Μ	.Sc.	(Ser	nester - I) (New) (NEP CE CHEM	BCS) Examination: March/April-2024	ŀ
	ŀ	nys	ical Chemistry – I (23241) (2302101/2303101)	/01/2325101/2326101/2327101) /2304101/2305101)	
Day Time	& Dat : 03:0	te: Fr 00 PN	iday, 10-05-2024 И То 05:30 РМ	Max. Marks:	60
Instr	uctio	ons: ´	1) All questions are compulsory 2) Figure to right indicate full m 3) Use of log table/calculator is	, arks allowed.	
Q.1	A)	Cho	oose correct alternative.		08
		1)	<ul><li>a) increases</li><li>becomes infinite</li></ul>	by b) decreases d) becomes zero	
		2)	The probability of selecting a standard deck of 52 cards is _ a) 13/52 c) 4/52	card of the King of square from a  b) 1/52 d) 2/52	
		3)	Raoult's law is obeyed by a) real solutions c) ideal solutions	 b) non ideal solutions d) All of these	
		4)	Which of the following is income a) $\Delta H_{mix} = 0$ c) $\Delta P = P_{obs} - P_{calculated} =$	frect for an ideal solution? b) $\Delta V_{mix} = 0$ 0 d) $\Delta G_{mix} = 0$	
		5)	The combined form of first an as a) dE = q – PdV c) dE = TdS – PdV	d second law of thermodynamics is given b) dE = q – TdS d) dE = TdS + PdV	
		6)	For an ideal gas, fugacity is _ a) equal to unity c) greater than unity	b) less than unity d) equal to zero	
		7)	Entropy is a measure of		

- a) randomness
- b) disordenessd) both a and b c) orderness
- According to Bohr, the angular momentum of revolving electron is 8) integral multiple of \_\_\_\_\_.
  - a) 2n b) h/2π c) h d) h/4π

Seat No.

# SLR-HF-1

Set

Ρ

## B) Fill in the blanks OR Write True/False.

- 1) According to Heisenberg's uncertainty principle  $\Delta x \Delta p =$ \_\_\_\_\_.
- 2) Gibbs phase rule is expressed as\_\_\_\_
- 3) The most probable configuration is that configuration which has lowest microstates. [True/False]
- 4) The entropy of a substance at absolute zero temperature is always zero. [True/False]

## Q.2 Answer the following. (Any Six)

- **a)** What do you meant by excess thermodynamic functions?
- **b)** Give the statement for de Broglie hypothesis and write the mathematical expression.
- c) Mention the conditions for Grand canonical ensemble.
- d) What is residual entropy?
- e) Mention various methods of determination of activity coefficients.
- f) State Henry's law.
- **g**) Calculate the de Broglie wavelength of electron moving with the speed of light.
- h) Give the expression for energy of a particle in one dimensional box.

# Q.3 Answer the following. (Any Three)

- a) Derive Gibbs-Duhem equation. Write applications of it.
- **b)** What are ensembles? Describe Grand-canonical ensemble.
- c) Write a note on partial molar quantities.
- d) State de Broglie wave particle duality hypothesis.
   Estimate the de Broglie wavelength for an electron moving with the speed of 1% of speed of light.

## Q.4 Answer the following. (Any Two)

- a) Write in detail on Excess thermodynamic properties of Non-ideal solutions.
- b) What is activity? Explain the method of determination of activity coefficient.
- c) Illustrate quantum mechanical approach towards photoelectric effect.

# Q.5 Answer the following. (Any Two)

- a) Derive Schrodinger wave equation for a particle in one dimensional box.
- b) Mathematically derive Maxwell-Boltzmann distribution law
- c) State third law of thermodynamics. Explain how it helps in determination of entropy of liquid substance.

04

12

12

12

Seat No.				Set	Ρ
M.Sc	. (Sen	nester - I) (New) (NEI	P CBCS) Exa	amination: March/April-2	024
	Orga	anic Chemistry– I (23 (2302102/2303	24102/2325 <sup>0</sup> 3102/230410	102/2326102/2327102) 2/2305102)	
Day & Time: (	Date: N 03:00 P	londay, 13-05-2024 M To 05:30 PM		Max. Mark	s: 60
Instru	ctions:	<ol> <li>All questions are comp</li> <li>Figures to the right inc</li> </ol>	oulsory. licate full marks	5.	
Q.1 /	<b>A) Ch</b> (	oose the correct alterna	tives from the	options.	08
	• • •	a)	b)	13	
		11			
		c) 1	d)	10~	
		INT		1 1	
	2)	[18]-crown-6 forms com a) Rb⁺ c) Na⁺	plex with b) d)	metal ions. Cs⁺ K⁺	
	3)	Thermal or photochemic	cal rearrangem	ent of acyl asides to isocyanate	es
		<ul><li>a) Curtius rearrangem</li><li>c) Lossen rearrangem</li></ul>	ent b) ent d)	Schmidt rearrangement Fries' rearrangement	
	4)	The major product of the	e following read	ction is	
		450-10-2-043	Ph 603 H	t	
		a)	b)	40-(0)-c-0 ct.	
		с) <u>усо-то) с</u> -он	d)	4c-{0}-2-0H	
	5)	An isomer having simila bond is known as	r groups or ato isomer.	ms on the same side of C-C	
		a) Threo c) Erythrose	 b) d)	Cis Trans	

- molecule can be converted into chiral molecule by chemical 6) treatment.
  - a) Homotopic

b) Enantiotropic

c) Heterotopic

d) Prochiral

d) None of the three

- 7) is an example of ambident nucleophile.
  - b) a) d) c)
- A substrate undergoing nucleophilic substitution with anchimeric 8) assistance gives product with
  - a) inversion of configuration b) racemization
  - c) retention of configuration

#### B) State True/False:

- Fullerene having C<sub>240</sub>, C<sub>540</sub> and C<sub>960</sub> carbons are known as giant 1) fullerene.
- 2) Sommelet Hauser rearrangement is given by benzyl quaternary ammonium salts.
- Nucleophilic substitution reaction occur at vinylic and aromatic 3) carbon bonded to a halide.
- compound is trans and chiral. 4)

## Q.2 Answer the following. (Any Six)

- Explain with suitable example that pinacol-pinacolone rearrangement is a) intramolecular.
- Explain with suitable example nucleophilic substitution at vinylic carbon. b)

.....

- Give the synthesis of azulene. C)
- Explain different types of tautomerism. d)
- Explain with suitable example the term plane of symmetry. e)
- Complete the following reaction. f)



Complete the following reaction. g)

Explain SN<sup>2</sup> mechanism. h)

## Q.3 Answer the following. (Any Three)

- a) What is an ambident nucleophile? Explain the factors governing the regioselectivity in ambident nucleophiles.
- **b)** Explain aromaticity of nonbenzenoid compounds. Give the synthesis of tropone and tropolone.
- c) Give the different methods of generation of nitrene.
- d) Explain optical activity in biphenyl and allenes.

## Q.4 Answer the following. (Any Two)

- a) Explain with suitable examples the terms chirality, enantiomeric & diastereomeric relationships.
- **b)** Explain with suitable example, electrophilic substitution accompanied by double bond shift.
- c) Explain generation, reactivity of carbocation.

## Q.5 Answer the following. (Any Two)

- a) Explain with suitable examples alternant & non-alternant hydrocarbons.
- b) Explain witting reaction w.r.t. mechanism, stereochemistry & applications.
- c) Explain classical & non-classical carbocations & phenonium ions.

#### 12

# 12

Seat No.		Set	Ρ
M.Sc	. (Sen Inorç	nester - I) (New) (NEP CBCS) Examination: March/April - 20 CHEMISTRY ganic Chemistry –I (2324107/2325107/2326107/2327107)	)24
Day & E Time: 0	Date: W 3:00 PI	(2302107/2303107/2304107/2305107) /ednesday, 15-05-2024 Max. Mark M To 05:30 PM	s: 60
Instruc	tions:	1) All questions are compulsory. 2) Figure to right indicate full marks.	
Q.1 A	. <b>) Ch</b> ( 1)	oose correct alternative. Bond angle in NF₃ is less than in NH₃ due to a) Presence of lone pair b) Presence of double bond c) Electronegativity effect d) All of the above	08
	2)	According to VBT the hybridization and geometry of $[Ni(Cl)_4]^{2-}$ are respectively. a) sp <sup>3</sup> , Tetrahedral b) sp <sup>3</sup> , Square planar c) dsp <sup>2</sup> , Tetrahedral d) dsp <sup>2</sup> , Square planar	
	3)	How many $d\pi - p\pi$ bonds are present in CIO <sub>4</sub> - molecule? a) 0 b) 1 c) 2 d) 3	
	4)	<ul> <li>Origin of magnetism in ferromagnetic material is due to</li> <li>a) Unpaired electrons</li> <li>b) Parallel electron spin exchange</li> <li>c) Antiparallel electron spin exchange</li> <li>d) Paired electrons</li> </ul>	
	5)	<ul> <li>The conductivity of semiconductors can be increased by</li> <li>a) Increasing no of free electrons</li> <li>b) Doping of impurities</li> <li>c) Increasing temperature</li> <li>d) All of the above</li> </ul>	
	6)	G.M counter is most efficient to detect which type of radiations. a) $\alpha$ and $\beta$ b) only $\beta$ c) All type of radiations d) only $\alpha$	
	7)	<ul> <li><sup>31</sup>P (n, γ)<sup>32</sup>P it is the example of which type of nuclear reaction.</li> <li>a) Nuclear fission</li> <li>b) Photonuclear reaction</li> <li>c) Radiative capture reaction</li> <li>d) Photon induced reaction</li> </ul>	

- 8) How many numbers of M-M bonds are present in Co<sub>2</sub>(CO)<sub>8</sub> in solution?
  - a) 2 b) 0 c) 1 d) 3

# 

# SLR-HF-3

08

# B) Write True or False.

- 1) Insulators have small band gap between valance and conduction band.
- 2)  $V(CO)_6$  is diamagnetic in nature.
- 3)  $\alpha$  rays has highest ionization power.
- 4) According to crystal field theory  $NH_3$  is weak field ligand.

# Q.2 Answer the following. (Any Six)

- a) Predict the geometry, shape and hybridization of CIF<sub>3</sub> molecule with the help of VSEPR theory.
- **b)** Calculate the ground term symbol of Fe in  $[Fe (H2O)_6]^{2+}$
- c) Define Intrinsic and Extrinsic semiconductors and give their examples.
- d) Calculate the EAN of Fe(CO)<sub>5</sub>
- e) Define radioactive decay and give its types.
- f) What is meant by High-spin and Low-spin complexes? Give examples.
- g) Calculate the total electron count and predict the skeletal structure of metal cluster  $Rh_6(CO)_{16}$  by Wade's rule.
- **h)** Define Nuclear fission and Nuclear Fusion reaction and give their general reaction.

# Q.3 Answer the following. (Any Three)

- a) Write a short note on nephelauxetic effect and nephelauxetic series.
- **b)** Explain Bent's rule with the help of suitable examples.
- c) Write a short note on nuclear reaction cross section.
- **d)** Give the classification of metal carbonyl with suitable examples.

# Q.4 Answer the following. (Any Two)

- a) Explain in detail Walsh diagram for triatomic molecules.
- b) Explain in detail John teller effect.
- c) Define radioactive tracer techniques and describe its applications with examples.

# Q.5 Answer the following. (Any Two)

- a) Describe in detail about doping of semiconductors and its conduction mechanism.
- **b)** Explain in detail bonding in metal carbonyl complexes and their synergic relationship.
- **c)** Describe the principle, construction and working of Geiger-Muller (GM) counter.

#### 04

12

# 12

12

Seat No.			Set	Ρ			
M.S	M.Sc. (Semester - I) (New) (NEP CBCS) Examination: March/April-2024 CHEMISTRY Research Methodology (2324103/2325103/2326103/2327103)						
		(2302103/2303103/2304103/2305103)					
Day & D Time: 03	Day & Date: Friday, 17-05-2024 Max. Marks: 60 Time: 03:00 PM To 05:30 PM						
Instruct	t <b>ions:</b> 1 2	<ol> <li>All Questions are compulsory.</li> <li>Figure to right indicate full marks.</li> </ol>					
Q.1 A)	) Cho 1)	bose correct alternative. In polarography current is generated due to reduction of impurities. a) migration b) diffusion		08			
	2)	<ul> <li>c) residual</li> <li>d) limiting</li> <li>Supporting electrolyte is used in polarography to suppress</li> <li>current.</li> <li>a) diffusion</li> <li>b) migrating</li> </ul>					
	3)	<ul> <li>c) convection</li> <li>d) residual</li> <li>parameter is measured in DTA.</li> <li>a) dH. dt</li> <li>b) ΔT</li> <li>c) Mass</li> <li>d) dm/dt</li> </ul>					
	4)	may be defined as a cloud of highly ionised gas, composed electrons, ions and neutral particles. a) XRD b) Plasma c) DTA d) TG	of				
	5)	type nebuliser is used for handling slurries that can contain 10 % solids. a) Babington b) Jet c) Ultrasonic d) None of these	upto				
	6)	Signal splitting in NMR arises from a) Shielding effect b) Spin-spin decoupling c) Spin-spin coupling d) Deshielding effect					
	7)	includes data concerning the family background and educat development. a) Case study b) General behaviour c) genetic Approach d) Adequacy	ional				
	8)	<ul> <li>Research is basically</li> <li>a) a methodology of enquiry</li> <li>b) search of truth</li> <li>c) a systematic exploration of facts</li> <li>d) all of the above</li> </ul>					

## Google Scholar easily allows you to explore authors related research 4) works . Q.2 Answer the following. (Any Six) a) Define Chemical Shift? How is it calculated? b) What are the instrumental factors that affect thermogravimetric curves. c) What are the disadvantage of DME? d) Why alkene protons are shielded while alkene protons are deshielded, Justifv? e) Explain with diagram the Simultaneous multielement spectrometer. f) What is Scopus? g) What is meant by plagiarism? h) What is Sampling in research methodology? Q.3 Answer the following. (Any Three) a) Explain the following terms in Thermogravimetry. Recording of results 1) Information from a TG curve 2) b) What are the applications of amperometric titration. c) What are the factors that affect Chemical Shift? d) What is Hypothesis? What are different types of Hypothesis? Q.4 Answer the following. (Any Two) a) Describe instrumentation for Differential Thermal Analysis (DTA). b) Describe different currents produced by polarography. c) An organic compound of molecular formula C<sub>9</sub>H<sub>9</sub>OCI shows the following features: IR (KBr): a strong band at 1730cm<sup>-1</sup>; <sup>1</sup>HNMR: 2.5 $\delta$ (t, 2H, J=7Hz); 6.7 $\delta$ (m, 5H); 4.1 $\delta$ (t, 2H, J=7 Hz); Make proper assignment of the data Q.5 Answer the following. (Any Two) a) Discuss in details the applications of X-ray diffraction. b) Derive an equation for Half- Wave potential. c) What is Research Problem? What condition need to be followed while selecting a research problem?

## B) Fill in the blanks.

2)

- 1) Polarography involves the precise determination of \_\_\_\_\_ relationship.
  - The most widely used nebuliser system in ICP is the \_\_\_\_\_
- 3) The difference in energy  $\Delta E$  between +1/2 and -1/2 spin state of a proton is directly proportional to strength of
- SLR-HF-6

04

12

# 12

12

# Seat M.Sc. (Semester - I) (Old) (CBCS) Examination: March/April-2024

Day & Date: Friday, 10-05-2024 Time: 03:00 PM To 06:00 PM

No.

Instructions: 1) Q. Nos. 1 and 2 are compulsory.

2) Attempt any three guestions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.

**CHEMISTRY** Inorganic Chemistry - I (MSC05101)

#### Q.1 A) Choose correct alternative.

- The colour of the d-block elements is due to 1)
  - nd (n + 1)p transition a) nd - (n+1)s transition b) nd - (n+1)d transition d)
  - c) nd nd transition
- series correctly places the ligands in order of increasing 2) nephelauxetic effect.
  - a)  $F^- < Cl^- < I^-$
  - c)  $en < NH_3 < H_2O$
- b)  $I^- < Cl^- < F^$ d)  $I^{-} < Br^{-} < [CN]^{-}$
- 3) The following structure of a carbonyl compound is formed by which transition metal.



4) A half-life is

a)

c)

c)

- constantly changing a)
- the time for one-half of an unstable nuclei to decay b)
- half of the lifetime of an unstable nucleus c)
- independent of the rate constant for decay d)
- As a ligand,  $Cl^-$  is \_\_\_\_\_. 5)
  - $\sigma$ -donor a)

- b)  $\pi$ -donor
- both  $\sigma \& \pi$  donor d)  $\sigma$  donor and  $\sigma$  acceptor
- Antibonding molecular orbitals are produced by . 6)
  - destructive interaction of atomic orbitals a)
  - the overlap of the atomic orbitals of two negative ions b)
  - constructive interaction of atomic orbitals c)
  - d) All of these
- The transition metal ion that has "spin-only" magnetic moment value 7) of 5.92 is
  - Mn<sup>2+</sup> b) Fe<sup>2+</sup> a)
  - c)  $V^{2+}$ d) Cu<sup>2+</sup>

Max. Marks: 80

10

# SLR-HF-7

Set

06

16

- 8) All elements with Z > 83 are \_\_\_\_\_.
  - a) Stable and unreactive
  - b) Nonradioactive
  - c) Likely to decay by  $\beta$  emission
  - d) Likely to have neutron/proton ratio of less than or equal to 1:1

## 9) Most common oxidation states of Cu (Copper) are \_\_\_\_\_.

- a) +2,+3 b) +2,+4
- c) +3,+4 d) +1,+2
- 10) Bond Order of O<sub>2</sub>, F<sub>2</sub>, N<sub>2</sub> respectively are \_\_\_\_
  - a) +1, +2, +3b) +2, +1, +3d) +2, +2, +1
  - c) +2, +3, +1 d) +3, +2, +1

## B) Write True/False.

- 1) Atomic numbers of the isotopes of an element are different.
- 2) White and black phosphorus are allotropic forms of the chemical element phosphorus.
- 3) O<sub>2</sub> molecule is paramagnetic on the basis of MOT.
- 4) If the metal is in high oxidation state and the ligands contain nonbonding electrons, then: Ligand-to-metal charge-transfer transitions are observed.
- 5)  $PF_3$  is a ligand that is similar to CO in that it is a weak  $\sigma$ -donor but a strong  $\pi$ -acceptor. Thus,  $PF_3$  forms complexes that are analogues of carbonyls.
- 6) The donation of lone pair of electrons of CO carbon into the vacant orbital of metal atom results in pi bond.

## Q.2 Answer the following.

- a) Explain the band theory.
- b) Write note on radioactive decay and equilibrium.
- c) What is effective atomic number? Explain with examples.
- d) What is the Bent rule? Explain with examples.

## Q.3 Answer the following.

a) Explain the ligand field energy parameters in detail.
 b) Write a note on the counting techniques such as G.M., ionization and proportional counters.
 08

## Q.4 Answer the following.

- a) State and explain Jahn-Teller theorem. Show schematically the splitting of d-orbitals in d<sup>7</sup> case for octahedral and tetrahedral system.
- b) What is VSEPR theory discuss the structure and geometry of CIF<sub>3</sub> and SF<sub>4</sub>. 08

## Q.5 Answer the following.

- a) Explain charge transfer spectra its examples and comment on
   08 spectrochemical series.
- b) Preparation, properties & structures of mono, di & tri nuclear carbonyl
   08 complexes.

