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CHEMISTRY

BOOKS - CENGAGE CHEMISTRY (HINGLISH)

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.

$3 \times 10^{-19}, 9 \times 10^{-15}, 12 \times 10^{-15}, 18 \times 10^{-15}$

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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 intrapositive 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 rutherford's scattering 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 α- particle are defleted back

D. α- 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. Retherford's experiment , which estabished 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 statementregarding cathode rays is not currect ?

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 metarial of the cathode

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

Answer: B

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17. Oxygen consists of isotapes O^{16}, O^{17} and O^{16} and carbon consists of isolopes 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 number of two isotopes of O are 15.9936 and 17.0036 Calculate in each atom

A. Nnumber of neutrons

B. Nnumber of protons

C. Nnumber of electrons

D. Mass Nnumber

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19. Nuturally occurring boron consists of two isotopes whese atomic weight are 10.01 and 11.01The atomic weight of nurons is 10.81 Calculate the percentage of each isotope is 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 1 mol of electrons is

A. $0.55mg$

B. $1.0008g$

C. $1.000g$

D. $0.184g$

Answer: A

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

$$\left(20gCa = \frac{1}{2}Ca\right)$$
$$\left(Ca = \frac{6.023 \times 10^{23}}{2} = 3.012 \times 10^{23}\right)$$

A. $12gC$

B. $12.15gMg$

C. $24.0gC$

D. $24.3gMg$

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

$M_1 \text{ne} M_2$ and $Z_1 \text{ne} Z_2$ but $M_1 - Z_1 = M_2 - Z_2$. These elements are

A. Isotonic

B. `Isoharic

C. Isotople

D. Isoprotonic

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24. Two nuclides A and B are isonutroair .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 deterium to heavy water ?

A. 20%

B. 80%

C. 60%

D. 40%

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

A. H_2O and D_2O

B. H_2O and HTO

C. D_2O and HTO

D. D_2O and HCI

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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 el,ectron is its tertpositive 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. The density of flatrine nucleus supposing that the shape of the nucleus is spherical and its radius is 5×10^{-13} (Mass of $f = 19$ ams) is $Y \times 10^{-13}$. What is the value of Y ?

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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 protons and neutrons are there in the following nuclel ?

$._6 C^{12}, _8 C^{17}, _{12} Mg^{25}, _{26} Fe^{56}, _{38} Sr^{88}$

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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 6. 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 $28kJ$ while addition of an electron to each atom of mixture releases $68.8kJ$ energy .Calcualte 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 enthaply for F and Cl are $-5.31 \times 10^{-22} kJ$ and $-5.78 \times 10^{22} kJ$ respectivley

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

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41. Yellow light emitted from a sodium lamp has eavelenght (i) of $580 nm$ .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 ratio station and the received set is 300 km how long the signal would take in reach the set from the radio station ? Also calculate the wavelength and wavelength of radio waves

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43. Calculate the wavelength of an ubraviolet wave , if its frequency is 12×10^{16} cycles per second and $c = 3 \times 10^{6} \text{ins}^{-1}$?

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

A. 18 rays

B. UV rays

C. Microwaves

D. Rediowaves

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

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- charge ratio for A^{Θ} ion is $1.97 \times 10^{-7} kgC^{-1}$. The mass of A atom is $M = S \times 10^{-26} kg$. Find the value of S .

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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 frection of an atom is occupted by nucleus ?

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53. Nuclear radius is of the order of $10^{-13}cm$ white atomic radius is of $10^{-8}cm$ .Assuming the nucleus and the to be spherical .What frection of an atom is occupted 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. Calculate and compare the energies of two radition one with a wavelength of $300nm$ and the other 600 nm

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56. What is the number of photon of light with wavelength 300nm that provide $2J$ of energy ?

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57. A 100 W bulb is emmiting 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 photon emitted in 10 hours by a $60W$ sodium lamp (λ of photon $= 5893\text{Å}$)

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59. An Eletromagnetic radition of wavelenght 242 nm is just sefficient to ionise a sodium atom .Calculate the ionisation energy of sodium in $KJmol^{-1}$.

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60. Write the numerical value of h and its unit

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

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62. Calculate the longest wavelength that can an electron from the first bohr given $E_1 = 13.6eV$

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63. Find the energy of a photon that

a corresponds in light frequency at $3 \times 10^6 Hz$

b. Has a wavelength of $300nm$

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64. A bulb emits light of wavelength 4500Å .The bilb is nrated as 150 and 8% of the energy is emmitted as light .How amny photon are emitted by the bulb per second?

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65. Electronic energy is a negative energy 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 cesium has a wavelength of 456 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 electrons with maximum kinetic energy $1.3 \times 10^{-19} J$. 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

b. The kinetic energy of photoelectrons

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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 $4.0 \times 10^{16} s^{-1}$ 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 as α- particle travel toward the nucless of a copper atom at a distance of $10^{13} m$ from the nucless 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

$O_2 \xrightarrow{hv} O + O^6$

The maximum wavelenght (1) neded for this is 17.4 nm .If the exchation energy $O \rightarrow O^{6} is 3.15 \times 10^{-19} J$ haw much energy in kJ mol^{-1} is neded for the dissociation of 1 and of oxygen into normal atomic is 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 vel,ocity of electron ejected from a pltinum when radiation of 200 nm falls on it .The work function of platinum in $5eV, (1eV = 1.6 \times 10^{-19}J)$

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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 photoelectron effect is v_0 then which of the following will not happen ?

A. If the frequency of the incident radiation in v_0 the kinetic energy of the electrons ejected is zero

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

C. If the frequency is kept same at v but intesity is increased the number of electrons ejected will increases

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

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84. The dissociation energy of H_2 is $430.53 kJmol^{-1}$, If H_2 is of disociated by illamition wityh radiation of wavelength $253.7 nm$, the fraction of the radiant energy which will be converted into ikinetic 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 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 vacume innitially slowly .Extimate the average total energy of an electron in to ground state .Also if the magnitude iof the average kinetic energy is half of the magnitude of teh 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. stationary $He^{\oplus}$ ion emits a photon corresponding to the first line (H_4) of the lyman series .The photon than emitted strikles a if atom in the ground state .Find the velocity of the photoelectron ejected out of the hydrogen atom .The value of R is $1.097 \times 10^7 m^{-1}$

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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 diemeter 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 shiniong atraviolet light wavelength 1.5 nm on the metal by shining liught 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 $5 \times 10^{-17} J$ .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 eknergy charge of an 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 $\left(\lambda_1 = 4.10 \times \ \%^{-5} \ cm\right)$ 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 $100W$ power source emits green light at a wavelegth of $5000\AA$ .How many photon p-er minute are emitted by the source

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

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109. Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise a sodium atom .Calculate the energy corresponding to tjhis wavelength and the ionisation potential of Na

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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 ? (Given $R_H = 109677 cm^{-2}$)

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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 spectrum of Lyman when $R_H = 109677 cm^{-1}$.

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114. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition $n = 4$ to $n = 2$ 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 $4344 Å$ .Calculate the number of highest energy level from which electron drops to second energy level in hydrogen spectrum . $(R \times c = 3.289 \times 10^{15})$

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117. Calculate frequency energy and wavelength of the radiation corresponding to the speciral line of the lowest frequency in lyman series in the spectrum of a hydrogen atom .Also calculate the energy for the coresponding line in the spectrum of Li^{2+}. $(R_H = 109.677 cm^{-1}, c = 3 \times 10^6 ms^{-1}, Z = 3)$

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118. What is the maximum number of emission lines when th eexcited electron of a H atom in$n = 6$ drop to the ground state?

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119. The ionisation energy of H atom is $13.6eV$ 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 $19.6 \times 10^{-18} Ja \rightarrow m^{-1}$ .The energy of the first stationary state of Li^{2+} will be

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

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 $R_H = 109678cm^{-1}$ is

A. 1002.7Å

B. 1215.67Å

C. 1127.30Å

D. 911.7Å

Answer: D

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122. The wavelength of the first line in the hbalmer series is $656nm$ .Calculate the wavelength of the second line and the limeting line in the Ralmerseries

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123. A spectral line in the spectrum of H atom has a wavelength of $15222.22cm^{-1}$ .The transition responsible for this rediation is (Rydherg 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 $1.0g$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 in the series limit for the 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. Postronium consists of an electron and a position (same mass apposite charge) orbiting around their common center of mass .The specitum is, therefore expected to be hydrogen like , the difference arining from the mass difference .Calculate the wavelength of the first three line of the balmer series of positrunium

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

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130. Find the quantum number n corresponding to the excited state of He^{Θ} ion if on transition to the ground state that ion emits two photon in succession with wavelength $108.5$and $30.4nm$

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131. The Lyman series of the hydrogen spectrum can be represensted 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 wavelength of the lines in this series

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132. Two hydrogen atom collide 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 ? How fast werte the hydrogen atom transition before collision ?

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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. Calculate the iongest wavelength transition in the paseches series of $He^{\oplus}$.

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136. Calculate the ratio of the wavelength of the first and the nltimate line of the ballmer of Li^{2+} ?

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137. What transition in the hydrogen spetrum would have the same wavelength as the balmer transition $n = 4$ to $He^{\oplus}$ spectrum ?

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138. Calculate the wavelength and wave number of the spectrum, line when an electron of H atom falls from a higher energy state $n = 3$ in a state $n = 2$ also determine the energy of a photonm to ionic this atom by removing the electron from the second orbit .Compare it with the energy of photon required to ionic the atom by removing the electron from the ground state

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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 expased to electromagnetic waves of 256.4Å The excited electron gives out induced radiation .Find the wavelength of the induced radiation when the electron de-excetes back to the ground state $\left(R = 109677 cm^{-1}\right)$

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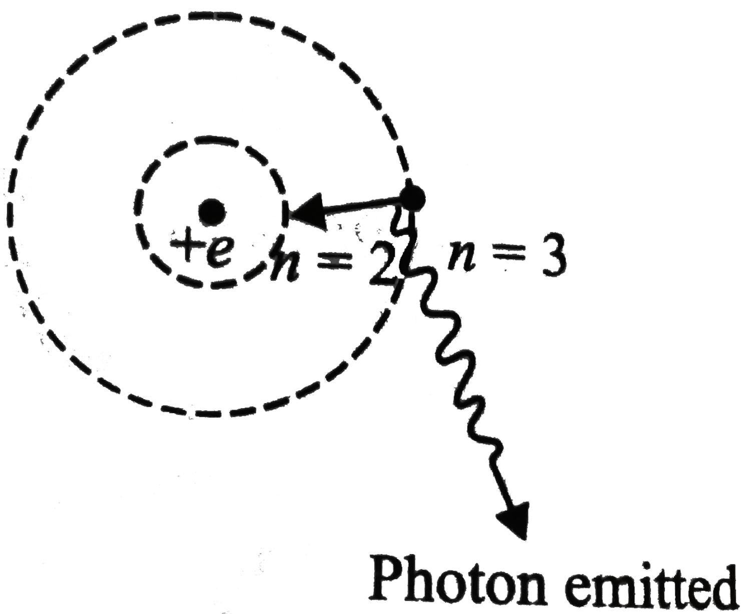
142. A single electron orbits around a stationary nucless of charge $+Ze$ where Z is a constant and e is the magnitude of electronic charge ,if respuires 47.2 e



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

a. Find the value of Z

b. Find the energy required to the electron from $n = 3 \text{ to} n = 4$

c. Find the wavelength of radiation to remove the electron from the second bohr orbit to infinity

d. Find the kinetic energy potential energy and angular momentum of the electron in the first orbit

Find the ionination energy of above electron system in electronvalt.

