Sr. No: 5001 Roll. No:

M.SC. (CHEMISTRY) - 2ND SEMESTER EXAMINATION, MAY-2016

SUBJECT- INORGANIC CHEMISTRY-II (PAPER CODE - 09040201)

Time: 3 Hours **Maximum Marks-80**

Instruction:

1. **Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.**
2. **Attempt any five questions in all. Question No. 1 is compulsory. Attempt other four questions selecting one from each unit.**
3. **All question carry marks as noted against each question.**

Q1. Answer all the following questions: **(8x2=16)**

(a) Differentiate between bonding and antibonding orbitals.

(b) Define John Teller Theorm.

(c) Calculate the number of microstabtes for $P^2$and d^4 configurations.

(d) What are nido and arachno carboranes?

(e) What is temperature independent paramagnetism?

(f) Why No^+ is considered to be three electron donor and No^- is one electron donor?

(g) Briefly explain spin state cross over phenomenon.

(h) Although N_2 is iso-electronic with CO, it is a poor σ - donor than CO, why?

UNIT-I

Q2. (a) Why is motealar orbital theory preferred over crystal field theory in explaining metal – ligand bonding in transition metal complexes. **(6)**

(b) Draw and explain MO diagram for octahedral complex, $[Co(NH_3)_6]^{3+}$. **(5,5)**

OR

Q3. (a) Discuss and draw the generally accepted energy level diagram for a tetrahedral complex. **(8)**

(b) Explain the effect of pi-bonfing in square planar complexes. **(8)**

UNIT-II

Q4. (a) What are orgel diagrams? Draw and discuss a combined orgel energy level diagram for d^1(oh) and d^9(oh). **(8)**

(b) Draw and explain the T.S. diagram for d^3 complex $[Cr(NH_3)_6]^{3+}$. **(8)**

OR

Q5. (a) Discuss the nature of electronic transition in d^6 octahedral complexes with high spin. **(6)**

(b) What are the spectral consequences of John –Teller effect? **(4)**

(c) Show the charge transfer MLCT transitions in ML_6 octahedral complex. **(6)**

P.T.O

UNIT-III

Q6. (a) Define magnetic susceptibility. How is magnetic moment calculated from magnetic susceptibility? **(8)**

(b) Explain the structure and bonding of Hexaborane -10 and Nonaborane -15. **(8)**

OR

Q7. (a) What are carboranes? Give there structure and bonding? **(6)**

(b) Bristly explain: **(5,5)**

(i) The effect of ligand field on magnetic properties.

(ii) Phenomenon of orbital contribution to magnetic moment of a substance.

UNIT-IV

Q8. (a) Discuss the molecular orbital picture of bonding in metal carbonyls. How is carbon oxygen bond strength affected by the synergic effect in metal carbonyls? **(8)**

(b)Descirbe structure of the following: **(8)**

(i) $Mn_2(co)_{10}$

(ii) $Fe_2(co)_9$

OR

Q9. (a) Describe the method of preparation and structure of nitroso ferrous sulphate. **(6)**

(b) What is the linear terminal M-NO bonding and bent terminal M-NO bonding? Explain with suitable examples. **(5)**

(c) Write short note on tertiary phosphine as ligand. **(5)**

****

Sr. No: 5001 Roll. No:

M.SC. (CHEMISTRY) - 2ND SEMESTER EXAMINATION, MAY-2016

SUBJECT- PHYSICAL CHEMISTRY-II (PAPER CODE - 09040202)

Time: 3 Hours **Maximum Marks-80**

Instruction:

1. **Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.**
2. **Attempt any five questions in all. Question No. 1 is compulsory. Attempt other four questions selecting one from each unit.**
3. **All question carry marks as noted against each question.**

Q1. Answer all the following questions: **(8x2=16)**

(a) What do you mean by degeneracy among energy levels?
(b) What is zero point energy?
(c) Define Narnest heat theorem?
(d) Distinguish between fugacity and activity.
(e) What are the general features of chain reactions?
(f) What is Lineweaver-Burk Plot?
(g) What do you understand by ionic drift velocity?
(h) Define diffusion potential.

