

**VIDYASAGAR COLLEGE FOR WOMEN**

**CHEMISTRY HONOURS PART I EXAMINATION 2020**

**PAPER IIA+IIB**

**Full Marks-50+50**

**Time 2hr**

**PAPER IIA** (answer any ***five*** questions out of eight)

(5x10 = 50)

1. a) Explain the term ‘penetration of orbitals’ and its effect, with the help of radial distribution functions of 2s, 2p and 3s orbitals of hydrogenic system.

b) Pauli exclusion principle gives the measure of maximum capacity of an orbital to accommodate the electrons – justify. 4+6

2. a) The wavelength of the first line of Lyman series for hydrogen is identical to that of second line of the Balmer series for some hydrogen like ion ‘X’. Identify the ion X and also find its ionization energy. Given ionization energy of Hydrogen is 13.6 eV.

b) Determine the ground state term symbol of  $V^{3+}$ . 4+6

3. a) Calculate the Allred – Rochow electronegativity of ‘As’ and ‘Br’ from the given data :

$$r_{As} = 1.22 \text{ \AA} \text{ and } r_{Br} = 1.14 \text{ \AA}$$

b) Explain why electronegativity of Ge is higher than that of Si and Sn? 4+6

4. a) How does the effective nuclear charge change for a 2p electron in passing from Boron to Carbon and that of 2s electron in going from Lithium to Beryllium ? Give reason.

b) Explain why electronegativity of Ge is higher than that of Si and Sn? 4+6

5. a) Explain the variation of colour and solubility of halides of silver in the light of Fajan’s rule.

b) Account for the type of defects in NaCl and AgCl crystals. 4+6

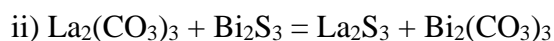
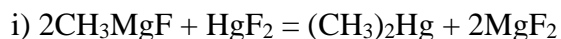
6. a) Predict the shape of the following using VSEPR theory.  $IO_2F_2^-$ ,  $XeF_5^-$ ,  $TeCl_4^{2-}$ .

b) The F-S-F bond angle in  $NSF_3$  is small ( $94^\circ$ ). Explain 4+6

7. a) What are super acid? How is the acidity of such solutions measured? Explain with an example

b)  $CH_3COOH$  is a weak acid in water but strong in liquid  $NH_3$  – Explain 4+6

8. a) Predict the following equilibrium



b) Common ores of Ni, Zn, Cu are sulphides but Al is obtained from oxides and Ca from carbonates.

4+6

1. In the test for phosphate with nitric acid and ammonium molybdate a canary yellow precipitate was observed. Write the formula of the yellow compound.
2. Write down the formula of DMG and draw the structure of complex formed by  $\text{Ni}^{2+}$  and DMG.
3. What are the group reagents for systematic group separation of Gr. IV cations?
4. Write the chemical formula of the gas which burns with green edged flame in the test for borate with conc  $\text{H}_2\text{SO}_4$  and  $\text{C}_2\text{H}_5\text{OH}$ .
5. What happens when a solution of  $\text{MnSO}_4$  is added to a bromate solution in  $\text{H}_2\text{SO}_4$ ?
6. Write down the reaction of chromyl chloride gas with sodium hydroxide.
7. Give the reaction of manganese sulphate solution with sodium bismuthate in dilute nitric acid medium?
8.  $\text{AgNO}_3$  solution was added to a  $\text{Na}_2\text{CO}_3$  extract of a sample. The colour changes gradually from white to brown to black. Identify the radical present in the sample.
9. How will you bring  $\text{Al}^{3+}$  into solution from  $\text{Al}_2\text{O}_3$ ?
10. Name the ingredients required for the brown ring test of  $\text{NO}_2^-$ .
11. Why conc HCL is used in flame test instead of  $\text{HNO}_3$  or  $\text{H}_2\text{SO}_4$ ?
12. Oily appearance in the inner wall of the test tube during heating a fluoride sample with conc  $\text{H}_2\text{SO}_4$  is due to the action of a compound on the glass wall. Name the compound (formula only).
13. Name a chloride compound which does not respond to chromyl chloride test.
14. How will you test a fluoride with  $\text{FeCl}_3$  reagent?
15. Give colour and formula of a precipitate when Zn radical is subjected to ammonium mercury thiocyanate –copper sulphate test.
16. Which of the following sulphides are soluble in dil HCl?  $\text{CuS}$ ,  $\text{NiS}$ ,  $\text{CoS}$ ,  $\text{ZnS}$ .
17. How ferricyanide ion is detected?
18. Name one radical from your syllabus which can interfere the brown ring test of  $\text{NO}_2^-$ .
19. What happens when chlorine water is added dropwise to an aqueous solution of bromide taken with  $\text{CCl}_4$  and the mixture shaken thoroughly.
20. What happens when  $\text{H}_2\text{S}$  gas is passed to an acidified chromate solution?