 1, m = 1, s = -1/2$

3.$n = 3, l = 2, m = 0, s = +1/2$

4.$n = 3, l = 0, m = 0, s = -1/2$

A. $1 > 2 > 3 > 4$

B. $2 > 1 > 3 > 4$

C. $3 > 1 > 2 > 4$

D. $4 > 3 > 2 > 1$

Answer: C

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78. $._4 Be^7$ captures a K electron into its nucleus .What is the mass number and atomic number of the nuclide formed ?

A. $3, 7$

B. $4, 8$

C. $3, 6$

D. $4, 7$

Answer: A

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79. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4 \rightarrow n = 2 of He^{+}$ spectrum?

A. $n_1 = 1$ "to" $n_2 = 2$

B. $n_1 = 2 to n_2 = 4$

C. $n_1 = 1 to n_2 = 3$

D. $n_1 = 2 to n_2 = 3$

Answer: A

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80. The wavelength of H_{α} line of Balmer series is $X\text{Å}$ what is the $XofH_{\beta}$ line of Balmer series

A. $X\frac{108}{80}\text{Å}$

B. $X\frac{80}{108}\text{Å}$

C. $\frac{1}{X}\frac{80}{108}\text{Å}$

D. $\frac{1}{X}\frac{108}{80}\text{Å}$

Answer: B

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81. The shortest and longest wave number respectively in H spectrum of Lyman series is : (R = Rydberg constant)

A. (1) $\frac{3}{4}R, R$

B. (2) $\frac{1}{R}, \frac{4}{3}R$

C. (3) $R, \frac{4}{3}R$

D. (4) $R, \frac{3}{4}R$

Answer: A

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82. The radius of the second Bohr for Li^{2+} is

A. $0.529 \times \frac{4}{3}\text{Å}$

B. $0.529 \times \frac{2}{3}\text{Å}$

C. $0.529 \times \frac{4}{9}\text{Å}$

D. $0.529 \times \frac{2}{9}\text{Å}$

Answer: A

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83. The radius of the first Bohr orbit for $H^{\oplus}$ is

A. 0.529Å

B. 0.264Å

C. 0.132Å

D. 0.176Å

Answer: B

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84. In an oil drop experiment , the following charge (in arbitary units) were found on a series of all droplets $2.30 \times 10^{-15}, 6.90 \times 10^{-15} \times 1.38 \times 10^{-14}, 5.75 \times 10^{-15}, 3.45 \times 10^{-15}, 1.$. Calculate the magnitude of the charge on the electron.

A. 1.15×10^{-15}

B. 2.30×10^{-15}

C. 0.575×10^{-15}

D. 1.69×10^{-14}

Answer: A

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85. In what ratio should $._{17}CI^{37}$ and $._{17}CI^{35}$ be presents so as to obtain $._{17}CI^{35.5}$?

A. $1:2$

B. $1:1$

C. $1:3$

D. $3:1$

Answer: C

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

A. Interference

B. $E = mc^2$

C. Diffraction

D. $E = hv$

Answer: D

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87. Which of the following sets of quantum numvber is not correctly represented in case of the indicated series of hydrogen atom ?

A. Lyman series $n_1 = 1, n_2 = 2, 3, 4. \ldots .$

B. balmer series $n_1 = 2, n_2 = 3, 4, 5. \ldots .$

C. Paschen series $n_1 = 1, n_2 = 3, 4, 5. \dots .$

D. Brakett series $n_1 = 4, n_2 = 5, 6, 7. \dots .$

Answer: C

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88. If the aufbau principle had not been followed, Ca (Z=20) would have been placed in the:

A. $K(19)$

B. $Sc(21)$

C. $V(23)$

D. $Ni(28)$

Answer: A

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89. If Hund's rule is not obeyed by some element given below then which atom has maximum magnetic moment

A. $Fe^{2+} < Mn^{+} < Cr$

B. $Fe^{2+} = Cr < Mn^{+}$

C. $Fe^{2+} = Mn^{+} < Cr$

D. $Mn^{+} = Cr < Fe^{+2}$

Answer: B

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90. If wavelength is equal to the distance travelled by the electron in one second then

A. $\lambda = h / p$

B. $\lambda = h / m$

C. $\lambda = \sqrt{h / p}$

D. $\lambda = \sqrt{h/m}$

Answer: D

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91. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

A. $1/2$

B. $-1/2$

C. 1

D. -1

Answer: B

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92. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

A. $1/2$

B. $-1/2$

C. 1

D. -1

Answer: D

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93. The ratio of potential energy and total energy of an electron in a Bohr of a hydrogen -like species is

A. 2

B. -2

C. 1

D. -1

Answer: A

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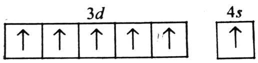
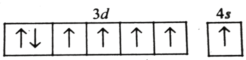
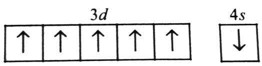
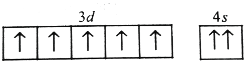
94. Which of the following arrangements of electron is mostly likely to the stable ?

A. 

B. 

C. 

D. 

Answer: A

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95. The velocity of electron moving in 3rd orbit of He^{+} is v. The velocity of electron moving in 2nd orbit of Li^{+2} is

A. V

B. $\frac{V}{3}$

C. $3V$

D. $9V$

Answer: A

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96. The energy of an electron in the first Bohr orbit of H atom is $-13.6eV$ The potential energy value (s) of exxcited state(s) for the electron in the Bohr orbit of hydrogen is//are

A. $-3.4eV$

B. $-6.8eV$

C. $-1.7eV$

D. $13.6eV$

Answer: A

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97. The spectral line obtained when an electron jumps from $n=6$to $n=2$ level in hydrogen atom belong to the

A. Balmer series

B. Lyman series

C. Pasches series

D. Pfund series

Answer: A

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98. Which of the following species will produce the shortest wavelength for the transition $n = 2 \text{to} n = 1$?

A. Hydrogen atom

B. Singly ionised helium

C. Deuterium atom

D. Dioubly ionised lithium

Answer: D

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99. The ionisation potential of hydrogen atom is $13.6eV$ The energy required to remve as electron in the $n = 2$ state of the hydrogen atom is

A. $3.4eV$

B. $6.8eV$

C. $13.6eV$

D. $27.7eV$

Answer: A

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100. If the wavelength of the first line of the Blamer series of hydrogen atom is 6561Å , the wavelength of the second line of the series should be a.13122Å b.3280Å c.4860Å d.2187Å

A. $218.7nm$

B. $328.0nm$

C. $486. nm$

D. $640.0nm$

Answer: C

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101. The energy of an electron in the first Bohr orbit of H atom is $-13.6eV$ The potential energy value (s) of exxcited state(s) for the electron in the Bohr orbit of hydrogen is//are

A. $-3.4eV$

B. $-4.2eV$

C. $-6.8eV$

D. $+6.8eV$

Answer: A

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102. The ground state electronic configeration of nitrogen atom can be represented by

a. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

b. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\uparrow}$

c. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

d. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

A. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

B. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\uparrow}$

C. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

D. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

Answer: A::D

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103. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^4 3d^5 4s^1$ .This represents its