## Q.6 Answer the following.

- a) Explain in detail about rectifiers.
- b) What are types of nuclear reactions? Explain nuclear fission reaction in detail.
   08

# Q.7 Answer the following.

- Give the classification of metal clusters. Explain the structures of carbonyl 80 a) clusters (LNCC and HNCC). What is mean by radioactive techniques? Explain traces techniques for
- 80 b) structure determination.

Seat No.			Se	t P
M.Sc.	(Semester -	I) (Old) (CBCS) Exan CHEMISTRY	nination: March/April-202	4
	Orę	ganic Chemistry – I (	MSC05102)	
Day & Date Time: 03:00	: Monday, 13-0 ) PM To 06:00 F	5-2024 YM	Max. Mar	ks: 80
Instruction	s: 1) Q. Nos. 1 2) Attempt a 3) Figures to	and 2 are compulsory. ny Three questions from ( the right indicate full mar	Q. No. 3 to Q. No. 7 ks.	
Q.1 A) C	hoose the cor	rect alternatives from th	e options.	10
1	) Which of the	e following is/are aromatio	?	
	a)	b		
	$\searrow$		$\bigvee_{\Theta}$	
	c)	d	) All of the above	
		-		
2	) The nitrene	s can be trapped with ber	zene in the form of	
	a) Azepine	) )		
	b) N-subs	aniline		
	d) Substitu	ited aniline		
3	) Alkenes for	m complex with Ag <sup>+</sup> , Hg <sup>2+</sup>	because	
	a) Alkene	are soft bases b	) Alkenes are soft acids	
	c) Alkenes	s are hard bases d	) Alkenes are hard acids	
4	) Which of the	e following groups are me h	ta-directing?	
	c) -NHCO	R d	) Both a and b	
5	) is Z-	somer.		
	a) F	,I b	) H CI	
		Br	CI H	
		Dr d	) None of these	
	Cl	Ĭ		
ĥ	) What is the	general formula of crown	ether?	
0	a) -(0-C	$H_2$ -CH <sub>2</sub> ) <sub>n</sub> b	) CnH2n	
	c) C <sub>n</sub> H <sub>2n</sub> O	d	) None of these	

# Seat

Page **1** of **3** 



- a) Write note on: Ambident nucleophiles
- **b**) Write note on: Bonding in Fullerene
- c) Define the following terms with examples.
  - 1) Enantiomer
  - 2) Diastereomer
- d) Explain Hammett equation.

Q.3	Ans a) b)	<ul> <li>nswer the following.</li> <li>) Explain E and Z nomenclature with suitable examples?</li> <li>) Explain aliphatic SN<sub>2</sub> reaction with respect to:</li> <li>0</li> <li>1) Effect of substrate structure.</li> <li>2) Attacking nucleophile</li> <li>3) Leaving group</li> <li>4) Reaction medium</li> </ul>			
Q.4	Ans	swer the following.			
	a)	Discuss optical activity of allenes and spiranes?	80		
	b)	Explain electrophilic substitution reaction with its mechanism.	08		
Q.5	Ans	swer the following.			
	a)	What are Crown ethers? Give some methods of preparation and	80		
	F)	applications of Crown ethers.	00		
	D)	what are the free radicals? Discuss their structure and reactions.	08		
Q.6	Ans	swer the following.			
	a)	What is mean by Perturbation molecular orbital (PMO) theory? Give its	80		
	h)	What are carbocations? How they are formed? Discuss their reactions	08		
	~)				
Q.7	Ans	swer the following.	00		
	a) h)	Explain orientation and reactivity in monosubstituted benzenes.	80 80		
	<i></i> ,		00		

Day & Dat Fime: 03:0	te: We 00 PM	dnesday, 15-05-2024 To 06:00 PM		Max. Marks	: 80
nstructio	o <b>ns:</b> 1) 2) 3)	Q. Nos. 1 and. 2 are compulsory. ) Attempt any three questions from G ) Figure to right indicate full marks.	Q. No	o. 3 to Q. No. 7	
Q.1 A)	<b>Cho</b> ( 1)	ose correct alternative. (MCQ) The energy of photon is given by a) $E = \frac{hc}{\lambda}$ c) $E = hcv$	b) d)	$\vec{E} = hv$ All of these	10
	2)	The operator ⊽ is called ope a) Laplacian c) Poisson	erato b) d)	r. Hamiltonian Vector	
	3)	Thermodynamic probability a) Increases c) Does not change	with b) d)	n entropy. Decreases None of the above	
	4)	$(dT/dP)_{S} = \$ a) $-(dP/dS)_{V}$ c) $(dP/dT)_{V}$	b) d)	$(dV/dS)_{ ho}$ $-(dV/dT)_{ ho}$	
	5)	<ul> <li>For dilute solution, Raoult's law state</li> <li>a) the relative lowering of vapor point</li> <li>b) the vapor pressure of the solution</li> <li>c) the relative lowering of vapor point</li> <li>d) lowering of vapor pressure is a solvent in solution</li> </ul>	tes ti press tion press equa	hat: sure is equal to mole fraction is equal to mole fraction of the sure is proportional to amount I to the mole fraction of	
	6)	<ul> <li>Which of the following is the conditi</li> <li>a) Wave function must be finite</li> <li>b) Wave function must be continued</li> <li>c) Wave function must be single</li> <li>d) All of these</li> </ul>	on fo ues valu	or well-behaved wave function? ed	
	7)	The chemical potential $(\mu_i)$ of the $i^t$ a) $\mu_i = \left(\frac{\partial U}{\partial n_i}\right)_{T.P}$	<sup>th</sup> co b)	mponent is defined as $\mu_i = \left(\frac{\partial H}{\partial n_i}\right)_{T.P}$	
		c) $\mu_i = \left(\frac{\partial A}{\partial n_i}\right)_{T.P}$	d)	$\mu_i = \left(\frac{\partial G}{\partial n_i}\right)_{T.P}$	

Seat No.

> M.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2024 CHEMISTRY

# Physical Chemistry – I (MSC05103)

Day & Date: Wednesday. 15-05-2024

# C

Set

Ρ

06

16

- 8) The collection of one or more outcomes from an experiment is called \_\_\_\_\_.
  - a) Event
- b) Probability
- c) Ensemble d) Random variable
- 9) The entropy will usually increase when \_
  - a) A molecule is broken into two or more smaller molecules.
  - A reaction occurs that results in an increase in the number of moles of gas.
  - c) both a & b
  - d) None of above
- 10) The probability of selecting a card of queen of square from a standard deck of 52 cards is \_\_\_\_\_.
  - a) 4/52 b) 1/52
  - c) 2/52 d) 13/52

## B) Write True/False.

- 1) Fugacity is helpful to study actual behavior of ideal gases.
- 2) Heisenberg's Uncertainty principle is applicable to macroscopic systems.
- 3) Heat and work are the point functions.
- 4) At equilibrium, the thermodynamic probability of a system is appears to be zero.
- 5) Grand-canonical ensemble is a NVE ensemble.
- 6) For dilute solution. Raoult's law states that, the vapor pressure of the solution is equal to mole fraction of the solvent.

## Q.2 Answer the following.

a) Estimate the most probable configuration for distribution of 3 quanta energy packets between three simple harmonic oscillators.

- **b)** Give a short note on the partial molar quantities.
- c) Define and explain various types of ensembles.
- d) State and derive the third law of thermodynamics.

## Q.3 Answer the following.

- a) What are the excess thermodynamic functions? Derive any four of them. 08
- b) Derive Maxwell's relations and both of the thermodynamic equations of state.

## Q.4 Answer the following.

- a) Define activity coefficient and obtain an expression to determine the activity
   08 of solute and solvent by using vapor pressure method.
- b) Derive an expression for the energy of a particle in one dimensional box. 08

## Q.5 Answer the following.

- a)Derive Duhem-Margules equation.06
- b) Derive the Schrodinger wave equation in three dimensions. 10

## Q.6 Answer the following.

- a) Define phase, component, and degrees of freedom. Derive Gibbs phase 08 rule.
- b) How to determine absolute entropies for solids, liquids, and gases? 08

# Q.7 Answer the following.

a)	Find the most probable configuration for distribution of 5 quanta energy	06
	packets between ten simple harmonic oscillators.	
b)	Derive Maxwell Boltzmann (MB) distribution law and give its Physical	10
	significance.	

Seat No.

# M.Sc. (Semester - I) (Old) (CBCS) Examination: March/April - 2024 **CHEMISTRY**

# Analytical Chemistry – I (MSC05108)

Day & Date: Friday, 17-05-2024 Time: 03:00 PM To 06:00 PM

## Instructions: 1) Q. Nos. 1 and. 2 are compulsory.

2) Attempt any three guestions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.

#### Q.1 Choose correct alternative. **A**)

- ICP's principle is similar to which of the following . 1)
  - Flame emission spectroscopy a)
  - Fourier transforms spectroscopy b)
  - c) Atomic emission spectroscopy
  - Absorption spectroscopy d)

#### 2) of the following is the correct abbreviation of COMPUTER.

- Commonly Occupied Machines Used in Technical and a) Educational Research
  - Commonly Operated Machines Used in Technical and b) **Educational Research**
  - Commonly Oriented Machines Used in Technical and c) **Educational Research**
  - Commonly Operated Machines Used in Technical and d) **Environmental Research**
- Systematic errors occur due to . 3)
  - overuse of instruments a)
  - careless usage of instruments b)
  - both a) and b) c)
  - human sight d)
- The expected value or \_\_\_\_\_ of a random variable is the center of 4) its distribution.
  - a) Mode

c)

c)

- b) Medium Mean d) None of above
- 5) of the following forms of electrochemistry seek to obtain condition for full polarization.
  - Potentiometry a) Coulometry
- b) Voltammetry d) Electrogravimetry
- 6) of the following language does the computer understand.
  - Computer understands only Language a)
    - Computer understands only BASIC b)
    - Computer understands only Binary Language c)
  - Computer understands only Assembly Language d)
- Measurement which is close to true value is 7)
  - a) accurate
  - precise c)

- b) average
- d) error

Max. Marks: 80

10

- 8) The auxiliary electrode in polarography is \_\_\_\_\_
  - Dropping mercury b) Mercury pool
  - c) Graphite electrode d) Rotating platinum electrode
- 9) In Atomic Absorption Spectroscopy \_\_\_\_\_ of the following is the generally used radiation source.
  - a) Tungsten lamp

a)

- b) Xenon mercury arc lamp
- c) Hydrogen or deuterium discharge lamp
- d) Hollow cathode lamp
- 10) \_\_\_\_\_ is working principle of amperometry.
  - a) It is based on the principle of polarography, with the exception that the voltage is altered during the titration.
  - b) It is based on the principle of polarography, with the exception that the current is maintained constant during the titration.
  - c) It is based on the principle of polarography, with the exception that the voltage is maintained constant during the titration.
  - d) None of these.

## B) True or False.

06

16

16

- 1) The function of the chopper in Atomic Absorption Spectroscopy is to break the steady light into pulsating light. It is a rotating wheel placed between the flame and the source.
- Double focusing section analyzers offer better resolution than ICP spectrometry system. Their disadvantage is that they are large and have a high capital cost.
- 3) Reference electrode used in polarography is non-saturated calomel electrode.
- 4) Systematic errors can be removed by recalibrating the instrument.
- 5) A character that is raised and smaller above the baseline is known as subscript.
- 6) The electrode used in amperometric titration is rotating platinum electrode.

#### Q.2 Answer the following

- a) How to prepare sample for analysis?
- b) Write a note on applications of Amperometry.
- c) Use of CHEM DRAW, CHEM SKETCH.
- d) How is AAS is differ from FES.

# Q.3 Answer the following. a) What are types of error and how to minimize error? b) Discuss the principles, instrumentation, nature of titration curves of

Polarography.

Q.4	Ans	swer the following.	16
	a)	Discuss in detail of method of sampling techniques.	
	b)	Discuss the Detection limits and sensitivity, Interference of atomic absorption spectroscopy.	

# Q.5Answer the following.16a)Explain the Amperometry principle and working.16

b) Discuss the principles and instrumentation of ICP.

## Q.6 Answer the following

- a) Explain in details of variance and Limit and least square method.
- b) Analysis of a sample of hematite gave the following percentage values for the iron content: 7.08, 7.21, 7.12, 7.09, 7.16, 7.14, 7.07, 7.14, 7.18, 7.11 Find out the mean, standard deviation and coefficient of variation for the values.

## Q.7 Answer the following.

- **a)** What is half wave potential and give the qualitative and quantitative applications.
- b) Discuss the use of internet for searching research data.

Seat No.						Set	Ρ
M.S	c. (	Ser	nester - II) (	New) (NEP ( CHE Physical	CBCS) E MISTRY Chemist	xamination: March/April-202 rrv - II	24
(232	620	1/2	325201/232	4201/230220	1/23042		)1)
、 Day & Time: ´	Date 11:0	e: Th 0 Al	nursday, 09-0 ⁄I To 01:30 PI	5-2024 M		Max. Marks	s: 60
Instruc	ctior	<b>าร:</b>	1) All questior 2) Figures to 1	ns are compulso the right indicate	ory. e full mark	S.	
Q.1 /	4)	Cho 1)	For triplet state a) 1 c) 3	<b>alternative.</b> ates, the spin m	ultiplicity is b) d)	5 2 1⁄2	08
		2)	Order of a ch a) zero c) half integ	nemical reaction ger	may be _ b) d)	integer all of these	
		3)	A primary dry a) The elec b) The elec c) Dry elec d) None of	y cell is called s trolyte used is a trolyte used is a trodes are used the above	o because completely a moist pa	dry ste	
		4)	Which region between photochemic a) 8000 Å a	ns of the light ra wavelength al reactions? nd 2000 Å	diations of n are chief b)	the visible ultraviolet lying ly concerned in bringing about 19000 Å and 12,000 Å	
			c) 1000 Å a	nd 2000 Å	d)	1500 Å and 1000 Å	
		5)	Storage batte	ery is a cell or c	ombinatio	n of cells in which the reactions	
			are a) irreversil c) spontane	ole eous	b) d)	highly reversible all of these	
		6)	For the term	symbol <sup>3</sup> P1, the	correspor	nding values for 1, and s are	
			a) 1, 1 c) 0, 1	eouvery.	b) d)	1, 0 0, 0	
		7)	The Stern-Vo a) exponen c) non linea	olmer expressio tial ar	n is b) d)	_ in quencher concentration. linear can't say	
		8)	Debye-Huck	el - Onsager eq	uation can	be verified by plotting the graph	
			or a) Λ agains c) Λ agains	t c <sup>1/2</sup> t c <sup>2</sup>	b) d)	$\Lambda$ against c All of these	

-

04

12

## B) Fill in the blanks OR Write True/False.

- 1) P-type delayed fluorescence first observed in \_\_\_\_\_.
  - Spin inversion of electrons take place in the \_\_\_\_\_ photophysical process.
  - 3) \_\_\_\_\_ is a radiative transition between two electronic states of the same spin multiplicity and instantaneous process.
  - 4) The potential of reference electrode changes with the change in concentration of an analyte. [True/False]

## Q.2 Answer the following. (Any Six)

- a) Mention typical lifetime for fluorescence and phosphorescence.
- b) State the law of photochemical equivalence.
- c) State Franck-Condon principle.
- d) Give the names of any two electrodes that can be used as reference electrodes.
- e) What do you mean by rate determining step?
- f) Define quantum yield.
- g) Give the statement for Beer-Lambert's law.
- **h**) Mention various electronic transitions possible in an organic compound.

# Q.3 Answer the following. (Any Three)

- a) With the help of suitable diagram explain various photo physical pathways.
- b) Discuss intermolecular energy transfer process with suitable example.
- c) Explain in detail the acid storage battery.
- d) Discuss the kinetics of reaction between  $NO_2$  and  $F_2$ .

# Q.4 Answer the following. (Any Two)

- a) Using double sphere model, illustrate the influence of solvent on the rate of ionic reaction in solution state.
- **b)** Describe electrical double layer and its structure with the help of Stern's model.
- c) Discuss decomposition of ozone reaction.

# Q.5 Answer the following. (Any Two)

- a) Give an account of bimolecular collisional quenching.
- **b)** State Franck-Condon principle. Discuss the shapes of absorption bands using this principle.
- c) Explain the method of determination of dissociation constant of monobasic acid by e.m.f. measurement.

#### 12

12

CH2U2	-> ?
R	b)
K	d)

**CHEMISTRY Organic Chemistry - II** (2326202/2325202/2324202/2302202/2304202/2305202/2303202/2327202) Day & Date: Saturday, 11-05-2024

Time: 11:00 AM To 01:30 PM

a)

c)

a)

c)

a)

c)

3)

1)

2)

Seat

Q.1 A)

No.

Instructions: 1) All questions are compulsory.

NaBH<sub>4</sub>

Choose the correct alternatives.

NH<sub>2</sub>NH<sub>2</sub> / KOH /  $\Delta$ 

2) Figures to the right indicate full marks.

CH2

B<sub>2</sub>H<sub>6</sub>

b) AI(O-i Pr)<sub>3</sub> / i - PrOH

0

d)

b)

d)

M.Sc. (Semester - II) (New) (NEP CBCS) Examination: March/April-2024

Max. Marks: 60

SLR-HF-13

Set

Ρ



8) \_\_\_\_\_ is the decreasing order of the leaving group of the substrate in E, reaction.



### B) Fill in the blank.

- 1) The reaction in which cyclisation occurs through Michael addition followed by Aldol Condensation is known as \_\_\_\_\_ reaction.
- 2) Friedel-Crafts alkylation using secondary and tertiary alkyl halides involves as the active electrophile predominantly.
- 3) Cyclic ketones are converted into \_\_\_\_\_ by peracid in Baeyer-Villiger oxidation.
- 4) Wilkinson's catalyst is used for the hydrogenation of \_\_\_\_\_ alkene.

### Q.2 Answer the following. (Any Six)

- b)  $R CH = C \xrightarrow{R'} 0_3 , 9 \xrightarrow{H_2 0_2} 9 + 9$
- c) Give two applications of ruthenium tetroxide as an oxidizing agent with suitable examples.
- d) Give two applications of Bu<sub>3</sub>SnH as a reducing agent.
- e) Explain addition of HBr to 3-methly-1-butene.
- f) Give two applications of Simmon Smith reaction.
- g) Explain with suitable example o/p directing and activating groups.
- **h)** What is the effect of substrate structure on aromatic nucleophilic substitution reaction (ArSN<sup>2</sup>)?

#### Q.3 Answer the following. (Any Three)

- a) Explain Friedel Craft's alkylation reaction with suitable example.
- **b)** Explain Mc-Murry coupling reaction with suitable example.
- c) Give applications of Pb(OAc)<sub>4</sub> as an oxidizing agent.
- d) Give application of DIBAL-H.

## Q.4 Answer the following. (Any two)

- a) Explain the mechanism of electrophilic substitution reactions of aromatic compounds and discuss O/P ratio of substituted aromatic compounds towards electrophilic substitution reactions.
- **b)** Explain the stereochemistry of addition reactions involving free radical addition.
- c) Give the mechanism and applications of Birch reduction.

