

2014

## CHEMISTRY

( Major )

Paper : 5.4

( Inorganic Chemistry )

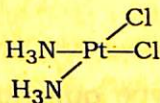
Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks  
for the questions

Objective-type questions (choose the correct  
answers) : 1×5=5

- Three-fold axes of symmetry are present in
  - octahedron
  - tetrahedron
  - trigonal bipyramid
  - All of the above
- The point group symmetry of the following complex



is

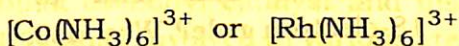
- $T_d$
- $D_{4h}$
- $C_{2v}$
- $D_{2h}$

3. The crystal field stabilization energy for a  $d^4$ -ion in a weak octahedral field is
- (a)  $0.4 \Delta_o$
  - (b)  $0.6 \Delta_o$
  - (c)  $0.8 \Delta_o$
  - (d)  $1.2 \Delta_o$
4. The catalytically important metal in Ziegler-Natta polymerization is
- (a) Rh
  - (b) Al
  - (c) Ti
  - (d) Pd
5. The metalloprotein which is involved in the storage of iron in living systems is
- (a) ferredoxin
  - (b) haemoglobin
  - (c) myoglobin
  - (d) ferritin

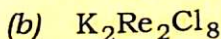
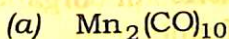
Very short answer-type questions : 2×5=10

6. Why do five coordinate complexes commonly have a structure that is intermediate between trigonal bipyramidal and square pyramidal geometries?

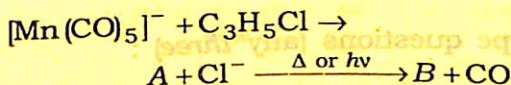
7. Which of the following complexes has a larger crystal field splitting parameter?



8. What is the M—M bond in the following compounds?



9. Identify A and B in the following reaction :



10. What is oxyhaemoglobin? What is the oxidation state of iron in this metalloprotein?

Short answer-type questions (any three) :  $5 \times 3 = 15$

11. (a) Explain why CO is a strong field ligand while  $\text{I}^-$  is a weak field ligand.

(b) Write what are normal and inverse spinels giving examples. With the help of CFSE calculation, find out which type of spinel  $\text{Mn}_3\text{O}_4$  is.