CHE 601 **Reg. No. .....**

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION - APRIL 2012

CHEMISTRY

GENERAL CHEMISTRY - VII

Duration: 3 hours **Max marks: 70**

PART A

1. Answer any TEN of the following: **1x10=10**

a) Write the molecular formula for tetrammine copper (11) tetraiodo mercurate (11)

b) Give two limitations of valence bond theory.

c) Arrange the following ligands according to spectrochemical series: H_2O, NH_3 and CO.

d) Calcualte the number of microstates possible for d^3 configuration.

e) How is the EMF of a cell computed?

f) How many degrees of freedom are possible at triple point of water?

g) What is liquid junction potential?

h) Give an example for freezing mixture.

i) Among pyridine and pyrrole is more basic and why?

j) Explain the aromatic character of thiophene using Huckel rule.

m) What is meant by finger-print region in IR spectra?

n) What is a molecular ion peak in mass spectra?

PART-B

UNIT-I

Answer any TWO of the following. **10x2=20**

2. a) Explain ionization isomerism of coordination compounds with an example. 02

   b) What are the factors affecting the stability of the complexes? Give examples. 04

   c) On the basis of crystal field theory explain, magnetic property and colour of the octahedral complexes. 04

3. a) Explain trans effect in square planar complexes. 03

   d) How is magnetic susceptibility determined by Guoy's method? 05

   e) Predict the spin contribution to magnetic moment of complexes having configuration $t_{2g}^2\ e_g^o$ and $t_{2g}^6\ e_g^o$ 02

4. a) Explain different types of electronic transitions in coordination compounds. 04

   b) Give any three applications of metal complexes. 03

   c) Explain the factors affecting the crystal field parameters. 03

UNIT-II

Answer any TWO of the following. **10x2=20**

5. a) Calculate the standard EMF of a electrochemical cell $Ni/Ni^+(1M)//\ Cu^{2+}(1M)/Cu$. Given $E^o_{N_i} = -0.24V$ $E^o_{Cu} = +0.34V$
   02

   b) Explain the determination of solubility of sparingly soluble salt by EMF measurement
   04

   c) Explain the phase diagram of lead-silver system.
   04

6. a) How is the valency of an ion determined by EMF measurement?
   03

   b) Explain the phase diagram of sulfur system.
   05

   c) What is hydrogen over voltage?
   02

7. a) Explain the determination of strength of ferrous ion solution by potentiometric method.
   04

b) Explain the phase diagram of water system. 03

c) What are concentration cells? Calculate the EMF of a concentration cell $Cu|CuSO_4\ (a_2 = 0.022)//CuSO_4\ (a_1 = 0.0064)|Cu$ at 25°C. 04

UNIT-III

Answer any TWO of the following. **2x10=20**

8. a) How is isoquinoline synthesised? 02

   b) Explain the mechanism of electrophilic substitution reaction of furan. 04

   c) Explain the use of mass spectra in identification of methane and propane. 04

9. a) Explain the NMR spectrum of ethanol. 03

   b) Explain the mechanism of nucleophilic substitution reaction of pyridine. 05

   c) Explain Skraup synthesis. 02

10. a) Explain the NMR spectrum of 2, 2-dimethyl propane. 04

    b) What are the different types of molecular vibrations? 03

    d) Explain Fisher-indole synthesis. 03

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CHE 601 **Reg. No. .....**

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION - APRIL 2013

CHEMISTRY

GENERAL CHEMISTRY - VII

Duration: 3 hours **Max marks: 80**

PART A

1. Answer any TEN of the following: **2x10=20**

a) Pyrrole is acidic. Give reason.

b) CO_2 is IR active while H_2 is IR inactive. Why?

c) How many NMR signals are obtained for the molecule given below? Give reason.