UNIT-I

Q2. Set up Schrodinger wave equation for a linear harmonic oscillator and give its solution by polynomial method. **(16)**

OR

Q3. (a) Set up the Schrodinger equation for hydrogen atoms in polar from and separate it into three independent equations for each variable. **(12)**

(b) Find the radius of the sphere in which the probability of locating the 1s election of hydrogen atom is 0.95. **(4)**

UNIT-II

Q4. (a) What is physical significance of entropy? **(4)**

(b) One mole of ideal gas changes its volume reversibly from 10ml at 278 k to 20ml at 298 K. Assume $C_v = 1.5$ R. Calculate entropy change for the process. **(4)**

(c) Explain the method for determination of absolute entropy. **(8)**

OR

Q5. (a) Describe phase diagram in brief of any two component completely miscible system. **(10)**

(b) Define activity coefficient and discuss the significance of choices of standard states. **(6)**

UNIT-III

Q6. (a) Describe in brief the kinetics of hydrogen-chlorine photochemical reaction. **(8)**

(b)Discuss in brief the Rice-Herzfeld mechanism of decomposition of acetaldehyde. **(8)**

P.T.O

OR

Q7. Explain the kinetics and mechanism of enzyme catalyzed reaction in detail. Also evaluate Michaelis's constant for enzyme-substrate binding by Eadie- Hofstae method. **(16)**

UNIT-IV

Q8. (a) Explain relations of (i) ionic drift velocity with current density and (ii) absolute mobility with diffusion coefficient in ionic solution. **(8)**

(b) Discuss Walden's rule for ion transport under the influence of electric field and explain under what conditions it is obeyed for different sizes of ions. **(8)**

OR

Q9. Write short notes on the following;

(a) Total driving force for ionic transport. **(8)**

(b) Plank-Henderson equation for diffusion potential. **(8)**

****

Sr. No: 5003 Roll. No:

M.SC. (CHEMISTRY) - 2ND SEMESTER EXAMINATION, MAY-2016

SUBJECT- ORGANIC CHEMISTRY-II (PAPER CODE - 09040203)

Time: 3 Hours **Maximum Marks-80**

Instruction:

1. **Candidate should ensure that they have been provided with correct question paper. Complaints in this regard, if any, should be reported to the invigilator on duty in the examination hall within 15 minutes of the commencement of the exams. No compulsory shall be entertained thereafter.**
2. **Attempt any five questions in all. Question No. 1 is compulsory. Attempt other four questions selecting one from each unit.**
3. **All question carry marks as noted against each question.**

Q1. Answer all the following questions: **(8x2=16)**

(a) Explain why ethoxymethyl chloride reacts with nucleophiles 10^6 times faster than 1-cholorobutane?

(b) Write short not on S_Ni mechanism.

(c) Why reactions with o-bromoanilsole with $NaNH_2$ gives only m-bromoanisole?

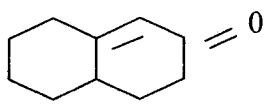
(d) Why fluoride gives Hofmann elimination product?

(e) Why bromination of toluene is five times faster than that od t-butyl benzene?

(f) Explain the pyrolusis of xanthate esters.

(g) Give the synthesis of $\beta - aryl - \alpha,\beta -$ unsaturated acid by aromatic aldehyde.

(h) Predict the product:



$$\xrightarrow[(ii)H_2O/H^+]{(i)CH_3MgBr/Cu_2Br}$$

UNIT-I

Q2. (a) Write short note on: **(4x4=16)**

(i) Wagner Marvien rearrangement.