### Q.5 Answer the following. (Any two)

- a) Discuss E, elimination reaction mechanism with suitable example. Draw energy profile diagram for the E, elimination reaction.
- b) What is Jone's reagent. Give its applications.
- c) Discuss the mechanism and application of Robinson annulation reaction.

-					F			
Seat No.					Set	Ρ		
M.Sc. (Semester - II) (New) (NEP CBCS) Examination: March/April-2024 Inorganic Chemistry - II (2326207/2325207/2324207/2302207/2304207/2305207/2303207/2327207)								
Day & D Time: 1	ate: Tue 1:00 AM	sday, 14-05-2 To 01:30 PM	2024		Max. Marks	; 60		
Instruct	i <b>ons:</b> 1) 2)	Q. Nos. 1 and Figure to rig	id. 2 are compulsory. Jht indicate full marks.					
Q.1 A)	) <b>Cho</b> o 1)	ose correct a ligand a) H <sub>2</sub> O c) C <sub>2</sub> H <sub>4</sub>	alternative. I will form a stable com	plex v b) d)	with Ln <sup>3+</sup> ion. CO PPh₃	08		
	2)	and a) 2, 4 c) 1, 5	heme groups pre	sent i b) d)	n hemoglobin and myoglobin. 4, 1 2, 2			
	3)	The reductive a) electro b) electro c) electro d) electro	e elimination steps are on rich metal centers on rich and electron det on deficient and electro on deficient metal centr	favor ficient n rich es	ed by t metal centers respectively n metal centers respectively			
	4)	Which of the a) B <sub>2</sub> H <sub>6</sub> c) B <sub>2</sub> H <sub>16</sub>	following is an exampl	e nido b) d)	o borane? B₅H൭ B₄H₀			
	5)	The catalyst Wacker proce a) alcoho c) ethyler	[PdCl <sub>4</sub> ] <sup>2–</sup> is used in the cess. of to acetaldehyde me to acetaldehyde	b) d)	version of using acetaldehyde to ester ester to ketone			
	6)	In the one-din a) $SiO_3^{2-}$ c) $Si_2O_3^{2-}$	imensional silicate	ba b) d)	sic structural unit is present. $SiO_4^{2-}$ $Si_2O_4^{2-}$			
	7)	Zr and Hf hav a) inducti c) lanthai	ive similar atomic and i ive effect inide contraction	onic ra b) d)	adii, because of atomic size screening effect			
	8)	Cerium elem a) +2 c) +3	nent forms most stable <sub>.</sub>	b) d)	oxidation state. +4 +6			
B)	) <b>Fill i</b> 1) 2)	n <b>the blanks</b> In biological s The STYX co	<b>OR Write True/False</b> system Cobalt is the m ode 2002 is for	ain co	onstituent of	04		

- The electronic configuration of the  $Gd^{3+}$  is \_\_\_\_\_. The geometry of XeF<sub>4</sub> molecule is \_\_\_\_\_. 3)
- 4)́

# S

#### Q.2 Answer the following. (Any Six) 12 What are the methods used for lanthanide separation? a) Write a brief note on Polymorphism of carbon. b) Draw the structure of XeOF<sub>2</sub> and write the oxidation state of Xe in it. C) Name the major elements which are used in biological processes. d) Name the method used for preparation of actinides. e) f) What are silicates? Give the example of three-dimensional silicates. Explain in brief homogeneous catalysis. g) Draw the resonance structure of borazine. h) Q.3 Answer the following. (Any Three) 12 Discuss the factors affecting the stability of metal complexes. a) Explain the structure of BrF<sub>3</sub> on the basis of VSEPR theory. b) What are phosphazenes? Give the classification of phosphazenes. C) Explain how chelate effect is related to stability constant. d) Q.4 Answer the following. (Any Two) 12 How copper is occurred in nature? How copper is extracted by using a) electrochemical method? b) Write a note on Wacker process. What are carbides? Discuss the applications of carbides. C) Q.5 Answer the following. (Any Two) 12 Discuss the catalytic cycle involved in hydroformylation of alkene. a) Explain in detail nitrogen fixation. b) Discuss the electronic configuration and oxidation states of lanthanides. C)

Instr	uctio	o <b>ns:</b> 1) 2 3	Q. Nos. 1 and 2 are compulsory. Attempt any three questions from Q. No. 3 to Figure to right indicate full marks.	Q. No. 7				
Q.1	A)	Cho 1)	Se correct alternative. The outermost electronic configuration of most $s_{1}$ a) $2S^{2} 2P^{4}$ b) $3S^{2} 3Z^{2}$ c) $2S^{2} 2P^{5}$ b) $2S^{2} 2P^{5}$	st electronegative element 3P <sup>5</sup> 2P <sup>6</sup>				
		2)	The correct set of pseudohalide ions is a) $CN^-$ , $ClO_4^-$ , $PF_6^-$ b) $N_3^-$ , D c) $SCN^-$ , $N_3^-$ , $PO_4^{3-}$ d) $CN^-$ ,	- NO <sub>3</sub> -, ASF <sub>6</sub> - N <sub>3</sub> -, SCN-				
		3)	rhe catalyst used for polymerization of olefins a) Ru(PPh₃)₃Cl b) TiCl₄ c) PdCl₂ and CuCl d) Co₂(	s is generated from ₄ and AlEt₃ CO)൭				
		4)	Which one of the following element shows oxi a) Am b) Pu c) U d) Cm	idation state up to +7?				
		5)	ron-Sulphur clusters in biological systems are a) proton transfer b) atom c) ion transfer d) elect	e involved in n transfer tron transfer				
		6)	Dres containing sulphide form of metals are n vhich of the following method? a) Gravity separation b) Mag c) Froath flotation d) All o	nainly concentrated by netic separation f the above				
		7)	<ul> <li>Which the following is incorrect about Hydroformylation of Alkenes?</li> <li>a) Reaction of H<sub>2</sub> and CO<sub>2</sub> with alkene</li> <li>b) Rh / Co catalyst can be used</li> <li>c) Alkenes are converted to aldehyde</li> <li>d) None of the above</li> </ul>					
		8)	The value of stability constant (K) is affected I a) Only steric factor b) Only c) Both steric and statistical factor d) None	by statistical factor e of the mentioned				
		9)	Rhizobium bacteria is a) Free living bacteria b) Sym c) Anaerobic bacteria d) None	biotic bacteria e of these				
		10)	Refining of Gold metal from its ore can be dor a) Electrolysis b) Liqua	ne by method. ation				

d) All of the above

CHEMÍSTRY

Seat	
No.	

M.Sc. (Semester - II) (Old) (CBCS) Examination: March/April-2024

Set Ρ

# SLR-HF-17

Cupellation c)

10

Inorganic Chemistry - II (MSC05201) Day & Date: Thursday, 09-05-2024 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

	В)	<ul> <li>Fill in the blanks.</li> <li>1) The common oxidation state of Lanthanide elements is</li> <li>2) is the essential structural element in all organism and also play important role in blood clotting.</li> <li>3) The fusible mass produced by the pyrometallurgical action of flux on the matrix is called</li> <li>4) The STYX number for B<sub>2</sub>H<sub>6</sub> is</li> <li>5) The chemical reaction of an organometallic compound in which its oxidation number and coordination number both increased by two units is called an reaction.</li> <li>6) The type of hybridization of carbon in Graphite is</li> </ul>	06				
Q.2	Ansv a) b) c) d)	wer the following. Write a short note on Interhalogen compounds. Define organometallic compounds and give their classification on the basis of hapticity of ligand. Give a short note on Cytochromes and Ferredoxins. Describe the determination of formation constants by spectrophotometric method.	16				
Q.3	Ans <sup>.</sup> a) b)	<b>wer the following.</b> Explain the Synthesis, properties and structure of Diborane. Explain in detail Hydrogenation of Alkenes by using Wilkinson's catalyst.	08 08				
Q.4	Ans <sup>r</sup> a) b)	wer the following.0Describe the Spectral and Magnetic properties of Lanthanides.0Give the occurance and explain in detail the metal extraction process of Tin (Sn).0					
Q.5	Ans <sup>.</sup> a) b)	<b>wer the following.</b> Discuss in detail about Oxygen Uptake Proteins. Explain in detail Chelate effect and its thermodynamic origin with suitable examples.	08 08				
Q.6	Ans <sup>r</sup> a) b)	<b>wer the following.</b> Explain in detail polymorphism of phosphorus. Explain the Isomerization of Alkenes by using homogenous organometallic catalyst.	08 08				
Q.7	Ans a) b)	<b>wer the following.</b> Discuss the separation methods of Actinides. Explain in detail the extraction process of lead.	08 08				

Seat	
No.	

# M.Sc. (Semester - II) (Old) (CBCS) Examination: March/April-2024 **CHEMISTRY**

# Organic Chemistry – II (MSC05202)

Day & Date: Saturday, 11-05-2024 Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. No. 1 and. 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7. 3) Figure to right indicate full marks.

#### Q.1 Choose correct alternative. A)

c)

a)

4)

c)

under

a)

c)

- The reagent used to bring about the following conversion. 1)
  - a) Butyl lithium, H<sub>2</sub>O/H<sup>+</sup>

LiAIH<sub>4</sub>, H<sub>2</sub>O

b) carbanion

- 2) Reaction intermediate of E1 cb reaction is
  - a) carbocation
  - six membered cyclic TS c) d) carbene
- Suggest the suitable reagent for the following transformation. 3)

\_ is a very selective reducing agent for the reduction of aldehydes 5) and ketones to alcohols.

The acid sensitive aldehydes and ketones reacts to give alkanes only

- LiAIH<sub>4</sub> a)
- Na in alcohol c)

KMnO<sub>4</sub>

Lead tetra-acetate

Catalytic reduction

MPV reduction

b) Na and Liq. NH<sub>3</sub>

b) Birch reduction

d) Wolf-Kishner reduction

d) NaBH<sub>4</sub>

- - b) BH<sub>3</sub>, H<sub>2</sub>O<sub>2</sub> / OH d) KMnO<sub>4</sub>, H<sub>2</sub>O

SLR-HF-18

Max. Marks: 80





 $H_2O_2$ 

d) Osmium tetroxide

b)

6) Predict the product for the following reaction.



### Q.2 Answer the following.

B)

a) Predict the product and outline the mechanism for the following reaction.



16

16

16

16

16

16

b) Complete the following conversion and explain it with mechanism.



- c) Both m-bromoanisole and o-bromoanisoe yield the same product manisidine, Explain why?
- d) Give comparison between E1 and E2 reaction.

### Q.3 Answer the following.

- a) Describe the mechanism for Stobbe condensation reaction and give its applications.
- b) Write a detail note on Sharpless asymmetric epoxidation with suitable example.

### Q.4 Answer the following.

- a) Discuss aromatic nucleophilic substitution reaction via benzynes with example.
- b) Discuss Diazonium coupling reaction in detail.

### Q.5 Answer the following.

- a) Explain in detail ambient nucleophile and factors governing the regioselectivity in ambient nucleophiles.
- **b)** Discuss the nucleophilic addition reaction of Grignard reagents with carbonyl compounds.

## Q.6 Answer the following.

- a) Give the synthetic applications of the following reagents:
  - i) Ruthenium tetroxide
  - ii) m-CPBA
- b) Discuss the applications and importance of DIBAL in organic synthesis.

## Q.7 Answer the following.

- a) What is hydrogenolysis? Discuss the hydrogenolysis of amines, ehers, C-X bond and cyclopropane rings.
- b) Discuss the oxidation reactions of lodobenzene diacetate.

	M.S	c. (S	eme	ster - II) (Old) (CBC Physical Chemi	CS) Exam istry–II (N	nina /IS	ation: March/April-2024 C05206)	
Day & Time	& Dat : 11:0	e: Tu 0 AM	esday I To 0	/, 14-05-2024 2:00 PM			, Max. Marks	s: 80
Instr	uctio	<b>ns:</b> 1 2 3	) Q. N ) Atte ) Figu	los. 1 and 2 are compu mpt any three question are to right indicate full a	llsory. Is from Q. N marks.	۷o.	3 to Q. No. 7	
Q.1	A)	Mult 1)	t <b>iple (</b> If the pher a) c)	choice Questions e fluorescence intensity nomenon is called as Internal quenching Phosphorescence	v gets dimir  b d	nish ) )	ed due to IC & ISC, External quenching delayed fluorescence	10
		2)	a) c)	forms the transient of Excimer Monomer	complex in b d	the ) )	excited state. Exciplex Dimer	
		3)	Acco a) c)	ording to Debye-Hucke 0.55 0.48	l limiting lav b d	N, - ) )	$-\log f = \z^2 \sqrt{\mu}$ 0.51 None of these	
		4)	Wha a) c)	at is the color of a positi While Brown	ive plate of b d	a le ) )	ead-acid battery? Grey Yellow	
		5)	The <sub>_</sub> a) c)	can be measure zeta resistance current	d by the mo b d	ove ) )	ment of electrophoresis. voltage zeta potential	
		6)	Acco inter a) b) c) d)	ording to steady state a mediate is Equal to the rate of dia Zero Unity Equal to rate of disap	pproximations sappearance opearance o	on i ce c f in	rate of formation of of reactants termediate	
		7)	Emis to al a) c)	ssion fluorescence inte osorption spectra. Blue Green	nsity is alw b d	ays ) )	s shifted as compared Red All of these	
		8)	The a) c)	battery converts Chemical, electrical Potential, electrical	energy into b d	5 ) )	energy. Electrical, chemical Electrical, potential	
		9)	The knov a) c)	influence of charged s wn as Base effect Salt effect	pecies (ion) b d	) or ) )	the rate of reaction is Acid effect Acid-base effect	

Ρ

Seat No.

		10)	Acco leve	ording	to Kasha's	rule, emission	prec	dominantly occurs from			
			a)	S <sub>1</sub>			b)	T <sub>1</sub>			
			c)	T <sub>2</sub>			d)	All of these			
	B)	Write	e Tru	e/Fals	е				06		
		1) 2)	<ol> <li>In quenching process, the fluorescence intensity decreases.</li> <li>Typical lifetime of fluorescence emission is in the order of few micro- seconds</li> </ol>								
		3) 4)	In al Duri	kaline ng recl	batteries, e harging pro	lectrolyte is H cess of secon	₂SO₄ dary	cells electrons are absorbed by			
		5) 6)	<ul> <li>P-type delayed fluorescence is first time observed in pyrene.</li> <li>Batteries of TV remote control are consisting of secondary cells.</li> </ul>								
Q.2	Ans	wer th	ie fo	llowing	g.				16		
	a) b) c) d)	Write Defin Show Deriv	a sh e anc <sup>,</sup> vario e a ra	ort not d expla ous typ ate law	e on predist in n-type de pes of electr for reaction	sociation. elayed fluores ric double laye n between NO	cence r with 2 and	e. h the help of suitable diagram. d F <sub>2</sub> ?			
Q.3	Ans	Answer the following.									
-	a) b)	Defin Defin mediu	<ul> <li>ne fluorescence quenching and derive Stern-Volmer equation.</li> <li>ne primary and secondary salt effect and show how ionic strength of</li> <li>1</li> <li>lium affects the rate of ionic reactions in solution.</li> </ul>						06 10		
Q.4	Ans	Answer the following									
	a)	What is exciplex? Explain its formation and various pathways of exciplex <b>0</b>									
	b)	Write	te a detailed note on acid and alkaline storage batteries.								
Q.5	Ans a)	Answer the following a) Derive the equation to determine dissociation constant of monobasic acid						06			
	u)	by us	using e.m.f. method.								
	b)	What is mean by steady state approximation? Apply it to derive rate law to decomposition of acetaldehyde and ethane.							10		
Q.6	Ans	wer th	ie fo	llowin	g						
	a) b)	Write Deriv	a sh e rate	ort not e law fo	e on photo- or the react	oxidation and ion between H	phot l₂ and	o-reduction. d Cl <sub>2</sub> .	08 08		
Q.7	Ans a)	Answer the following Derive an equation to determine mean activity coefficients of ions from <b>0</b>							06		
		e.m.f.	data	à.							
	b)	Give	the d	etailed	notes on o	zone layer de	pletic	on and green house effect.	10		
Seat No.		Set	Ρ								
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M.S	ic. (Se	mester - III) (New) (CBCS) Examination: March/April-2024 Organic Chemistry									
		Advanced Organic Chemistry – I (MSC07301)	~~								
Day & Da Time: 11	ate: Fri :00 AN	To 02:00 PM	30								
Instructi	ons: 1 2 3	Q. No. 1 and. 2 are compulsory. Attempt any three questions from Q. No. 3 to Q. No. 7 Figure to right indicate full marks.									
Q.1 A)	Cho	ose correct alternative.	10								
	1)	In reaction ketene is formed as an intermediate. a) Wolff rearrangement b) Witting									
		c) Hofmann rearrangement d) Neber									
	2)	Harning 9									
		a) $HNO_3$ c) $C_rO_3$ b) $HNO_2$ d) $H_2SO_4$									
	3)	In Suzuki coupling reaction can be used as an electrophilic component along with arylboronic acid. a) aryl diazonium ion b) triflate c) aryl halide d) all three									
	4)	The Henry reaction is a base catalyzed C - C bond forming reaction between and aldehydes or ketones. a) amines b) nitroalkenes c) amides d) None of these									
	5)	<ul> <li>is used for oxidation of ketones to corresponding acyloins.</li> <li>a) Selenium dioxide</li> <li>b) Periodic acid</li> <li>c) Peracid</li> <li>d) Iodoisobenzyl diacetate</li> </ul>									
	6)	is useful in the structure determination of carbohydrates and 1,2 - glycols. a) Peracid b) lodoisobenzyl diacetate c) Periodic acid d) Ozone									
	7)	R-CH2-CEC-H DBULI @ MezsiI &									
		a) R CH2-C = C - CH3 b) R CH2 C = C - Simes									
		c) $R - CH_2 - C \equiv C - Bu$ d) $R - CH_2 - C \equiv C - Bu$ $M_3 - CH_2 - C \equiv C - Bu$									

## Γ

SLR-HF-21

Page 1 of 3



B)

Page 2 of 3



### Q.2 Answer the following.

- Discuss various applications of complex metal hydrides. a)
- Discuss mechanism of Kumada reaction with suitable example. b)
- Discuss the mechanism of Hofmann-Loffler-Freytag reaction with the C) suitable example.
- d) Discuss the effect of solvent on enolate structure and reactivity.

#### Answer the following Q.3

- Explain the reaction mechanism and applications of lodoisobenzyl diacetate. a)
- Explain the reaction mechanism and applications of Hofmann rearrangement b) reaction.

#### Answer the following Q.4

- Explain reaction mechanism and applications of Strecker amino acid a) synthesis.
- b) Discuss generation and alkylation of dianions.

#### Q.5 Answer the following

- Discuss reaction mechanism and applications of Sonogashira reaction. a)
- Discuss the reaction mechanism & applications of Smiles rearrangement b) reaction.

#### Answer the following Q.6

- Discuss with suitable examples alkylation of aldehydes and amides. a)
- b) Discuss application of DDG.

#### Answer the following Q.7

- Discuss mechanism and applications of Corey-Winter definition. a)
- Discuss reaction mechanism and applications of Semi pinacol rearrangement b) reaction.