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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 energy required in ionise a helium atom is equal to $24.6eV$ The energy required to remove both the electron from the helium atom would be

A. $59eV$ 0

B. $81eV$

C. $79eV$

D. $40eV$

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145. Let v_1 be the frequency of the series limit of the lyman series v_2 be the frequency of the first line of th elyman series and v_3 be the frequency of the series limit of the Balmer series

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 rine ias a total of 10 lines .How many of these belong to the UV spetrum ?

A. 3

B. 4

C. 6

D. 5

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147. The transition from state $n = 4$ to $n = 3$ in a $He^{\oplus}$ ion result in ultraviolet radition Intrated radiation will be abtained in the transiion 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 face (s) about H atomic is//are

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

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

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

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 $13.22eV$ 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 excited state of $He^{\oplus}$ 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 wave leagth of the first line of lyman series of hydrogen is identical to that second line of balmer series for some hydrogen like ion X The IF_2 for X is

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 ratio of bohr's third orbit ion 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 of H atom is $13.6eV$ 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 $100 mol^{-1}$ 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. $12.09 eV$

B. $6.04 eV$

C. $42.18 eV$

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 (He^{2+}) 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 $He^{\oplus}\text{ion}(R = 1.097 \times 10^7 m^{-1})$

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164. One mole of $He^{\oplus}$ ions is excited .An anaylsis showed that 50% of ions are in the third energy level 25% are in the second energy level and the remalining ary 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 revolation in its third orbit

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167. The circumference of the second Bohr orbit of an electron in a hydrogen atom is $600nm$ Calculate the potential difference to which the electron has to be Broglie wavelength curresponding to this circumferance

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168. An electron in a Bohr orbit of hydrogen atom in quantum level n_2 has an angular momuntum $4.2176 \times 10^{-34} kgm^2 s^{-1}$ .If this electron drops from this level to the next level , find the wavelength of this spectral line (Gives $R_H = 10979cm^{-1}$)

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

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170. The number 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 the third orbit of a hydrogen atom the radius of the first Bohr of hydrogen atom is 0.53Å

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173. Calculate the energy of an electron in second orbit of an excited hydrogen atom the energy of the electron in the first Bohr orbit the energy of the electron in the 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 oth 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^(o+)

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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 $6.04eV$ Find the area of the third bohr orbit to which this electron belongs .Also repurt the atom

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177. 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. $+6.8eV$

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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. The differnce between nth and $(n+1)$ the Bohr radius of B atom is equal to be its $(n-1)$ th Bohr radius .The value of n is

A. 1

B. 2

C. 3

D. 4

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

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182. An electron an a hydrogen like species makes a transition from the oth Bohr orbit to the next outer Bohr $(\equiv n+1)$ .Find an appocimate relation between the dependence of the frequency of the photon abserbed 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 molti 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 a

D. Angular momentum of an electron is propartional of a

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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 $1.10L$ 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 $436kJmol^{-1}$.Also calculate the minimum frequency of a photon to break this bond

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187. Estimate the difference in energy between the first and second Bohr's orbit for a 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 $\lambda = 3.0 \times 10^{-8} m$? Which hydogen -like species does this atomic number correspond to ?

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188. Bohr's orbit are calledx 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 Bohr's 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 $1.1 \times 10^6 s^{-1}$ 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 the Bohr's orbit is r then the de Broglie wavelength of the electron in the third orbit will be

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 atomn?

A. Energy of the electron in the orbit is quantized

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

C. Electron revolving in different orbit have difference velocities

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

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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 not same for all hydrogen like atom and lons is 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 thurth orbit of hydrogen atom are r_1, r_2, r_3 and r_4 respectively .Then their current increases order will be

A. $r_4 < r_3 < r_2 < r_1$

B. $r_1 < r_2 < r_3 < r_4$

C. $r_4 < r_3 < r_2 > r_1$

D. Equal in all

Answer: $r_1 < r_2 < r_3 < r_4$

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197. The ratio of the fifth orbit of He^{Theta} and Li^{Theta}will be

A. $2:3$

B. $3:2$

C. $4:1$

D. $5:3$

Answer: $3:2$

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198. Which of the followin g orbits of hydrogen atom should have the value of their radius in the radius $1:4$?

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 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 H bears the ratio $1:275$ to the velocity of light M

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

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

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

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204. An electron beam in accelectrated by a potential difference of $1000K$ what is the wavelength of the w ave associated with the electron beam ? (Mass of electron $= 9.11 \times 10^{-31} kg)$

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205. What is the ratio of the velocities of CH_4 and O_2 molecules no that they are associated with de broglie waves of equal wavelength ?

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206. Which of the following is associated with a de Brogle wave of langer wavelength -a proton or an electron having same 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 has a mass of $40g$ and a speed of $45ms^{-1}$ .If the speed can be measured an accurary of 2% calculate the uncertainty in the position

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

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

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212. If the uncertainties in the measurement of position and momentum of an electron are equal calculat 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 particle 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 $589nm$ 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 $1CH_4$ and O_2 molecules so that they are associated with de Broglie wave of equal wavelegth ?

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219. The mathematical expression for the uncertainty principle is

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 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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223. Show that the wavelength of a $150g$ rubber at a velocity of $50ms^{-1}$ is short emopngh 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. Calculate the retarding potential to be applied to an eklectron to de Broglie wavelength from $1.73\text{Å} \rightarrow 2.25\text{Å}$?

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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 wavelght 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 nucertainty in its momentum be

A. Zero

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

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

D. Infinity

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229. IfE_(1),E_(2) and E_(3)` represent respectively , the kinetic energies of an elctron an alpha particle 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 correct 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 particle

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 comment on the result

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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 uncertainties in the measurement of position and momentum of an electrona re equal, calculate uncertainty in the measurement of velocity.

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. The principle quantum number of n of ann atomic in 5 .What are the position value of t ?

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243. Give the notation for the sab-shell denoted by the following quantum number:

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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-with$l = 3$?

In the shell-with$n = 3$?

In the orbital with$m_1 = +3$?

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247. Which of the following orbital are and possible ?

$2d, \Delta f, 4g$ and $6d$

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248. What is the lowest value of n that allow g orbitals

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249. How many orbitals are possible in

a. 4th energy level b. $5f$ sub-shell

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

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251. What is the difference is the angular momentum associated with the electron in two successive whits of a hydrogen atom ?

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252. What should be the value of the apin quantum number of the electron in d ? 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. $7 \text{orbitals}, 14 \quad \text{electrons}$

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

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

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

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256. The quantum number $+1/2$ and $-1/2$ for the electron spin 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. $(n-1)$ sub-shell has higher energy than m sub-shell

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

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

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

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258. The radial probability is the probability of finding electron in a small spherical shell around the nucless at a particular distance ® Hence radial probility 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 government 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. $7s6p5d4f$

B. $4f5p6s4d$

C. $7s6p5d6d$

D. $4s5d6p7s$

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263. What is the maximum number of electron in the posible sub-shell for $n+1=4$?

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. 40

C. 44

D. 100

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

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267. Arrange the electrons represented by the following sets of quantum in decreasing orbit order of energy s

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 oricutation

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 $1s2s \text{ and } 3s$ 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 mometum 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 malti-electrons atom which of the following orbitals deseribed by the three quantum number will have the same energy in the absence of megnetic and electric field ?

I.$n = 1, l = 0, m = 0$

II. $n = 2, l = 0, m = 0$

III.$n = 2, l = 1, m = 1$

IVgt$n = 3, l = 2, m = 1$

V$n = 3, l = 2, m = 0$

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^{+} (atomic number $= 25$ is $sqt(15)BM$ .The number of unpaired electron and the value of x respectivekly 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 if 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 e^(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 excied state when the val,ue 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 $n=4, l=1, m=-1, s=-1/27$

A. 31

B. 35

C. 30

D. 32

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

A. $6d_{x^2}$6d

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

C. $6d_{sp}$

D. $6p_2$

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284. The orbital having $n = 2, l = p12$ 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=+(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. $n = 3, l = 2, m = \ - 2s = \ + \frac{1}{2}$

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

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

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

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

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 the maximum number of ampaired 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 paires of orbitals. Which orbital will the lagrest effective anuclear charge ?$2s \text{ and } 3s$

4d and Delta f 3d and 3p`

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292. The bromine atom posseses $3s$ electrons It contain six electron in $2p$ orbits six electron in $3p$ orbit and five electron $4p$ orbits .Which of these electrons experience the lower effective nuclear charge ?

