CBSE TEST PAPER-06

CLASS - XI CHEMISTRY

(Structure of Atom)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

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1. Which orbital is non – directional? [1]
2. What is the meaning of quantization of energy? [1]
3. Why is energy of 1s electron lower than 2s electron? [1]
4. Which quantum number determines

(i) energy of electron

(ii) Orientation of orbitals. [2]

5. What is nodal surface or nodes? [1]
6. How many spherical nodal surfaces are there in 4s – sub-shell? [1]
7. Arrange the electrons represented by the following sets of quantem number in decreasing order of energy. [2]

1. n = 4, l = 0, m = 0, s = +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

8. What designations are given to the orbitals having [3]

(i) n = 2, l = 1 (ii) n = 2, l = 0 (iii) n = 4, l = 3 (iv) n = 4, l = 2 (v) n = 4, l = 1?

9. Write the electronic configuration of (i) Mn^{4+}, (ii) Fe^{3+} (iii) Cr^{2+} and Zn^{2+} Mention the number of unpaired electrons in each case. [3]

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[ANSWERS]

Ans1. S – orbital is spherically symmetrical i. e it is non – directional.

Ans2. Quantization of energy means the energy of energy levels can have some specific values and not all the values.

Ans3. 1s electron being close to the nucleus experiences more force of attraction than 2s–electron which is away from the nucleus.

Ans4. (i) Principal quantum number (n), and

(ii) Magnetic quantum number (m).

Ans5. The region where the probability of finding an electron is zero i. e. $Y^2 = 0$

Ans6. In ns orbital, the number of spherical nodal surfaces are(n – 1), hence is 4s (4 – 1) = 3 nodal surfaces are present.

Ans7. (i) Represents 4s orbital

(ii) Represents 3p orbital

(iii) Represents 3d orbital

(iv) Represents 3s orbital

The decreasing order of energy 3d > 4s > 3p > 3s

Ans8. (i) Here, n = 2, and l = 1

Since l = 1 it means a p-orbital, hence the given orbital is designated as 2p.

(ii) Here, n = 2 and l = 0

Since l = 0 means s – orbital, hence the given orbital is 2s.

(iii) Here, n = 4 and l = 3

Since, l = 3 represents f – orbital, hence the given orbital is a 4f orbital.

(iv) Here, n = 4 and l = 2

Since, l = 2 represents d – orbital, hence the given orbital is a 4d – orbital.

(v) n = 4 and l = 1

since, l = 1 means it is a p – orbital, hence the given orbital can be designated as – 4p orbital.

Ans9. (i) Mn (z = 25), Mn^{4+} (z = 21)

The electronic configuration of Mn^{4+} to Given by

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$

As the outermost shell 3d has 3 electrons, thus the number of unpaired electrons is 3.

(ii) Fe (z = 26), Fe^{3+} (z = 23)

The electronic configuration of Fe^{3+} is given lay

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

The number of unpaired electron is 5.

(iii) Cr (z = 24), Cr^{2+} (z = 22)

The electronic configuration of Cr^{2+} is

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

The number of unpaired electron is 4.

(iv) Zn (z = 30), Zn^{2+} (z = 28)

The electronic configuration of Zn^{2+} is

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}$

The number of unpaired electron is 0.