

2010

## CHEMISTRY

( Major )

Paper : 2.2

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 )

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

## PART—I

( Marks : 65 )

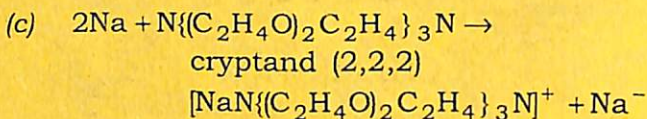
1. Answer any five questions : 3×5=15

(a) A non-metal despite having second largest resistivity (electrical) has an allotrope which conducts electricity. Name the element, the allotrope and the reason for conductance in the allotrope.

1+1+1

(b) Which element is most electronegative and why (give two reasons)?

1+2



State whether the above reaction will take place or not. If not, why? If yes, how  $\text{Na}^+$  and  $\text{Na}^-$  ions will be formed from Na? What important chemical property will be shown by such alkalide (alkali metal anions)?

1+1+1

(d) Bartlett noted the similarity of ionization energies of xenon (1169 kJ/mol) and  $\text{O}_2$  (1175 kJ/mol) and he did an experiment. What is the experiment and what are the results?

1+2

(e) Which metal is used in galvanization of iron? Why tin cannot be used in the galvanization?

1+2

(f) Explain why some ionic compounds like  $\text{KClO}_4$  are insoluble in water at room temperature.

3

(g) Explain why  $\text{PF}_3$  is a much weaker base than  $\text{PH}_3$ .

3

(h) Explain why the melting point of neopentane is  $-17^\circ\text{C}$ , while that of *n*-pentane is  $-130^\circ\text{C}$ .

3



2. Answer any *two* questions :  $5 \times 2 = 10$

(a) State and explain Fajan's rules.  $2+3$

(b) Discuss liquid ammonia as a solvent in terms of precipitation, reaction, auto-ionization, neutralization reaction, amphoteric behaviour and acid-base behaviour.  $1 \times 5 = 5$

(c) Explain the preparation, properties and structure of fullerene. Are all bonds and atoms in fullerene equivalent?  $1+1+2+1$

3. Answer any *five* questions :  $2 \times 5 = 10$

(a) Mention the condition and catalysis used in the synthesis of ammonia in nature and in industry.  $1+1$

(b) Suggest a method of preparation of oxygen fluorides. Why OF compounds are called fluoride rather than oxide?  $1+1$

(c) Nitrogen forms a number of oxides. Of these oxides which one may be used as an anaesthetic and which one is used by the body for blood vessel relaxation?  $1+1$

(d) What are pseudohalides? Write three reactions of pseudohalides which are similar to those of halogens.  $\frac{1}{2} + \frac{1}{2} \times 3 = 2$

(e) What are the hydrolysis products of  $\text{XeF}_2$  and  $\text{XeF}_4$ ?  $1+1$

- (f) Draw the silicate structure of talc  $Mg_3(OH)_2Si_4O_{10}$ . Write two properties of talc which make it useful as Talcum Powder. 1+1
- (g) Suggest a preparative route for  $1,2-C_2B_{10}H_{12}$ . How can you isomerize it to form  $1,7-C_2B_{10}H_{12}$ ? 1+1

4. Answer any *two* questions : 5×2=10

- (a) What is the relationship between electrode potential and extraction methods for metals? Name two metals with their sources, which can be extracted by electrolytic and reduction process. 1+2+2
- (b) Explain Cupellation and van Arkel-de Boer process.  $2\frac{1}{2}+2\frac{1}{2}$
- (c) Write brief notes on alloys and intermetallic compounds.  $2\frac{1}{2}+2\frac{1}{2}$

5. Answer any *two* questions : 5×2=10

- (a) How do you classify transition elements into groups? Based on electronic configuration, what are the important distinctions between them? Elaborate with reasons. 2+3
- (b) Draw all the isomers of  $M(abcd\hat{e}e)$ , where  $\hat{e}e$  is a bidentate ligand. 5



- (c) Discuss the preparation and structure of  $\text{Fe}(\text{CO})_5$ ,  $\text{Fe}_2(\text{CO})_9$  and  $\text{Fe}_3(\text{CO})_{12}$ . 2+3
6. Answer any *two* questions : 5×2=10
- (a) What are Slater's rules? Calculate effective nuclear charge for valence (4s) electron and a 3d-electron in  ${}_{30}\text{Zn}$ . 3+2
- (b) Explain the relative acid-base strength of protonic acids. 5
- (c) Explain the variation of ionization energy in periods and groups of periodic table. 5

PART—II

( Marks : 10 )

( In lieu of Internal Assessment )

7. Answer any *ten* questions : 1×10=10
- (a) Why  $\text{BF}_3$  is a weaker Lewis acid than  $\text{BCl}_3$ ?
- (b) Why solvent must have a wide range of voltage over which it is not oxidized or reduced in electrochemical reactions?
- (c) Name a superacid.
- (d) Why Ag and Hg occur as sulfide ores in nature?

- (e) What is the difference between *ortho*- and *para*-hydrogen?
- (f) Draw the structure of  $P_4O_{10}$ .
- (g) What is inert pair effect?
- (h) Write the electronic configuration of Cr.
- (i) Draw the structure of mer-triammine-trinitrocobalt(III).
- (j) Name the compound  
$$[Cr(NH_3)_5(\mu-OH)]Cl_5$$
- (k) Name principal ore of Mn.
- (l) Draw the structure of borazine.

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