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

Answer: B

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104. The de Broglie wavelength associated with a ball of mass 200 g and moving at a speed of 5 metres/hour, is of the order of ($h = 6.625 \times 10^{-34}$ J s) is

A. $10^{-10} m$

B. $10^{-20} m$

C. $10^{-30}m$

D. $10^{-40}m$

Answer: C

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105. Rutherford's experiment , which established the nuclear model of atom used a beam of

A. βparticles, which impinged on a metal foil got absorbed

B. γrays, which impinged on a metal foil and ejected electrons

C. Helium atom, which impinged on a metal foil and got scattered

D. Helium nuclei, which impinged on a metal foil and got scattered

Answer: D

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106. Amongst the following elements (whose electronic configuration an given below) the one having bighest ionization energy is

A. $[Ne]3s^2 3p^1$

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

C. $[Ne]3s^2 3p^2$

D. $[Ar]3d^{10} 4s^2 4p^3$

Answer: B

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107. The correct state electronic configuration of chromium atom is

A. $[Ar]3d^5 4s^1$

B. $[Ar]3d^4 4s^2$

C. $[Ar]3d^6 4s^0$

D. $[Ar]3d^5 4s^1$

Answer: A

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108. The correct set of quantum numbers for the unpaired electron of chlorine atom is

A. $2 \quad 1 \quad 0$

B. $2 \quad 1 \quad 1$

C. $\quad 1 \quad 1$

D. $3 \quad 0 \quad 0$

Answer: C

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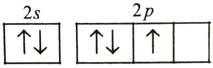
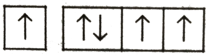
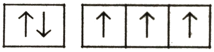
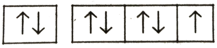
109. The orbital diagram in which the Aufbau principle is violated is

A. a. 

B. b. 

C. c. 

D. d. 

Answer: B

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110. The first loinsatisation in electron volts of nitrogen and oxygen atoms are respectively , given by

A. 14.6, 13.6

B. 13.6, 14.6

C. 13.6, 13.6

D. 14.6, 14.6

Answer: A

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111. Atomic radii of fluorine and neon in Angstrom units are respectively given by

A. $0.72, 1, 60$

B. $1.60, 1, 60$

C. $0.72, 0, 72$

D. None of these

Answer: A

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112. The ratio of energy of photon of $\lambda = 2000 \text{Å}$ to that of $\lambda = 4000 \text{Å}$ is

A. $1/4$

B. 4

C. $1/2$

D. 2

Answer: D

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113. The sum of the number of neutrons and protons in the isotopes of hydrogen is :

A. 6

B. 5

C. 4

D. 3

Answer: D

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114. The radius of an atomic nucleus is of the order of

A. $10^{-10} cm$

B. $10^{-13} cm$

C. $10^{-15} cm$

D. $10^{-8} cm$

Answer: B

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115. Which of the following is true ?

A. (1) The outer electronic configuration of the ground state chromium atom is $3d^4 4s^2$

B. (2) Gamma rays are electromagnetic radiations of wavelength of $10^{-6} cm$ to $10^{-5} cm$

C. (3) The energy of the electron in the $3d$ orbital is less than that in the $4s$ orbital of a hydrogen atom

D. (4) The electron density in the xy plane in $3d_{x^2-y^2}$ orbital is zero

Answer: C

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116. Which of the following is true ?

A. (1) Dipositive zinc exhibits paramagnetism due to loss of two electrons from a $3d$ orbital of neutral atom.

B. (2) In β emission from a nucleus , the atomic number of the daughter element decreases by 1

C. (3) The emission of one α particle from a radioactive atom results in the decrease of atomic number by 2 and mass number by 4

D. (4) The successive atom result in the decrease of atomic number by 11, by loss of an alpha particle.

Answer: C

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117. Which of the following is true ?

A. Neutrino is a positively charged electron

B. The magnetic moment of an atom is related to the number of unpaired electron in its electronic configuration

C. Bohr theory can be succesifully modified to explain the electronic spectrum of multielectron atom

D. The angle momentum of an eklectron in an atom is gives by $n\left(\frac{h}{2\pi}\right)$

Answer: B

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118. Which of the following is false?

A. The angule momentum of an electron due to its spinni9ng is given as $\sqrt{s(s+1)}\left(\frac{h}{2\pi}\right)$, where s can take a value of $1/2$

B. The angule momentum of an electron due to its spinni9ng is given as $m_s\left(\frac{h}{2\pi}\right)$, where m_s can take a value of $+1/2$

C. The azinuthal quantum number cannot have negative values

D. The potential energy of an electron in an orbit is twice in magnitude as campaired to its kinetic energy

Answer: B

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119. Which of the following is true ?

A. According to pauli's exclasion principle ,no two electron in an atom can have the same value of quantum number n,l, and m

B. The total energy of an electron in an orbit is half of its potential energy

C. The speed of an electron in a orbit increases with increase of its quantum number n

D. The energy of an electron in a orbit decreases with increase of its quantum number n

Answer: B

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120. Which of the following is true ?

A. The ionisation energy of a hydrogen -like species in its ground state is equal to the magnitude of energy of the orbit having $n = 1$

B. The ionisation energy of a hydrogen -like species in its ground state increases in principle to the positive charge in its nucleus

C. According to the uncertainty principle $\Delta p \Delta s \leq \frac{h}{4\pi}$

D. The energy of an electron in a orbit of a multielectron atom depends only on the principle quantum number n

Answer: A

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121. Which of the following is false?

A. The energy of an electron in an orbital of a hydrogen -like species depends only on the principle quantum number n

B. The angular momentum of electron in an orbital of a multielectron atom depends on the quantum number l and m

C. The experiment of angular momentum of an orbital is given as

$$\sqrt{l(1-1)}\left(\frac{h}{2\pi}\right)$$

D. The z-component of angular momentum of an electron in an orbital is given as $m\left(\frac{h}{12\pi}\right)$

Answer: B

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122. Which of the following is false?

A. The number of orbital for a given value of l is equal to $2l+1$

B. The number of orbitals for a given value of an is equal to n^2

C. An atom having unpaired electrons is diamagnetic in nature

D. All s orbitals arte spherical symmetrical is shape

Answer: C

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123. Which of the following is true ?

A. (1) The half -filled and full-filled electronic configuration are less stable than the other configuration having the same number of electron.

B. (2) The symbol 's' for the orbitals having $l = 0$ has its origin from the term spherical symmetrical.

C. (3) The increasing order for the value of e/m (charge /mass) for electron (e) proton (p) neutron (n) and alpha particle (a) is : $n > a > p > e$

D. (4) The energy of photon having wavelength $800nm$ is larger than having $400nm$.

Answer: C

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124. Which of the following is false?

A. Pfund spectral series for which $n_1 = 5$ and $n_2 = 6, 7. \dots.$ lies the infrared region of the electronetic radation

B. Visible region of electromagnetic radiation has wavelength from $400nm \rightarrow 800nm$

C. Balmer spectral series lies in the visible proton of the electromagnetic radiation

D. Lyman series lies in the visible protion of the electronetic radiation

Answer: D

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125. Which of the following is false?

