B.Sc. CHEMISTRY
SECOND SEMESTER
INORGANIC CHEMISTRY-II
BSC – 201 [REPEAT]
[USE OMR FOR OBJECTIVE PART]

SET A

Duration: 3 hrs.

Full Marks: 70

(**Objective**)

Time: 30 min.

Marks: 20

Choose the correct answer from the following:

$1 \times 20 = 20$

1. Boric acid is a
   a. Weak monobasic acid
   b. Strong monobasic acid
   c. Weak dibasic acid
   d. Strong dibasic acid

2. Which one of the following is an example of orthoborite
   a. $Mg_3(BO_3)_2$
   b. $CaSn(BO_3)_2$
   c. HBO_3
   d. All of the above

3. Which of the following boron nitride resemble with graphite
   a. Cubic-BN
   b. Hexagonal-BN
   c. Both (a) and (b)
   d. None of the above

4. The monomer unit present in Borane is
   a. BO_3^-
   b. BO_2^{2-}
   c. BH_3
   d. B_2O_3

5. The ratio of Si to O in pyrosilicate is
   a. 2:4
   b. 1:4
   c. 2:7
   d. 1:5

6. The hybridization of XeF_2 molecule is
   a. sp^3d
   b. dsp^2
   c. sp^3
   d. sp^2

7. The geometry and shape of XeO_3 molecule respectively
   a. Tetrahedral geometry and pyramidal shape
   b. Pyramidal geometry and Tetrahedral shape
   c. Both Tetrahedral
   d. Both Pyramidal

8. The formula of noble gas species which is isostructural with BrO_3^- is
   a. $XeOF_4$
   b. XeF_2
   c. XeO_3
   d. None of the above

9. The oxidation state of Oxygen in O_2PtF_6 is
   a. 0
   b. +1/2
   c. -1/2
   d. +1

10. XeF_6 on reaction with CsF produce
    a. $[XeF_5][CsF_2]$
    b. $Cs[XeF_7]$
    c. $[XeF_4][CsF_3]$
    d. No Reaction

11. Relative strengths of strong acids is determined in
    a. Water
    b. Sodium hydroxide
    c. anhydrous acetic acid
    d. None of the above

12. 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. None of the above

13. According to Lewis Concept, a base is a substance that can
    a. Donate an electron pair.
    b. Accept single electron
    c. Accept electron pair
    d. None of the above

14. Hard acids prefer to bind
    a. Hard bases
    b. Soft bases
    c. Strong bases
    d. None of the above

15. HCl is
    a. Stronger than $HClO_4$
    b. Weaker than $HClO_4$
    c. Of the same strength as $HClO_4$
    d. None of the above

16. $KMnO_4$ solution is
    a. Primary standard solution
    b. Secondary standard solution
    c. Tertiary standard solution
    d. None of the above

17. H_2S is
    a. Oxidizing agent
    b. Reducing agent
    c. Both a and b
    d. None of the above

18. Volumetric analysis is .... chemical analysis.
    a. Quantitative
    b. Qualitative
    c. Both a and b
    d. None of the above

19. Standard electrode potential is used to
    a. Calculate cell potential
    b. Predict possible reaction
    c. Both a and b
    d. None of the above

20. If the standard reduction potential values of X and Y is 3.04 V and 1.24 V respectively, then
    a. X will reduce Y
    b. Y will reduce X
    c. X will oxidise Y
    d. Both b and c

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(Descriptive)

Time : 2 hrs. 30 mins.   Marks : 50

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

1. a. Write down one preparation and property of $(NPCl_2)_3$. Write   2+1=3
        down the possible interhalogen compounds of AX_3.

    b. Explain the hybridization of XeF_2 using Valence Bond Theory.   2

    c. Making use of Pearson's Rule, how can you predict relative   2
        strengths of compounds and complexes?

    d. What do you mean by oxidizing agent and reducing agent?   3
        Give examples.

2. a. Discuss the preparation method of nitric acid.   2+3+2+3
                                                                                     = 10
    b. Draw the structure and bonding of phosphorous pentaoxide.

    c. "Electron deficient hydride behaves as a Lewis acid"- Justify the
        statement.

    d. Justify that solubility of borax is temperature dependent.

3. a. Write the preparation of XeF_6 molecule.   3+2+5
                                                                                      =10
    b. Discuss the shape of XeF_4 molecule.

    c. Explain the chemical properties of XeF_4 molecule.

4. a. How degree of acidity determined is based on strengths of Y-H   3+3+4
        bond?   =10

    b. What is a levelling solvent? How are the strengths of strong
        acids differentiated by levelling solvents?

    c. How Arland, Chatt and Davis categorized metal ions and
        ligands in to two classes?

5. a. What are Soft acids and soft bases? Explain with suitable   4+4+2
        examples.   =10

    b. Illustrate Pearson's Simple Rule of Thumb with suitable
        examples.

c. What is the role of indicator in case of volumetric analysis? Give one example.

6. a. Identify the class of following carboranes and find their total number of electron pair: 4+1+2+3 =10
        (i) $C_2B_3H_7$ and (ii) $C_2B_4H_6$

    b. Find out the oxidation state of "Hyponitrous acid"

    c. Draw the structure of peroxoacids of sulphur.

    d. Show oxidation and reduction process in the following reaction. Also show which one is acting as reducing agent and which one acting as oxidizing agent.
        $$2FeCl_3 + H_2 = 2FeCl_2 + 2HCl$$

7. a. What are the chemical properties of XeF_2 molecule?   5+3+2 =10

    b. Write the preparation of XeF_4 molecule.

    c. What are the standard conditions to measure standard electrode potential? And this is measured with respect to which electrode?

8. a. Explain what is redox reaction with suitable example? Define standard electrode potential? What is electrochemical series and which couple has the highest positive value?   6+4=10

    b. What are the criteria for a primary standard solution? What are the different types of titrations involved in volumetric analysis?

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