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293. If the value of $n+1=7$ then what should be the increasing orbit of energy of the possible sub -shells

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294. Calculate the total spin and magnitic moment for atom having atomic number $7, 24, 34 \text{ and } 36$

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

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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 $[Ar]3d^4$ 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. $\sqrt{6R}$

B. $\sqrt{2R}$

C. R

D. $2R$

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301. If nitrogen atoms had el,ectonic configuration is ? 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 $1s^2$ is not oberved 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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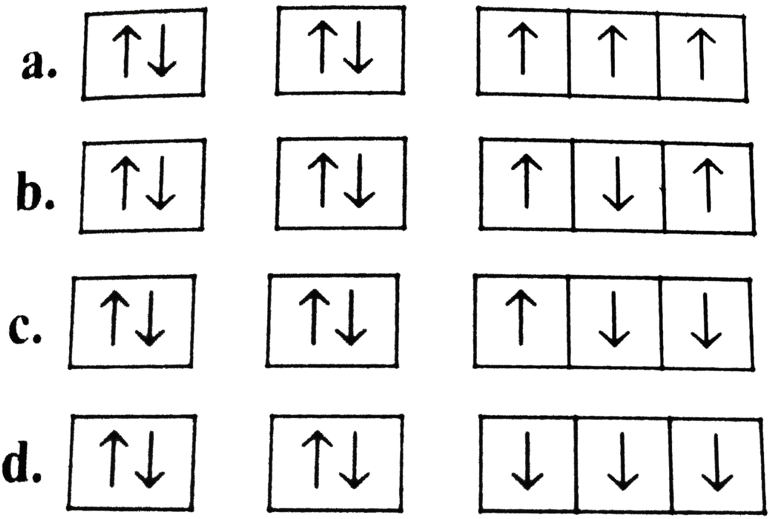
302. The less ground state electronic configeration of nitrogen atom can be represented by



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

A. There are serven principle electron energy levels

B. The second principal energy level cab be 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 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

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. 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 $n = 2, l = 0, s = +1/2$ 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. The paoli exclasion principal applies to

A. H

B. $H^{\oplus}$

C. $H^{\oplus}$

D. None of these

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313. Whaich 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 orbit can accommodate a maximum of two electron

D. None of these

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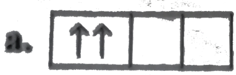
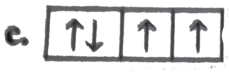
314. Which of the following is not according to the panli exclasion principal ?

A. 

B. 

C. 

D. a and b both

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

A. 16, 14

B. 11, 9

C. 16, 9

D. $34, 17$

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316. Supposing that the pauil exclesion principal is non-exitent .Which of the following is the most unacceptable 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 hond'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 $n + l = 7$ then what should be the increasing order of energy of the possible sub-shells ?

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

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

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

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

Answer: A

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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 $(n-2)s^2(n-1)s^a p^b m s^2 p^2$ 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 eklectronic configuration and indication the following in it :

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. What atoms are indicated by the following configuration ?

$[He]2s^1$

$[Ne]3s^2 3p^3$

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

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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 numbers of the less electron of an element are given below predict the atomic number and name of the element from the following quantum numbers:

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

A. $13, V$

B. $21, Se$

C. $29, Cu$

D. 28,Nì

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

A. $5, B$

B. $8, O$

C. $6, C$

D. $7, N$

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

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

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

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

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329. A compound of vanadium has a magnetic moment of $1.73 BM$ Work out the electronic configuration of vanadius 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 boelectronic 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_2PO_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 $2K, KL, 9M$, 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.Velocity 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. $._4Be^7$ capaires a K electron into its nucless .What is the mass number and atomic number of the nuclide formed ?

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338. a. An atomic orbit has $n=3$ What are the possible values of i?

b. An atomic orbital has $l=3$ when are the possible value of m ?

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339. Using the s,p, d notation , deseribe the orbit with the following number

a $n = 1, l = 0$ b. $n = 2, l = 0$ c.$n = 3, l = 3$ d. $n = 4, l = 2$e. $n = 4, l = 3$

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340. Using the Aufban principal , write the electron configuration for the gropuped srtate of the following atomic boron $(Z = 5)$ neon $(Z = 10)$ aluminum $(Z = 13)$ chlorine $(Z = 17)$ calcium $(Z = 20)$, rabidium $(Z = 13)$

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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 wave function of $2s$ electron is given by

$$W_{2s} = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left(2 - \frac{r}{a_0}\right)e^{-1a0}$$

It has a node at $r = r_p$ .Find the radiation between r_p and a

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

a. If the probability of finding an x 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 $x = z = 0 = a$?

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. Suggest the angular and spherical nodes in the following

A. $3p$

B. $3d$

C. $2s$

D. $3s$

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346. The wave function of $3s$ electron is given by

$$\psi_{3s}=\frac{1}{81\sqrt{3\pi}}\left(\frac{1}{a_0}\right)^{3/2}\left[27-18\left(\frac{r}{a_0}\right)+2\left(\frac{r}{a_0}\right)^3\right]e^{-r/3a0}$$

It has a node at $r=r_p$ .Find the radiation between r_0 and a_p

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347. T^he wave function v in the schrondinger wave equation 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 $2p$ elelctron orbitals and compare them

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349. In all, how many nodal plates are there in the atomic orbiitals 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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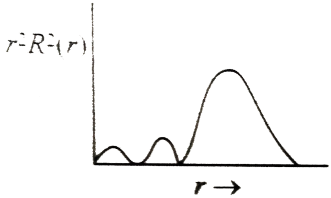
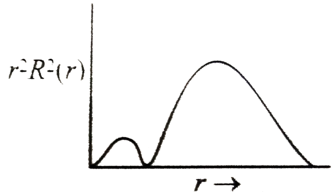
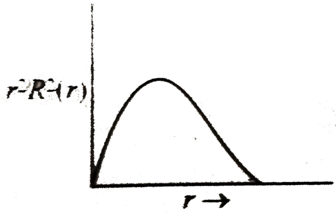
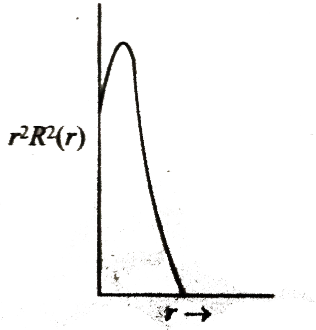
351. Which of the following radiation distribation graph coreesponds to $l = 2$ for the least value of a for which $l = 2$ is allowed ?

a. 

b. 

c. 

d. 

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352. For an electron in a hydrogen atom , the wave function Φ is proparitional to exp -r/a_p where a_0 is the Bohr's radius What is the radio of the probability of finding the electron at the nucless at the nucless to the probability of finding id=f at a_p ?

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 onder

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

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

A. $1au$

B. $2au$

C. $2.5au$

D. $4au$

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354. Suggest the angular and spherical nodes in

a.$4p$ b.$3p$ c. $3s$

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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 inhes indicates the

A. Sign of the probability distribution

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 scheodinger wave an idea of .... Quantum number

A. 4

B. 2

C. 3

D. 1

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

A. d_{xy}

B. d_{yz}

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

D. d_{x^2}

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359. The bnumber of nodal planes d orbital has

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

Answer: C

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361. a. What is the shape of ltbrltgt 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 final maximum if the first and the second if of Mg are $740kJmol^{-1}$ 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 H 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 the radiation emitted when the electron jumps from $(n+1)$ state to the ground state $\left(R = 1.0987 \times 10^5 cm^{-1}\right)$

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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 ?

Watch Video Solution

374. The ionisation energy of $He^{\oplus} is$19.6 xx 10^(-19) J "atom "^(-1) $. Calc\underline{a}tethee \ne rgyofthefirststationarystateof$li^(2+)`

Watch Video Solution

375. An Electromagnetic radiation of wavelength 242 nm is just sufficient to ionise a sodium atom .Calculate the ionisation energy of sodium in

$KJmol^{-1}$.

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376. Calculate the shortest wavelength in H spectrum of Lyman series, when $R_H = 109677cm^{-1}$.

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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 :$E_1 = 13.6eV$)

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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 $R_H = 109.737 cm^{-1}$

Watch Video Solution

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

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381. The ionisation of a H-like atom is $4R_h$

a. Calculate the wavelength radiation when an electron jumps from the first excited state to the ground state

b. What is the radius of first orbit of this atom ? ?Given $1Rh = 2.18 \times 10^{-18} J$

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382. The $IP_1$of H is $13.6 eV$ it is expoxed induced radiation .Find the wavelength of these ijnduced radiation

View Text Solution

383. 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 $-2.42 \times 10^{-12} erg$ respectively ,Calculate the wavelength of the emitted radiation when the electron drops from the third to the second orbit.

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384. The electron energy in hydrogen atom is given by $E_n = \left(-21.7 \times \frac{10^{-12}}{n^2}\right) erg$. Calculate the energy required to remove an electron completely from the $n = 2$ orbit.What is the longest wavelength (in cm) of light 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 $h = 6.62 \times 10^{-34} Js$

A. 1.9kJ

B. 1.825kJ

C. 182.5kJ

D. 18.25kJ

Answer: C

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386. $1.8g$ hydrogen atomic are excited to radiation .The stady of specits indicate that 27% of the atom are is third energy level and 15% of atom in second energy level and the rest is 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. ForHe^{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. What hydrogen-like ion has the wavelength difference the first lines

of Balmer and Lyman series equal to $59.3nm$? $R_H = 109.678cm^{-1}$

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

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390. A series of linenes in the spectrum of atomic H lies at wavelength $656.46, 486.27, 434.17, 410.29nm$ 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 can make a transition number n .The ecxited state by succesively emitting two ophoton to the first $10.20eV$ and $17.00Ev$ respectively .Alternatively, the atom from the same excited state can make a transition to the second excited state by seccessivelyemitting two photon of energy $4.25 eV$ and $5.95 eV$ respectivel,y.Determine the values oF N AND z

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392. Estimate the difference in energy between the first and second Bohr's orbit for a 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 $\lambda = 3.0 \times 10^{-8} m$? Which hydogen -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 level 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 certain transition emits 6.37×10^{15} quats per second per square .Calculate the power out put in joule equare metre per second .Given $\lambda = 632.8 nm$

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396. Find the quantum number n corresponding to the excited state of $He^{\oplus}$ ion if on transition to the ground state that ion emits two photon in succession with wavelength 108.5 and $30.4 nm$

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397. Calculate the angular frequency of an electron occapying the second Bohr orbit of He^{Θ} 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

b. Find the maximum and minimum energies of the initially emitted photon

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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.This excited atom can make transition to the first excited state by succesively emitting two photons of energies $10.20eV$ and $17.00eV$ 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 $4.25eV$ and $5.95eV$ respectively. Determine the values of n and z

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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 $17.98eV$ if the electron in Be is assumed to move in a spherical orbit with a centeral field of effective nuclearcharge (Z_{6H}) consisting of the nucless and otherelectron by haw many units of charge in the nucless shicided by other electrons? (the energy of electrons in first Bohr of H is $-13.6eV)$ If the extent of shielding by the if electron of Li atom is the same as you have calculated above , find the ionisation potential of Li

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403. Calculate the deBroglie wavelength of an electron travilling at 1% of the speed of the light

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404. A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 Ã.... What is the uncertainty involved in the measurement of its velocity ?

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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. Give the electron coeficient of the following elements $\cdot_{19} K,_{25} Mn,_{20} Ca$

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6. What is the maximum number of element that can be presents in

a. $2d$ orbitals

b. All the orbitals with $n = 3$

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7. Give the number of identical orbitals 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 quantum number has a value of 2 what are the permited values of the quantum number m ?

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11. Which of the orbitals $1p, 2s, 3p, 3f$ are not position?