A. Breaker spectral series for which $n_1 = 4$ and $n_2 = 5, 6, 7....$ lies in the infrared regaion of the electromagnetic radiation

B. The orbitals $3d_{x^2}$ is symmetrical sbout z-axis

C. The orbital $3d_{xy}$ has no probability of finding electron along x-and y-axis

D. The orbital $3d_{x^2-y^2}$ has probabilityy of linding electron along x- and y-axis

Answer: D

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126. Which of the following is true ?

A. The electron density in the xy- plane in $3d_{xy}$ orbital is zero

B. The electron density in the xy- and xz plane in $3d_{yz}$ orbital is zero

C. The electron density in the xy- plane in $3d_{x^2}$ orbital is zero

D. Pauli excussion principle is folloed by bosons which have integral spin

Answer: B

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127. Which of the following is false?

A. The orbitals are no more degenerate in the presence of a magnetic field

B. The spin quantum number was introduced to explain the splitting of spectral lines of hydrogen atom in the presence of a magnetic field

C. Pauil exclusion principle is followed by fermions which have half integral spins

D. The energy of an orbitals in an atom remains the same with increases in the positive charge in its nucleus

Answer: D

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Exercises Assertion And Reason

1. Assertion (A) :F atom has less electron gain enthalpy than CI^{Θ} atom

Reason (R) : Additional electrons are repelled more effectively by $3p$ electron in CI atom than by$2p$ electron in F atom

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: C

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2. Assertion (A) : Nuclide AI_{13}^{30} is less stable than Ca_{20}^{40}

Reason (R) : Nuclide having unequal number of proton and neutrons are generally unstable

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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3. Assertion: The first ionization energy of Be is greater than that of B.

Reason: 2p-orbital is lowerr in energy than 2s-orbital.

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: C

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4. Assertion (A) : The electronic configuration of nitrogen atom is represented as

$$\boxed{\uparrow\downarrow}\quad\boxed{\uparrow\downarrow}\quad\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$$

and not as

$$\boxed{\uparrow\downarrow}\quad\boxed{\uparrow\downarrow}\quad\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{}$$

Reason (R) : The electronic configuration of the ground state of an atom is the one which has the greatest multiplicity

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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5. Assertion (A) : The atomic radii of the electrons of oxygen family are smaller than the atomic radii of corresponding electrons of the nitrogen family

Reason (R) : The members of oxygen family are all more electronegative and thus have lower value of nuclear than those of the nitrogen family

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: C

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6. STATEMENT-1: For $n = 3$ l may be $0, 1$ and 2 and ma may be $0, 0 \pm 1, 0 \pm 1$ and ± 2

STATEMENT-2: For each value of n, there are 0 to $0(n-1)$ possible values of l, and for each value of l, there are 0 to $\pm$ l , values of m.

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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7. Assertion (A) : An orbital cannot have more than two electrons

Reason (R) : The two electrons in an orbital create opposite magnetic fields

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: B

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8. Assertion (A) : The configuration of B atom cannot be $1s^2 2s^3$

Reason (R) : Hund's rule demands that the configuration should display maximum multiplicity

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: D

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9. Assertion (A) : The ionisation energy of N is more than that of O

Reason (R) : Electronic configuration of N is more stable due to half - fillied $2p$ orbitals

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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10. Assertion (A) : p orbital is dumb- bell shaped

Reason (R) :Electron presents in p orbital can have any one of three value of magnetic quantum number i.e. $0, \ +1, \ \text{ or } \ -1$

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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11. Assertion (A) : A spectral line will be seen for $2p, -2p$ transition

Reason (R) : Energy is raleased in the form of wave of light when the electron drops from $2p_x$, to $2p_y$ orbital.

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If both (A) and (R) are incorrect

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12. Assertion (A) : Ionisation potential of Be (atomic number 4) is more than B (atomic number 5)

Reason (R) : The first electron released fromm Be is of p orbitals but that from B is of s orbitals.

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If both (A) and (R) are incorrect

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13. Assertion (A) : In rutherford's gold foil experiment, very few α particle are deflected back

Reason (R) : Nuclear present inside the atom is heavy

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is not the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If both (A) and (R) are incorrect

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14. Assertion (A) : Limiting line is the balmer series ghas a wavelength of $364.4 nm$

Reason (R) : Limiting line is obtained for a jump electyron from $n = \propto$

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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15. Assertion (A) : Each electron in an atom has two spin quantum number

Reason (R) : Spin quantum numbers are obtained by solving schrodinger wave equation

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If both (A) and (R) are incorrect

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16. Assertion (A) : There are two spherical nodes in $3s$ orbital

Reason (R) : There is no planer nodes in $3s$ orbital.

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is not the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: B

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17. Assertion (A) : In an atom, the velocity of electron in the higher orbits keeps on decreasing

Reason (R) : Velocity of electron in inversely proportional to the radius of the orbit

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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18. Assertion (A) : If the potential difference applied to an electron is made 4 time , the de Broglie wavelength associated is halved

Reason (R) : On making potential difference 4 times , velocity is doubled and hence λ is halved

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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19. Assertion (A) :Angular momentum of $1s, 2s, 3s,$ ets all have spectrical shape

Reason (R) : $1s, 2s, 3s,$ ets all have spherical shape

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: A

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20. Assertion (A) : The radial probability of$1s$ electrons first increases,till it is maximum at $0.53Å$ and then decreases to zero

Reason (R) : Bohr's radius for the first is $0.53Å$

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If (A) is incorrect but (R) is correct

Answer: B

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21. Assertion (A) : On increasing the internsity of incident radiation, the photoelectrons eject and then KE increases

Reason (R) : Greater the intensity means greater the energy which in turn means greater the frequency of the radiation.

A. If both (A) and (R) correct and (R) is the correct explanation for (A)

B. If both (A) and (R) correct and (R) is the correct explanation for (A)

C. If (A) is correct but (R) is incorrect

D. If both (A) and (R) are incorrect

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Exercises Integer

1. What is the total number of pairs of electrons having at least three same quantum number of Be?

A. 2

B. 4

C. 3

D. 8

Answer: B

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2. The magnitude of an orbital angular momentum vector of an electron is $\sqrt{6}\frac{h}{2\pi}$ into how many components will the vector split if an external field is applied to it ?

A. 3

B. 5

C. 7

D. 10

Answer: B

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3. A certain transition is H spectrum from an excited state to the ground state in one or more steps gives a total of 10 lines .How many of these belong to the UV spectrum ?

A. 3

B. 4

C. 5

D. 6

Answer: B

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4. The uncertainty in position of an electron in equal to its de Broglie wavelength .The minimum percentage error in de measuremebnt of velocity under this circumstance will be approsimately

A. 4

B. 8

C. 16

D. 22

Answer: B

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5. The sum of all the quantum number of helium atom is

A. 1

B. 2

C. 3

D. 4

Answer: A

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6. The maximum number of electrons that can be accommodated in a molecular orbital is two.

A. 1

B. 3

C. 2

D. 4

Answer: C

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7. The orbital angular momentum quantum number of the state S_2 is

A. 0

B. 2

C. 1

D. 3

Answer: C

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8. How many of the following are possible

$1p, 2s, 3p, 3f, 3d$

A. 1

B. 2

C. 3

D. 4

Answer: C

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9. How many of the following ions have the same magnetic moments ?

