SLR-JF-100

Seat No.	

Set P

M.Sc. (Semester - II) (CBCS) Examination Oct/Nov-2019
Chemistry
PHYSICAL CHEMISTRY - II

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Fluorescence intensity _____ with rigidity in the structure.
   a) increase b) decreases
   c) remains constant d) doesn't affect

2) Which of the electrodes can be used as a reference electrode?
   a) calomel b) hydrogen
   c) silver-silver electrode d) all of these

3) _____ phenomenon represents radiationless transitions.
   a) Intersystem crossing b) Phosphorescence
   c) Fluorescence d) Delayed fluorescence

4) For endergonic biochemical reaction. ΔG is _____.
   a) 0 b) < 0
   c) > 0 d) ∞

5) Which of the following is spin allowed transition?
   a) $S_1 \rightarrow S_0$ b) $S_1 \rightarrow T_1$
   c) Phosphorescence d) $T_1 \rightarrow S_0$

6) Order of a chemical reaction may be _____.
   a) zero b) integer
   c) half integer d) all of these

7) Fluorescence emissions are mainly confined to the following transitions.
   a) $\pi \rightarrow \pi^*$ b) $\sigma \rightarrow \sigma^*$
   c) $n \rightarrow \sigma^*$ d) $n \rightarrow n^*$

8) Which of the following gas is not a greenhouse gas?
   a) H_2O vapors b) CO_2
   c) CH_4 d) O_3

9) For triplet state, the spin multiplicity is _____.
   a) 1 b) 2
   c) 3 d) ½

10) The activity of pure metal is taken as _____.
   a) zero b) unity
   c) infinite d) finite

11) The ground state of molecular oxygen is _____.
   a) singlet b) doublet
   c) triplet d) quartet

12) The temperature coefficient of a chemical reaction normally lies in between _____.
   a) 1 to 2 b) 2 to 3
   c) 3 to 4 d) 0 to 1

13) One Einstein energy is equivalent to _____ hν.
   a) 6.023 b) 6.023×10^{23}
   c) 6.023×10^{10} d) ∞

14) Typical lifetime for fluorescence emission is _____.
   a) millisecond b) microsecond
   c) nanosecond d) picosecond

Q.2 A) Answer the following questions. (Any Four) **08**

1) Mention various electrical double layer theories.
2) List any two fluorescence standard materials.
3) State steady state approximation.
4) What do you mean by rate determining step of a chemical reaction?
5) What is photochemical smog?

B) Write Notes. (Any Two) **06**

1) Greenhouse effect
2) Alkaline storage battery
3) Excimer emission

Q.3 A) Answer the following questions. (Any Two) **08**

1) Construct Jablonski's diagram for an organic system indicating various pathways of deactivation of excited molecules.
2) Distinguish between RNA and DNA.
3) Give an account of fractional order reactions with suitable example.

B) Answer the following questions. (Any One) **06**

1) Explain singlet-singlet energy transfer process. Give the criteria for efficient energy transfer between host-guest pairs.
2) Derive an expression for the effect of ionic strength on rate of ionic reactions in solution state.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Discuss the structure of protein.
2) Describe the role of ATP in biological systems.
3) Diagrammatically illustrate Franck-Condon principle.

B) Answer the following questions. (Any One) **04**

1) Mention characteristic features of electrochemical series.
2) Define ionic strength. Estimate the ionic strength of 0.05 m solution of $Cu(NO_3)_2$.

Q.5 Answer the following questions. (Any two) **14**

1) Describe the method of determination of activity coefficient of an electrolyte using concentration cell.
2) Discuss in detail Stern's electrical double layer theory.
3) Explain thermal and photochemical decomposition of ozone.

SLR-JF-102

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
ADVANCED ORGANIC CHEMISTRY – I

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Answer to all questions should be written in same answer book.
4) All question carry equal marks.
5) Use of log table and calculator is allowed.

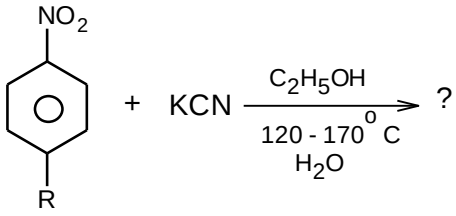
Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

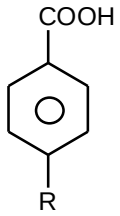
1) Reaction of _____ with nitriles in strongly acidic medium gives amides in Ritter reaction.
   a) olefins b) sec. alcohols
   c) tert. alcohols d) all three

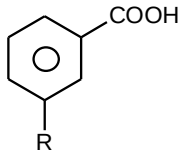
2) _____ is the example of the multicomponent reaction.
   a) Ugi reaction b) Biginelli reaction
   c) Passerini reaction d) all three

3) Tosylhydrazone of aldenyde or ketone on treatment with Na in ethylenegycol generates _____ by subsequent loss of $^{-}OT_s$ and N_2.
   a) Carbanion b) Carbocation
   c) Carbene d) None

4) In Stille coupling reaction _____ is slow step.
   a) oxidative addition b) Cis-trans isomerisation
   c) reductive elimination d) transmetallation

5) 

a) 

b) 

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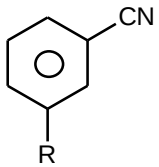
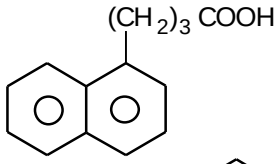
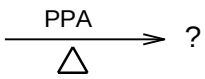
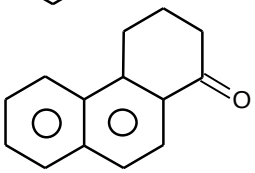
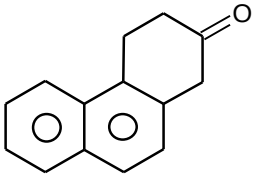
d) 

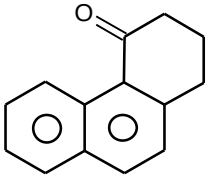
6) SeO_2 is an oxidizing agent, specific for the oxidation of _____.
   a) Methyl group
   b) Methylene group
   c) Reactive Methyl & Methylene group
   d) All

7) 

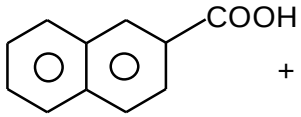


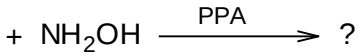
a) 

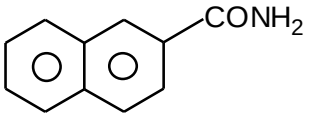
b) 

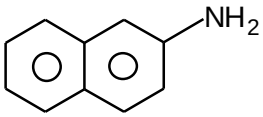
c) 

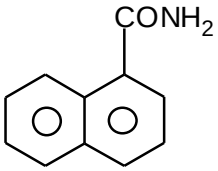
d) All

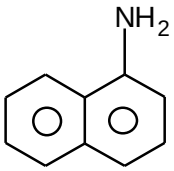
8) 



a) 

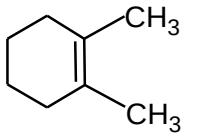
b) 

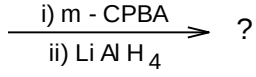
c) 

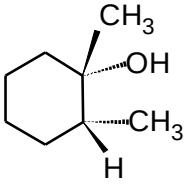
d) 

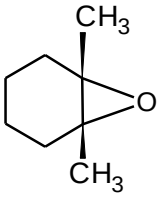
9) Negative sign of e indicates the development of _____ charge at the reaction centre.
   a) positive charge b) negative charge
   c) neutral charge d) both a & b

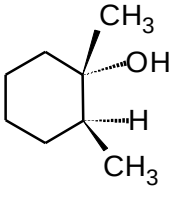
10) Chemical reaction of an amine, aldehyde, vinyl / aryl boronic acid to form substitute amines is knows as _____ reaction.
   a) Ugi b) Petasis
   c) Passerini d) Biginelli

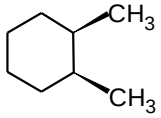
11) 



a) 

b) 

c) 

d) 

12) Radicals can be generated by _____.
   a) Photolysis b) Thermolysis
   c) Redox reactions by inorganic ions d) All three

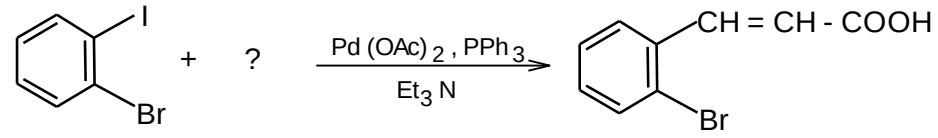
13) The relative stability of simple alkyl radicals is found to follow the sequence _____.
   a) $\mathrm{R_3\dot{C} > R_2\dot{C}H > R\dot{C}H_2 > \dot{C}H_3}$ b) $\mathrm{R_3\dot{C} < R_2\dot{C}H < R\dot{C}H_2 < \dot{C}H_3}$
   c) $\mathrm{R_3C > R_2\dot{C}H < R\dot{C}H_2 < \dot{C}H_3}$ d) $\mathrm{R_3\dot{C} < R_2\dot{C}H > R\dot{C}H_2 < \dot{C}H_3}$

14) Substituent constant $\sigma_{\times}$ is given by equation

a) $\sigma_{\times} = \frac{k_{\times}}{k_H}$ b) $\sigma_{\times} = \frac{K_X}{K_H}$

c) $\sigma_{\times} = \frac{K_{\times}}{k_H}$ d) $\sigma_{\times} = \frac{k_{\times}}{K_H}$

Q.2 A) Complete the following reactions and give the name of the reaction. (Any Four) **08**

1) 

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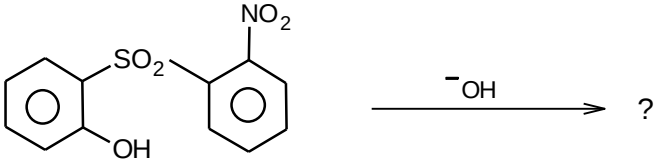
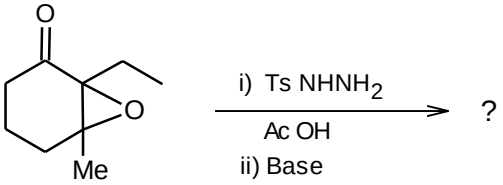
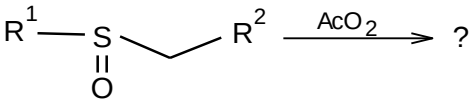
3) 

4) 

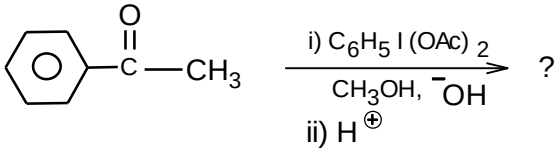
5) 

B) Attempt any two of the following questions. **06**

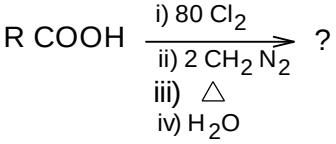
1) Explain the mechanism of conversion of arylsulfonyl hydrazone of ketones to vinyl lithium.
2) Explain the mechanism of Wolff rearrangement with suitable example.
3) Explain with suitable examples isotopic labeling technique used to study reaction mechanism.

Q.3 A) Attempt any two of the following questions. **08**

1) Discuss the arylation of aromatic compounds by diazonium salts.
2) Predict the product and discuss the mechanism of the reaction.



3) Predict the product and suggest the mechanism.

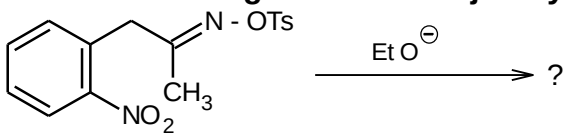


B) Attempt any one of the following question. **06**

1) Discuss reaction mechanism and applications of Peterson reaction.
2) Discuss Heck reaction with suitable example.

Q.4 A) Complete the following reaction and justify your answer. (Any Two) **10**

1)



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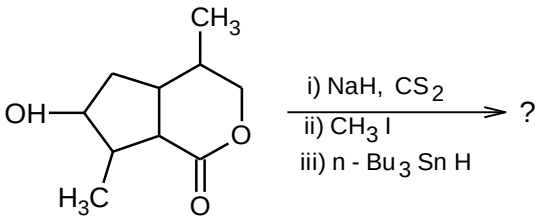

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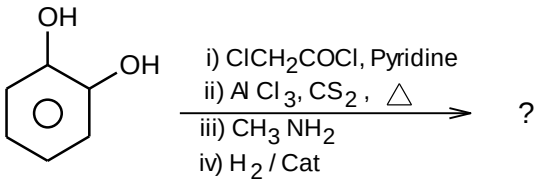
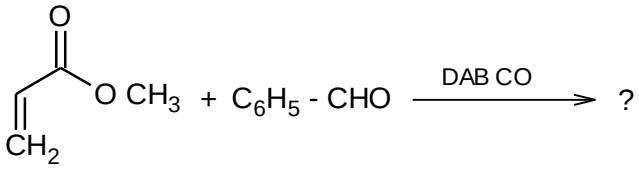
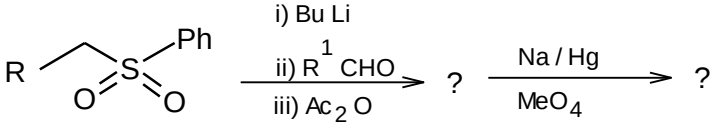


B) Complete the following reaction and give its mechanism.(Any One) **04**

1)



2)



Q.5 Write short notes on. (Any Two) **14**

1) Hammett equation and its modification
2) Passerini reaction
3) Iodolactonization

SLR-JF-103

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
ADVANCED SPECTROSCOPIC METHODS

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculators is allowed.

Q.1 A) Fill in the blanks by choosing correct alternatives given below. 09

1) Which of the following transitions is the highest energy transition?
   a) $\pi - \pi*$ b) $\sigma - \sigma*$
   c) $n - \pi*$ d) $\sigma - \pi*$

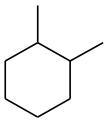
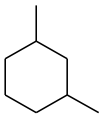
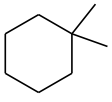
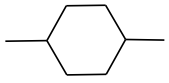
2) HETCOR spectra is used to detect directly bonded _____.
   a) ^{13}C-^{1}H b) ^{13}C-^{13}C
   c) ^{1}H-^{1}H d) None of the above

3) How many Hertz does 1 ppm correspond to for PMR spectrometer operating at a radio frequency of 60 MHz and 100 MHz?
   a) 600 Hz, 1000 Hz b) 6 Hz, 10Hz
   c) 0.6 Hz, 0.100 Hz d) 60 Hz, 100 Hz

4) ^{19}F and ^{31}P have nuclear spin equal to _____.
   a) 1/2 b) 1
   c) 5/2 d) 3/2

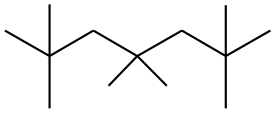
5) DEPT is _____.
   a) Distortion less enhancement polarisation transfer
   b) Different enhancement polarisation transfer
   c) Distortion less enhancement polarisation technique
   d) All above

6) The areas under three separate peaks in an NMR spectrum are 31, 93, and155. The numbers of hydrogens for each peak are respectively _____.
   a) 1, 2, and 5 b) 1,3, and 5
   c) 1, 5, 6 d) 2, 4, 6

7) Which of the following compound shows 4 absorptions in CMR spectrum?
   a)  b) 
   c)  d) 

8) In proton decoupled CMR spectra of ortho, meta and para positional isomers of xylene exhibits signals respectively.
   a) 3, 4, 5 b) 4, 5, 3
   c) 5, 4, 3 d) 3, 5, 4

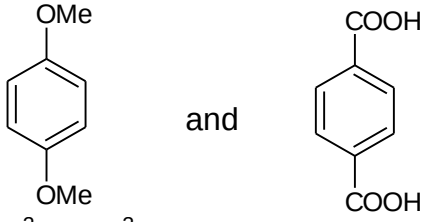
9) How many signals do you expect to see in the ^{13}C NMR spectrum for the following molecule?



a) 4 b) 5
c) 6 d) 8

Q.1 B) Answer the following questions. **05**

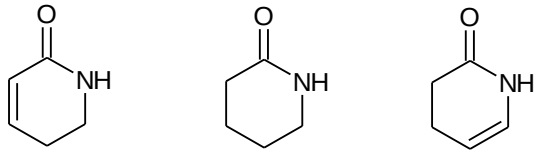
1) How many signals are possible in the ^{13}C NMR spectrum of following compounds?



2) What do you mean by ^{2}J and ^{3}J Coupling?
3) Which of the following diatomic molecules don't absorb in the IR region?
HCl, Cl_2, Br_2, H_2, ClBr
4) What is molecular ion peak in mass spectrum?
5) Explain Nitrogen Rule?

Q.2 A) Answer the following questions. (Any Four) **08**

1) Arrange the following compounds in order to their increasing wave number of absorption due to >C=0 stretching in the following compounds.



I II III

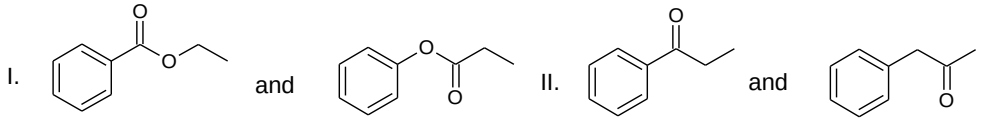
2) Why ethyl benzene exhibits a strong peak at m/z = 91?
3) What is spin notation?
4) What is n+1 rule?
5) How will you distinguish between cis and trans isomer of olefins by PMR?

B) Write Notes. (Any Two) **06**

1) Weak coupling and strong coupling phenomenon?
2) DEPT technique of NMR
3) Anisotropy effect

Q.3 A) Answer the following questions. (Any Two) **08**

1) Distinguish between following compounds by IR technique.



2) Write different factors affecting on IR stretching frequency?
3) Illustrate AB_2 and AX_2 spin systems with examples?

B) Answer the following questions. (Any One) **06**

1) What are different modes of fragmentation in mass spectroscopy?
2) Give HETCOR technique in NMR?

Q.4 A) Answer the following questions. (Any Two) **10**

1) Write about chemically and magnetically equivalence phenomenon in NMR?
2) Deduce the structure of the compound using following data
Molecular Formula: $C_{12}H_{14}O_2$.
IR: 2900-3000, 1710, 1630, 1600 cm^{-1}; ^1H NMR (δ in ppm): 1.89 (s, 12 mm), 3.45 (s, 8 mm), 7.04 (d, *J*= 7.5 Hz, 4mm), 7.10 (s, 2 mm), 7.43 (t, *J*= 7.5 Hz, 2 mm); ^{13}C NMR (δ in ppm): 204, 134.1, 131.1, 128.9, 127.5, 50.6, 30.5.
3) Deduce the structure of the compound using following data
Molecular Formula: $C_8H_{14}O_3$
IR: 1750, 1100-1200 cm^{-1};
^1H NMR (δ in ppm): 1.2 (t, 12 mm), 1.7 (quintet, 8 mm), 2.3 (t, 8 mm).

B) Answer the following questions. (Any One) **04**

1) Write on FAB and MALDI techniques of mass spectroscopy?
2) Explain Nuclear Over Hauser Effect (NOE)

Q.5 Answer the following questions. (Any Two) **14**

a) Deduce the structure of organic compound using given spectral data.
Molecular Formula: $C_8H_9NO_2$
IR: 2900-3000, 1725, 1620, 1600, 1100-1200 cm'^{1}; ^1H NMR (δ in ppm):1.29 (t, *J*= 8.0 Hz, 15 mm), 4.30 (q, *J* = 8.0 Hz, 10 mm), 7.92 (d, *J*= 7.5 Hz, 10 mm), 8.89(d, *J*= 7.5 Hz, 10 mm); ^{13}C NMR (δ in ppm): 165.9, 150.3, 137.3, 122.9, 60.9,14.1; ^{13}C NMR, DEPT-135 (δ in ppm): 150.3, 122.9 and 60.9 (up), 14.1(down).

b) Deduce the structure of organic compound using given spectral data.
Molecular Formula: $C_{10}H_{13}NO$
IR ($\bar{\upsilon}$ in cm^{-1}): 1705, 3000; ^1H NMR ($CDCl_3$, δ in ppm): 2.50 (s, 3 mm), 3.06 (s, 6 mm), 6.87 (d, *J*= 7.5 Hz, 2 mm), 7.76 (d, *J*= 7.5 Hz, 2 mm); ^{13}C NMR($CDCl_3$, δ in ppm): 197.0, 155.5, 130.5, 129.7, 117.7, 4.3 and 26.6;
MASS: m/z =44, 78,121, 163.

c) Deduce the structure of organic compound using given spectral data.
Molecular Formula: $C_{14}H_{14}$
IR: 2900-3000, 1620, 1580, cm^{-1}
^1H NMR ($CDCl_3$, δ in ppm): 2.34 (s, 12 mm), 7.29 (d, *J* = 7.5 Hz, 8 mm); 7.33 (d, *J* = 7.5 Hz, 8 mm); Mass: m/z = 152, 167, 182.

SLR-JF-104

Seat No.	

Set P

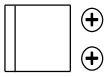
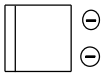
M.Sc. (Semester – III) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
PHOTOCHEMISTRY AND PERICYCLIC REACTIONS

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

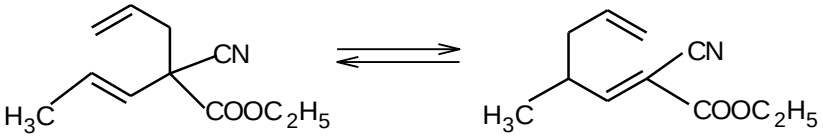
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks
3) Draw neat diagram and give equation wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Which of the following is anti-aromatic?

a) 
b) 
c) 
d) 

2) The Pericyclic reaction given below is an example of _____.



a) [1, 3] - Sigmatropic rearrangement
b) [1, 5] - Sigmatropic rearrangement
c) [3, 3] - Sigmatropic rearrangement
d) None of these

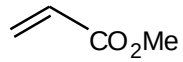
3) Electrocyclic reactions are _____.

a) Regioselective b) Stereospecific
c) Chemoselective d) None of these

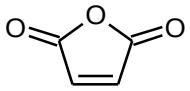
4) A reaction involving Photochemical reorganization of Phenolic ester is known as _____.

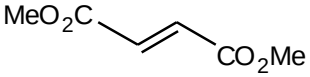
a) Claisen rearrangement b) Photo-Fries rearrangement
c) Perkin reaction d) None of these

5) Which of the following dienophiles is most reactive _____?

a) 

b) 

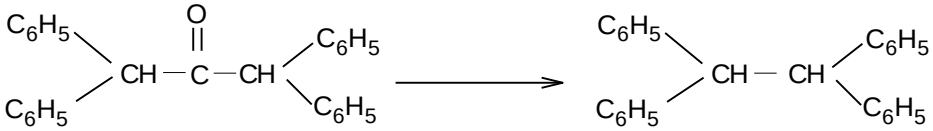
c) 

d) 

6) The reaction in which carbonyl compounds give cyclo addition with alkenes, dienes and alkynes on Photolysis is known as _____.

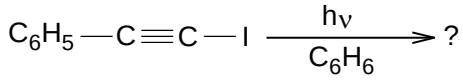
a) Norrish Type – I reaction b) Norrish Type – II reaction
c) Paterno-Buchi reaction d) None of these

7) The Photochemical reaction given below is _____.



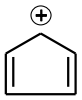
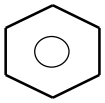
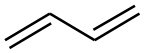
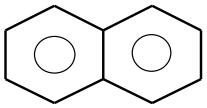
a) Norrish Type – I
b) Norrish Type – II
c) Di-Π Methane
d) None of these

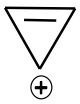
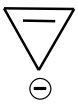
8) The product obtained in the following reaction is _____.



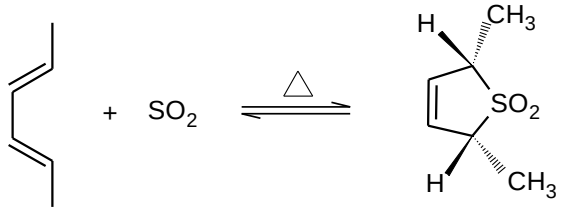
a) $C_6H_5—C\equiv C—C_6H_5$
b) C_6H_6
c) $C_6H_5—C\equiv C—H$
d) None of these

9) The phenomenon in which electron returns to ground state (S_o) from Triplet state (T_1) by liberating energy is known as _____.
a) Phosphorescence
b) Fluorescence
c) Photo reduction
d) All of these

10) Which of the following is non alternant hydrocarbon?
a) 
b) 
c) 
d) 

11) Which of the following molecular species having greatest stability?
a) 
b) 
c) 
d) All of these

12) The following Photochemical reaction is _____.



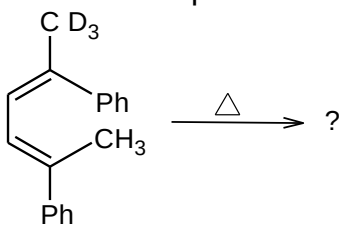
a) Ene reaction
b) Chelotropic reaction
c) Sigma tropic reaction
d) None of these

13) Alcohol's show which type of transition?
a) $\sigma \rightarrow \sigma^*$
b) $\pi \rightarrow \pi^*$
c) $n \rightarrow \sigma^*$
d) All of these

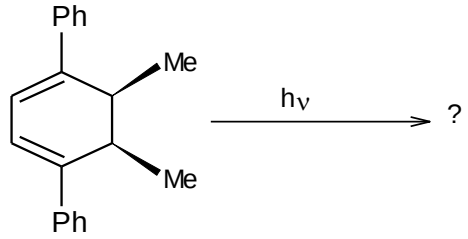
14) Which type of symmetry is present in HOMO of 1, 3, 5 – Hexatriene?
a) Mirror
b) C_2
c) Both a and b
d) None of these

Q.2 A) Answer the following questions. (Any Four) **08**

1) Predicate the product with mechanism.



2) Define:
   i) Conrotatory process
   ii) Disrotatory process
3) Explain why Ψ_3 of 1-3-Butadiene has higher energy than the Ψ_2 ?
4) Predict the products.



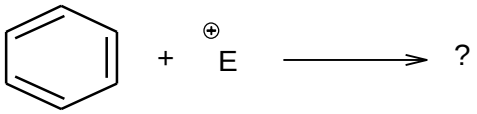
5) Draw Molecular orbital diagram of 1-3-Butadiene.

B) Write notes. (Any Two) **06**

1) Photoreduction reaction
2) Ene reaction
3) Photo-Fries rearrangement.

Q.3 A) Answer the following questions. (Any Two) **08**

1) Calculate reactivity index for following electrophilic substitution reaction?

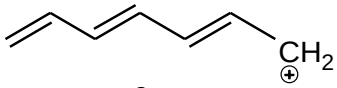


2) Explain Paterno-Buchi reaction with stereochemical consequences.
3) Discuss Hoffman-Loeffler – Freytag reaction.

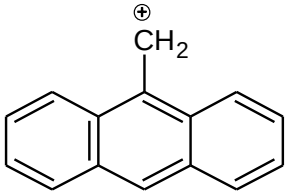
B) Answer the following questions. (Any One) **06**

1) Assign coefficient and calculate charge density in following.

i)



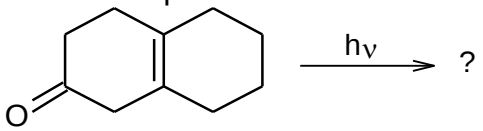
ii)



2) With the help of FMO method explain the stereo chemistry of [3, 3], Sigmatropic rearrangement under thermal and photochemical condition.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Predict the product with mechanism.



2) Explain electrocyclic reaction with help of correlation diagram?
3) Discuss photoaddition reaction given by aromatic compounds.

B) Answer the following questions. (Any One) **04**

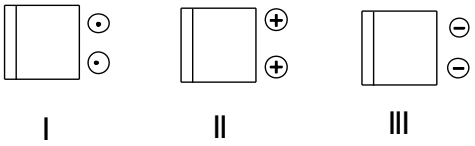
1) Discuss photochemistry of diazo and azide compounds.
2) Explain Di- Π – methane rearrangement with suitable examples.

Q.5 Answer the following questions. (Any Two) **14**

a) Explain FMO Method for cycloaddition reactions.

b) Explain reactions given by β,γ unsaturated carbonyl compounds.

c) Calculate Huckel's delocalization energy and arrange the following molecules by decreasing order of stability.



I II III

SLR-JF-106

Seat No.	

Set P

M.Sc. (Semester – IV) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
ADVANCED ORGANIC CHEMISTRY – II

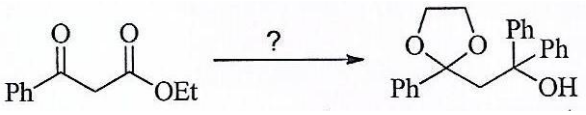
Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and give equation whenever necessary.

Q.1 A) Fill in the blanks by choosing correct alternatives given below. **07**

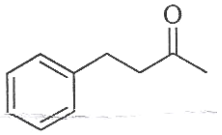
1) Which of the following act as Umpolung reagent?
   a) 1,3-Dithianes b) Cyanide
   c) Nitro compounds d) All of these

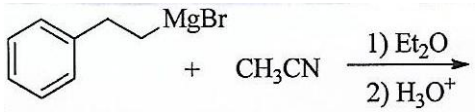
2) Which combination of reagents is appropriate for following transformation?

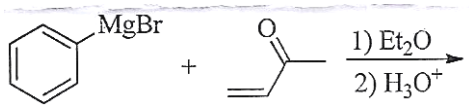


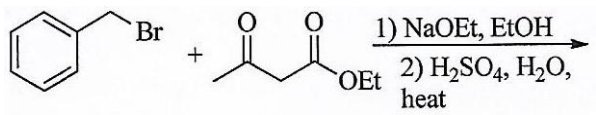
   a) 1) $HO-CH_2-CH_2-OH, H^+$
      2) $2PhMgBr, H^+$
   b) 1) $NaBH_4, MeOH$
      2) $LiAlH_4, Et_2O,$
      3) H_3O^+
   c) 1) $LiAlH_4, Et_2O^+$
      2) H_3O^+
   d) 1) $HO-CH_2-CH_2-OH, H^+$

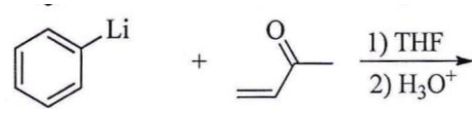
3) Which reaction is not appropriate for the synthesis of the following?



   a) 

   b) 

   c) 

   d) 

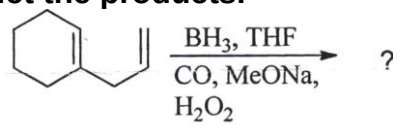
4) The site of disconnection is shown by _____.
   a) Wiggly line b) Double headed arrow
   c) Ray d) All of these

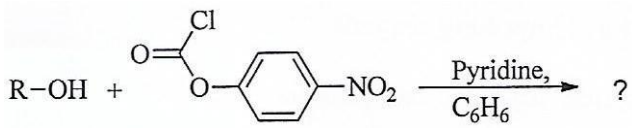
5) A reaction which predominantly produces one of several possible structural isomer is called _____.
   a) Regioselectivity b) Stereoselectivity
   c) Chemoselectivity d) All of these

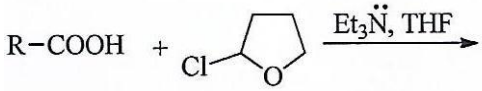
6) An imaginary bond breaking corresponding to the reverse of real reaction is known as _____.
   a) FGI b) Disconnection
   c) Target molecules d) None of these

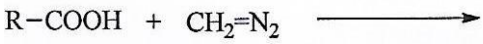
7) Conversion of one functional group into another functional group is known as _____.
   a) Functional group interconversion
   b) Oxidation
   c) Reduction
   d) None of these

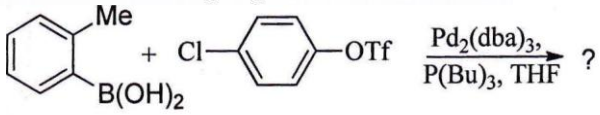
B) Predict the products. **07**

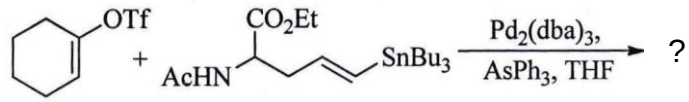
1) 

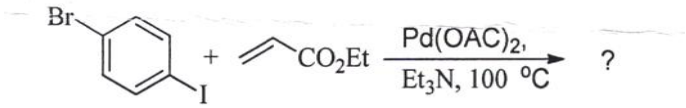
2) 

3) 

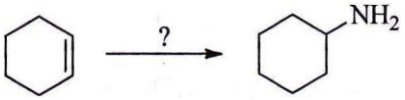
4) 

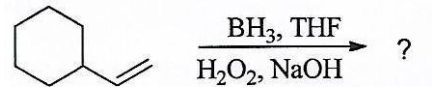
5) 

6) 

7) 

Q.2 A) Answer the following questions. (Any Four) **08**

1) Mention conditions for following conversion?