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12. Which of the following sets of quantum number for orbitals in hydrogen atom has a greater energy of electrons ?

a. $n = 3, l = 2, m = +1$ b. $n = 3, l = 2,$ and $m = -1$

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13. Give the electronic of the following a $H^{\oplus}$ b.$Li^{\oplus}$ c. $F^{\oplus}$ d. $N^{\oplus}$

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14. Which of the following atoms and ions are isoelectronic (i.e. Have dor the same number of electrons) with a neon atom a C b. O^{2-} c.n^{Θ} d. $F^{\oplus}$ e. $Na^{\oplus}$ f. AI^{3+}

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15. If the energy different between the electronic stazte in $214.68 mol^{-1}$ calculate the frequency of light emited when an electron drop form the hight to the lower state planks constant , $h = 39, 79 \times 10^{-14} kJ mol^{-1}$

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16. A spectral line in the Lyman series of hydrogen atom has a wave number of $82200 cm^{-1}$ .What transition is resposible for the radiation ? $(R = 109600 cm^{-1})$

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17. Energy in the nth Bohr's is given by

$$E = \frac{-2.179 \times 10^{-18}}{n^2} Js$$

Calculate the frequency and wave number of the radiation emitted when an electron jumps from the third orbit to the second orbit $(h = 6.62 \times 10^{34} Js)$

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18. Calculate the momentum of a particle which has a de Broglie wavelength of $10 nm$

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

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20. An electron is accelerated to one -tenth the velocity of light suppose its velocity can be measurted with a precision of 1% what must be the uncertain with qa precition of 1% what must be the uncertainty in position ?

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21. What is the energy difference and the frequancy and the wavelength 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 α paricle travel towards the nucleus of a copper atom so as to arrive at a distance $10^{-13}m$ 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 potentail difference of $10.0keV$ .What is the wavelength of the electron beam

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25. If $12.0g$ body is traveling along the x-axes at $100cms^{-1}$ within $1cms^{-1}$ .What is the uncertainty in its position ?

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26. a. Calculate the radius of Bohr's first orbit for hydrogen atom and the energy of electron in this orbit .

b. Calculate the Bohr's radius for the fifth orbit of the hydrogen atom

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27. Calculate the velocity of an electron in the first Bohr orbit of a hydrogen atom

Watch Video Solution

28. Is a hydrogen atom, an electron in the first from the second orbit to the first orbit , Find out

a. The frequency of the radiation emitted

b. The wavelength of the radiation

c. The regain of the electromagnetic spectrum in which this line with fall

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29. 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 $-2.42 \times 10^{-12} erg$ respectively ,Calculate the wavelength of the emitted radiation when the electron drops from the third to the second orbit.

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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 2.17×10^{-11} ergs per atom

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32. A light wavelength $12818Å$ is emitted when the electron of a hydrogen atom drop from fifth to third quantum level .Find the wqavelemngth of the photon emitted when electron falls from third to ground level

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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 an electron in the n^{th} orbit is given by $E_n = (-2.17 \times 10^{-18}) \times \frac{z^2}{n^2} J$

Calculate the longest wavelength of light that will be needed in remove an electron from the third Bohr orbit of $He^{\oplus}$

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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 2.17×10^{-11} ergs per atom

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37. 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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38. Calculate the wavelength and energy of radiation emitted for the electron transition from infinity to stationary state of the hydrogen atom

Watch Video Solution

39. The ionisation energy of $He^{\oplus}$ is $19.6 \times 10^{-19} J \text{atom}^{-1}$. Calculate the energy of the first stationary state of Li^{2+}

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

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

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42. Calculate frequency, energy and wavelength of the radiation corresponding to the speciral line of the lowest frequency in lyman series in the spectrum of a hydrogen atom .Also calculate the energy for the coresponding line in the spectrum of Li^{2+}. $(R_H = 109677cm^{-1}, c = 3 \times 10^8 ms^{-1}, Z = 3)$

Watch Video Solution

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

Watch Video Solution

44. Find the accelerating potential (V) that must be impurated to a belium atom so that its wavelegth is $5\text{Å}\left(1a\mu = 1.67 \times 10^{-24}g\right)$

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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 regain $(R = 1.097 \times 10^7 m^{-1})$

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47. What is the final velocity of an electron accelerating through a potential of $1600V$ if its initial velocity is zero .

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48. Calculate the de Broglie wavelength for a beam of electron whose energy is $100eV$

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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. Calculate the energy required to excite two line of hydrogen gas at 1 atm and $298K$ to the first excited state of atomic hydrogen .The energy fior the disociation of H_2 bond of photon to break this bond

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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^{2+} .A chromium atom contain 17% morte neutron than the proton. Now answer the following questions

The number of unopaired electron in Cr^{2+} 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 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 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. 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 group number and period of the chomium is the periodic table atom is

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 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 electron atom can be respresentted by the symbol

A. $._{24}Cr^{50}$

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

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

D. $._{50}Cr^{24}$

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

Atomic number of neutral atom

A. 20

B. 18

C. 15

D. 25

Answer: C

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

Number of electron in valent shell

A. 5

B. 6

C. 7

D. 4

Answer: A

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

Number of electron having $n + 1 = 3$

A. 6

B. 8

C. 10

D. 4

Answer: B

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10. A nutral atom of an electron 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 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 quantum number n of the statement finaly populated is He^{Θ} ion is .

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 $8.4eV, 12.09eV$ and $15.0eV$ 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 $He^{\oplus}$ 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

When an electron of H jumps from a higher to lower energy state ,there

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 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 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 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

Number of waves made by the point when orbital 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. $\lambda_\pi \propto \frac{n}{m_\pi z}$

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

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

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

Answer: A

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20. 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 value of atomic number (Z) is

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 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 excited sate (n) of the atom is

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 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 hydrogen -like atom in the question is

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. It is impossible to determine simaltancously the position of velocity of small mictroscopic particle such as electron , proton or neutron with accoracy .This is called Heisenberg's uncertainty principal, Malthematically, it is represenites as $\Delta x. \Delta p \geq \frac{h}{4\pi}\Delta x$ is uncertainty in position Δp is uncertainty in momentum

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

Watch Video Solution

27. It is impossible to determine simaltancously the position of velocity of small mictroscopic particle such as electron , proton or neutron with accoracy .This is called Heisenberg's uncertainty principal, Malthematically, it is represenites as $\Delta x . \Delta p \geq \frac{h}{4\pi} \Delta x$ 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 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 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. 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

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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

If HUnds rule is not abeyed by some element given below then which atom has maximum magnitic moment

A. Fe

B. Cu

C. Cr

D. Mn

Answer: C

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30. 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 element with lowest atomic number follows rule (b)?

A. _ $(19) K$

B. _ $(24) Cr$

C. _ $(12) Na$

D. _ $(29) Cu$

Answer: A

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31. 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

In which element (c)(i) is folowed ?

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. $\frac{3^2 R}{4^2}$

D. $3^2 R$

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. $\frac{119}{8\$}$

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 elecvtron 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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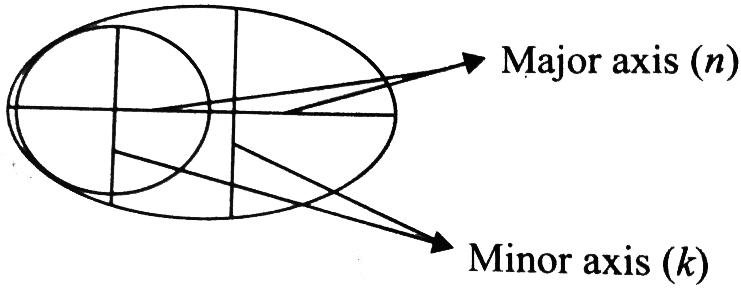
37. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ 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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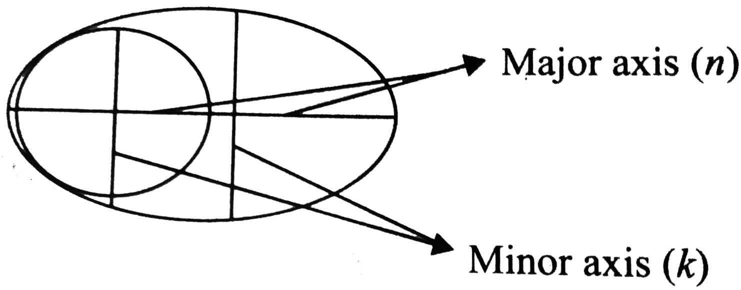
38. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ 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

The ratio of $n/k = 2$ does not related to

A. 2p

B. 4d

C. 6f

D. 2s

Answer: D

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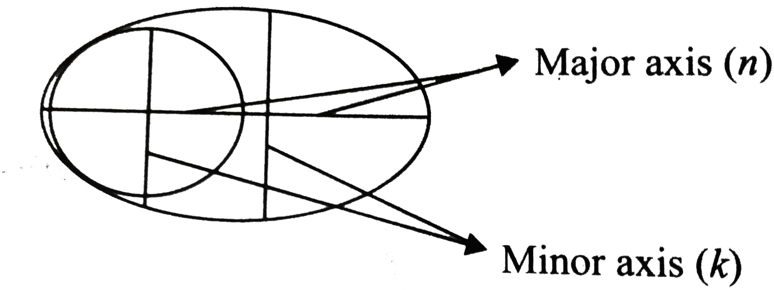

If n is the major axis and k is th e minor axis , then $n/k = 1$ for circular shape white $n/k > 1$ for elliptical shape

Which shape is used to be circuit having n/k value

A. $3/3$

B. $4/3$

C. $3/2$

D. $1/2$

Answer: A

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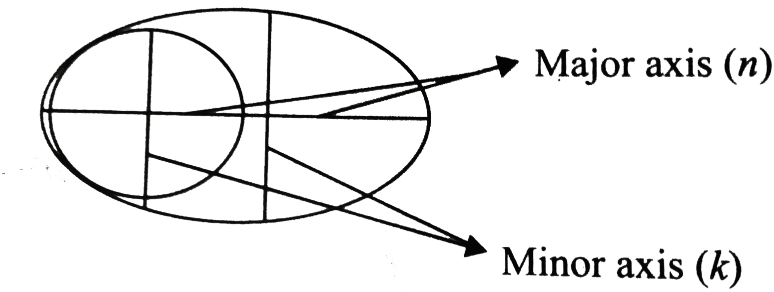
40. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ 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 $n/ki > \; > 1$ value?