$Fe^{2+} Mn^{2+} Cr^{2+} Ni^{2+}$

A. 1

B. 2

C. 3

D. 4

Answer: B

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10. The number of nodes in $3p$ orbital

A. 1

B. 2

C. 3

D. 4

Answer: A

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11. In a mixture of $He^{\oplus}$ gas H atom and $He^{\oplus}$ ions are excited to their respective first excited states. subsequently , H atom transfers its total excitation energy to $He^{\oplus}$ ions by collision .Assuming that Bohr model of an atom is applicable , answer the following question:

If each hydrogen atom in the ground state of $1.0 mol$ of H atom is excited by absorbing photon of energy $8.4 eV, 12.09 eV$ and $15.0 eV$ of energy then the number of spectral lines emitted is equal to

A. 1

B. 2

C. 3

D. 4

Answer: C

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Exercises Fill In The Balnks

1. The e/m ratio for electron was determined by ....

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2. The charge of electron is ....

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3. The charge on α particle is ....The charge on proton

Watch Video Solution

4. Neutron was discovered by ....

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5. The angular momentum of the electron, according to Bohr's model , is the whole number multiple of ....

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6. The shape of s-orbital is ....while the shape of p-orbital is...........

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7. The shape of orbital is determined by ....quantum number

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8. The principal quantum number determines ....of the atom

Watch Video Solution

9. The dual nature of radiation was proposed by ....

Watch Video Solution

10. The wave nature of electron was verified by

Watch Video Solution

11. Isotopes are those atoms which have same ....

Watch Video Solution

12. $._{6}^{14}C$ and $._{8}^{16}O$ are ....

Watch Video Solution

13. For each value of l the possible value of ml are.........

Watch Video Solution

14. In hydrogen spectum the limiting line the value of n ....

Watch Video Solution

15. In the third energy level , there are ..... Orbirtals

Watch Video Solution

16. In the third energy level , the maximum number of electron can be accomodated are ....

Watch Video Solution

17. The uncertainty in position and momentum has a value ....

Watch Video Solution

18. In the spectrum of visible light , the red light has maximum .... and .... Minimum

Watch Video Solution

19. The velocity of electromagnetic radiation in a medium of permittivity ε_0 and permeability μ_0 is given by:

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20. The $2p_x$ and $2p_y, 2p_z,$ orbitals of an atom have identical shapes but differ in their............

Watch Video Solution

21. According to pauli erxclasion principle , the maximum number of electron that be can accomodated is an orbital is..........

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22. In hydrogen atom, the order of energies of sub-shell of third energy level is ....

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23. The electronic configuration of Ti^{2+} ion is ....

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24. What is the difference in the angular momentum associated with the electron in two successive orbits of a hydrogen atom?

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25. The orbital angular momentum of an electron in $2s$ orbital is ....

Watch Video Solution

26. If the uncertainty in the position of an electron is zero the uncertainty in its momentum be

Watch Video Solution

Watch Video Solution

27. Hydrogen spectrum consists of ....

Watch Video Solution

28. The maximum number of electron inm $n=1, l=0, m=0, s=\pm 1/2$ is ....

Watch Video Solution

29. Na^{Θ} and Ne are .... To each other

Watch Video Solution

30. Energy density in the region between $1s$ and $2s$ orbital is ....

Watch Video Solution

31. When there are two electrons in the same orbitals , they have .... spins

Watch Video Solution

32. The values of n_1 and n_2 in the pfund spectral series of hydrogen atom are........ And .... Respectively.

Watch Video Solution

33. The angular momentum of an electron in Bohr is given as ......

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34. The filling of degenrate orbital by electrons is govermed by .... principle

Watch Video Solution

35. The sequence of filling atomic orbitals is govermed by .... Principle

Watch Video Solution

36. The sequence of filling atomic orbitals is govermed by .... Principle

Watch Video Solution

37. The constant of proorionality which related energy to frequency of electronamagnetic radiation is .... and its value is ....

Watch Video Solution

38. The energies of orbitals in hydrogen -like spectries depend on the quantum number (s) ....

Watch Video Solution

39. The energies of orbitals in a multi -electron atom depend on the quantum number (s) ....

Watch Video Solution

40. The degenerate orbitals have ....value of.........and.......... quantum numbers.

Watch Video Solution

41. The angular momentum of an electron in an orbital is given as ....

Watch Video Solution

42. The z-component of angular momentum of an electron in an atomic orbital given as ....

Watch Video Solution

Watch Video Solution

43. The angular momentum of an electron due to its spin is given as ....

Watch Video Solution

44. The z-component of angular momentum of an electron due to its spin is given as ....

Watch Video Solution

45. The shape of an orbital's is govermed by the quantum number known as .... Quantum number and is represented by the symbol ....

Watch Video Solution

46. Which quantum number defines what orientation of orbital in the space around the nucleus ?

Watch Video Solution

47. d orbitals are five fold degenerate and are speclled as ....

Watch Video Solution

48. the p ,orbital has zero ....of occurance and are spelled as ....

Watch Video Solution

49. According to ....rule, nitrogen atom has ....unpaired electrons

Watch Video Solution

50. The number of orbitals in a quantum shell is equal to ....

Watch Video Solution

51. The total allowed values of m for an given value of l are equal to ....

Watch Video Solution

52. The total allowed values of l for an given value of n are equal to ....

Watch Video Solution

53. One atomic mass unit is equivalent to .... Energy

Watch Video Solution

54. The light radiations with discrete quantities of energies are called............

Watch Video Solution

55. Wave functions of electrons in atoms and molecules are called..............

Watch Video Solution

56. The $2p_x$ and $2p_y, 2p_z,$ orbitals of an atom have identical shapes but differ in their...........

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Exercises True And False

1. The number of electrons and proton are always equal in all atom

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2. Neutron can be found in all the atom

Watch Video Solution

3. Isotopes have same number of atomic mass

Watch Video Solution

4. $._{7}^{14}N$ and $._{6}^{14}C$ are isobars

Watch Video Solution

5. Bohr's model failed to explain atomic spectra of multielectron atom

Watch Video Solution

6. Which sub-atomic particle was discovered by

Goldstein

Watch Video Solution

7. Electron has wave rature as well as particle nature

Watch Video Solution

8. What is the velocity of electron present in first Bohr orbit of hydrogen atom?

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9. The order of energy of orbitals is $s < p < d < f$

Watch Video Solution

10. Fe^{2+} is paramagnetic

Watch Video Solution

11. The azimuthal quantum, number (l) determines the energy level of the shell

Watch Video Solution

12. e/m ratio of proton is greater than that of electron

Watch Video Solution

13. p_x orbital , is symetrical about x -axis

Watch Video Solution

14. In an orbital, maximum two electron can be accomodated

Watch Video Solution

15. ψ^2 determine the probability of finding the electron in particular region of sapce

Watch Video Solution

16. All Emr travel with speed of light

Watch Video Solution

17. The s orbital is spectrical in shape

Watch Video Solution

18. For ant two electrons in an atom, the set of all four quantum numkber can be same

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19. Half-filled and fully-filled orbital orbitals are more stable