(j) Ambident nucleophile

(k) Phase transfer catalysis

(l) Non-classical carbocation

Q3. (a) Give application of NMR spectroscopy in detection of carbocations. **(4)**

(b) Explain anchimeric assistance in nucleophillic substitution reactions. **(7)**

(c) Give a brief account of SNI' reactions. **(5)**

UNIT-II

Q4. Write short note on the following: **(4x4=16)**

(i) Von Richter Rearrangement

(ii) Vilsmeir Haack reaction

(iii) Diazonium coupling

(iv) Sommelet Hauser Rearrangement

P.T.O

Q5. (a) Write a note on aliphatic electrophillic substitutions with its mechanism. **(6)**

(b) What do you understand by benzyne mechanism? Give details **(4)**

(c) Explain the factor affecting the reactivity in aromatic nucleophillic substitutions. **(6)**

UNIT-III

Q6. (a)What do you understand by E2 elimination reaction? Explain all the conditions in detail in which Hofmann product is obtained. **(6)**

(b) Give details of E1CB mechanism. **(4)**

(c) Give the mechanism of **(3x2=6)**

(i) Pyrolytic eliminations

(ii) Sharpless asymmetric epoxidation.

Q7. (a) Write short note on: **(4x4=16)**

(i) Michael addition reaction

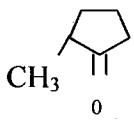
(ii) Addition reaction to cyclopropane ring

(iii) Regio and chemo selectivity

(iv)Effect of substrate structure and attacking base in elimination reaction.

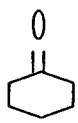
UNIT-IV

Q8. Predict the product of following reactions: **(4x4=16)**

(i)  $+ CH_2O + H_2N^{(+)}(CH_3)_2\,Cl^{(-)}$

(ii) $C_6H_5CHO + C_6H_5CHO \xrightarrow[H_2O]{NaCN/EtOH}$

(iii) $C_6H_5CHO + (CH_3CO)_2O \xrightarrow[\Delta]{CH_3COONa}$

(iv)  $+ Ph_3P = CH_2 \longrightarrow$

Q9. (a) Give the mechanism of : **(3x2=6)**

(i) Writing reaction

(ii) Hydrolysis of amides

(b) Describe the meachanism of reduction of various functional groups by sodium borohydride and boranes **(6)**

(c) Give an account of addition of Organolithium regents to unsaturated carbonyl compound. **(4)**

****

Sr. No. 5004 Roll No. _____

M.SC. (CHEMISTRY)–2ND SEMESTER EXAMINATION, MAY- 2016

[SUB.:- GENERAL SPECTROSCOPY; PAPER CODE: 09040207]

Time: 03:00 Hrs. **Max. Marks: 80**

Instructions:-

1. Write your Roll No. on the Question paper.
2. Candidate should ensure that they have been provided correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter.
3. Attempt five questions in all. Question no.-1 is compulsory. Attempt remaining four questions selecting atleast one from each Section.
4. Draw diagram wherever required.

---

1. Answer the followings:
   a) What is coupling constant? (2)
   b) Explain the concept of quantization of energy. (2)
   c) What is the selection rule for microwave spectroscopy? (2)
   d) What does a Boltzman population excess of 0.99991 mean? (2)
   e) What do you mean by intensity of spectral lines? (2)
   f) What is precessional motion? (2)
   g) What are the selection rules in U.V? (2)
   h) What is equivalent protons? (2)

SECTION-A

2. Explain Frank- Condon principle and vibrational course structure of electronic band. (16)
3. Derive an expression for rotational energy levels for rigid diatomic rotator. (16)
4. Define Molecular vibrations. What factors affect the vibrational frequencies in polyatomic molecules? (16)

SECTION-B

5. Describe the application of infrared spectroscopy to inorganic compounds. (16)
6. Discuss the use of U.V spectroscopy to inorganic compounds. (16)
7. How can fluxional inorganic molecules can be studied by NMR spectroscopy. (16)

SECTION-C

8. What is the basis of NMR Spectroscopy. (16)
9. What is relaxation in NMR? Discuss its two types in detail. (16)
10. Explain the magnetic anisotropy in detail. (16)

****