

- (b) Give the preparation of ortho, meta, para-carboranes and draw the structure of 1, 2 - dicarba-closo-dodecarborane. 5
- (c) Write note on magnetic properties of free ion. 3

#### SECTION - D

8. (a) Draw and discuss the structure of the following metal carbonyls :  
 (i)  $\text{Co}_2(\text{CO})_8$   
 (ii)  $\text{Rh}_6(\text{CO})_{16}$  8
- (b) Discuss the preparation, bonding and structure of transition metal nitrosyl complexes. 8
9. (a) Explain the preparation, properties and structure of sodium nitroprusside. 6
- (b) What are various types of tertiary phosphine complexes ? Give their methods of preparation and reaction. 5
- (c) Describe the methods of preparation and uses of dinitrogen complexes. 5

Roll No. ....

74051

### M. Sc. Chemistry 2nd Semester (For Affiliated Colleges)

Examination - May, 2016

#### INORGANIC CHEMISTRY

Paper : CH-405

Time : Three Hours ]

[ Maximum Marks : 80

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

**Note :** Attempt five questions in all, selecting at least one question from each Section. Question No. 1 is compulsory. All questions carry equal marks.

1. **Compulsory** questions:

$2 \times 8 = 16$

- (a) According to MO approach, classify the metal orbitals for  $\sigma$  and  $\pi$  bonding in square planar complexes and name according to group theory.
- (b) What information you get from Tanabe-Sugano diagrams?

- (c) Give the term symbol for ground state of nitrogen.
- (d) Define John-Teller Theorem.
- (e) What is Curie's law ?
- (f) Define metal clusters.
- (g) Define homonuclear and heteronuclear carbonyls with examples.
- (h) How can you differentiate between terminal and bridging carbonyls in metal carbonyls ?

#### SECTION - A

2. (a) Draw and explain MO diagram for octahedral complex  $[\text{Co}(\text{NH}_3)_6]^{3+}$ . 10
- (b) Discuss the limitations of Crystal field theory. 6
3. (a) Draw and explain molecular orbital energy level diagram for square planar complexes ? 8
- (b) Discuss and draw the generally accepted energy level diagram for a tetrahedral complex. 8

#### SECTION - B

4. (a) Discuss the nature of electronic transition in  $d^6$  octahedral complexes with high spin. 6

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- (b) What are Tanabe-Sugano diagrams ? Discuss the T-S diagram for  $d^6$  system. 4, 6

5. (a) Write short note on nephelauxetic series. 4
- (b) Discuss Orgel diagram of  $d^2$  and  $d^3$  octahedral complexes, giving suitable examples. What is the reason for some curved lines in the diagram ? 6
- (c) Explain the charge transfer spectra in  $\text{MnO}_4^-$  ion. 6

#### SECTION - C

6. (a) How can we calculate the magnetic moment of the compound from its molar susceptibility ? Calculate the magnetic moment in B. M. for  $\text{Mn}^{2+}$  and  $\text{Cr}^{3+}$  ion from spin-only formula. 8
- (b) What are various steps for TEC in metal clusters ? How it is related to closo, nido, arachno structures ? Give suitable examples. 8
7. (a) Explain the structure and bonding of the following :
- (i)  $\text{B}_6\text{H}_{10}$
- (ii)  $\text{B}_9\text{H}_{15}$  8

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P.T.O.