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20. The orbital angular momentum of a p electron is equal to $\sqrt{2}\frac{h}{2\pi}$

Watch Video Solution

21. The position and velocity of an can be determined precisely

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22. The magnetic quantum number gives the orientation of electron clouds with respect to external magnetic field

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23. The electron distribution is sheprically symmerical for $l = 2$

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24. For hydrogen atom , the energies of the sub-shells $4s, 4p, 4d$ and $4f$ are in the order $4f > 4d > 4p > 4s$

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25. $3s$ orbital has three nodes

Watch Video Solution

26. $4s$ orbitals has less energy than $3d$ orbital

Watch Video Solution

27. The order of sheiding effect for different orbital is $s > p > d > f$

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28. The $3g$ orbital is not possible

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29. A single photon excites only a single electron

Watch Video Solution

30. An electron can absorb more than one photon simultaneously. (T/F)

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Archives (Linked Comprehension

1. The hydrogen -like species Li^{2+} is in a spherically sysmmetric state S_1 with one node ,Upon ansorbing light , the ion undergoes transition to a state S_2 The state s_2 has one radial node and its energy is equal is to the ground state energy of the hydrogen atom

The sate S_1 is

A. 1s

B. 2s

C. 2p

D. 3s

Answer: B

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2. The hydrogen -like species Li^{2+} is in a spherically sysmmetric state S_1 with one node ,Upon ansorbing light , the ion undergoes transition to a state S_2 The state s_2 has one radial node and its energy is equal is to the ground state energy of the hydrogen atom

Energy of the state S_1 in units of the hydrogen atom ground state enegy is

A. 0.75

B. 1.5

C. 2.25

D. 4.5

Answer: C

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3. The hydrogen -like species Li^{2+} is in a splrically sysmetric state S_1 with one node ,Upon ansorbing light , the ion underidoes transition to a state S_2 The state has one radial node and it energy is equal is equal to the ground state energy of the hydrogen atom

The orbit angular momentum quantum number of teh state S_2 is

A. 0

B. 1

C. 2

D. 3

Answer: B

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Archives Multiple Correct

1. The isotone (s) of $._{32}^{77}Geis/are$

A. $._{32}^{77}Ge$

B. $._{33}^{77}As$

C. $._{34}^{77}As$

D. $._{34}^{78}Se$

Answer: B::D

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2. When α particle are sent through a this metal foil mass of then go straight through the foil because

A. αparticle are much heavier than electrons

B. αparticle are positively charged

C. Most part of the atom is empty space

D. α particle move with high velocity

Answer: C

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3. Many elements have non-integral atomic masses because

A. They have isotopes

B. Their isoptopes have non-integral masses

C. Their isoptopes have difference masses

D. The constituents neutrons , protons, and electrons comvbine to gives fractional masses

Answer: A::C

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4. The sum of the number of neutrons and protons in the isotopes of hydrogen is :

A. 6

B. 5

C. 4

D. 3

Answer: D

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5. The atomic nucleus contaits

A. Proton

B. Neutron

C. Electron

D. Photons

Answer: A::B

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6. Which of the following statement are correct ?

A. The electronic configuration of Cr is $[Ar]3d^5 4s^1$(atomic number of Cr is 24)

B. The magnetic quantum number may have a negative value

C. In silver atom 23 electron have spin of one type and 24 of the opposite type (atomic number of $Agis47$)

D. The oxidation state of nitrogen in HN_3 is -3

Answer: A::B::C

Watch Video Solution

7. The ground state electronic configeration of nitrogen atom can be represented by

a. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

b. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\uparrow}$

c. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

d. $\boxed{\uparrow\downarrow}$ $\boxed{\uparrow\downarrow}$ $\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

A. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

B. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\uparrow}$

C. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

D. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}$ $\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

Answer: A::D

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Archives Single Correct

1. Rutherford's experiment on scattering of alpha particles showed for the first time that atom has :

A. Electron

B. Proton

C. nucleus

D. Neutrons

Answer: C

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2. Rutherford's scattering experiment is related to the size of the

A. nucleus

B. Atom

C. Electron

D. Neutrons

Answer: A

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3. A p-orbital can accommodate

A. Four electrons

B. Six electrons

C. Two electrons with parallel spins

D. Two electrons with opposite spins

Answer: D

Watch Video Solution

4. The principal quantum number of an atom is related in the

A. Size of the orbital

B. Spin angular momentum

C. Orienitation of the orbital in space

D. Orbital abgular momebntum

Answer: A

Watch Video Solution

5. Which electronic level would allow the hydrogen atom to absorb a photon but not to emit a photon?

A. 3s

B. 2p

C. 2s

D. 1s

Answer: D

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6. 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, alpha

B. p,n,e, alpha

C. n,p, alpha,e

D. n, alpha,p,e

Answer: D

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7. The correct set of four quantum numbers for the valence elections of rubidium atom (Z= 37) is:

A. $5, 0, 0, +1/2$

B. $5, 1, 0, +1/2$

C. $5, 1, 1, +1/2$

D. $6, 0, 0, +1/2$

Answer: B

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8. Of the following the radition having the maximum wavelength is

A. Ultraviolet

B. Radio wave

C. X-rays

D. Infrated

Answer: B

Watch Video Solution

9. Bohr's model can explain

A. The sopectrum of hydrogen atom only

B. The sopectrum of an atom or ion containing one electron only

C. The sopectrum of a hydrogen molecule

D. The solar spectrum

Answer: B

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10. The radius of an atomic nucleus is of the order of

A. $10^{-19} cm$

B. $10^{-13} cm$

C. $10^{-15} cm$

D. $10^{-8} cm$

Answer: B

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11. Rutherford's α particle scattering experiment eventually led to the conclusion that

A. Mass and energy are related

B. Electrons occupy space arround the nucleus

C. Neutrons are buried deep in the nucleus

D. The point of impact with matter can be precise determined

Answer: B

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12. Which of the following sets of quantum numbers represents an impossible arrangement?

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13. The ratio of energy of photon of $\lambda = 2000\text{Å}$ to that of $\lambda = 4000\text{Å}$ is

A. $1/4$

B. 4

C. $1/2$

D. 2

Answer: D

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14. The wavelngth fo a spectrl line for an electronic transition is inversely related to :

A. Thenumber of electron undergoing the transition

B. The nuclear charge of the atom

C. The difference in the energy of the energy7 levels involoved in the transition

D. The velocity of the undegoing the transition

Answer: C

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15. The triad of nuclie that are isotomic is

A. $._{6}^{14} C_{7}^{15} N_{6}^{17} F$

B. $._{6}^{12} C_{7}^{14} N_{9}^{19} F$

C. $._{6}^{14} C_{7}^{14} N_{6}^{17} F$

D. $._{6}^{14} C_{7}^{14} N_{9}^{19} F$

Answer: A

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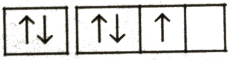
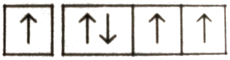
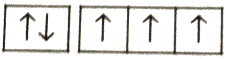
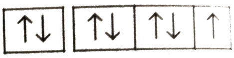
16. The orbital diagram in which the Aufbau principle is violated is

