

2012

CHEMISTRY

(Major)

Paper : 2.2

(Inorganic Chemistry)

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

*Candidates **eligible** for Internal Assessment shall
answer from PART—I only (Marks : 65)*

*Candidates **not eligible** for Internal Assessment shall
answer both from PART—I and PART—II (Marks : 75)*

PART—I

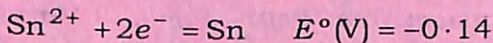
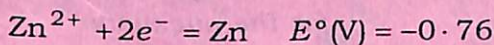
(Marks : 65)

1. Answer any *five* questions : 3×5=15

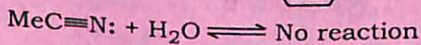
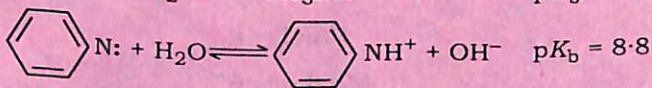
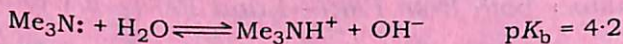
(a) A nitrogen atom could have electronic configuration $2p_x^1 2p_y^1 2p_z^1$ or $2p_x^2 2p_y^1 2p_z^0$.

Find the number of electrons that could be exchanged in each case, and the coulomb and exchange energies for the atom. Which arrangement would be lower in energy?

- (b) Bartlett noted the similarity of ionization energies of xenon and O_2 (1169 kJ/mol and 1175 kJ/mol) and he did an experiment. What is the experiment and result?
- (c) Arrange the oxyacids of chlorine in order of increasing acid strength and give two factors responsible for using this order.
- (d) The half-cell reduction potential of three systems are given below. Based on this, find one famous application for prevention of corrosion :



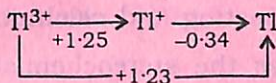
- (e) Explain the following reactions on the basis of electronegativity :



- (f) Explain the variation of melting and boiling points of—
- molecular solid;
 - ionic compound;
 - covalent compound.
- (g) Explain the tendency of homocatenation in silicon.

2. Answer any two questions : 5×2=10

- (a) Construct a Frost diagram from the Latimer diagram for Tl



- (b) Discuss the HSAB principle.
- (c) Draw and explain the structure of diborane.
3. Answer any three questions : 5×3=15

- (a) Discuss the chemistry of oxyacids of phosphorus.
- (b) Discuss the mechanism of ozone layer formation and depletion.
- (c) Discuss the preparation, properties and structures of XeF_6 and XeF_4 .
- (d) Discuss the chemistry of zeolites.
- (e) Discuss the structures of P_4O_6 and P_4O_{10} .

4. Answer any two questions : 5×2=10

- (a) In what form would you expect the metals Ag, Na, Al, Fe and Hg to occur in nature?

- (b) Define the following :
- Alloy; mineral; ore; gangue; slag;
steel; refractory; galvanization;
roasting and calcination.
- (c) Discuss the stereochemistry of Zn and Cd compounds.
- (d) Although H_2 is a reducing agent yet it is not widely used as a reducing agent in metallurgical operations. Why?

5. Answer any *three* questions : 5×3=15

(a) Explain the following isomerisms with at least one example each :

- (i) Geometrical isomerism
- (ii) Optical isomerism
- (iii) Ionization isomerism
- (iv) Linkage isomerism
- (v) Hydrate isomerism

(b) Discuss the bonding of metal carbonyls.

(c) Discuss the trend in physical and chemical properties of second and third transition elements.

(d) Name the following compounds (IUPAC) :

- (i) $K_4[Fe(CN)_6]$
- (ii) $K_2[OsCl_5N]$
- (iii) $[CuCl_2\{O=C(NH_2)_2\}_2]$
- (iv) $Ni(O_2C_2S_2)_2$
- (v) $[\{Cr(NH_3)_5\}_2(\mu-OH)]Cl_5$

(5)

PART—II

[In lieu of Internal Assessment]

(Marks : 10)

6. Answer any five questions : 2×5=10

- (a) Why Ag and Hg occur as sulfide in nature?
- (b) Draw the structure of phosphazene.
- (c) What is inert pair effect?
- (d) What are inclusion compounds?
- (e) What are the clinical use of oxides of nitrogen?
- (f) What are graphenes?
- (g) Draw the structure of [bis(dithioxalato -S, S')platinum(II)].
- (h) Explain the use of vacant *d*-orbital in bonding with examples.

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