**CHE 401** **Reg. No. .....**

**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION - APRIL 2012**

**CHEMISTRY**

**GENERAL CHEMISTRY - IV**

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

**PART A**

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

a) Atomic size of lanthanides decreases with increase in atomic number. Give reason.

b) Write the general electronic configuration of actinides.

c) Calculate the magnetic moment of $Fe^{2+}$ ion based on spin only formula.

d) $Cu^{+}$ is diamagnetic but $Cu^{2+}$ is paramagnetic. Give reason.

e) How many planes of symmetry and axis of symmetry are present in simple cube?

f) State the law of rationality of indices.

g) What is Osmotic pressure? How is it related to molar concentration?

h) Define ebullioscopic constant.

i) Give an example for Wolf-Kishner reduction.

j) What happens when butanone reacts with ammonia?

m) Explain HVZ reaction.

n) Give any one method of preparation of acetic anhydride.

## PART-B

## UNIT-I

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

2. a) Give any three similarities between later actinides and later lanthanides. 03

   b) What is lanthanide contraction? Explain its causes and consequences. 04

   c) Write the electronic configuration of Copper (At. No = 29) Calculate the magnetic moment of $Cu^{2+}$ ion 03

3. a) How is plutonium separated from Uranium? 03

   e) Discuss the oxidation states of 3d series elements. 04

   f) Compare the ionic radii of 4d and 5d series of elements with their 3d analogues. 03

4. a) Discuss the formation of coloured compounds by 3d series elements. 03

   b) Explain the magnetic behaviour of d-block elements. 04

   c) Explain the complex formation tendency of lanthanides. 03

## UNIT-II

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

5. a) What are Miller indices? Explain the procedure for determining Miller indices for a crystal plane.

   b) Describe the Ostwald-Walker method of determination of relative lowering of vapour pressure. 04

   g) Pure water boils at 100$^{o}$C. A solution prepared by dissolving 1.5 g of solute in 15 g of water boils at 100.9$^{o}$C. Calculate the molecular mass of solute. Molal elevation constant of water is 0.52$^{o}$/1000g.

6. a) Define molality of a solution. Calculate the molality of solution prepared by dissolving 24g of urea (molecular mass 60) in 200g. of water.
   b) Derive Bragg's equation.
   c) Describe the Landesberger's Method of determining the elevation of boiling point.

7. a) Molecular weight of benzoic acid determined by the elevation of boiling point method in benzene is about double the normal value. Why?

   b) How is X-ray diffraction used to show that sodium chloride has F.C.C. lattice?
   c) Give the thermodynamic derivation of relation between molecular weight and elevation in boiling point.

**UNIT-III**

**Answer any <u>TWO</u> of the following.** **2x10=20**

8. a) Explain the mechanism of benzoin condensation reaction. 03
   d) Give the methods of preparation of monocarboxylic acids from alcohols and Grignard reagent. 04
   e) Explain Hinsberg method of separation of primary, secondary and tertiary amines. 03

9. a) Explain the mechanism of esterification reaction. 04
   b) What is the action of nitrous acid on primary, secondary and tertiary amines? 02
   c) Explain the mechanism of Perkins reaction. 02

10. a) Give an example for Witting reaction and Mannich reaction. 04
    b) Arrange the following in the increasing order of basicity and give the reason: ethyl amine, dimethyl amine, trimethyl amine. 03
    c) Explain the effect of substituents on the acidity of carboxylic acid. 03

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**CHE 401.1** **Reg. No. .....**

**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION - APRIL 2013**

**CHEMISTRY**

**GENERAL CHEMISTRY - IV**

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

## PART A

**1. Answer any <u>TEN</u> of the following:** **2x10=20**

a) Write the IUPAC name of $K_3[(AlC_2O_4)_3]$.

b) $Ti^{3+}$ and $Sc^{3+}$ are colourless. Why?

c) What is ionization isomerism? Give an example.

d) Complexes of d-block elements are coloured. Why?

e) Calculate the osmotic pressure of 2% glucose solution at 30°C.

f) Explain the law of constancy of interfacial angles.

g) Diagrametrically represent the planes having Miller indices (100) and (111) in a cubic crystal.

h) Write any two applications of nanomaterials.

i) What are dicarboxylic acids? Give two examples.

j) What is HVZ reaction? Give an example.

o) What is the action of acetone on (i) hydrazine (ii) ammonia.

p) How do you synthesise benzene from benzene diazonium chloride? Write equation.