A. a. 

B. b. 

C. c. 

D. d. 

Answer: B

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17. The outermost electric configuration of the most electron of chlorine atom is

A. ns^2np^3

B. ns^2np^4

C. ns^2np^5

D. ns^2np^6

Answer: C

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18. The correct set of quantum numbers for the unpaired electron of chlorine atom is

A. $n = 2, l = 1, m = 0$

B. $n = 2, l = 1, m = 0$

C. $n = 3, l = 1, m = 1$

D. $n = 3, l = 0, m = 0$

Answer: C

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19. The correct ground state electronic configuration of chromium atom is

A. $[Ar]3d^5 4s^1$

B. $[Ar]3d^4 4s^2$

C. $[Ar]3d^6 4s^0$

D. $[Ar]3d^5 4s^2$

Answer: A

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

A. The radiation can ionise gases

B. They case ZnS to flaoresece

C. They are definected by electric and magnetic rays

D. They have wavelength shorter than ultraviolet rays

Answer: C

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

A. Interference

B. $E = mc^2$

C. Diffraction

D. $E = hv$

Answer: D

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22. Which of the following has the maximum number of ampaired electrons ?

A. Mg^{2+}

B. Ti^{3+}

C. V^{3+}

D. Fe^{2+}

Answer: D

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23. What will be the orbital angular momentum of an electron in 2s-orbital?

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

B. Zero

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

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

Answer: B

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24. The first use of quantum theory to explain the structure of atom was made by

A. Heisenberg

B. Bohr

C. Plank

D. Einstein

Answer: B

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25. For a d electron the orbital angular momentum is

A. $\sqrt{6}\left(\frac{h}{2\pi}\right)$

B. $\sqrt{2}\left(\frac{h}{2\pi}\right)$

C. $\left(\frac{h}{2\pi}\right)$

D. $2\left(\frac{h}{2\pi}\right)$

Answer: A

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26. The energy of an electron in the first Bohr orbit of H atom is $-13.6eV$

The potential energy value (s) of exxcited state(s) for the electron in the Bohr orbit of hydrogen is//are

A. $-3.4eV$

B. $-4.2eV$

C. $-6.8eV$

D. $+6.8eV$

Answer: A

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

A. iv lt ii lt iii lt i

B. ii lt iv lt i lt iii

C. i lt iii lt ii lt iv

D. iii lt i lt iv lt ii

Answer: A

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28. The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^4 3d^5 4s^1$ .This represents its

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

Answer: B

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29. The de Broglie wavelength associated with a ball of mass 200 g and moving at a speed of 5 metres/hour, is of the order of ($h = 6.625 \times 10^{-34}$ J s) is

A. $10^{-10} m$

B. $10^{-20} m$

C. $10^{-30} m$

D. $10^{-40} m$

Answer: C

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30. The number of nodes palnes in a p_(y) orbital is

A. One

B. Two

C. Three

D. Zero

Answer: A

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31. The quantum number $+1/2$ and $-1/2$ for the electron spin represent

A. The rortation of the electron in clockwise and anticlockwise directions respectively

B. The rortation of the electron in unticlockwise and anticlockwise directions respectively

C. The magnetic moment of the electron in pointing up and down respectively

D. Two quantum mechanical spin which have an classical analogne

Answer: D

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32. Rutherford's experiment , which established the nuclear model of the atom , used a beam of

A. βparticles, which impinged on a metal foil got absorbed

B. γparticles, which impinged on a metal foil ejected electron

C. Helium atoms which impinged on a metal foil got scattered

D. Helium nuclei which impinged on a metal foil got scattered

Answer: C

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33. If nitrogen atoms had electronic configuration 1s7 It would have energy lower than that of the nornal ground state configuration $1s^2 2s^2 2p^3$ because the electrons would be clear to the nucleus yet $1s^7$ is not oberved because it violates ?

A. Heisenberg uncertainty principle

B. Hund's rule

C. Pauli's exxlusion principal

D. Bohr's postulate of stationary orbital

Answer: D

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34. Which hydrogen -like species will have the same r adius as that of Bohr orbit of hydrogen atom ?

A. $n=2, Li^{2+}$

B. $n=2, Be^{3+}$

C. $n=2, He^{\Theta}$

D. $n=3, Li^{2+}$

Answer: B

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35. The number of orbital nodes of $3s$ and $2p$ orbital are, respectively

A. $2, 0$

B. $0, 2$

C. $1, 7$

D. $2, 11$

Answer: A

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36. Given that the abundacne of isotopes $.^{54}Fe, .^{56}Fe$, and $.^{57}Fe$ is 5%, 90% and 5% respectively. The atomic mass of Fe is

A. 55.85

B. 55.95

C. 55.75

D. 55.05

Answer: B

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Archives Integer

1. The maximum of electrons can have principal quantum number $n = 3$ and spin quantum number $m_s = 1/2$ is

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2. The work function (ϕ) of some metals is listed can have principal quantum of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metal is Metal $Li, Na, K, Mg, Cu, Ag, Fe, Pt \& W \phi(eV) 2.4, 2.3, 2.2, 3.7, 4.8, 4.3, 4.7, 6.3$ respectively.

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Archives Fill In The Balnks

1. When there are two electron is the same orbitals , they have .... spins

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2. Isotopes of an element differ in the number of ....in their nuclei

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3. What is the name given to elements with same mass number and different atomic number ?

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4. The uncertainty principle and the concept of wave nature of matter were proposed by ....and ....respectively.

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5. Wave functions of electrons in atoms and molecules are called..............

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Watch Video Solution

6. The light radiations with discrete quantities of energies are called............

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7. The $2p_x$ and $2p_y, 2p_z,$ orbitals of an atom have identical shapes but differ in their............

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8. The outermost electron configuration of Cr is ....

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Archives True And False

1. The outer electronic configuration of the ground state chromium atom is $3d^4, 4s^2$

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2. The energy of the electron in the $3d$ orbital is less than that in the $4s$ orbital in the hydrogen atom

Watch Video Solution

3. γ rays are electromagnetic radiation of wavelength of $10^{-6} \text{ to} 10^{-5} cm$ (T/F)

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4. The electron density in the xy- plane in $3d_{x^2-y^2}$ orbital is zero

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5. In a given electric field , the β particle are deflected more than the α - particle in spin of the α- particle having a larger charge

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Archives Subjective

1. Naturally occurring boron consists of two isotopes whose atomic weight are 10.01 and 11.01The atomic weight of natural boron is 10.81 Calculate the percentage of each isotope in natural boron

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2. Account for the following limit your answer to two sentence Atomic weight of most of the elements are fraction ?

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3. The energy of the electron in the second and third Bohr's orbitals of the hydrogen atom is $-5.42 \times 10^{-12} erg$ and $-2.41 \times 10^{-12} erg$ respectively ,Calculate the wavelength of the emitted radiation when the electron drop from the third to the second orbit

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4. Calculate the wavelength in Angstroms of the photon that is emitted when an electron in the Bohr's orbit, n = 2 returns to the orbit, n = 1 in the hydrogen atom. The ionisation potential of the ground state hydrogen atom is 2.17 x 10^{-11} erg per atom.