2) Complete following reaction.


3) Define.
   i) Hydroboration
   ii) Coupling reaction

4) Which are the protecting groups for amines?

5) Show mechanistic pathway for following conversion?


B) Write Notes on. (Any Two) **06**

1) Collmans reagent
2) Reversal of polarity
3) Carbonylation reaction

Q.3 A) Answer the following questions. (Any Two) **08**

1) Explain role of organoboranes in organic synthesis.
2) Discuss protecting groups for alcohol.
3) Discuss one group C-X disconnection with suitable examples.

B) Answer the following questions. (Any One) **06**

1) Explain role of $Co_2(CO)_8$ in organic synthesis.
2) Using disconnection approach design a convenient pathway for following Compounds?

Q.4 A) Answer the following questions. (Any Two) **10**

1) Discuss two groups C-C disconnection with reference to Diels-Alder reactions.
2) Explain Pd catalysed N-aryl and N-alkyl bond formations.
3) Explain guidelines for disconnection.

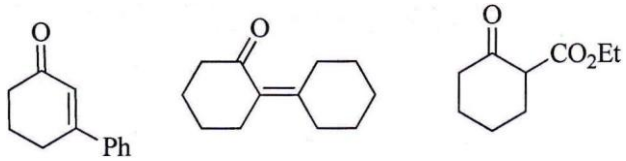
B) Answer the following questions. (Any One) **04**

1) Explain functional group transformation with suitable examples.
2) Discuss Sonogashira coupling reaction.

Q.5 Answer the following questions. (Any Two) **14**

a) Explain Stille coupling reaction and their importance.

b) Suggest synthesis for the following compounds, using disconnection approach.



c) Discuss role of silane complexes in organic synthesis.

SLR-JF-107

Seat No.	

Set P

M.Sc. (Semester – IV) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
STEREOCHEMISTRY

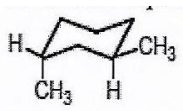
Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

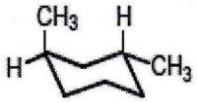
Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Hexane and 3-methylpentane are examples of _____.
   a) Enantiomers b) Stereoisomers
   c) Diastereomers d) constitutional isomers

2) The structures represents _____.



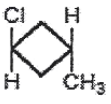


   a) A single compound b) Enantiomers
   c) meso forms d) Diastereomers

3) (2R,4S) -2,4-Dichloropentane and (2S,4R)-2,4-dichloropentane are _____.
   a) Enantiomers b) Diastereomers
   c) Identical d) constitutional isomers
   e) Conformational isomers

4) Which compound does NOT possess a plane of symmetry?

I



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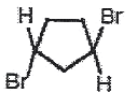

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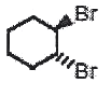

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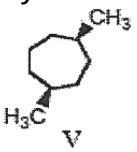
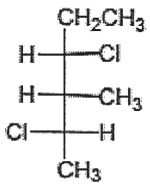


V

   a) I, II and V b) I, III and IV
   c) II, III and IV d) III and IV

5) The following is properly named as?



   a) (3R,4S,5R)- 3,5-Dichloro-4-methylhexane
   b) (2S,3S,4S)- 2,4-Dichloro-3-methylhexane
   c) (2S,3R,4R)- 2,4-Dichloro-3-methylhexane
   d) (2S,3R,4S)-2,4-Dichloro-3-methylhexane
   e) (2S,3S,4R)- 2,4-Dichloro-3-methylhexane

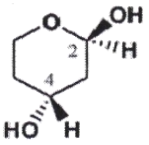
6) Which one of the following can exist in optically active forms?
   a) cis-1,3-Dichlorocyclohexane b) trans-1,3-Dichlorocyclohexane
   c) cis-1,4-Dichlorocyclohexane d) trans-1,4-Dichlorocyclohexane
   e) cis-1,2-Dichlorocyclohexane

7) The regioselectivity and stereospecificity in the hydroboration-oxidation of an alkene is best described as _____.
   a) Markovnikov orientation with syn-addition.
   b) Markovnikov orientation with anti-addition.
   c) Anti-Markovnikov orientation with syn-addition.
   d) Anti-Markovnikov orientation with anti-addition.

8) Which of the following definitions of an asymmeric reaction is the most accurate?
   a) A reaction that creates a new chiral centre in the product
   b) A reaction that involves a chiral reagent.
   c) A reaction which creates a new chiral centre with selectivity for one enantiomer / diasatereoisomer over another.
   d) A reaction that is carried out on an asymmetric starting material

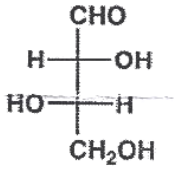
9) What is meant by a reaction going in 94% enantiomeric excess?
   a) The product contains 94% of one enantiomer and 6% of the other enantiomer.
   b) The product contains 94% of one enantiomer and 6% of other products.
   c) The product contains an enantiomer which is 94% pure.
   d) The product contains 97% of one enantiomer and 3% of the other enantiomer.

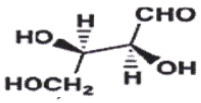
10) Which is the correct assignment of chirality at C2 and C4 of the following molecule?

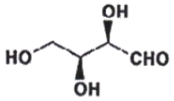


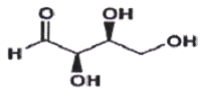
   a) $2S, 4S$
   b) $2R, 4R$
   c) $2S, 4R$
   d) $2R, 4S$

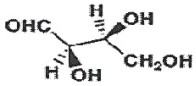
11) Which is the enantiomer of the following molecule?

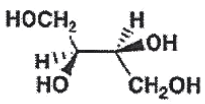


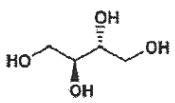
   a) 

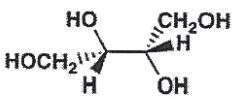
   b) 

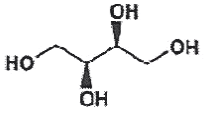
   c) 

   d) 

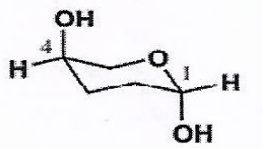
12) Which is the *meso* isomer of butane-1,2,3,4-tetraol?
   a) 

   b) 

   c) 

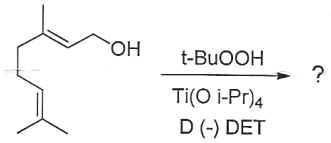
   d) 

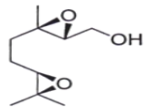
13) Which is the correct assignment of chirality at C1 and C4 of the following molecule?

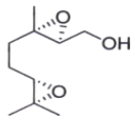


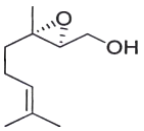
a) $1S, 4R$ b) $1R, 4R$
c) $1R, 4S$ d) $1S, 4S$

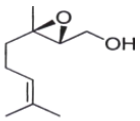
14)



a) 

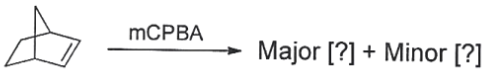
b) 

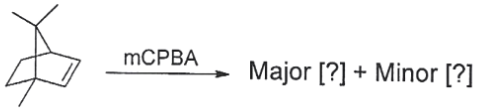
c) 

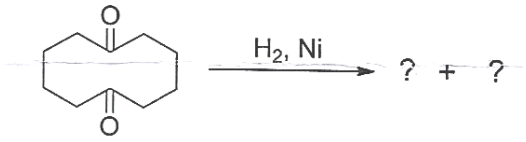
d) 

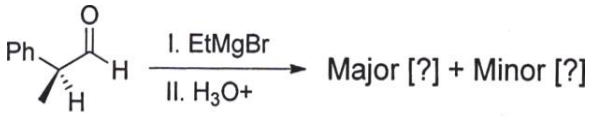
Q.2 A) Answer the following questions. (Any Four) **08**

1)

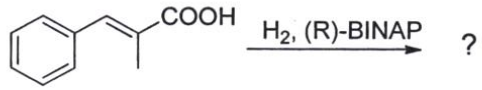
a) 

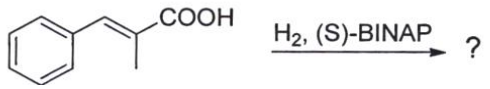
b) 

2) 

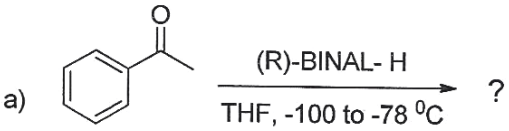
3) 

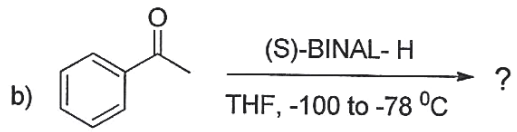
4)

a) 

b) 

5)

a) 

b) 

B) Write Notes. (Any Two) **06**

1) Stereochemistry of biphenyl compounds.
2) Optical purity and enantiomeric excess.
3) Enatiotopic and diastereotopic atoms, groups and faces.

Q.3 A) Answer the following questions. (Any Two) **08**

1) Explain ring fusion of cis and trans 9-methyl decalin? Comment on its chirality and point groups?
2) Define chiral catalyst? What is Jacobsen-Katsuki epoxidation?
3) What is the reactivity in iodide induced elimination of bromine from 2,3-dibromobutane?

B) Answer the following questions. (Any One) **06**

1) What is stability of different isomers of perhydrophenanthrene and comment on its chirality?
2) Explain pyrolysis of cycloalkyldimethylamine oxides & cycloalkyltrimethyl ammonium hydroxide in six membered and larger than six membered ring in details?

Q.4 A) Answer the following questions. (Any Two) **10**

1) Define stereospecific reaction? Why Electrophilic epoxidation of alkenes are diastereospecific?
2) Explain relative reactivity of diastereomers in molecular elimination reactions?
3) What is chiral reagent? What is synthesis of CBS reagent and its applications in enantioselective synthesis?

B) Answer the following questions. (Any One) **04**

1) Discuss diastereomers stability of 2,3-butanediol and tartaric acid.
2) What is Zimmerman Traxler transition state? Explain with examples.

Q.5 Answer the following questions. (Any Two) **14**

a) What is enantioselective synthesis? Explain enantioselective synthesis *via* hydrazones?

b) What is Curtin-Hammett principle? Explain classes of reactions under Curtin-Hammett control.

c) What is diastereoselectvity? What is diastereoselective addition to carbonyl group? Explain via Felkin Ahn model.

SLR-JF-108

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
CHEMISTRY OF NATURAL PRODUCTS

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Answer to all questions should be written in same answerbook.
4) All questions carry equal marks.
5) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Mycosterols are obtained from _____.
   a) Fungi b) Yeast
   c) Both a and b d) None

2) _____ is an example of corpus luteum harmones.
   a) Oestogens b) Androgens
   c) Gestogens d) All

3) Testosterone contains _____ group because it is very sensitive to alkali.
   a) Ketone b) Aldehyde
   c) Unsaturated ketone d) $\propto, \beta$ – unsaturated ketone

4) X-ray analysis studies have shown that the hydroxyl group in cholesterol is _____ and _____ of the methyl group at C-10.
   a) Above the plane and cis b) Above the plane and trans
   c) below the plane and cis d) below the plane and trans

5) The biological function of thiamine is mainly in the form of its _____.
   a) Pyrophosphate ester b) Pyrophosphate
   c) Ester d) All

6) _____ suppresses the production of prostaglandis by inhibiting or killing an enzyme cyclooxygenase.
   a) Aspirin b) Ibuproten
   c) Haproxen d) All three

7) _____ deficiency causes severe dermatitis in rats and other animals.
   a) Vit B_1 b) Vit B_2
   c) Vit B_4 d) Vit B_6

8) _____ is due to deficiency of folic acid.
   a) Dermatitis b) Glossitis
   c) Inflation d) Convulsions

9) _____ isoprene units are present in triterpenes.
   a) Two b) Four
   c) Six d) Five

10) Precursors of alkaloids are _____.
   a) Amino acids b) Carboxylic acids
   c) Amines d) Amides

11) _____ describes hypothetical transformations by which natural products are synthesized in the living organisms.
a) Biosynthesis b) Biogenesis
c) Retrosynthesis d) All

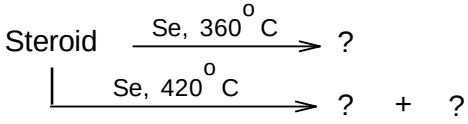
12) Yobyrine on zinc distillation gives _____.
a) 3 – Ethylindole b) Isoquindline
c) 3 – Ethylindale and isoquindline d) Quindline

13) Dinitrostrychan carboxylic acid gives dinitroisation by _____.
a) Curtius degradation
b) Decarboxylation and conversion is a the amine
c) Decarboxylation
d) both a and b

14) Oxetane ring is attached to _____ in taxol.
a) Ring A b) Ring B
c) Ring C d) Ring A and ring B

Q.2 A) Complete the following reactions. (Any Four) **08**

1)



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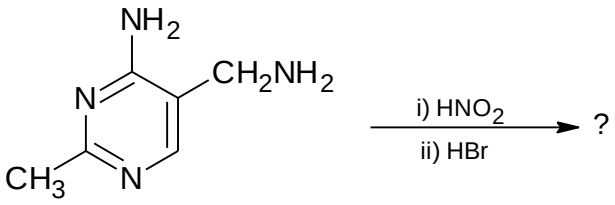

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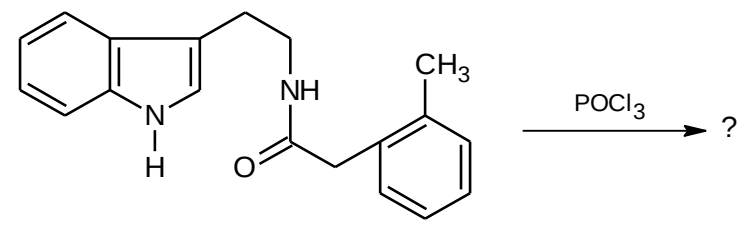
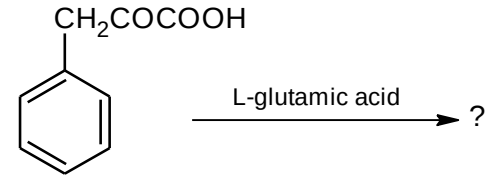
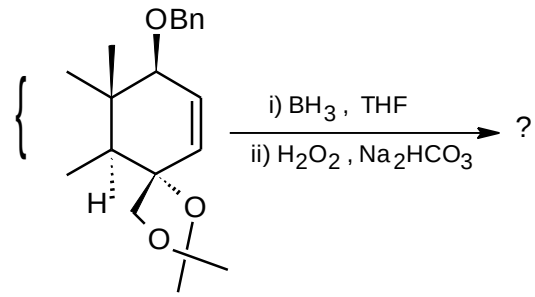


4)



5)



B) Answer the following. (Any Two) **06**

1) Discuss the biochemical role of biotin.
2) Give the synthesis of testosterone from cholesterol.
3) Discuss the biogenesis of thromboxanes.

Q.3 A) Answer the following questions. (Any Two) **08**

1) Give the synthesis of alkaloid from ornithine.
2) Discuss the biochemical role of vitamin B6.
3) Give the synthesis of progesterone from cholesterol.

B) Answer the following questions. (Any One) **06**

1) Give the synthesis of reserpine.
2) Discuss the stereochemistry of steroids.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Give the synthesis of mifepristone.
2) Discuss the biogenesis of podophyllotoxin.
3) Discuss biogenesis of Cinnamic acid using Shikimic acid pathway.

B) Answer the following questions. (Any One) **04**

1) Discuss the nature of nitrogen and oxygen atoms in Strychnine.
2) Give the synthesis of biotin.

Q.5 Write notes on. (Any Two) **14**

1) Structure determination of oestrone.
2) Ring A and ring C synthesis of taxol.
3) Synthesis and biological role of vitamin B_2.

SLR-JF-109

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Organic Chemistry
APPLIED ORGANIC CHEMISTRY

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Glucose on oxidation to gluconic acid with following oxidizing agents.
   a) Br/H_2O b) HNO_3
   c) Ag_2O d) a, b, c

2) The _____ are sugars which on hydrolysis give three moles of the same or different Monosaccharides?
   a) Disaccharide b) Trisaccharide
   c) Polysaccharide d) Monosaccharides

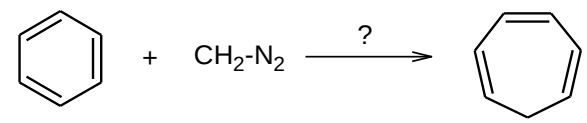
3) The number of chiral carbon atoms in the β-D-glycopyranase is _____.
   a) 2 b) 3
   c) 4 d) 5

4) Merrifield resin is a _____% cross linked co-polymer of polystyrene and divinylbenzene
   a) 1% b) 2%
   c) 3% d) 4%

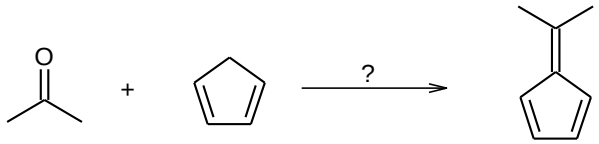
5) Ionic liquid is a organic salt in the liquid state whose M.P. is below _____.
   a) 40°c b) 60°c
   c) 80°c c) 100°c

6) Polysaccharides are also known as _____.
   a) Sugars b) Non sugars
   c) Water insoluble sugar d) None of these

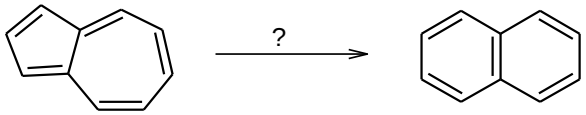
7) The carbohydrates which does not undergo further hydrolysis are known as _____.
   a) Monosaccharide b) Oligosaccharides
   c) Polysaccharides d) None of these

8) 

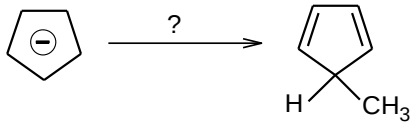
   a) $h\nu$ b) CO
   c) Δ d) 100^0 C

9) 

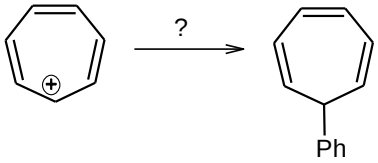
   a) Piperidine b) Morpholine
   c) Pyrrolidine d) Pypridine

10) 

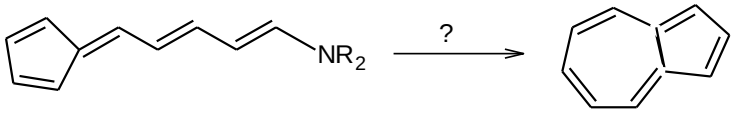
a) > 350°c
b) > 200°c
c) > 300°c
d) > 250°c

11) 

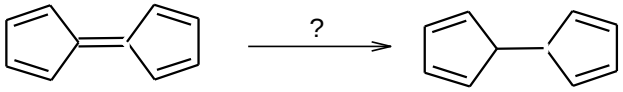
a) CH_3-I
b) $(CH_3)_2So_4$
c) CH_3-Cl
d) CH_3-Br

12) 

a) ph-Br
b) ph-Cl
c) ph-I
d) ph-Li

13) 

a) Acid/Δ
b) Base/Δ
c) H_2O/Δ
d) None of these

14) 

a) $LiAlH_4$, $H^{\oplus}$
b) Na/Hg, H^{+}
c) BH_3, $H^{\oplus}$
d) Zn/Hg, $H^{\oplus}$

Q.2 A) Answer the following questions. (Any Four) **08**

1) What are Epimers? Explain with examples.
2) What are tropylium ion? Explain with examples.
3) What are atom economy? Explain with suitable examples.
4) What are carbohydrates? Draw the correct structures of D-glucose and D-fructose.
5) What are ionic liquids? Give any two examples of ionic liquids.

B) Write Notes. (Any Two) **06**

1) Cyclodextrins
2) Synthetic Musk
3) Utrasonication reactions

Q.3 A) Answer the following questions. (Any Two) **08**

1) What are Mutarotation? Explain with suitable examples.
2) Discuss the $\propto -D$ and $\beta - D$ −configurations of D-glucose with stability.
3) What are ferrocene? Explain their electrophilic substitution reactions.

B) Answer the following questions. (Any One) **06**

1) What are enzyme catalysed reactions? Explain in detail enzymatic reduction and oxidation reactions.
2) What are glycosides? Explain their conformations of Methyl $\propto - D$ and methyl $\beta - D$ −glycosides.

Q.4 A) Answer the following questions. (Any Two) **10**

1) What are Annulene? Explain their structure and preparation of various annulene.
2) What are Azulenes? Explain their structure and characteristics.
3) What are Merrifield resin? How it is prepared? Discuss their applications as a polymer support reagent.

B) Answer the following questions. (Any One) **04**

1) Anomeric effect
2) Kiliani-Fischer's synthesis

Q.5 Answer the following questions. (Any Two) **14**

1) Explain the synthesis and industrial applications of 2 - phenyl ethanol and vanillin.
2) Explain the various chemical reactions of glucose
3) Explain the various basic principles of green chemistry.

SLR-JF-113

Seat No.	

Set P

M.Sc. (Semester – III) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
UNIT OPERATIONS OF CHEMICAL ENGINEERING

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) In differential extractor, the two phases are always _____.
   a) In continuous contact b) counter-current to one another
   c) co-current to one another d) None of the above

2) Separation of gold from its ore by using sodium cyanide solutions is ____.
   a) Extraction b) Leaching
   c) Distillation d) Evaporation

3) Filter aids should have following property _____.
   a) Chemically reactive b) Chemically inert
   c) Non–porous d) All of these

4) _____ is heat exchange equipment used to meet latent heat requirement at the bottom of distillation column.
   a) Heater b) Reboiler
   c) Vaporiser d) Evaporator

5) The temperature at which a liquid mixture start to vaporize as the temperature is increased _____.
   a) Boiling Point b) Freezing point
   c) Bubble point d) Dew Point

6) What is true about Bubble cap tray plate used in industrial distillation?
   a) Disperse gas phase into the liquid as the fine bubble
   b) Prevents liquid drainage at low gas rate
   c) Direct gas flow first horizontally and then vertically upward through the pool of liquid
   d) All of the above

7) Crystallization involves _____.
   a) Only heat transfer
   b) Only mass transfer
   c) Simultaneous mass and heat transfer
   d) None of the above

8) The function of spiral agitator in Swenson-Walker is to _____.
   a) Prevent the accumulation of the crystal on cooling surface
   b) Accumulate crystal on cooling surface
   c) Increase the rate of crystallization
   d) Increase the rate of cooling

9) Distribution of two separate phases randomly through one another is called _____.
   a) Mixing b) Agitation
   c) Crushing d) Conveying

10) Pulse column is used for _____.
   a) processing radioactive solution
   b) processing metal solution
   c) processing industrial discharge
   d) None of the above

11) Ball mill operate on principle of _____.
   a) Impact b) Compression
   c) Attrition d) Both a & c

12) Factors that affect the rate of leaching are _____.
   a) Solvent b) Particle size
   c) Temperature d) All of these

13) The unit 'Mesh' is used to measure _____.
   a) Distance between adjacent wire
   b) Number of opening per linear inch
   c) Number of opening per linear cm
   d) Number of opening per linear meter

14) Internal floating head possess _____ advantage over fixed tube heat exchanger.
   a) Eliminates differential expansion
   b) Tube bundle is removable for inspection
   c) Tube bundle is removable for mechanical cleaning from outside
   d) All of the above

Q.2 A) Attempt any four of the following question. **08**

1) Explain the term constant pressure filtration.
2) What is meant by entrainment?
3) What is Efflorescence? Give one example.
4) What do you understand from the term Extract?
5) What are the disadvantages of natural circulation evaporator?

B) Write Notes on (Any Two) **06**

1) Criteria for steam distillation
2) Methods of Supersaturation
3) Dorr Thickener

Q.3 A) Attempt any two of the following question. **08**

1) Explain the term
   a) Nucleation
   b) Hygroscopicity and Hydrate.
2) Explain with schematic diagram working of U-tube heat exchanger.
3) Discuss valve plate used in distillation column.

B) Attempt any one of the following question. **06**

1) What is Azeotropic? Explain how absolute ethanol is obtained by Azeotropic distilliation?
2) Explain with neat labeled diagram Forced circulation evaporator.

Q.4 A) Attempt any two of the following question. **10**

1) Discuss construction and working of Blake Jaw crusher.
2) Explain with schematic diagram working of propeller used for mixing of liquid phases?
3) Discuss multiple effects useful in increasing efficiency of evaporation process.

B) Attempt any one of the following question. **04**

1) Explain with neat labeled diagram working of perforated plate tower.
2) Draw neat and labeled sketch of Tunnel dryer and summarize the working.

Q.5 Attempt any two of the following question. **14**

a) Draw schematic of Rotocel extractor and explain operation process.
b) Draw neat labeled sketch and explain construction and working of vacuum crystallizer.
c) Explain construction, working and application of centrifugal filter.

SLR-JF-114

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
UNIT PROCESSES IN CHEMICAL TECHNOLOGY

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) What is the mixture of Nitric acid and Sulphuric acid called?
   a) Nitrite ion b) Combined acid
   c) Addition acid d) Mixed Acid

2) "-NO2" produces which effect?
   a) Both the effects b) Does not produce any
   c) +I effect d) -I

3) Which of the following is the nitrates of polyhydroxy compound which has an extensive use in propellants and explosives?
   a) Glycerol b) Cellulose
   c) Pentaerythritol d) All of the mentioned

4) Is there a difference between Sandmeyer and Gattermann reaction?
   a) Difference reaction temperature b) Difference in pressure condition
   c) Difference in catalyst d) All of the mentioned

5) For the reaction of Alkyl chloride in presence of Alc.KOH gives what in product?
   a) Alkyl b) Alkene
   c) Alcohol d) None of the mentioned

6) $CH_2=CH_2 + 2Cl_2 + O_2 \longrightarrow$ _____ $+2H_2O$. Complete the following reaction?
   a) CHCl=CHCl b) $CH_2Cl\text{-}CH_2Cl$
   c) $CH_3\text{-}CH_3$ d) $CCl_3\text{-}CCl_3$

7) The major uses of Chlorosulfonic acid is/are in the preparation of what?
   a) Aromatic sulfonyl chlorides b) Alcohol sulfates
   c) Sulfamates d) None of the mentioned

8) Sulfonation-Desulfonation is useful in preparation of what?
   a) Ortho isomer b) Para isomer
   c) Meta isomer d) None of the mentioned

9) Which is the most widely used Sulfonating agent in Industries?
   a) Oleum b) Sulphur dioxide
   c) Sulfuric acid d) None of the mentioned

10) In esterification plant it is necessary to employ which catalyst?
   a) Nitric acid b) Hydrochloric acid
   c) Sulphuric acid d) All of the mentioned

11) What is the formula of Fuming Sulphuric acid?
   a) $H_2SO_3+SO_2$ b) $H_2SO_4+SO_3$
   c) $H_2SO_4+SO_4$ d) H_2SO_4+OH

12) How is the degree of polymerization of the polymer obtained?
a) Termination/ Propagation b) Propagation/ Termination
c) Propagation* Termination d) None of the mentioned

13) What are the factors of solution polymerisation?
a) Nature of solvent b) Concentration
c) Temperature d) All of the mentioned

14) Which of the following acts as a promoter in oxidation of aliphatic hydrocarbon?
a) Mn b) Co
c) Mg d) Ce

Q.2 A) Answer the following questions. (Any Four) **08**
1) What is nitric ratio?
2) What is Strecker reaction?
3) What is meant thermosetting plastics?
4) What are syndiotactic polymers?
5) What are the applications of polypropylene?

B) Write Notes on. (Any Two) **06**
1) Desulphonation
2) Nitrate esters
3) Alkyd resins

Q.3 A) Answer the following questions. (Any Two) **08**
1) Explain the epoxy resin.
2) Explain in brief different types of oxidative reactions.
3) What is oxynitration?

B) Answer the following questions. (Any One) **06**
1) Discuss with labeled diagram
   i) Batch Sulphonation kettle
   ii) Ball Mill Sulphonator
2) Discuss in details the manufacture of ethyl acetate.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Explain with neat labeled diagram the nitration process by Biazzi method.
2) Describe the manufacturing process of polyethylene.
3) Give an account of liquid phase oxidation with oxidizing agent.

B) Answer the following questions. (Any One) **04**
1) Discuss the relationship between DVS and Stability of Nitrator Charge.
2) Discuss the mechanism of aromatic sulphonation.

Q.5 Answer the following questions. (Any Two) **14**
a) What is nitration? Explain the Continuous manufacturing process of nitrobenzene.
b) Give the manufacturing process of vinyl acetate.
c) How is chloral manufactured?

Seat No.	

