



BS-1362

Seat No. _____

B. Sc. (Sem. IV) Examination

April / May – 2014

(CC) CH-402 : Chemistry

Time : 3 Hours]

[Total Marks : 70

૧ (અ) જવાબ આપો : (બે)

(૧) B_2H_6 નું બ્રીજ બંધારણ સમજાવો.

(૨) ઉચ્ચ બોરેનમાં જોવા મળતાં વિવિધ પ્રકારના બંધોની ચર્ચા કરો.

(૩) B_5H_{11} અને B_5H_9 નાં બંધારણો દોરી તેમાં વિવિધ બંધોમાં ઇલેક્ટ્રોનની વહેંચણી સમજાવો.

(બ) જવાબ આપો : (એક)

(૧) ઇલેક્ટ્રોનની ઊણપ ધરાવતા અણુઓમાં બોરોનના હાઈફાઈડને શા માટે સમાવવામાં આવે છે. સમજાવો.

(૨) ડાય બોરેનનાં પિટ્ઝર અને સવર્ગ સૂત્ર બંધારણ સમજાવો.

૨ (અ) જવાબ આપો : (કોઈ પણ બે)

(૧) ઉદાહરણસહ સમજાવો :

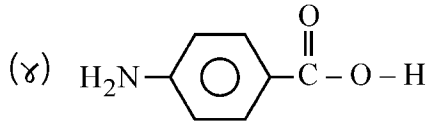
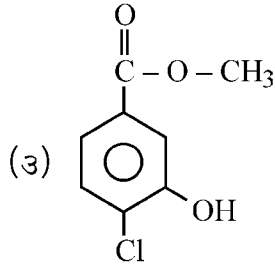
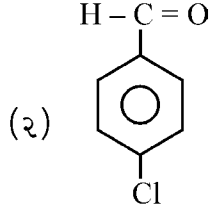
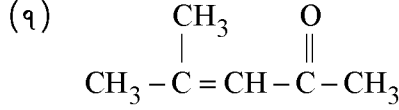
- કોમોફોર

- ઓક્ટોકોમ

(૨) પારજાંબલી વર્ણપટમાં $\sigma \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ સંક્રાંતિઓ સમજાવો.

(૩) વુડ-વર્ડ-ફિશરના નિયમો ઉદાહરણસહ સમજાવો.

(બ) λ_{\max} ગણો : (કોઈ પણ ત્રણ)



૩ (અ) જવાબ આપો : (કોઈ પણ બે)

(૧) $E_{\text{Zn}^{2+}/\text{Zn}}^{\circ} = -0.760 \text{ V}$ અને $E_{\text{Al}/\text{Al}^{3+}}^{\circ} = +1.66 \text{ V}$
પરથી અર્ધકોષ તેમજ સંપૂર્ણ કોષ માટેનાં નન્સર્ટ સમીકરણ મેળવો.

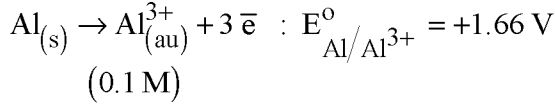
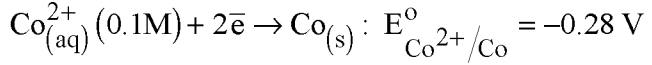
(૨) $\text{Hg} \left| \text{Hg}_2\text{Cl}_2(\text{s}) \right| \text{KCl}$ ઇલેક્ટ્રોડ પર ટૂંકનોંધ લખો.

(૩) ડેનિયલ કોષની રચના અને કાર્ય પદ્ધતિ સમજાવો.

(બ) દાખલો ગણો : (કોઈ પણ એક)

(૧) $E^{\circ}_{\text{Au}^{3+}/\text{Au}} = +1.50 \text{ V}$ અને $E^{\circ}_{\text{Cu}/\text{Cu}^{2+}} = -0.34 \text{ V}$
પરથી (૧) કોષ નિરૂપણ (૨) કોષ પ્રક્રિયાઓ (૩) ઓક્સિડેશન
અને રિડકશન કર્તા (૪) એનોડ અને કેથોડ (૫) E°_{cell}
(૬) નન્સર્ટ સમીકરણ લખો.