A. 7s

B. 5p

C. 3d

D. 4d

Answer: C

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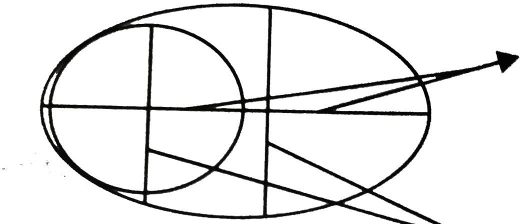
41. The shape of orbitals are related to the ratio of principal quantum number (n) to substiary quantum number (k,a modifacation of Bohr-sommerfield theory).The value of k for any shell has a value ranging betwe3en n to l .The amximum value for k is given for x sub-shell white k becomes with p, d,f........ 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 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

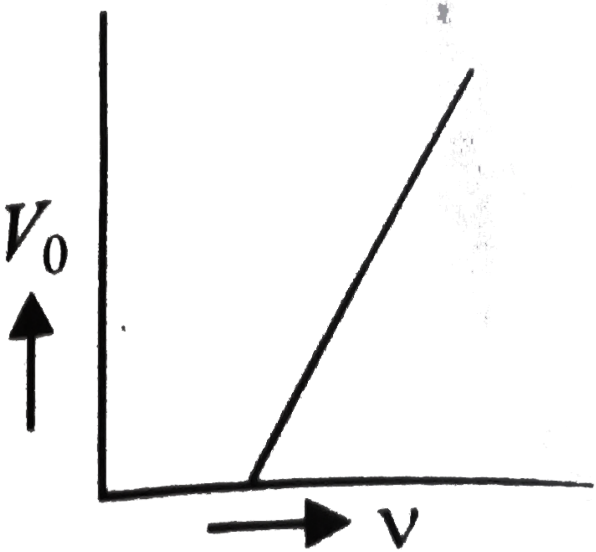
Maximum kinetic energy of ejected electron = Aborbed energy - Work function

$$\frac{1}{2}mv_{\max}^2 = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - \frac{1}{\lambda_n}\right]$$

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. plak's constant

D. ratio of plank's constyant to charge on electron

Answer: D

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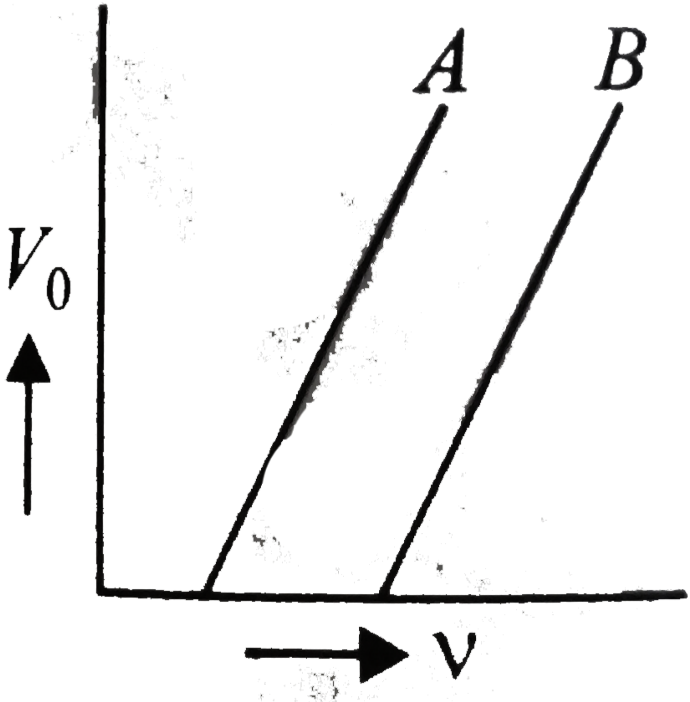
$$\frac{1}{2}mv_{\max}^{2} = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

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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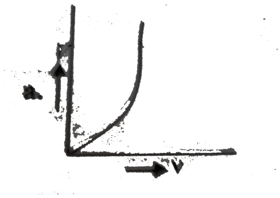
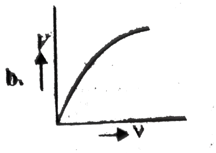
$$\frac{1}{2}mv^2_{\max} = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

Where v_n and λ_0 are thereshold frequency and threshold wavelength respectively

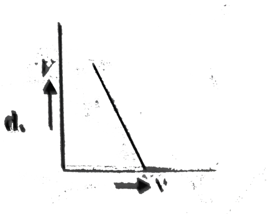
Sopping potential : it is the miximum potential at which the photoelectric current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

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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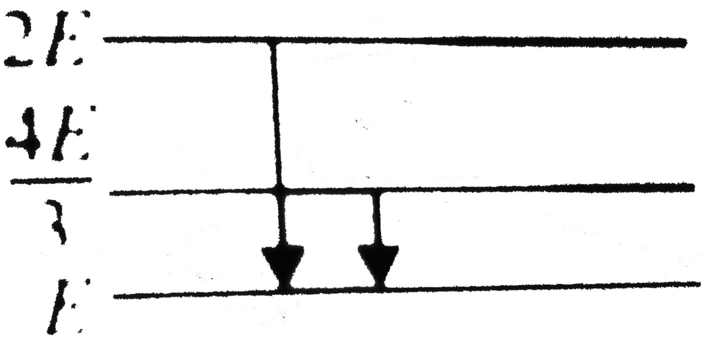
45. The emission of electrons from a metal surface exposed rto light radaition of appropriate wavelength is called photoelectroic effect .The emmited electron are called photo=-weklectron work function of threshold energy may be defined as the minimum amount of energy required to ejercted electron from a most surface .According to Einstein Maximum kinetic energy of ejected electron = Aborbed energy - Work function

$$\frac{1}{2}mv_{\max}^2 = h(v) - h(v_n) = hv\left[\frac{1}{\lambda} - 0\frac{1}{\lambda_n}\right]$$

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 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

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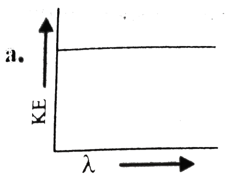
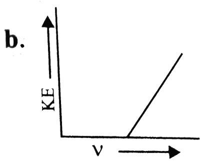
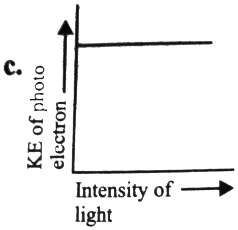
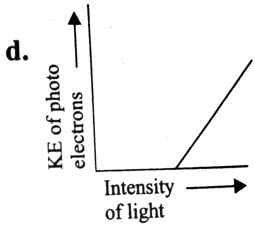
current becomes zero if V_0 is the stopping potential $eV_0 = h(v - v_0)$

Which graph is correct ?

A. 

B. 

C. 

D. 

Answer: C

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47. It is 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

Electron transition from $4s$ to $3s$ orbital is forbiddeon meating that it cannot because

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

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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

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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 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

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. Cground state element conifiguration of nitrogen atom can be represented as

A. $\boxed{\uparrow\downarrow}\ \boxed{\uparrow\downarrow}\ \boxed{\uparrow|\uparrow|\uparrow}$

B. $\boxed{\uparrow\downarrow}\ \boxed{\uparrow\downarrow}\ \boxed{\uparrow|\downarrow|\uparrow}$

C. $\boxed{\uparrow\downarrow}\ \boxed{\uparrow\downarrow}\ \boxed{\uparrow|\downarrow|\downarrow}$

D. $\boxed{\uparrow\downarrow}\ \boxed{\uparrow\downarrow}\ \boxed{\downarrow|\downarrow|\downarrow}$

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 value s of the excited state s for electron in $He^{\oplus}$ is (are)

A. $-54.4eV$

B. $-13.6eV$

C. $-3.4eV$

D. $-6.4eV$

Answer: B::D

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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 specits accure IR region

A. Lyman

B. Pashen

C. Bracket

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

Watch Video Solution

8. Which of the following properies by cathode my?

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

Watch Video Solution

10. The energy of an electron in the first Bohr orbit of H atom is $-13.6eV$

The potential energy value (s) of excited 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 this metal foil mass of then 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. Nutron

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 orbit of the following statement (s) is//are correct ?

A. Electrons behavaves 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$(n+1)$ is more then 3 and than 6 , then what will be the possible number of orbitals ?

A. 6

B. 9

C. 10

D. 13

Answer: D

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20. Which of the following is//are not indicated by the sign of lohes is 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 streem 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 person 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 abserbs 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. $12 \text{ and } 4$

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. $5 \rightarrow 3z$

B. $4 \rightarrow 1$

C. $3 \rightarrow 1$

D. $5 \rightarrow 4$

Answer: C

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32. Ratherford's α scattering led to the folowing concliusions

A. Atom has hargely empty space

B. The centre of the atom has positively charged nucless

C. The size of the nucless is very small as compared to the size of the atom

D. Electrons revolve aroung the nucless

Answer: B::C::D

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33. 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. They produce effect

D. They can effect photographic plate

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 certqain regain 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 principal is not valid for

A. Moving electron

B. Motor car

C. Stationary particles

D. All of the BOVE

Answer: B::C

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38. Which of the following statement are correct for an electron that has $n = 4$ and $m = -27$

A. The electron may be in a d-orbital

B. The electron in the fourth principal electyronic shell

C. The electron may be in a p- orbital

D. 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 d=same shape but the overal l size in creases 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 plsys an important rule in determining molecular grometries

C. The change closed of a single electron ibn $2p_x$ atomic

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 but for a given the lower the value of ? The lower the energy

B. An electron close to the nucless experiences a large electrostate attraction

C. For a given value of n an electron penetrates of the nucless more than n p el,ectron 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 mass

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

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 will the orbital desigrated by $n=2, l=1$?

A. Spherical

B. Tetrahedral

C. Dumb-shell

D. Pyramidil

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 a characterists of plank's quantum 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 number is an impossible arrangement ?

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

B. $n = 4, m = 3, s = +1/2$

C. $n = 5, m = 2, s = -1/2$

D. $n = 3, m = -3, s = -1/2$

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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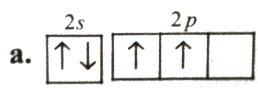
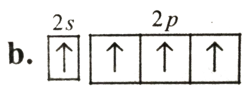
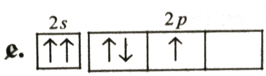
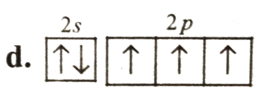
15. For which of the following electron distribution in ground state the (auli's exclasion principal is violated ?

A. 

B. 

C. 

D. 

Answer: C

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16. Which of the following orbital does not same ?