Set **P**

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
INSTRUMENTAL ANALYSIS

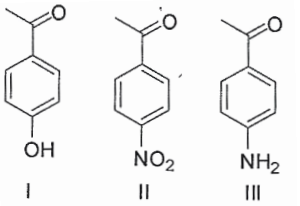
Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Which of the following internal solution is used in gas sensing electrode to detect CO_2 in analyte solution?
   a) $NaHSO_3$ b) NH_4Cl
   c) $NaHCO_3$ d) None of the given

2) Arrange the compounds in their increasing order of C=O stretching frequency

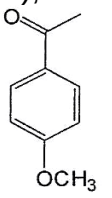


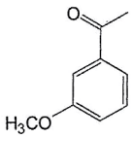
   a) (I)>(II)>(III) b) (II)>(I)>(III)
   c) (II)>(III)>(I) d) (III)>(II)>(I)

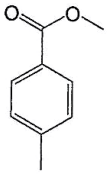
3) ZnO ionic conductor is used to sense _____.
   a) Flue gas b) Hydrocarbon gas
   c) Oxygen gas d) Reducing gas

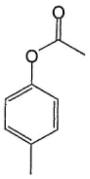
4) Long range proton- carbon correlation of nuclei routenly extracted from _____ spectra
   a) HETCOR b) NOESY
   c) HSQC d) HMBC

5) Predict the structure for the given data, IR= 1690cm^{-1}: ^{1}HNMR : 2.5 (s, 3H); 3.8δ (s, 3H); 6.9δ (d, 2H, J=8.0 Hz); 7.8δ (d, 2H, J=7.8Hz);

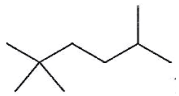
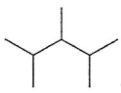
   a) 

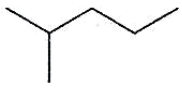
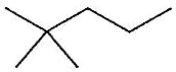
   b) 

   c) 

   d) 

6) The CMR spectrum of an unknown compound shows 6 absorptions and the PMR spectrum shows 5 absorptions. Which of the following compounds is the unknown compound?

a)  b) 

c)  d) 

7) In the IR spectrum of a compound 'X', there is a strong absorption at 1718 cm^{-1} in addition to bands at 2978 and 2940 cm^{-1}. The ^{1}H NMR spectrum contains two signals: a quartet and a triplet with relative integrals of 2: 3. of the following compounds, which is 'X' most likely to be?
   a) $CH_3CH_2CO_2H$ b) $CH_3CH_2OCH_2CH_3$
   c) CH_3CH_2OH d) $CH_3CH_2COCH_2CH_3$

8) A proton H_b is coupled to four equivalent proton H_a. The relative intensity of lines in the signal H_b is _____.
   a) 1:4 b) 1:4:6
   c) 1:4:6:4:1 d) 1:4:6:4

9) The distance between the centre of the peaks of the doublet is called as _____.
   a) Coupling constant b) Chemical shift
   c) Spin-spin coupling d) Scalar coupling (J -coupling)

10) The natural abundance of ^{13}C is about _____.
   a) Four times less than 1H b) 0.11% of total carbon
   c) 1.1% of total carbon d) 99% of total carbon

11) Turbidimetery method is based on _____ of light.
   a) Interference b) Scattering
   c) Reflection d) Refraction

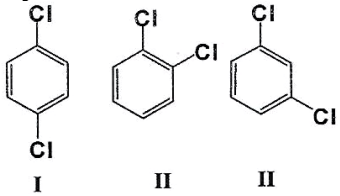
12) Which of the following peak appear in the mass spectrum of 2-pentanone?
   a) m/e =43 b) m/e =71
   c) m/e =28 d) both a & b

13) Why is an aromatic proton signal desheilded so much to show chemical shift (δ) value approximately above seven?
   a) Anisotropy b) Isotropy
   c) Resonance effect d) Both a & b

14) Which of the following of mass spectroscopy deal with resolving the ions into their characteristics mass components according to their mass-to-charge ratio?
   a) Ion source b) Detector
   c) Analyzer d) acceleration chamber

Q.2 A) Answer the following questions. (Any Four) **08**

1) How will you differentiate the following compounds by ^{13}C NMR



2) What is Fermi resonance and overtone in IR Spectroscopy?
3) What is the most characteristic feature of compound containing one Bromine atom in mass spectrum?
4) Draw a neat labeled diagram of gas sensing glass membrane electrode.
5) Draw Pascal's Triangle and give its significance.

B) Write notes. (Any Two) **06**

1) Applications of Turbidimetry
2) Finger print region
3) Shift reagent

Q.3 A) Answer the following questions. (Any Two) **08**

1) An organic compound of molecular formula $C_{10}H_{12}O$ shows the following features:

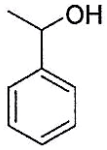
IR(KBr) : a strong band at 1730cm^{-1}

^{1}HNMR : 2.6δ (q, 2H, J=7Hz); 1.5δ (t, 3H, J=7.2Hz); 2.2δ (s, 3H); 7.23δ (d, 2H, J=7.1Hz); 7.49δ (d, 2H, J=7.0 Hz); Make proper assignment of the data

2) Explain why gaseous ethanol shows strong OH band at 3650 cm^{-1} while in liquid state a board band is observed at 3300 cm^{-1}?
3) How Liquid membrane electrode is useful in determination of polyvalent cation in analyte solution?

B) Answer the following questions. (Any One) **06**

1) Justify, the following compound show fragments m/e= 107,79,77,51



2) An organic compound of molecular formula $C_{12}H_{15}O_2N$ shows the following features:

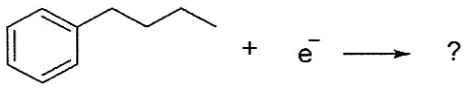
IR (KBr) : 1670cm^{-1};

^{1}HNMR : 8.0δ (d, 1H, J=12.1 Hz); 7.7δ (d, 2H, J=8.0 Hz); 6.8δ (d, 2H, J=8.0Hz); 5.8δ (d, 1H, J=12.1Hz); 3.8δ (s, 3H); 3.0δ (s, 6H)

Predict the structure

Q.4 A) Answer the following questions. (Any Two) **10**

1) Discuss with suitable example $_p$H- sensing membrane electrode.
2) Find out the various possible fragment formed of the given molecular ion



3) Draw the Karplus Curve and explain its significance.

B) Answer the following questions. (Any One) **04**

1) How would you distinguish between the reactant and product using DEPT NMR? Explain with an example.
2) How will you differentiate 4-Nitro Tolune and 2-Nito Tolune by ^{13}C NMR?

Q.5 Answer the following questions. (Any Two) **14**

1) Discuss ^{1}H-^{1}H COSY experiment of Dinitrobenzene and interpret the spectrum.
2) Discuss in detail instrumentation of Quadrupole Mass Analyzer.
3) An organic compound of molecular formula $C_9H_{10}O_2$ shows the following features:

IR (KBr) : 1740cm^{-1}; 3200-3300cm^{-1}(broad)

^{1}HNMR : 3.89δ (s, 1H); 6.88δ (dd, 1H, J=7.2 Hz and J=1.5Hz); 6.90δ (s, 1H, board); 7.41-7.49δ (m,2H); 7.88δ (dd,1H, J=8.0 Hz and J=2.0Hz);

Make proper assignment of the data and predict the structure

SLR-JF-116

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
CHEMICAL INDUSTRIES

Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) At room temperature, hardness of precipitation hardening alloys _____.
   a) increases with time b) decreases with time
   c) remains constant d) none of the above

2) The product from blast furnace is called _____.
   a) Cast Iron b) Wrought Iron
   c) Pig Iron d) Steel

3) Lime obtained from calcination of Pure Limestone is called _____.
   a) Quick Lime b) Pure Lime
   c) Lean Lime d) Rich Lime

4) Which of the following ions causes the cement to set quickly?
   a) Sulphate b) Carbonate
   c) Chloride d) Nitrate

5) What is the maximum service temperature of aluminosilicate glass?
   a) $220^{o}C$ b) $460^{o}C$
   c) $650^{o}C$ d) $1200^{o}C$

6) The temperature at which a non-crystalline material transforms from a supercooled liquid to rigid glass is _____.
   a) Melting point b) Glass transition temperature
   c) Boiling point d) Crystalline temperature

7) How does drier act as a catalyst?
   a) Releasing oxygen b) Releasing water
   c) Absorbing oxygen d) Absorbing water

8) Which of the below is an oil based varnish?
   a) Alcohol b) Acrylic
   c) Polyurethane d) Urea

9) The reactive dyes are applied to a cellulosic fiber in an alkaline dye bath, they form a _____ with hydroxyl group of the fiber by chemically reacting with fiber.
   a) Covalent bond b) Salt Linkage
   c) Hydrogen bond d) None

10) A wool/acrylic blended fabric can be dyed to solid shade using a combination of
   a) Direct and acid dyes b) Vat and acid dyes
   c) Acid and acid dyes d) Direct and reactive dyes

11) What are the units of LD50?
   a) milligrams/ kilogram of animal body weight
   b) kilogram/gram of animal body weight
   c) milligrams/gram of animal body weight
   d) gram/gram of animal body weight

12) Pest control measures are best implemented _____.
   a) before fruiting starts
   b) after plants flower
   c) before the destructive stage of the pest
   d) after the pest starts to destroy the plant

13) Which one of the following is NOT a use of catalytic cracking?
   a) Gives more useful products
   b) Gives products needed for petrol
   c) Produces hydrogen gas
   d) Gives products with high octane numbers

14) The fraction of crude oil that is used in LPG (liquid petroleum gas) is ____.
   a) refinery gas b) naphtha
   c) gas oil d) residue

Q.2 A) Answer the following questions. (Any Four) 08

1) Give any three functions of pigments in paints.
2) Define catalytic cracking.
3) What is function of sand in lime/cement mortars?
4) Give the structure of methyl orange and Congo Red.
5) What is basic difference between brass and bronze?

B) Write Notes. (Any Two) 06

1) Emulsion paints
2) Manufacturing processes of titanium oxide
3) Manufacturing process of stainless steel

Q.3 A) Answer the following questions. (Any Two) 08

1) Give an account of the following Organochlorine pesticides w.r.t. synthesis and application of Aldrin.
2) What is paint? Give its important functions.
3) Explain the manufacturing process of Whitewares.

B) Answer the following questions. (Any One) 06

1) What are petrochemicals? Give an outline of chemicals derived from propylene.
2) What are agrochemicals? Discuss manufacturing process, properties and applications of Endosulphan.

Q.4 A) Answer the following questions. (Any Two) 10

1) Give an outline of chemicals derived from Benzene.
2) Describe in brief the manufacturing of glass.
3) Explain in brief the classification of dyes according to the chemical constitution.

B) Answer the following questions. (Any One) 04

1) Give the synthesis and application of N,N Diethyl-3-methyl benzamide.
2) Give the properties and application of zinc oxide.

Q.5 Answer the following (Any two) **14**

a) With the help of neat labeled diagram explain the extraction of iron from its ores.

b) Give the synthesis and applications of
i) Malathion
ii) Dimethoate

c) Write the chemical reactions that takes place during the setting and hardening of cement and explain.

SLR-JF-117

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
POLLUTION MONITORING AND CONTROL

Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Which of the following method is not the method of desalination?
   a) Reverse osmosis b) Multi flash distillation
   c) Electro dialysis d) Smelting

2) COD values are always _____ BOD.
   a) Less than b) Higher than
   c) Equal d) Nearly equal

3) Which of the following is involved in production of carboxy haemoglobin?
   a) CO b) SO_2
   c) NO_2 d) NO_3

4) Which of the following is a secondary air pollutant?
   a) SPM b) PAN
   c) SO_2 d) NO_2

5) Which air pollutant cause corrosion of building?
   a) SO_2 b) SO_3
   c) CO d) NO_2

6) In reverse osmosis, the water flows from _____concentration to _____ concentration.
   a) Low, high b) High, low
   c) High, moderate d) Moderate, low

7) Which of the following is a liquid form of aerosol?
   a) Fume b) Dust
   c) Mist d) Smoke

8) The sources of hexavalent chromium [Cr(VI)] in the environment are _____ industries.
   1) Plating
   2) Paint and pigment
   3) Leather
   a) 1 & 2 b) 1, 2 & 3
   c) Only 1 d) Only 2

9) Which of the following air pollution control device has maximum efficiency?
   a) Electrostatic precipitator b) Dynamic precipitator
   c) Spray tower d) Wet cyclonic scrubber

10) Which of the following catalyst is used for removing hydrocarbon from gaseous pollutant in combustion unit?
   a) Platinum b) Activated alumina
   c) Vanadium d) Potassium permanganate

11) These polymers cannot be recycled.
   a) Thermoplasts b) Thermosets
   c) Elastomers d) All polymers

12) What does it mean to recycle?
   a) Make something into something new
   b) Use something over and over again
   c) Use less of something, creating smaller amounts of waster
   d) Make something that can clean your room

13) What is soil erosion?
   a) It is the process by which soil is formed
   b) A harmful process that involves the removal and transport of soil by wind and water
   c) A natural method of filtering harmful pollutants
   d) A process often referred to as the 'greenhouse' effect

14) Why area treatment is important for soil?
   a) To reduces the impact of raindrops on the soil
   b) To maximize surface run-off
   c) Not treating the upper catchment and proceeds towards an outlet
   d) Not storing surplus rainwater

Q.2 A) Answer the following questions. (Any Four) **08**

1) Why Alum is preferred over other coagulants?
2) What is electrodialysis?
3) What is sedimentation with coagulation?
4) Which industry consumes maximum mercury?
5) What is the importance of dissolved oxygen in water?

B) Write Notes. (Any Two) **06**

1) MINAS for- Distilleries.
2) Tricking filters for waste water treatment.
3) Analysis of fluorides in waste water.

Q.3 A) Answer the following questions. (Any Two) **08**

1) Discuss in brief the reverse osmosis for waste water treatment.
2) Explain in short oxidation pond process for the waste water treatment.
3) Discuss the end use of recycled polymer.

B) Answer the following questions. (Any One) **06**

1) Discuss briefly the salient features of the Air (prevention and control of pollution) Act 1981.
2) Discuss in brief various measures used to control the pollution of air by NOx.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Explain the analysis of soil for the parameters Moisture, pH and total nitrogen.
2) Describe in brief the removal of mercury from the liquid streams.
3) Describe in short Stream gas stripping for the removal of phenolic residue.

B) Answer the following questions. (Any One) **04**

1) Discuss in brief Water quality management in India.
2) Explain the biological treatment technique used for the removal of phenols from liquid effluents.

Q.5 Answer the following questions. (Any Two) **14**

a) Discuss briefly IS - 2490, IS - 3360 and IS - 3307.

b) Discuss the methods used for the recycling of plastic polymers. What are the important products obtained from recycled plastic polymeric materials?

c) Explain methods used for the removal of chromium.

SLR-JF-118

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
NANOTECHNOLOGY AND INSTRUMENTAL ANALYSIS

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) What electron source is used in SEM?
   a) Tungsten and LaB_6 b) only LaB_6
   c) only Tungsten d) All of the above

2) Horizontal portion in TG curve indicate _____.
   a) Weight loss b) No weight loss
   c) weight gain d) None of the above

3) X-ray diffraction patterns are used for studying crystal structure of solids because _____.
   a) They have very high energy; hence they can penetrate through solids
   b) They are electromagnetic radiation, and hence do not interact with matter (crystals)
   c) Their wavelengths are comparable to inter-atomic distances
   d) Their high frequency enables rapid analysis

4) $SiO_2 + C \xrightarrow{Heat}$
   a) Si b) $Si + CO_2$
   c) $SiO + CO$ d) $SiC + CO_2$

5) Which among the following helps us in getting a three-dimensional picture of the specimen?
   a) Transmission Electron Microscope
   b) Scanning Electron Microscope
   c) Compound Microscope
   d) Simple Microscope

6) _____ size of sample is required in DSC.
   a) 20-50 mg b) 2-10 mg
   c) 2-10 gm d) 0.5-10 gm

7) Which of the following are true for electron microscopy?
   a) specimen should be thin and dry
   b) image is obtained on a phosphorescent screen
   c) electron beam must pass through evacuated chamber
   d) specimen should be thin and dry, image is obtained on a phosphorescent screen and electron beam must pass through evacuated chamber

8) Differential scanning calorimetry is _____ technique.
   a) Qualitative b) Quantitative
   c) both a) and b) d) Additive

9) For destructive interference to take place, the path difference between the two waves should be _____.
   a) $(2n+1)\,\lambda/2$ b) $(2n+1)\,\pi/2$
   c) $(2n+1)\,\lambda$ d) $(2n-1)\,\pi/2$

10) Characterization of limestone used in the production of Portland cement is done with _____.
   a) DTA b) DSC
   c) Both a) and b) d) TGA

11) Which method is used for the purification of silicon?
   a) Zone refining b) Czochralski method
   c) Both (a) and (b) d) refining process

12) A Miller index of a plane making intercept 1/3a, 2/3b, and 1c _____.
   a) (3 3/2 1) b) (6 3 1)
   c) (3 2 1) d) (1 3 6)

13) _____ silicon possesses ordered structure.
   a) amorphous b) crystalline
   c) semi- amorphous d) Both (a) and (b)

14) _____ Particles present in Face centered cubic cell.
   a) 4 b) 3
   c) 1 d) 2

Q.2 A) Answer the following questions. (Any Four) **08**

1) What are the applications of TEM?
2) What is the equation for interplaner distance in terms of miller indices?
3) What are the steps involved in synthesis of Sol-gel?
4) What is Electrodeposition?
5) Find the Miller index of a plane making intercept 2a, 2/3b, and 2c and draw plane.

B) Write Notes. (Any Two) **06**

1) Power compensated DSC
2) X-ray Production
3) Spray pyrolysis process

Q.3 A) Answer the following questions. (Any Two) **08**

1) What are the applications of DSC?
2) Explain different types of analyzer used in XPS.
3) Explain in detail the Laue X-ray Diffraction method.

B) Answer the following questions. (Any One) **06**

1) Discuss with Principle Transmission electron Microscope.
2) Discuss factors affecting TGA curve.

Q.4 A) Answer the following questions. (Any Two) **10**

1) X-ray diffraction of copper has a face centered cubic structure, which is done using X-ray with a wavelength of 0.154nm. One peak is seen in XRD pattern at theta = 21.6^0. What are the miller indices for this peak?
2) Discuss with Principle scanning electron Microscope.
3) At what glancing angle would the first order diffraction from (110) plane of KCI observed using X-rays of wavelength 150 ppm? The dimension of the unit cell is 305pm.

B) Answer the following questions. (Any One) **04**

1) Derive the density equation for a crystal by unit cell method.
2) What are the basic chemical reactions involved in CVD process.

Q.5 Answer the following questions. (Any Two) **14**

a) What is the Principle of Differential thermal analysis? Discuss in details the Instrumentation involved in Differential thermal analysis.

b) What is constructive interference phenomenon? Derive Bragg's equation.

c) Explain the crystal growth from vapor, melt and solution.

SLR-JF-119

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Industrial Chemistry
INDUSTRIAL MANAGEMENT AND MATERIAL BALANCE

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Differential material balance is applied to _____.
   a) Continuous b) Batch
   c) Semi-Batch d) Both (b) and (c)

2) _____ Raw material used to make Bio-ethanol.
   a) Agricultural residue b) forestry waste
   c) Energy crops d) All the above

3) When a body is subjected to a tangential deforming force, then the lateral displacement between any two surfaces, separated by a unit distance at right angles to the direction of the force is called as _____.
   a) Volume strain b) Shear strain
   c) Tensile strain d) Strain

4) _____ is/are the pyrophoric chemical.
   a) Grignards reagent b) Metal hydride
   c) Alkali metals d) All of the above

5) Which of the following chemical was responsible for Bhopal gas tragedy?
   a) Methyl-isocynate b) Methyl-isothiocynate
   c) Nitrocellulose c) Picric acid

6) Which of the following statement is true about Control Chart?
   a) It judges quality characteristics of samples
   b) detect variation in the processing and warns if there is departure from the specified tolerance limit
   c) it is a diagnostic technique
   d) All of the above

7) Which statement is false about pilot plant?
   a) It is a collection of equipment
   b) designed to study some critical aspect
   c) It ranges from laboratory unit to a facility greater than commercial unit
   d) It perform basic research

8) _____ is a renewable source of energy.
   a) Ocean tides b) Wind
   c) Solar d) All of the above

9) _____ Institute offers to SSI technical consultancy and training design of modern tools.
   a) NSIC b) SISI
   c) SIDO d) CITD

10) _____ process system is open system.
a) Batch b) Semi- Batch
c) Continuous d) Both b and c

11) Water flows through a pipeline at a rate of 100Kg/hr, the molar flow rate of water would be _____.
a) 5.55 Kg-moles/hr b) 4.55Kg-moles/hr
c) 5.44Kg-moles/hr d) None of these

12) _____ materials finds importance as a material of design in food and pharmaceutical industries.
a) Aluminum b) Ceramic
c) Plastic d) Lead

13) Calculate the molar flow rate of KOH in a 1000mols solution/min stream that contains 30mols % KOH.
a) 200mols/min b) 300mols/min
c) 200Kg/min d) 250Kg/min

14) The standard deviation of the data set; 2, 2, 5, 3, 4,6.
a) 1.4 b) 1.1
c) 1.3 d) None of the above

Q.2 A) Answer the following questions. (Any Four) **08**
1) Derive Energy balance equation closed system.
2) Derive modulus of rigidity equation for a solid undergoing shearing strain.
3) How plastic is important material of construction for chemical plant?
4) What is SSI and Ancillary undertaking?
5) What is the importance of I.P, B.P and U.S.P in quality determination?

B) Write Notes. (Any Two) **06**
1) Technology transfer
2) Biofuel and its economy
3) Advantages of Incinerator

Q.3 A) Answer the following questions. (Any Two) **08**
1) Give an account on Flowchart and the procedure for material balance calculation.
2) Explain the regulation for Transportation of Hazardous waste.
3) What is the procedure to start SSI?

B) Answer the following questions. (Any One) **06**
1) Discuss with respective raw material the manufacturing process of Biodiesel.
2) Discuss with example the X bar and R- chart with respect to sample size five for quality determination.

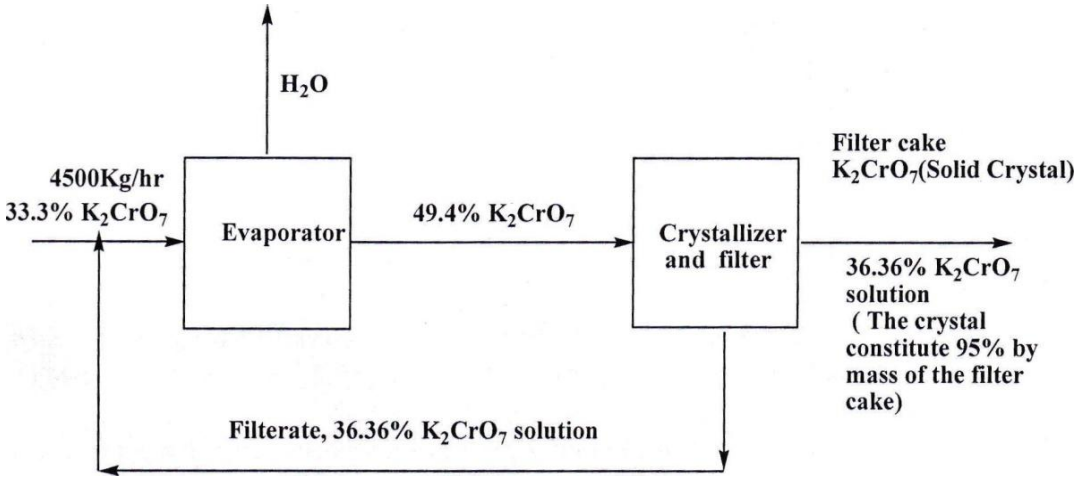
Q.4 A) Answer the following questions. (Any Two) **10**
1) 1000kg/ hr of a mixture of benzene and tolune that contains 50% benzene by mass are separated by distillation into two fractions. The mass flow rate of benzene in the top stream is 450 kg B/hr and that of tolune in the bottom stream is 475kg T/hr. The operation is at steady state. Write the balances on benzene and tolune to calculate the unknown component flow rates in the output streams.
2) Explain the classification and segregation of hazardous waste.
3) What is patent? What is the procedure to obtain patent?

B) Answer the following questions. (Any One) **04**

1) What is fuel cell? How do fuel cell works?
2) What is Export? Explain the export regulation.

Q.5 Answer the following questions. (Any Two) **14**

1) The flow chart of a process to recover crystalline potassium chromate (K_2CrO_4) from an aqueous solution of this salt is shown below.



Calculate the weight of water removed in the evaporator, the rate of production of crystalline K_2CrO_4.

2) An aqueous solution of sodium hydroxide contains 20% NaOH by mass. It is desired to produce an 8% NaOH solution by diluting a stream of the 20% solution with a stream of pure water.
   i) Calculate the ratio (g H_2O/g feed solution) and (g product solution/g feed solution)
   ii) Determine the feed rates of 20% solution and diluting water needed to produce 2310 lb_m/min of the 8% solution.
3) Explain in detail Stress - Strain relationship with respect to wire.

SLR-JF-121

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
FUNDAMENTALS OF FEEDSTOCKS AND POLYMERS

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Which is synthetic polymer?
   a) polystyrene b) cellulose
   c) lignin d) all of above

2) Which is free radical initiator for polymerization?
   a) methanol b) AIBN
   c) carbon dioxide d) lignin

3) Precipitation polymerization yields _____.
   a) oligomers b) high molecular polymer
   c) no polymer d) none of above

4) Castor oil is used to preparer _____.
   a) polyacetals b) lignin
   c) polyol d) all of above

5) Which component is used for in phase transfer catalyst polymerization?
   a) TBAB b) Titanium dioxide
   c) AIBN d) all of above

6) Thermocool is prepared from _____.
   a) vegetable oil b) cellulose
   c) polystyrene d) NYLON 66

7) Which is example of inorganic polymer?
   a) silicone b) polyethylene
   c) NYLON 66 d) lignin

8) Which is example of thermoplastics?
   a) polyethylene b) polyurethane
   c) epoxy resin d) none of above

9) In solid state polymerization which solvent is used _____.
   a) water b) chloroform
   c) methanol d) no solvent

10) Which is non polar polymer?
   a) polystyrene b) epoxy resin
   c) polyurethane d) polyol

11) Polyvinylchloride is used for making _____.
   a) pipes b) glasses
   c) chair d) bottle

12) Which solvent is used in bulk polymerization?
a) acetone b) methanol
c) water d) no solvent

13) Which is natural polymer?
a) NYLON 66 b) polyacetal
c) PET d) cellulose

14) Polymethylmethacrylate is also called as _____.
a) plexigas b) snow
c) silica glass d) all of above

Q.2 A) Attempt any four of the following question. **08**
1) Name any one free radical initiator for polymerization with its properties.
2) Give any three names of thermosets.
3) Write two application/use of polyacytelene.
4) What are the uses of inorganic polymers?
5) Give any two uses/applications of dendrimers.

B) Write Notes on (Any Two) **06**
1) Ionic liquids and their role in polymerization
2) Applications of polypropylene polymer
3) Castor oil based polymers

Q.3 A) Attempt any two of the following question. **08**
1) Explain precipitation polymerization method with example.
2) Describe addition polymerization method with example.
3) What are inorganic polymers? Describe with example.

B) Attempt any one of the following question. **06**
1) Differenciate between melt and solid state polymerization.
2) Describe in detail Carbon dioxide based polymers.

Q.4 A) Attempt any two of the following question. **10**
1) Explain condensation polymerization with example.
2) What are natural polymers? Describe Natural Polymers with example.
3) Describe thermoset polymers with example.

B) Attempt any one of the following question. **04**
1) Explain lignin based polymers.
2) What are dendrimers? Describe dendrimers with example.

Q.5 Attempt any two of the following question. **14**
1) Describe batch polymerization with example.
2) Describe in details disadvantages of petroleum based polymers.
3) Explain in detail interfacial polymerization with example.

SLR-JF-122

Seat No.	

Set P

M.Sc. (Semester – III) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
MORPHOLOGY AND PHYSICAL CHEMISTRY OF POLYMERS

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Attempt five questions.
4) Use of logarithmic table and non programmable calculator is allowed.
5) Question one is write on separate sheet.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) For a monodisperse polymer the $\overline{Mn}$ and $\overline{Mw}$ are related to _____.
   a) $\overline{Mn} < \overline{Mw}$ b) $\overline{Mn} = \overline{Mw}$
   c) $\overline{Mn} > \overline{Mw}$ d) $\overline{Mw} < \log \overline{Mn}$

2) Addition of the plasticizer in polymers results in _____.
   a) Increase in Tg b) decrease in Tg
   c) increase in flexibility d) Both b) and c)

3) Unit of solubility parameter in SI unit is _____.
   a) $(cal/cm^3)^{1/2}$ b) $(joul/m^3)^{1/2}$
   c) $(cal/cm^3)^{3/2}$ d) $(joul/m^3)^{3/2}$

4) Avrami equation is used to calculate _____.
   a) Tg of polymer b) Tm of polymer
   c) Percent Crystallinity d) Tg and Tm of polymer

5) The value of K in standiger equation depends on _____.
   a) solvent b) temperature
   c) polymer nature d) all of these

6) What is the effect of cross linking of molecule after degradation in polymers?
   a) MW increase b) MW decrease
   c) No change in MW d) Variation in MW

7) Hildebrand and Scott equation is used to calculate _____.
   a) ΔG b) ΔH
   c) ΔT d) ΔS

8) The temperature at which value of $\alpha = 1$ is called _____
   a) Tg b) Tm
   c) T_θ d) Tmax

9) Which of the following degradation is economical one?
   a) Chain b) Random
   c) Photo d) Ultrasonic

10) Arrange the following polymers their correct order of thermal stability PE, PS, PTFE.
   a) PE >PS > PTFE b) PTFE >PS >PE
   c) PTFE >PE >PS d) None of the above

11) The Flory-Huggins Theory is used to calculate _____.
   a) Solubility Parameter b) Viscosity
   c) Kinetic Parameter d) Density

12) Spherulite shows _____.
   a) Isotopic Properties b) Anisotopic Properties
   c) Both a) and b) Properties d) heterotopic Properties

13) The $\overline{Mv}$ is calculated by _____.
   a) Osmomer b) Viscometer
   c) Light Scattering d) GPC

14) Degradation of natural rubber in presence of oxygen gives products likes ____.
   a) aldehyde derivatives b) Acid derivatives
   c) CO_2 gas d) all of these

Q.2 A) Answer the following questions. (Any Four) **08**

1) Osmometer method is used for what purpose? Draw the schematic diagram for ostwald viscometer.
2) What is spherulites? Give examples of spherulites.
3) Give the relation between Tg and Tm for symmetrical and unsymmetrical molecule.
4) Give the importance of solubility parameter.
5) Why molecular weight of polymer is given in terms of average not absolute value?

B) Write Notes on (Any Two) **06**

1) Importance of Photostabilizers in Polymer Degradations
2) Fringed Micelle Concept
3) Stages of Polymer Dissolution

Q.3 A) Answer the following questions. (Any Two) **08**

1) Describe the vapour phase osmometer method with its importance for polymers.
2) Explain the thermal degradation in PVC polymers in detail.
3) Discuss the factors affecting on crystallinity of polymers.

B) Answer the following questions. (Any One) **06**

1) Define the term Tg. Describe the Dilatometer method used for determining Tg of polymers.
2) Draw typical molecular weight distribution curve for polymers and write down the different equations used to calculate average MW of polymers.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Discuss the WLF equation with its importance in polymer industry.
2) Explain the formation of polymer single crystal with suitable example.
3) Discuss any five the factors affecting on Tg of polymers.

B) Answer the following questions. (Any One) **04**

1) What is principle of GPC? Give advantages and limitations of this method.
2) Describe the degradation in polymers by high energy radiations.

Q.5 Answer the following questions. (Any Two) **14**

a) Describe the TMA method used for determining the Tg of the polymer in brief.
b) Give the equation of Flory-Huggins theory for monodisperse and poly disperse polymer solutions in terms of power series and Give the limitations of this theory.
c) In detail, describe the use of Ubblehode Viscometer for determining the MW of the polystyrene.

