

## Chemistry (Hons.) Paper-III

Answer five questions, selecting at least one from each Section, in which Q.No. 1 is compulsory.

1. Explain any three of the following : [LNMUonline.com](http://LNMUonline.com)
- First law of thermodynamics is the law of conservation of energy.
  - $\text{NH}_3$  is polar but  $\text{CO}_2$  is non-polar.
  - $\text{BF}_3$  is Lewis acid but  $\text{NH}_3$  is Lewis base.
  - Selenium exhibits both +2 and +4 oxidation states.
  - $\text{K}_2\text{SO}_4$ ,  $\text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$  is a double salt.

### Section-A

- Calculate the work done in a reversible isothermal expansion of an ideal gas.
  - Differentiate between internal energy and enthalpy.
- State and explain second law of thermodynamics.
  - Deduce Gibb's helmholtz equation.
  - Give criteria of spontaneity and equilibrium.
- Explain the following : (a) Heat of reaction (b) Heat of formation (c) Heat of neutralization
- Write short notes on any three of the following : (a) Carnot Theorem (b) Bond Dissociation Energy (c) Nernst Distribution Law (d) Triple Point

### Section-B

- Draw M.O. diagram of  $\text{O}_2$  and  $\text{O}_2^+$ . Compare their bond order, bond energy and magnetic property.
- Explain the chemistry of Mn or Ni with respect to the following :  
(a) Position in P.T. (b) Occurrence and extraction (c) Important O.S. (d) Analytical test
- Discuss the preparation, properties and structures of the following :  
(a) Thionic acids (b) Sodium thiosuphate (c) HF
- Predict the structure and magnetic properties of the following :  
(a)  $[\text{Fe}(\text{CN})_6]^{4-}$  (b)  $[\text{Fe}(\text{CN})_6]^{3-}$  (c)  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  (d)  $[\text{Ni}(\text{CN})_4]^{2-}$  (e)  $[\text{Mn}(\text{NH}_4)_6]^{2+}$
- Write short notes on three of the following :  
(a) Arrhenius Theory (b) Bronsted Theory (c) Dipole Moment (d) Pollution Control

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