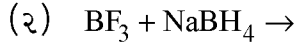
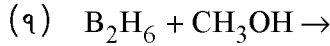
(૨) નીચેની અર્ધ-કોષ પ્રક્રિયાઓ પરથી 30°C તાપમાને કોષ
પોટેન્શિયલ ગણો.



૪ નીચેના પ્રશ્નોના ટૂંકમાં જવાબ આપો :

(૧) હિપ્સોકોમિક સ્થાન ફેરને કારણે રંગ આછો થાય છે શા માટે ?

(૨) પ્રક્રિયાઓ પૂર્ણ કરો :



(૩) ક્ષાર-સેતુનાં કાર્યો જણાવો.

(૪) આઈસોપ્રિન 200 nm થી ઉપર શોષણ દર્શાવે છે શા માટે ?

(૫) વીજ રસાયણિક કોષનો સિદ્ધાંત જણાવો.

(૬) બોરેન્સનાં સામાન્ય સૂત્રો જણાવો.

(૭) ડેનિયલ કોષ માટે $E^{\circ}_{\text{cell}} = 1.10 \text{ V}$ છે. તો $\Delta G^{\circ} = \underline{\hspace{2cm}}$ Jule હશે ?

(૮) એક્સોસાયક્લિક દ્વિબંધ ઉદાહરણથી સમજાવો.

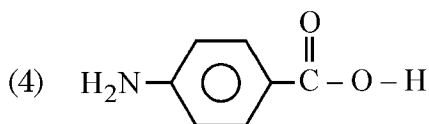
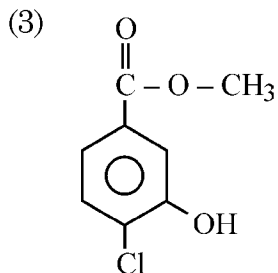
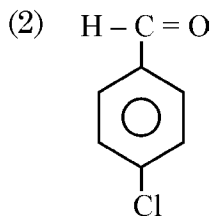
(૯) $\text{Sn}^{4+} + \text{Cr}^{2+} \rightarrow \text{Cr}^{3+} + \text{Sn}^{2+}$ પ્રક્રિયાનો $E^{\circ}_{\text{cell}} = 0.52 \text{ V}$ છે ?

પ્રક્રિયા માટે $\Delta G^{\circ} = \underline{\hspace{2cm}}$ Jule હોય.

(૧૦) હાઈડ્રોબોરેશન એટલે શું ?

ENGLISH VERSION

- 1 (a) Give the answers : (any **two**)
- (1) Explain the bridge structure of B_2H_6 .
 - (2) Discuss the different types of bonds in higher boron.
 - (3) Draw the structure and explain the distribution of electrons in various bonds in B_5H_{11} and B_5H_9 .
- (b) Give the answers : (any **one**)
- (1) Explain : Why the boron hydride is included in electron efficient molecules.
 - (2) Explain the Pitzer and co-ordination formula.
Structure of B_2H_6 .
- 2 (a) Give the answers : (any **two**)
- (1) Explain with examples :
 - Chromophore
 - Auxochrome
 - (2) Explain the transitions of $\sigma \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$,
and $n \rightarrow \pi^*$ in ultraviolet spectroscopy.
 - (3) Explain with examples the wood-ward-fisher rules.
- (b) Calculate λ_{\max} : (any **three**)
- (1)
$$\begin{array}{c} \text{CH}_3 \quad \quad \text{O} \\ | \quad \quad \quad || \\ \text{CH}_3 - \text{C} = \text{CH} - \text{C} - \text{CH}_3 \end{array}$$



3 (a) Give the answers : (any **two**)

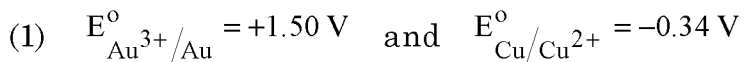
(1) Give Nernst equation of Half-cell and full-cell from $E_{\text{zn}^{2+}/\text{zn}}^{\circ} = -0.760 \text{ V}$ and

$$E_{\text{Al}/\text{Al}^{3+}}^{\circ} = +1.66 \text{ V}.$$

(2) Write a short note on : $\text{Hg} \left| \text{Hg}_2\text{Cl}_2(\text{s}) \right| \text{KCl}$ electrode.