## PART-B
## UNIT-I

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

2. a) On the basis of valence bond theory, explain hybridization, electron arrangement, geometrical shape and magnetic properties of $[NiCl_4]^{2-}$ 04

   b) Give an example each for ambidentate ligand and chelating ligand. 02

   c) Explain the magnetic properties of d-block elements. 04

3. a) Transition elements exhibit variable oxidation states? Why. 04

   h) Calculate EAN of Ni in $[Ni(NH_3)_6]^{2+}$ atomic number of Ni is 28. 02

   What are the postulates of valence bond theory? Mention any two limitations. 04

4. a) Discuss geometrical isomerism in coordination compounds with coordination number 4. 04

   b) Give any two general characteristics of elements of second and third transition series. 02

   c) Transition metal ions form a large number of complexes. Why? 04

## UNIT-II

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

5. a) Derive Bragg's equation $n\lambda = 2d\ sin\theta$.
   04

   b) Derive relationship between elevation in boiling point and molecular mass

of solute.

04

c) Mention the different types of liquid crystals.

6. a) How is X-ray diffraction method used to show that NaCl has face centered cubic lattice?

b) A solution containing 5.9 g. of a solute in 50g. of diethyl ether has a vapour pressure of $5.4x10^4\ Nm^{-2}$ at 300 K. Calculate molecular mass of solute. if vapour pressure of ether at 300 K is $5.9x10^4\ Nm^{-2}$ 02

c) How is Osmotic pressure determined by Berkeley and Hartley method?

7. a) Explain how relative lowering of vapour pressure is determined by Ostwald and Walker dynamic method.

b) Define (i) Space lattice (ii) Unit cell.

c) A solution containing 2g of solute in 86.66g of water boils at 100.2°C. Calculate molecular mass of solute. The boiling point of water is 100°C. $K_b$ = 0.52K. kg/mol.

## UNIT-III

**Answer any <u>TWO</u> of the following.** **2x10=20**

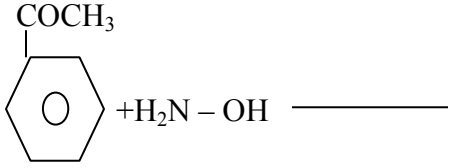
8. a) Explain the mechanism of Perkin's reaction. 04

b) Explain the effect of heat on α and β hydroxyl acids. Give equations. 02

i) Explain the separation of amine mixture using Hinsberg method. 04

9. a) Complete the equation

04

(i) 


(ii) $H_3C - CH_2 - \overset{\overset{O}{\|}}{C} - H + CH_3 - CH_2 - OH$ ————

(iii) $CH_3 - CHO + NH_2$ ————

(iv) $H_3C - \overset{\overset{O}{\|}}{C} - CH_3 \xrightarrow[Con.HCl]{Zn-Hg}$

b) Explain the mechanism of hydrolysis of an ester in acidic conditions. 04

c) What is the action of nitrous acid on primary and secondary amines? 02

10. a) What is Aldol condenstation? Explain its mechanism. 04

b) What is Mannich reaction? Give an example. 02

c) (i) Give one method of synthesis of diazonium chloride.

(ii) Chloro acetic acid is stronger than acetic acid. Give reason. 04

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**CHE 401.1** **Reg. No. .....**

**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2014**

**CHEMISTRY**

**PAPER IV: GENERAL CHEMISTRY**

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

**PART A**

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

a) Specify the oxidation number and co-ordination number of the metal in the complex $[Co(en)_3]Cl_3$

b) What is hydrate isomerism? Give an example.

c) Give the electronic configuration of $Ni^{2+}$ ion. How many unpaired electrons are present in it?

d) $NiSO_4$ is coloured whereas $ZnSO_4$ is colourless. Why?

e) State Boyle-Van't Hoff's law and Charles – Van't Hoff's law.

f) The boiling point of sea water is not $100^{\circ}C$. Give reason.

g) State the law of rationality of indices.

h) Define plane of symmetry. Write the total number of plane of symmetries in a cubic crystal.

i) Between methyl amine and aniline which is more basic? Why?

j) Explain HVZ reaction with an example.

q) What is the action of heat on 3-hydroxypropanoic acid?

r) How do you convert acetone to propane?