SLR-JF-123

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
BASIC CONCEPTS OF POLYMERIZATION

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Use of log table and calculators is allowed.
3) Draw neat and labeled diagrams wherever necessary.
4) All Questions carry equal marks.
5) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Two molecules joined together leaving small molecule is called as _____.
   a) Condensation polymerization b) Addition polymerization
   c) Substitution polymerization d) Radical polymerization

2) _____ polymer is prepared by free radical polymerization.
   a) Polyester b) Polyamide
   c) Polystyrene d) Polyurethane

3) Benzyl peroxide is used in _____ polymerization method.
   a) Ring opening b) Elimination
   c) Step growth d) Free radical

4) Cyclosiloxanes are polymerized by _____ reaction.
   a) Condensation b) Substitution
   c) Ring opening d) Cationic

5) Ring opening Metathesis polymerization is carried by using _____.
   a) NaOH b) HCl
   c) Transition metal d) NaCl

6) Tacticity of polymer depends on _____.
   a) Crystalinity b) Surface pattern
   c) Elemental composition d) Chiral carban

7) Anionic polymerization of epoxides are initiated by _____.
   a) Metal hydroxides b) Oxides
   c) Amides d) All of the above

8) _____ is the driving force for ring opening reaction.
   a) Stress b) Elastic
   c) Ring strain d) Vander wall force

9) _____ is the example of copolymer.
   a) ABS b) Polypropylene
   c) Nylon d) None of the above

10) Function of Inhibiter is to _____.
   a) Propagate reaction b) Increase rate of reaction
   c) Initiate reaction d) Terminate reaction

11) _____ type of monomers undergo cationic polymerization.
   a) Electron donating b) Electron withdrawing
   c) Both a and b d) None of the above

12) _____ is the natural polymer.
   a) Polyisobutylene
   b) Poly(methyl methacrylate)
   c) Polytetrafluoroethylene
   d) Cellulose

13) Polymerization of ethylene is _____.
   a) Depending on reaction condition
   b) Endothermic
   c) Exothermic
   d) All of the above

14) _____ is the example of a retarder.
   a) Bromobenzene
   b) Nitro benzene
   c) Chlorobenzene
   d) All of the above

Q.2 A) Answer the following questions.(Any Four) **08**

1) What are advantages of condensation polymerization method?
2) What is auto acceleration reaction?
3) What are advantages of ADMET polymerization method?
4) Give the examples of copolymers and its applications.
5) Explain cyclic ether polymer.

B) Answer the following questions.(Any Two) **06**

1) What is AIBN? Explain its use in polymerization.
2) Explain free radical polymerization method.
3) Explain copolymerization equation and reactivity ratio.

Q.3 A) Answer the following questions.(Any Two) **08**

1) Write note on enzyme catalysed step growth polymerization.
2) Write a mechanism of a lactams ring opening polymerization method.
3) Discuss advantages of cationic polymerization method.

B) Answer the following questions.(Any One) **06**

1) Discuss difference between cationic and anionic polymerization methods.
2) Discuss difference between radical and ionic polymerization methods.

Q.4 A) Answer the following questions.(Any Two) **10**

1) Write a note on Suzuki polymerization method with suitable example.
2) Write note on photochemical radical polymerization method.
3) Write a note on hyperbranched polymers.

B) Answer the following questions.(Any One) **04**

1) Write a note on Heck polymerization method with suitable example.
2) Explain Carothers equation for degree of polymerization

Q.5 Answer the following questions.(Any Two) **14**

1) Explain is ring opening polymerization method? Explain with suitable example.
2) Discuss types of copolymerization with suitable example.
3) What is group transfer polymerization method? Explain with suitable example.

SLR-JF-125

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
STEP-GROWTH OF POLYMERS

Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and non programmable calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Which polymers occur naturally?
   a) Starch and Nylon b) Starch and Cellulose
   c) Protein and Nylon d) Protein and PVC

2) Reaction of cyclohexane with NOCl photochemically gives _____.
   a) ε - Caprolactam b) ω - Caprolactam
   c) γ - Caprolactam d) δ - Caprolactam

3) Phenol is prepared by _____.
   a) Hock Process b) Sulfonation Process
   c) Toluene process d) All of above

4) For making High Quality Plastic Beaker which of the following polymer is used?
   a) Nylons b) Poly (Para-Phenylene)
   c) Polyimide d) Polyester

5) Polymerization of HMDA with sebacic acid gives _____.
   a) Nylon-6, 8 b) Nylon-6, 6
   c) Nylon-6,10 d) Nylon-6,11

6) Which of the following statement is not correct?
   a) Caprolactam is monomer of nylon-6
   b) Terylene is polyester polymer
   c) Phenol formaldehyde resin is known as Bakelite
   d) Monomer of natural rubber is butadiene

7) Use of lower P^H during preparation of Novalac give more percentage of _____.
   a) Ortho methyl Phenol b) Para methyl Phenol
   c) Meta methyl Phenol d) all of above

8) Acid catalyzed reaction of phenol with formaldehyde gives prepolymers known as _____.
   a) Resole b) Resite
   c) Bakelite d) Novolac

9) Saponification of castor oil at 250 ^{0}C gives _____.
   a) Adipic Acid b) Sebacic Acid
   c) Malonic Acid d) Azelaic Acid

10) Which of the following is example of a polyamide?
   a) Teflon b) Nylon-6,6
   c) Terylene d) Bakelite

11) Fully condensed reaction of Melamine with Formaldehyde gives prepolymer structure _____.
a) Monomethyl MF b) Dimethyl MF
c) Hexamethylol MF d) Tetramethylol MF

12) The curing of epoxy resin with polyfunctional amine like treithylenetetramine gives _____.
a) LY-556 b) HY-951
c) HT-972 d) HT-976

13) Reaction of phthalic anhydride with glycerol gives network polyester known as _____.
a) Epoxy Resin b) Glyptal Resin
c) UF resin d) MF Resin

14) PolyImide known under trade name _____.
a) Capton b) Dacron
c) Lexan d) All of above

Q.2 A) Answer the following questions. (Any Four) **08**

1) Draw the structure of HEXA and Where it is used?
2) Which reactants are used for preparation of Kevlar? Draw structure of Kevlar.
3) What are polyesters? Draw the chemical repeat unit structure of polyester PTT.
4) Give the synthesis method of melamine by urea route.
5) By chemical equation only, show the formation of phenol by cumene process.

B) Write Notes on. (Any Two) **06**

1) Polysulfone Synthesis and Applications
2) Saturated Network Polyester
3) Chemistry of polyurethanes

Q.3 A) Answer the following questions. (Any Two) **08**

1) What is IUPAC name of Melamine? Describe the preparation of modified MF resin.
2) How PEEK is synthesized? State their each of two properties and applications.
3) Explain any one method for preparation of DMT and HMDA.

B) Answer the following questions. (Any One) **06**

1) Give the solid phase methods for synthesis of Epoxy Resin and write down applications of Epoxy Resin.
2) Discuss the synthesis of UF prepolymer and What is effect of p^H on its structure?

Q.4 A) Answer the following questions. (Any Two) **10**

1) Discuss the synthesis and applications of Polybenzimidazole (PBI).
2) Describe the Interfacial method for the synthesis of aromatic polycarbonate; mention advantages and limitations of this method.
3) Give the synthesis method for
   i) 1,3-propane diol by shell process
   ii) Epichlorohydrin from propylene

B) Answer the following questions.(Any One) **04**

1) Illustrate the synthesis of Nylon 6, 6 by batch process. List its important properties and applications.
2) Discuss the preparation and applications of Poly (para-phenylene) polymer.

Q.5 Answer the following questions. (Any Two) **14**

a) Discuss the transesterification method for manufacture of poly (butylene terephthalate) (PBT) with their important properties and applications.

b) Describe properties and crosslinking reactions of Epoxy Resin in detail.

c) Give the important properties and applications of phenol formaldehyde resin and discuss the Lederer Manasse mechanism for the formation of pre-polymer resol structures.

SLR-JF-126

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
STEREOREGULAR POLYMERS AND MODERN POLYMERISATION METHODS

Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Atom transfer radical polymerization initiator contains ____ element.
   a) Cu b) Al
   c) Si d) All of the above

2) Ziegler Natta catalyst allows the insertion of _____ monomer.
   a) acrylic acid b) glucose
   c) cylic silicone d) all of above

3) Thermoplastic elastomer is _____.
   a) homopolymer b) copolymer
   c) dendrimer d) Crosslinked polymer

4) A regular polymer, in which the molecules have equal numbers of the possible configurational base units in a random sequence distribution is _____.
   a) Streoregular polymer b) syndiotic polymer
   c) atactic polymer d) isotactic polymer

5) A portion of a polymer molecule, comprising many constitutional units, that has at least one constitutional or configurational feature which is not present in the adjacent portions _____.
   a) block b) oligomer
   c) polymer d) macromolecule

6) A regular polymer, in which the molecules can be described in terms of only one species of stereorepeating unit in a single sequential arrangement is _____.
   a) Streoregular polymer b) syndiotic polymer
   c) atactic polymer d) isotactic polymer

7) Which polymer is prepared by atom transfer radical polymerization?
   a) Polystyrene b) polyether
   c) polyurethane d) PTFE

8) Which metal is part of Ziegler Natta initiator?
   a) Ti b) Zr
   c) Hf d) all of above

9) The arrangement of atoms in an optically active molecule, based on chemical interconversion from or to a known compound is known as _____.
   a) relative configuration b) absolute configuration
   c) isotopes d) isobars

10) Geometrical isomerism can be found with _____.
a) diene b) aliphatic diacid
c) aromatic diamines d) diisocynates

11) Atom transfer radical polymerization produces polymer with _____.
a) high PDI b) low PDl
c) both (low & high) d) none

12) The orderliness of the succession of configurational repeating units in the main chain of a polymer molecule is _____.
a) Tacticity b) oligomer
c) polymer d) none of above

13) Which polymer is produced using Ziegler Natta catalyst?
a) Polypropylene b) polyethylene
c) polystyrene d) all of the above

14) α- $TiC1_3$ catalyst produces _____ type of polymer.
a) isotactic b) syndiotactic
c) atactic d) none

Q.2 A) Answer the following question.(any four) **08**
1) β-$TiC1_3$ has low stereospecificity; why?
2) What is A-B diblock copolymer? Give one example.
3) What are the components of Z-N initiators.
4) Co-ordination polymerization is also called an insertion polymerization; why?
5) What is the role of MAO?

B) Write Notes on. (any two) **06**
1) Bernoulli Model
2) polar monomer polymerization by Z-N initiators
3) post metallocence

Q.3 A) Answer the following question.(any two) **08**
1) What are the advantages of ATRP (Atom transfer radical polymerization)?
2) What is absolute configuration?
3) Define syndiotactic polymers with example.

B) Answer the following question. (any one) **06**
1) What is ring opening metathesis polymerization?
2) Discuss in details functional olefin polymerization.

Q.4 A) Answer the following question. (any two) **10**
1) Describe metallocene catalysed polymerization.
2) What are multi block copolymers?
3) What is Brookhart catalyst?

B) Answer the following question. (any one) **04**
1) What are the properties of Streoregulated polymers?
2) Explain Drent catalyst (Phosphine-Sulfonate catalyst).

Q.5 Answer the following question. (any two) **14**
a) Discuss in detail Ziegler Natta catalyst.
b) Discuss in detail Tri-block copolymer.
c) Discuss in detail Mechanism of Ziegler Natta polymerization.

SLR-JF-127

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
SELECTED TOPICS IN POLYMERS

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Neoprene is a _____.
   a) Synthetic rubber b) Natural rubber
   c) Plastic d) None

2) Land filling is a method to _____.
   a) Save the land b) Fill the land
   c) Water saving d) Waste disposal

3) Plasticizers _____.
   a) Reduce Tg b) Increase Tg
   c) Reduce Tm d) Increase Tm

4) Polymer membranes work on the principle of _____.
   a) Adsorption b) Diffusion
   c) Absorption d) Reaction

5) Nitroso refers to _____.
   a) R-NO b) $R\text{-}NH_2$
   c) NOS d) None

6) Fuel cells_____.
   a) Use O_2 and H_2
   b) Convert chemical to electrical energy
   c) None
   d) Both, a and b

7) Low cross – linked polystyrene beads can be used in peptide synthesis _____.
   a) True b) false
   c) highly crosslinked only d) uncrosslinked only

8) Azo dyes have following linkage.
   a) N=N b) N=O
   c) NH_2 d) None

9) Cellulose has following linkage.
   a) 1,4-glycosidic bonds b) 1,2-glycosidic bonds
   c) 1,6-glycosidic bonds d) None

10) Azo pigments are _____.
   a) Yellow b) Red
   c) Orange d) All three a, b, c,

11) Chlorinated PE has _____ chemical resistance.
a) Good b) Poor
c) Moderate d) No

12) Lithography refers to _____.
a) drawing b) typing
c) printing d) None

13) Composite of two polymers show _____.
a) Two Tgs b) One Tg
c) No Tg d) High Tg

14) The primary purpose of paint is to _____.
a) Decoration b) Colouration
c) Protection d) All a, b, c.

Q.2 A) Answer the following questions. (Any Four) **08**
1) Give the hydrogenation product of polystyrene.
2) Draw smectic phase diagram for LCP polymer.
3) Give two examples of UV absorbers.
4) Give two examples of drying oils.
5) Give minimum two uses of UHMWPE in medicine.

B) Write Notes. (Any Two) **06**
1) Properties and Applications of Adhesives.
2) Properties and application of EPM rubber.
3) Polymer Support in reduction reactions.

Q.3 A) Answer the following questions. (Any Two) **08**
1) Explain the role of polymers in control drug release system.
2) Discuss the typical properties of paint film.
3) Explain incineration process in recycling.

B) Answer the following questions. (Any One) **06**
1) Explain the chlorination of polyethylene with their properties and applications.
2) Explain mechanism of conducting in polymers with their applications.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Discuss the ingredients used in paint formation; give two examples with each of their properties.
2) Explain the use of polymer support as catalyst with suitable example.
3) Give the structure and properties of silicone resins.

B) Answer the following questions. (Any One) **04**
1) Discus the Floty-Rehner equation with its application in polymer industry.
2) Give manufacture of butyl rubber with its properties and applications.

Q.5 Answer the following questions. (Any Two) **14**
a) Explain the preparation, properties and applications of Cellulose Triacetate (CTA) and HPC.
b) Discuss chlorination and hydrogenation reaction of natural rubber in detail.
c) What is a pigment? Give two examples each of red, blue and green pigments.

SLR-JF-128

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Polymer Chemistry
PROCESSING TECHNOLOGY AND POLYMER PROPERTIES

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Viscoelasticity property depends on _____.
   a) Temperature and experimental time scale
   b) only temperature
   c) only solvent
   d) All above

2) Which of the following is water absorbing materials?
   a) polyethylene b) glass fiber based
   c) cellulosic or fiber-based d) all of above

3) Which titration method is used for moister content?
   a) PH-Meter titration b) colorimetric titration
   c) karl fisher titration d) Complex metric titration

4) Ash content for plastic is used to determine _____.
   a) Carbon content b) Inorganic content
   c) both a and b d) None of above

5) P-doping gives information about _____.
   a) oxidation of valance bond b) Reduction of valance bond
   c) both a and b d) None of above

6) Materials break down in strong fields is called as _____.
   a) Dielectric loss b) electric or dielectric strength
   c) both a and b d) None of above

7) Tear test is used for _____.
   a) only for thermosetting polymers b) metal
   c) elastomeric d) Thermocool

8) Hardness and scratch resistance test belongs to _____.
   a) Chemical testing b) Physical testing
   c) Mechanical testing d) Rheological testing

9) Burst threshold test used for _____.
   a) Containers b) Pipes
   c) Tubes d) Tyres

10) In polymer stress-relaxation occurs due to _____.
   a) chain scission b) bond interchange
   c) Disentanglement d) All of above

11) Addition of _____ reduce cost and improve certain properties of costly plastics.
   a) Fillers b) Colorant
   c) UV stabilizer d) Plasticizers

12) Extrusion molding products are _____.
   a) Pipes and wire coating b) bottles and chairs
   c) syntax tank and car bumper d) all of above

13) Which molding ‘’torpedo” used for uniform heat spreading?
   a) Extrusion molding b) Blow molding
   c) Injection molding d) none of above

14) Transfer molding product are ____.
   a) hallow products
   b) Electrical insulating parts and connecters
   c) house wares
   d) both a and c

Q.2 A) Attempt any four of the following questions. **08**

1) What do you mean by HDT?
2) How will you differentiate between PVC and PE by burning test?
3) What is modulus?
4) State principle of thermoforming.
5) Describe the blow molding.

B) Write Notes. (Any Two) **06**

1) Photoelastic properties
2) Water absorption
3) Tear strength

Q.3 A) Attempt any two of the following questions. **08**

1) Difference between ideal/Newtonian and Non-Newtonian fluid.
2) Explain the ultimate polymer properties of elastomers and fiber with structure relationship.
3) What is post-spinning processes?

B) Attempt any one of the following questions. **06**

1) What are the factors that affect mechanical spectra?
2) Draw neat diagram and explain in detail calendaring molding.

Q.4 A) Attempt any two of the following questions. **10**

1) Explain thermoforming molding process and transfer molding with neat diagram.
2) Describe testing procedure for tube and pipe.
3) Explain the factors controlling dielectric loss and dielectric loss factor.

B) Attempt any one of the following questions. **04**

1) Explain processing of fibers and fabrics.
2) Explain in short dielectric strength and volume resistivity.

Q.5 Attempt any two of the following questions. **14**

a) Explain in detail viscoelastic behavior and stress-relaxation.
b) Explain in detail with neat diagram of injection molding.
c) Explain Maxwell and Voight model and Boltzman’s superposition principle.

SLR-JF-130

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
QUANTUM CHEMISTRY

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Quantum tunneling is a phenomenon in which _____.
   a) nuclei of lighter elements collide to form a heavier element
   b) nuclei repel electrically
   c) objects pass through an impermeable barrier
   d) a heavier atom divides into two lighter elements

2) Which of these physicists assigned a wave function to all quantum objects?
   a) Schrodinger b) de Broglie
   c) Einstein d) Planck

3) The value for a_o (Bohr radius) is _____.
   a) 0.0529 Å b) 0.529 Å
   c) 0.00529 Å d) 5.29 Å

4) The Compton shift depends on _____.
   a) angle of scattering b) wavelength of incident light
   c) interacting material d) all of these

5) The uncertainty principle applies to _____.
   a) energy and momentum b) velocity and position
   c) momentum and position d) energy and position

6) The number of nodes for 3d and 4f atomic orbital are _____.
   a) 0 and 0 b) 0 and 1
   c) 1 and 2 d) 2 and 3

7) According to variation principle E _____ E_0
   a) smaller or is equal to b) greater or is equal to
   c) is equal to d) all of these

8) The zero point energy of simple harmonic oscillator is
   a) 0 hν b) ∞ hν
   c) ½ hν d) hν

9) Quantum mechanics describes the motion of objects _____.
   a) moving at high speed b) of very small sizes
   c) of macroscopic sizes d) in strong gravitational fields

10) A particle of mass 'm' is confined to a two dimensional box of side length 'a' Å. It's zero point energy is _____.
   a) $h^2/8ma^2$ b) $2h^2/8ma^2$
   c) $3h^2/8ma^2$ d) $4h^2/8ma^2$

11) According to the Bohr's atomic theory, the angular momentum of an electron in 5th orbit is _____.
   a) $h/2\pi$ b) h/π
   c) $5h/2\pi$ d) $9h/2\pi$

12) The degeneracy of an excited state of a particle in three dimensional cubical box with energy 3 times its ground state is _____
   a) 3 b) 2
   c) 1 d) 4

13) The kinetic energy of a particle can be given as _____.
   a) mvr b) $p^2/2m$
   c) $2mv^2$ d) mv/r^2

14) When two waves strengthen each other, we are talking about _____.
   a) destructive interference b) destructive diffraction
   c) constructive interference d) constructive diffraction

Q.2 A) Answer the following questions. (Any Four) **08**

1) Define eigen function and eigen value with suitable example.
2) Mention two important assumptions of Bohr atomic theory.
3) Define
   i) free valence index
   ii) charge density
4) Mention any two semi-empirical methods for calculation of approximate energy.
5) Construct secular determinant for cyclobutadiene molecule.

B) Write Notes. (Any Two) **06**

1) Consequences of Heisenberg's uncertainty principle
2) Shape of atomic orbitals
3) First order perturbation theory

Q.3 A) Answer the following questions. (Any Two) **08**

1) Show that the asymptotic solution of the harmonic oscillator Schrodinger equation is $\exp(-\alpha x2/2)$.
2) What is an operator? Derive the expression for linear momentum operator (p).
3) Normalize the wave function $\psi = N \sin(n\pi/a)x$. find out the normalization constant, where $0 < x < \infty$.

B) Answer the following questions. (Any One) **06**

1) Solve the radial part of the Schrodinger equation for hydrogen atom. Give its solution.
2) Describe quantum mechanical approach of photoelectric effect.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Give the physical interpretation of ψ and ψ^2 for quantum mechanical harmonic oscillator.
2) Estimate the average position of a particle < x > in a one dimensional box.
3) Discuss radial plots for hydrogen atoms.

B) Answer the following questions. (Any One) **04**

1) Given that the work function for Cr is 4.40 eV, calculate kinetic energy of electron emitted from a Cr surface when it is irradiated with UV light of wavelength 200 nm.
2) The total π electron energy for naphthalene is $E\pi = 10\alpha + 13.68\beta$. Calculate the delocalization energy and delocalization energy per electron for naphthalene.

Q.5 Answer the following questions. (Any Two) **14**

1) Derive the Schrodinger equation using wave mechanical approach.
2) Discuss restricted and unrestricted Hartree-Fock theories.
3) What is Compton effect? Derive the expression for Compton shift.

SLR-JF-131

Seat No.	

Set P

M.Sc.(Semester – III) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
ELECTROCHEMISTRY

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.
4) Use of logarithmic table / scientific calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Debye-Huckel limiting law for the mean activity coefficient of an electrolyte is _____.
   a) $\log f \pm = -A\, z_+ \;\; z_- \;\; (\mu)^{1/2}$ b) $\log f \pm = \; -A z_- \, z_- (\mu)^{1/2}$
   c) $\log f \pm = -A\, z_+ \;\; z_+ \;\; (\mu)^{1/2}$ d) $\log f \pm = +A\, z_+ \;\; z_- \;\; (\mu)^{1/2}$

2) In Debye-Huckel Onsager equation the value of constant A= _____.
   a) $82.4/(DT)^{1/2}\eta$ b) $82.4/(DT)\,\eta$
   c) $82.4/(DT)^{2}\eta$ d) None of the above

3) The mobility of ion _____ due to electrophoretic force.
   a) increases b) Decreases
   c) remains constant d) both (a) and (b)

4) At high voltage the conductance of an electrolyte solution increases due to _____ effect.
   a) Debye b) Falkenhagen
   c) Wien d) Debye-Falkenhagen

5) The concept of association of ions to form ion pair was introduced by the scientist _____.
   a) Debye-Huckel b) Onsager
   c) Bjerrum d) Grotthuss

6) The interaction between the soult and solvent molecule is called _____.
   a) ion-solvent interaction b) solvent interaction
   c) ion-ion interaction d) solvent-solvent interaction

7) The overvoltage _____ with increase in temperature.
   a) decreases b) increases
   c) becomes zero d) remains constant

8) Common energy source in Indian villages is _____.
   a) electricity b) wood and animal dung
   c) coal d) sun

9) Destruction of material due to its reaction with environment called _____.
   a) corrosion b) collision
   c) erosion d) both (a) and (b)

10) For H_2O_2 fuel cell ΔG^0 = _____.
   a) -237.2 kJ/mole b) -500 kJ/mole
   c) 327.2 kJ/mole d) -100 kJ/mole

11) Streaming potential method is used to measure the _____.
   a) zeta potential b) single electrode potential
   c) discharge potential d) both (b) and (c)

12) When the dispersed particles move under the influence of either gravity or centrifugation in a medium is known as _____.
   a) sedimentation potential b) streaming potential
   c) decomposition potential d) discharge potential

13) In fuel cells oxidation occur at the _____.
   a) anode b) cathode
   c) on both electrode d) first at cathode then at anode

14) The mobile phase in electrophoresis is _____.
   a) liquid b) solid
   c) gases d) all of these

Q.2 A) Answer the following (Any Four) **08**

1) What is fuel cell?
2) Mention the different methods to determine the hydration number.
3) Define polarization and corrosion.
4) Define the relaxation time.
5) Write the Debye-Huckel Onsager equation.

B) Write Notes on (Any Two) **06**

1) Laws of electrolysis.
2) Direct and indirect losses of corrosion.
3) Tafel equation.

Q.3 A) Answer the following (Any Two) **08**

1) For KF the value of ΔH lattice is 810 kJ/mole and ΔH solution is -17.58 kJ/mole at 25^0C. Similarly for NaF the value of ΔH lattice is 912 kJ/mole and ΔH solution is 0.410 kJ/mole at 25^0C. calculate the values of $\Delta H_{l\text{-}S}$ for K^+, Na + and F^-
2) Calculate the thickness of ionic atmosphere for 0.01 m solution of uni-univalent electrolyte in menthol.
   $(D = 32.6, \varepsilon = 1.603 \times 10 - 19$C/electron ,
   Boltzmann constant $= k = 1.3806 \times 10^{-23}$J/K , $\pi = 3.14, N = 6.023 \times 10^{23}$) at 298K
3) Outcomes of Born theory.

B) Answer the following (Any One) **06**

1) Define overvoltage. What are their types? Explain experimentally determination of overvoltage.
2) What are the advantages and disadvantages of electroforming process?

Q.4 A) Answer the following (Any Two) **10**

1) Write a note on pourbaix diagram for iron system.
2) Write a note on streaming potential.
3) Calculate the activity coefficients of barium and chloride ions and the mean activity coefficient of a 0.008 molal solution of barium chloride in aqueous solution at 25^0C.

B) Answer the following (Any One) **04**

1) Describe the construction and working of H_2 _ O_2 fuel cell.
2) Write a note on Wien effect.

Q.5 Answer the following (Any Two) **14**

a) Explain the mechanism of abnormal ionic conductance's of hydrogen and hydroxyl Ions.
b) Explain the construction and working of Lippmann capillary electrometer.
c) Derive Debye-Huckel limiting law.

SLR-JF-132

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
MOLECULAR STRUCTURE – I

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Answers to all questions should be written in the same answer book.
3) Figures to right indicate marks.
4) Neat and Iebelled diagrams should be drawn.
5) Use of calculator and logtable is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Name the pint group of H_2 molecule _____.
   a) C_{2v} b) C_{3v}
   c) $D_{\infty h}$ d) D_{2h}

2) A planar MX_4 molecule has $E, C_4, S_4, 4C_2, 4\sigma_v$ and σ_h as its symmetry element which is the principle axis of rotation?
   a) C_3 b) C_4
   c) C_2 d) C_6

3) The following transformation matrix represents _____ operation.
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
   a) σ_{xz} b) σ_{yz}
   c) σ_{xy} d) σ'_{xy}

4) For a non-rigid rotator the spacing between the first two lines of rotational spectrum is _____.
   a) 2B - 4D b) 2B - 8D
   c) 6B - 8D d) 2B - 20D

5) The expression for rotational energy of a prolate symmetric top molecule is E_J = _____.
   a) $BJ(J+1) + (B-A)K^2$ b) $2BJ(J+1) + (A-B)K^2$
   c) $BJ(2J+1) + (A-B)K^2$ d) $BJ(J+1) + (A-B)K^2$

6) The value of J for the maximum population of rotational energy levels of a molecule is given by J_{max} = _____.
   a) $\sqrt{[kT/2hcB]} - 1/2$ b) $\sqrt{[kT/hc]} - 1/2$
   c) $\sqrt{[kT/2hc]} - 1/2$ d) $\sqrt{[2kT/hcB]} - 1/2$

7) If the rotational frequency, ω, of a diatomic molecule is 3.14×10^{11} radians s^{-1} its period of rotation is _____ $\times 10^{-12}\ s$.
   a) 10 b) 20
   c) 30 d) 40

8) If the rotational constant of H_2 molecule is B what will be the rotational constant B' of D_2 molecule?
   a) 2B b) B/2
   c) B d) B(J+1)

9) Total number of vibrations in $CH_2=CHCH_2Br$ are _____.
   a) 21 b) 22
   c) 23 d) 24

10) The hot bands in IR spectroscopy are obtained due to excitation of molecule from V = _____ state.
   a) 0 b) 1
   c) 2 d) 3

11) The O-H stretching frequency for methanol is 3300 cm^{-1} then the corresponding O-D frequency is _____ cm^{-1}.
   a) 2350 b) 2312
   c) 2401 d) 2412

12) The term symbols for a state is $^2P_{3/2}$ the values of J, S and L are _____.
   a) 3,2,1 b) 3/2, ½, 1
   c) 3 ½ , 1 ½, 1 d) 3,1,1

13) The continuum observed well below the true dissociation energy is called _____.
   a) Association b) Complex formation
   c) Disoociation d) Predissociation

14) One of the source of radiation used in Raman spectrophotometer is _____.
   a) Tungsten Lamp b) Deuterium lamp
   c) Krypton Laser d) CO_2 laser

Q.2 A) Answer the following questions. (Any Four) **08**

1) How do you represent inversion operation by a transformation matrix?
2) What are Anti-Stokes lines?
3) If a molecule of the formula XY_2 and contain centre of symmetry. How many IR and Raman active bands will be observed?
4) Why the rotational energies of a non-rigid rotator decreases as J increases as compared with that of rigid rotator?
5) Differentiate between v' and v" progressions.

B) Write notes. (Any Two) **06**

1) Properties of a group
2) Stark effect
3) Fortrat diagram

Q.3 A) Answer the following questions. (Any Two) **08**

1) Write and explain the multiplication table for C_{2v} group.
2) Discuss the effect of isotopic substitution on rotational spectra of a diatomic rigid rotator.
3) Find the quantum numbers for the states represented by $^3P_2$, $^3P_1$ and $^3P_0$.

B) Answer the following questions. (Any One) **06**

1) Write down the character table for of a C_{3v} group.
2) The microwave spectrum of BrF shows series of lines spaced by nearly constant amount of 0.7143 cm^{-1}. Calculate the bond length of BrF. (Given $m_{Br} = 132.0 \times 10^{-27}$ kg, $m_F = 31.79 \times 10^{-27}$ kg, $c = 3.0 \times 10^8$ ms^{-1}, $h = 6.626 \times 10^{-34}$ Js)

Q.4 A) Answer the following questions. (Any Two) **10**

1) Mention the conditions for a set of symmetry elements to be called a group.
2) Derive expression for Jmax for a rigid diatomic molecule assuming the degeneracy of its rotational energies is (2J+1).
3) Explain how the dissociation energy of a molecule can be obtained from Birge-Sponer

B) Answer the following questions. (Any One) **04**

1) For a symmetric top molecule obtain expression for the frequencies of IR spectrum of parallel vibrations.
2) Explain with the help of IR and Raman Spectra of AB_3 molecule that the molecule has a planar or a pyramidal structure.

Q.5 Answer the following questions. (Any Two) **14**

a) Obtain expressions for fundamental, first and second overtone absorption frequencies of a diatomic molecule considering it as an unharmonic oscillator.

b) Discuss pure vibrational Raman spectrum of a molecule.

c) What are term symbols? How they are represented?

SLR-JF-133

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
STATISTICAL MECHANICS AND IRREVERSIBLE THERMODYNAMICS

Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Which of the following particles is fermion?
   a) He (IV) b) photons
   c) electrons d) deuterium

2) How many quantum states are possible for a atom having configuration $1s^2 2s^2 2p^3$?
   a) 5 b) 10
   c) 15 d) 20

3) The ensemble in which N, V and E are constant is referred as _____ ensemble.
   a) canonical b) micro canonical
   c) grand canonical d) both (a) and (b)

4) The zero point energy of simple harmonic oscillator having frequency v is _____.
   a) ½ hv b) 2 hv
   c) 3/2 hv d) 5/2 hv

5) According to Debye's theory of specific heat at low temperatures specific heat is proportional to _____.
   a) T b) T^2
   c) T^3 d) independent of T

6) For an atom, the term is $^2P_{3/2}$, the electronic partition function will be _____.
   a) 2 b) 3
   c) 4 d) 5

7) _____ is simply degeneracy of the ground electronic state.
   a) Q_{trans} b) Q_{rot}
   c) Q_{vib} d) Q_{ele}

8) Protons obeys _____statistics.
   a) Fermi-Dirac b) Maxwell-Boltzmann
   c) Bose-Einstein d) all of these

9) What is the probability of receiving a card of king of spade from a standard pack of 52 cards?
   a) 1/13 b) 1/4
   c) 1/52 d) 4/52

10) The classic value of specific heat capacity of an atomic solid at room temperature is _____cal/K/mol.
a) ½ R b) 3/2 R
c) 2 R d) 3 R

11) Which of the following is inexact differential?
a) dS b) dw
c) dG d) dE

12) What is the ratio of para to ortho hydrogen at room temperature?
a) 25:75 b) 75:25
c) 50:50 d) 0:100

13) The symmetry number of hetero nuclear diatomic molecules is ____.
a) 0 b) 1
c) 2 d) 6

14) The specific heat is highest for ____ element.
a) Si b) C
c) Cu d) Au

Q.2 A) Attempt the following questions. (Any Four) **08**
1) Mention any two bosons.
2) What do you mean by ortho and para hydrogen?
3) Give the statement for second law of thermodynamics.
4) Mention any two conjugate pair of variables.
5) Give the physical interpretation of partition function.

