



## End Semester Examination – Nov/Dec – 2016

Code : **15CH3002**  
Sub. Name : **Chemical Bonding and Nuclear Chemistry**

Semester : **2016-17 ODD**  
Duration : **3hrs**  
Max. marks : **100**

### ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Give Reason. $IE_2$ of sodium is higher than $IE_1$ .	CO1	2
	b.	Calculate the pH of a $3.0 \times 10^{-4}$ M solution of NaOH	CO2	4
	c.	Arrange the following in the increasing order of electronegativity and justify your answer.  Li, O, N, B, C, Be, Ne	CO2	4
	d.	Give the equation to calculate $\Delta H_f^0$ for the formation of $MgCl_2$ from its elements on the basis of Born Haber thermodynamic Cycle.	CO3	10
(OR)				
2.	a.	$BCl_3$ is a Lewis acid Where $CCl_4$ is not, explain	CO2	4
	b.	Calculate $Z_{eff}$ for Li, Be, F, Ne and on this basis explain the electronegativity of these elements whether it increases or decreases?	CO2	4
	c.	Derive Born Lande equation and give its significance	CO1	12
3.	a.	Write the self ionization reactions of $H_2O$ , $H_2SO_4$ , $SO_2$ , $NH_3$ and HF	CO1	5
	b.	At $60^\circ C$ , the ion product of water is $4.6 \times 10^{-14}$ . What is the pH of a neutral solution at this temperature?	CO2	5
	c.	Brief the levelling Effect with example	CO1	5
	d.	What causes ammonia molecules to deviate from bond angle of $109^\circ$ to $107^\circ$ ? Explain.	CO2	5
(OR)				
4.	a.	The melting point of chlorides of II-A group elements are increasing down the group Justify your answer.	CO2	4
	b.	Arrange the following in the increasing order of bond order by working out on the basis of MOT.  $N_2$ , $O_2^-$ , $N_2^+$	CO2	9
	c.	Can the bond length of $CO^+$ ( $1.115A^0$ ), $CO$ ( $1.128A^0$ ) be explained by MOT? Give reason.	CO2	7
5.	a.	Define fluxionality.	CO1	3
	b.	Discuss on Berry Pseudo rotation Mechanism.	CO1	10
	c.	Account on the basis of dipole moment - Boiling point (K) of Propane, dimethyl ether, methyl chloride and acetaldehyde are 231, 248, 249, 294.	CO2	7
(OR)				

6.	a.	What causes hydrogen bonding interactions? Give your answer with example.	CO1	4
	b.	Identify the polar molecules and give reason for your answer? CCl <sub>4</sub> , HCl, CH <sub>3</sub> Cl, BF <sub>3</sub>	CO2	4
	c.	The boiling point of HF, HCl, HBr, HI are (K) 293, 188, 206, 238. Explain why the boiling points increase from HCl through HBr to HI.	CO2	8
	d.	Can octet rule be applied to all molecules? Justify.	CO2	4
7.	a.	Classify the following <i>nuclides</i> as examples of isotopes, isobars and isotones  $^{30}_{14}\text{Si}$ , $^{31}_{15}\text{P}$ and $^{32}_{16}\text{S}$ $^{238}_{92}\text{U}$ , $^{235}_{92}\text{U}$ and $^{234}_{92}\text{U}$ $^6_2\text{He}$ , $^7_3\text{Li}$ and $^8_4\text{Be}$ $^{235}_{92}\text{U}$ , $^{235}_{93}\text{Np}$ , and $^{235}_{94}\text{Pu}$	CO1	4
	b.	(b) Predict the geometry of the following molecules using the VSEPR model. (i) PCl <sub>5</sub> (ii) IF <sub>5</sub> (iii) TeF <sub>4</sub> (iv) XeF <sub>2</sub> (v) BF <sub>3</sub>	CO2	10
	c.	Thermal stability of carbonates of IA group metal ions increasing down the group. Justify.	CO2	6
(OR)				
8.	a.	Identify the missing particle in the following reaction $^{27}_{13}\text{Al} + ^4_2\text{He} \rightarrow ^{30}_{15}\text{P} + \text{_____}$	CO1	2
	b.	Write a note on nuclear stability on n/p ratio.	CO1	5
	c.	Fill up the missing entities $^{235}_{92}\text{U} + ^1_0\text{n} \rightarrow ? \text{Kr} + ? + ?$		3
	d.	Calculate the mass defect of oxygen atom $^{12}_8\text{O}$ which has a mass of 11.994910 amu. Given that mass of a neutron is 1.008665 amu, mass of a proton is 1.007277 amu and of an electron is 0.0005486 amu.	CO2	10
<b><u>Compulsory:</u></b>				
9.	a.	Calculate the packing fraction of Argon isotope, $^{40}_{18}\text{Ar}$ . Mass is 39.96 amu. What does the value of packing fraction imply?	CO2	7
	b.	Write a note on nuclear stability on mass defect.	CO1	6
	c.	What is binding energy per nucleon? Calculate the binding energy per nucleon in $^{14}_7\text{N}$ which has a mass of 4.00260 amu. Mass of 1 neutron is 1.008665 amu and mass of 1 H atom = 1.007825 amu. Express the result in Joules as well.	CO2	7

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