$CH_2 = CHCl$

d) Electrophilic substitution in indole takes place at C-3. Why?

e) Why quinhydrone electrode is not used in highly alkaline solutions?

f) Give the IUPAC name for i) $Na_2[Cu(C_2O_4)_2]$ ii) $[Pt(NH_3)_2Cl_2]SO$

g) $[Co(NH_3)_6]^{3+}$ is diamagnetic while $[CoF_6]^{3-}$ is paramagnetic. Explain.

h) What is spectrochemical series?

i) Calculate the electrode potential of $Cu|Cu^{2+}$ electrode in which the concentration of Cu^{2+} ions is 1.5M $E^0_{Cu} = 0.34V$

j) Define liquid junction potential. How it is eliminated?

o) Define eutectic point in a phase diagram.

p) Calculate ΔG^o for the cell reaction $Zn + Cu^{2+} \rightleftharpoons Zn^{2+} + Cu$ $E^o_{cell} = 1.1v$

PART-B
UNIT-I

Answer any <u>TWO</u> of the following. **10x2=20**

2. a) Explain ionization and hydration isomerism in Coordination compounds. 04

   b) Explain the optical isomerism in coordination compounds with coordination number four. 04

   c) Calculate the magnetic moment of $[Fe(CN)_6]^{3-}$ complex using spin-only formula. 02

3. a) Describe crystal field splitting in square planar complexes. 04

   f) What are the factors that affect the stability of complexes? 02

   g) How is the magnetic susceptibility of a complex determined by Guoy's balance? 04

4. a) What are μs and μ_{eff} values in metal complexes? How are they correlated? 02

   b) Explain selection rules in d-d transitions in metal complexes. 04

   c) Explain the applications of complexes in volumetric and qualitative analysis. 04

UNIT-II

Answer any <u>TWO</u> of the following. **10x2=20**

5. a) What is the number of components and the number of degrees of freedom in an aqueous solution of glucose?

   b) Draw and discuss the phase diagram for Pb – Ag system.

   c) With a suitable example describe the principle of potentiometric redox titration. 04

6. a) Explain compound formation with congruent melting point in solid solutions.

   b) What are reference electrodes? Explain the construction and working of any one reference electrode?

c) Calculate the EMF of the following cell.

$$X|X^{+2}(1.0M)\ ||\ Y^{+2}(1.0M)/Y$$

$E^{0}_{x} = -1.66V$ $E^{0}_{y} = -0.13V$

7. a) How is the P^{H} of a solution determined using quinhydrone electrode?

b) Calculate the equilibrium constant of cell reaction.

$2Ag^{+} + Zn \rightleftarrows 2Ag + Zn^{2+}$

Occurring in Z_n - Ag cell at 25°C with standard emf of the cell is =1.62V.

c) Explain the construction and working of a concentration cell without transference.

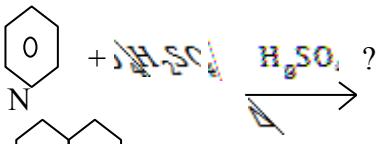
UNIT-III

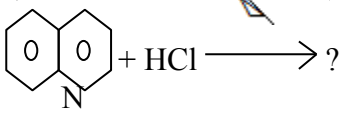
Answer any TWO of the following. **2x10=20**

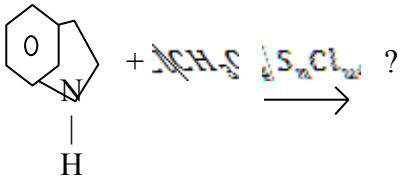
8. a) Outline Bischler Napieralski synthesis of isoquinqoline. 04

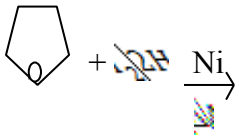
b) Pyridine is less reactive towards electrophilic substitution. Why? 02

c) Complete the following reactions. 04

(i) 

(ii) 

(iii) 

(iv) 

9. a) Describe the orbital picture and aromaticity of thiophene. 04

b) Electrophilic substitution in Furan takes place at C-2 or C-5. Why? 02

c) Explain the application of IR spectroscopy in the structural elucidation of organic compounds. 04

10. a) What is molecular ion and base peak in mass spectra? 02

b) Explain Fischer-indole synthesis. 04

d) Explain the NMR spectra of 2, 2-dimethyl propane. 04

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CHE 601.1 **Reg. No. .....**

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2014

CHEMISTRY

PAPER VII: GENERAL CHEMISTRY

Duration: 3 hours **Max marks: 80**

PART A

1. Answer any TEN of the following: **10x2=20**

a) What is hydrogen overvoltage?

b) Define the term degree of freedom.

c) Calculate the number of phases, components and degree of freedom in the following system.

d) What are concentration cells with transference?

e) Give any two applications of complexes in analysis.

f) Write the relation between μ_s and μ_{eff} and explain the terms.

g) Give any 2 limitations of valence bond theory.

h) What are organometallic compounds? Give 2 examples.

i) Give two applications of IR spectroscopy.

j) Name the reference material used in NMR spectroscopy? What are its advantages?

q) Pyrrole in acidic in nature. Why?

r) Give one method of preparation of furan.