B) Write Notes. (Any Two) **06**
1) Electron gas in metals
2) Most probable configuration
3) Integrating factor

Q.3 A) Answer the following questions. (Any Two) **08**
1) Discuss entropy production due to heat flow.
2) Derive the expression for vibrational partition function.
3) Discuss conservation of mass in open and closed system.

B) Answer the following questions. (Any One) **06**
1) Derive the expression for Fermi-Dirac statistics.
2) Discuss in detail electrokinetic effects.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Derive Saxen's relations.
2) If E = f(T,V) and dE is an exact differential then prove that $(dE/dV)_T = T(dP/dT)_V - P$.
[Given: dq = dE + PdV and 1/T is an integrating factor]
3) Discuss in brief Einstein's theory for heat capacity of solid.

B) Answer the following question. (Any One) **04**
1) 3 quanta of energy shared among 3 harmonic oscillators. Estimate the possible configurations and total number of microstates associated with this system.
2) Estimate the rotational partition function, Q_{rot}, for O-H radical at 298 K. (Given r_{O-H}= 0.97 Å).

Q.5 Answer the following question. (Any Two) **14**

a) Derive the expression for Sackur-Tetrode equation.

b) Derive classical Maxwell-Boltzmann distribution law. Write significance of the term β.

c) Define ensemble. Discuss in detail canonical and microcanonical ensembles.

SLR-JF-134

Seat No.	

Set P

M.Sc. (Semester – IV) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
CHEMICAL KINETICS

Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.
4) Use of logarithmic table/scientific calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) The reaction $A + B + C \rightarrow$ Products is followed the rate law as, $r = -d[A]/dt = k[A]^2[B]^{3/2}[C]^{-1/2}$. The overall order of reaction is _____.
   a) $3/2$ b) $7/2$
   c) 3 d) $5/2$

2) The reaction which proceed in a series of successive stages initiated by suitable primary process is called _____.
   a) exothermic b) chain
   c) endothermic d) spontaneous

3) Arrhenius equation may be written as, _____.
   a) $\mathrm{d\ln k/dt = E_a/RT}$ b) $\mathrm{d\ln k/dt = E_a/RT^2}$
   c) $\mathrm{d\ln k/dt - E_a/RT}$ d) $\mathrm{d\ln k/dt - E_a/RT^2}$

4) Nuclear disintegration follows _____ order kinetics.
   a) first b) third
   c) zero d) second

5) The role of catalyst in a chemical reaction is to change the _____.
   a) equilibrium constant b) activation energy
   c) Arrhenius factor d) all of these

6) For a reaction the plot of In k verses 1/T gives a straight line, then _____.
   a) $\mathrm{E_a = -(slope)\ x\ R}$ b) $\mathrm{E_a = (slope)\ x\ R}$
   c) $\mathrm{solpe = R\ x\ E_a}$ d) $\mathrm{R = solpe\ x\ E_a}$

7) A reaction in which all reactants are in the same phase is called _____.
   a) Elementry b) hetrogeneous
   c) homogeneous d) biomolecular

8) For first order reaction A → Products $t_{1/2}$ is 200 s the rate constant of the reaction is _____.
   a) $6.9 \times 10^{-2}\ s^{-1}$ b) $3.45 \times 10^{-4}\ s$
   c) $3.45 \times 10^{-3}\ s^{-1}$ d) $34.0 \times 10^{-2} s^1$

9) Potential energy of the reactant is less than the potential energy of the product, then the reaction is _____.
   a) exothermic b) endothermic
   c) spontaneous d) chain

10) In elastic collision energy is _____.
a) remains constant b) transferred
c) absorbed d) all of these

11) The collision theory is satisfactory for _____ order reaction.
a) zero b) first
c) second d) third

12) Which one of the following is not a biological catalyst?
a) washing powder enzyme b) catalyase
c) yeast d) hydrogen per oxide

13) The rate determining step for a consecutive reaction is the one which is _____.
a) fastest b) slowest
c) last in sequence d) first in sequence

14) The reactions having smaller values of energy of activation are _____.
a) fast b) slow
c) steady d) both (a) and (b)

Q.2 A) Answer the following questions. (Any Four) **08**

1) What do you mean by acidity function?
2) What do you mean by oscillatory reactions?
3) What are disturbing factors in determination of order of reaction?
4) Write the Arrhenius equation. Give its significance.
5) What are the weakness of collision theory?

B) Write notes. (Any Two) **06**

1) General aspects of chain reaction.
2) Tunnelling effect
3) Partition function

Q.3 A) Answer the following questions. (Any Two) **08**

1) Calculate ΔG^* for dimerisation reaction at 326K having velocity constant $k = 1.42 \times 10^{-2}$ dm^3/mole/sec. ($h = 6.626 \times 10^{-34}$Js, Boltzmann constant $k = 1.38 \times 10^{-23}$ J/K , $R = 8.314$ J/K/mole)
2) Write a note on autocatalysis.
3) Illustrate the kinetics of parallel reactions with suitable example.

B) Answer the following questions. (Any One) **06**

1) For first order isomerization of an organic compound at 130^{0}C, the activation energy is 108.4kJ/mole and the rate constant is $9.12 \times 10^{-4} s^{-1}$. Calculate the standard entropy of activation for this reaction. ($h = 6.626 \times 10^{-34}$Js, Boltzmann constant $k = 1.38 \times 10^{-23}$ J/K ,$R = 8.314$ J/K/mole)
2) Discuss the kinetics of thermal decomposition of acetaldehyde.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Give the comparative study of the reaction between Hydrogen and Halogens.
2) Derive an expression for velocity constant for forward reaction in case of first order reaction opposed by first order reaction.
3) Explain the mechanism of an acid-base catalysis.

B) Answer the following questions. (Any One) **04**

1) For a first order reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$ $A = 4.3 \times 10^{13}\ s^{-1}$ $E_a = 103.35$ kJ, what is k at 300K? (R=8.314 J/K/mole)

2) The rate constant of second order reaction is $5.7\ X\ 10^{-5}$ $dm^3mole^{-1}s^{-1}$ at 298 K And 1.64 X 10^{-4} $dm^3mole^{-1}s^{-1}$ at 313 K, Calculate the activation energy .{ Given-R =8.314 J/K/mole}

Q.5 Answer the following questions. (Any Two) **14**

a) Obtain a rate expression for unimolecular reaction as proposed by Lindemann.

b) Derive a rate expression for the reaction between H_2 and CI_2.

c) Write a general mechanism of an enzyme catalysed reaction and obtain an expression for Michaelis-Menten constant.

SLR-JF-135

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
MOLECULAR STRUCTURE – II

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and give equations wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) A dipole moment of para-dichlorobenzene is _____.
   a) one b) zero
   c) infinite d) fraction

2) Debye theory is applicable only for _____ molecules.
   a) polar b) non polar
   c) linear d) complex

3) For diamagnetic substance, magnetic permeability is always _____.
   a) less than one b) greater than one
   c) equal to one d) zero

4) The mathematical equations of Curie's law is _____.
   a) $K \alpha T$ b) $K \alpha P$
   c) $K \alpha 1/T$ d) $K \alpha 1/P$

5) If the mass number is even and atomic number is also even, then nuclear spin is always _____.
   a) 1/2 b) 3/2
   c) 1 d) zero

6) For C^{12}, the magnetic moment is _____.
   a) 1/2 b) zero
   c) one d) negative

7) The value of g-factor is _____ in ESR spectroscopy.
   a) 2.0083 b) 2.0023
   c) 2.023 d) 23.023

8) The ESR Spectra are generally recorded in _____.
   a) absorption mode b) emission mode
   c) derivative mode d) sharp mode

9) Dipole moment is _____ quantity.
   a) vector b) scalar
   c) ruler d) magnetic

10) The dipole moment of trans isomers is _____.
   a) one b) zero
   c) not definite d) infinite

11) The temperature at which substance possesses Ferrimagnetism's is called as _____.
   a) Curie b) Debye
   c) Neel d) Absolute

12) The mathematical equation of volume susceptibility is _____.
   a) $\mathrm{K} = \mathrm{I}/\mathrm{H}$ b) $\mathrm{K} = \mathrm{H}/\mathrm{I}$
   c) $\mathrm{I} = \mathrm{K}/\mathrm{H}$ d) $\mathrm{K} = \mathrm{H}/\mathrm{V}$

13) Nuclear spin angular momentum is expressed in _____.
   a) radians $\mathrm{T}^{-1}\ \mathrm{S}^{-1}$ b) radians TS^{-1}
   c) radians $\mathrm{T}^{-1}\ \mathrm{S}^{1}$ d) radians $\mathrm{T}^{1}\ \mathrm{S}^{1}$

14) _____ ray detector is used in the Mossbaur spectrometer.
   a) alpha b) beta
   c) gamma d) electron

Q.2 A) Answer the following questions. (Any Four) **08**

1) Define Group moment. Give one example.
2) Derive a relation between magnetic moment and number of unpaired electrons.
3) Define magnetic susceptibility. How it is related with magnetic induction?
4) Define Doppler broadening.
5) Define chemical shift.

B) Write notes. (Any Two) **06**

1) Ferromagnetism and Ferrimagnetism
2) Mossbaur sources
3) Kramer's degeneracy in ESR spectroscopy

Q.3 A) Answer the following questions. (Any Two) **08**

1) Discuss the relationship between dipole moment and ionic charater of a bond.
2) Discuss Langevin's theory for paramagnatism.
3) For an AX molecules, explain the splitting of resonance energy levels (NMR signals) due to spin-spin coupling.

B) Answer the following questions. (Any One) **06**

1) Explain the term Lennard-Jones potential.
2) Discuss the Gouy method for the determination of magnetic susceptibility.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Calculate the recoil velocity and energy of a Mossbaur nucleus having at.wt. 60 if the emitted gamma-ray has a frequency 1.84×10^{14}Hz.
   $(N = 6.023 \times 10^{23}, h = 6.626 \times 10^{-34} Js, c = 3.0 \times 10^{8} m.s^{-1})$
2) Discuss the components of ESR spectrometer with a schematic diagram.
3) Discuss Larmor precession and the meaning of resonance in NMR Spectroscopy.

B) Answer the following questions. (Any One) **04**

1) Discuss the Nuclear-Overhauser Effect (NOE).
2) Explain in detail the basic principle of ESR spectroscopy.

Q.5 Answer the following questions. (Any Two) **14**

a) Derive Debye equation for the molar polarization of a molecule.
b) Explain the study of Hindered rotation occurred NMR spectroscopy.
c) Discuss the factors affecting "g" value in ESR spectroscopy.

SLR-JF-136

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Physical Chemistry
SURFACE CHEMISTRY

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Neat and labeled diagrams should be drawn
4) Use of calculator and logtable is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Gas mask containing active charcoal removes poisonous gases from atmosphere. This process is based on _____ phenomenon.
   a) adsorption b) absorption
   c) sorption d) emission

2) In physical adsorption, the gas molecules are held on solid surface by _____ forces.
   a) chemical b) gravitational
   c) electrostatic d) van der waal's

3) The term _____ is known as adhesion tension.
   a) $(1 + sin\theta)$ b) $(1 + 1/cos\theta)$
   c) $(1 + tan\theta)$ d) $(1 + cos\theta)$

4) Which of the followings is the cationic surfactant?
   a) Octadecyl ammonium chloride b) Sodium palmitate
   c) Sodium stearate d) all of these

5) Which of the following kinds of catalysis can be explained by the adsorption theory?
   a) homogeneous catalysis b) heterogeneous catalysis
   c) enzyme catalysis d) acid - base catalysis

6) Composite material are solid bodies made up of at least two ____ materials.
   a) dissimilar b) similar
   c) same d) identical

7) Which of the following is the role played by an emulsifier?
   a) Accelerates the dispersion b) stabilizes the emulsion
   c) homogenizes the emulsion d) aids the flocculation of emulsion

8) Capillary rise experiments are preferred with ____ contact angle.
   a) zero b) Single
   c) double d) Finite

9) The function of an emulsifier is to _____.
   a) Coagulate a colloidal solution b) stabilize a sol
   c) Stabilize an emulsion d) electrify a colloidal solution

10) According to the Langmuir adsorption isotherm, the amount of gas adsorbed at very high pressure _____.
   a) reaches a constant limiting value.
   b) goes on decreasing with pressure.
   c) goes on increasing with pressure.
   d) increases first and then decreases

11) Wetting is _____ process.
   a) non spontaneous and exothermic
   b) non spontaneous and endothermic
   c) Spontaneous and exothermic
   d) spontaneous and endothermic

12) During hydrogenation of oils commonly used catalyst is _____.
   a) Chromium b) Nickel
   c) Iron d) Magnesium

13) Which of the following is the Young and Laplace equation for a spherical surface?
   a) $\Delta P = 1/r$ b) $\Delta \mathrm{P} = 2r/3r$
   c) $\Delta P = 2r$ d) $\Delta P = 2r/r$

14) Generally a pharmaceutical emulsion is _____.
   a) a solid
   b) a solution
   c) a dispersion of liquid within another liquid
   d) a gel

Q.2 A) Attempt any four of the following questions. **08**

1) How fluorescence property helps in identification of emulsion type?
2) What is detergency?
3) Mention different types of emulsions.
4) Why simple fatty acids do not spread on the surface of water to form monolayers?
5) Define critical micelle concentration.

B) Write Notes. (Any Two) **06**

1) Selective wetting
2) Trube's rule
3) Surface energy of solids

Q.3 A) Attempt any two of the following questions. **08**

1) Discuss application of BET equation in determination of surface area of adsorbent.
2) Derive Kelvin equation for vapor pressure inside and outside the droplet of water.
3) Using the concept of condensed film, derive Harkins-Jura equation.

B) Attempt any one of the following questions. **06**

1) Give an account of physical states of monomolecular insoluble films.
2) Discuss structure and energetic of micellization. Explain surface tension method of determination of critical micelle concentration.

Q.4 A) Attempt any two of the following questions. **10**

1) Initial spreading coefficient of benzene water is positive while final spreading coefficient is negative. Why?
2) Derive Gibbs adsorption equation.
3) What are the factors that affects heat of adsorption?

B) Attempt any one of the following questions. **04**

1) Describe Adam-Langmuir surface pressure balance.
2) Explain with suitable example method of preparation of organic nanoparticles based micro- emulsion.

Q.5 Attempt any two of the following questions. **14**

a) Illustrate the gravimetric method of gas adsorption.

b) What are solid lubricants? Discuss the mechanism of hydrodynamic and boundary lubrication.

c) Write in detail on kinetics of chemisorptions.

SLR-JF-138

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
ADVANCE SEPARATION TECHNIQUES

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labeled diagram and give equations wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) The term electro chromatography is used with reference to the physical transport of charged _____.
   a) solvent b) solutes
   c) ions d) particles

2) There are various factors which affects migration rates in _____ electrophoresis.
   a) capillary b) curtain
   c) spot d) zone

3) The electro chromatographic homogeneity of zones is an important criteria in the establishment of _____.
   a) ions b) particles
   c) atoms d) purity

4) Fresh water tends to move through a _____ membrane.
   a) dark b) transparent
   c) polymembrane d) semipermiable

5) Gel filtration is technique that fractionates substances largely according to their _____ size.
   a) Ionic b) Molecular
   c) Atomic d) all of these

6) Ion exchange resin is used as the _____ phase.
   a) immobile b) mobile
   c) transfer d) equilibrium

7) The movements of substances relatives to the solvent is expressed in terms of _____ value.
   a) R_f b) R_x
   c) R_a d) R_s

8) The paper spotted with the samples is first developed using one solvent system as the _____ phase.
   a) transfer b) mobile
   c) immobile d) equilibrium

9) In solvent extraction two phases are namely aqueous and _____ phase.
   a) Inorganic b) Physical
   c) organic d) equilibrium

10) The extraction of uranium with 8 hydroxyquiline in _____.
a) Acetone b) Chloroform
c) Alcohol d) Benzene

11) The stability of metal complexes _____ with ionic potential.
a) increases b) decreases
c) lower d) None of these

12) The _____ basic methods used in liquid-liquid extraction.
a) two b) one
c) three d) all of these

13) The proper conditions for the separation can be predicted by_____ theory.
a) Mulliken b) Hukel
c) plate d) all of these

14) The solubility of the salts in the oxygen containg solvents depends upon specific interaction of the solvent oxygen and the _____.
a) solute b) solubility
c) solvent d) effluent

Q.2 A) Attempt any four of the following question. **08**
1) Define synergic extraction.
2) Mention the detector used in ion chromatography.
3) Explain in short current efficiency in electrodialysis.
4) Give two examples of semi-rigid gels.
5) Give steps involved in chromatographic methods.

B) Write Notes on (Any Two) **06**
1) Gel filtration chromatography
2) Ultracentrifugaion
3) Zone electrophoresis

Q.3 A) Attempt any two of the following question. **08**
1) Explain in brief sedimentation equilibrium of ultra-centrifugation.
2) Explain the term Miceller electro kinetic capillary
3) Explain the technique of ultra filtration.

B) Attempt any one of the following question. **06**
1) What is principle of capillary electrophoresis? Explain in brief its sample preparation.
2) What is the principle in zone refining technique? Explain process of Zone refining.

Q.4 A) Attempt any two of the following question. **10**
1) Explain in brief principle and working of paper chromatography.
2) Discuss the electro dialysis cells.
3) Explain in brief the technique of solvent extraction.

B) Attempt any one of the following question. **04**
1) Discuss the extraction equilibria for solvation.
2) Explain the elusion methods used in affinity chromatography.

Q.5 Attempt any two of the following question. **14**
1) Explain in brief principle and working of affinity chromatography?
2) Give application of electrophoresis in inorganic and organic separations.
3) Explain factors affecting solvent extraction.

SLR-JF-139

Seat No.	

Set P

M.Sc.(Semester - III) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
INSTRUMENTAL METHODS OF ANALYSIS - I

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator Is allowed.

Q.1 Multiple Choice Questions. **14**

1) In the standard notation for a voltaic cell, the single vertical line "|" represents:
   a) a phase boundary b) gas electrode
   c) a wire (metal) connection d) a salt bridge

2) Glass electrode contains the solution of _____.
   a) 1N KCI b) Saturated KCI
   c) 0.1 N HCI d) 1N HCI

3) Electrogravimetric method is applicable only to materials that are conductors of _____.
   a) Heat b) Electricity
   c) Sound d) Both a and b

4) An example of the electrode in solid-state ion selective electrode for F- determination is,
   a) BF_3 b) LaF_3
   c) PF_5 d) NaF

5) Which of the following is most appropriate to study polymorphism?
   a) TGA b) DTA
   c) DTGA d) DSC

6) High frequency titration technique was introduced by _____.
   a) Hall b) Jensen and Parrack
   c) Adams d) Hyrosky

7) Which of the following is not a type of radiation detectors?
   a) Geiger Muller counter b) Proportional counter
   c) Semiconductor detector d) Flame emission detector

8) In liquid membrane electrode, the liquid ion exchanger is held in a porous disc of _____.
   a) Solid material b) Semi-permeable membrane
   c) Hydrophobic material d) Water absorbing material

9) In solid state membranes, the body of the electrodes are made of which of the following?
   a) Polyvinyl chloride b) Plastic
   c) Polythene d) Teflon

10) The DTA plot of calcium oxalate in air shows an upward peak due to ____.
   a) Formation of calcium oxide b) Formation of calcium carbonate
   c) Burning of CO d) Elimination of water

11) In the heat vs temperature plot of DSC of a polymer the glass transition is represented by _____.
   a) A gradual slope
   b) A hump
   c) Glass transition cannot be detected
   d) A kink

12) In high frequency titrimetry, the titration curve depends on _____.
   a) concentration of the substance being titrated
   b) change in oscillator current
   c) change in frequency
   d) all of these

13) Which of the following electrochemical methods requires the formation of an insoluble form of the analyte?
   a) electrogravimetry
   b) coulometry
   c) potentiometry
   d) voltammetry

14) The limiting current in a linear sweep voltammogram is related to _____.
   a) The standard reduction potential for the redox couple under investigation.
   b) The reduction potential of the reference electrode
   c) The point at which concentration polarization begins
   d) The concentration of the analyte of interest

Q.2 A) Answer the following questions. (Any Four) **08**

1) Give the expression for Randles – Sevic equation.
2) Mention different ion selective electrodes.
3) What are the prerequisite conditions required for supporting electrolytes?
4) What are nuclear radiations?
5) Mention different microelectrodes used in amperometric titration technique.

B) Write Notes on (Any Two) **06**

1) Radiochromatography.
2) Dead stop end point method.
3) Advantages and disadvantages of electrogravimetric titrations.

Q.3 A) Answer the following questions. (Any Two) **08**

1) Differentiate between the constant current and constant potential coulometry.
2) Explain in brief the thermogravimetric analyzer.
3) Explain how nuclear α, β and γ radiations differs from each other.

B) Answer the following questions. (Any One) **06**

1) With the help of typical pulse high-voltage curve, discuss ionization and proportional region.
2) Explain how differential thermal analysis technique helps in determining melting point, boiling point and decomposition point.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Give the principle of isotope dilution analysis. Explain how it is used in biomedical investigations.
2) Discuss with suitable example liquid-liquid membrane electrode.
3) Explain the factors affecting the results obtained by thermal methods of analysis.

B) Answer the following questions. (Any One) **04**

1) Draw the typical cyclic voltammogram and show peak voltages and peak currents.
2) Discuss the difference between the thermal methods: TAG and DTA

Q.5 Answer the following questions. (Any Two) **14**

a) What are radioactivity tracers? Discuss its applications in various fields.
b) Describe the basic principles of cathodic / anodic stripping voltammetry.
c) Discuss the principle and working of coulometer.

SLR-JF-140

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
APPLIED ANALYTICAL CHEMISTRY

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Answer to all questions are to be written in one answer book only.
4) All questions carry equal marks.
5) Draw neat labeled diagram wherever necessary.
6) Use of calculator and log table is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Molecular formula of DDT is _____.
   a) $C_{14}H_9Cl_5$ b) $C_{14}H_{10}Cl_4$
   c) $C_{11}H_9CI_4$ d) $C_{14}H_{11}CI_4$

2) Alloy is a mixture of _____.
   a) Element b) Metal
   c) Ore d) Rock

3) Ziram is digested with _____ acid.
   a) HNO_3 b) HCL
   c) H_2So_4 d) CH_3COOH

4) Estimation of phosphorus _____ is used.
   a) Colorimetric b) Gravimetric
   c) Volumetric d) Digestion

5) In dry ashing _____ of the plant sample occur at high temperature.
   a) Reduction b) Digestion
   c) Oxidation d) Precipitation

6) Triacid digestion is recommended only for the estimation of _____ &_____.
   a) N,K b) P,K
   c) N,P d) P,N

7) In brass alloy _____&_____ are in major composition.
   a) Cu&Zn b) Cu&Fe
   c) Sn&Pb d) Zn&Fe

8) Plant contain _____ &_____ macronutrient.
   a) N,P,K b) N,Ca,K
   c) N,Mg,Ca d) P,K&Mg

9) Major constituents of solder alloy are _____ and _____.
   a) Sn,Pb b) Pb,Al
   c) Sn,Fe d) Ca,Mg

10) The triacid digestion is carried out using a mixture of _____ & _____.
   a) $HNO_3HCI, HCIO_4$ b) HNO_3, H_2So_4
   c) $H_2SO_4HCIO_4, HCI$ d) $HCIO_4, CH_3COOH, HNO_3$,

11) Pyrolusite is the ore of _____.
   a) Fe b) Zn
   c) Mn d) Cu

12) In kjeldhal method $CuSo_4$:k_2So_4 is used as _____.
   a) Reaction mix. b) Catalyst
   c) Reagent d) indicator

13) In face powder _____ & _____ are analyzed by gravimetric method.
   a) Calcium & Barium b) Magnesium & Barium
   c) Zinc & calcium d) Calcium & Mg

14) Chemical formula for Dolomite ore is _____.
   a) $CaMg(Co_3)_2$ b) $CaMgCO_3$
   c) $CaMg(CO)_2$ d) $CaCO_3$

Q.2 A) Answer the following questions. (Any Four) **08**

1) Write the two copper based alloys and mention their composition and uses.
2) Which factors influence the soil reaction?
3) Mention the role of borate's and carbonates in creams.
4) Write about texture of soil.
5) What are constituents of feeding stuffs?

B) Write Notes on. (Any Two) **06**

1) Moisture determination form plant sample
2) Pyralusite ore analysis
3) Field description of soil.

Q.3 A) Answer the following questions. (Any Two) **08**

1) What is pH? Give details of PH determination of soil.
2) Explain determination of water, ash and mineral contents from the cream and lotion.
3) Write classification of pesticides and insecticides estimate the thiometon content from it.

B) Answer the following questions.(Any One) **06**

1) What are the fertilizer and manure? Write analysis of potassium by STPB method.
2) What is ore? How will you estimate silica and aluminum from bauxite ore.

Q.4 A) Answer the following questions. (Any Two) **10**

1) What are deodourands and antiperspirant? How will you estimate titanium and hexachlorophone from them.
2) Explain the ion exchange capacity of the soil.
3) How will you determine the crude protein, true protein from non-feeding **nitrogen** for determining the feeding value of stock feed.

B) Answer the following questions. (Any One) **04**

1) Give in detail analysis of steel alloy.
2) What are major and minor constituents of soil? Write methods for soil fertility evaluation.

Q.5 Answer the following questions. (Any Two) **14**

a) Write the experimental procedure for the determination of various constituents present in dolomite ore.

b) How will you analyses the following pesticides from there.
   i) Gamaxene
   ii) Chloridane

c) What are cosmetics? How non-volatile matter ash and mineral contents can be determined from it.

SLR-JF-141

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
ADVANCED ANALYTICAL TECHNIQUES

Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) All questions carry equal marks.
4) Use of log tables and calculators is allowed.
5) Draw neat and labeled diagram and give equations wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) The analyzers which handles each sample as a separate entity and usually only one assay is made per sample is known as _____ analyzer.
   a) Magnetic b) Discrete
   c) Continuous flow d) Centrifugal

2) Mie scattering theory are used to obtain relationship between _____ and light Intensity distribution pattern.
   a) particle size b) particle density
   c) particle mass d) none of these

3) The increase in the degree of _____ makes the resin more selective.
   a) -ve charge on ion b) cross-linking
   c) +ve charge on ion d) size of ion

4) On which factors the vibrational stretching frequencies of diatomic molecule depend?
   a) Force constant b) Atomic population
   c) Temperature d) Magnetic field

5) The difference between the field necessary for resonance in the sample and in some arbitrary a chosen compound is which of the following?
   a) Field shift b) Matrix effects
   c) Chemical shift d) Resonance shift

6) What is the wavelength range for UV spectrum of light?
   a) 400 nm - 700 nm b) 700 nm to 1 mm
   c) 0.01 nm to 10 nm d) 10 nm to 400 nm

7) The reaction rate is defined as the rate at which the concentration of the reactants _____ with time or the concentration of products ____ with time.
   a) Increase, increase b) Decrease, decrease
   c) Decrease, increase d) Increase, decrease

8) Among the following detectors which detector is not used in SFC chromatography?
   a) flame ionization detector b) flame photometry detector
   c) refractive index detector d) thermopile detector

9) The unit of rate of reaction is _____.
   a) Mol $L^{-1}S^{-1}$ b) Mol $L\,S^{-1}$
   c) Mol $L^{-1}S$ d) Mol $L\,S$

10) The concentration of glucose in the blood can be expressed in terms of _____.
   a) mg/dl b) mg/cm^2
   c) mg/dl^{-1} d) mg^2/dl

11) Enzymes cannot _____.
   a) act as biological catalysts
   b) operate over a wide range of pH
   c) be highly specific
   d) operate over wide temperatures only

12) Sedimentation technique based upon _____.
   a) Stokes law b) Lamberts' law
   c) Beer's law d) all of these

13) In SFC ____ is used as a mobile phase.
   a) CO_2 b) CO
   c) NO d) Na_2CO_3

14) The function of suppressor column is to convert eluent ions into species giving _____.
   a) low conductance b) high conductance
   c) constant conductance d) all of these

Q.2 A) Answer the following questions. (Any Four) **08**
1) Give two names of resins used in Ion chromatography.
2) Give two examples of carries gases used in GC-MS.
3) Explain in short On-line extraction.
4) Write the types of automated techniques.
5) Mention two applications of mass spectroscopy.

B) Write Notes on. (Any Two) **06**
1) COD analyzer
2) Enzyme catalysed reactions
3) Eluents used in ion chromatography

Q.3 A) Answer the following questions. (Any Two) **08**
1) Explain characteristics of second order reaction.
2) Explain in brief instrumentation super critical fluid chromatography.
3) Discuss the Low-angle laser light scattering instrumentation.

B) Answer the following questions. (Any One) **06**
1) Describe the automatic multipurpose analyzer.
2) Explain the structure of resins used in ion chromatography.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Describe automatic organic electric analyzer.
2) Discuss in detail detectors used in ion chromatography.
3) Give the principle of Dynamic light scattering and its applications.

B) Answer the following questions. (Any One) **04**
1) Explain in brief GC-MS technique.
2) Describe the properties of super critical fluids.

Q.5 Answer the following questions. (Any Two) **14**
a) Explain in brief automated analyzer based on multilayer film principle and its instrumentation.
b) What is principle of ion chromatography? Explain in brief instrumentation of ion chromatography.
c) Explain the HPLC-MS technique and its applications.

SLR-JF-142

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
INSTRUMENTAL METHODS OF ANALYSIS - II

Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) The X-ray region of the electromagnetic spectrum consists of wavelengths in the region of _____.
   a) $0.1 - 100$ Å b) $100 - 1000$ Å
   c) $0.0001 - 0.001$ Å d) $0.1 - 100$ cm

2) The processes occurring in flame are _____.
   a) translational b) excitation
   c) ionization d) all of these

3) The smallest interplanar spacing in a crystal which will give the nth order Bragg reflection is _____.
   a) $d_{hkl} = n$ $d_{hkl} = n/2$
   c) $d_{hkl} = n/3$ d) $d_{hkl} = n/4$

4) The element used as an ionization suppressor is _____.
   a) Bi b) Na
   c) Cs d) Mg

5) For very dilute suspensions, the most sensitive technique is _____.
   a) Turbidimetry b) Nephelometry
   c) Colorimetry d) Photometry

6) The good oxidants to excite metals in the flame is _____.
   a) hydrogen b) cyanogens
   c) butane d) Oxygen

7) _____ are the non-radiative transitions.
   a) inter system crossing b) vibrational relaxation
   c) Internal conversion d) all of these

8) For triplet states, the spin multiplicity is _____.
   a) 1 b) 2
   c) 3 d) 3/2

9) Which of the following system shows chemiluminescence phenomenon?
   a) jelly fish b) fire flies
   c) luminol d) all of these

10) X-ray was discovered by _____.
   a) Bohr b) Einstein
   c) Rotengen d) Compton

11) Fluorescence emissions are mainly confined to the following transitions.
   a) $\pi \rightarrow \pi^*$ b) $\sigma \rightarrow \sigma^*$
   c) $n \rightarrow \sigma^*$ d) $n \rightarrow n^*$

12) According to snell's law, the refractive index _____.
   a) sin i/sin r b) sin r/sin i
   c) sin i x sin r d) Sin^2r

13) No Bragg's reflection of X-rays from a crystal will be observed if dhkl is smaller than _____.
   a) λ b) 2λ
   c) $\lambda/2$ d) $\lambda/4$

14) Scattering of radiation is produced by _____.
   a) thermal density fluctuations b) colloidal solids
   c) optical inhomogeneity d) all of these

Q.2 A) Answer the following question.(any four) **08**

1) What do you meant by soft and hard X-ray radiations?
2) Mention typical lifetimes of fluorescence and phosphorescence.
3) State Kasha's rule.
4) Give the statement for Franck-Condon principle.
5) Mention various excitation sources used in emission spectroscopy.