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 $s\pi$ represents

A. Orbit

B. Wave function

C. Wave

D. Radial probability

Answer: B

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20. Heisenherg's uncertainty principal rules out the exact simulateous measurment 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 $3, 2 - 2, \ +1/2$

$3, 0, 0, \ +1/2$

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 electronsame

D. None of the statement is correct

Answer: B

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22. When electric transition occurs from higher energy state to lower energy state with energy difference equal to ΔE electron volts , the wavelkength of the line emitted is apporomately equal to

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

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

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

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. Auther 's mass spectrogtain experiment

Answer: C

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25. A cricket ball of $0.5kg$ moving with a velocity of $100ms^{-1}$The wavelength associated with in motion 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. In hydrogen spectyrum the series of lines appearing in altra violet region of electronmagnetic spectyrum are called

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 work function of a metal is $4.2eV$ If radiation of 2000Åfall on the metal then the kinetic energy of the fastest photoelectrn is

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 when irradiated to light $(v = 3.2 \times 10^{16} Hz)$ emit photoelectrons with twice kinetic energy as did photoelectrons when the same metal is irradiation by light $(n = 2.0 \times 10^{16} Hz)$ The v_0 Threshold frequency) 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 $4s$ orbital is

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. Ther ratio of the three Bohr is

A. $1:1/2:1/3$

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 spection of electron from metal is $350nm$then work function for the photoelectric emission is

A. $1.2 \times 10^{-18} J$

B. $1.2 \times 10^{-20} J$

C. $6 \times 10^{-29} J$

D. $6 \times 10^{-12} J$

Answer: B

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35. The havest 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. They do not have same number of nuctrons

B. They have dissimilar mass number

C. They have different energy level schemes

D. They have different numebr 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 the pllotoelectrons does not depends upon

A. 32

B. 42

C. 30

D. 34

Answer: C

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39. The kinetic energy of thephotoelectrons 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 experimetal evidence for dual nuture of mater 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 symmetrqacal

D. Unsymetrical

Answer: C

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45. For a given principal level $n = 4$ the energy of its subshells is of the odrer

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 choride impqarts a yellow colour to the Bunsen flame .This can be interpreted due to the

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. How many unpaired electrons are there in Ni^{2+}?

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 serven principle electron energy levels

B. The second principle energy levels has four sub-energy levels and contain a maximum of right electron

C. The principle energy levels N cn have a maximum of 32 electrons

D. The$4s$sub energy level has hight energy than $3d$ subenergy level

Answer: C

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50. Any p arbital can accommodate up to

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 releted to the

A. Size of the orbital

B. Spin angular momentum

C. Orbital angular momentum

D. Orientation of the orbit in space

Answer: D

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52. Rutherford's scattering experiment in related to the size of the

A. Nucleus

B. Atom

C. Electron

D. Neutron

Answer: A

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53. The number of sperical nodes in $3p$ orbital 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 gt 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 hydrogen atom is its ground state is $-13.6eV$ The enrgy 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. At $200^\circ C$ hydrogen molecules have velocity $2.4 \times 10^5 cms^{-1}$ The de Brogelie waqvelength in this case is approximately

A. $1Å$

B. $1000Å$

C. $100Å$

D. $10Å$

Answer: A

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58. Which combinations of quantum number n, l, m, s for the electron in an atom does not provide a permission solution of 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 $15200cm^{-1}$ The wave number of the first Balmer line of Li^{2+} ion is

A. $15200cm^{-1}$

B. $60800cm^{-1}$

C. $76000cm^{-1}$

D. $136800 cm^{-1}$

Answer: D

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60. The radius of second Bohr's orbit is

A. $0.053 nm$

B. $\frac{0.053}{4} nm$

C. $0.053 \times 4 nm$

D. $0.053 \times 20 nm$

Answer: C

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61. The set of quantum not applicable to 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. The 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. In the above question $(Q, 63)$ the number of spectral lines orbitals in Bohr spectrum of hydrogen atom when an electron is excited from 2nd orbit to 5th arbit,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 lngest 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 n causes photoelectric emmission from a surfece with thereshold .The de Broglie wavelength λ of the photoelectrn emitted is given as

A. $Delatn = \dfrac{h}{2m\lambda}$

B. $Delatn = \dfrac{h}{\lambda}$

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

D. $\lambda = \sqrt{\dfrac{h}{2m\Delta n}}$

Answer: D

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66. The important principals that do not help in assigning electronic configguration to atoms are

A. Authan rule

B. Hend's rule

C. Heisenberg's uncertainity principle

D. Pauil's exciasion principle

Answer: C

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67. The Total spin and magnetic number far the atom with atomic number 7 are

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. The Total spin and magnetic number far the atom with atomic number 24 are

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

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

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

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

Answer: A

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69. A natural atom of an element has $2K, 8L, 9M$ and $2N$ electrons .The atomic number of element is :

A. 20

B. 21

C. 22

D. 23

Answer: B

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70. A natural atom of an element has $2K, 8L, 9M$ and $2N$ electrons .The atomic number of element is :

The total number of s electons are

A. 8

B. 6

C. 4

D. 10

Answer: B

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71. A natural atom of an element has $2K, 8L, 9M$ and $2N$ electrons .The atomic number of element is :

The total number of p electons are

A. 6

B. 12

C. 18

D. 24

Answer: B::D

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72. A natural atom of an element has $2K, 8L, 9M$ and $2N$ electrons .The atomic number of element is :

The total number of d electons are

A. 1

B. 2

C. 3

D. 4

Answer: A

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73. A natural atom of an element has $2K, 8L, 9M$ and $2N$ electrons .The atomic number of element is :

The total number of unpaired electons are

A. 1

B. 2

C. 3

D. 4

Answer: A

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74. A natural atom of an element has $2K, 8L, 9M$ and $2N$ electrons .The atomic number of element is :

The valency of element is

A. $+2$

B. $+3$

C. $Both + 2 \text{ and } + 3$

D. -1

Answer: C

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75. An nodel of N has vapour density 46 find the total number of electron in its $92g$. ($N_A =$ Avogdro'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 ajnd $4th$ orbit are

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

B. $\frac{1}{\sqrt{2}}\frac{h}{2}, \frac{2h}{\pi}, 0$

C. $0, \frac{\sqrt{2h}}{\pi}\frac{4h}{\pi}$

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. Be^7 captures a K electron into its nucless .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 $n=4$ to $n=2$ of $He^{\oplus}$ spectrum ?

A. $n_1 = 1$ "to" $n_2 = 2$

B. $n_1 = 2 \text{to} n_2 = 4$

C. $n_1 = 1 \text{to} n_2 = 3$

D. $n_1 = 2 \text{to} n_2 = 3$

Answer: A

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80. The wavelength of H_{α} line of Balmer series is $X\text{Å}$ what is the $X of H_{\beta}$ line of Balmer series

A. $X\dfrac{108}{80}\text{Å}$

B. $X\dfrac{80}{108}\text{Å}$

C. $\dfrac{1}{X}\dfrac{80}{108}\text{Å}$

D. $\dfrac{1}{X}\dfrac{108}{80}\text{Å}$

Answer: B

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81. The shortest and longest wave number is H spectrum of Lyman series is (R = Rydherg constant)

A. $\dfrac{3}{4}R, R$

B. $\dfrac{1}{R}, \dfrac{4}{3}R$

C. $R, \dfrac{4}{3}R$

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

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 orbitrary units) were found on a series of oil droplets $2.30 \times 10^{-15}, 6.90 \times 10^{-15} \times 1.38 \times 10^{-14}$ $, 5.75 \times 10^{-15}, 3.45 \times 10^{-15}, , 1.96 \times 10^{-14},$

The magnitude of charge on the electron (in the same unit) is

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 photon both as wave motion and as a streams 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. Series series $n_1 = 2, n_2 = 3, 4, 5. \ldots .$

C. Paschen series $n_1 = 1, n_2 = 3, 4, 5. \ldots .$

D. Brakett series $n_1 = 4, n_2 = 5, 6, 7. \dots .$

Answer: C

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88. If Aufbau rule is not followed in filling of suborbitals , then block of the element will change in

A. $K(19)$

B. $Sc(21)$

C. $V(23)$

D. $Ni(28)$

Answer: A

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89. If Hind's rule is not followed , magnetic moment of Fe^{2+}, Mn^{+} and Cr all having 24 electron will be in order

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 and potential energy of an electron in a Bohr of a hydrogen -like species is

A. $1 / 2$

B. $-1 / 2$

C. 1

D. -1

Answer: B

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92. The ratio of kinetic energy and total energy of an electron in a Bohr of a hydrogen like species 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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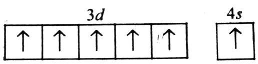
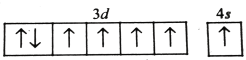
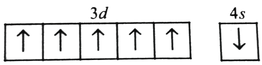
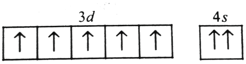
94. Which of the following arrangements of electron is mostly likely to the stable ?

A. 

B. 

C. 

D. 

Answer: A

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95. If velocity of an electron in Ist orbit of AH atoms is V , what will be the velocity in 3rd orbit of Li^{2+} ?

A. V

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

C. $3V$

D. $9V$

Answer: A

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96. The energy of an electron in the Bohr orbit for hydrogen is $-13.6eV$ .Which of the following is a possible excited state for electron in Bohr orbit of hydrogen atom ?

A. $-3.4eV$

B. $-6.8eV$

C. $-1.7eV$

D. $13.6eV$

Answer: A

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97. The spectral line abtained 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 Balmer series of hydrogen atom is $656.1nm$the wavelngth of the second line of this series would be

A. $218.7nm$

B. $328.0nm$

C. $486.\ nm$

D. $640.0nm$

Answer: C

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101. The enrgy of an electron in the first Borh orbit of H atom is $-13.6eV$

The possible energy values (s)of the excited state (s) for electron in bohr orbitsw of hydrogen is (are)

A. $-3.4eV$

B. $-4.2eV$

C. $-6.8eV$

D. $+6.8eV$

Answer: A

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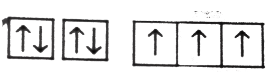
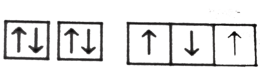
102. Ground state electronic conifiguration of nitrogen atom can be represented as

A. 

B. 