PART-B

UNIT-I

Answer any **TWO** of the following. **2x10=20**

2. a) Derive the relationship between stability constant and overall stability constant. 04

b) Explain the bonding in metal carbonyls. 03

c) Explain the factors affecting the stability of metal complexes. 03

3. a) Explain different types of electronic transitions in metal complexes. 03

b) Explain the crystal field splitting in case of octahedral complexes. 04

c) Explain the selection rules for d-d transition 03

4. a) Give the salient features of crystal field theory. 04

b) Explain the different types of organometallic compounds and give example

for each 04

c) Give the IUPAC names of and 02

UNIT-II

Answer any **TWO** of the following. **2x10=20**

5. a) Describe construction and working of Ag/Agcl electrode. 04

b) What is liquid junction potential? How can it be minimized? 03

c) Calculate the free energy change of the following cell at 03

Standard EMF of the cell is 0.014 volt

6. a) Describe potentiometric method of determination of pH of a solution using quinhydrone electrode. 04

b) How will you determine the valency of ions from EMF measurement? 03

c) State Gibb's phase oule and explain the terms involved. 03

7. a) What is decomposition potential? Give any two of its applications. 03

b) Give the labeled phase diagram of water system and discuss the importance of various points, lines and areas. 04

c) Calculate the EMF of a zinc-silver cell at when activity of ions is 0.5 and the activity of ions is 10. Standard reduction potentials at are: and 03

UNIT-III

Answer any TWO of the following. **2x10=20**

8. a) Describe the mechanism of nucleophillic substitution in phyridine? 04

d) Compare the basicity of pyridine, piperidine and pyrrole. 03

e) Explain NMR spectra of ethil alcohol. 03

9. a) With an example explain the principle of mass spectroscopy.

b) Explain the synthesis of isoquinoline. 03

c) Write a note on bathochromic and hypsochromic shifts. 03

10. a) Give the molecular orbital picure of pyridine and explain its aromatic character

b) What are the different modes of vibrations responsible for IR spectra? 03

c) Although pyrrole, furan and thiophene do not contain any benzene ring they are classified as aromatic compounds. Explain. 03

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CHE 601.1 **Reg. No. .....**

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2015

CHEMISTRY

PAPER VII: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

PART A

1. Answer any TEN of the following: **10x2=20**

a) Mention nay two applications of organolithium compounds.

b) Explain one use of complexation in gravimetric analysis.

c) Give any two limitations of Valence Bond Theory.

d) Explain spin selection rule for d-d transition.

e) What is meant by liquid junction potential?

f) Explain the term hydrogen over voltage.

g) The mixture of two completely miscible liquids is considered as a single phase system. Why?

h) Give the relation between free energy change and equilibrium constant for a cell reaction and explain the terms.

i) What happens when isoquinoline is treated with alkaline $KMnO_4$ solution?

j) Pyrrole is less basic than pyridine. Give reason.

s) Give an example for Chichibabin reaction.

t) Explain the term 'Bathochromic shift' with an example.