16

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Seat No.							Set	Ρ
Μ	l.Sc.	. (Se	emester - III Chemistry (	) (New) (CB( ORGANIC of Bioactive	CS) Exa CHEM Hetero	amination: March/ ISTRY cvcles (MSC0730)	April-2024 2)	
Day & Time:	Date 11:00	: Mo ) AM	nday, 13-05-2 To 02:00 PM	2024			, Max. Marks	: 80
Instru	ction	<b>is:</b> 1 2 3	) Question No ) Attempt any ) Figure to rig	os.1 and 2 are c three questions ht indicate full n	ompulso s from Q narks.	ry. . No. 3 to Q. No. 7.		
Q.1 A	A) (	<b>Cho</b> ( 1)	The IUPAC r	I <b>ternative.</b> Iomenclature fo	r the give b)	en heterocycle is Oxetane		10
		•	c) Oxolane		d)	Oxaolane		
		2)	(a) = (b) = (c)		b) d)	R R R R R R R R R R R R R R R R R R R		
		3)	The major pro	oduct formed in BuLi PhCOPh/ H <sub>3</sub> O	the follo	owing reaction is:		
					d)			

4) The product formed in the following reaction is:



5) Which compound is most basic?



6) The product formed in the following reaction is:



7) The major product formed in the following reaction is:



Which is the main product of the following reaction? 8)



#### Q.4 Answer the following.

with mechanism.

Q.3

- a) What is the reactivity of pyridine towards electrophilic substitution reaction 08 with regioselectivity?
- b) What is regioselectivity of bromination and nitration reactions in pyrrole with 08 examples.

Q.5	Ans a) b)	<b>swer the following.</b> What are Baldwin Rules? Discuss in Details. What are Skraup synthesis and Doebner-Miller synthesis reactions? Discuss with examples and detail mechanism.	08 08
Q.6	Ans	swer the following.	
-	a)	Write any two methods with mechanism for synthesis of oxazole and isoxazole.	80
	b)	Write two methods of each with mechanism for synthesis of benzimidazole and benzoxazole.	08
Q.7	Ans	swer the following.	
	a)	At which positions do benzofuran and benzothiophene reacts most readily with electrophiles? Give reason of each.	08
	b)	Write two methods of each with mechanism for synthesis of quinazolines and piperazine.	08

N	/I.Sc	. (Ser	nes	ter - III) (New) (CBCS) E	xami mist	ination: March/April - 2024	
		Pho	otoc	hemistry and Pericyclic	Rea	actions (MSC07306)	
Day a Time	& Dat : 11:0	e: We 00 AM	dnes To 0	day, 15-05-2024 2:00 PM		Max. Marks:	80
Instr	uctio	<b>ns:</b> 1) 2) 3)	Q. N Atte Figu	los. 1 and 2 are compulsory. mpt any three questions from ure to right indicate full marks.	Q. N	o. 3 to Q. No. 7	
Q.1	A)	Choo 1)	A re ano a) b) c) d)	correct alternative. (MCQ) action in which a sigma bond ther end of $\pi e^-$ system is call Electrocyclic reaction Cycloaddition reaction Sigmatropic rearrangement Group transfer reaction	forma ed	ally migrates from one end to	10
		2)	Whe proc a) c)	en ground state orbitals of rea duct then such transformation Thermally allowed Both a & b	ctant is b) d)	correlate with gr.st. orbitals of <sup>.</sup> Photochemically allowed None of above	
		3)	The	following Sigmatropic rearran	b)	ent is example of	
			c)	[1, 7]	d)	[3, 3]	
		4)	If a ther a) c)	Sigmatropic rearrangement pont n it is thermally allowed both a & b	rocee b) d)	ds via antiaromatic transition state photochemically allowed neither a nor b	;
		5)	In s invo a) c)	upra facial cycloaddition react lved are apposite both a & b	ion of b) d)	the $\pi$ system the faces same none of above	
		6)	Prec 2 a)	dict major product of following $ \begin{array}{c} & & \\ & \\ & + & \\ & \\ & \\ & \\ & \\ & \\ &$	react b)	ch,	
			c)	och3	d)	All	

10

Seat

No.

Set P

7)	Electron spin resonance spe	ectroscopy is used to detect
	a) Free radicals	b) Carbocations

- c) Carbanions d) Protons
- The 1,2- cycloaddition reactions of alkenes with aromatic compounds 8) are
  - Stereoselective a)
- b) Stereospecific d) Enantioselective
- c) Regioselective
- 9) Energy of E<sub>2</sub> orbitals of ethylene is
  - b)  $\alpha - \beta$ a)  $\alpha + \beta$
  - c)  $\alpha + 2\beta$ d) α
- Energy released during new bond formation is given by formula \_\_\_\_\_. 10)
  - a)  $\delta E = 2\beta \in a$ b)  $\delta E = 4\beta \in a$
  - $\delta E = 2a \in \beta$ c) d)  $\delta E = 4a \in \beta$

### B) Write True/False.

- When total number of  $(4q+2)_s \& (4r)_a$  component is even, reaction is 1) thermally allowed.
- 2) Cope rearrangement take place via [3, 3] Sigmatropic rearrangement.
- Photo induced [2 + 2] cycloaddition reaction are symmetry allowed. 3)
- Selective allylic bromination can be achieved using NBS. 4)
- Dienes having  $\pi$  system separated by 2 or more SP<sup>3</sup> hybrid carbon 5) atoms show  $di - \pi$  methane rearrangement.
- Resonance energy of naphthalene is more than benzene. 6)

### Answer the following. Q.2

- Constant  $\pi$  MO diagram of allylic cation & anion. a)
- With the help of FMO method explain mechanism of [1,3] Sigmatropic b) rearrangement.
- Write note on 1, 2 addition of alkene with aromatic compounds. C)
- Calculate energies of different molecular orbitals or cyclopropane. d)

#### Answer the following. Q.3

Q.4

Q.5

Explain following reaction with the help of correlation diagram. a)

b)	Explain Wodward-Hoffmann rule for $[2 + 2] \& [4 + 2]$ cycloaddition reaction.	08
Ans a) b)	<b>swer the following.</b> Explain in detail Norish type - I process. Calculate delocalization energy of cycloheptatrienyl cation, anion & free radical and comment on their relative stability.	08 08
Ans	swer the following.	

- **08** a) Explain with suitable examples con rotatory & dis rotator motion in ring closure & opening electrocyclic reactions.
- Explain Claisen rearrangement w.r.t. mechanism, stereochemistry and 08 b) applications.

### Answer the following. Q.6

- Explain in detail Aromatic photo substitution. a)
- Calculate charge density of anthracene and comment on reactivity for b)

**08** 

**08** 

16

08

electrophilic substitution at different positions.

## SLR-HF-23

## Q.7 Answer the following.

a)	Write short notes on	
-	1) Photochemical oxidation	05
	2) Endo selectivity in Diels-Alder reaction.	05
b)	Explain Huckel - Mobius method in Sigmatropic rearrangement.	06

rsda To (	ay, 09-05-2024 )6:00 PM		Max. Marks:	80
Que Atte Fig	estion 1 and 2 are compulsor empt any three questions from ures to the right indicate full r	y. n Q.: nark	3 to Q.7 s.	
<b>se</b> ( Wh a) c)	<b>Correct Alternative.</b> ich of the following do not act 1,3-Dithianes Nitro compounds	t as l b) d)	Jmpolung reagent? Cyanide amines	10
A re syn a) c)	eal chemical compound (reag thon is called Synthetic equivalent Target Molecules	lent) b) d)	carrying out the function of a FGI None of these	
The stai a) c)	e process of breaking down a ting materials by disconnecti Retrosynthetic analysis Synthetic analysis	targ ons b) d)	et molecule into available and FGI is called Connection analysis None of these	
Wh a) c)	ich of the following compound Carbamates Fmoc	ds ao b) d)	ct as protecting group for amines? BOC group All of these	
The a) c)	e protecting group must be Small Large	b) d)	Stable to reaction conditions Unstable to reaction condition	
Cou pre a) c)	upling reaction between aryl o sence of Pd(0) complex is kn Heck reaction Oxidative addition reaction	or vir own b) d)	nyl halides and alkenes in the as Wacker oxidation Suzuki coupling	
Wh a) c)	ich of the reaction is not give Heck Sonogashira	n by b) d)	Pd(0) complex? Suzuki Wacker oxidation	
Wh an a) c)	ich of the following reaction a olefin and CO in one step? Pauson Khand Stille coupling	b) d)	s the coupling of an acetylene, Wacker Heck	

Advanced Organic Chemistry – II (MSC07401) Day & Date: Thursday, 09-05-2024

Time: 03:00 PM To 06:

Instructions: 1) Quest

- 2) Attem
- 3) Figure

#### **Choose Co** Q.1 A)

- Which 1)
  - a) 1
  - c) N
- A real 2) of a syntho
  - a) S
  - c) T
- 3) The p startin
  - a) R
  - c) S
- 4) Which amines? a) C
- 5) The p a) S
- ons
- dition
- 6) Coupli the prese
  - a) H
  - c) O
- 7) Which
  - a) H
  - c) S
- Which 8) lene, an ole
  - a) P
  - c) Stille coupling
- 9) In Hydroboration addition is and addition of boron atom of BH<sub>3</sub> adds on olefinic carbon.
  - a) Syn, less hindered
- b) Syn, more hindered
- c) anti, less hindered d) anti, more hindered

SLR-HF-25

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 **ORGANIC CHEMISTRY** 

Seat No.



16

- Trialkylboranes react with carbon monoxide in the presence of \_\_\_\_\_ 10) to give R<sub>3</sub>CBO.
  - a) acid
  - c) base

- b) diglyme
- d) peracid

### B) Fill in the blanks.

- 1) A reaction which predominantly produces one of several possible structural (position) isomer is called reaction.
- The situation in which a synthon of polarity opposite to that normally 2) associated with the required functional group must be used is called \_\_\_\_

3) R OH 
$$\frac{Me_3SiCl}{Pyridine}$$
 ?

- is cross coupling reaction in which the organometallic compound 4) is alkenyltrialkyl or alkynyltrialkyl stannene.
- Pentacarbonyl iron can be reduced by sodium amalgam in THF to 5)
- 6) Hydroboration occurs by a concerted process and take place through a membered cyclic transition state.

### Q.2 Answer the following.

- Discuss the terms synthons and synthetic equivalents. a)
- Define and explain b)
  - 1) Umpolung
  - 2) Retrosynthetic analysis
- c) Write a note on protection of amine with Fmoc-Cl and tBOC-Cl with suitable example.
- Using a suitable protecting group how would you bring about the following d) conversion.



### Q.3 Answer the following.

- Discuss the protection of carbonyl group and describe the use of a) cyclic acetals and ketals as protecting groups for carbonyl compounds.
- Based on the disconnection approach suggest a convenient synthesis for b) the given compounds.



### Answer the following. Q.4

- Write a note on cross coupling reactions give its general mechanism and a) Explain Suzuki coupling reaction in detail.
- Explain the role of organoboranes in organic synthesis. b)

16

06

### Q.5 Answer the following.

a) Give the synthon and synthetic equivalent for the following T.M.



**b)** Discuss the role of  $Co_2(CO)_8$  in organic synthesis.

### Q.6 Answer the following.

- a) Discuss the one group C X disconnection with suitable examples.
- **b)** Explain the role of (Ipc)BH<sub>2</sub> and (Ipc)<sub>2</sub>BH in organic synthesis.

### Q.7 Answer the following.

- a) Write a note on Collmans reagent.
- **b)** Write a note on carbonylation reactions in organoborane.

16

Δ	()	Choose the correct alternative. <ol> <li>Predict the product of the following reaction</li> </ol>	10
		$R^1 \longrightarrow H + Br \xrightarrow{O} R^2 + NaN_3 \xrightarrow{Cu(II)-TD@nSiO_2}$ ? Sodium ascorbate $H_2O/EtOH$ ?	
		a) $R^{1}$ $N = N = N = 0$ $R^{2}$ b) $R^{2}$ $N = N = 0$ $R^{1}$ $R^{1}$	
		c) $R^1$ $N-R^2$ d) $N=N$ $N-R^1$ $R^2$	
		2) Predict the correct option of a major product. Ph $BH_3,THF$ $H_2O_2, NaOH$ ?	
		a) Ph OH Ph D	
		c) chieve	

**ORGANIC CHEMISTRY** Modern Organic Chemistry (MSC07402) Day & Date: Saturday, 11-05-2024

Time: 03:00 PM To 06:00 PM

Seat

No.

- Instructions: 1) Question no. 1 and 2 are compulsory.
  - 2) Attempt any three questions from Q. No. 3 to Q. No. 7.

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024

3) Figure to right indicate full marks.

#### Q.1 Δ) Choose the correct alternative



- a) Chiral reagent
- b) Chiral catalyst
- c) Chiral pool
- d) Chiral Auxiliary

SLR-HF-26

Max. Marks: 80

Set Ρ

4) Predict the product of the following reaction.



5) Predict the correct option of a major product.



6) In the following transformation, the correct option is \_\_\_\_\_



- a) Ultrasound b) Sol
  - Olliasouna Crystal transformati
- b) Solvo-thermal
- c) Crystal transformation
- d) Electro-chemical

06

16

9) Predict the correct option of a major product.



- 10) By partial substitution of surface ligands in the ZIF-8 framework, the surface improves to enhance thermal stability of the material.
  - a) Texture
- b) Hydrophilicity
- c) Morphology
- d) Hydrophobicity

### B) True or False.

- 1) The synthesis involves reactions that include multiple chemical conversions between, substrates, reagents and catalysts which are performed in a single vessel are called one pot reactions.
- 2) The chiral pool approach for asymmetric synthesis always gives product with 100% ee.
- 3) In HKUST-1 metal organic framework, HKUST stands for Hong Kong University of Scientific Technology.
- 4) The pore size of mesoporous materials ranges less than 2 Å.
- 5) The Ugi reaction is isocyanide-based multicomponent reactions.
- 6) The Strecker amino synthesis reaction proceeds via formation of imine intermediate.

### Q.2 Answer the following.

- a) Write a note on secondary building unit (SBUs).
- **b)** Differentiate zeolites, active carbons, and MOFs on the basis of their surface area and porous structure with the help of suitable examples.
- c) What is the Product in the following reaction? give its mechanism?

d) Define Pro-R, Pro-S, Re face and Si face with examples.

### Q.3 Answer the following.

- a) What is Jacobson-Katsuki epoxidation and Shi epoxidation? Comment on 08 the stereoselectivity with three examples of each.
- b) Explain diastereoselectivity of Aldol reactions with examples.

08

### Q.4 Answer the following.

- a) How MCRs are useful for synthesis of heterocycles using Aldol reaction? 08
- b) Discuss the mechanism of epoxidation with stereochemistry of major product. Give justification for major and minor product.



### Q.5 Answer the following.

- a) What are the functionalized MOFs? Explain in detail the methods involved in 08 MOF Functionalization.
- b) What is chiral reagent? What is synthesis of CBS reagent and its08 applications in enantioselective synthesis?

### Q.6 Answer the following.

- a) Define stereoselective reaction. Explain stereoselectivity of epoxidation with mCPBA and vanadyl reagent.
- b) How to confirm the structure of synthesized MOF? Explain the ways for MOF **08** analysis in detail.

### Q.7 Answer the following.

- a) What are the synthetic routes to metal organic frameworks? Explain
   Belectrochemical and microwave/ultrasound methods of MOF synthesis with suitable diagrams.
- b) What is the mechanism of Passerini and Gewald reaction? Write different08 examples of each.

	M.So	c. (S	emes	ster - IV) (New) (CBCS) ORGANIC CH	Exa EM	amination: March/April-2024 ISTRY	
			C	hemistry of Natural Pr	odu	icts (MSC07403)	
Day Time	& Da : 03:0	te: Ti 00 PI	uesda <u>y</u> M To C	y, 14-05-2024 06:00 PM		Max. Marks: 80	)
Instr	uctio	ons:	1) Que 2) Atte 3) Figi	estion no. 1 and 2 are compu empt any three questions fro ure to right indicate full mark	ulsor m Q s.	y. . No. 3 to Q. No. 7.	
Q.1	A)	<b>Cho</b> 1)	a) c)	<b>he correct alternatives.</b> _ is used primarily as a pest Strychnine Hardwickiic acid	icide b) d)	Taxol Reserpine	)
		2)	a) c)	_ is an antiprogesterone dru Carptothecin Podophyllotoxin	g. b) d)	Taxol Mifepristone	
		3)	a) c)	_ is believed to be the precu Ornithine Lysine	rsor b) d)	of the Indole alkaloid group. Tryptophan Methionine	
		4)	Gera vario a) c)	nyl and neryl pyrophosphate us monoterpenoids. acyclic bicyclic	es se b) d)	rve as the precursor for the monocyclic All three	
		5)	a) c)	_ have cis A/B ring fusion. Allolithobillianic acid Lithorillianiz acid	b) d)	Alloisolithobillianic acid All Three	
		6)	a) c)	_ function as an emulsifying Vitamins Sodium salt of bile acids	age b) d)	nt in the intestinal tract. Harmones None of these	
		7)	The r with _ a) c)	aw egg white contains a gly and its absorpt biotin, blocks folic acid, blocks	copr ion f b) d)	otein avidin, which tightly binds rom the intestine. biotin, enhances riboflavin, enhances	
		8)	The e of thia a) c)	enzyme carbohydrate require amine to break down pyruvic acetone acetic acid	es th c acio b) d)	e coenzyme pyrophosphate ester d into acetaldehyde formaldehyde	
		9)	In cis a) c)	-decalin two cyclohexane rir a, e e, e	ngs a b) d)	are fused through bonds. a, a Both b and c	
		10)	a) c)	_ does not undergo condens Strychnine Strychnidine	satio b) d)	n with benzaldehyde. Dihydostrychnine All three	

## Seat No.

SLR-HF-27

Set Ρ

06



Q.2	An	swer the following.	16
	a)	Explain the nature of 'N' atom present in reserpine.	
	b)	Discuss the synthesis of progesterone from cholesterol.	
	c)	Discuss the biosynthesis of Tryptophan.	
	d)	Discuss the synthesis of pyridoxine starting with ethonyacetylacetone by Harries-Folker's method.	
Q.3	An	swer the following.	
	a)	Draw the conformations of different diastereomeric forms of perhydro anthracenes and compare their stabilities.	08
	b)	Discuss the synthesis of Riboflavin and explain its biochemical role.	08
Q.4	An	swer the following.	
	a) b)	Discuss the structure elucidation and synthesis of oestrone. Give the synthesis of Fredericamycin A.	08 08
Q.5	An	swer the following.	
	a)	Discuss the biosynthesis of isoquinoline and phenanthrene group alkaloids	08

b) Discuss the synthesis of mifepristone and give its applications.

