UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Jan 2021

Course: B.Sc.(H) Chemistry   **Semester: I**
Program: Inorganic chemistry I   **Time: 03 hrs.**
Course Code: CHEM 1003   **Max. Marks: 100**

Instructions: Read the instructions given below carefully:
All questions are compulsory.

SECTION A

Instructions:

1. Each Question will carry 5 Marks
2. Answer should be short
3. You have to very careful to write the answer.

S. No.			Marks	CO
Q 1		Explain which of compound of the following pairs is more covalent i) CuO or CuS ii) AgCl or NaCl iii) LiCl or KCl iv) $SnCl_2$ or $SnCl_4$ v) $AlCl_3$ or $GaCl_3$	5	CO3
Q 2		Explain the following i) The dipole moment of NH_3 is greater than that of NF_3 ii) SO_2 has dipole moment while CO_2 does not	5	CO3
Q 3		Explain the following with reasoning i) LiI is soluble in H_2O while LiF is not ii) Solubility of halides of a given metal increases in the order Fluoride<Chloride<Bromide<Iodide	5	CO3
Q 4		What is meant by polarizing power of cation and polarizability of anion?	5	CO3
Q 5		The bond order of He_2, O_2^{-2} and N_2+ will be _____, _____ and _____respectively.	5	CO3

Q 6		Define the following	5	
		a) Ionization energy b) Electron enthalpy		**CO2**

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SECTION B

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Instructions:

1. Each question will carry 10 marks
2. Write short/brief notes of 1-2 page answer.
3. Draw the neat diagram, to justify your answer as well as to score higher marks.

Q 1	i) Discuss the effect of intermolecular and intramolecular hydrogen bonding on boiling point of a liquid ii) Explain Bent's rule. On the basis of Bent's rule draw the structure of PF_2Cl_3 and SF_2Cl_2	10	CO3
Q 2	i) What is radius ratio? What is its significance in case of ionic crystals? ii) What are n-type and p-type semi-conductors?	10	CO3
Q 3	i) Which set of the following quantum numbers are not permitted? Explain. [5 marks] a) n =2, l =2, m = -1, s = +1/2 b) n =2, l =1, m = -1or 0, s = -1/2 c) n =2, l =0, m =0, s = 0 d) n =2, l =1, m = 2, s = +1/2 e) n = 3, l= 2, m = 1, s = -1/2 ii) Calculate the uncertainty in the velocity of an electron if the uncertainty in its position is 10^{-10} m (mass of electron = 9.1 X 10^{-31} kg). [3 marks] iii) The kinetic energy of sub-atomic particle is 5.85 X 10^{-25} J. Calculate the frequency of the particle wave. (h= 6.626 X 10^{-34} kg m^2s^{-1}) [2 marks]	10	CO1
Q 4	Draw and explain Molecular orbital diagram of Carbon monoxide. Explain which one has higher bond order CO or CO^+. Give suitable reasoning.	10	CO3

Q 5	a) Arrange the following in increasing order of mentioned trend, with suitable reasoning.
	        i) F, Cl, Br, I, At (electron affinity)
	        ii) S^{-2}, Cl^-, Ca^{+2},K^+ (ionic size)
	b) Explain shape of following molecules
	    ClF_3, SF_6, PCl_3.
		5+5	CO2

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SECTION C

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Instructions:

1. Question is of 20 marks
2. Write long answer.
3. Draw the neat diagram, to justify your answer as well as to score higher marks.
4. <u>Internal choices is there attempt any one of them.</u>

| Q 1 | i) Derive Schrodinger's wave equation [8 marks]

ii) Discuss the significance of Ψ and Ψ^2 [6 marks]

iii) Explain radial probability curve of 1s and 2p [6 marks]

OR

i) Discuss postulates and limitation of Bohr's atomic model? [8 marks]

ii) What do you understand by(a) radial probability R^2 (b) Radial probability function $4\pi r^2 R^2$ [6 marks]

iii) What do you understand by quantum numbers. Briefly explain significance of each of them.   [6 marks] | **20** | **CO1** |