PART-B

UNIT-I

Answer any **TWO** of the following. **2x10=20**

2. a) Give an elementary account of Crystal Field Theory. 04

b) Explain any two factors affecting the stability of metal complexes. 03

c) Describe the bonding in alkyl aluminium compounds. 03

3. a) Give any two methods of preparation of organomercury compounds. 03

b) Explain the ligand field spectra and charge transfer spectra of transition metal complexes. 04

d) Explain three factors affecting crystal field splitting. 03

4. a) How is magnetic susceptibility determined by Guoy's method? 04
   b) Explain the crystal field splitting of d orbitals in tetrahedral complexes. 03
   c) Describe the bonding in metal carbonyls. 03

UNIT-II

Answer any **TWO** of the following. **2x10=20**

5. a) What is meant by 'component' of a system? Explain two component system with an example. 04
   b) Explain the application of potentiometric measurements for determining the valency of ions. 03
   c) Calculate the single electrode potential for copper metal in contact with a 0.1M Cu^{+2} solution. is 0.34 Volt. 03

6. a) How do you determine p^H of a solution using quinhydrone electrode? 04
   b) What are concentration cells with transference? 02
   c) Discuss the application of phase rule to Lead-Silver system. 04

7. a) Explain the construction and working of calomel electrode. 03
   b) State the phase rule and explain its application to sulphur system. 04
   c) Calculate the EMF of electrochemical cell at 298K.

Given: 03

UNIT-III

Answer any TWO of the following. **2x10=20**

8. a) Draw the molecular orbital picture of pyrrole and explain its aromatic character. 04
   f) Give the mechanism of electrophilic substitution in furan. 03
   g) Explain the finger print region in IR spectroscopy. 03

9. a) Write any two electrophilic substitution reactions of indole.
   b) Explain Skraup's synthesis of quinoline. 03
   d) Outline the principle of NMR spectroscopy. 04

10. a) Give the mechanism of nucleophilic substitution in pyridine.
    b) Give the applications of uv/visible spectroscopy. 03
    c) Explain the NMR spectrum of toluene. 03

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CHE 601 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2016

CHEMISTRY

PAPER VII: GENERAL CHEMISTRY

Duration: 3 hours **(2009 Admission)** **Max marks: 70**

Note: 1. Write question numbers and subdivisions clearly.
2. Write chemical equations and diagrams wherever necessary.

PART A

1. Answer any TEN of the following: **10x1=10**

a) Give the IUPAC name of $K_4[Fe(CN)_6]$.

b) State 'Leporte Selection' rule.

c) What is spectrochemical series?

d) Write the spectroscopic ground state for d^2 system.

e) What are reference electrodes?

f) What is hydrogen overvoltage?

g) Write phase equation for a two component system.

h) What is incongruent melting point?

i) Among pyridine and piperidine which is less basic?

j) What is nuclear magnetic resonance?

k) What is finger print region in 1R spectrum?

l) Name the product obtained when Pyrrole in treated with dil HCl.

PART-B
UNIT-I

Answer any TWO of the following. **2x10=20**

2. a) What are the factors affecting stability of complexes? 03

b) Discuss the limitations of Valence bond theory. 03

c) Explain the application of magnetic moment data in deducing the structure of the complexes. 04

3. a) Discuss the application of complexation in
i) Metallurgy ii) Gravimetric estimation 04

b) What are charge transfer spectra? 02

c) Explain the splitting of the 'd' orbitals in tetrahedral complexes. 04

4. a) Explain the orbital contribution of the magnetic moment. 04

b) Explain spin selection rule. 02

c) What are the factors affecting crystal-field stabilization energy. 04

UNIT-II

Answer any **TWO** of the following. **2x10=20**

5. a) Calculate the single electrode potential of Zinc metal in contact with 0.01M zinc sulphate solution at 298K . $E^0_{Zn^{2+}/Zn} = -0.76V$. 02

   b) Explain how emf of the cell in measured using quinhydrone electrode. 04

   c) Explain phase diagram for CO_2 system. 04

6. a) Explain phase diagram for Zn-Cd system. 04

   b) How the pH of a solution is measured using hydrogen electrode by potentiometric method? 04

   c) What are concentration cells? 02

7. a) Define the term i) Phase ii) component iii) Degree of Freedom 03

   b) Write the Nernst equation for the electrode potential and explain the terms involved. 02

   c) i) Standard free energy change for a reaction is – 400 kJ. What is the value of equilibrium constant for the reaction? 02

      ii) Explain the phase diagram for silver – lead system. 03

UNIT-III

Answer any TWO of the following. **2x10=20**

8. a) Draw the molecular orbital picture for pyridine and account for its
   (i) Aromaticity (ii) Basicity 05

   b) Give one method of synthesis for Pyrrole. 02

   c) Explain how mass spectroscopy is used with identification organic compounds. 03