### Q.6 Answer the following.

Q.7

a)	Discuss the synthesis of biochemical role of thiamine.	08
b)	Discuss the biosynthesis of tryptophan, tyrosine and phenylalanine by	08
,	shikimk acid pathway.	
An	swer the following.	
a)	Discuss the stereochemistry of steroids.	08
. (		

**b)** Discuss the synthesis of reserpic acid.

	3	Figure to right indicate full marks.
.)	<b>Cho</b> 1)	ose correct alternative. Which one of the following does not contain the piperidine moiety in the structure? a) Mepivacaine c) Lidocaine d) Bupivacaine
	2)	C-12 position is a part of the keto-enol system ina)Macrolide antibioticsb)Penicillinc)Tetracyclined)Aminoglycoside antibiotics
	3)	is the agent that acts directly on the cell membrane of the microorganism affecting permeability. a) Penicillins b) Nystacin c) Tetracycline d) Erythromycin
	4)	<ul> <li>The macrolide antibiotics do not have</li> <li>a) A large ketone ring</li> <li>b) A glycosidically-linked amino sugar</li> <li>c) A spiroketal group</li> <li>d) A ketone group</li> </ul>
	5)	is an antiviral drug.a) Captoprilb) Phenytoinc) Thiopentald) Acyclovir
	6)	Memory loss is associated witha) Parkinson's diseaseb) Alzheimer's diseasec) Psychosisd) Arthritis
	7)	<ul> <li>Mechanism of action of phenytoin is to</li> <li>a) Block sustained repetitive neuronal firing</li> <li>b) Reduce L-glutamate-mediated excitation</li> <li>c) Enhances pre-synaptic release of GABA</li> <li>d) To enhances Allosterically GABAergic inhibition</li> </ul>
	8)	Chloramphenicol is obtained from.a)Streptomyces capreolusb)b)Streptomyces venezuelaec)Streptomyces orchidaceusd)Streptomyces griesus
	9)	The penicillins have a carboxylic acid group placed ata)C-3b)C-2c)C-6d)C-7

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2024 **ORGANIC CHEMISTRY** 

**Medicinal Chemistry (MSC07408)** 

Day & Date: Thursday, 16-05-2024 Time: 03:00 PM To 06:00 PM

Seat

No.

Instructions:1) Q. Nos. 1 and. 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7

### Q.1 A

SLR-HF-28

Set

Ρ

10

Max. Marks: 80

Page 1 of 2

		10)	Chlor a) c)	oquine is Luminal amoebi Mixed amoebicio	 cide de	b) d)	Systemic amoebicide Oral amoebicide	
	B)	<b>True</b> 1) 2) 3) 4) 5) 6)	or Fa Clotri Bigua Penic Capto inhibi The C Strep	Ise mazole is a drug anides increases t cillin G is classified opril is an oral dru tors. Chemical name of tomycin is used to	with bis-triazo the excretion o d under narrov g & a membe f a Paracetam o treat fungal i	le nu of su w sp r of c ol is infec	ucleus. gar by the kidneys. ectrum antibiotics. class of drugs called ACE 2-Acetoxybenzoic acid. ctions.	06
Q.2	Ans a) b) c) d)	Give of Give of Explai Explai Explai	te folle classifi in the in antii in clas	owing cation and uses of synthesis of Para neoplastic activity sification of Penio	of Antidiabetic cetamol. v of Antimetab cillin.	drug olite:	gs. s.	16
Q.3	Ans a) b)	<b>swer th</b> Explai Explai	in the in SAF	<b>owing</b> SAR and synthes R and mechanism	is of Phenelzi of action of T	ne. etra	cyclines.	08 08
Q.4	Ans a) b)	<b>swer th</b> Explai Explai	ne follo in the in the	<b>owing</b> SAR and mechar SAR and synthes	iism of action is of chloroqui	of Ib ine.	uprofen.	08 08
Q.5	Ans a) b)	<b>swer th</b> Classi Explai	<b>ify anti</b> ify anti in the	<b>owing</b> imetabolites drug synthesis & SAR	s and their mc of captopril.	ode c	of action.	08 08
Q.6	Ans a) b)	<b>swer th</b> Explai Explai	<b>ne foll</b> e in the in synt	<b>owing</b> synthesis and me hesis and mecha	chanism of ac nism of action	tion of A	of Sulfacetamide. Aspirin.	08 08
Q.7	Ans a) b)	<b>swer th</b> Explai Classi	<b>in the</b>	<b>owing</b> synthesis and me ianginal drugs and	chanism of ac d discuss their	tion mo	of Propranolol. de of action.	08 08

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 INDUSTRIAL CHEMISTRY

Unit operations of chemical Engineering (MSC06301)

Day & Date: Friday, 10-05-2024 Time: 11:00 AM To 02:00 PM

Seat

No.

Instructions: 1) Q. Nos. 1 and. 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.

#### Q.1 A) Multiple choice Questions.

- 1) Mixer settler is an example of \_\_\_\_\_
  - b) Differential type extractor a) Stage type extractor
  - c) Both a & b
- d) None of the above
- 2) In the fixed tube sheet 1-1 heat exchanger, the tube side fluid flows in fashion with respect to shell side fluid. Countercurrent

b)

- Co-current a)
- c) Both a & b d) Not specific
- 3) 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
- 4) Following factors affect rate of filtration .
  - a) Viscosity of the filtrate
  - b) Properties of liquid to be concentrated
  - c) Resistance of the filter cake
  - d) Both a & c
- 5) In fractionating column, the portion below the feed plate including feed plate is called
  - a) Rectifying section
  - c) Accumulator
- 6) Packed tower is used in \_\_\_\_\_.
  - a) Coal industry
  - c) Polymer industry
- 7) Agitated tank crystallizer is \_\_\_\_\_ type of crystallizer.
  - b) Continuous a) Batch c) Semibatch d) Both a & b
- 8) Factors that affect the rate of leaching are
  - a) Solvent b) Agitation
  - c) Temperature d) All of these
- 9) Blake Jaw crusher is classified under Crusher.
  - Intermediate a) Coarse b) c) Fine grinder
    - d) All of these

Stripping Section b)

- Steam section d)
- b) Petrochemical industry
- d) All above

10

SLR-HF-30

Set

Max. Marks: 80

								•=	•••
		10)	Supera a)   b) / c)   d)	saturation in va Evaporation of I Adiabatic evapo By adding third Indirect cooling	cuum crysta hot solution orative coolir component	llizer is ach ng	ieved by		
	B)	Fill 1) 2) 3) 4) 5) 6)	in the Crysta Dew p Grizzle Induce called The ur	blank and True Illization proces oint measure thes are used to se d distribution o nit 'Mesh' is use are used to inc	e/ False. s is a unit op boling po creen f two separa d to measur crease veloci	peration. int of liquid _ Material. te phases t re ty and turb	mixture. hrough one ulence of the	another is shell side fluid.	06
Q.2	Ans a) b) c) d)	<b>swer the following.</b> What is volume and Longitudinal Strain? What are different method of supersaturation? Explain Supersaturation achieved by evaporation. Explain Long tube Vertical tube evaporator. Explain working of Dorr thickener with neat labelled diagram.							
Q.3	Ans a) b)	<b>swer</b> t Expl Drav	<b>the fol</b> l ain with v neat l	l <b>owing.</b> n schematic dia abeled sketch a	gram Rotary and explain v	drum filter working of I	3lake Jaw cr	usher.	08 08
Q.4	Ans a) b)	swer t Expl Disc	<b>the fol</b> l ain with uss Bu	l <b>owing.</b> n schematic dia bble cap and va	gram workin alve plate us	g of Kettle ed in distilla	reboiler. ation column		08 08
Q.5	Ans a) b)	swer f Expl tolue Expl	t <b>he fol</b> ain the ene mix ain with	l <b>owing.</b> process of Stea ture. n neat labeled d	am distillatio liagram mult	n with resp iple effect e	ect to Benze evaporator.	ne and	08 08
Q.6	Ans a) b)	<b>swer</b> f Disc Expl	<b>the fol</b> l uss cor ain with	l <b>owing.</b> nstruction and v n schematic dia	vorking of O gram Stress	slo cooling -Strain rela	crystallizer. tionship.		08 08
Q.7	Ans a) b)	<b>swer</b> f Drav Drav	<b>the fol</b> l v scher v neat l	l <b>owing.</b> natic diagram o abeled sketch a	f Pulse colu and explain v	mn and exp working of I	olain operatic 3ollman Extra	on process. actor.	08 08

Set

Max. Marks: 80

## Seat No.

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 INDUSTRIAL CHEMISTRY

Unit Processes in Chemical Technology (MSC06302)

Day & Date: Monday, 13-05-2024

Time: 11:00 AM To 02:00 PM

2)

**Instructions:** 1) Q. Nos.1 and 2 are compulsory.

- 2) Attempt any Three questions from Q.No.3 to Q.No.7.
- 3) Figures to the right indicate full marks.

## Q.1 A) Choose correct alternative.

- 1) How is sodium or potassium xanthate purified?
  - a) Distillation

b) Recrystallizationd) All of the mentioned

Initiators

- c) Evaporationd) All of the mentionedSubstance which are introduced in a polymerization reaction to slow
  - down or stop the reaction \_\_\_\_\_. a) Inhibators b)
  - a) Inhibators c) Catalyst
    - d) Accelerators
- 3) Sulfation involves placement of which group on carbon atom?
  - a) -OSO2OH b) -SO2-OH
  - c) CISO<sub>3</sub>H d) SO<sub>2</sub>CI

## 4) Which is the most important Nitrating medium?

- a) Nitric acid and H<sub>2</sub>SO<sub>3</sub>
- b) Nitric acid and Sulphuric acid
- c) Nitrogentetraoxide and -H<sub>2</sub>SO<sub>4</sub>
- d) All of the mentioned
- 5)  $C_2H_2 + 2CI_2 \longrightarrow$ 
  - a) CICH CHCI b)  $CI_2CH CHCI_2$
  - c) CI<sub>3</sub>CH CHCI d) CICH=CHCI
- 6) In which position does the nitro group enters?
  - a) Ortho b) Para
  - c) Meta d) All of the mentioned
- 7) What happens to the rate of reaction as reflux ratio increases?
  - a) Increases b) Decreases
  - c) No change d) None of the mentioned
- 8) Dimethyl terephthalate is obtained by esterification of what?
  - a) Benzene c) Terephthalic acid

a) Exothermic

- b) Ethanold) phthalic acid
- 9) What type of reaction is a dehydrogenation reaction?
  - b) Endothermic
  - c) Neutral d) None of the mentioned

		10) Predict the product: OH	
		$\frac{OsO_4}{TMEDA} ?$	
		а) он	
		c) OH OH OH OH OH OH OH	
	B)	Write true/false OR fill in the blanks.	06
		a) True b) False	
		<ol> <li>Cellulose acetate is used in manufacturing of photographic films.</li> <li>a) True</li> <li>b) False</li> </ol>	
		<ul> <li>3) Vanadium oxide acts as a catalyst in vapour phase oxidation of</li> </ul>	
		a) True b) False	
		<ul> <li>While decreasing the D.V.S value the stability also decreases.</li> <li>a) True</li> <li>b) False</li> </ul>	
		<ul> <li>5) The formation of acetic acid through oxidation is done in phase.</li> <li>6) The nitrating agent is a reactant.</li> </ul>	
Q.2	Ans	swer the following.	16
	a) b)	Describe in brief the desulphonation. Describe in brief the oxynitration	
	c)	Describe the Schmid nitrator.	
	d)	Give the relationship between D.V.S. and Stability of Nitrator Charge.	
Q.3	Ans	swer the following. Discuss the vapour phase ovidation of methanol?	08
	b)	Describe in detail the manufacturing process of cellulose acetate.	08
Q.4	Ans	swer the following.	
	a)	Predict the product and discuss the mechanism.	08
		ii. $H_2O_2/H_2O$	
		i. (CH <sub>3</sub> ) <sub>2</sub> CuLi	
		iiBr	
	b)	Discuss in detail Hoffmann-Loffler-Freytag reaction with mechanism.	08

Q.5	Ans a) b)	<b>swer the following.</b> Explain with the diagram the manufacturing process of mono sulfonation of benzene. What is nitration? Discuss in brief nitrating agents.	08 08
Q.6	Ans a) b)	<b>wer the following.</b> Discuss the Liquid phase oxidation with oxygen of acetaldehyde to acetic acid, Explain with the diagram the manufacturing process of nitrobenzene?	10 06
Q.7	Ans a) b)	<b>wer the following.</b> Describe in detail the manufacturing process of monochlorobenzene. Explain in details various types of chemical reactor.	08 08

Seat				
No.			Set P	)
M.S	Sc. (Sei	nester - III) (New) (CBCS) Ex INDUSTRIAL CHE Instrumental Analysis -	amination: March/April - 2024 EMISTRY – I (MSC06307)	
Day & D Time: 1	0ate: We 1:00 AM	dnesday, 15-05-2024 To 02:00 PM	Max. Marks: 8	0
Instruct	tions: 1) 2) 3)	Q. Nos. 1 and 2 are compulsory. Attempt any three questions from 6 Figure to right indicate full marks.	Q. No. 3 to Q. No. 7	
Q.1 A)	) Choo 1)	ose correct options. is used in the gas chromato a) Cuvette c) Capillary tube	ography MS. b) Paper support d) Flask	0
	2)	GC-MS system consists of intensity. a) electromer c) ion transducer	_ system for measurement of ion b) ion meter d) all of these	
	3)	Open capillary tube columns consi a) glass c) coal	ists of material. b) metal d) silica	
	4)	Light is a principle of nephe a) absorption c) scattering	elometry. b) transmission d) reflection	
	5)	In linear sweep voltammetry, the c measured while the potential betwee reference electrode is swept a) diagonally c) linearly	urrent at a working electrode is een the working electrode and a in time. b) radially d) all of these	
	6)	In D.C. polarography, dropping a) silver c) mercury	electrode is used as a cathode. b) gold d) platinum	
	7)	a) resolution c) pretreatment	imeter in chromatography. b) mixing d) none of these	
	8)	In recent liquid membrane electroc replaced with a) polyvinyl chloride c) polyacryl chloride	des, the porous liquid membrane is b) polyester membrane d) polyacryl amide	
	9)	A proton Hb is coupled to four equintensity of lines in the signal Hb is a) 1:4 c) 1:4:6:4:1	ivalent proton Ha. The relative <u>)</u> b) 1:4:6 d) 1:4:6:4	

- filters are used in turbidimetry. 10)
  - b) white a) red c) blue
    - d) yellow

### B) Write true/false.

- In GC, slow injection of large samples leads to broadening of band and 1) less resolution.
- 2) Theoretical plates are used to estimate the column efficiency.
- The potential of reference electrode is set constant in voltammetry. 3)
- Ion selective electrode are unaffected by colour or turbidity of the solution. 4)
- The residual current in D.C. polarography is due to the reduction of analyte. 5)
- The difference between measured activity and actual concentration 6) becomes higher at higher concentration.

## Q.2 Answer the following.

- Describe with examples any four applications of ionic conductors. a)
- Write the differences between classical D.C. polarography and voltammetry. b)
- Write any four applications of gas chromatography. C)
- Draw the instrumentation of liquid chromatography mass spectrometry (LC-MS). d)

### Q.3 Answer the following.

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

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

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

Predict the structure

An organic compound of molecular formula C9H90Br shows the following b) features:

IR(KBr): a strong band at 1730cm - 1;

1*HNMR*: 2.4 $\delta$  (*s*, 3*H*, ); 3.1 $\delta$  (, *s*, 2*H*, ); 7.23 $\delta$  (*d*, 2*H*, *J* = 7.0 *Hz*); 7.49 $\delta$  (*d*, 2H, J = 7.0 Hz);

Make proper assignment of the data and predict the structure.

## Q.4 Answer the following.

- Write the principle, working and applications of nephelometry with neat a) labelled diagram.
- Describe membrane and enzyme electrodes with necessary mechanism. b)

### Q.5 Answer the following.

- Discuss D.C. polarography with neat labelled diagram a)
- Explain cyclic voltammetry and how it is useful for analysis various metal ions. b)

### Answer the following. Q.6

- Discuss the instrumentation, working and applications of gas chromatographic a) technique.
- b) Write about plate theory of chromatography and enlist the applications of LC-MS.

### Answer the following. Q.7

- Discuss temperature programmed gas chromatography with an illustration. a)
- Explain the working of metal oxide gas sensors with proper diagram. b)

16

16

16

06

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## Seat No.

## M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 **INDUSTRIAL CHEMISTRY** Chemical Industries (MSC06401)

Day & Date: Thursday, 09-05-2024 Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and. 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.

#### Multiple Choice Questions. Q.1 A)

3)

- Which of these is not a function of alloy steels? 1)
  - a) Increases strength c) Reduces cost
- b) Improves ductility d) Improves machinability

d) Crystalline temperature

b) An aliphatic primary amine

### 2) The temperature at which a non-crystalline material transforms from a supercooled liquid to rigid glass is b) Glass transition temperature

- a) Melting point
- c) Boiling point
- Which of the below is not an example of a base for paints?
  - a) White lead b) Cobalt
  - c) Zinc oxide d) Red lead
- 4) An azo dye is formed by interaction of an aromatic diazonium chloride with . a) A phenol
  - d) Nitrous acid c) Benzene
- Which of these is not a property of duralumin? 5)
  - a) High strength
  - b) 1/3 the weight of steel
  - c) Excellent casting and forging abilities
  - d) Poor machinability

### 6) Alizarin dye obtained from the root of madder plant is anthraquinone derivative. Its structure corresponds to

- a) 1, 2-dihydroxy anthraquinone b) 2, 3-dihydroxy anthraquinone
- c) 1, 4-dihydroxy anthraquinone d) 1-hydroxy anthraquinone
- Household Pesticide sprays are \_\_\_\_\_. 7)
  - a) Finit (flit)
  - b) Finit and Baygon
  - c) Finit, baygon, mosquito coils and cakes
  - d) DDT
- On average, what is the maximum use temperature of engineering 8) ceramics?
  - b) 815°C a) 260°C
  - c) 1200°C d) 2760°C

Max. Marks: 80

03

03

16

9)	The pesticide u	sed in foundations of buildings for preventing termite
	attack is	

- a) DDT b) BHC
- c) Endrin d) Aldrin

10)	The pesticides having very low biodegradation and strong affinity for
	fatty tissues are

- a) Organochlorines
- b) Organophosphates
- c) Triazines d) Pyrethroids

#### B) Fill in the blanks.

- An azo dye is fixed on fabrics by the process applicable in . 1)
- Any heavy petroleum oil, including residual asphaltic oil, used as dust 2) palliative and surface treatment on road is termed
- The mode of action of insecticides is through the attack on . 3)

#### C) State True or False.

- The primary element used for making stainless steel alloy is chromium. 1)
- 2) The melting point of pure aluminum is 520°C.
- In cast iron the percentage of carbon present is more than 2%. 3)

### Q.2 Answer the following.

- a) What are varnishes and enamels?
- **b)** Give the synthesis and applications of Aldrin.
- c) Give functions of pigments in paints.
- d) Give important application of borosilicate glass.

### Q.3 Answer the following.

a)	Manufacturing processes of titanium dioxide.	10
b)	Synthesis and applications of Endosulphan.	06

### Q.4 Answer the following.

- a) Describe in detail the extraction of aluminum from its ore. 08 08
- **b)** Explain in brief the purpose of alloying.

#### Answer the following. Q.5

- What are petrochemicals? Give an outline of chemicals derived from **08** a) butylene.
- What are agrochemicals? Discuss manufacturing process, properties and 08 b) applications of Malathion.

#### Answer the following. Q.6

Give the synthesis of Dimethylcarbamate, Dimethylpthalate. 08 a) Explain with suitable examples properties and applications of 08 b) triphenylmethane dyes.