**PART-B**

**UNIT-I**

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

2. a) Explain the formation of coloured compounds by transition elements. 04

b) Among $[Co(en)_3]^{3+}$ which is more stable? Why? 03

c) Explain co-ordination isomerism with suitable example. 03

3. a) Describe geometrical isomerism in a complex compounds with co-ordination number – 4. 04

b) Calculate the magnetic moment of ion. 03

c) Give the IUPAC name of the following complex compounds

i) ii) iii) 03

4. a) What are the postulates of velence bond theory? 04

b) Write the structures of cis and trans diamminedibromoplatinum (11) 03

c) Explain the variable oxidation states exhibited by transition elements. 03

## UNIT-II

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

5. a) Derive Bragg's equation, for a crystalline solid. 04

b) Explain Berkely-Hartley method of determination of osmotic pressure. 03

c) Define the terms (i) Molarity (ii) mole fraction (iii) cryoscopic constant 03

6. a) Derive the thermodynamic relation between boiling point elevation and molecular mass of the solute. 04

b) What are the Miller indices of a crystal plane having intercept 2 and 3 on x & y axes respectively and parallel to Z-axis. 03

c) Write a note on classification of liquid crystals with one example for each type. 03

**7.** a) Explain the measurement of relative lowering of vapour pressure by Ostwald and Walker dynamic method. 04

b) Explain different type of lattices in cubic system. 03

c) Pure water freezes at 273K. A solution prepared by dissolving 20 grams of a solute in 120 grams of water freezes at 271.3K. Calculate the molecular mass of the solute (Given for water = 1.86 K. kg/Mol). 03

## UNIT-III

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

8. a) How is the mixture of primary, secondary and tertiary amines separated by Hinsberg method? 04

f) Give the mechanism of aldol condensation. 03

g) Explain the action of heat on oxalic acid and succinic acid. 03

9. a) Explain the use of acetal as protecting group with an illustration.

b) How does nitrous acid react with primary and secondary amines? 03

c) Write the mechanism of acid catalysed hydrolysis of an ester. 03

10. a) Explain any 2 methods of preparation of monocarboxylic acids.
b) Starting from benzene diazonium chloride how do you prepare bromo benzene and phenol? 03
c) How does ammonia react with (i) acetaldehyde (ii) acetone 03

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**CHE 401.1** **Reg. No. .....**

**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2015**

## CHEMISTRY

**PAPER IV: GENERAL CHEMISTRY**

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

**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:** **2x10=20**

a) Write IUPAC name of  .
b) Mention any two limitations of valence bond theory of complexes.
c) What is hydrate isomerism? Give an example.
d) What are d-clock elements? Give general electronic configuration of d-block elements.
e) State Raoult's law of relative lowering of vapour pressure.
f) Explain the law of constancy of interfacial angles.
g) Define the centre of symmetry.
h) Write any two applications of nanomaterials.
i) Formic acid is stronger than acetic acid. Give reasons.
j) Give one method of formation of carboxylic acids.
s) What is the action of acetaldehyde on
(i) Hydrazine (ii)Ammonia
t) Explain conversion of benzene diazonium chloride to chlorobenzene.

### PART-B
### UNIT-I

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

2. a) Discuss structure, geometry and magnetic property of  on the basis of valence bond theory 04
b) Give an example for bidentate ligand. Indicate the donor atoms present in it. 03
c) Explain complex formation in the case of transition elements. 03

3. a) What are the postulates of valence bond theory for complexes. 04

b) Explain magnetic properties of d-block elements. 03

c) Explain the property of colour formation in transition elements. 03

4. a) Discuss geometrical isomerism in coordination compounds with coordination number 6. 04

b) Transition elements exhibit variable oxidation states – Explain. 03

c) Explain the general trends in any two characteristics of second and third transition series. 03

## UNIT-II

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

5. a) Derive relation between molecular weight of solute and boiling point elevation. 04

b) What is Boyle-Van't Hoff's law? 03

c) Explain axes of symmetry. How many axes of symmetries are possible in cubic crystal? 03

