2023/06

SET A

B.Sc. CHEMISTRY
SECOND SEMESTER
INORGANIC CHEMISTRY-I
BSC-201

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. Which of the following salt has an outcome of blue as a result of a borax bead test:
   a. Nickel Sulphate
   b. Ferrous Sulphate
   c. Cobalt Sulphate
   d. Chromium Sulphate

2. The correct bond angle order is:
   a. $NO_2^- < NO_2 < NO_2^+$
   b. $NO_2^- < NO_2^+ < NO_2$
   c. $NO_2^- < NO_2^+ < NO_2$
   d. $NO_2 < NO_2^+ < NO_2^-$

3. Which one of the following is a monobasic acid:
   a. H_3PO_4
   b. $H_4P_2O_6$
   c. H_3PO_3
   d. H_3PO_2

4. The overall charge present on cyclic silicate anion $[Si_6O_{18}]^{n-}$ is:
   a. 24
   b. 12
   c. 18
   d. 6

5. The bond length present in B_2H_6 is:
   a. B-H-B > H-B-H
   b. B-H-B < H-B-H
   c. B-H-B = H-B-H
   d. None of the above

6. Which of the following statements about standard reduction potentials is true?
   a. Higher positive values indicate stronger reducing agents
   b. Higher positive values indicate stronger oxidizing agents
   c. Lower positive values indicate stronger reducing agents
   d. Lower positive values indicate stronger oxidizing agents

7. $BiCl_5$ is highly unstable due to:
   a. Its large size
   b. Inert pair effect
   c. presence of d orbitals
   d. None of the above

8. Diagonal relationship is attributed to:
   a. Similar atomic radii of the elements
   b. Similar electronegativity values of the elements
   c. Both (a) and (b)
   d. None of the above

9. The primary standard in volumetric analysis refers to:
   a. a reagent that is extremely pure
   b. stable
   c. has no waters of hydration
   d. All of the above

10. Allotropy refers to:
    a. The ability of an element to form compounds with other elements
    b. The tendency of an element to exhibit different physical forms or structures
    c. The process of converting an element into a different isotope
    d. The property of an element to readily form ions

11. When xenon reacts with F_2 in a ratio of 1:5 at a temperature of 873K it forms:
    a. XeF_4
    b. XeF_6
    c. $XeOF_4$
    d. XeF_2

12. Which of the following has linear shape:
    a. XeF_4
    b. XeF_2
    c. XeO_3
    d. $XeOF_4$

13. The hybridization of XeF_4 molecule is:
    a. Sp^3d^2
    b. Sp^3
    c. Sp^3d
    d. Sp

14. XeF_6 reduced to "Xe" by the action of:
    a. H_2
    b. NH_3
    c. HCl
    d. All of the above

15. When XeF_4 reacts with H_2O gives:
    a. XeO_3
    b. XeF_2
    c. XeF_4
    d. HF

16. Relative strengths of strong acids is determined in:
    a. water
    b. NaOH
    c. Anhydrous acetic acid.
    d. None of the above

17. Basicity of an acid is defined as:
    a. the number of hydrogen atoms furnished by a molecule
    b. the number of protons furnished by a molecule
    c. the number of hydroxide ions furnished by a molecule
    d. none of the above

18. According to Lewis Concept, a base is a substance that:
    a. donates an electron pair
    b. accepts a single electron
    c. accepts an electron pair
    d. none of the above

19. Hard acids prefer to bind:
    a. hard bases
    b. soft bases
    c. strong bases
    d. none of the above

20. HCl is:
    a. stronger than Perchloric acid
    b. weaker than Perchloric acid
    c. of the same strength as Perchloric acid
    d. none of the above

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Descriptive

Time : 2 hrs. 30 mins. Marks : 50

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

1. a. Draw the structure of $B(OH)_3$ and identify the following: **2+3+2+3=10**
   (a) Hybridization (c) Steric number
   (b) Shape (d) Dipole moment

   b. Write down the preparations of XeF_2.

   c. Explain inert pair effect showing examples.

   d. Making use of Pearson's Rules, how can you predict relative strengths of compounds and complexes?

2. a. How many types of oxoacids of sulphur are forms? Give the structure of these acids along with oxidation state of the central atom in each case? **5+2+3=10**

   b. Write nomenclature of the following boranes:
   (i) Na $[B_2H_7]$ (ii) B_4H_{10}

   c. Discuss the structure of Diborane?

3. a. P_4O_{10} is very good drying agent but it cannot be used to dry HCl gas- Give reason. **2+3+2+3=10**

   b. Explain the various steps of Ostwald Process for the preparation of nitric acid?

   c. What is meant by pseudohalogen? Give examples.

   d. Discuss the structure and bonding of $(NPCl_2)_3$

4. a. The $E^0 M^{3+}/M^{2+}$ values for Cr, Mn, Fe and Co are -0.41V, +1.57V, +0.77V and +1.97V respectively. For which one of these metals the change in oxidation state from +2 to +3 is easiest? **3+3+2+2=10**

   b. What is the application of standard redox potential to inorganic reactions?

   c. What do you mean by volumetric analysis?

   d. What is equivalent weight of $Ca(OH)_2$?

5. a. Explain the chemical properties and structure of XeF_2. 5+5=10

   b. Discuss the preparation and chemical properties of XeF_4.

6. a. What is diagonal relationship? Write about diagonal relationship of lithium and magnesium. 4+2+4 =10

   b. Give two examples of redox indicators.

   c. Explain the chemical properties of XeF_6.

7. a. How's 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 a levelling solvent?

   c. How Arland, Chatt and Davis categorised metal ions and ligand in to two classes?

8. a. What are the preparations of xenon hexafluoride? 3+4+3 =10

   b. What are soft acids and bases? Explain with suitable examples.

   c. Give a brief account of the "Pearson's Simple Rule of thumb".

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