16/12/2015

DOON UNIVERSITY, DEHRADUN

Final Semester Examination, First Semester, 2015

School of Physical Sciences

Integrated M.Sc. Physics/ Integrated M.Sc. Maths / Integrated M.Sc. Computer Sciences

Course Code: CYG–101; Course Title: Generic Chemistry-I

Time Allowed: 3 Hours *Maximum Marks: 30*

Note: Attempt All Questions from Sections A,B,C.

SECTION: A

Attempt All Questions.

(Marks:6Q×1=6)

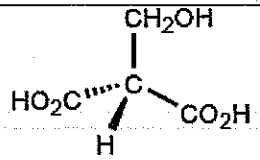
1. Define Nucleophiles and electrophiles with example of each. [1]

2. Write the equation to calculate the lattice energy of ionic crystal. [1]

3. Give the formula for bond order and calculate bond order for carbon monoxide molecule. [1]

4. Calculate percentage ionic character $CaCl_2$, if experimental value of dipole moment is 0.47×10^{-29} Cm and calculated value of dipole moment is 2.03×10^{-29} Cm. [1]

5. What do you mean by chirality? Is the molecule shown below chiral or achiral? [1]



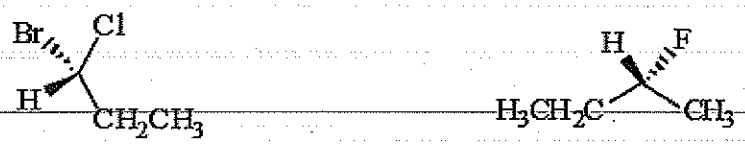
6. Explain Hückel's rule of aromaticity with two suitable examples. [1]

SECTION: B

Attempt All Questions. *(Marks:4Q × 3=12)*

1. (i) Assign R or S to the following molecules. [1]

(a) (b)



(ii) Draw the structure of (2R,3S)-2,3-dichloropentane. [1]

(iii) Why are the repulsions of non-bonding pairs of electrons are greater than that of bonding pairs of electrons? [1]

2. Explain why O_2 is paramagnetic and O_2^{2-} is diamagnetic. Draw the MO diagram for O_2^{2+} molecular ion. [3]

3. Give the hybridization, shape and bond angles for carbonate ion, ammonia and carbon diooxide molecule as per VESPR theory. [3]

4. (i) Why is AgX more covalent than NaX? Also describe the reason why solubility of sodium halide in water is higher than that of silver halide? [1]

(ii) Why do Group I carbonates have higher solubility in water than other carbonates? [1]

(ii) Explain anti-Markownikoff's addition of HBr on 2-pentene. [1]

SECTION: C

Attempt All Questions.

(Marks:2Q × 6=12)

1. (a) Draw the Born Haber cycle to show the formation of NaCl(s). When a mole of crystalline NaCl is prepared from 1 g atom of sodium and 0.5 mole of chlorine gas, 410 KJ of heat is produced. The heat of sublimation of Na metal is 108.8 KJ. The heat of dissociation of chlorine gas into atoms is 242.7 KJ, the ionization energy of Na is 493.7 KJ and the electron affinity of chlorine is 368.2 KJ. Calculate the lattice energy of NaCl. [2]

(b) Explain the difference in the structures of H_2O and H_2O^+ molecules on the basis of VESPR theory. [1]

(c) Define the term Bond Order. Calculate the bond order in Li_2^+, O_2^{2-}, and He_2. [3]

2. (a) Write the following reactions: (i) Birch reduction (ii) Wurtz reaction [1+1]

(b) Explain dehydrohalogenation of propyl bromide with the help of Sytzeff's rule. [2]

(c) Write reaction for preparation of (i) acetylene by CaC_2 (ii) Ethane by Grignard reagent [2]