

B.Sc. CHEMISTRY
FIRST SEMESTER (SPECIAL REPEAT)
INORGANIC CHEMISTRY-I
BSC-101

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

(Objective)

Time: 30 mins.

Marks: 20

Choose the correct answer from the following:

1X20=20

- Stoichiometric compounds are those where the number of different types of atoms are:
 - Not according to chemical formula
 - Are as in Berthollide compounds
 - Exactly according to the chemical formula
 - None of the above
- o-nitro phenol has:
 - Higher melting point than p-nitro phenol
 - Lower melting point than p-nitro phenol
 - Has same melting point as p-nitro phenol
 - None of the above
- For an ionic compound to dissolve:
 - The Madelung Energy must be overcome
 - The two ions must have different lattice energies
 - Two ions must have equal charges
 - None of the above
- Lanthanum is a:
 - s-block element
 - p-block element
 - d-block element
 - f-block element
- Radius of a cation is always:
 - Smaller than that of the atom of the element
 - Larger than that of the atom of the element
 - Same as the atom of the element
 - None of the above
- According to Fajan, a small positive charge favours:
 - Coordination
 - Electrovalency
 - Covalency
 - None of the above
- With increase in atomic number, electron affinity:
 - Increases along a group
 - Increases along a period
 - Remains unchanged in a group or period
 - None of the above
- Second ionization potential is:
 - Smaller than first ionization potential
 - Larger than first ionization potential
 - Larger than third potential
 - None of the above
- The number of lone pairs in the Lewis diagram of following compounds CH_4 , NH_3 , H_2O , HF are:
 - 1, 2, 3, 4
 - 0, 1, 2, 3
 - 0, 2, 3, 4
 - 1, 2, 4, 5

10. The structure of BeH_2 structure can be explained by..... Hybridization in Be-atom.
- | | |
|------------------|-------------------|
| a. sp | b. sp^2 |
| c. sp^3 | d. dsp^2 |
11. According to VSEPR theory the structure of ClF_3 is:
- | | |
|-------------------|----------------|
| a. T-shape | b. Tetrahedral |
| c. TrigonalPlanar | d. Linear |
12. According to MO theory, The HOMO of oxygen molecule contains two:
- | | |
|-------------------------------|------------------------------------|
| a. σ -Bonding electron | b. σ^* -Antibondingelectron |
| c. π -Bonding electron | d. π^* -Antibonding electron |
13. A cricket ball weighing 100g is to be located within 0.1\AA . What is the uncertainty in its velocity?
- | | |
|---|---|
| a. $5.27 \times 10^{-23} \text{ ms}^{-1}$ | b. $5.27 \times 10^{-20} \text{ ms}^{-1}$ |
| c. $4.27 \times 10^{-23} \text{ ms}^{-1}$ | d. $3.27 \times 10^{-25} \text{ m}$ |
14. The effective nuclear charge felt by a 3d electron of chromium atom is:
- | | |
|---------|---------|
| a. 4.60 | b. 5.60 |
| c. 2.50 | d. 4.00 |
15. Electrovalent compounds are:
- | | |
|----------------------------------|--------------------------------|
| a. Low melting | b. Insoluble in polar solvents |
| c. Conductors in the fused state | d. None of the above |
16. When an element of very low ionization potential reacts with an element of very high electron affinity:
- | | |
|------------------------------|----------------------------|
| a. A covalent bond is formed | b. An ionic bond is formed |
| c. A metallic bond is formed | d. No bond is formed |
17. Factors affecting the value of lattice energy:
- | | |
|--|--------------------------|
| a. The size of the ion | b. The charge of the ion |
| c. The size of the ion and the charge of the ion | d. None of these |
18. An electron is confined in a one dimensional box of length 1\AA . Its ground state energy in electron volts:
- | | |
|------------|------------|
| a. 37.6 eV | b. 47.6 eV |
| c. 32.6 eV | d. 35.6 eV |
19. An electron has a speed of 300 ms^{-1} accurate upto 0.001%. What is the uncertainty in locating its position?
- | | |
|------------------------------------|------------------------------------|
| a. $1.93 \times 10^{-2} \text{ m}$ | b. $2.93 \times 10^{-2} \text{ m}$ |
| c. $1.93 \times 10^{-3} \text{ m}$ | d. $4.93 \times 10^{-4} \text{ m}$ |
20. The effective nuclear charge felt by 1s electron of helium atom?
- | | |
|--------|--------|
| a. 1.9 | b. 2.3 |
| c. 1.7 | d. 2.5 |

(PART-B : Descriptive)

Time : 2 hrs. 40 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a. State and derive de Broglie's equation. 3+2+3+2=10
b. Write the distinction between matter waves and electromagnetic waves.
c. The kinetic energy of an electron has been found to be 5.76×10^{-15} J. Calculate the wave length associated with the electron.
d. Calculate the effective nuclear charge at the periphery of chromium atom.
2. Explain what you mean by Hybridization. Give the details of different hybridization, bond angle and shape of molecules. 10
3. a. Give a brief account of ion-dipole interaction with suitable example. 2
b. What are screening effect and effective nuclear charge? 2
c. Calculate the effective nuclear charge of aluminium (13) on the basis of Slater empirical formula. 2
d. Describe how Allred Rochow worked out electronegativity value of an atom in terms of covalent radius, charge on the electron and effective nuclear charge? 2
e. How does ionization enthalpy vary along a 2
(i) group
(ii) period, and why ?
4. a. Explain the bonding in H_2 molecule with the help of Molecular Orbital theory. 5 \times 2 = 10
b. Explain the shape of following molecule with VSEPR theory, SF_4 , H_2O , NH_3 , XeF_2 and PCl_5 .
5. a. What are the defects observed in crystals? 2
b. What is Schottky defect? How does it differ from Frenkel defect? 2+2=4
c. How do you differentiate among conductor, semi-conductor and insulator? 4
6. a. Discuss the basis of Hund's rule. 2+3+2+3=10
b. What are the difference between the energy level diagram of hydrogen atom and that of a multi electron atom?
c. State and explain Zeeman effect.
d. What are the conditions of an eigen wave function?
7. a. Discuss the postulates of quantum mechanics or wave mechanics. 4+4+2=10
b. Complete and balance the following redox reaction
(i) $MnO_4^- + SO_3^{2-} + H^+ \longrightarrow$
(ii) $Cr_2O_7^{2-} + NO_2^- + H^+ \longrightarrow$
c. Define disproportionation reaction with examples.

8. a. Explain why the boiling points of hydrides of the first member of any group higher than that of the second member. 3+3+4=10
b. What is hydrogen bonding? Explain the necessary conditions for the formation of hydrogen bond.
c. How does Band theory explain metallic bonding?

= = *** = =