B) Write Notes on. (any two) **06**

1) Jablonski diagram
2) X-ray generation
3) Significance of critical angle in refractive index measurement

Q.3 A) Answer the following question.(any two) **08**

1) Discuss the applications of phosphorimetry.
2) Why there is a need of surface study of solids?
3) Give an account of delayed fluorescence emissions.

B) Answer the following question.(ony One) **06**

1) Give the principle and working of typical interferometer.
2) Illustrate various interferences in flame photometry.

Q.4 A) Answer the following question. (any two) **10**

1) Write on qualitative and quantitative applications of flame photometry.
2) Discuss essential features of Nephelometer.
3) Describe the applications of fluorimetry in organic analysis.

B) Answer the following question.(any one) **04**

1) Lists various analytical applications of turbidimetry.
2) Write on chemiluminescence phenomenon.

Q.5 Answer the following question. (any two) **14**

a) Discuss in detail factors affecting fluorescence and phosphorescence.
b) Describe the X-ray fluorescence method used in chemical analysis.
c) Give an account of general techniques used in surface spectroscopy.

SLR-JF-143

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
BIO-CHEMICAL AND FOOD ANALYSIS

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Neat diagram must be drawn whenever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Thiamine is name of _____.
   a) vit. C b) vit. B1
   c) vit. A d) B 12

2) In Kjeldahl's method _____ acts as catalyst.
   a) $CuSO_4$ b) K_2SO_4
   c) $AgSO_4$ d) Na_2SO_4

3) The iodine value of nondrying oil is usually _____.
   a) Above 100 b) Below 100
   c) 95 to 140 d) 80 to 90

4) Blood urea test is carried out for _____.
   a) Diabetes b) Heart disease
   c) Anaemia d) Kidney failure

5) _____ sugar is present in milk.
   a) Glucose b) Lactose
   c) Maltose d) Sucrose

6) The temperature at which the liquefied fatty acids prepared from fats solidify is called _____ point.
   a) Freezing b) Titre
   c) Fusion d) Melting

7) The normal range for fasting glucose level in blood is _____ mg/dl.
   a) 90 to 120 b) 70 to 110
   c) 80 to 100 d) 80 to 110

8) Caramel is colouring agent that causes _____ deficiency.
   a) vit. B1 b) vit. C
   c) vit. B6 d) vit. B12

9) Indirect bilirubin soluble in _____.
   a) Water b) Alcohol
   c) Acetone d) None of these

10) Jaundice is diagnosed by _____.
   a) Uric acid b) Bilirubin
   c) Blood urea d) Blood glucose

11) In pasteurization process sample heating is not less than _____.
   a) 70^0 c b) 71^0 c
   c) 72^0 c d) 75^0 c

12) _____ is a protein harmone secreted from the β-cells of the islet of langerhans.
a) Progesterone b) Insulin
c) Oxytocin d) Pepsin

13) _____ represents the amount of volatile and water soluble fatty acid component in an oil or fat.
a) Sap value b) Acid value
c) Iodine value d) RM value

14) Prominent carbohydrates present in honey are _____.
a) Fructose & glucose b) Maltose & sucrose
c) Glucose & sucrose d) Glucose & maltose

Q.2 A) Answer the following questions. (Any Four) **08**
1) Draw the neat and well labeled diagram of Gutzeit apparatus.
2) Write the classification of vitamins.
3) What is bad cholesterol?
4) Define Titre point and cloud point.
5) What is hormone? Give its functions.

B) Write Notes. (Any Two) **06**
1) Food preservatives
2) Mode of action of snake venom
3) Limit test of chloride

Q.3 A) Answer the following questions. (Any Two) **08**
1) How impurities get added during storage or manufacturing process?
2) Outline analytical procedure for determination of HMF in honey.
3) Describe assay of ascorbic acid.

B) Answer the following questions. (Any One) **06**
1) What are electrolytes? Write estimation of serum potassium and serum sodium.
2) How will you estimate total nitrogen and protein from milk?

Q.4 A) Answer the following questions. (Any Two) **10**
1) Write the analysis of butte with respect to water, curd salt and fat.
2) Explain assay of oxytocin.
3) How will you estimate blood cholesterol?

B) Answer the following questions. (Any One) **04**
1) Give the classification of food colours.
2) What is sap value? How it is estimated form oil sample?

Q.5 Answer the following questions. (Any Two) **14**
a) Explain the qualitative analysis of milk in terms of specific gravity, degree of acidity, and amount of lactic acid.
b) Define the term drug. How drugs are classified.
c) How uric acid is formed? Write estimation of blood urea.

SLR-JF-144

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Analytical Chemistry
ENVIRONMENTAL CHEMICAL ANALYSIS

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Neat diagram must be drawn wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Untreated waste water is called as _____.
   a) Reclaimed water b) Effluent
   c) Raw sewage d) Scum

2) The incubation period in BOD is _____ days.
   a) 5 b) 7
   c) 4 d) 3

3) Tannin and lignin are waste products from the _____.
   a) paper industry b) sugar industry
   c) polymer drugs d) nuclear power point

4) _____ is a membrane technology used for the concentration of ions under the impact of electrical field.
   a) Adsorption b) Denitrification
   c) Sedimentation d) Electrodialysis

5) In determibation of COD _____ is used for oxidation.
   a) FAS b) $K_2Cr_2O_7$
   c) $Na_2S_2O_3$ c) $KMnO_4$

6) Alkalinity of water is due to the presence of _____ and _____.
   a) carbonate & hydroxide ions b) chloride & hydroxide ions
   c) carbonate & sulfate ions d) None of these

7) _____ water is suitable for industrial and steam generation purpose.
   a) Soft b) Hard
   c) Chlorinated d) Fluorinated

8) _____ is a continuous process in which liquid effluent is aerated to reduce BOD, ammonia and nitrogen.
   a) Sedimentation b) Activated sludge
   c) Sewage d) Raw Sewage

9) _____ accelerates corrosion of metals.
   a) Particulates b) Carbon monoxide
   c) Nitrogen oxides d) Hydrocarbons

10) _____ is one of the most potent eye irritants found in smog.
   a) Hydrocarbons b) Photochemical smog
   c) Nitrogen oxides d) Sulfur oxides

11) Anion exchange resins are represented as _____.
   a) $R(OH)_2$ b) H_2R
   c) RSO_4 d) HR

12) _____ is the downward movement of material clay, bases or organic stuff in solution or colloidal form.
   a) Illuviation b) Cheluviation
   c) Leaching d) Podzolisation

13) The meaning of eluviation is _____.
   a) settle down b) washing out
   c) floating out d) suspend in

14) The Bhopal gas accident is due to _____.
   a) Ethylcynide b) ethyl isocyanate
   c) methyl cyanide d) methyl isocyanate

Q.2 A) Answer the following questions. (Any four) **08**
1) Write a note on controls of radioactive pollution.
2) Give the classification of hazardous substances.
3) Explain the adsorption method for tertiary waste water treatment.
4) Describe the soil formation process.
5) Give the effects of Chernobyl nuclear explosion.

B) Write Notes. (Any Two) **06**
1) Minamata disaster
2) Nitrogen cycle
3) Acid rain

Q.3 A) Answer the following questions. (Any Two) **08**
1) Describe hydrological cycles with suitable example.
2) Discuss Winkler method for determination of DO in natural and waste water.
3) Explain the sample collection and preservation of water.

B) Answer the following questions. (Any One) **06**
1) What are surfactants? How will you estimate the anionic surfactants?
2) How colour, turbidity and TS from water are measured.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Describe the methods followed for soil conservation.
2) Explain contribution of sugar industry in environmental pollution.
3) Discuss sedimentation of waste water.

B) Answer the following questions. (Any One) **04**
1) How the waste water can be reused?
2) Explain the ultimate disposal of hazardous waste.

Q.5 Answer the following questions. (Any Two) **14**
1) What are particulates? Give their sources, effect and control measurements.
2) How the alkalinity and hardness of water sample are measured?
3) Explain the pollution caused by polymer industry.

SLR-JF-146

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Inorganic Chemistry
INORGANIC CHEMICAL SPECTROSCOPY

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagram and give equations wherever necessary.
4) Use of logarithmic table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Symmetry operation which brings molecule back to its original position is called _____ operation.
   a) back b) asymmetry
   c) identity d) unidentity

2) d-d transition in octahedral complexes is _____.
   a) laporate forbidden b) laporate allowed
   c) spin allowed d) spin forbidden

3) The total number of vibrations in allyl bromide (CH_2=$CHCH_2Br$) are _____.
   a) 18 b) 21
   c) 14 d) 16

4) The NMR spectra of CH_4 exhibit ____.
   a) singlet b) doublet
   c) triplet d) quintet

5) Ammonia molecule belong to _____ point group.
   a) C_{4v} b) C_{1v}
   c) C_{2v} d) C_{3v}

6) A transition in which an electron is transfered from one atom to another is called _____ transition.
   a) charge transfer b) ion transfer
   c) ligand transfer d) state transfer

7) The IR active molecules must undergoe change in _____.
   a) polarizability b) magnetic moment
   c) dipole moment d) refractive index

8) NMR spectroscopy falls in the _____ frequency region of electromagnetic spectrum.
   a) microwave b) radiowave
   c) X- rays d) far IR

9) _____is the point group in which allene molecule belongs.
   a) D_2d b) D_3d
   c) D_1d d) D_4d

10) _____transition has highest order of energy.
   a) $n \rightarrow \pi^*$ b) $\pi \rightarrow \pi^*$
   c) $n \rightarrow \sigma^*$ d) $\sigma \rightarrow \sigma^*$

11) Raman spectroscopic measurement is usually carried in the range _____.
   a) 10-200nm b) 200-400nm
   c) 400-700nm d) 700-800nm

12) Photoacoustic spectroscopy is also called _____spectroscopy.
   a) photovoltaic b) optoacoustic
   c) microscopic d) macroscopic

13) The rotational spectrum of rigid diatomic rotaor consist of equally spaced lines with spacing _____.
   a) 2B b) B
   c) B/2 d) 3B/2

14) The element which do not produce Auger electron spectra is _____.
   a) Carbon b) Nitrogen
   c) Halogens d) Helium

Q.2 A) Answer the following questions. (Any Four) **08**

1) Define symmetry operation.
2) Calculate ground term for $[Mn(H_2O_6]^{2+}$ complex ion.
3) What is Stark effect?
4) What is TMS? Why it is used as a standard reference in NMR spectroscopy?
5) Write only three dimensional matrix representation of symmetry of matrix (i).

B) Write Notes. (Any Two) **06**

1) Molecular point groups
2) Polarized Raman lines
3) Applications of PAS

Q.3 A) Answer the following questions. (Any Two) **08**

1) Calculate a reduced mass and moment of inertia of NaCl using the mean internuclear distance of 2.36Å. The atomic masses are $\mathrm{Na} = 23 \times 10^{-3}$ Kg/mole and $\mathrm{Cl} = 35 \times 10^{-3}$ Kg/mole.
2) Discuss morse potential energy diagram.
3) Give the factors affecting magnitude of chemical shift in NMR.

B) Answer the following questions. (Any One) **06**

1) What is multiplication table in molecular symmetry? Construct the multiplication table for C_{2v} point group.
2) How would you distinguish octahedral and tetrahedral Ni(II) complexes on the basis of their electronic absorption spectra?

Q.4 A) Answer the following questions. (Any Two) **10**

1) Discuss symmetry elements with example.
2) Discuss principle of Raman spectroscopy.
3) Explain the instrumentation of auger electron spectroscopy.

B) Answer the following questions. (Any One) **04**

1) Explain reducible and irreducible representation.
2) What are the salient features of Tanabe Sugano diagram?

Q.5 Answer the following questions. (Any two) **14**

a) Explain the effect of isotopic dilution in microwave spectrum.
b) Draw and explain the nature of electronic spectrum of formaldehyde molecule.
c) Discuss the basic principle and instrumentation of NMR spectroscopy.

SLR-JF-147

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov 2019
Inorganic Chemistry
CO-ORDINATION CHEMISTRY – I

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagram and give equations wherever necessary.
4) All equations carry equal marks.
5) Use of log tables and calculators is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Write geometry and hybridization for $[Ni(CN)_4]^{2-}$ ions using VBT.
   a) Tetragonal sp^2 b) Hexagonal and dsp^2
   c) Square planar and dsp^2 d) Tetragonal dsp3

2) The CFSE for high spin d4 octahedral complex is _____.
   a) -0.6 Δoct b) -1.8 Δoct
   c) -1.6 Δoct + P d) -1.2 Δoct

3) "The solutions of Cu(II) and Ti(III) ion show different colors". Why?
   a) Same electronic d-d transition
   b) Different electronic d-d transition
   c) Same electronic f-f transition
   d) Different electronic f-f transition

4) How many number of unpaired electrons present in $[Fe(CN)_6]^{4-}$ complex as per CFT approach?
   a) 1 b) 0
   c) 2 d) 3

5) "Intensity of d··d transition is usually weak". This is due to _____.
   a) Orbital allowed transition b) Laporate forbidden transition
   c) Hunds rule d) Aufbau rule

6) How many electronic transitions are possible for d^2 case in octahedral system?
   a) 2 b) 3
   c) 4 d) 5

7) According to MOT, the shape and size of a molecular orbital depends upon _____.
   a) Shape and size of the combining atomic orbitals
   b) Numbers of the combining atomic
   c) Orientation of the combining atomic orbitals
   d) All of these

8) How many number of unpaired electrons present in $[Fe(CN)_6]^{3-}$ complex as per CFT approach?
   a) 1 b) 0
   c) 2 d) 3

9) Mention the compound used for the synthesis of Ziegler Natta catalyst.
   a) $[RhI_2(CO_2)]$ b) $HCO(CO)_4$
   c) $[RhCl(PPh_3)_3]$ d) $HRh(PPh_3)_3$

10) What is the measurable property of material in Differential Thermal analysis as a temperature or time?
   a) Change in volume b) Difference in temperature
   c) Change in mass d) Change in time

11) Basic source of magnetism _____.
   a) Charged particles alone
   b) Movement of charged particles
   c) Magnetic dipoles
   d) Magnetic domains

12) Common example for ferri-magnetic materials is _____.
   a) Salts of s-block elements b) Rare earth elements
   c) Transition metals d) Ferrites

13) The magnetic materials follow which law?
   a) Faraday's law b) Curie Weiss law
   c) Lenz law d) Ampere law

14) Which calibrant is used in DTA?
   a) Glass beads b) Silicon carbide
   c) Alumina d) All of these

Q.2 A) Answer the following questions. (Any Four) **08**
1) What is mean by ternary complexes?
2) Which catalysts are used for Monsanto acetic acid process?
3) What are the factors affecting DTA curve?
4) What is Weak field ligand?
5) What do you mean by diamagnetic substance?

B) Write Notes. (Any Two) **06**
1) Olefin hydrogenation
2) Diamagnetic correction
3) Factors affecting Crystal Field Stabilization Energy

Q.3 A) Answer the following questions. (Any Two) **08**
1) Explain the Wackers process.
2) Discuss the origin of paramgnetism.
3) Explain the factors affecting TGA curve.

B) Answer the following questions. (Any One) **06**
1) Distinguish between paramgnetism, Diamagnetism and Ferromagnetism.
2) Explain the catalytic cycle of Monsanto acetic acid process.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Outline the decarboxylation reaction of β-keto acid.
2) Explain the structure of $[Ni(Cl)_4]^{2-}$ on the basis of VBT.
3) Give the advantages of TGA and DTA.

B) Answer the following questions. (Any One) **04**
1) Draw MO energy level diagram for octahedral structure involving sigma bonding.
2) Explain in brief stability of ternary complexes.

Q.5 Answer the following questions. (Any Two) **14**

a) What is John Teller effect? Discuses its influence on octahedral complexes.

b) Explain the electronic spectra of Co^{2+} ion in aqueous solution.

c) Explain the decomposition mechanism of $CuSO_4.5H_2O$ TGA Curve involved it.

SLR-JF-148

Seat No.	

Set P

M.Sc. (Semester - III) (CBCS) Examination Oct/Nov-2019
Inorganic Chemistry
NUCLEAR CHEMISTRY

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Draw neat labeled diagram and give equations wherever necessary.
3) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) The measure of the probability of reaction numbers is known as _____.
   a) reaction rate b) reaction cross section
   c) nuclear reaction d) Threshold energy

2) _____ is not used as a moderator.
   a) Heavy water b) Water
   c) Graphite d) Boron

3) The reactor performs the following functions as that of _____ in a steam power point.
   a) Furnace b) Turbine
   c) Electric generator d) Boiler

4) _____ fuel occurred naturally.
   a) U^{235} b) Pu^{239}
   c) Pu^{241} d) U^{233}

5) In gas cooled reactors ____ moderator is used.
   a) Light water b) heavy water
   c) Graphite d) Beryllium

6) Mass absorption coefficient unit is _____.
   a) N/m^2 b) cm^2 /g
   c) N/m d) Joule m^2

7) The stopping power is the rate of energy loss per unit length of matter is referred as _____.
   a) LET b) EC
   c) EZ d) IE

8) Q-value for the reaction $^{11}B(d, p)^{12}B$ 1.36 then threshold energy is _____.
   a) 1.343 MeV b) 2.272 MeV
   c) 0.568 MeV d) 1.192 MeV

9) _____ model corresponds to the magic numbers.
   a) Spin-orbit coupling b) Collective model
   c) liquid drop model d) Fermi gas model

10) The unit of Quadrapole moment of nucleus is _____.
   a) m^2 b) m^3
   c) cm^3 d) N/m^2

11) The reaction ^{9}Be (p, n)^{9}B have threshold energy 2.059Mev, then its threshold energy is _____.
   a) 1.35 MeV b) -1.86 MeV
   c) -1.02 MeV d) -1.22 MeV

12) Nuclear reactions induced by X-rays or √-photons of high energy are referred as _____reactions.
   a) Randiative b) Photonuclear
   c) Evaporation d) Spallation

13) The unit of reaction cross-section is _____.
   a) Barn b) cm^3
   c) N/m d) Joule m^2

14) When a nucleus on high excitation splits into a light & a heavy fragment having same N/Z ratio, the process is called as _____.
   a) Fragmentation b) spallation
   c) Fusion d) thermonuclear reaction

Q.2 A) Answer any four of the following questions. **08**
1) What is threshold energy of nuclear reaction?
2) What is critical mass?
3) What is elastic scattering?
4) What is the reproduction factor K for nuclear reactors?
5) What is radiolysis? List the products of radiolysis of water.

B) Write Notes. (Any Two) **06**
1) Binding energy
2) Direct nuclear reactions
3) Research reactor

Q.3 A) Answer any two of the following questions. **08**
1) Explain nuclear fission cross section and fission threshold energy.
2) Discuss the construction and working of graphite moderated liquid sodium cooled reactor.
3) Explain in brief passage of neutrons through matter.

B) Answer any one of the following questions. **06**
1) What are special nuclear reactions? Give Bohr's hypothesis of compound.
2) Discuss the prospects of the thermonuclear reactors as sources of energy.

Q.4 A) Answer any two of the following questions. **10**
1) Discuss the N/P ratio and nuclear stability.
2) Explain in brief enriched uranium reactors.
3) Explain in brief units for measuring radiation absorption.

B) Answer any one of the following questions. **04**
1) Explain the nuclear stability with respect to binding energy.
2) Discuss the photonuclear reactions.

Q.5 Answer any two of the following questions. **14**
1) Explain heavy water manufacture in India.
2) What are magic and semi magic numbers? Give experimental evidence in support of magic numbers.
3) Discuss the formation of compound nucleus and compound nucleus theory in explaining the nuclear reaction mechanism.

SLR-JF-149

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Inorganic Chemistry
INSTRUMENTAL TECHNIQUES

Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) All questions carry equal marks.
4) Draw neat and labeled diagram and give equations wherever necessary.
5) Use of logarithmic table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Debye Scherrer's equation in X-ray diffraction is used to determine _____of the powder.
   a) particle size b) particle volume
   c) isomers d) particle density

2) Mössbauer spectroscopy is due to the absorption of _____radiations.
   a) beta ray b) gamma ray
   c) x-ray d) cosmic

3) _____ is based on the measurement of mechanical properties of materials as a function of temperature.
   a) TGA b) DTA
   c) DSC d) TMA

4) In ESR, for two equivalent protons, the number of lines are _____.
   a) 2n b) 2nl
   c) 2nl+1 d) $2n^2$

5) When high velocity electrons bombard on metal target, _____ are generated.
   a) gamma rays b) X-rays
   c) beta rays d) cathode rays

6) Isomer shift in Mössbauer spectroscopy is also known as _____.
   a) environment shift b) chemical shift
   c) nuclear shift d) volume shift

7) Generally the inert atmosphere involved in thermogravimetry is _____.
   a) pure nitrogen gas b) pure oxygen gas
   c) air d) compressed air

8) A Klystron in ESR generates _____radiations.
   a) radiowaves b) IR
   c) microwave d) X-ray

9) Neutron diffraction is also called _____ scattering of neutron.
   a) inelastic b) isostatic
   c) static d) elastic

10) The process of recoilless emission and _____ in nuclear resonance fluorescence is called Mössbauer effect.
a) sorption b) absorption
c) adsorption d) ejection

11) The technique in which the sample weight is recorded as a function of _____at constant temperature is called isothermal /static thermogravimetry.
a) area b) volume
c) time d) concentration

12) In NQR, 'η' is a measure of _____.
a) symmetry of EFG b) couplings
c) spins d) Nonsymmetry ol EFG

13) X-rays have larger wavelengths than _____.
a) Beta rays b) Gamma rays
c) Visible light d) Microwaves

14) In Mössbauer spectrometer, _____and absorber both have atoms of same element.
a) source b) signal generator
c) analyser d) amplifier

Q.2 A) Answer the following questions. (Any Four) **08**

1) How will you differ exactly the X-ray diffraction from neutron diffraction?
2) Give any two essential characteristics which a nuclide have for exhibiting Mössbauer effect?
3) What are the peaks obtained in DTA curve? Give their significance.
4) What is mean by $q_{xx} = q_{yy} = q_{zz}$ in NQR?
5) How will you differs Electron Spin Resonance from Nuclear Magnetic Resonance spectroscopy?

B) Write Notes on. (Any Two) **06**

1) Applications of neutron diffraction
2) Factors responsible for multiple lines in NQR spectrum
3) Applications of TMA

Q.3 A) Answer the following questions. (Any Two) **08**

1) Explain the thermogram of mixture of $MgC_2O_4 \cdot 2H_2O$ and MgO.
2) X-rays of wavelength 1.392Å are reflected from the face of NaCl crystal. The first order reflection is observed at an angle of $14^{\circ}17'$. Calculate the lattice spacing.
3) Explain the use of Mössbauer spectroscopy in the investigation of tin compounds.

B) Answer the following questions. (Any One) **06**

1) Discuss the isomer shift in Mössbauer spectra with examples.
2) Predict the ESR spectrum of $\cdot NH_2$ radical and explain the behavior.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Enumerate NQR frequencies for nucleus with $I = {}^{3}/_{2}$ in an axially symmetric $EFG\ (\eta = 0)$.
2) Explain only theory of neutron diffraction.
3) What is DTA? Explain the factors affecting DTA with suitable examples.

B) Answer the following questions. (Any One) **04**

1) The compound $K_4[Fe(CN)_6] \cdot 3H_2O$ gives single line Mössbauer spectrum with no quadrupole splitting, Explain.
2) Calculate the magnetic field at which the resonance occurs if the 'g' value of benzene radical anion is 2.0025 and the ESR spectrometer is operating at 9302MHz.

Q.5 Answer the following questions. (Any Two) **14**

a) Discuss the theory and applications of X-ray diffraction technique.
b) Explain the instrumentation and applications of differential scanning calorimetry (DSC).
c) Explain the quadrupole splitting and hyperfine interaction in Mössbauer spectroscopy with suitable example.

SLR-JF-150

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Inorganic Chemistry
CO-ORDINATION CHEMISTRY - II

Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Unimolecular nucleophilic substitution follows _____.
   a) dissociative mechanism b) associative mechanism
   c) solvation mechanism d) SN^1(CB) mechanism

2) Associative mechanism is also known as _____.
   a) SN^1(CB) mechanism b) SN^2(CB) mechanism
   c) SN^2 mechanism d) SN^1 mechanism

3) SN^1(CB) mechanism was proposed by _____.
   a) Garrik b) Werner
   c) Aston d) Anderson

4) The reactions in aqueous medium in which OH^- ion replaces the co-ordinate ligand from the complex species is known as _____.
   a) acid hydrolysis b) base hydrolysis
   c) aquation reaction d) salvation

5) Which stable intermediate is formed during SN^2 Substitution?
   a) square pyramidal b) tetrahedral
   c) trigonal d) octahedral wedge

6) According to VBT the complexes with ____ configuration are labile for SN^1 reactions.
   a) ns np^3 nd^2 b) $(n-1)d^2$ ns np^3
   c) ns np^2 nd^2 d) $(n-1)d^2$ ns np^2

7) Optical isomerism is shown by _____.
   a) $[Ni(CO)_4]$ b) $[Ni(CN)_4]^{2-}$
   c) $[Pt(NH_3)_4]^{2+}$ d) $[Co(en)_3]^{3+}$

8) Which stable intermediate is formed during SN^1 Substitution?
   a) square pyramidal b) tetrahedral
   c) trigonal d) octahedral wedge

9) According to CFT which of the following metal configuration is labile if reaction follows SN^1 mechanism.
   a) d^1 weak field b) d^3 weak field
   c) d^8 weak field d) d^4 strong field

10) What is the order of SN^2 substitution reaction?
   a) 1 b) 0
   c) 2 d) 3

11) Which of the following acts as π-acid ligand?
   a) F^- b) O^{2-}
   c) CO d) NH_3

12) The optically active molecule must have _____.
   a) centre of symmetry b) plane of symmetry
   c) an improper axis d) none of these

13) The rate of change of specific rotation with wavelength is known as _____.
   a) ORD b) CD
   c) Cotton effect d) Faraday effect

14) The symmetric molecule contains _____.
   a) proper axis of rotation b) an improper axis of rotation
   c) Plane of symmetry d) axis of symmetry

Q.2 A) Answer the following question.(any four) **08**

1) What is quantum yield?
2) What is first law of photochemistry?
3) Why electron transfer from $[Fe(CN)_6]^{4-}$ to $[Fe(CN)_6]^{3-}$ is very rapid?
4) Which factors favor the outer sphere mechanism?
5) What is cis effect?

B) Write Notes on. (any two) **06**

1) Two electron transfer reactions
2) Kinetics of SN^1 substitution reaction
3) Lability & inertness of metal complexes.

Q.3 A) Answer the following question.(any two) **08**

1) How are the cis & trans $[Pt(NH_3)(NO_2)Cl_2]^-$ synthesized from $[PtCl_4]^-$
2) Explain briefly CD curves with suitable examples.
3) Give a brief account of octane rule & cotton effect.

B) Answer the following question. (any one) **06**

1) Discuss the photochemical reactions of Fe (III) octahedral complexes.
2) Discuss the characteristics & mechanism of inner sphere electron transfer reactions.

Q.4 A) Answer the following question. (any two) **10**

1) What are the applications of ORD & CD spectroscopy?
2) Discuss the stereochemistry of the intermediates formed during the base hydrolysis of ammine complexes of Co (III) complexes.
3) Discuss the electronically excited states of transition metals.

B) Answer the following question. (any one) **04**

1) Explain in brief base hydrolysis with suitable example.
2) Explain the trans effect with the help of polarization theory & pi bonding theory.

Q.5 Answer the following question. (any two) **14**

a) What are optically active molecules? And discuss the conditions for a compound to behave as an optical compound.
b) Discuss the photo substitution reactions of octahedral Cr (III) complexes.
c) What is mean by labile & inert complexes? Explain it on the basis of crystal field theory.

SLR-JF-151

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Inorganic Chemistry
CHEMISTRY OF INORGANIC MATERIALS

Day & Date: Friday, 08-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagrams and give equations wherever necessary.
4) Use of log tables and calculators is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) Following is not the 2-dimensional imperfection.
   a) Twin boundary b) Dislocation
   c) Surface d) Grain boundary

2) Theoretical strength is about _____ times to average real strength of a material.
   a) 1 b) 10
   c) 100 d) None of these

3) Stacking fault energies are in the range of _____.
   a) 0.01-0.1J/m^2 b) 0.01-0.1 J/cm^2
   c) 0.1-10J/m^2 d) None of these

4) Average frequency of atomic vibrations in a solid (in Hz) _____.
   a) 10^{-12} b) 10^{-13}
   c) 10^{12} d) 10^{13}

5) A solid having irregular shape is called _____ solid.
   a) amorphous b) crystalline
   c) anisotropic d) isomorphous

6) _____ solids are also called giant solids or network solids.
   a) Covalent b) Molecular
   c) Ionic d) Metallic

7) Schottky defect is noticed in _____.
   a) NaCl b) KCl
   c) CsCl d) All of these

8) Crystals can be classified into _____ basic crystal units.
   a) 3 b) 7
   c) 14 d) 4

9) Band theory of metals is based on _____.
   a) Valance bond theory b) Molecular orbital theory
   c) Crystal field theory d) Ligand field theory

10) Due to Frenkel defect, the density of ionic solids _____.
   a) increases b) decreases
   c) does not change d) changes

11) The electrical conductivity of a nanotube is _____ times that of copper.
   a) 10 b) 100
   c) 1000 d) 1/100

12) The size of a quantum dot is _____ nm.
a) 5 b) 10
c) 50 d) 100

13) _____ is synthesized and explained nanotubes first time.
a) Sumio Tijima b) Richard Smalley
c) Eric Drexler d) Richard Feynman

14) The network of _____ glasses can be classified based on the oxygen to phosphorous (atomic) ratio in the glass compositions.
a) Phosphate b) Silicate
c) Boron d) Cobalt

Q.2 A) Answer the following questions. (Any Four) **08**
1) Write broadly classification of magnetic materials.
2) What is the basic component of glass?
3) Write the two methods used for preparation of solid state materials.
4) What are normal, inverse and random spinels?
5) What are different types of defect?

B) Write notes. (Any Two) **06**
1) Applications of Nanomaterials
2) Point defects
3) Ferromagnetism

Q.3 A) Answer the following questions. (Any Two) **08**
1) Discuss the type I & II superconductors.
2) Explain the mechanism of conduction in super ionic conductors.
3) Explain sol-gel method for preparation of inorganic materials.

B) Answer the following questions. (Any One) **06**
1) Discuss in brief challenges and opportunities scope of nanotechnology.
2) Discuss any one method of manufacturing of nanomaterials .

Q.4 A) Answer the following questions. (Any Two) **10**
1) Discuss super exchange interaction in magnetic materials.
2) Discuss the applications of magnetic materials.
3) Explain the formation of spin glasses.

B) Answer the following questions. (Any One) **04**
1) Explain in brief Co-precipitation technique.
2) Discuss the Nonstoichiometric defect.

Q.5 Answer the following questions. (Any Two) **14**
a) Discuss the BSC theory of superconductors.
b) Explain Langevin's theory of paramagnetism.
c) Discuss the sol gel techniques of making inorganic materials.