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5. What is the maximum number of electron that may be present in all the atomic orbitals with principal quantum number 3 and azimuthal quantum number2?

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6. The electron energy in hydrogen atom is given by $E = (-21.7 \times 10^{-12})\ln^2$ ergs. Calculate the energy required to remove an electron completely from the n=2 orbit. What is the longest wavelength in cm of light that can be used to cause this transition?

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7. Give reason for why the ground state outermost electronic configuration of sillcon's

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8. According to Bohr's theory , the electronic energy of hydrogen atom is the nth Bohr's orbit is given by

$$E_n = \frac{-21.76 \times 10^{-19}}{n^2} J$$

Calculate the longest wavelength of electron from the third Bohr's of the He^+ ion

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9. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4 \rightarrow n = 2 of He^+$ spectrum?

Watch Video Solution

10. Estimate the difference in energy between 1st and 2nd Bohr orbits for hydrogen atom. At what minimum atomic number, a transition from n = 2 to n=1 energy level would result in the emission of X-rays with

$\lambda = 3 \times 10^{-8} m?$ Which hydrogen atom like species does this atomic number correspond to?

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11. Find out the number of waves made by a bohr electron is one complete revolution in its third orbit

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12. An iodine dissociates into atom after absorting light of wave length $4500 Å$ If quantum of radition is absorbed by each molecule calculate the kinetic energy of iodine (Bood energy of $I_2 is 240 kJ (mol))$

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13. Consider the hydrogen atom to be a proton embededded in a cavity of radius (Bohr radius) whose charge is neutralised by the addition of an electron to the cavity in a vacuum initially slowly .Estimate the average total energy of an electron in to ground state .Also if the magnitude of the average kinetic energy is half of the magnitude of the average energy ,find the average potential energy

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14. Calculate the wave number for the shortest wavelength transition in the Balmer series of atomic hydrogen

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15. An electron beam can undergo defraction by crystals. Through what potential should a beam of electrons be accelerated so that its wavelength becomes 1.54 Å?

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16. With what velocity should an alpha (α)- particle travel towards the nucleus of a copper atom arrive at a distance of $10^{-13}m$ from the nucleus of the copper atom ?

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17. A compound of vanadium has a magnetic moment of $1.73BM$ Work out the electronic configuration of vanadium in the compound

Watch Video Solution

18. The wavelength of high energy transition of H atom is $91.2nm$ Calculate the corresponding wavelength of He atom

Watch Video Solution

19. The Schrodinger wave equation for hydrogen atom is

$$\Psi_{2s} = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2 - \frac{r}{a_0}\right)e^{-\sigma/a_0}$$

where a_0 is Bohr's radius. If the radial node in 2s be at r_0, then r_0 would be equal to :

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20. Calculate the velocity of an electron in the first Borh's orbit of hydrogen atom (given $r = a_0$)

b. Find de Broglie wavelength of the electron in the first Bohr's orbit

c. Find the orbital angular momentum of $2p$ orbital in terms of $h/2\pi$ units

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Concept Applicationexercise (4.1)

1. Given two point of difference between cathode rays and anode rays

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2. How will you show that electrons are negatively charged particle ?

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3. Calculate:

a. The number of electrons which will together weight $1g$.

b. The mass of 1 mol of electrons

c. The charge of 1 mol of electrons.

Watch Video Solution

4. The number of electrons which will together weigh one gram is

Watch Video Solution

5. Which experiment observation led to the following conclassions ?

a. Atom contains a massive positive center

Size of the nucleus is very small

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6. Give an isobar,isotone , and isotope of $._6 C^{14}$

Watch Video Solution

7. An isotope of atomic mass 25 has 13 neutrons in its neucleus .What is its atomic number and what are the name and chemicalsymbol of the element ?

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8. Calculate the total number of electrons in 1 mol of ammonia

Watch Video Solution

9. Calculate the total number of proton neutron and electgron is $\_(35) Be^{40}$

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10. the number of electrons protons and neutrons in a species are equal to 18 , 16 and 16 reqectively . Assign the proper symbol to the species.

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11. 2×10^{6} atoms of carbon are aranged state by side .Calculate the carbon atom if the length of this arrangement is $2.4 cm$

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Concept Applicationexercise(4.2)

1. Electrons revolve around the nucleus in fixed orbits or shells called energy levels'. State how these energy levels are represented.

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2. Why energy level are also know as stationary state ?

Watch Video Solution

3. An electron jump from the fourth energy level to the first energy level in hydrogen atom. How many photons of energy are emitted ?

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4. Is the angular momentum of an electron in an atom quantized ? Explain

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5. What is the energy of the electron in `He+ ion in the ground state ?

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6. An electron is to be removed from the first energy level of hydrogen atom .How much energy is required for this purpose ?

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7. With the help of Bohr 's model , calculate the second ionisation energy of helium (energy required to remove the electron from $He^{\oplus}$

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8. Calculate the momentum of a particle which has a de Broglie wavelength of 2Å, $(h = 6.6 \times 10^{-34} kgm^2 s^{-1})$

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9. Calculate the wavelength a particle of mass $m = 6.6 \times 10^{-27} kg$ moving with kinetic energy $7.425 \times 10^{-13} J(h = 6.6 \times 10^{-34} kgm^2 s^{-1}$

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10. What must be the velocity of a beam of electron if they are to display a de Broglie wavelength of 1Å

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11. A beam of α particle moves with a velocity of $3.28 \times 10^3 ms^{-1}$ Calculate the wavelength of the α particles.

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12. Calculate the de Broglie wavelength of an electron travelling at 1% of the speed of the light

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13. For a given kinetic energy, which of the following has the smallest de Broglie wavelength : electron, proton and $\alpha - partic \le$?

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14. What should be the ratio of the velocity of CH_4 and O_2 molecules so that they are associated with de Broglie wave of equal wavelegth ?

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15. Why don't we observe the wave properties of large objects such as a cricket ball?

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16. What would be the uncertainty in momentum of an electron whose position is known with absolute certainty ?

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17. Describe the difference between the properties of line electron and a moving cricket ball .

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18. Using Heisenberg's uncertainty principle, calculate the uncertainty in velocity of an electron if uncertainty in its position is $10^{-11}m$ Given, $h = 6.6 \times 10^{-14} kgm^2 s^{-1}, m = 9.1 \times 10^{-31} kg$

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19. Calculate the unceertainty in the momentum of a particle if the uncertainity in its position is $6.6 \times 10^{-32} m$

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20. If an electron is , to be located within $10 \pm$ what will be the uncertainty in its velocity ?

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21. What is the uncertainty in velocity of an electron if the uncertainty in its position is $10^{-10}m$? Mass of the electron is $9.1 \times 10^{-31}kg$ and $h = 6.6 \times 10^{-34} m^2 s^{-1}$?

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22. The uncertainty in the position of a buller weight $20g$ is $\pm 10^{-4}m$ .Calculate the uncertainty in its velocity

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23. Using Bohr's model , calculate the wavelength of the radiation emitted when an electron in a hydrogen atom makes a transition from the fourth energy level to the second energy level.