#### Answer the following. Q.7

a) Give the synthesis and application of BHC. 08 b) Explain the setting and hardening of cement. 08

Cont					
Seat				Set	Ρ
N	/I.Sc	:. (Se	emester - IV) (New) (CBCS) Examination: March/April-2 INDUSTRIAL CHEMISTRY Pollution Monitoring and Control (MSC06402)	2024	
Day 8 Time:	a Dat 03:0	e: Sa 0 PN	aturday, 11-05-2024 Max. I 1 To 06:00 PM	Marks	: 80
Instru	uctio	<b>ns:</b> 1 2 3	) Q. Nos. 1 and. 2 are compulsory. 2) Attempt any three questions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.		
Q.1	A)	<b>Cho</b> 1)	Dose correct options.Which of the following is not a greenhouse gas?a) O2b) CO2c) water vapord) methane		10
		2)	The Water (Prevention and Control of Pollution) Act is passed in the year ofa) 1980b) 1973c) 1974d) 1975	e	
		3)	method is used for the determination of phosphorus from the a) Gilbert b) Oslen c) Polanco d) Sarah	e soil.	
		4)	appoints chairman of Central Pollution Control Board.a) Central Governmentb) Citizensc) State Governmentd) Governor of the State		
		5)	in water is estimated by Winkler method. a) Dissolved oxygen b) Cyanide c) Iodide d) Molecular nitrogen		
		6)	Phenolic compounds as an emerging pollutants have been enlistedfirstly by anda) WHO, US-FDAb) MHRA, EUc) US-EPA, EUd) IP, ANVISA	l by	
		7)	The head office of Central Pollution Control Board is at a) Mumbai b) Chennai c) New Delhi d) Hyderabad		
		8)	Heavy metals ions are known to be verya) toxicb) non-poisonousc) carcinogenicd) both a and c		
		9)	In removal of chromium by reduction method, Cr <sup>+6</sup> is converted to a) Cr <sup>+3</sup> b) Cr <sup>+7</sup> c) Cr <sup>+6</sup> d) Cr <sup>+8</sup>		·
		10)	The bacteria which requires free oxygen for their survival arebacteria.a) aerobicc) facultativeb) anaerobicd) None of these	_	

# Seat

### 06

16

- Write True or False.
  1) The CPCB plays an important role in the abatement and control of pollution in the country.
- 2) Sodium is a heavy toxic metal for human body.
- 3) The BOD limit as per MINAS for distilleries is 100 mg/L.
- 4) Melt processing is used for polymer recycling.
- 5) Kjeldahl method is used for estimation of carbon from the soil.
- 6) Steam gas stripping method is used for removal of phenols.

## Q.2 Answer the following.

B)

- a) Explain the sedimentation process for waste water treatment.
- **b)** Give details about the sources of phenolic compounds in the environment.
- c) Give an account on reduction method of chromium removal.
- d) Explain the sources of water pollution.

## Q.3 Answer the following.

- a) Explain in detail Air (Prevention and Control of Pollution) Act 1981, its implication and application in industrial pollution control.
- **b)** Describe in detail with necessary diagrams the ion exchange and biological methods for removal of phenolic residues.

## Q.4 Answer the following.

- a) Discuss any two tertiary treatment methods for waste water treatment with diagrams.
- **b)** Explain the nature of gaseous and liquid industrial effluents? Discuss how CO, SO<sub>2</sub> and NO<sub>x</sub> are analyzed in the air sample?

## Q.5 Answer the following.

- a) Discuss in detail removal of chromium by lime coagulation and reverse osmosis method.
- **b)** Explain in detail toxic effects of mercury and its removal from gaseous and liquid streams.

## Q.6 Answer the following.

- a) What is soil pollution? Explain analysis of soil for the factors like moisture content and phosphorus.
- **b)** What is water pollution? Explain analysis of water for the factors of free acids and dissolved oxygen.

## Q.7 Answer the following

- a) Discuss the methods used for the recycling of plastic polymers. What are the important products obtained from recycled plastic polymeric materials?
- **b)** What is water management? Explain briefly IS-2296, IS-3360 and IS-3307.

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										S	SLR-H	1F-	36
Seat No.											S	et	Ρ
М.	Sc.	(Se	mest	ter - I	V) (Nev	v) (CBC	S) Ex	amina	tion: M	arch/A	pril-20	)24	
		Na	anon	nateri	ials and	dustrial	Chem aracte	nstry erizati	on (MS	C0640:	3)		
Day & I Time: 0	Date )3:00	e: Tue D PM	sday, To 06	14-05 6:00 Pl	5-2024 M						Max. M	arks	: 80
Instruc	tion	n <b>s:</b> 1) 2) 3)	Ques Atter Figur	stion n npt an re to ri	o. 1 and y three q ght indic	2 are cor uestions ate full m	npulsor from Q arks.	y. . No. 3	to Q. No	. 7.			
Q.1 A	2) (	<b>Choo</b> 1)	se co An in a) L b) E c) S d) N	orrect nporta .arge s Big stre Shining None c	options nt physic surface to ength g in colou of these	al proper o volume ır	ty of na ratio	anomat	erials is_				10
	2	2)	Nanc a) F c) C	omater <sup>-</sup> uel ce Catalys	rials have ell sis	e large ap	plicatio b) d)	ns in Medi All of	cine these				
	č	3)	Nanc range a) 1 c) 1	otechn e from to 10 to 10	ology is 1  0 mm 0 cm	he synth	esis an b) d)	d applie 1 to 1 1 to 1	cation of ι 100 nm 100 μm	material	having	size	
	2	4)	In ze nano a) C c) T	ro dim range Dne <sup>-</sup> wo	ensional e.	nanoma	terial, _ b) d)	d No Three	imension	is outsi	de the		
	Ę	5)	CVD a) C b) C c) C d) N	stand Chemio Chemio Chemio None c	s for cal vapor cal vapor cal volum of these	 depositio degrada ne deposi	on tion tion						
	(	6)	SEM a) F c) F	belon hoto- hoto-a	gs to the emission absorptic	family of	b) d)	spectro Elect None	oscopies. ron e of these				
	7	7)	The I abou a) T c) ∆	DSC a t g \H	nalysis c _·	of the poly	/mer sa b) d)	imple g Tm All of	ives infor these	mation			
	٤	8)	Ther a) T b) C c) T d) E	nitroge o mai Other g o avo Soth a)	en gas is ntain an gases are id oxidat ) and c)	used in T inert atm e costly ion	「GA ana osphere	alysis a e	IS				

06

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9) The number of atoms present in a simple cubic cell is \_\_\_\_\_.

a)	2	b)	1
c)	3	d)	4

10) For destructive interference to take place, the phase difference between the two waves should be

a)	(2n+1)∏//2	b)	(2n+1)λ
c)	(2n+1)π	d)	(2n-1)π/2

### B) Write true or false.

- 1) In nanotechnology, SEM can be used to study the surface phenomenon of the materials.
- 2) Nano-sensors are highly selective towards their target side.
- 3) Electrodeposition method is not used for the synthesis of nanomaterials.
- 4) Nano-devices are small enough to enter into the cell.
- 5) TGA is used to measure the change in weight or weight property of a material.
- 6) X-ray K $\alpha$  line wavelength is longer than K $\beta$  line.

### Q.2 Answer the following.

- a) What are zero-, one-, two-, and three-dimensional nanomaterials?
- **b)** Explain some properties and applications of nano-sensors.
- **c)** Describe the different thermal stability graphs obtained by different polymers in TGA.
- **d)** What are the Miller indices of a plane making intercept la, 2/3b, and 1c also draw the plane?

### Q.3 Answer the following.

Q.4

Q.5

a)	Describe in detail the electrodeposition and spray pyrolysis methods with neat labeled diagram for the synthesis of materials.	08		
b)	Explain the chemical bath deposition and chemical vapor deposition methods for the synthesis of nanomaterials.	08		
Answer the following.				
a)	Explain in detail the principle, construction, working and applications of scanning electron microscopy (SEM).	08		
b)	Explain the principles with labeled diagrams of x-ray photoelectron microscopy (XPS) and transmission electron microscopy (TEM).	08		
Answer the following.				

- a) Explain in detail the applications of nanomaterials in the agriculture and electronics Industries.
   08
- b) Explain in brief Czochralski method for the preparation of gallium and indium. 08

### Q.6 Answer the following.

a) Describe in details the instrumentation of DSC analysis
b) The lattice constant of a unit cell of Aluminium is 4.049 A.<sup>0</sup> Calculate the spacing of (1 1 0) plane.
08

### Q.7 Answer the following.

- a) Give the principle of DTA & describe the factors affecting DTA analysis.
  b) Derive an equation for the interplanar distance between two planes in the
  08
- orthorhombic unit cell.

Page 2 of 2

Ρ Set

M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April - 2024 INDUSTRIAL CHEMISTRY

Industrial Management and Material Balance (MSC06408)

Day & Date: Thursday, 16-05-2024 Time: 03:00 PM To 06:00 PM

Seat

No.

**Instructions:** 1) Q. Nos. 1 and 2 are compulsory.

- 2) Attempt any Three questions from Q.No.3 to Q.No.7.
- 3) Figures to the right indicate full marks.

### Choose the correct alternatives from the options. Q.1 A)

- Fats-containing substances are used for production. 1)
  - a) Biodiesel c) Both a) and b)
- Bioethanol b) d) Polyethylene Glycol
- 2) The Non-renewable source of energy is
  - a) Coal
  - c) Wind energy

Solar Energy b)

Stratified random sampling

- d) Ocean tides
- A solution of common salt in water is prepared by adding 20 kg of 3) salt to 100 kg of water, to make a liquid of density 1323 kg m<sup>-3</sup>. Calculate the concentration of salt in this solution as a weight fraction, and %weight/weight
  - a) 0.167 and 16.7%
  - b) 0.207 and 20.7% c) 0.20 and 16.7% 0.181 and 18.1% d)
- Researchers use the method to choose the sample members of a 4) population at regular intervals. It requires the selection of a starting point for the sample and sample size that can be repeated at regular intervals. This type of sampling method has a predefined range, and hence this sampling technique is the least time-consuming. Cluster sampling

b)

d)

- a) Simple random sampling
- c) Systematic sampling
- 5) Batch process falls into the category of
  - Closed system a) Open system b)
  - c) Isolated system d) Both b) and c)
- Which statement is wrong with respect to Industry-University 6) Collaborative Relationships?
  - a) Society get benefitted
  - b) University get benefits, as it procure infrastructural facilities available with industry
  - c) It stimulates companies' internal research and development programs
  - d) When university researchers develop a patent, sponsored by industry the university often gains the first right to license the product

Max. Marks: 80
- 7) \_\_\_\_\_ Institute provides SSI, workshops & laboratory facilities to small-scale units & to demonstrate the use of modern technical processes on different machines & equipment.
  - a) NSIC b) IDEMI
  - c) SIDO d) SISI
- 8) Acetone is incompatible with \_\_\_\_\_
  - a) Concentrated nitric and sulphuric acid mixtures
  - b) Water and sulphuric acid mixtures
  - c) Concentrated nitric and water mixtures
  - d) All of the above
- 9) MMTC stands for \_
  - a) Minerals and Metals Trading Corporation of India Ltd
  - b) Minerals and Material Trading Corporation of India Ltd
  - c) Metals and Material Trading Corporation of India Ltd
  - d) None of the above
- 10) A mixture of gas has the composition- of 16% oxygen, 17% carbon dioxide, 4% carbon monoxide, and 63% Nitrogen. What are the moles of Oxygen in the overall composition?
  - a) 0.05-mols b) 0.05 mols
  - c) 0.04 mols d) 0.4 mols

### B) Fill in the blanks/Write true or false.

- Toys making is a type of Small scale Industry.
   a) True
   b) False
- Selection of Product' is not a condition to establishing a Small scale Industry.
  - a) True b) False
- 3) Peroxide are shock-sensitive chemical, when moist.a) Trueb) False
- 4) Input + generation output -consumption =accumulation is a general energy balance equation.
  - a) True b) False
- 5) Byproduct of fuel cell is carbon dioxide.a) Trueb) False
- 6) Stratified random sampling is a method in which the researcher divides the population into smaller groups that don't overlap but represent the entire population.
  - a) True b) False

### Q.2 Answer the following.

- a) What information is procured from a pilot plant study?
- **b)** What is the unsteady state process? Write the material balance Equation.
- c) Write short notes on the importance of research and development (R&D).
- **d)** Define an Ancillary Small scale unit. How it differs from a small-scale unit.

### Q.3 Answer the following.

- a) Explain with respect to the raw material the manufacturing process of Bio- 08 ethanol.
- **b)** What is meant by Export? Describe the rules and regulations.

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#### Q.4 Answer the following.

- a) Explain with a graphical representation p-chart in quality determination. 08
- b) A labeled flowchart of a continuous steady-state two-unit process is shown below. Each stream contains two components, A & B, in different proportions. Three streams whose flow rates &/or compositions are not known are labeled 1, 2, and 3. Calculate unknown flow rates & compositions of streams 1, 2, & 3. The outer boundary encompasses the entire process and has as input & output streams all of the streams that enter & leave the process. Two of the interior boundaries surround individual process units, & the third encloses a stream junction point.



#### Q.5 Answer the following.

- a) What is meant by Process Patent? What are the step involved to obtain 08 Patent?
- b) Discuss the rules and regulation for Transportation of Hazardous chemical 08 waste.

#### Q.6 Answer the following.

- a) Discuss the general procedure for solving the Material balance problem. 08
- **b)** Discuss in detail the Indian factory act 1948.

#### Q.7 Answer the following.

- a) Explain the term.
  1) Integral Balance
  2) Shaft work
  3) Recycle stream
  - 4) Purge stream
- b) What are the Advantages and Disadvantages of Incineration process. 08

		Fur	ndam	entals of Feedstocks	s and Po	olyı	mers (MSC05301)	
Day Time	& Dat : 11:(	te: Fr 00 AN	iday, ′́ ⁄I To C	10-05-2024 02:00 PM		-	Max. Mark	s: 80
Instr	uctio	ons: 1 2	1) Q. N 2) Atte 3) Figu	Nos. 1 and 2 are compulso empt any three questions f ure to right indicate full ma	ory. from Q. No irks.	o. 3	to Q. No. 7	
Q.1	A)	<b>Cho</b> 1)	<ul> <li>(hoose correct alternative.</li> <li>What is the role of chain transfer agent in polymerization? <ul> <li>a) To initiate the polymerization</li> <li>b) To increase the molecular weight</li> <li>c) To increase polymerization rate</li> <li>d) To control the molecular weight</li> </ul> </li> <li>What is the order of solubility among the various types of polymers? <ul> <li>a) Branched &lt; Linear &lt; Cross linked</li> <li>b) Cross linked &gt; Linear &gt; Branched</li> <li>c) Branched &lt; Linear &lt; Branched</li> </ul> </li> </ul>					
		2)						
		3)	Knoo term a) c)	cking characteristics of fue s of in terms of what? Octane rating Cetane rating	el used in b) d)	peti C C	rol engine are expressed in etane number racking number	
		4)	<ul> <li>Why polymer obtained with narrow molecular weight distribution in suspension polymerization method?</li> <li>a) Good control on stabilizer</li> <li>b) Good control on inhibitor</li> <li>c) Good control on kinetic chain length</li> <li>d) Good control on retarder</li> </ul>					
		5)	Whio a) c)	ch of the following chemica Toluene & Butanol Cresol & Propanol	als obtain b) d)	ed k P A	by Cumene process? henol & Acetone II of these	
		6)	Poly a)	mers of aldehyde are com Polyketals	imonly ter b)	rme N	d as? ylons	

M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 POLYMER CHEMISTRY

- c) Polyols d) Polyacetals
- What are the potential problems for runaway reactions by Batch Process? 7)
  - Removal of byproduct a)

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- Incremental addition of monomers b)
- Maintaining batch to batch product uniformity c)
- Suitable for polymerization to carried out higher conversion d)
- What is the trade name of phenol formaldehyde polymer synthesized by 8) using base catalyst?
  - a) Resol c)
- b) Ryton
- Novolac d) Lexan

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- 9) Temperature at which vapours of oil is sufficient to maintain the flame when oil is heated in standard apparatus, is known as?
  - a) Fire point
  - b) Flash point
  - c) Smoke Point
  - d) Spontaneous ignition temperature
- 10) Why refining of crude oil is necessary?
  - a) For addition of the impurities
  - b) For evaporation
  - c) For Fractionation
  - d) All of above

#### B) Fill in the blanks and Write True/False.

#### 1) Write True or False.

- i) In the chain growth polymerization long reaction time is essential to obtain the high molecular weight polymer. (True / False)
- ii) Polymers having more than four terminals are known as Single strand polymers. (True *I* False)
- iii) In the Nylon 6, 12 the first number added onto nylon indicates number of carbon atoms in diacid. (True / False)

#### 2) Fill in the blanks.

- i) The IUPAC rules published in \_\_\_\_\_ year allow to name the organic polymers in a systematic manner based on polymer structure.
- ii) PET is produced by the polymerization of \_\_\_\_\_ and \_\_\_\_\_ monomers.
- iii) Concentration beyond which micelle formation takes place is known as \_\_\_\_\_.

#### Q.2 Answer the following

#### 16

06

- a) Discuss the various theories associated with origin of petroleum.
- **b)** Give an account on solution polymerization method.
- c) Explain the manufacturing and properties of PP.
- d) Compare the addition polymerization with condensation polymerization.

### Q.3 Answer the following

	a) b)	Discuss in detail emulsion polymerization technique. Describe the use of toluene as resource for chemicals and polymers.	10 06			
Q.4	Ans	swer the following.				
	a)	Discuss the use of ethylene as feedstock towards monomers and polymers.	10			
	b)	Describe the synthesis, properties and application of nylon-6,6.	06			
Q.5	Answer the following.					
	a)	Describe the manufacturing of polystyrene by various methods. Give its properties and applications.	08			

b) Discuss the classification of polymers based on origin, backbone, thermal behavior, ultimate uses etc. with one example of each.

### Q.6 Answer the following.

a)	What is Refining of crude oil? How to remove the various impurities from	08					
	crude oil? Discuss the refining process of crude oil in details.						
b)	Discuss the interfacial and phase transfer catalyzed interfacial polymerization techniques for synthesis of polymers.	08					
A	A new on the fallowing						

## Q.7 Answer the following

a)	Describe in detail about Nomenclature of organic polymers based on	80
	polymer structure in a systematic manner with suitable common examples.	

b) Give an account on any one renewable resource as building block for 08 polymer industries.