6. a) Explain how relative lowering of vapour pressure is determined by Ostwald and Walker dynamic method. 04

b) 0.25g of acetic acid was dissolved in 10g. of benzene depressed the freezing point (a) 04
*K* 1.67 *Kkgmol* . Calculate the apparent molecular weight of acetic acid
. 03

c) What are Miller indices? Explain the procedure for determining the Miller indices for a plane. 03

**7.** a) How is osmotic pressure determined by Berkeley and Hartley method? 04

b) What are liquid crystals? How are they classified? 03

c) Derive Bragg's equation . 03

## UNIT-III

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

8. a) Explain the mechanism of benzoin condensation. 04

h) Give any one method for the preparation of acetic anhydride. 03

i) Explain action of heat on alpha hydroxy acid and beta hydroxy acid. 03

9. a) Complete the equation.

(i) *CHCHONaOH*

(Strong)

(ii) *CHCOCHHNNH*

(iii) $C_6H_5CHO + CH_3CHO \xrightarrow{NaoH}$

(iv)

b) Explain the mechanism of base hydrolyzing of ester. 03

d) What is the action of nitrous acid on

(i) Methylamine (ii) aniline 03

10. a) Explain the separation of a primary, secondary and tertiary amines by Hinesburg method.

b) Explain Hoffmann bromamide synthesis of amines. 03

c) Give an example for Mannich reaction. 03

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CHE 401.1 Reg. No. .....

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

# CHEMISTRY

## PAPER IV: GENERAL CHEMISTRY

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

**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:** **2x10=20**

a) Specify the oxidation number and coordination number of the metal in the complex $[Co(en)_2Cl_2]Br$

b) Calculate the magnetic moment of $Cr^{+3}$. (Atomic no. of Cr = 24).

c) What are transition elements? Write the general electronic configuration of transition elements.

d) What is ionization isomerism? Give an example.

e) State law of constancy of interfacial angle.

f) Define osmotic pressure. What is its SI Unit?

g) What is a liquid crystal? Give an example.

h) State Raoult's law of relative lowering of vapour pressure.

i) Explain Cannizzarro's reaction with suitable example.

j) Arrange of following in the increasing order of their acidic strengths.

$ICH_2COOH$, $FCH_2COOH$, $BrCH_2COOH$, $ClCH_2COOH$

k) Give one example each for the following

(i) Hydrxy Carbexylic acid (ii) dicarbexylic acid

l) What happens when aniline is treated with acetylchloride in the presence of concentrated $H_2SO_4$ acid?

## PART-B

## UNIT-I

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

2. a) Explain geometrical isomerism in complex compounds with co-ordination number-6. 04

b) Give any three limitations of valence bond theory of complexes. 03

c) Describe the magnetic behavior of d-block elements. 03

3. a) Compare 4d and 5d series of elements with their 3d analogues in respect of ionic radii and magnetic properties. 04

b) Explain linkage isomerism with suitable example. 03

c) Explain the variable oxidation state exhibited by transition elements. 03

4. a) Write a short note on optical isomerism in complexes with coordination number 4. 04

b) Giving reasons, indicates which of these ions are coloured $Cu^{+}, Ti^{+4}$ and $Ni^{+2}$. 03

c) Write the IUPAC name of the following complex compounds.

(i) $Na_3[AlF_6]$ (ii) $K_2[PtCl_6)$ (iii) $[CoBr(NH_3)_5]SO_4$ 03

## UNIT-II

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

5. a) How is crystal structure of rock salt determined by X-ray diffraction method? 04

b) Define the term (i) mole fraction (ii) molality (iii) ebullioscopic constant. 03

c) Calculate the relative lowering of vapour pressure for a solution prepared by dissolving 9 grams of area in 60 grams of water. 03

6. a) Explain how elevation of boiling point by Landsberger's method. 04

b) What are the Miller indices of a crystal plane having unit intercept on x-axis and parallel to y and z axis? 03

c) Give an account of abnormal molar mass obtained by methods using colligative properties. 03

7. a) Derive thermodynamics relation between freezing point depression and molecular mass of the solute. 04

b) Define axis of Symmetry. Write the total number of axis of symmetries in a cubic crystal. 03

c) Calculate the osmotic pressure of 5% solution of cane sugar at $25^{\circ}C$
(Given molecular mass of cane sugar = 342) 03