9. a) Explain how 1R spectroscopy can be used to identify the functional groups. 04

   b) Explain i) Chichibabin reaction for pyridine
   ii) Diel's Alder reaction for furan. 04

   c) How thiophene is nitrated? Explain its mechanism. 02

10. a) Using the concept of spin-spin coupling how are the following compounds identified
   i) 2, 2-dimethyl propane
   ii) Ethonol 04

   b) Explain chemical shift. 02

   c) How Quinoline is sulphonated? Explain its mechanism. 04

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CHE 601.1 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2016

CHEMISTRY

PAPER VII: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

PART A

1. Answer any TEN of the following: **10x2=20**

a) What are reference electrodes? Give one example.
b) Define the term phase and component.
c) What is decomposition potential?
d) What are concentration cells without transference.
e) Write the IUPAC names of
$Cr(C_6H_6)_2$ and $Fe(C_5H_5)_2$
f) Give any two applications of metal complexes.
g) Mention the selection rules for d-d transitions in complexes.
h) What is spectrochemical series?
i) Give two applications of mass spectroscopy.
j) Name the reference material used in NMR spectroscopy? What are its advantages?
k) Pyridine does not undergo Friedel-Craft's reaction. Why?
l) What is Chichibabin reaction?

PART-B

UNIT-I

Answer any **TWO** of the following. **2x10=20**

2. a) Explain how is magnetic susceptibility determined by Guoy's method. 04
b) Explain the crystal field splitting in tebahedral complexes. 03
c) Calculate the effective magnetic moment of d^5 system using spin only formula. 03

3. a) Explain the nature of bonding in metal carbonyls. 04
b) Explain any two methods of preparation of alkyl lithium. 03
c) Write the relation between μ_s and μ_{eff} and explain the terms. 03

4. a) Compare the valance bond theory with crystal field theory of complexes. 04
b) Derive the relationship between stepwise and overall stability constants. 03
c) How is magnetic moment data useful in deducing the structure of complexes? 03

UNIT-II

Answer any **TWO** of the following. **2x10=20**

5. a) Describe the construction and working of calomel electrode. 04

   b) Describe potentiometric method to determine the pH of a solution using glass electode. 04

   c) Consider the cell $Pt \mid H_2(1atm) \mid H^+_{(x)} \parallel Kcl(0.1M) \mid Hg_2Cl_2 \mid Hg$

   If the EMF of this cell is 0.50 Volt at $25^\circ C$. What would be the pH of the solution of the hydrogen electrode? Electrode potential of the calomel electrode is 0.281 Volt at $25^\circ C$. 02

6. a) What is the EMF of a concentratin cell consisting of zinc electrodes, one immersed in a solution of 0.05 molar concentration and the other in a solution of 0.5 molar concentration of its ions at $25^\circ C$? The 2 solutions are connected by salt bridge. 03

   b) How will you determine solubility product of sparingly soluble salts from emf measurement? 04

   c) Explain the phase equilibrium of zinc-cadmium system. 03

7. a) Draw the labeled phase diagram of sulphur system and discuss its salient features. 04

   b) What is liquid junction potential? How it can be minimized? 03

   c) Calculate the number of components, phases and degrees of freedom in the following equilibrium system: -

   $$CaCo_3(s) \rightleftharpoons CaO(s) + CO_2(g)$$ 03

UNIT-III

Answer any TWO of the following. **2x10=20**

8. a) Describe the mechanism of nitration of pyridine. 04

   c) What is finger print region in IR spectra? What is its significance? 03

   c) Explain Fisher indole synthesis. 03

9. a) What is the principle of NMR spectroscopy? Discuss the significance of chemical shift in NMR spectroscopy. 04

   b) Explain PMR spectra of acetaldehyde and ethyl bromide. 03

   c) How is quinoline obtained from Skraup's synthesis? 03

10. a) Give the Molecular orbital picture of pyrrole and explain its aromatic character. 04

    b) Write a note on bathochromic and hypsochromic shifts in UV-visible spectra. 03

    c) Compare the basicity of pyridine with piperidine. 03

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