Μ	l.Sc.	. (Se	mester - III) (New) (CBCS) E	Exa =MI	mination: March/April-2024
	Мо	rpho	ology and Physical Chemis	try	of Polymers (MSC05302)
Day 8 Time	& Da : 11:(	te: M 00 AN	onday, 13-05-2024 / To 02:00 PM		Max. Marks: 80
nstr	uctic	ons: ´	<ol> <li>Q. Nos.1 and 2 are compulsory.</li> <li>Attempt any Three questions from the second second</li></ol>	om ( mar	Q.No.3 to Q.No.7. ks.
Q.1	A)	<b>Cho</b> 1)	ose correct alternative. DSC technique is used to measu a) Tg c) Tm	ıre b) d)	T <sub>c</sub> All of the above
		2)	Molecular mass of polymers are a) average c) mode	exp b) d)	ressed as a/an median percentage
		3)	<ul><li>Function of the photo stabilizer is</li><li>a) To absorb UV- radiations</li><li>c) Transmit the radiations</li></ul>	s b) d)	Reflect-photo radiations All of the above
		4)	<ul> <li>Cryoscopy is related to of</li> <li>a) osmotic pressure</li> <li>b) elevation of boiling point</li> <li>c) depression in freezing point</li> <li>d) lowering of vapour pressure</li> </ul>	a so	blution.
		5)	<ul><li>TMA analysis of polymer is used material against temperature.</li><li>a) dimensions</li><li>c) viscosity</li></ul>	to e b) d)	estimate change in of the molecular weight mobility
		6)	<ul><li>In GPC the column is filled with a</li><li>a) column Powder silica</li><li>c) polymer beads</li></ul>	a ma b) d)	iterial called as column silica None of the above
		7)	The physical mixture of two or m covalent bonds is called as a) oligomers c) blends	ore  b) d)	polymers that are not linked by dendrimer copolymer
		8)	By XRD analysis of polymers a) thermal stability c) crystallinity	b) d)	is estimated. solubility viscosity
		9)	The T <sub>g</sub> of the polymers on a) increases	ado b)	dition of plasticizer. decreases

c) is not affected

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## C

- d) suddenly increases

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		<ul> <li>10) is useful lor inhibition of microbial growth in biodegradable polymer.</li> <li>a) Antimicrobial agent</li> <li>b) Antioxidant</li> <li>c) Stabilizer</li> <li>d) None of these above</li> </ul>							
	B)	<ul> <li>Fill in the blanks.</li> <li>1) In analysis, change in temperature is maintained to zero.</li> <li>2) The glass transition temperature of polymers shows transition from to state.</li> <li>3) The viscosity-average molecular weight is denoted by</li> <li>4) are used to protect the polymers from oxidation.</li> <li>5) Yellowing of the white synthetic garment after long use is due to</li> <li>6) GPC is used to determine and types of molecular weight of polymers.</li> </ul>	<b>06</b>						
Q.2	Ans a) b) c) d)	swer the following.       1         Describe mechanical degradation of polymeric material with suitable example.       1         What is the principle of DSC? Describe Heat flux DSC method.       1         Write a note on Inherent viscosity of polymers.       1         Describe in brief biodegradable polymers.       1							
Q.3	Ans a) b)	<b>swer the following.</b> What is TMA analysis? Give details about its instrumentation. Describe in detail types of degradation of polymers.							
Q.4	Ans a) b)	nswer the following. Describe Ultracentrifugation method in detail. Define glass transition temperature (Tg). Give the various factors affecting the Tg of polymers.							
Q.5	Ans a) b)	<b>wer the following.</b> Describe briefly the instrumentation and working of gel permeation chromatography (GPC). Write a detailed note on end group analysis method for polymers.	16						
Q.6	Ans a) b)	<b>wer the following.</b> Explain the mechanism of degradation by ozone attack with suitable example. Explain amorphous phase of polymers with suitable diagram.	16						
Q.7	Ans a) b)	wer the following. Explain the degradation behaviour of polymers by thermal and photo oxidation reaction with suitable example. Write a short note on light scattering.	10 06						

ľ	M.Sc	. (Ser	nes	ter - III) (New) (CBCS) Exa POI YMER CHEM	min IIST	ation: March/April - 2024 RY	
			Bas	sic Concepts of Polymeriz	atic	on (MSC05306)	
Day Time	& Dat : 11:0	e: We 00 AM	dnes To 0	day, 15-05-2024 2:00 PM		Max. Marks	: 80
Instr	uctio	<b>ns:</b> 1) 2) 3)	Q. N Atte Figu	los. 1 and 2 are compulsory. mpt any three questions from Q ire to right indicate full marks.	. No.	3 to Q. No. 7	
Q.1	A)	<b>Choo</b> 1)	ose o Mon a)	correct alternatives. (each will omer reactivity r1> 1, r2 > 1 is f Random copolymerization	carr or b)	Alternating copolymerization	10
		2)	a) c)	is used as a catalyst for ani Protonic acids AIBN	onic   b) d)	polymerization. Benzyl peroxide Metal alkoxides	
		3)	a) b) c) d)	is involved in ROMP. AIBN Visible light Co-ordination of the double bo None of the above	nd		
		4)	The a) c)	Multicomponent monomer adde Alternating polymer Random polymer	ed po b) d)	lymer is called as Block polymer Terpolymer	
		5)	a) b) c) d)	are used for analysis of Co- Nuclear magnetic resonance Infrared spectroscopy Radio isotopic labeling techniq All of the above	polyr ue	ners.	
		6)	The equa a) c)	temperature at which rate of pro al is called as propagation temperature ceiling temperature	opag b) d)	ation and depropagation are depropagation temperature all of the above	
		7)	typic a) c)	monomers are required for cal step-growth polymerization. Phenol and formaldehyde Diamine and formaldehyde	the fo b) d)	ormation of Bakelite via a Isocyanate and alcohol Ester and phenol	
		8)	a) c)	Polymer is used as drug de Block co-polymer Radical chain polymer	livery b) d)	agent. Dendrimeric polymers Condensation polymers	
		9)	a) c)	occurs in plasma stage. Ionized solid molecules Both a and b	b) d)	lonized liquid molecules lonized gaseous molecules	

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		10) are starting monomer in addition polymerization.	
		a) Diacid and diol b) Diboronate and dihalide	
	B)	Fill in the blanks.       ()         1)       Free Radical Polymerization occurs in three steps, i.e.       ,	)6
		<ul> <li>and</li> <li>2) The carbon-oxygen bond in ethers is a strong bond, and the ether oxygen in the Lewis sense.</li> </ul>	is
		<ol> <li>Based on its occurrence nylon is the polymer.</li> <li>is used as initiator in anionic ROP of cyclic siloxanes.</li> <li>Organo-silicon initiator is used for</li> <li>Condensation polymerization is also called as</li> </ol>	
Q.2	Ansv a) b) c) d)	wer the following. (each question carries 4 marks) How to control molecular weight in linear step-growth polymers? Explain the photochemical initiation in polymerization. Derive rate constant for the kinetics of cationic polymerization. Write a note on Copolymer composition.	6
Q.3	Ansv a) b)	<b>wer the following. (8+8)</b> Discuss the redox initiation in polymerization. Give the differences between radical and ionic polymerization.	6
Q.4	Ansv a) b)	<b>wer the following. (8+8)</b> Write in detail the Group transfer polymerization reaction. Derive rate constant for Kinetics of condensation polymerization in absence of catalyst.	6
Q.5	Ans a) b)	<b>wer the following. (8+8)</b> Give in brief the ring opening metathesis polymerization. Write the Heck reaction with example.	6
Q.6	Ansv a) b)	<b>wer the following. (8+8)</b> Explain the ring opening polymerization of cyclic ether. Describe in detail the Q-e scheme.	6
Q.7	Ans a) b)	<b>wer the following. (8+8)</b> Write in detail the monomer reactivity ration in copolymerization. Explain in the chain transfer reaction with example.	6

## Seat No.

## M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 POLYMER CHEMISTRY Step-growth Polymers (MSC05401)

Day & Date: Thursday, 09-05-2024 Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. No.1 and 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7 3) Figure to the right indicate full marks.

#### Q.1 A) Choose the correct alternative.

- is prepared by using the reaction of an acidic hydroxy groups 1) and epichlorohydrin.
  - a) Epoxy resin
  - b) Polyimide resin c) MF resin d) Both a) and b)
- 2) The Polyimide film formed by reaction between PMDA & ODA is called as . b) Sarona
  - a) Lexan
  - c) Dacron
- 3) Cobalt substances are \_\_\_\_\_.
  - a) thorough driers
  - c) bottom driers
- 4) Alternative source for phosgene gas in the synthesis of polycarbonate is
  - a) Phenyl calcium carbonate
  - b) Phenyl carbonate
  - c) Diphenyl carbonate
  - d) Diphenyl potassium carbonate
- is the trade name of PBT. 5)
  - a) Sarona
  - c) Dacron d) Celanex

#### 6) resin is also called as the aminoplast.

- a) Melamine formaldehyde
- c) Phenol formaldehyde
- 7) The polyimide is prepared by two steps by using \_\_\_\_\_ and \_\_\_\_\_ in presence of polar aprotic solvent.
  - a) PMDA and PPD
  - c) OMDA and PPD

9)

- 8) The reactants used for formation of Phenol in Cumene process are
  - a) Benzene & Propene
- d) Benzene & Hydrochloric acid
- c) Benzene & Chlorine gas is an initial molar ratio of melamine to formaldehyde in
- commercial resinification reaction.
- a) 1:3 b) 1:2 d) 2:1 c) 3:1

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Max. Marks: 80



10

d) Kapton

- b) surface driers
- d) Both a) and b)

- b) Cortora

- b) Urea formaldehyde
- d) Both a) & b)

  - b) PMDA and OPD
  - d) None of these
  - b) Benzene & Sulphuric acid

### 10) In manufacturing process of PTT \_\_\_\_\_ is used as a starting compound and \_\_\_\_\_ as a catalyst. b) DMD and metal acetate

- a) DMP and metal acetate
- d) None of these c) DMT and metal acetate

#### B) Fill in the blanks.

- The formation of small areas of swelling on the painted surface is 1) known as
- is a mechanical dispersion mixture of one or more pigments in 2) a vehicle.
- 3) The trade name Dacron, Mylar, Terylene is used for Polymer.
- 4) Novolac after crosslinking gives resin.
- In the preparation of urea formaldehyde resin catalyst is used. 5)
- Glyptal resin is also called as \_\_\_\_\_. 6)

#### Q.2 Answer the Following.

- What is Polyester? Explain the Semi aromatic polyester with suitable example. a)
- Describe the methods of applications of Paint. b)
- Write a short note on polybenzoxine. C)
- Define Paint and explain different constituents of paint. d)

#### Q.3 Answer the following.

- Describe the synthesis of PEN by transesterification reaction with the a) synthesis of monomers.
- b) Explain the Direct as well as Stepwise methods of synthesis of DMT.

#### Answer the following. Q.4

- Define Polycarbonates. Describe the synthesis of polycarbonate by Interfacial a) polymerisation method and give its advantages and disadvantages.
- **b)** Give the synthesis of formaldehyde and Hexa. Describe the synthesis of Resite.

#### Q.5 Answer the following.

- Write a short note on PBT & explain the drawback of using acidic condition a) while synthesis of PBT.
- b) Describe the synthesis of phenol by cumene and sulphonation processes and give the properties PF resin.

#### Answer the following. Q.6

- Explain the synthesis of Nylon 6 by Batch process and Anionic mechanism. a)
- Give the manufacture of phosphorous based flame-retardant epoxy resin. b)

#### Q.7 Answer the following.

- Define Aramide. Discuss the synthesis of Kevlar and give its applications. a)
- Describe the synthesis of melamine. Give the synthesis of MF resin by b) different processes.

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## M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 **POLYMER CHEMISTRY**

## Stereoregular Polymers and Modern Polymerisation Methods (MSC05402)

Day & Date: Saturday, 11-05-2024 Time: 03:00 PM To 06:00 PM

Instructions: 1) Question number 1 and 2 are compulsory.

2) Attempt any three questions from question number 3 to question No. 7 3) Figure to right indicate full marks.

#### Q.1 Choose correct alternative. A)

- 1) Which letters are used in denoting Absolute Configuration?
  - b) E and Z a) D and L
  - c) R and S d) P and Q

### 2) The "ABS" copolymer is formed by using which comonomers?

- a) Acrylamide-Butadiene-Styrene
- b) Acrylonitrile-Butene-Styrene.
- c) Acrylonitrile-Butadiene-Styrene.
- d) All of above

#### Which monomer unit is important in the First-Order Markov Model in determining subsequent stereochemistry of polymers?

- a) Last monomer unit is important
- b) Penultimate monomer unit is important.
- c) Antipenultimate monomer unit is important.
- d) No any monomer unit is important.
- 4) In terms of the nomenclature used for stereoregular polymers, cellulose has which structure?
  - a) Erythrodisyndiotactic Threodiisotactic b) c) Erythrodiisotactic
    - d) Threodisyndiotactic
- 5) In (AB)n ether-ester multi block copolymers soft polyether blocks provides flexibility and polyester hard block provides physical crosslink effect due to?
  - a) Crystallizability c) Polar nature
- b) Amorphous nature d) None of these
- 6) What is NMP in Controlled or Living Radical Polymerization?
  - a) Nitrogen Mediated Polymerization
  - b) Nitrogen- Mercury Polymerization
  - c) Nitroxide-Mediated Polymerization
  - d) None of above
- 7) What is the relation between initiation and propagation in Control **Radical Polymerization?** 
  - a) Initiation is slower than propagation
  - b) Initiation is faster than propagation
  - c) Initiation is equal to propagation
  - d) None of above



Max. Marks: 80

- 8) How many types of stereoregular polymers will obtain on polymerization of cyclopentene? a) Two
  - b) Three
  - d) Five c) Four
- 9) In Ziegler-Natta polymerizations the major interest is on which initiator system for isoselective polymerization?
  - a) Vanadium-Lithium system
  - b) Vanadium-Aluminum system
  - c) Titanium-Lithium systems
  - d) Titanium-Aluminum systems
- 10) Which basic morphological units are observed in St-Bu block copolymers?
  - a) Spheres b) Cylinders
  - d) All of these c) Lamellae
- B) Fill in the blanks and write True / False.
  - 1) Write True / False.
    - a) Polypropylene polymer has true chiral center in its monomer.
    - b) As per the significant evidences propagation takes place at Group I - III metal - Carbon bond in Ziegler-Natta polymerizations.
    - c) When the distribution of dyads and triads is less than completely random, the polymer is Stereoblock polymer.
  - Fill in the blanks. 2)
    - a) The isomerism displayed by unsaturated compounds or by ring compounds, where rotation about a carbon bond is restricted is called as isomerism.
    - b) Among the Primary and Secondary insertion when the substituted end of the double bond becomes attached to 'G' insertion will occur.
    - c) A branch of chemistry that deals with the study of the threedimensional structure of molecules is known as \_\_\_\_\_.

#### Q.2 Answer the following.

- a) Discuss the stereoselective and stereoelective polymerization.
- b) Discuss the E-Z nomenclature system.
- c) Give an account on Bernoullian Model.
- d) Describe the synthesis of A-B diblock co-polymer.

#### Q.3 Answer the following.

- Explain the effect of components of Z-N initiator system in non-polar vinyl a) 10 monomers. 06
- Discuss the different properties of block co-polymers. b)

#### Answer the following. Q.4

- Explain the various stereoregular structures obtained on polymerization of 10 a) 1.3- butadiene and 2-substituted-1.3-butadiene monomers.
- b) Explain the evidences towards propagation at carbon transition metal bond 06

#### Q.5 Answer the following.

- a) Explain the stereochemistry of polymer derived from ring opening 08 polymerization of suitable cyclic monomer.
- b) Discuss the (A-B-A)n triblock copolymer synthesis, properties and 08 applications with suitable example.

06

Q.6	An a) b)	<b>swer the following.</b> Explain the Co-ordination polymerisation of olefins and dienes. Discuss the advantage of RAFT over ATRP.	08 08
Q.7	An: a) b)	swer the following. Describe the stereoisomerism in poly(vinyl chloride). Discuss the mechanism of syndiotactic polymerisation using Z-N initiator with suitable example.	08 08

	M.S	Sc. (S	Semester - IV) (New) (CBCS) POLYMER CH	Exam IEMIS	ination: March/A	pril-2024
			Selected Topics in Pol	ymers	(MSC05403)	
Day Time	& Da : 03:(	te: Tu 00 PM	еsday,14-05-2024 I To 06:00 PM		· · · ·	Max. Marks: 80
Instr	uctio	o <b>ns:</b> 1 2 3	) Q. Nos. 1 and 2 are compulsory. ) Attempt any three questions from ) Figure to right indicate full marks	ו Q. No.	. 3 to Q. No. 7	
Q.1	A)	Cho 1)	<b>ose correct alternative. (Each qu</b> material is most commonly containing devices. a) Polystyrene	u <b>estion</b> used fo	carry 1 mark) or the production of bl Polyethylene	<b>10</b> ood
		2)	<ul> <li>c) Polypropylene</li> <li>Antimony oxide is an additive wh</li> <li>a) Flame resistance</li> <li>c) Conductivity</li> </ul>	d) ich impa b) d)	Polyurethane arts property. Heat resistance Weather resistance	
		3)	In optical lithography is use substrate. a) Visible light c) IP radiation	ed as a b) d)	source for exposing to Ultraviolet light Both a) & b)	o the
		4)	Cellulose ethers are prepared by presence of catalyst. a) sodium hydroxide, alkyl hali b) sodium hydroxide, sulfuric a c) potassium chloride, alkyl ha d) None of these	reactio de acid llide	n of cellulose with	in
		5)	Cellulose acetate film forms a/an a) elastic c) electrically conductive	r b) d)	naterial. optically clear thermally conductive	)
		6)	The electron beam induces cross a) PE c) PC	slinking b) d)	of PVC All of these	
		7)	Which of the following is used for a) Polypyrrol c) Polyaniline	<sup>.</sup> making b) d)	g rechargeable batteri Polyester Polyacrilonitrile	es?
		8)	Oxidative doping of polymers are a) p-doping c) Both a) and b)	b) d)	n-doping None of the above	
		9)	SBR is also known as a) Buna-S c) Buna-B	b) d)	Buna-R Buna-O	

Set P

		10)	Pho a) c)	toresist materials in optic inorganic polymers organic polymers	cal lithograp b) d)	hy are bio-polymers all of these	
	B)	Writa 1) 2) 3) 4) 5) 6)	e the The tissu Poly Dop poly Liqu Cell The	<b>True or False (Each qu</b> artificial construction or ue engineering. thene bags are the biode ing is the process of add mer to conduct electricity id crystals can be used to ulose acetate is used in to SBR is manufactured by	uestion car regeneration egradable w ling certain p y. co prepare m making of ci y solution po	<b>ry 1 mark)</b> n of new tissues is called as vaste. cositive or negative impurities in nedical drugs. igarette filters. olymerization method.	06
Q.2	Ans a) b) c) d)	Expla Expla Discu Write Expla	he fo ain in uss th note ain th	<b>Ilowing. (each question</b> short the polymers in me e physical properties and on waste polymer recove e advantages of polymer	n carries 4 edicine and d chemistry very. reagents a	<b>marks)</b> biomedical applications. of natural rubber. nd catalysts.	16
Q.3	Ans a) b)	<b>wer t</b> l Discu Defin	h <b>e fo</b> uss in e Hy	<b>llowing.</b> short the role of various drogel & explain in detail	additives ir the stimuli	rubber processing. sensitive hydrogel.	08 08
Q.4	Ans a) b)	<b>wer t</b> l Discu Expla	<b>he fo</b> uss th ain th	<b>llowing.</b> le polymer blends and al e polystyrene modificatio	loys. on <i>via</i> hydrog	genation and sulfonation.	08 08
Q.5	Ans a) b)	<b>wer ti</b> Discu Expla	<b>he fo</b> uss in ain in	<b>llowing.</b> detail synthetic rubbers detail the importance of	such as EP polymer nai	DM and neoprene. noparticles.	08 08
Q.6	Ans a) b)	<b>wer ti</b> Discu Expla hydro	h <b>e fo</b> uss th ain the ogena	<b>llowing.</b> le Conducting polymers a e process of natural rubb ation.	and Polyme ber modifica	rs in lithography. tion <i>via</i> chlorination, epoxidation,	08 08
Q.7	Ans a) b)	<b>wer t</b> l Discu cellul Expla	h <b>e fo</b> uss in ose. ain th	<b>Ilowing.</b> detail the cellulose mod e solid-phase synthesis o	ification, es	terification and etherification of des.	08 08