SLR-JF-152

Seat No.	

Set P

M.Sc. (Semester - IV) (CBCS) Examination Oct/Nov-2019
Inorganic Chemistry
APPLIED INORGANIC CHEMISTRY

Day & Date: Monday, 11-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagram and give equations wherever necessary.
4) Use of log tables and calculators is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. 14

1) What is the coordination of Si in zeolites?
   a) tetrahedral b) octahedral
   c) hexagonal d) none of these

2) Which one of the following complex obeys 18 electron rule?
   a) $V(CO)_6$ b) $Fe(CO)_4$
   c) $Mn(CO)_3$ d) $Cr(CO)_6$

3) Elements which are good catalysts and have ability to change their oxidation number are?
   a) transition metals b) alkalis
   c) noble gases d) all of them

4) Process in which catalyst has a different phase to a reaction mixture, this process is known as _____.
   a) homogeneous catalysis b) heterogeneous catalysis
   c) hypergeneous catalysis d) hypogeneous catalysis

5) Which one of the following is microporous material _____.
   a) zeolite b) Ferrite
   c) perovskite d) pyrochlore

6) Silicones are called inorganic polymers due to absence of _____ atom in the main backbone chain.
   a) Nitrogen b) oxygen
   c) carbond d) hydrogen

7) Which of the following gives linear chain silicones on polymerisation by controlled hydrolysis?
   a) $(CH_3)_2SiCl_2$ b) $(CH_3)_3SiCl$
   c) $(CH_3)_4Si$ d) $(CH_3)SiCl_3$

8) Phosphazene can be synthesized by reacting PCl5 with another compound in a chlorohydrocarbon solvent under mild conditions. The other compound is _____.
   a) NH_4OH b) NH_4NH_2
   c) NH_4Cl d) $PhNH_2$

9) Which among the following is not a renewable source of energy?
   a) solar energy b) geothermal
   c) hydro-power d) biomass

10) The power from the sun intercepted by the earth is approximately _____.
   a) $1.8x10^{8}$ MW b) $1.8x10^{11}$ MW
   c) $1.8x10^{14}$ MW d) $1.8x10^{17}$ MW

11) The process of producing energy by utilizing the heat trapped inside the surface is called _____ energy.
   a) hydrothermal b) Geo-thermal
   c) Solar d) wave

12) "There is a plenty of room at bottom." This was stated by _____.
   a) Eric Drexler b) Richard Feynmannc
   c) Tijima d) R. Smalley

13) Fullerene or Bucky ball is made up of _____ carbon atoms.
   a) 100 b) 20
   c) 75 d) 60

14) 10 nm = _____ m.
   a) 10^{-8} b) 10^{-7}
   c) 10^{-9} d) 10^{-10}

Q.2 A) Attempt any four of the following questions. **08**

1) Why zeolites are called as solid acids?
2) Write the reaction for the synthesis of chain phosphazenes.
3) What do you mean by fission reaction? Which element is generally used for the fission?
4) Give at least two names of the 2D nanomaterials.
5) List the analytical techniques used for characterization of nanomaterials.

B) Write Notes. (Any Two) **06**

1) Wind energy
2) Boron based polymers
3) Bonding in π-metal complxes

Q.3 A) Attempt any two of the following questions. **08**

1) In what way organometallic compounds are classified based on type of M-C bond?
2) What is the difference between homogenous and heterogeneous catalysis?
3) What do you mean by geothermal energy? How geothermal energy is produced?

B) Attempt any one of the following questions. **06**

1) What are the general properties of inorganic polymers?
2) What are the different reactions shown by ferrocene?

Q.4 A) Attempt any two of the following questions. **10**

1) What are the applications of zeolites?
2) Explain with suitable example how the surface area of nanoparticle is a size dependent property.
3) What do you mean by photovoltaic cell? Explain its working.

B) Attempt any one of the following questions. **04**

1) Write a short note on chain coordination polymers.
2) What are the applications of nonmaterial's?

Q.5 Attempt any two of the following questions. **14**

a) Explain the shape selectivity using zeolites with suitable examples.

b) Outline the role of transition metal complexes in solar energy production.

c) Describe the methods for preparation of silicones and explain how polymers with any specified properties can be prepared.

SLR-JF-154

Seat No.	

Set P

M.Sc. (Semester – III) (New) (CBCS) Examination Oct/Nov-2019
Pharmaceutical Chemistry
BASICS IN PHARMACEUTICAL CHEMISTRY

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) _____ immunity is a first line of defence against microbes.
   a) Adaptive b) Innate
   c) Uninnate d) Unadaptive

2) Icosomes are involved in _____.
   a) Signal transduction b) Apoptosis
   c) Affinity maturation d) Development of b cells

3) Which of the following is not a physic-chemical parameter of drug design?
   a) log P b) Pka
   c) Es d) Ps

4) _____ is an non-organ specific (systemic) autoimmune disease.
   a) Pernicious anemia b) Diabetes mellitus
   c) Myasthenia gravis d) Thyroditis

5) The process in which all living cells, spores and viruses are completely destroyed from object is called _____.
   a) Disinfection b) Pasteurisation
   c) Sterilization d) Antiseptic

6) The type of bond involved in interaction between lipophilic drugs and biological membrane lipid is _____.
   a) Covalent b) Electrostatic
   c) Hydrophobic d) Hydrophilic

7) Compound that after administration, is metabolized into a pharmacologically active drug is termed as _____.
   a) Drug b) Prodrug
   c) Metabolite d) Xenobiotic

8) Which of the following assay is the most accurate method for microbial assay of antibiotics?
   a) Physical b) Chemical
   c) Biological d) Chemical & Biological

9) Which of the following are the QSAR methods used in drug design?
   a) Molecular modeling b) Quantam mechanics
   c) Statistical methods d) All of these

10) Therapeutic index is calculated as _____.
   a) LD50 / ED50 b) ED50 / LD50
   c) MIC / MEC d) MEC / MIC

11) Hammett constant is related to _____.
a) Electronic b) Steric
c) Biological d) None of these

12) Which of the following is the most abundant immunoglobulin (Ig)?
a) IgM b) IgG
c) IgA d) IgE

13) An agent which activates a receptor to produce submaximal effect but antagonizes the action of full agonist?
a) Inverse agonist b) Partial agonist
c) Antagonist d) Physiological antagonist

14) The rate and extent of drug absorption is called as _____.
a) Bioavailability b) Biotransformation
c) Biotechnology d) Biodistribution

Q.2 A) Attempt any four of the following question. **08**
1) Define drug design. Enlist its applications.
2) Define the terms absorption, distribution , metabolism and excretion.
3) Classify microorganisms.
4) Define Immunomodulator.
5) What are immunosuppressive drugs?

B) Write Notes on. (Any Two) **06**
1) Define pharmacokinetic and describe its role in drug development process.
2) Discuss free Wilson model.
3) Differentiate between adaptive & innate immunity.

Q.3 A) Attempt any two of the following question. **08**
1) Describe quantal and graded drug dose response relationship.
2) Discuss on Hansch Model.
3) Write on roles of immunomodulators.

B) Attempt any one of the following question. **06**
1) Discuss on hypersensitivity & autoimmunity.
2) Explain immunological techniques.

Q.4 A) Attempt any two of the following question. **10**
1) Describe various phases involved in drug development.
2) Write on Bacterial growth curve.
3) Write on autoimmune disorders.

B) Attempt any one of the following question. **04**
1) Describe different types of ligand-receptor interactions.
2) Explain the role of bio-isosterism in drug design.

Q.5 Attempt any two of the following question. **14**
1) Explain various physico-chemical parameters used in QSAR.
2) Write on different microbial media. Describe microbial assay by cup & plate method.
3) Define hypersensitivity. Elaborate on the types of hypersensitivity.

SLR-JF-155

Seat No.	

Set P

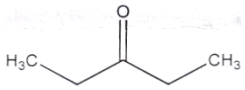
M.Sc. (Semester – III) (New) (CBCS) Examination Oct/Nov-2019
Pharmaceutical Chemistry
ORGANIC SPECTROSCOPY

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) How many signals would you expect for following compound in ^{1}H NMR spectrum?

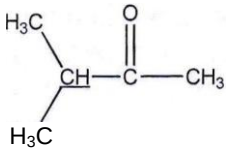


a) 4 b) 3
c) 2 d) 1

2) ^{12}C, ^{13}C and ^{16}O have nuclear spin equal to _____ respectively.
a) 0, ½ , 1 b) 0, 1, 0
c) 0, ½ , 0 d) 1, 0, ½

3) 2D experiments are Correlation that provides information about nuclei which interact through some mechanism like _____.
a) J-coupling b) through space
c) both a and b d) None of these

4) The underline proton in the following compound shows a signal in ^{1}H NMR as _____.

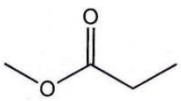


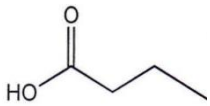
a) triplet b) quartet
c) pentet d) septet

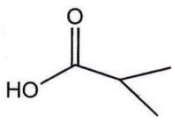
5) In DEPT-45, _____.
a) Carbon bearing at least one proton shows a positive signal
b) Quaternary carbon shows a positive signal
c) Both a) and b)
d) None of these

6) In proton coupled ^{13}C NMR spectra shows signals as _____.
a) $-CH_3$ shows quartet and $-CH_2$ gives triplet
b) Quaternary carbon does not shows any signal
c) All carbon shows singlet
d) All of these

7) Which of the following compound shows McLafferty rearrangement?

a) 

b) 

c) 

d) All of these

8) In the mass spectrum of Br_2, how many peaks will the parent ion contain?
a) 4 b) 3
c) 2 d) 1

9) Karplus equation is for coupling constant of _____.
a) geminalprotons b) long range coupling
c) vicinal protons d) all of these

10) Highest intensity peak in mass spectra is called _____.
a) molecular ion peak b) base peak
c) fragment ion peak d) metastable ion peak

11) What is the ratio of M to M+1 in the mass spectrum of butane?
a) 100 :1.1 b) 100 :4.4
c) 1 :1 d) 3 :1

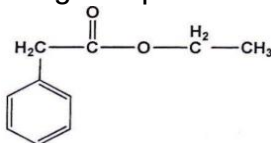
12) At what m/e value would the ion $C_2H_3O^+$ appear in the mass spectrum?
a) 43 b) 54
c) 60 d) 72

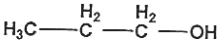
13) COSY spectra is used to detect coupling interaction between _____.
a) ^{13}C-^{1}H b) ^{13}C-^{19}F
c) ^{1}H-^{1}H d) None of the above

14) The NMR signal of a compound is found to be 240 Hz downfield from TMS peak using spectrometer operating at 60 MHz. The chemical shift δ in ppm relative to TMS is _____.
a) 1 ppm b) 2 ppm
c) 3 ppm d) 4 ppm

Q.2 A) Answer the following questions. (Any Four) **08**

1) Define base peak with suitable example.
2) Why TMS is used as reference standard in NMR?
3) Write a short note on proton coupled ^{13}C NMR spectra.
4) How you would use the proton NMR spectra to distinguish between 1-bromopropane and 2-bromopropane?
5) How many numbers of signals would be expected in ^{13}C NMR spectra of following compounds?

i) 

ii) 

B) Write notes. (Any Two) **06**

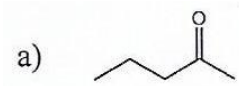
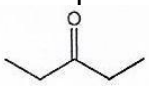
1) Spin-Spin splitting
2) HETCOR Spectra
3) Nitrogen rule

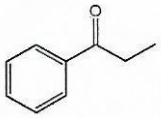
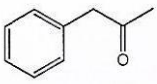
Q.3 A) Answer the following questions. (Any Two) **08**

1) A compound of M.F. $C_8H_{10}O_2$ gave the following signal in its ^{13}C NMR spectra: 55(q), 64(t), 114(d, strong), 129(d, strong), 133.5(s, weak), 159(s, weak) ppm. Deduce the structure.
2) A compound of M .F. $C_{10}H_{14}O$ gave the following signal in its ^{1}H NMR spectra:
   δ 1.25 ppm (s, 9H)
   δ 5.20 ppm (bs, exchange with D_2O, 1H)
   δ 6.82 ppm (d, J= 8Hz, 2H)
   δ 7.25 ppm (d, J= 8Hz, 2H)
   Deduce the structure.
3) Deduce the structure of organic compound using given spectral data:
   Molecular Formula: $C_9H_{12}O$
   UV: 241nm; IR ($\bar{\nu}$ in cm^{-1}): 600-700, 1200, 1680, 2900.
   ^{1}H NMR (200 MHz; $CDCl_3$, δ in ppm): 1.0 (t, 9 mm), 1.7 (sextet, 6mm), 3.0 (t, 6mm), 7.5 (m, 9mm), 8.0(m, 6mm); MASS: m/z = 77, 105 (base peak, 100%), 120, 136.

B) Answer the following questions. (Any One) **06**

1) Differentiate following pair compounds:

a)  and  (by ^{13}C NMR)

b)  and  (by Mass spectrometry)

2) What is metastable ion peak? For m/e values for parent ion (m_1) and daughter ion (m_2) are 150 and 122, calculate the m/e value of metastable ion (m*)?

Q.4 A) Answer the following questions. (Any Two) **10**

1) A formula $C_5H_{12}O_2$.
   ^{1}H NMR data: δ 1.2 ppm, t, 12mm; δ 3.6 ppm, q, 8mm;δ 4.8 ppm, s, 4mm.
   The normal carbon-13 NMR spectrum has three peaks. The DEPT-135 and DEPT-90.
   spectral results are tabulated:

Normal Carbon	DEPT-135	DEPT-90
15 ppm	Positive	No peak
63 ppm	Negative	No peak
95 ppm	Negative	No peak

   Deduce the structure of this compound.
2) Discuss the solvent used in NMR spectroscopy in detail.
3) Discuss the fragmentations in:
   i) straight chain hydrocarbon.
   ii) alkyl aryl hydrocarbon.

B) Answer the following questions. (Any One) **04**

1) Discuss the HETCOR spectra of n-butanoic acid.
2) Discuss magnetic anisotropic effect in ^{1}H NMR.

Q.5 Answer the following questions. (Any Two) **14**

a) Discuss the lanthanide shift reagents with suitable example.

b) Write a note on retro-Diels-Alder fragmentation.

c) Discuss the chemical shift values in ppm of ^{13}C NMR for different types of compounds and factor affecting it.

SLR-JF-156

Seat No.	

Set P

M.Sc. (Semester - III) (New) (CBCS) Examination Oct/Nov-2019
Pharmaceutical Chemistry
BIOACTIVE HETEROCYCLES AND NATURAL PRODUCTS

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Opium is a plant belonging to family _____.
   a) Apocyanaceae b) Euphorbiaceae
   c) Papaveraceae d) None of the above

2) Which of the following is used to make pain relieving drug?
   a) Cinchona b) Digitalis
   c) Both a and b d) None of the above

3) Which of the following is more basic?
   a) Pyrrole b) Pyridine
   c) Furan d) Thiophene

4) The Zeisel method is used to detect _____ functional group.
   a) Hydroxy group b) Primary amine
   c) Methoxygroup d) Tertiary amine

5) Systematic name of Indole is _____.
   a) Benzo [b] pyrrole b) Benzo [d] pyrrole
   c) Benzo [c] furan d) None of the above

6) Generally the receptors for steroid hormones reside at _____.
   a) Nucleoplasm b) Nuclear membrane
   c) Cytoplasm d) Plasma membrane

7) Steroids have _____.
   a) Sterol nucleus with two alkyl chain attached to the ring D of cholesterol
   b) Sterol nucleus with two CH_3 between C and D ring and A and B ring of cholesterol
   c) Sterol nucleus without CH_3 between C ring and D ring of cholesterol
   d) Sterol nucleus but lack the alkyl chain attached to the ring D of cholesterol

8) The essential intermediates in the pathway from acetate to cholesterol are _____.
   a) Acetic acid b) Ethylene
   c) Isoprene units d) Methane

9) Which of the following is NOT the class of secondary metabolite?
   a) Amino acids b) Terpenes
   c) Phenolics d) Alkaloids

10) How many isoprene units, are there in sesquiterpenes?
   a) 1 b) 2
   c) 3 d) 8

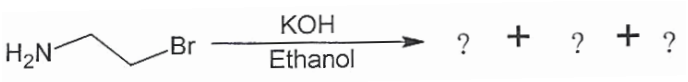
11) Which of the following does NOT take part in the biosynthesis of terpenes?
a) Mevalonic acid b) Methylerythritol phosphate
c) Acetyl-COA d) Phenol

12) Which of this statement is INCORRECT regarding the function of hormones?
a) Reproduction and sexual differentiation
b) Maintenance of internal environment
c) Maintain body temperature
d) Development and growth

13) Mark the one, which is NOT the precursor of the hormone?
a) Amino acids b) Cholesterol
c) Phospholipids d) Proteins

14) What is the precursor of steroid hormone?
a) Protein b) Cholesterol
c) Carbohydrate d) Lipid

Q.2 A) Answer the following questions. (Any Four) **08**

1) What is zerewitinoff's determination?
2) Explain briefly the electrophilic substitution reactions of pyrimidines.
3) Enumerate the medicinal properties of benzofuran derivatives.
4) Give the biological importance of hexosterol.
5) 

B) Write Notes. (Any Two) **06**

1) ACTH
2) Purines
3) Methods of lsolation of Alkaloidds

Q.3 A) Answer the following questions. (Any Two) **08**

1) Outline the synthesis of Oxirane.
2) Discuss the electrophilic substitution reactions of pyrazole.
3) Give the synthesis of Morphine.

B) Answer the following questions. (Any One) **06**

1) Explain the general methods of structure elucidation of alakaloids.
2) Give an account of constitution of cholesterol.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Explain any two synthetic methods of Azetidine.
2) Discuss the reactivity of Pyrazine.
3) Describe the biological importance of Santonine and give its synthesis.

B) Answer the following questions. (Any One) **04**

1) Write a note on PGE.
2) Give the synthesis of progesterone.

Q.5 Answer the following questions. (Any Two) **14**

a) Explain the following methods of Indole synthesis.
i) Fischer indole synthesis
ii) The Bischler synthesis
b) Establish the structure of Morphine.
c) Explain the biological importance of Stilbosterol and give its synthesis.

SLR-JF-93

Seat No.	

Set P

M.Sc. (Semester - I) (CBCS) Examination Oct/Nov-2019
Chemistry
INORGANIC CHEMISTRY - I

Day & Date: Monday, 18-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) All questions carry equal marks.
3) Neat and labeled diagrams should be drawn wherever necessary.
4) Use of log table and calculators in allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) In the nuclear equation $^{64}Cu_{29} \rightarrow ?\ ^{64}Ni_{28}$ missing term is _____.
   a) An electron b) a positron
   c) a neutron d) a proton

2) What is the band gap of germanium?
   a) 106 kJ/mole b) 68 kJ/mole
   c) 149 kJ/mole d) 206 kJ/mole

3) What is the geometry of $N(CH_3)_3$ molecule?
   a) Trigonal pyramidal b) Pyramidal
   c) Tetrahedral d) Square planner

4) Which of the following have lowest Nephelauxetic ratio?
   a) $[RuCl_6]^{3-}$ b) $[Ru(Py)_4Cl_2]$
   c) $[Ru(NH_3)_6]^{2+}$ d) $[Ru(bipy)_3]^{2+}$

5) What is the energy of electron in hydrogen atom in ground state?
   a) 13.3 eV b) 12.6 eV
   c) -12.6 eV d) -13.6 eV

6) The product obtained by successive emission of an α and β particle from $^{238}U_{92}$ is an isotope of _____.
   a) Radium b) Thorium
   c) Lead d) Protactinium

7) Which are the majority carriers in n-type semiconductors?
   a) Electrons b) Protons
   c) Neutrons d) Mesons

8) From the following _____ has square planner structure.
   a) $[BF_4]^-$ b) $[FeCl_4]^-$
   c) SF_4 d) XeF_4

9) The cation of dichlorobis (ethylenediamine) cobalt (III) belong to D_3 system is an example of _____.
   a) coordination isomerism b) optical isomerism
   c) linkage isomerism d) ionization isomerism

10) In photoelectric effect, electrons should be removed from the _____ of metals.
   a) inner shells b) surface
   c) from core d) nucleus

11) Nuclear reactions accompanied with emission of neutron(s) is _____.
   a) $^{27}Al_{13} + ^{4}He_{2} \rightarrow ^{30}P_{15}$ b) $^{12}C_{6} + ^{1}H_{1} \rightarrow ^{13}N_{7}$
   c) $^{30}P_{15} \rightarrow {}^{30}Si_{14}$ d) $^{238}U_{92} \rightarrow ^{239}U_{92}$

12) Metallocenes are the metal complexes of _____.
   a) halides b) aliphatic amines
   c) cyclopentadiene anion d) cyanide

13) Light interacts with matter as _____.
   a) wave b) particle
   c) rays d) wave as well as particle

14) What is the EAN of $Fe(CO)_5$?
   a) 36 b) 33
   c) 37 d) 40

Q.2 A) Answer the following questions. (Any Four) **08**
1) What is photoelectric effect?
2) In the crystal of $K_4[CuF_6]$, why all Cu-F bond distance are not equal?
3) Why the shape of SO_2 molecule is V-shaped?
4) What is transistor?
5) What is binding energy of nucleus?

B) Write Notes. (Any Two) **06**
1) Black body radiation
2) Metal clusters
3) Ionization counter

Q.3 A) Answer the following questions. (Any Two) **08**
1) How the three variables in the wave equation are separated?
2) With suitable example, explain the electronic absorption spectra of low spin complex.
3) Why nuclear fusion reactions are known as thermonuclear reactions?

B) Answer the following questions. (Any One) **06**
1) Explain in brief Walsh diagram of $p\pi - d\pi$ bonding.
2) What are the rectifiers? Explain its construction and working.

Q.4 A) Answer the following questions. (Any Two) **10**
1) Describe construction and working of photovoltaic cell.
2) Explain the terms ferromagnetism and antiferromagnetism.
3) Write a note on neutron activation analysis.

B) Answer the following questions. (Any One) **04**
1) Explain atomic inversion reaction and Berry pseudorotation reaction with suitable examples.
2) How will you distinguish the intrinsic and extrinsic semiconductors?

Q.5 Answer the following questions. (Any Two) **14**
a) Derive the Schrodinger time independent wave equation. What is the physical significance of Ψ?
b) State and explain Jahn-Teller theorem. Show schematically the splitting of d-orbitals in d^7 case for octahedral and tetrahedral system.
c) What is cross section? Give the relation between cross section and rate of reaction.

SLR-JF-94

Seat No.	

Set P

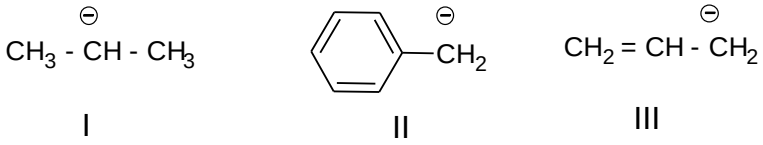
M.Sc. (Semester – I) (CBCS) Examination Oct/Nov-2019
Chemistry
ORGANIC CHEMISTRY - I

Day & Date: Tuesday, 05-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagram and give equations wherever necessary.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

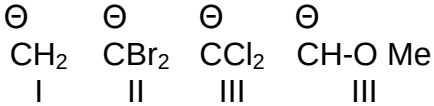
1) Rank the following carbanions in decreasing order of stability _____.



I II III

a) III > *I* > *II* b) III > *II* > *I*
c) I > *II* > *III* d) II > *III* > *I*

2) Which of the following carbenes are electrophilic in nature?

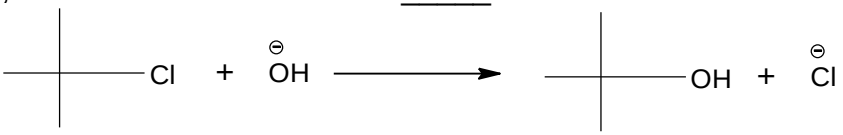


I II III III

a) only I b) I and II
c) I, II, III and IV d) I, II and III

3) In an SN^2 reaction, there is _____.
a) Partial racemisation b) Complete racemisation
c) Complete inversion d) Complete retension

4) In the following substitution reaction if the concentration of hydroxide ion is doubled, the rate of the reaction will _____.

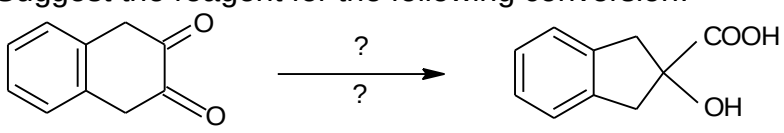


a) become double b) become one half
c) become four fold d) Remain unchanged

5) Which molecule amongst the following will not undergo Friedel-Craft Acetylation?
a) Nitrobenzene b) Chlorobenzene
c) Anisole d) Toluene

6) In electrophilic aromatic substitutions, among the substituents -Cl, $-CH_3$, $-NO_2$, $-COCH_3$ the groups that are meta directing are _____.
a) -Cl, $-CH_3$, and $-COCH_3$ b) $-NO_2$ and $-COCH_3$
c) -Cl and $-CH_3$ d) Only $-NO_2$

7) Suggest the reagent for the following conversion:



a) $NaOH / H^+$ b) H_2SO_4
c) $NaOH / Br_2$ d) Ph-COOOH

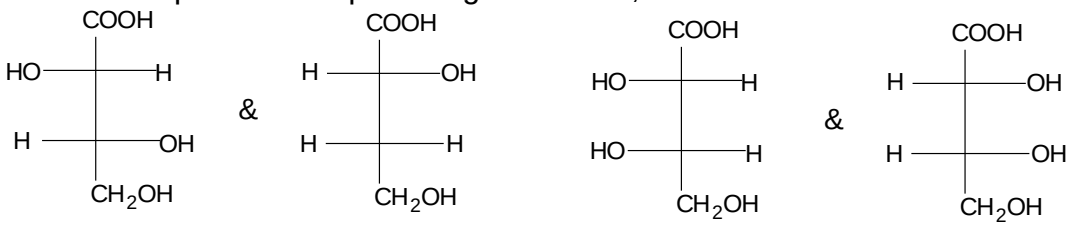
8) Which one of the following is correctly matched?
a) Saytzeff rule - least substituted alkene
b) Hofmann rule - most substituted alkene
c) E_2 reaction - stereospecific reaction
d) E1 reaction - one step reaction

9) Reaction intermediate of E1cb reaction is _____.
a) carbocation b) carbanion
c) carbene d) nitrene

10) Among the following, which statement is incorrect in case of Hofmann rearrangement?
a) It is intramolecular
b) It is intermolecular
c) Proceeds through retention of configuration
d) Product forming with one carbon atom less w.r.t reactant

11) In Schimidt rearrangement, _____ is used to react with carbonyl compounds to convert into acyl azide.
a) HN_3 b) NH_3
c) NH_2NH_2 d) NH_2OH

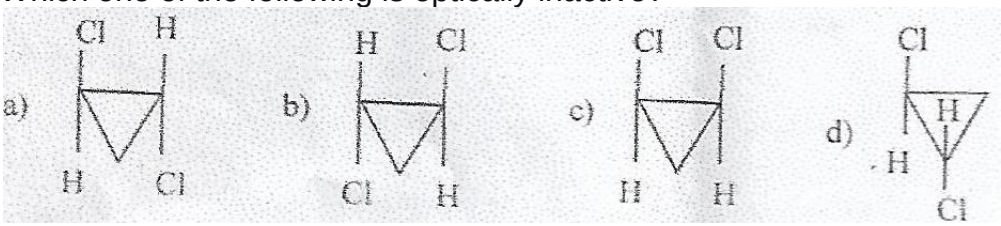
12) For the two pairs of compounds given below, choose the correct statement.



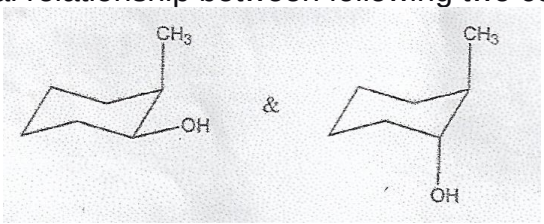
(i) (ii)

a) Pair (i) is enantiomeric while pair (ii) is diastereomeric
b) Pair (i) is diastereomeric while pair (ii) is enantiomeric
c) Both pairs are diastereomeric
d) Both pairs are enantiomeric

13) Which one of the following is optically inactive?



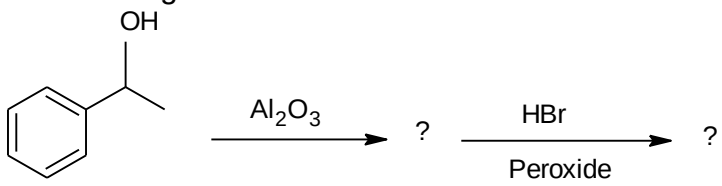
14) The stereochemical relationship between following two compounds are ____.



a) Structural isomers b) Cis-trans isomers
c) Conformational isomers d) R & S Isomers

Q.2 A) Answer the following questions. (Any Four) **08**

1) Define prochirality with suitable example.
2) Triphenylamine (Ph_3N) is not at all basic. Give reason.
3) Complete the following reaction:



4) Give the evidence in favour of the fact that the Hofmann rearrangement is intramolecular.
5) Define regioselectivity with suitable example.

B) Write Notes. (Any Two) **06**

1) Effect of a ring substituent on the acid strength of phenols.
2) Why aromatic amines are weaker than aliphatic amines?
3) Ipso attach

Q.3 A) Answer the following questions. (Any Two) **08**

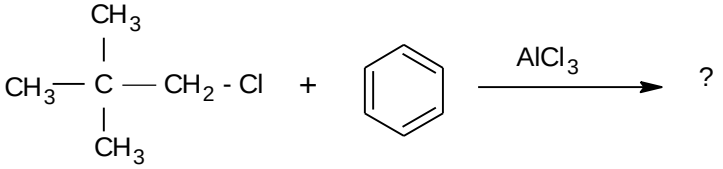
1) Explain stereospecific and stereoselective addition reaction with suitable example.
2) Write a note on element of symmetry.
3) Discuss the conformations of 1,2-dimethyl cyclohexane with stability.

B) Answer the following questions. (Any One) **06**

1) What is SN_1 reaction? Give an account of following factors affecting on reactivity of SN_1 reaction:
   i) Substrate
   ii) Solvent
   iii) Leaving group
   iv) Attacking nucleophile
2) What is resolution? Discuss their different methods with suitable examples.

Q.4 A) Answer the following questions. (Any Two) **10**

1) What are free radicals? Explain their structure, generation, stability and reactivity.
2) Predict the product(s) and outline the mechanism of following reactions.



3) Explain the addition of HBr to 2-methyl-but-1-ene under different conditions giving the mechanisms.

B) Answer the following questions. (Any One) **04**

1) Discuss E_i reaction with suitable example.
2) Halogens are ring deactivators but o, p-directors. Explain.

Q.5 Answer the following questions. (Any Two) **14**

a) What is Sharpless asymmetric epoxidation reaction? Explain their stereochemistry and applications.
b) Discuss Vilsmeier-Haack reaction. Give its mechanism and applications.
c) What is conformational isomerism? Discuss the stability of various conformers of 1, 3-dimethyl and 1, 4-dimethyl cyclohexane.

SLR-JF-95

Seat No.	