C. $\boxed{\uparrow\downarrow}\,\boxed{\uparrow\downarrow}\quad\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

D. $\boxed{\uparrow\downarrow}\,\boxed{\uparrow\downarrow}\quad\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

Answer: A::D

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

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

Answer: B

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104. The wavelength associated with a golf hall weight $200g$ and moving at a speed of $5mh^{-1}$ is of the order

A. $10^{-10}m$

B. $10^{-20}m$

C. $10^{-30}m$

D. $10^{-40}m$

Answer: C

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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 number for the unpaired electron of chlorine atom is

$n \quad l \quad m_1$ " " $n \quad l \quad m_1$

A. $2 \quad 1 \quad 0$

B. $2 \quad 1 \quad 1$

C. $\quad 1 \quad 1$

D. 3 0 0

Answer: C

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109. The orbital diagram in which the Aufhan principle is violated is

A. a. 2s $\boxed{\uparrow\downarrow}$ 2p $\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{}$

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

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

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

Answer: B

Watch Video Solution

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

Watch Video Solution

111. Atomic radil of flaorine and meon 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 proton in the isotope of hydrogen is

A. 6

B. 5

C. 4

D. 3

Answer: D

Watch Video Solution

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. The outer electronic configuration of the ground state chromium atom is $3d^4 4s^2$

B. Gamma rays are electroomagnetic radiations of wavelength of $10^{-6} cm \text{to} 10^{-5} cm$

C. The energy of the electron in the $3d$ orbital is less than that in the $4s$ orbital of a hydrogen atom

D. The electron density in the xy plane in $3d_{s^2 - y^2}$ orbital is zero

Answer: C

Watch Video Solution

116. Which of the following is true ?

A. Diapositive zine exbibits paramagenetism due to loss of two electron dfrom a $3d$ orbitals of nutrqal atom

B. In β emmision from a nucless , the atomic number of the diagram element decreases by 1

C. The emission of one α particle from a radioactive atom result in the decreases of atomic n umber by 2 and mass number by 4

D. The successive atom result in the decrease of atomic number by 11

Answer: C

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117. Which of the following is true ?

A. Neutron 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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

120. Which of the following is true ?

A. The ionisation energuy 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 unsertainty 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

Watch Video Solution

121. Which of the following is false?

A. The enrgy 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 orbityal is given as $m\left(\frac{h}{12\pi}\right)$

Answer: B

Watch Video Solution

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

Watch Video Solution

123. Which of the following is true ?

A. The half -filled and filled elkectronic configuration are less stable than the other congfiguration having the same number of electron

B. The symbols s for the orbitals having $l=0$ has iots origim=n from the term spherical symmetrical

C. The insreasing order for the value of e//m (charge //mass) for eletron (e) proton (p) neatron (n) and alpha partickle (u) is $nit\alpha itpite$

D. The energy of photon having wavelength $800nm$ is larger than having $400nm$

Answer: C

Watch Video Solution

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

Watch Video Solution

125. Which of the following is false?

A. Breaker spectral series for which $n_1 = 4$ and $n_2 = 5, 6, 7. \ldots$ 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

Watch Video Solution

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

Watch Video Solution

127. Which of the following is false?

A. The orbital,s are no more degenerate in the presence of a magnetic field

B. The spin quantum number was introduced to explian the spilitting of specvtral lines of hydrogen atom in the presents of a magnetic field

C. Pauil exelssion principle is followed by fermious which have half integral spins

D. The energy of an orbitals in an atomn remains the same with increases in the possitive charge in its nucleus

Answer: D

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Exercises Assertion And Reason

1. Assertion (A) :F atom has less electron 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

Watch Video Solution

2. Assertion (A) : Nuclide AI_{13}^{30} is less stable than Ca_{20}^{40}

Reason (R) : Nuclide having odd number of proton and neuctrons 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

Watch Video Solution

3. Assertion (A) : The first IE of Be is greater than that of B

Reason (R) : $2p$ orbitals is lower in energy than $2s$

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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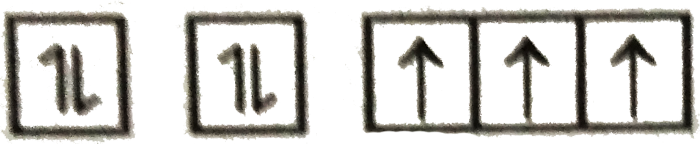
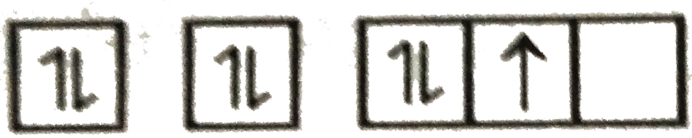
4. Assertion (A) : The electronic configuration of nitrogen atom is represented as



and not as



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

Watch Video Solution

5. Assertion (A) : The atomic radil of the electrons of oxygen family are smaller than the atomic radil of corresponding electrons of the nitrogen family

Reason (R) : The members of oxygen family are all more electromagative and thus have lower value of nuclear tahn those of the nitrogen famoly

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. Assertion (A) : For $n = 3, l1$ may be $0, 1$ and 2 and m may be $0, \pm 1$ and $0, \pm 1$, and ± 2

Reason (R) : For each value of n, there are 0 to $(n - 1)$ possible value of l for eachvalue of l , there are $0 \rightarrow \pm l$ valie 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

Watch Video Solution

7. Assertion (A) : An orbital cannot have more than creat electron

Reason (R) : The two electrons is an orbital creat opposite mabnitic field

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

Watch Video Solution

8. Assertion (A) : The configuration of B atom cannot be $1s^2 2s^2$

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

View Text Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

12. Assertion (A) : Ionisation potential of Be (atomic number 4) is than B (atomic number 5)

Reason (R) : The first electron released fromm Be is of p orbitals but that from B is of a 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

Watch Video Solution

13. Assertion (A) : In rutherford's gold foil experiment, very few α particle are defected back

Reason (R) : Nuclear present inside the atom is heavuy

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

View Text Solution

14. Assertion (A) : Limiting line is the balmer series ghas a wavelength of $364.4nm$

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 planqaqr 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 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 spectrical 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

View Text Solution

20. Assertion (A) : The radial probability of$1s$ electrons first increases,till it is maximum at 53Å and then decreases to zero

Reason (R) : Bohr's radius for the first is 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

Watch Video Solution

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 electrons atlest same quantum number for 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 rine ias a total of 10 lines .How many of these belong to the UV spetrum ?

A. 3

B. 4

C. 5

D. 6

Answer: B

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4. The ucertianity in the possition of an electron is equal to its de Vbroglie wavelength .The minimum peremit error in its measurement of velocity under circunstance will be qapproximately

A. 4

B. 8

C. 16

D. 22

Answer: B

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5. The sum of all the quantum number of helium atomm is

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

6. The maximum number of dectrens that can be accomodeated in an orbital is

A. 1

B. 3

C. 2

D. 4

Answer: C

Watch Video Solution

7. The orbital angular mometum quantum number of the state s_2 is

A. 0

B. 2

C. 1

D. 3

Answer: C

Watch Video Solution

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

Watch Video Solution

11. If each hydrogen atom in the ground state $1.0 mol of H$ atom are excited by axeited by absorbing photon of energy $8.4eV, 12.09eV \text{ and } 15.0eV$ of energy, then 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 ....

Watch Video Solution

3. The charge on α particle is ....The charge on proton

Watch Video Solution

4. Neutron was discovered by ....

Watch Video Solution

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 ....white the shape of p orbital

Watch Video Solution

7. The shape of orbital is determined by ....quantum number

Watch Video Solution

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 charaters of electron was experimenally 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 m_(1) 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 possition 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 all electromagnetic radiation is ....

Watch Video Solution

20. The $2p_x, 2p_y$ and $2p_z$ orbitals of 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..........

Watch Video Solution

22. In hydrogen atom, the order of energies of sub-shell of third energy level is ....

Watch Video Solution

23. The electronic configuration of Ti^{2+} ion is ....

Watch Video Solution

24. What is the difference in the angular momentum associated with the electron in two successive orbits of a hydrogen atom?

Watch Video Solution

25. The orbital angular momentum of an electron in $2s$ orbital is ....

Watch Video Solution

26. If uncertainty in possition of electron is zero, then the uncertainty in its momentum would be ....

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 el,ectron is 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 ......

Watch Video Solution

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 quantum number(s)...........

Watch Video Solution

41. The angular momentum of an in a 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

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. The orientation of an orbital is govermed by the quantum number known as .... and is rerresented by the suymbol ....

Watch Video Solution

47. d orbitals are fold degenerate and are speclled as ....

Watch Video Solution

48. the p ,orbital has zero ....of occurate and are spelled as ....

Watch Video Solution

49. According to ....rule, nitrogen atom has ....unpaired electrons

Watch Video Solution

50. The number of orbitals is 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 otomic mass unit is quivvalent to .... Energy

Watch Video Solution

54. The light radiations with discrete quantities of energy are called ....

Watch Video Solution

55. Wave functions of electrons in atoms and molecules are called ....

Watch Video Solution

56. The $2p_x$, $2p_y$ and $2p_z$ orbitals of atom have identical shapes but differ in their ....

Watch Video Solution

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. Electron was discovered by Goldstein

Watch Video Solution

7. Electron has wave rature as well as particle nature

Watch Video Solution

8. The velocity of the electron is maximum in the Bohr's first orbit.

Watch Video Solution

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

Watch Video Solution

19. Half-filled and fully-filled orbital orbitals are more stable

Watch Video Solution

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

Watch Video Solution

22. The magnetic quantum number gives the orientation of electron clouds with respect to external magnetic field

Watch Video Solution

23. The electron distribution is sheprically symmerical for $l = 2$

Watch Video Solution

24. For hydrogen atom , the energies of the sub-shells $4s$, $4p$, $4d$ and $4f$ are in the order $4f > 4d > 4p > 4s$

Watch Video Solution

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 $s > p > d > f$

Watch Video Solution

28. The $3g$ orbital is not possible

Watch Video Solution

29. A single photon excites only a single electron

Watch Video Solution

30. An electron can absorb more than one photon simultaneously .

Watch Video Solution

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 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 orbital momentum 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 element 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 proton in the isotope 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

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7. Ground state electronic conifiguration of nitrogen atom can be represented as

A. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\quad\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$

B. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\quad\boxed{\uparrow}\boxed{\downarrow}\boxed{\uparrow}$

C. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\quad\boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$

D. $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\quad\boxed{\downarrow}\boxed{\downarrow}\boxed{\downarrow}$

Answer: A::D

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Archives Single Correct

1. Rutherford's experiment on the scattering of α particle showed for the first time that the 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. Any p arbital can accommodate up to

A. Four electrons

B. Six electrons

C. Two electrons with parallel spins

D. Two electrons with opposite spins

Answer: D

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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

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5. Which electronic level would allow the hydrogen atom to absorbe 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 value of $e/m(\text{charge}/\text{mass})$ for electron€, 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 number for the valence (outermost) electron of radiation $(Z = 37)$ 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

