M.Sc.-Chem.-IS-(402)

2019

(January)

Time : 3 hours

Full Marks : 80

The figures in the right hand margin indicate marks.
Answer from both the Sections as per direction.

(Basic Inorganic Chemistry)

Section –A

1. *Answer any four of the following :* *(4x4=16)*
   (a) Give M.O. diagram for O_2.
   (b) Explain about anti bonding molecular orbitals.
   (c) Explain the application of EAN rule to metal carbonyls.
   (d) Discuss on the different bonding modes in metal dinitrogen complex.
   (e) Wrtie down the application of metallaboranes.
   (f) Explain α-particle disintegration.

OR

2. *Answer all questions* *(2x8=16)*
   (a) Give MO diagram for CO.
   (b) State VSEPR theory.
   (c) Write down the applications of sodium nitroprusside in inorganic analysis.

(Turn over)

(d) Explain the preparation and applications of carbonyl hydrides.
(e) Write down two methods of preparation of metallacarboranes.
(f) Give example of few compounds showing heterocatenation.
(g) Explain Nuclear fusion
(h) Explain about isotopes.

Section – B

Answer all questions *(16x4=64)*

3. (a) Explain formation of H_2 molecule by VBT, add a note on its shortcomings. *(16)*

OR

(b) Explain linnel's double quartet theory and MO diagram for O_2^-, O_2 and show paramagnetic character of oxygen. *(16)*

4. (a) Explain the bonding in linear and bent nitrosyls with suitable examples. *(06)*
(b) Discuss on the structure of brown ring compound and sodium nitroprusside ion. *(06)*
(c) Explain the utility of IR spectroscopy in differentiating terminal and bridging carbonyls. *(04)*

OR

(d) Explain the applications of carbonylate anions in organic synthesis. *(06)*
(e) Discuss on the structure and bonding in following metal carbonyls *(06)*

$Co_2(CO)_8$, $Fe_3(CO)_{12}$

(f) Explain the back bonding in metal carbonyls showing orbital overlap. *(04)*

5. (a) Explain Wade's rule for nomenclature of boranes and carboranes with suitable example. *(08)*
(b) Explain the quadruple bonding in $[Re_2Cl_8]^{2-}$. *(08)*

OR

(c) Explain the difference in reactivities of borazine and phosphazene by taking suitable examples. *(08)*
(d) Write down the applications borides and carbides. *(04)*
(e) Describe the different reactions of metallaboranes by taking suitable examples. *(04)*

6. (a) Explain various applications of radioactive isotopes, radioactive decay. *(16)*

OR

(b) What is artificial radioactivity ? Discuss the various types of nuclear reactions. *(16)*