

5. Write short notes on **any three** of the following:

5+5+5=15

- (a) LCAO method in MO approach
 - (b) Metallic bonding
 - (c) Catalytic properties of metals and their compounds
 - (d) Van der Waals forces.
6. (a) What is s-p mixing? How can it be used for explaining magnetic behaviour of C_2 ? Explain it using MO diagram of C_2 .
- (b) The electron gain enthalpy increases from B to C but it decreases from C to N.
- (c) Arrange the chlorides of the alkali metals in increasing order of solubility in water and explain it.
- (d) The 2nd ionisation enthalpies of alkali metals are higher than those of alkaline earth metals in respective periods. Explain.

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This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : 2932 I

Unique Paper Code : 2172521202

Name of the Paper : Periodic Properties and Chemical Bonding

Name of the Course : **B.Sc. (Prog.) Physical Science/Industrial Chemistry/Analytical Chemistry**

Semester : II

Time : 2 Hours

Maximum Marks : 60

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt any **four** questions in **all**.
- (c) **All** questions carry equal marks.

1. (a) State and explain Fajan's Rules with examples.
- (b) The cationic sizes are smaller whereas the anionic sizes are larger than respective atomic sizes. Explain with examples.

- (c) CO_2 is linear whereas SO_2 , is not. Explain.
 (d) Write limitations of VBT.

5+5+3+2

2. (a) Deduce the structures and shapes of following molecules based on VSEPR theory:

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- (i) H_2O
 (ii) NH_4^+
 (i) PCl_3F_2
 (ii) XeF_4
 (b) Which of NO and NO^+ is more stable. Explain with MO diagrams.
 (c) Explain resonance, resonating structures, resonance hybrid and resonance energy. Draw all possible resonating structures of H_2 .

3. (a) Define the term dipole moment. What is its common unit? Write its value in SI unit. Calculate percentage ionic character in a molecule AB if its dipole moment is 1.03 D and internuclear distance is 127 pm.

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- (b) Draw MO diagram of CO. Explain its magnetic behavior and bond order.

- (c) Most of the transition metal compounds are paramagnetic and colored. Explain with examples.

4. (a) Draw the born-Haber cycle of NaBr. Calculate the enthalpy of formation of NaBr using Born-Haber cycle with following data:

Lattice energy of NaBr, $U_o = -718.8 \text{ kJ mol}^{-1}$ Enthalpy of atomisation of sodium,
 $\Delta H_{A(\text{Na})} = +107 \text{ kJ mol}^{-1}$ Enthalpy of atomisation of chlorine,
 $\Delta H_{A(\text{Br})} = +100 \text{ kJ mol}^{-1}$ First ionisation enthalpy of sodium,
 $\text{IE} = +496 \text{ kJ mol}^{-1}$ Electron affinity of bromine, $\Delta H_{\text{EA}(\text{Br})} = -324 \text{ kJ mol}^{-1}$

- (b) Explain the following:
 (i) KI is soluble in alcohol whereas KCl is insoluble.
 (ii) H_2O is liquid whereas H_2S is gas.
 (c) Explain the paramagnetic behavior of O_2 using MO diagram. Also explain its bond order.

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