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**DEPARTMENT OF SCIENCES, I SEMESTER M.Sc. (CHEMISTRY)**
**END SEMESTER EXAMINATIONS, NOVEMBER 2018**

## SUBJECT : Inorganic Chemistry [CHM - 4101]
**(REVISED CREDIT SYSTEM-2017)**

Time: 3 Hours | Date: 19th Nov 2018 | MAX. MARKS: 50

Note: (i) Answer **ALL** questions

(ii) Draw diagrams, and write equations wherever necessary

**1. A. i)** Depict the process of ionic bonding in $Al_2O_3$. Construct the Born-Haber cycle for its formation.

**ii)** Provide wave mechanical description of MOT, using the LCAO method

**iii)** Explain the use of dipole moment data in the identification of ortho-, meta- and para-isomers and to predict the variation in boiling points.

**B.** Distinguish clearly between the following terms:

**i)** Equivalence point and end-point

**ii)** Accuracy and precision

**iii)** Absolute and relative error

**iv)** Bonding and antibonding molecular orbitals

**(6+4)**

**2. A. i)** Explain the characteristic features of the following structures: HCP, CsCl, TBP.

**ii)** Describe the four information obtained from bond order parameter.

**iii)** Give two explanations why the metals exhibit bright natural lustre.

**B.** Give reasons for the following observations from the bonding perspective

**i)** Ice is less dense than water at zero degree Celsius

**ii)** In the solid state, single ionic molecules do not exist

**iii)** The solubility of p-nitrophenol in an aqueous medium is more than that of o-nitrophenol

**iv)** Mercury, paraffin oil and honey are typical examples of more viscous liquids

**(6+4)**

**3. A. i)** Draw potential energy diagram of an ionic solid and comment on the salient features.

**ii)** Calculate the percentage ionic character of the following substances from the given data **a)** Hydrochloric acid (bond length = 127 pm; Dipole moment = $3.44 \times 10^{-30}$ Cm

**b)** Hydrofluoric acid (internuclear distance = 0.92 A°; Dipole moment = 1.91 D)

**iii)** How do you account for the observed bond angles: $NO_2$ (132°), $NO_2^-$(115°) $NO_2^+$(180°)?

**B. i)** Compare and contrast the characteristic features of ionic and covalent hydrides. Give an example of each.

**ii)** Explain the influence of size and the charge of cations on the extraction of metals by crown ethers.

**(6+4)**

**4. A. i)** Explain the structural features of cyclic and chain silicates with an example of each.

**ii)** How is borazine prepared? How do you distinguish the closo-, nido- and arachno- boranes? Give an example of each.

**B .i)** Explain the structural characteristics of $XeO_2F_2$. Write any two applications each of helium and argon.

**ii)** What are zeolites? Explain their structural features and applications.

**(6+4)**

**5. A. i)** What are chemical twins? Give examples. Explain the reason of its occurrence.

**ii)** Describe the separation of lanthanides by valency and ion exchange methods.

**iii)** Explain the differences in the electronic spectra of lanthanides and transition metals.

**B.** Give reasons for the following;

**i)** Unlike lanthanides transition metals form more number of complexes with CN and CO ligands.

**ii)** The oxidation states of actinides resemble those of transition metals.

**iii)** $Ca(OH)_2$ is more basic than $Mg(OH)_2$.

**iv)** Interhalogens are more reactive than the corresponding halogens.

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