Learning Horizon

Chemistry class 11th Important Questions

Q1. Which of the following is responsible to rule out the existence of definite paths or trajectories of electrons?
(a) Pauli's exclusion principle.
(b) Heisenberg's uncertainty principle.
(c) Hund's rule of maximum multiplicity.
(d) Aufbau principal

Q2. Number of angular nodes for 4d orbital is _____.
(a) 4 (b) 3 c) 2 (d) 1

Q3. 3. For which of the following sets of quantum numbers, an electron will have the highest energy?
(a) 3, 2, +1, +1/2 (b) 4, 2, -1, +1/2
(c) 4,1,0, -1/2 (d) 5,0,0, +1/2

Q4. Which of the following atoms or atom/ion have identical ground state configuration?
(a) Li+ and He+ (b) Cl and Ar
(c)Na and K (d) F+ and Ne

Q5. Which of the following orbitals has dumb-bell shape?
(a)s (b)p (c)d (d) f

Q6. The total number of orbitals in a shell having principal quantum number n is
(a) 2n (b)n2 (c)2n2 (d)n+1

Q7. Azimuthal quantum number defines:
(a) e/m ratio of electron (b)spin of electron
(c) angular momentum of electron (d)magnetic momentum of electron

Q8. Quantum numbers n=2, l=1 represent:
(a)1s orbital (b)2s orbital (c) 2p orbital (d)3d orbital

Q9. The quantum number m of a free gaseous atom is associated with:
(a)The effective volume of the orbital
(b) The shape of the orbital
(c)The spatial orientation of the orbital
(d)The energy of the orbital in the absence of the magnetic field.

Q10.Iso-electronic species are:
(a)F^-, O^{-2} (b)F^-, O (c)F^-, O^+ (d)F^-, O^{+2}

Q1 What is the physical significance of Ψ^2 ?
Ans: Ψ^2 represents the probability of finding an electron. It is the probability of finding a particle specified by a particular wave function

Q2. Which orbital is non directional?
Ans: S- orbital is spherically symmetrical i.e. it is non-directional. It has a spherical shape, like a hollow ball

Q3. Heisenberg's uncertainty principle has no significance in our everyday life. Explain.
Ans: In our daily life we can see only the moving macro and semi-micro-object's.

- The mass of the striking photons of light are too small to cause any shift in their position by the time the reflected photons form the image of the object.
- For such particles, there is no problem in measuring the exact momentum simultaneously. Thus, the principle has no relevance for such objects.

Q4. Out of 3d and 4s orbitals which is filled first?
Ans: 4s orbital is filled first because it has lower energy. The energies of the orbitals can be compared by their n+l values. For 4s orbital n+l .
(4+0) value is 4
while for 3d orbital, n+l ,(3+2) value is 5, Therefore 4s orbital is filled before3d orbital

Q5. How many electrons can be filled in all the orbitals with n+l=5?
Ans: (n+l) =5 has 5s,4p and 3d orbitals with two, six and ten electrons respectively. Therefore, the total number of electrons=18

Q6. Which one of the following electronic configurations is correct for chromium? a) [Ar] $4s^2$ $3d^4$ or b) [Ar]$4s^1$ $3d^5$? Justify your answer.
Ans: b) Ar]$4s^1$ $3d^5$ is correct as half-filled orbitals are more stable than nearly half-filled orbitals due to exchange energy and more symmetry.

Q7. Explain Pauli's exclusion principle with an example.
Ans: Pauli's exclusion principle: No two electrons can have all the four quantum numbers same.
Example: For Helium the three quantum numbers are same but fourth quantum number (spin quantum number) is different.
E.C. of He: $1s^2$ For 1st electron, n=1, l=0, m=0 and s=+1/2.
For 2nd electron n=1, l=0, m=0 and s= -1/2.
Q8. Designate the orbitals using s, p, d and f notations which are applicable:
a) n=4, l=2 b) n=5, l=1.
Ans: a) 4d b) 5p

Q9. Calculate the total number of angular nodes and radial nodes present in 3p orbitals.
Ans: For 3p orbitals, n=3, l= 1 Number of angular nodes = l= 1 Number of radial nodes = n-l-1
= 3-1-1= 1.
Q10. (a)What is the lowest value of n that allows g orbitals to exist?
(b)An electron is in one of the 3d orbitals, Give the possible values of n, l and ml for this electron.

Q11.. Which of the followings are iso-electronic species, i.e. those having the same number of electrons? Na^+, K^+, Mg^{2+} , Ca^{2+} , S^{2-} , Ar.

Ans:

Q12. What is the uncertainty in locating its position? [Given, me = 9.11×10^{-31} kg] An electron speed of 40 ms^{-1} accurate up to 99.9 percent.
Ans:

Q13. Write the significance (one point) of each of the following: a) Principal quantum number b) Azimuthal quantum number c) Magnetic quantum number
Ans: Significance of principal Quantum number(n):
The principal quantum number determines the size and to large extent the energy of the orbital. It also identifies the shell.
Significance of azimuthal Quantum number(l): It defines the 3-dimensional shape of the orbital. Significance of
Magnetic Quantum Number(m): It gives information about the spatial orientation of the orbital with respect to standard set of co-ordinate axis.
Q14. State the following: a) Aufbau principle, b) Hund's rule of maximum multiplicity c) Heisenberg Uncertainty principle.
a) Aufbau principle: In the ground state of the atoms, the orbitals are filled with electrons in order of their increasing energies. It means the lower energy orbitals are filled first followed by higher energy orbitals.
b) Hund's rule of maximum multiplicity: In the orbitals like p, d, f etc which have degenerate states, the pairing of electrons takes place after all the orbitals getting singly filled.
c) Heisenberg Uncertainty principle: It is impossible to determine simultaneously the exact position and exact momentum or velocity of subatomic particles like electrons.
Q15. (i) An atomic orbital has n = 3. What are the possible values of l and m_l? (ii) List the quantum numbers m_l and l of electron in 3rd orbital. (iii) Which of the following orbitals are possible? 1p, 2s, 2p and
Ans: **(**i) For n = 3; l = 0, 1 and 2. For l = 0 ; ml = 0 For l = 1; ml = +1, 0, -1 For l = 2 ; ml = +2, +1,0, +1, + 2
(ii) For an electron in 3rd orbital ; n = 3; l = 2 ; ml can have any of the values -2, -1, 0, + 1, +2.
(iii) 1p and 3f orbitals are not possible

Ans: (a) minimum value of n= 5 b) n=3, l=2, m_l = -2, -1, 0, +1, +2.

Q16. The quantum numbers of six electrons are given below. Arrange them in order of increasing energies. List if any of these combination(s) has/have the same energy
(i) n = 4, l = 2, ml = -2, ms = -1/2
(ii) n = 3, l = 2, ml = 1, ms = +1/2
(iii) n = 4, l = 1, ml = 0, ms = +1/2
(iv) n = 3, l = 2, ml = -2, ms = -111
(v) n = 3, l = l, ml = -1, ms = +1/2
(vi) n = 4, l = 1, ml = 0, ms = +1/2
Ans:
The electrons may be assigned to the following orbitals: (i) 4d (ii) 3d (iii) 4p (iv) 3d (v) 3p (vi) 4p. The increasing order of energy is: (v) < (ii) = (iv) < (vi), = (iii) <(i)