

Chemistry | Test | Grade XI
Structure of Atom

Time: 1:15 hr

M.M. 35

1. Choose the correct answer

1 x 5 = 5

i. In which of the following pairs, the ions are isoelectronic?

- a. Na^+ , Mg^{2+}
- b. Al^{3+} , O^-
- c. Na^+ , O^{2-}
- d. N^{3-} , Cl^-

ii. Which of the following statements concerning the quantum numbers are correct?

- a. Angular quantum number determines the three dimensional shape of the orbital.
- b. The principal quantum number determines the orientation and energy of the orbital.
- c. Magnetic quantum number determines the size of the orbital.
- d. Spin quantum number of an electron determines the orientation of the spin of electron relative to the chosen axis.

iii. Which orbitals cannot exist?

- a. 2p, 3d
- b. 2d, 3f
- c. 4s, 4f
- d. 3d, 4f

iv. Which set of four quantum numbers not possible?

- a. $n = 4$ $l = 2$ $m_l = -1$ $m_s = +1/2$
- b. $n = 3$ $l = 0$ $m_l = 0$ $m_s = -1/2$
- c. $n = 2$ $l = 2$ $m_l = 1$ $m_s = 1/2$
- d. $n = 5$ $l = 3$ $m_l = -2$ $m_s = -1/2$

v. Which of the following quantum number gives the shape of atomic orbital of sub-shell?

- a. n
- b. l
- c. m
- d. s

2. Fill in the blanks:

1 x 5 = 5

- a. The orbitals having the same energy are called _____.
- b. The maximum number of _____ in the shell with principal quantum number n is equal to $2n^2$

- c. The distribution of electrons into orbitals of an atom is called its _____.
- d. the electrons that are added to the electronic shell with the highest principal quantum number are called _____
- e. In the ground state of the atoms, the orbitals are filled in order of their _____ energies.
3. If an element possesses $n = 3$, what are the possible l and m_l values? 1
4. What are the shapes of s , p , and d orbitals respectively? 1
5. What is the maximum number of orbitals when $n = 4$ and $l = 1$? 1
6. The two electrons in the orbital of helium have anti parallel spin. Why do not they have parallel spin? 1
7. Out of $3d$ and $4s$ orbitals, which is filled first? Explain. $1 + 1 = 2$
8. Why can $2p$ sub-shell accommodate more electrons than $2s$ sub-shell? 2
9. Write the electronic configuration of $1 + 1 + 1 = 3$
 (i) Mn^{4+} (ii) Fe^{3+} .
- Report the number of unpaired electrons in each case.
10. What will be the maximum number of electrons having the same spin in an atom with $n + l = 4$? 1
11. Write down all the four quantum numbers for $1 + 1 = 2$
 (i) 19th electron of $24Cr$
 (ii) 21st electron for $21Sc$.
12. Which of the four quantum numbers(n, l, m_l, m_s) determine $1 \times 4 = 4$
 (a) the energy of an electron in a hydrogen atom and in a many electron atom
 (b) the size of an orbital
 (c) the shape of an orbital
 (d) the orientation of an orbital in space?
13. The $4f$ subshell of an atom contains 10 electrons. What is the maximum number of electrons having spin in the same direction? 1
14. Using the s, p, d, f , notation, describe the orbital with the following quantum number: $1 \times 2 = 2$
 a. $n = 4, l = 3$ b. $n = 2, l = 1$
15. An electron is in one of the $3d$ orbitals. Give the possible value of n, l , and m_l for this electron. 1
16. What atoms are indicated by the following configuration: $\frac{1}{2} + \frac{1}{2} = 1$
 a. $[He] 2s^1$ b. $[Ne] 3s^2 3p^3$
17. For each of the following pair of hydrogen orbitals indicate which is higher in energy: $\frac{1}{2} \times 4 = 2$
 a. $1s, 2s$ c. $3d_{xy}, 3d_{yz}$
 b. $3s, 3d$ d. $4f, 5s$