LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – **APRIL 2023**

UCH 1501 – BASIC CONCEPTS IN INORGANIC CHEMISTRY

Date: 09-05-2023   Dept. No. [   ]   Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A

Answer ALL the Questions in one or two sentences

1.	**Fill in the blanks**	**(5 x 1 = 5)**	
a)	The number of valence electrons present in the elements of oxygen group is ………...	K1	CO1
b)	A substance that gets reduced can act as ………	K1	CO1
c)	Octet rule refers to the tendency of an atom to attain ………. in the valence shell.	K1	CO1
d)	The energy gap between conduction and valence band is known as……….	K1	CO1
e)	ClF is an example for ……… halogen compound.	K1	CO1
2.	**Choose the correct answer for the following**	**(5 x 1 = 5)**	
a)	The valence shell electronic configuration of the element, chromium is (i) $3d^4 4s^2$ (ii) $3d^5 4s^1$ (iii) $3d^2 4s^2$ (iv) $3d^2 4s^2$	K1	CO1
b)	Which of the following is not a common oxidizing agent? (i) ozone (ii) hydrogen peroxide (iii) sulphuric acid (iv) glucose	K1	CO1
c)	The hybridization of BF_3 is (i) sp (ii) sp^2 (iii) sp^3 (iv) sp^3d	K1	CO1
d)	The common example for intrinsic semiconductor is_____ (i) arsenic (ii) silicon (iii) boron (iv) gallium	K1	CO1
e)	The molecular formula of bleaching powder is _____ (i) $CaCl_2$ (ii) $Ca(OH)_2$ (iii) $NaHCO_3$ (iv) $Ca(OCl)_2$	K1	CO1
3.	**Match the following**	**(5 x 1 = 5)**	
a)	Isoelectric -- End to end overlap	K2	CO1
b)	Inert pair effect -- Germanium	K2	CO1
c)	Sigma bond -- Pb and Tl	K2	CO1
d)	Filled conduction band -- interhalogen compound	K2	CO1
e)	Iodine trifluoride -- O^- and F	K2	CO1
4.	**Define the following**	**(5 x 1 = 5)**	
a)	Pauli's exclusion principle	K2	CO1
b)	Reducing agent	K2	CO1
c)	Shielding constant	K2	CO1
d)	Bonding molecular orbitals	K2	CO1

1

e)		Iodometry		K2	CO1

SECTION B

Answer any TWO of the following (2 x 10 = 20)

5.	(a)	Relate Mulliken-Jaffe and Pauling electronegativity scales.	(5)	K3	CO2
	(b)	Outline the salient features of modern periodic table.	(5)	K3	CO2
6.	(a)	Solve and balance the following redox reaction by oxidation number method. $MnO_4^- + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2$ (Acidic Medium)	(5)	K3	CO2
	(b)	State the concept of Bronsted-Lowry theory of acid and base. Classify the following as Bronsted-Lowry acid and base. HCl, NH_3, NH_4^+ and Cl^-.	(5)	K3	CO2
7.	(a)	Sketch the Lewis electron dot structure of NH_3 and CO.	(5)	K3	CO2
	(b)	Arrive at the geometry of XeF_4 and XeF_6 using VSEPR theory.	(5)	K3	CO2
8	(a)	Sketch the structure of dioxygen difluoride and perchloric acid. Mention its hybridisation.	(5)	K3	CO2
	(b)	Predict the products for the following reactions: (i) $ClF_5 + CsF \rightarrow$? (ii) $X_2 + NH_3 \rightarrow$?	(5)	K3	CO2

SECTION C

Answer any TWO of the following (2 x 10 = 20)

9	(a)	Illustrate the postulates of Bohr's atomic model.	(5)	K4	CO3
	(b)	How will you represent the complete wave function in terms of radial and angular wave functions?	(5)	K4	CO3
10.	(a)	Calculate the oxidation number of underlined elements in the following. K$\underline{Mn}$O$_4$, H$\underline{N}$O$_3$, Ca$\underline{Cr}_2$O$_7$, H$\underline{Cl}$O$_4$, $\underline{C}$S$_2$	(5)	K4	CO3
	(b)	Explain the salient features of liquid ammonia as a solvent.	(5)	K4	CO3
11.	(a)	Illustrate the structure, hybridization and geometry of the following molecules. (i) BeF_2 (ii) $SnCl_2$	(5)	K4	CO3
	(b)	Explain the anomalous behaviour of fluorine on comparison with other halogen elements.	(5)	K4	CO3
12.	(a)	Compare the similarities and dissimilarities between VB and MO theories.	(5)	K4	CO3
	(b)	Write the salient features of delta (δ) bond. Compare the stability of this bond with sigma and pi-bonds.	(5)	K4	CO3

SECTION D

Answer any ONE of the following (1 x 20 = 20)

13.	(a)	Discuss the periodicity of ionization energy and electron affinity of the elements in the periodic table.	(5)	K5	CO4
	(b)	Compare the structure and properties of thiocyanate and azide ions.	(5)	K5	CO4
	(c)	Explain the double decomposition, disproportionation and electron transfer reactions with examples.	(10)	K5	CO4
14.	(a)	Discuss the postulates of Sidgwick-Powell theory.	(5)	K5	CO4
	(b)	Explain the postulates of VSEPR theory. Mention its limitations.	(5)	K5	CO4

	(c)	Summarize the essential features of molecular orbital theory (MOT). Write the necessary criteria for effective overlap of atomic orbitals in MOT.	(10)	K5	CO4

SECTION E

Answer any ONE of the following (1 x 20 = 20)

15.	(a)	Explain the diagonal relationship between Li and Mg.	(5)	K6	CO5
	(b)	The following molecules have comparable molecular formula, but their shapes are different. Illustrate with the help of VSEPR theory. ON_2, OF_2, OCl_2	(5)	K6	CO5
	(c)	Explain the Lewis and Lux-Flood concepts of acid and base with an example.	(10)	K6	CO5
16.	(a)	Construct the qualitative MO diagram of O_2^{2+} ion and obtain the bond order.	(5)	K6	CO5
	(b)	Explain the salient features of extrinsic semiconductors. How are they classified?	(5)	K6	CO5
	(c)	Describe a method to estimate the amount of chlorine present in bleaching powder.	(10)	K6	CO5

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