Watch Video Solution

24. What is the maximum number of emission lines when the excited electron of a hydrogen atom in n = 6 drops to ground state?

Watch Video Solution

25. Calculate the radius of bohr's third orbit in hydrogen atom.

Watch Video Solution

26. The energy associatied with the first orbit in the hydrogen atom is $-2.17 \times 10^{-18} \text{J atom}^{-1}$. What is the energy associated with the fifth orbit ?

Watch Video Solution

27. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4 \rightarrow n = 2 of He^{+}$

spectrum?

Watch Video Solution

28. Calculate the energy required for the process

$He^{+}(g) \rightarrow He^{2+}(g) + e^{-}$

The ionization energy for the H atom in the ground state is

$2.18 \times 10^{-18} J atom^{-1}$

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29. Explain why the uncertainty principle goes insignificant when applied to macroscope objects such as moving car ?

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30. What is the minimum product of the uncertainty in position and the uncertainty in momentum of a moving electron ?

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31. Why can't we evercome the uncertainty predicted by hesisenherg principle by building more precise devices to reduce the error in measurment below the $h/4\pi$ limit ?

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32. A single electron orbit around a stationary nucleus of charge $+Ze$ where Z is a constant and e is the magnitude of the electronic charge. It requires$47.2eV$ to excite the electron from the second bohr orbit to the third bohr orbit. Find

(i) The value of Z

(ii) The energy required by nucleus to excite the electron from the third to the fourth bohr orbit

(iii) The wavelength of the electronmagnetic radiation required to remove the electron from the first bohr orbit to inlinity

(iv) The energy potential energy potential energy and the angular momentum of the electron in the first bohr orbit

(v) The radius of the first bohr orbit (The ionization energy of hydrogen atom $= 13.6 eV$ bohr radius $= 5.3 \times 10^{-11} matre$ velocity of light $= 3 \times 10^8 m / \sec$ planks 's constant $= 6.6 \times 10^{-34}$ jules - sec)

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33. Calculate the energy emitted when electrons of $1.0 g$ of hydrogen undergo transition giving spectrum lines of the lowest energy in the visible region of its atomic spectrum.

$R_H = 1.1 \times 10^7 m^{-1}, c = 3 \times 10^8 ms^{-1}$ and $h = 6.62 \times 10^{-34} Js$

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34. An electron in the third energy level of an excited $He^{\oplus}$ ion returns back to the ground state.The photon emitted in the process is absorbed by a stationary hydrogen atom in the ground state. Determine the velocity of the photoelectron ejected from the hydrogen atom in metre per second.

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35. The ratio of energy of photon of $\lambda = 2000\text{Å}$ to that of $\lambda = 4000\text{Å}$ is

A. 2

B. 4

C. $1/2$

D. $1/4$

Answer: A

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36. Bohr's model can explain

A. The spectrum of hydrogen atom only

B. The sopectrum of an atom or ion containing one electron only

C. The spectrum of hydrogen molecule

D. The solar spectrum

Answer: B

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37. The wave number of the first Balmer line Li^{2+} ion is $136800cm^{-1}$ .The wave number of the first line of Balmer series of hydrogen atom is $(\text{in} cm^{-1})$

A. 68400

B. 15200

C. 76000

D. 30800

Answer: B

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38. If the uncertainty in the position of an electron is zero the uncertainty in its momentum be

A. $< \dfrac{h}{4\pi}$

B. $> \dfrac{h}{4\pi}$

C. Zero

D. infinity

Answer: D

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39. If travelling at same speeds, whichof the following mater waves have the shortest wavelength?

A. Electron

B. Proton

C. Neutron

D. α particle

Answer: A

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40. Which of the following postutates does not belong to Bohr's model of atom ?

A. Angular momentum of an electron in the stationary orbit is an integral multiple of $h/2\pi$

B. The electron in the stationary orbit is stable

C. The path of an electron is circular

D. The change in the energy levels of electron is continuous

Answer: D

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41. The Lyman series of the hydrogen spectrum can be represented by the equation

$$v = 3.2881 \times 10^{15} s^{-1} \left[\frac{1}{(1)^2} - \frac{1}{(n)^2}\right] [wheren = 2, 3, \ldots\ldots)$$

Calculate the maximum and minimum frequencies of the lines in this series

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Concept Applicationexercise(4.3)

1. How many quantum number are needed in designate an orbital ? Name them

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2. The principal quantum number of n of an atomic orbitals is 5 what are the posible values of l ?

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3. (a) An atomic orbital has n=3. What are the possible values of l?

(b) An atomic orbital has l=3. What are the possible values of m?

(c) An atomic orbital has n=2. What are the possible values of l and m?

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4. What is the lowest value of n that allows g orbital to exist?

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5. Given the notation for the sub-shell deotected by the following quantum number

a. $n=5, l=2$ b. $n=6, l=3$ c. $n=4, l=0$ d $n=5, l=4$

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6. How many electron on a fully filled f sub-shell have $m_1 = 0$?

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7. An electron is in one of the 3d orbitals. Give the possible values of n, l and m for this electron.

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8. If the largest value of$m_1$for an electron is $+3$ in what type of subshell the electron may be present ?

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9. Explain giving reasons, which of the following sets of quantum numbers are not possible?

(a) n=0, l=0, $m_l = 0, m_s = +\frac{1}{2}$

(b) $n = 1, l = 0, m_l = 0, m_s = -\frac{1}{2}$

(c) $n = 1, l = 1, m_l = 0, m_s = +\frac{1}{2}$

(d) $n = 2, l = 1, m_l = 0, m_s = -\frac{1}{2}$

(e) $n = 3, l = 3, m_l = -3, m_s = +\frac{1}{2}$

(f) $n = 3, l = 1, m_l = 0, m_s = +\frac{1}{2}$

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10. How many electron in atom may have the following quantum number ? A $n = 4, m_s = -\frac{1}{2}$ b $n = 3, l = 0$

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11. How many orbitals are possible in

a. 4th energy level b. $5f$ sub-shell

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12. What are the possible values of l and m_1 for an atomic orbital 4f?

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13. What is the shape of 1s and $2s$ orbital .Give two point of difference between $1s$ and $2s$ orbital

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14. (a) How many sub-shells are associated with n = 4? (b) How many electrons will be present in the sub-shells having $m_s$value of $-1/2f$ or $n = 4$?

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15. How many spherical nodes are present in $4s$ orbital in a hydrogen atom ?

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16. The principal quantum number representwsw

A. Shape of an orbital

B. Number of electron in an orbit

C. Distance of an electron from the nucleus

D. Orientation of the orbit in space

Answer: C

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17. The energy of an electron of $2p_1$ orbital is

A. Greater than $2p$ orbital

B. Less than $2p_x$ orbital

C. Equal to $2s$ orbital

D. Sum of that of $2p_x$ and $2p_z$ orbital

Answer: D

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18. The orbital angular momentum of an electron of an electron in $2s$ orbitals is

A. 4

B. 1

C. 0

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

Answer: C

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19. The number of angular nodal planes of zero electron density in the d_{xy} orbital is

A. 1

B. 2

C. 3

D. 4

Answer: B

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