Set P

M.Sc. (Semester - I) (CBCS) Examination Oct/Nov-2019
Chemistry
PHYSICAL CHEMISTRY – I

Day & Date: Thursday, 07-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table and calculator is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) In an open system, for maximum work, the process must be entirely
   a) irreversible b) reversible
   c) adiabatic d) spontaneous

2) Which of the following is/are path independent function?
   a) E b) H
   c) G d) all of these

3) When a beam of light is passed through a colloidal solution or a macromolecular solution, it suffers scattering. This phenomenon is called _____ effect.
   a) Raman b) Tyndall
   c) Rayleigh d) Stark

4) The sequence of processes that eventually returns the working substance to its original state is known as _____.
   a) event b) process
   c) thermodynamic cycle d) thermodynamic property

5) The ideal source in flash photolysis technique is _____.
   a) tungsten lamp b) laser pulse
   c) xenon arc d) helium lamp

6) All gases behaves ideally as
   a) P→1 b) P→0
   c) P→∞ d) P→-1

7) $(\delta T/\delta P)s$ =(---$/\delta S)p$
   a) δG b) δN
   c) δV d) δH

8) On mixing of gases the entropy _____.
   a) increases b) decreases
   c) becomes infinite d) becomes zero

9) Polydispersity index (PDI) is given as _____.
   a) M_W/M_N b) M_N/M_w
   c) $M_W + M_N/M_N$ d) $M_N/M_W + M_N$

10) For the reaction 2A+B+2C →D+2E, the rate law is : rate=k$[A]^2[B]^1[C]^1$, which of the following statement is false?
   a) the reaction is second order in [A]
   b) the reaction is first order in [B]
   c) the reaction is second order in [C]
   d) the reaction is 4^{th} order overall

11) In Grand canonical ensemble T, V and _____ remains constant.
   a) P b) T
   c) μ d) E

12) The probability of selecting a card of the King of square from a standard deck of 52 cards is _____.
   a) 13/52 b) 1/52
   c) 4/52 d) 2/52

13) The mathematical statement for Boltzmann-Planck equation is given as _____.
   a) $S = k \ln W$ b) $S = k N \text{ In } W$
   c) $S = k / \ln W$ d) $S = \text{In } W/k$

14) The minimum concentration of an electrolyte required to cause coagulation or flocculation of a sol is called as _____.
   a) flocculation value b) Critical micelle concentration
   c) Critical concentration d) Minimum concentration

Q.2 A) Answer the following questions. (Any Four) **08**

1) State Gibbs' phase rule and give the significance of the terms involved in it.
2) What do you mean by the term most probable configuration?
3) Mention different types of ensembles with their characteristics.
4) What is critical micelle concentration?
5) Define residual entropy.

B) Write notes. (Any Two) **06**

1) Microcanonical ensemble
2) Flash photolysis technique for study of kinetics of fast reactions
3) Surfactants

Q.3 A) Answer the following questions. (Any Two) **08**

1) Estimate the number of configurations and corresponding microstates for the system in which 5 vibrating molecules has to distribute 5 hv energy.
2) The activity of 3.5 moles of a substance changes from 0.055 to 0.75. What would be the change in its free energy at 27^0C K?
3) For the dissociation of water, the relaxation time obtained is 80 μs and the equilibrium constant is 1.011 x 10^{-14} at 298 K. Calculate the rate constants for both forward and backward reactions.

B) Answer the following questions. (Any One) **06**

1) Describe the concept of excess thermodynamic properties.
2) Describe the kinetics of addition polymerization.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Illustrate how thermodynamic probability is related with entropy.
2) Derive Maxwell relations.
3) Write on entropy change during various phase transformations.

B) Answer the following questions. (Any One) **04**

1) A protein sample consists of an equimolar mixture of haemoglobin (Mm = 12.3 kg/mol), ribonuclease (Mm = 11.2 kg/mol) and mioglobin (Mm = 15.5 kg/mol). Calculate the number average and mass average masses.
2) Calculate free energy changes accompanying the compression of 2 moles of gas at 325 K from 50 to 200 atm. The fugacities of the gas at 325 K may be taken as 32 and 72atm respectively at pressures 50 and 200 atm.

Q.5 Answer the following questions. (Any Two) **14**

a) Explain freezing point depression method for determination of activity coefficient.

b) What do you mean by thermodynamic equation of states? Show that $(\delta E/\delta V)_T = T(\delta P/\delta T)_V - P$

c) Mention Maxwell-Boltzmann distribution law. Evaluate the M-B constants α and β.Ø

SLR-JF-96

Seat No.	

Set P

M. Sc. (Semester – I) (CBCS) Examination Oct/Nov-2019
Chemistry
ANALYTICAL CHEMISTRY – I

Day & Date: Saturday, 09-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagram and give equations wherever necessary.
4) Use of log tables and calculators is allowed.
5) All question carry equal marks.

Q.1 Fill in the blanks by choosing the correct alternatives given below: 14

1) Which of the following forms of electrochemistry seek to obtain condition for full polarization?
   a) Potentiometry b) Voltammetry
   c) Coulometery d) Electrogravimetry

2) Interpreter is _____.
   a) An interpreter does the conversion line by line in program is run.
   b) An interpreter is the representation of the system being designed.
   c) An interpreter is a general purpose language proving very efficient execution.
   d) None of above

3) Text-styling feature of MS word is _____.
   a) Word Color b) Word Font
   c) Word Art d) Word Fill

4) In which voltage range DME can be applied in polarography?
   a) +2.3 to -3.3 V b) +2.4 to-3.3 V
   c) +2.3 to-3.0 V d) +2.4 to-3.0 V

5) The amperometric method is considered to be more accurate than polarographic method due to _____.
   a) Less dependent upon the characteristics of the capillary and the supporting electrolyte.
   b) More dependent upon the characteristics of the capillary and the supporting electrolyte.
   c) Not dependent upon the characteristics of the capillary and the supporting electrolyte
   d) None of these

6) What is capillary constant in Ilkovic equation?
   a) $m^{1/3}.t^{1/6}$ b) $m^{3/2}.t^{1/6}$
   c) $m^{2/3}.t^{1/6}$ d) None of these

7) Subtract 01110_2 from 10101.
   a) 00121 b) 00111
   c) 01011 d) 00112

8) Which one of the statement is true regarding residuals in regression analysis?
   a) Mean of residuals is always zero
   b) Mean of residuals is always less than zero.
   c) Mean of residuals is always greater than zero.
   d) There is no such rule for residuals.

9) Systematic errors occur due to _____.
   a) overuse of instruments b) careless usage of instruments
   c) Both a and b d) human sight

10) Standard deviation of population is denoted by _____.
   a) Ω b) ω
   c) σ d) Σ

11) In reversed-phase HPLC _____.
   a) a hydrophobic stationary phase is combined with a polar mobile phase.
   b) a hydrophilic stationary phase is combined with a non-polar mobile phase.
   c) a hydrophilic stationary phase is combined with a polar mobile phase.
   d) a hydrophobic stationary phase is combined with a non-polar mobile phase.

12) The eluent strength is a measure of _____.
   a) solvent adsorption energy b) solvent absorption energy
   c) solvent diffusivity d) solvent mixing index

13) Systematic errors can be removed by _____.
   a) buying new instrument b) breaking the instrument
   c) dusting the instrument d) recalibrating the instrument

14) HPLC methods include _____.
   a) liquid/liquid (partition) chromatography.
   b) liquid/solid (adsorption) chromatography.
   c) ion exchange and size exclusion chromatography.
   d) All of these

Q.2 A) Answer the following questions. (Any Four) **08**

1) What is column resolution?
2) State quantitative evaluation by voltammetry.
3) What is half wave potential?
4) Explain significant figure.
5) Write Ilkovic equation and give the significance of the terms involved in it.

B) Answer the following questions. (Any Two) **06**

1) Explain principle of amperometric titration with significance.
2) Give the classification of Chromatographic methods.
3) How determinate errors affect accuracy?

Q.3 A) Answer the following questions. (Any Two) **08**

1) Explain in short advantages of DME.
2) Explain difference between adsorption and partition chromatography.
3) Give the method of sampling.

B) Answer the following questions. (Any One) **06**

1) Explain Gas Chromatography instrumentation.
2) Explain in detail X-Y plot and linear regression.

Q.4 A) Answer the following questions. (Any Two) **10**

1) Give the quantitative application of polarography.
2) Discuss the methods of minimization of error.
3) Discuss data representation and microcomputer interfacing.

B) Answer the following question. (Any One) **04**

1) Explain different kinds of maxima.
2) Characteristic feature of HPLC.

Q.5 Answer the following questions (Any Two) **14**

a) What is gas chromatography? Explain in detail sample injection system in gas chromatography.

b) Explain in detail half wave potential of an electrolyte in polarography.

c) The mean $\bar{x}$ of four determination of the copper content of a sample of an alloy was 8.27% with a standard deviation s = 0.17% and degrees of freedom is 3.18. Calculate the 95% confidence limit for the true value.

SLR-JF-98

Seat No.	

Set P

M.Sc. (Semester - II) (CBCS) Examination Oct/Nov-2019
Chemistry
INORGANIC CHEMISTRY – II

Day & Date: Monday, 04-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat and labeled diagram and give equations wherever necessary.
4) All questions carry equal marks.
5) Use of log tables and calculators is allowed.

Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

1) Diborane on reaction with water gives _____.
   a) Trimethoxy borate ether b) Boric acid
   c) Haloborane d) Borane carbonyl

2) White phosphorous melts at ____℃.
   a) 40 b) 30
   c) 44.1 d) -44.1

3) The lanthanides were originally called _____ elements.
   a) alkali b) alkaline earth
   c) rare earth d) neutral

4) The haeme group consists of an _____ atom.
   a) zinc b) copper
   c) nickel d) iron

5) Actinide ions are generally _____.
   a) colorless b) colored
   c) neutral d) none of these

6) Weight of one heme unit is _____.
   a) 16500 b) 12000
   c) 64000 d) 17000

7) Trace element used in biological processes used is _____.
   a) Arsenic b) Iron
   c) Calcium d) Sodium

8) Sandwiched compound is also referred as _____.
   a) Metallocenes b) zeise's salt
   c) gilman reagent d) Grignard reagent

9) Sodium silicate is the only common silicate which is soluble in _____.
   a) Alcohol b) Water
   c) Acetone d) Chloroform

10) The most important mineral of lanthanide is _____.
   a) Monazite sand b) magnetite
   c) carnotites d) xenotime

11) Among the followings which is the strong basic ligand?
   a) Cl^- b) F^-
   c) CO^- d) Br^-

12) The Xe_4 molecule has a _____ structure.
a) Linear b) Tetrahedral
c) Square planner d) Octahedral

13) Which among the following acts as frother in flotation method?
a) Pine oil b) sodium cyanide
c) sodium sulphide d) xanthates

14) Wacker's process is the example of _____.
a) Hydroformylation b) olefinic oxidation
c) hydrogenation d) isomerisation

Q.2 A) Answer the following questions. (Any Four) **08**
1) Give the properties and occurrences of lead.
2) Write the oxides of sulphur.
3) Write functions of hemoglobin.
4) What is homogeneous catalysis?
5) What is the lanthanide contraction?

B) Write Notes. (Any Two) **06**
1) Monsanto acetic acid process
2) Polymorphism of carbon
3) Applications of lanthanides

Q.3 A) Answer the following questions. (Any Two) **08**
1) Explain the factors affecting the stability of metal complexes.
2) Discuss the structure and mechanism of hemoglobin.
3) Discuss a brief account of extraction of silver.

B) Answer the following questions. (Any One) **06**
1) What are silicones? Give the applications of silicones.
2) Discuss in brief Ziegler and Natta catalysis

Q.4 A) Answer the following questions. (Any Two) **10**
1) How is copper extracted? What are its properties and uses?
2) Discuss the synthesis, structure and properties of borazines.
3) What is Wackers process? Discuss the catalytic cycle involved it.

B) Answer the following questions. (Any One) **04**
1) Explain in brief nitrogen fixation.
2) Discuss the chelate effect and its thermodynamic origin.

Q.5 Answer the following questions. (Any Two) **14**
a) Explain in brief methods of separation of actinides.
b) Explain in brief oxyacids of phosphorus and nitrogen.
c) Discuss the pi-metal complexes with suitable example.

SLR-JF-99

Seat No.	

Set P

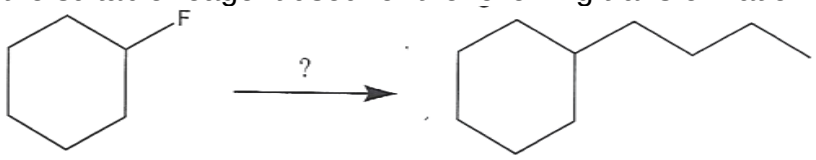
M.Sc. (Semester – II) (CBCS) Examination Oct/Nov-2019
Chemistry
ORGANIC CHEMISTRY – II

Day & Date: Wednesday, 06-11-2019 Max. Marks: 70
Time: 11:30 AM To 02:00 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams and give equations wherever necessary.

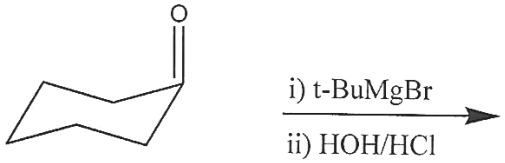
Q.1 Fill in the blanks by choosing correct alternatives given below. **14**

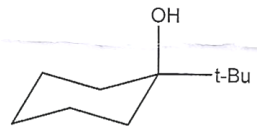
1) Suggest the suitable reagent used for the following transformation.

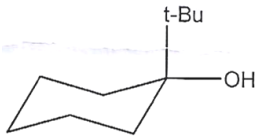


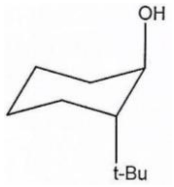
a) Jone's reagent
b) Wittig reagent
c) Gilman reagent
d) Peterson reagent

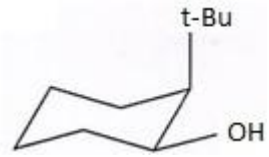
2) Predict the product for the following reaction.



a) 

b) 

c) 

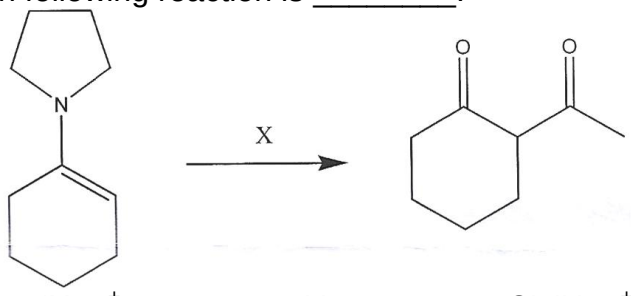
d) 

3) An imaginary bond breaking corresponding to the reverse of a real reaction is referred as _____.
a) Disconnection
b) Functional group interconversion
c) Synthon
d) Synthetic equivalent

4) A real chemical compound carrying out the function of synthon is called as _____.
a) Target molecule
b) FGI
c) Synthon
d) Synthetic equivalent

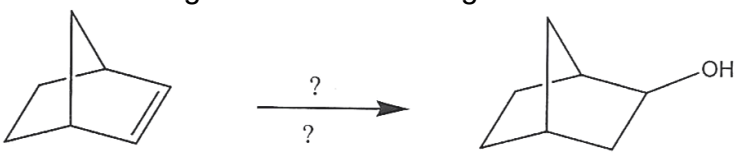
5) A group whose use makes possible to react a less reactive functional group selectively in the presence of a more reactive group is known as _____.
a) Disconnection approach
b) Functional Group Interconversion
c) Protecting group
d) Retrosynthetic analysis

6) The reagent X in following reaction is _____.



a) CH_3-CO-CH_3/H_3O^+ b) CH_3-CO-Cl/H_3O^+
c) CH_3-CO-OH/H_2O d) CH_3-CO-C_2H_5/H_3O^+

7) Suggest the suitable reagent for the following transformation.

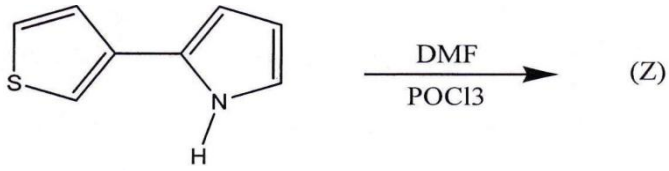


a) Butyl lithium, H_2O/H^+ b) BH_3, $H_2O_2/^-OH$
c) $LiAlH_4$, H_2O d) KMnO4, H_2O

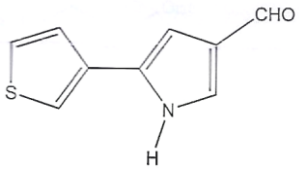
8) Oppenauer oxidation is a method for selective oxidation of secondary alcohols to ketones and this reaction process is opposite to _____.

a) Birch reduction b) MPV reduction
c) Wolf-Kishner reduction d) Clemmensen reduction

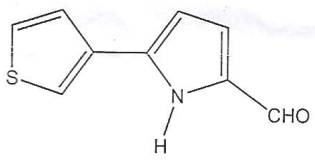
9) The major product (Z) in the following reaction is _____.



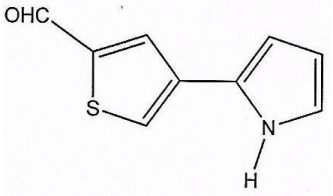
a)



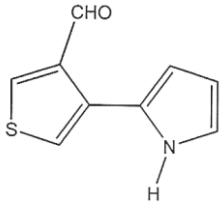
b)



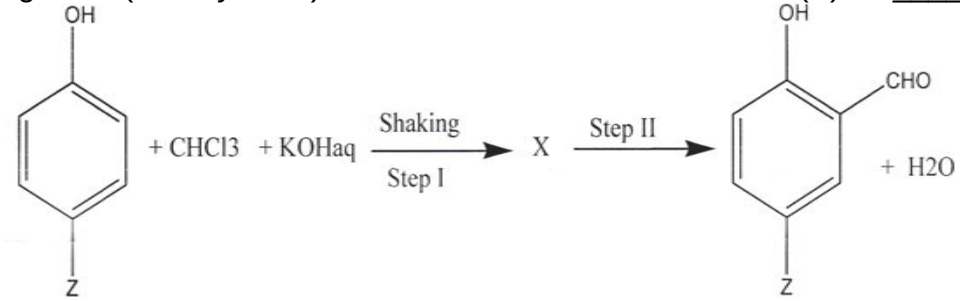
c)



d)



10) In the following reaction, first step involved deprotonation of chloroform by strong base (usually KOH) to form the reactive intermediate (X) as _____.

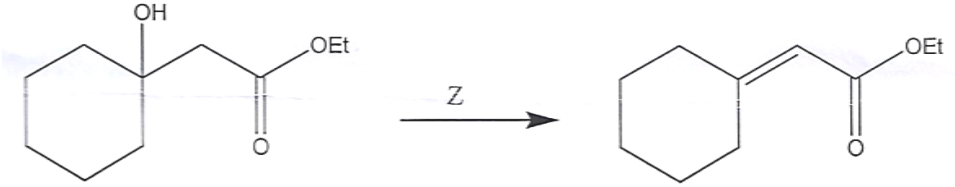


a) X = Dichlorocarbanion ion b) X = Trichlorocarbanion ion
c) X = Dichlorocarbenesoecies d) X = Chlorohydrin species

11) A group of cyclic polyethers used as phase transfer catalysts in different organic transformations are _____.

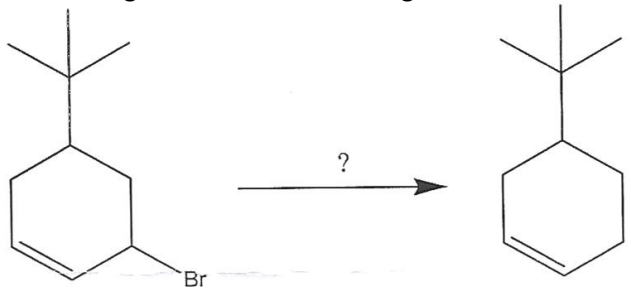
a) Petroleum ethers
b) Quaternary ammonium salts
c) Crown ethers
d) Diethyl ether

12) The reagent Z for the following conversion is _____.



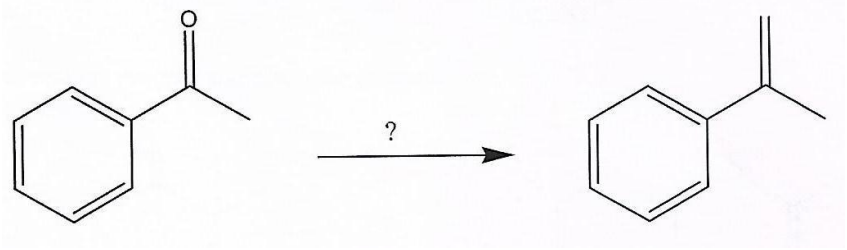
a) DDQ
b) MnO_2
c) DCC
d) $LiAlH_4$

13) Suggest the suitable reagent for the following transformation.



a) Sodium borohydride
b) Lithium alumunium hydride
c) Tributyl tin hydride
d) Potassium hydride

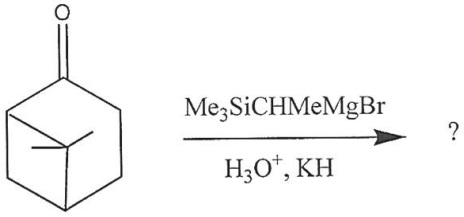
14) Suggest the suitable reagent for the following transformation.



a) Me_3SiCH_3Li
b) Me_3SiCH_2Li
c) $Me_3SiCH(CH_3)Li$
d) $Me_3SiPhLi$

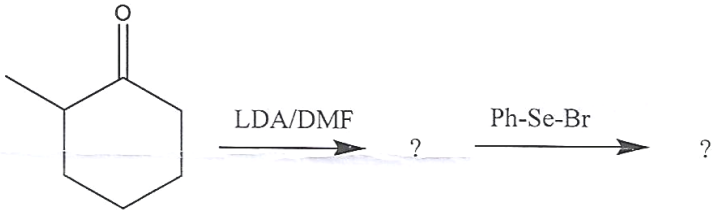
Q.2 A) Answer the following (Any Four) **08**

1) Predict the product and name the reaction.

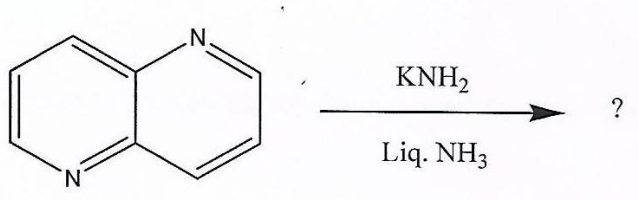


2) Define the terms:
   i) Synthon and
   ii) Functional group interconversion

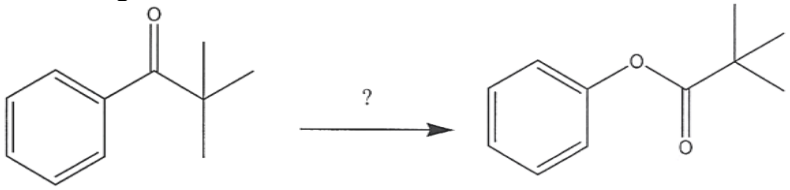
3) Complete the following sequence of reaction.



4) Write the product and name the reaction.



5) Suggest the reagent and name the reaction.

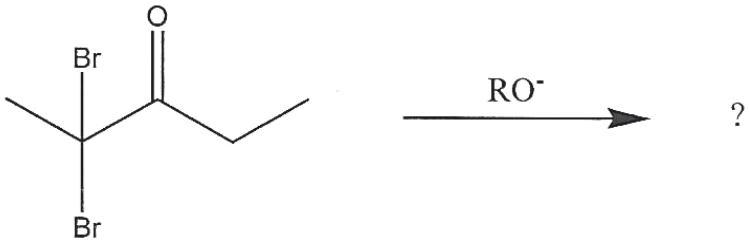


B) Write Notes on (Any Two) **06**

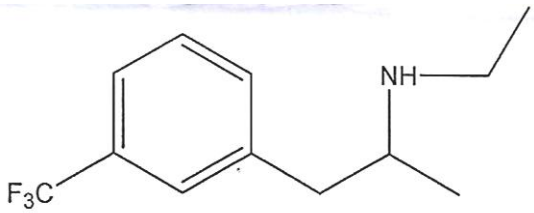
1) Lithium aluminium hydride
2) Manganese dioxide
3) Trialkylsilyl ethers as protecting group for alcohols

Q.3 A) Answer the following (Any Two) **08**

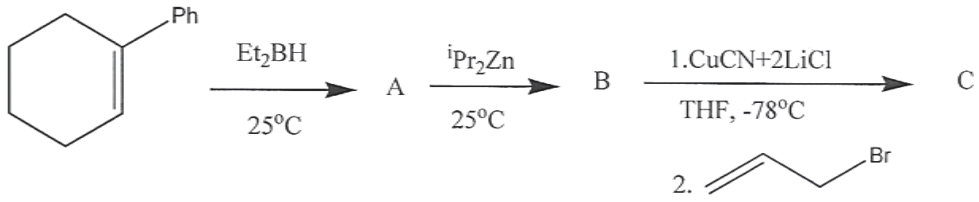
1) Predicate the product and give its mechanism.



2) Using disconnection approach, design a suitable synthesis for the following target molecule.

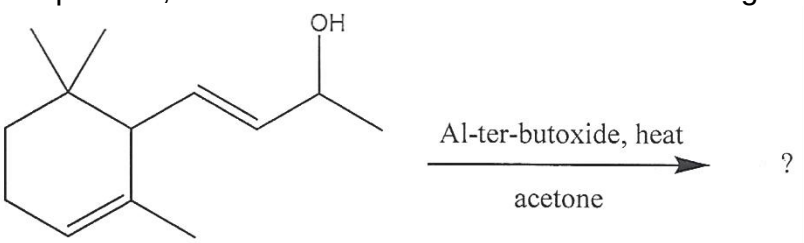


3) What is hydroboration? Complete the following conversion and identify the structure of A, B and C.

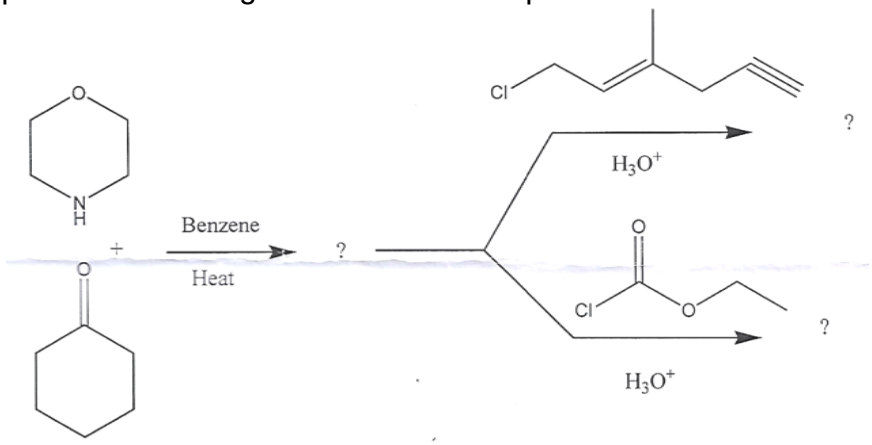


B) Answer the following (Any One) **06**

1) Predict the product, write mechanism and name the following reaction.



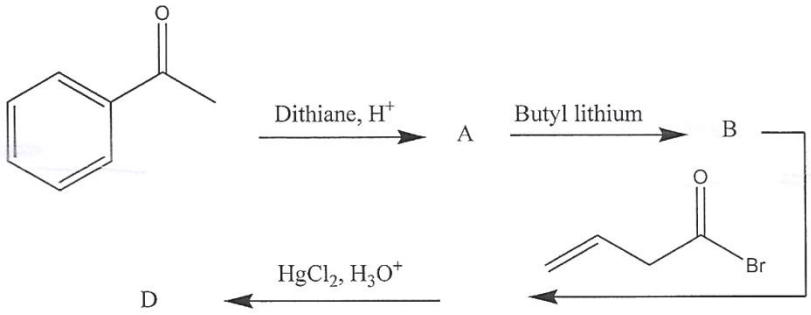
2) Complete the following conversion and explain it with mechanism.



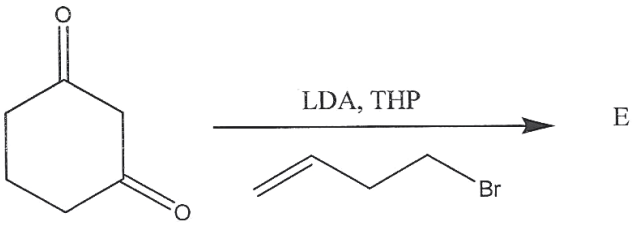
Q.4 A) Answer the following (Any Two) **10**

1) What are Crown ethers? Discuss its role in different organic transformations.
2) Complete the following sequence of reactions. Find the structure of A, B, C, D and E.

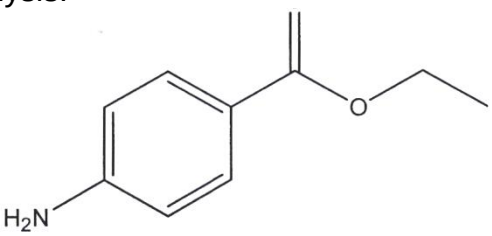
i)



ii)

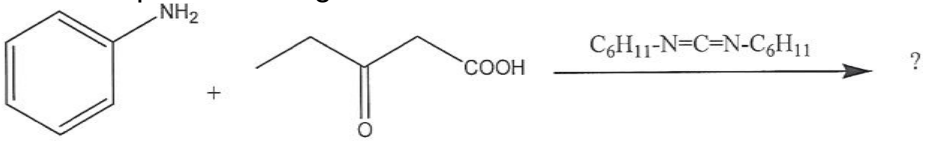


3) Design the synthesis of following target molecule on the basis of retrosynthetic analysis.



B) Answer the following (Any One) **04**

1) Predict the product and give its mechanism

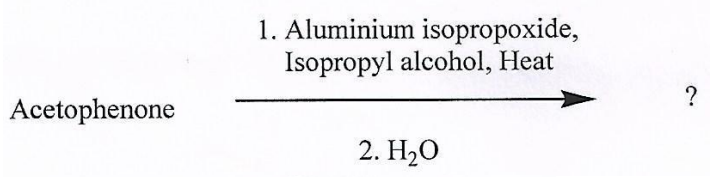


2) Explain in synthesis and applications organo lithium compound.

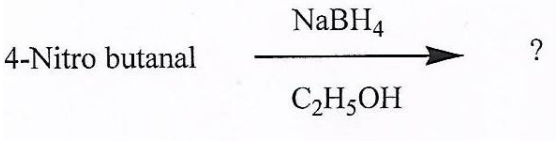
Q.5 Answer the following (Any Two) **14**

a) Complete the following reactions and discuss their mechanism.

i)

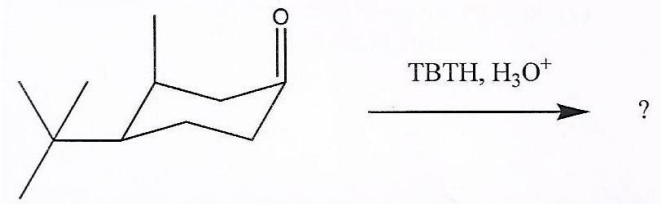


ii)

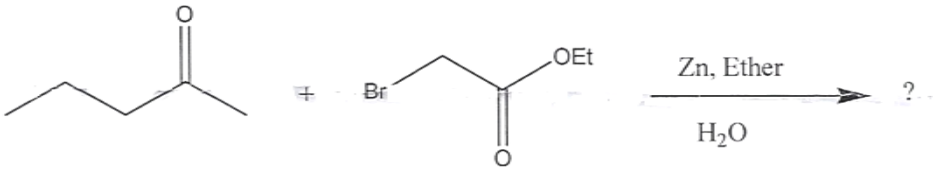


b) Write the product and mechanism for the following reactions.

i)



ii)



c) Explain the role of ketal and ether as a protecting group for alcohols.