## UNIT-III

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

8. a) Explain Hinsberg method for the separation of primary, secondary and tertiary amines. 04

b) Write a note on Rosenmund reduction. 03

c) Explain Wolf-Kishner reduction with an example. 03

9. a) Give the mechanism of Knoevenagel reaction. 04

b) How aniline is prepared from benzamide? 03

c) What happens when acetic acid reacts with
(i) Thionyl chloride (ii) Sodalime 03

10. a) Explain any two methods of preparation of dicarboxylic acids. 04

b) How does hydrazine react with
(i) acetaldehyde (ii) acetone 03

c) Describe carbyl amine reaction. 03

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CHE 401.2 Reg. No. .....

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

**CHEMISTRY**

PAPER IV: GENERAL CHEMISTRY

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

**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:** **2x10=20**

a) $CuSO_4$ is coloured where as $ZnSO_4$ is colourless. Why?

b) What is the stable oxidation state of $Mn$ and why?

c) What are d-block elements? Give general electronic configuration of d-block elements?

d) Calculate the bond order in $O_2^+$ ion.

e) State Nernst distribution law.

f) What are azeotropic mixtures? Give an example.

g) What is chemical adsorption? Give one example.

h) Air becomes dry in the presence of silica gel. Give reason.

i) How is aniline prepared from nitrobenzene? Write the chemical equation.

j) Arrange the following bases in the increasing order of basicity dimethyl amine, aniline methyl amine.

k) Mention any two uses of urea-formaldehyde resin.

l) Name the monomer units of Dacron.

## PART-B

### UNIT-I

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

2. a) Explain the energy level diagram, bond order and molecular orbital configuration of $F_2$ molecules on the basis of molecular orbital theory. 04

b) Calculate the magnetic moment of $Cr^{+3}$ using spin only formula. 03

c) Describe hybridization and shape of $CH_4$ on the basis of Valence bond theory. 03

3. a) Explain the main postulates of Valence shell electron pair repulsion theory. 04

b) Write any three differences between VBT & MOT. 03

c) Discuss the variation of atomic radius of the element along the 3d-series. 03

4. a) Explain the energy level diagram, bond order and molecular orbital configuration of $N_2^+$ ion on the basis of molecular orbital theory. 04

b) What are the conditions for the formation of molecular orbitals by linear combination of atomic orbital method? 03

c) Transition elements exhibit variable oxidation state. Justify the statement. 03

## UNIT-II

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

5. a) Describe steam distillation with neat diagram. 04
   b) Explain the effect of impurity on critical solution temperature of phenol-water system. 03
   c) Discuss the factor which affects the adsorption of gas on a solid adsorbent. 03

6. a) Write BET equation. How can it be used to determine the surface area of an adsorbent. 04
   b) Describe vapour pressure – composition curve for non ideal solution which shows positive deviation from Raoult's law. 03
   c) Explain Nicotine – water system. 03

7. a) Draw and explain boiling point – composition curve for binary liquid mixture which shows negative deviation from Raoult's law with an example. 04
   b) Discuss the behavior of Langmuir adsorption isotherm at very low and high pressure. 03
   c) Succinic acid was shaken with a mixture of water and ether. After distribution, upon analysis the concentrations of the acid in the two layers are found as

| | | | |
|---|---|---|---|
| In equines layer $(mol/dm^3)$ | 0.0252 | 0.071 | 0.121 |
| In ether layer $(mol/dm^3)$ | 0.0046 | 0.013 | 0.022 |

   If succinic acid has similar molecular mass in ether and water. Calculate its partition coefficient. 03

## UNIT-III

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

8. a) How is the mixture of 1°, 2° and 3° amines separated by Hoffmann's method. 04
   d) Write a short note on Gomberg – Bachmann reaction. 03
   c) Explain the mechanism of free radical polymerization of vinyl polymer. 03

9. a) Write a note on Zeigler – Natta polymerization. 04
   b) How do you convert benzene diazonium chloride to phenyl hydrazine? 03
   c) Explain the preparation of epoxy resin and give its applications. 03

10. a) How does primary and secondary amines react with nitrous acid. 04
    b) Explain how would you convert Benzene diazonium chloride to benzene. 03
    c) How is Buna –S manufactured? 03

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