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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 conclasion that

A. Mass and energy are related

B. Electrons occupy buroed deep in the nucleus

C. Neutrons are huried deep in the nucleus

D. The point of impoact with mater 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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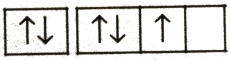
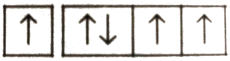
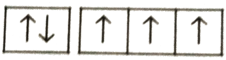
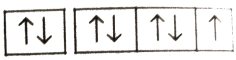
16. The orbital diagram in which the Aufbau principle is violated is

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 number for the unpaired electron of chlirine atom is

	n	l	m
a.	2	1	0
b.	2	1	0
c.	3	1	1
d.	3	0	0

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 photon 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. The orbital angular momentum of an electron in $2s$ orbital is

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 possible energy values (s) of the excited state (s) for electron in bohr orbits 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 quantum number n and l

i. $n = 4$ ii. $n = 4, l = 0$ iii. $n = 3, l = 2$ iv. $n = 3, l = 1$

Can be palced in the order of increasing energy from the lowest to highest,its

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 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

.This represents its

A. Excited state

B. Ground state

C. Cationic form

D. Anionic form

Answer: B

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29. The wavelength associtated with a golf ball weight $200g$ and moving

at a speed of $5mh^{-1}$ is of the order

A. $10^{-10}m$

B. $10^{-20}m$

C. $10^{-30}m$

D. $10^{-40}m$

Answer: C

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30. The number of nodes palnes in a p_(x) 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 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 el,ectonic configuration is ? 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 $1s^2$ 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 nodews 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 $LiNaKMgCuAgFePtW\phi(eV)2.42.32.23.74.84.34.76.34.75$

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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. Elements of the same number but of different atomic number are known as ....

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4. The ancertainity principle and the concept of wave nature were given by .... respectively.

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5. Wave function of electron in atoms and molecutes are called ....

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6. The light radiations with discrete quantities of energy are called ....

Watch Video Solution

7. The $2p_x 2p_y$ and $2p_z$orbital of 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 $3d^2, 4s^2$

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2. The energy of the elkectron in the $3d$ orbital is less than that in the $4s$ orbital in the hydrogen atom

View Text Solution

3. γ rays are electromagnetic radiation of wavelength of $10^{-6} \text{ to} 10^{-5} cm$

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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 langer charge

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Archives Subjective

1. Naturally occureing boron consists of two insotopes whose atomic weight are 10.01 and 11.01 The atomic weight of the natural boron is 10.81 Calkculate the precentage of e ach isotopes 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 $-2.42 \times 10^{-12} erg$ 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 is Bohr orbit $n = 2$ return to the orbit $n = 1$ in the hydrogen atom .The ionisation potential of the ground state hydrogen atom is 2.17×10^{-11} ergs 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 $E_n = \left(-21.7 \times \frac{10^{-12}}{n^2}\right) erg$ Calculate the energy required to remove an electron completely from the $n = 2$ .What is the longest wavelength (in cm) of light can be used to cases 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 oth 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^{Θ} ion

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9. What transition in the hydrogen spectron would have the same wavelength as the Balmer transition $n = 4$ to $n = 2$ of He^{Θ} spectrum ?

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10. Estimate the difference in energy between the first and second Bohr's orbit for a hydrogen atom At what minimum atomic number , a transition from $n = 2 \rightarrow n = 1$ energy level would result in the enmission of X - rays with $\lambda = 3.0 \times 10^{-8} m$? Which hydogen -like spectrium does this atomic bnumber corresponding to ?

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11. Find out the number of waves made by a Bohr's electron in one complete revolution in its $3rd$ orbit.

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12. Ioline molecule dissociated into atom after abesrbing light of 4500Å If can quantum of radiation is absorbed by each molecule, energy of $l_2 = 240 kJmol^{-1}$

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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 vacume innitially slowly .Extimate the average total energy of an electron in its ground state in a hydrogen atom as the work done in the above neutrallisation process .Also if the magnitude of teh average kinetic enerhy is half the magnitude of teh average potenrtial energy .Find teh 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 beb acceleration so that its wavelength becomkes equal to 1.54Å

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16. With what velocity should anα paricle towards the nucless of a copper atom so as to errive at a distance $10^{-3}m$ from the nucless 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 vanadius in the compound

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18. The wavelength of high energy transition of H atom is $91.2nm$ Calculate the corresponding wavelength of He atom

Watch Video Solution

19. a.The schrodinger wave equation for hydrogen atom is

$$\psi_{2s} = \frac{1}{4\sqrt{2\pi}}\left(\frac{1}{a_0}\right)^{\frac{3}{2}}\left(2 - \frac{r_0}{a_0}\right)e^{\left(-\frac{r}{a}\right)}$$

When a_0 is Bohr's radius Let the radial node in $2s$ be n at Then find r_0 in terms of a_0

b. A base ball having mass $100g$ moves with velocity $100ms^{-1}$.Find the value of teh wavelength of teh base ball

Watch Video Solution

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 qare negatively charged particle ?

Watch Video Solution

3. Calculate the mass and charge of l mol of electrons

Watch Video Solution

4. Calculate the number of elctron which will together weigh $1g$

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 electron is 1 mol of qammonia

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, neutron in a species are 18, $16$and 16 respectiveluy Assigs proper symbols

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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 $2.4cm$

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Concept Applicationexercise(4.2)

1. Why Bohr orbit are also know as energy levels ?

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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 are emitted ?

Watch Video Solution

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^{Θ} in the ground state ?

Watch Video Solution

6. An electron in 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, $\left(h = 6.6 \times 10^{-34} kgm^2 s^{-1}\right)$

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9. Calculate the wavelength a particle of mass $m = 6.6 \times 10^{-27} kg$ moving with kinetic energy $7.425 \times 10^{-13} J \left(h = 6.6 \times 10^{-34} kgm^2 s^{-1}\right.$

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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 $aplha$ particle moves with a velocity of $3.28 \times 10^3 ms^{-1}$ Calculate the wavelength of the α particles.

Watch Video Solution

12. What is the wavelength associated with welectron traviling at one throusmath the speed of light ?

Watch Video Solution

13. Which of the following is associated with a de Brogle wave of longer wavelength -a proton or an electron having same velocity ?

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14. What should be the ratio of the velocities of CH_4 and O_2 molecules so that they are associated with de Broglie waves of equal wavelength?

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15. Why don't we observe the wave properties of large objects such as a cricket hall or an neroplane ?

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16. What would be the uncertaininty in momentum of an electron whose powsition is known with absolute certaity ?

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17. Describe the difference between the properies of line electron and a moving circket hall .

Watch Video Solution

18. Calculate the unceertainty in position of an electron if the uncertainty in its velocity is $5.7 \times 10^5 ms^{-1}, h = 6.6 \times 10^{-24} kgm^2 s^{-1}$ mass of electron $= 9.1 \times 10^{-13kg}$

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19. Calculate the uncertainty 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

Watch Video Solution

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 H atom in $n = 6$ drop to the ground state?

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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 $n = 4$ to $n = 2$ of $He^{\oplus}$ spectrum?

Watch Video Solution

28. Calcultte the enrgy required for the process ,

$He^{+}(g) \rightarrow He^{2+}(g) + e$

The ionization energy for the H-atom in the grounds state is $2.18 \times 10^{-18} J\text{atom}^{-1}$.

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29. Explain why the uncertainty principle has significated when applied to macroscope objects such as moving car ?

Watch Video Solution

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 orbits around a stationary nucleus of charge $+Ze$ where Z is a constant and e is the magnitude of electronic charge. It requires 47.2 eV to excite the electron from the second bohr orbit to the third bohr orbit

a. Find the value of Z

b. Find the energy required to excite the electron from $n = 3$ to $n = 4$

c. Find the wavelength of radiation required to remove the electron from the second bohr orbit to infinity

d. Find the kinetic energy, potential energy and angular momentum of the electron in the first orbit

e. Find the ionisation energy of above electron system in electron-volt.

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33. Find the energy released (in erg) when $2.0g$ atom of hydrogen undergoes transition giving a spectral line of the lowest energy in the visible region of its atomic spectra

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34. Stationary $He^{\oplus}$ ion emits a photon corresponding to the first line of the lyman series. The photon then emitted strikes a H atom in the ground state. Find the velocity of the photoelectron ejected out of the hydrogen atom. The value of R is $1.097 \times 10^{7} m^{-1}$

Watch Video Solution

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 wavelength of the first Balmer line Li^{2+} ion is $136800cm^{-1}$ .The wavelength 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 nucertainty in its momentum be

A. $< \frac{h}{4\pi}$

B. $> \frac{h}{4\pi}$

C. Zero

D. infinity

Answer: D

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39. If the following mater travel with equal velocity the longest wavelength is that of a //am

A. Electron

B. Proton

C. Neutron

D. α particle

Answer: A

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40. Which of the following postutales does not belong to Bohr's model of atom ?

A. Angular momentum is an integral multiple of $h/2\pi$

B. The electron stationary in the 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 hydrogen spectrom can be respectively by the equation

$$v = 3.28 \times 10^{15} \left[\frac{1}{1^2} - \frac{1}{n^2} \right] s^{-1}$$

Calculate the maximum and minimum frequencies 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. The azimathal quantum number l of an arbital is 3 what are the possible values of m ?

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4. What is the lowest value of n that allows g orbitals 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 l sub-shell have $m_1 = 0$?

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7. An electron is in one of this electrons

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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 reason , which of the following sets of quantum number are not possible

$$\begin{array}{lllll} a & n=0 & l=0 & m_1=0 & m_s=+1/2 \\ b & n=1 & l=0 & m_1=0 & m_s=-1/2 \\ c & n=1 & l=0 & m_1=0 & m_s=+1/2 \\ d & n=2 & l=1 & m_1=0 & m_s=-1/2 \\ e & n=3 & l=3 & m_1=-3 & m_s=+1/2 \\ f & n=3 & l=1 & m_1=0 & m_s=+1/2 \end{array}$$

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10. How many electron in an 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 value of m_1 for the different orbital of

a. p sub -shell b. d sub-shell

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13. What is the shape $2s$ orbital .Give two9 point of difference between $1s$ and $2s$ orbital

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14. a. How many sub-shell are associated with $n = 4$?

b. How many electron will be present in the sub-shelll having m_s value of $-1/2$ for $n = 4$?

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15. How many spectrical nodal syrface are there in

a. a $3s$ orbital b. a $3p$ orbital

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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 nodals plates of zeroelectron density in the d_{xy} orbital is

A. 1

B. 2

C. 3

D. 4

Answer: B

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