(3) Explain : The structure and working principle of Daniell cell.

(b) Calculate example : (any **one**)



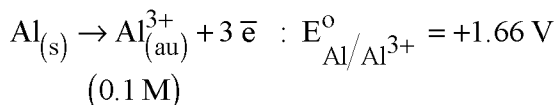
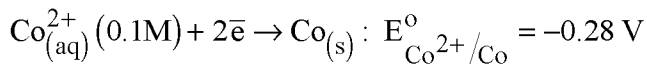
from this value. Give the (1) Cell Arrangement

(2) Cell reactions (3) Oxidation and Reduction

Agent (4) Anode and Cathode (5) E°_{cell}

(6) Nernst equation.

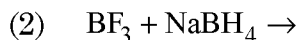
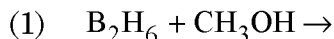
(2) Calculate the cell potential at 30°C from the following Half-cell reactions :



4 Give the answer :

(1) Why the intensity of colour decrease by Hypsochromic shift ?

(2) Complete the reaction :



(3) Give the working principal of Salt - bridge.

(4) Why the Adsorption of isoprine is above 200 nm ?

(5) Give the principal of Electro - chemical cell.

(6) Give the common formula of Borens.

(7) If E°_{cell} for decimal cell is 1.10 V then

$$\Delta G^\circ = \text{_____ Jule.}$$

(8) Explain exocyclic double bond with examples.

(9) If E°_{cell} for $\text{Sn}^{4+} + \text{Cr}^{2+} \rightarrow \text{Cr}^{3+} + \text{Sn}^{2+}$ reaction is

$$0.52 \text{ V. Calculate } \Delta G^\circ = \text{_____ Jule.}$$

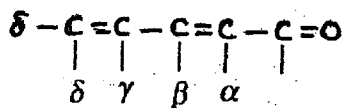
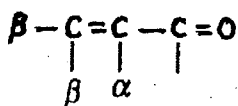
(10) What is Hydroboration ?

Spectral Data

Empirical Rules for Dienes :

Parent	Homoannular $\lambda = 253 \text{ nm}$	Heteroannular $\lambda = 214 \text{ nm}$
Increments for double bond extending conjugation	30	30
Alkyl substituent or ring residue	5	5
Polar grouping :		
-OCOCH ₃	0	0
-OR	6	6
-Cl, -Br	5	5
-NR ₂	60	60

Empirical Rules for Enones :



Base Values :

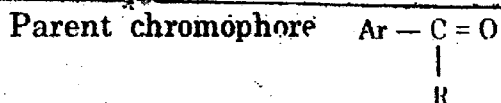
6-membered ring or acyclic enone	= 215 nm
5-membered ring parent enone	= 202 nm
Acyclic Dienone	= 245 nm

Increments for :

Double bond extending conjugation	30 nm
Alkyl subst. or ring residue	α 10 nm
	β 12 nm

<i>Polar groupings :</i>	γ or higher	18 nm
-OH	α 25; β 30; δ 50	nm
-OCOCH ₃	α, β, δ	6 nm
-OCH ₃	α 35, β 30; γ 17; δ 31	nm
-Cl	α 15; β 12	nm
-Br	α 25; β 30	nm
-NO ₂	β	95 nm
Exocyclic double bound		5 nm
Homocyclic diene component		39 nm

Empirical Rules for Benzoyl Derivatives :



R = alkyl or ring residue	246 nm
R = H	250 nm
R = OH or o Alkyl	230 nm

Increments for each substituent :

-Alkyl or ring residue	o, m p 10 nm
-OH, -OCH ₃ , -o Alkyl	o, m 7; p 25 nm
-Cl	o, m 0 (zero); p 10 nm
-Br	o, m 2; p 15 nm
-NH ₂	o, m 13; p 58 nm