

**B.Sc. CHEMISTRY
SECOND SEMESTER
INORGANIC CHEMISTRY II
BSC – 201**

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

Marks: 20

Choose the correct answer from the following:

$$1 \times 20 = 20$$

1. What is the color of bead form when CuO is heated with $\text{Na}_2\text{B}_4\text{O}_7$?
 - a. Blue
 - b. Green
 - c. Red
 - d. Blue-red
2. What is the hybridization of B-atom in metaborate?
 - a. sp^3
 - b. sp
 - c. sp^2
 - d. dsp^2
3. What is main application of BN in the aerospace industry?
 - a. Rocket fuel
 - b. Heat shields
 - c. Electronics
 - d. Lubricants
4. Which type of Borane has a highly open and net like structure?
 - a. Closo borane
 - b. Arachano borane
 - c. Nido borane
 - d. Hypo borane
5. Which of the following oxides of N is a strong oxidizing agent?
 - a. N_2O_5
 - b. N_2O
 - c. NO_2
 - d. All of the above
6. Which of the following is most stable oxidation state of Bi?
 - a. +1
 - b. +2
 - c. +3
 - d. +4
7. Which of the following pair is not diagonally related?
 - a. Be, Al
 - b. Li, Mg
 - c. B, Si
 - d. None of the above
8. Which of the following statement is false for 'reducing agent'?
 - a. Species tend to undergo oxidation
 - b. Species tend to loose electron
 - c. Species tend to accept electron
 - d. None of the above
9. Which of the following can act as reducing as well as oxidizing agent?
 - a. NaH
 - b. H_2S
 - c. H_2O_2
 - d. Zn

10. Which of the following statement is correct for redox indicators?
 - a. Have different color in its oxidized and reduced form.
 - b. They can be used to indicate end point of any titration
 - c. Change color depending on solution's electrochemical potential
 - d. Both a and c
11. Which among the following noble gases does not form clathrates?
 - a. Argon
 - b. Xenon
 - c. Krypton
 - d. Helium
12. The forces that holds the atoms of monoatomic noble gases are
 - a. Van der Waals forces
 - b. Electrostatic forces
 - c. Columbic forces
 - d. Hydrogen Bonding
13. Suplerfluid noble gas is -----
 - a. Xenon
 - b. Helium I
 - c. Helium II
 - d. Neon
14. The reaction between XeF_4 and water yields
 - a. XeO_4
 - b. XeO_3
 - c. XeOF_4
 - d. XeO_2
15. Radioactive noble gas is
 - a. Xenon
 - b. Krypton
 - c. Radon
 - d. Boron
16. Relative strengths of strong acids is determined in
 - a. Water
 - b. Sodium hydroxide
 - c. anhydrous acetic acid
 - d. H_2SO_4
17. Basicity of an acid is defined as
 - a. the number of hydrogen atoms furnished by a molecule
 - b. the number of H^+ furnished by a molecule.
 - c. the number of OH^- furnished by a molecule.
 - d. the number of O^{2-} furnished by a molecule
18. According to Lewis Concept, a base is a substance that can
 - a. donate an electron pair
 - b. accepts single electron
 - c. accepts electron pair
 - d. accepts OH^-
19. Hard acids prefer to bind
 - a. hard bases
 - b. soft bases
 - c. strong bases
 - d. weak bases
20. HCl is
 - a. stronger than HClO_4
 - b. weaker than HClO_4
 - c. of the same strength as HClO_4
 - d. of the same strength as HBr

(Descriptive)

Time : 2 hrs. 30 mins.

Marks : 50

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

1. a. Write down the preparation of boric acid? What is the hybridization and shape of boric acid? 3+3+2+2
=10
- b. Why is BrO_4^- a stronger oxidising agent than ClO_4^- ?
- c. Making use of Pearson's Rule, how can you predict relative strengths of compounds and complexes?
- d. The concentration of a noble gas in the atmosphere is 5 ppm by volume but its world production is 18000 ton/yr. Identify the gas and explain how it is produced?
2. Answer the following questions: 2+3+1+3+1
=10
- a. Explain the borax bead test with an example.
- b. Describe the type of bonding present in graphite.
- c. Write two application of boron nitride.
- d. Identify the class of $\text{C}_2\text{B}_4\text{H}_6$ carboranes and find the total no. of electron pair.
- e. Find the "STYX" value of diborane.
3. a. Write diagonal relationship of B and Si. 3+2+2+3
=10
- b. Write the anomalous behaviors that nitrogen show.
- c. Explain inert pair effect.
- d. Illustrate Pearson's Simple Rule of Thumb with suitable examples.
4. a. Identify the following as oxidizing and reducing agents. 3+3+4
=10
- KClO_3 , Hg_2Cl_2 , Na, HCl, NaH, MgO .
- b. Define standard reduction potential. The standard reduction potential values of three metallic cations X, Y and Z are 0.52V, -3.03 V and -1.18 V respectively. Write the order of reducing power of the corresponding metal ions.
- c. Discuss about different types of redox indicators. What do you mean by volumetric analysis?

5. a. How is degree of acidity determined based on strengths of Y-H bond? 3+3+4
=10
 b. What is a levelling solvent? How are the strengths of strong acids differentiated by levelling solvents?
 c. How Arland, Chatt and Davis categorised metal ions and ligands in to two classes?
6. Answer the following questions: 4+2+1+2+
1=10
 a. Draw the structure of following compounds:
 Nitrous oxide, Phosphorous pentaoxide, Pyrophosphoric acid, Hyponitric acid, Thiosulphuric acid, Dichloro heptaoxide, IF_7
 b. Write a short note on pseudo halogen compound.
 c. Write one uses of borazine.
 d. Discuss the structure and bonding of $[\text{NPCl}_2]_3$
 e. Write down the general formula and structure of **any one** of the following silicates:
 (i) Pyrosilicate and (ii) cyclic silicates.
7. a. What are the two forms of Helium? Write the characteristics of Helium II. 3+3+2+2
=10
 b. What happens when quinol is crystallized under 10-40 atm pressure in pressure of inert gases? What are its exceptions?
 c. Write the structure and shape of XeF_6
 d. Complete the following reactions:
 (i) $\text{XeF}_4 + \text{SF}_4 \rightarrow ?$
 (ii) $\text{CH}_3\text{I} + \text{XeF}_2 \rightarrow ?$
 e. How XeF_6 form metal complexes? Explain briefly.
8. a. Describe the structure and shape of XeF_2 showing the bonding of molecular orbitals. 3+3+4
=10
 b. Write the reactions showing reactivity of XeF_2 , XeF_4 and XeF_6 with water.
 c. What are Soft acids and soft bases? Explain with suitable examples.

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