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Sea No.	t							Set	Ρ
	М.	Sc. (S Proce	eme	ester-	IV) (New) POLY	(CBCS) MER C and Po	) Exa HEN	amination: March/April-2024 IISTRY er Properties (MSC05408)	
Day Time	& Da : 03	ate: Th :00 PM	ursda I To 0	iy, 16-0 6:00 P	)5-2024 M		''y''''	Max. Marks	: 80
Instr	ucti	ons:1) 2 3	Que ) Atte ) Figu	stion 1 empt ar ure to r	and 2 are co ny Three fro ight indicate	ompulsor m Q.3 to e full marl	y. Q.7. ks.		
Q.1	A)	Choo 1)	ose t Extr a) b) c) d)	he cor usion r pipes bottle synta all of	rect alterna molding proc and wire co s x tank and c the above	<b>atives.</b> ducts are pating car bump	 er	·	10
		2)	a) c)	is Nylon Wool	the Syntheti	c fiber.	b) d)	Jute Sisal	
		3)	The a) c)	Chlori PVC PP	ne smells pi	ungent dı	uring b) d)	burning test for ABS PE	
		4)	HDT a) b) c) d)	「stand Meat Heat Heat All of	s for depending t deflection te developmer the above	 temperatu emperatu nt temper	ure re ature		
		5)	The a) c)	yellow White White	ness index to yellow to Brown	is measu	re of b) d)	colour change White to white White to Black	
		6)	The a) c)	soften be Hard Soft	ing point is yond some	the tempo arbitrary	eratu stanc b) d)	re at which a material becomes lard. Brittle All of the above	
		7)	The a) c)	lamina aeros buildi	ated product pace ng	s are use	ed for b) d)	automotive all of the above	
		8)	a) c)	is/ Visco Moleo	are the rhec sity cular weight	ological a	spect b) d)	s, in polymer processing. Elasticity All of the above	
		9)	In N	on - Ne	ewtonian flu	id the co	efficie	ent of viscosity depends on the	
			a) c)	stress Both	s, strain rate a and b		b) d)	shear history of the sample chemical structure of the fluid	

Page 2 of 2

# SLR-HF-46

06

16

- 10) \_\_\_\_\_ is the pseudoplastic.
  - a) Hydroxmethyl cellulosec) Cellulose
- b) Hydrox propyle cellulose
- d) Hydrox propyl methyl cellulose

### B) Write the True or False.

- 1) Water is ideal fluid.
- 2) Maxwell model gives information about Electricity.
- 3) Parison is used in blow molding.
- 4) Male and Female mold parts are used in injection molding.
- 5) Spinning is the process of converting textile fibers and filaments into Yarn.
- 6) Thermo gravimetric analysis is the process used to determined glass transition temperature.

### Q.2 Answer the following.

- a) Explain water absorption in brief.
- b) Explain the testing procedure for tyres and pipes.
- c) Write a short note on the flexural strength.
- d) Give details of the Rotational molding.

### Q.3 Answer the following.

- a) With the help of neat labeled diagram explain gel spinning process. 08
- b) Discuss in detail the impact strength of the thermoplastic polymers 08

#### Q.4 Answer the following.

a) Explain dielectric strength and dielectric loss factor of polymers
b) Draw net labeled diagram and explain in detail thermo forming mold process.
08

#### Q.5 Answer the following.

- a) Discuss in detail the general behaviors of polymer melts. 06
- b) Explain in depth the compression molding process with suitable diagram. **10**

#### Q.6 Answer the following.

a) Discuss in brief the dynamic mechanical behavior of polymers.
 b) What is injection molding? Explain its various aspects with the help of suitable diagram.
 06

#### Q.7 Answer the following.

a) Explain the stress-relaxation phenomena in polymers.
 b) Discuss in detail single screw extrusion molding process.
 10

Seat No.		Set	
Μ	.Sc. (Semester -	II) (New) (CBCS) Examination: March/April-2024	ļ
		PHYSICAL CHEMISTRY	
	Q	uantum Chemistry (MSC11301)	

Day & Date: Friday, 10-05-2024

Time: 11:00 AM To 02:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.

- 2) Attempt any three questions from Q. No. 3 to Q. No. 7
- 3) Figure to right indicate full marks.
- 4) Use of log-table/nonprogrammable scientific calculator is allowed.
- 5) Neat diagram and sketches should be drawn wherever necessary.

#### Choose correct alternative. Q.1 A)

- Which orbital is represented by the wavefunction 1)
  - $\psi = A r \sin \theta \cos \varphi \exp[-\frac{r}{2a_0}]$  for H-atom?

a)	2 <i>Px</i>	b)	3 <i>Px</i>
c)	2Pv	d)	3Pv

- c) 2*Py* The average distance of 1s electron for hydrogenic atoms as
- 2) the atomic number Z increases. increases a) b) decreases
  - d) None of the above c) remains constant
- Selection rule for rigid rotator is \_ 3) b)  $\Delta l = \pm 1, \Delta m_l = 0$  and  $\mu \neq 0$ a)  $\Delta l = \pm 0, \Delta m_l = 0$  and  $\mu \neq 0$ 
  - $\Delta l = \pm 1$ ,  $\Delta m_l = 0$  and  $\mu = 0$ d)  $\Delta l = \pm 1$ ,  $\Delta m_l \neq 0$  and  $\mu = 0$ c)
- Potential energy operator of one dimensional linear harmonic oscillator 4) is .

a)	$-\frac{1}{2}kx^2$	b)	$\frac{1}{2}kx^2$
c)	$kx^2$	d)	$-kx^2$

If  $\hat{L}^2$  is the squared total orbital angular momentum operator and  $\hat{L}_z$  is the 5) z- component of total orbital angular momentum operator, then  $[L^2, \hat{L}_z]$ =?

a) 
$$\frac{h}{2\pi}$$
 b) 0  
c)  $l(l+1)\frac{h}{2\pi}$  d)  $\sqrt{l(l+1)}\frac{h}{2\pi}$ 

- The eigenfunctions of a rigid rotator are 6)
  - Spherical harmonics a) c) Hermite polynomials
- b) Laguerre polynomials d) Legendre polynomials
- The radial distribution function for a 1s state,  $4\pi r^2 \Psi^2_{1s}$ , is indicates that 7)
  - the most probable value of the distance from the nucleus is zero. a)
  - b) the average value of r is zero.
  - the average value of r is greater than the most probable value. C)
  - d) the average value of r is equal to the most probable value.

Max. Marks: 80

10

Set



- 8) Correct order for following species in accordance with their stability of existence.
  - i) allyl cation; ii) allyl radical; and iii) allyl anion
  - a) allyl cation > allyl radical > allyl anion
  - b) allyl anion > allyl cation > allyl radical
  - c) allyl radical > allyl cation > allyl anion
  - d) None of above
- 9) The ground-state configuration of the molecule is  $1\pi^2 2\pi^2$ , which corresponds to total  $\pi$ -electron energy of  $4\alpha + 2 \times 5^{1/2}\beta$ . The delocalization energy for this ground state configuration will be \_\_\_\_\_.
  - a)  $0.602 \beta$  b)  $0.372 \beta$
  - c)  $0.472 \beta$  d)  $0.618 \beta$
- 10) A set of equations which can be written as a single matrix equation  $Fc = Sc\varepsilon$  are called as \_\_\_\_\_.
  - a) STO \_\_\_\_\_
  - c) Brillouin's theorem

## B) Fill in the blanks OR Write True/False

- Eigen values associated with Hermitian operators are always real. (Ture or False)
- 2) Ground state energy of helium ion is \_\_\_\_\_ eV.
- 3) The matrix elements  $H_{ii}$  that appear on the diagonal of the determinant are called \_\_\_\_\_ integral.
- 4) Spinorbital must be antisymmetric with respect of the interchange of any pair of electrons is a consequence of \_\_\_\_\_ principle.
- 5) The difference between Hertree-Fock limit and the computed lowest energy in HF-SCF calculations is measure of \_\_\_\_\_\_ error.
- 6) The Hartree-Fock equation for a space orbital (spatial wavefunction)  $\Psi_s$  occupied by electron 1 is

$$\left\{h_1 + \sum_r (2J_r - K_r)\right\}\psi_s(1) = \varepsilon_s\psi_s(1) \quad \text{Here } J_r \text{ is } \_\_\_.$$

## Q.2 Answer the following.

- a) Prove that triplet state Slater determinantal wavefunction.  ${}^{3}\Psi_{SD} = \frac{1}{\sqrt{2}} [\psi_{a}(1)\alpha(1)\psi_{b}(2)\alpha(2) - \psi_{a}(2)\alpha(2)\psi_{b}(1)\alpha(1)]$  is normalized.
- **b)** Write in brief on radial shapes of hydrogenic atomic orbitals.
- c) Derive recursion formula for Hermite polynomials.
- d) Briefly describe the importance of free valence index.

### Q.3 Answer the following.

- a) For hydrogen atom, the ground state wave function has the form  $(r) = Ne^{-r/a_0}$ , where N is a normalization and constant and  $a_0 = h^2/4\pi^2 m e^2$ . Find the average values of the electron kinetic energy  $\langle T \rangle$ .
- **b)** For rigid rotator, the spherical harmonics are given as  $1 \sqrt{2l+1} \left(\frac{l-|m|}{2}\right) = \frac{1}{|m|}$

$$\psi(\theta, \Phi) = \frac{1}{\sqrt{2\pi}} \sqrt{\frac{2l+1}{2}} \cdot \frac{(l-|m|)!}{(l+|m|)!} P_l^{|m|}(\cos\theta) exp(\pm im\phi) \text{ where}$$
$$P_l^{|m|}(x) = (1-x^2)^{|m|/2} \frac{d^{|m|}}{dx^{|m|}} \left[\frac{1}{2^l l!} \frac{d^l}{dx^l} (1-x^2)^l\right] \text{ and } x = \cos\theta$$

Using this, deduce the ground and first excited states. State whether the transitions between these states are quantum.

b) Roothaan equations

d) CCSD

06

**08** 

### Q.4 Answer the following.

- Operators for the components of angular momentum are given a) by  $\hat{L}_x = \frac{h}{2\pi i} \left( y \frac{\partial}{\partial z} - z \frac{\partial}{\partial y} \right)$ ,  $\hat{L}_y = \frac{h}{2\pi i} \left( z \frac{\partial}{\partial x} - x \frac{\partial}{\partial z} \right)$ ,  $\hat{L}_z = \frac{h}{2\pi i} \left( x \frac{\partial}{\partial y} - y \frac{\partial}{\partial x} \right)$ . Prove that:  $[\hat{L}_y, \hat{L}_z - \hat{L}_z, \hat{L}_y] = \frac{i\hbar}{2\pi} \hat{L}_x$
- Prove that eigen values of the operators associated with physically b) observables are always real.

#### Q.5 Answer the following

- Assume a trail function  $\psi = Nx(a x)$  for the problem of particle in a one-**08** a) dimensional box to obtain the minimum average energy; here N is normalization constant, and a is length of the box. Compare the results with that obtained by solving the Schrödinger equation. 08
- Write in brief on first order correction in perturbation theory. b)

#### Answer the following Q.6

2s atomic orbital for hydrogen-like atoms are given as: a)

80

 $\psi_{2s} = \frac{1}{4\sqrt{2\pi}} \left(\frac{Z}{a_0}\right)^{3/2} \left(2 - \frac{Zr}{a_0}\right) exp\left(-\frac{Zr}{2a_0}\right)$ . Show that the given wavefunction is normalized.

Draw the coordinates and write the Hamiltonian for Hydrogen and Helium 08 b) molecules. Explain the terms involved in it.

#### Q.7 Answer the following

- Explain the utility of variation principle in Hückel MO theory. Use this theory **08** a) to calculate the stabilization energy, bond orders, electron densities etc. for cyclobutadiene. Schematically represent the occupation of electronic energy levels.
- Explain with suitable examples the differences between alternant and non-08 b) alternant hydrocarbons.

08

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No. M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 PHYSICAL CHEMISTRY Electrochemistry (MSC11302)

Day & Date: Monday, 13-05-2024

Time: 11:00 AM To 02:00 PM

Seat

**Instructions:** 1) Q. Nos.1 and 2 are compulsory.

- 2) Attempt any Three questions from Q.No.3 to Q.No.7.
- 3) Figures to the right indicate full marks.

### Q.1 A) Choose correct alternative. (MCQ)

- An increase in equivalent conductance of an electrolyte using high voltage was observed by the scientist
  - a) Debye

c) Wien

a) NaCl

- b) Falkenhagend) Onsager
- 2) The phenomenon of decomposition of an electrolyte by passing electric current through its solution is called as\_\_\_\_\_.
  - a) electrolysisc) both (a) and (b)
- b) electroplatingd) All of these
- 3) The over voltage increases with increase in \_\_\_\_\_.
  - a) temperature b) resistance
  - c) current density d) All of these
- 4) The relation between over voltage and current density ( $\omega = a + b \log I$ ) was derived by the scientist \_\_\_\_\_.
  - a) Born b) Tafel
  - c) Bjerrum d) Wien
- 5) 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)  $\log f \pm = +A z_+ z_- (\mu)$

### 6) Conductance of an electrolytic solution is proportional to\_\_\_\_\_.

- a) Dilution b) Current density
- c) Mobility of ions d) Volume of the solution
- 7) Which of the following can be considered a weak electrolyte?
  - b) HCl
  - c)  $CH_3COOH$  d)  $K_2SO_4$

Max. Marks: 80

8) electrolyte is used in natural gas and CO-Air fuel cell. a) Molten nitrate with Mg b) Molten sulphate with Mg c) Molten carbonate with Mg d) Both (a) and (b) 9) The thickness of ionic atmosphere with increase of concentration and valency of ion. a) decreases b) increases both (b) and (c) c) remains constant d) 10) In Debye-Huckel Onsager equation the value of constant A= a) 82.4/ (DT)<sup>1/2</sup>η b) 82.4/ (DT)n c) 82.4/ (DT)<sup>2</sup> $\eta$ none of these d) B) Fill in the blanks OR write true/false. 06 The mobile phase in electrophoresis is . 1) The mobility of an ion decreases due to electrophoretic force. (True 2) or False). The mathematical expression for estimation of ionic strength is 3) 4) Conductance of the solution depends upon number of ions present in the solution. (True or False). At high frequency the conductance of an electrolyte solution 5) According to first law of electrolysis, the amount of substance 6) deposited on the electrode surface is directly proportional to . Q.2 Answer the following. 16 What is polarization? Mention its different types. Explain how one can a) minimize the polarization. What do you mean by fuel cell? Explain hydrogen-oxygen fuel cell with b) neat labelled diagram. Write a note on an electroforming process. C) Calculate the thickness of ionic atmosphere for a 1:1 electrolyte in d) acetonitrile at 298K at 0.05 and 0.001 M. [D= 37.5] Q.3 Answer the following. a) Write a detailed note on Tafel equation. 80 Discuss various methods of corrosion prevention. b) 80 Q.4 Answer the following. Write on theories of overvoltage. a) **08** Illustrate the concept of electrical double layer through suitable model. 80 b)

An: a) b)	swer the following. Derive Debye- Huckel - Onsager equation. What are the experimental proofs for Debye- Huckel theory. Explain how they support the ionic atmosphere formation.	08 08
Ans a) b)	<b>swer the following.</b> Derive Debye-Hückel Bronsted equations. Explain Debye-Falkenhagen and Wein effect.	08 08
Ans a) b)	<b>swer the following.</b> What is hydration number? Discuss Bernal- Fowler method for its determination. What are different electrokinetic phenomena? Explain any two of them.	08 08
	Ans a) b) Ans a) b) Ans a) b)	<ul> <li>Answer the following.</li> <li>a) Derive Debye- Huckel - Onsager equation.</li> <li>b) What are the experimental proofs for Debye- Huckel theory. Explain how they support the ionic atmosphere formation.</li> <li>Answer the following.</li> <li>a) Derive Debye-Hückel Bronsted equations.</li> <li>b) Explain Debye-Falkenhagen and Wein effect.</li> <li>Answer the following.</li> <li>a) What is hydration number? Discuss Bernal- Fowler method for its determination.</li> <li>b) What are different electrokinetic phenomena? Explain any two of them.</li> </ul>

Seat No.				Set	Ρ					
М.S	Sc. (Se	mester - III) (New) (CBCS) E	Examination: March/A	pril - 2024						
	Molecular Structure-I (MSC11306)									
Day & D Time: 1	0ate: We 1:00 AM	dnesday, 15-05-2024 To 02:00 PM		Max. Marks	: 80					
Instruct	tions: 1) 2 3	Q. Nos.1 and 2 are compulsory. Attempt any three questions fron Figure to right indicate full marks	n Q. No. 3 to Q. No. 7							
Q.1 A	) Cho 1)	D <b>se correct alternative.</b> BF <sub>3</sub> molecule possesses a) S <sub>2h</sub> c) C <sub>n</sub>	axis of symmetry. b) C <sub>2v</sub> d) S <sub>n</sub>		10					
	2)	All the symmetry operation in a molecular group is called as a) class c) sub group	nolecule can be combined t  b) point group d) conjugate	to form a						
	3)	The micro wave active molecules a) HCl, CO <sub>2</sub> c) O <sub>2</sub> , Cl <sub>2</sub>	s are b) C0, CO <sub>2</sub> d) HCl, CO							
	4)	<ul><li>Rotational spectrum is useful to a</li><li>a) bond length</li><li>c) bond strength</li></ul>	letermine the b) bond order d) bond angle							
	5)	The overtone and combination ba a) mono atomic c) polyatomic	and arise in molect b) diatomic d) double bond	ule.						
	6)	In mutual exclusion rule for a mo vibration which is active in IR is _ a) active c) exclusive	lecule possess a centre of in Raman. b) inactive d) intense	symmetry, tl	he					
	7)	Distortion factor is present in a) non-rigid c) linear	diatomic molecule. b) Rigid d) non-polar							
	8)	Electronic spectra is observed in a) radio wave c) X- ray	region. b) IR d) UV and visible							
	9)	How many vibrational modes are a) 0 c) 2	b) 1 b) 3							
	10)	O <sub>2</sub> molecule show Raman spectr a change in of the molec a) polarizability c) mass	a since their vibration is ac ule. b) spin d) dipole	companied	by					

Set P

	В)	Fill in 1) 2) 3) 4) 5) 6)	The principle axis of rotation in BCI3 molecule is The moment of inertia for linear molecule along principle axis is The selection rule for a pure rotational transition is $\Delta J =$ In Fortrat diagram, the band head is at the of parabola. Birge - Sponer extrapolation is used to determine energy of molecule. If %T = 80 the absorbance is	06
Q.2	Ans a) b) c) d)	<b>wer th</b> What Write What Write	<b>ne following.</b> is the importance of symmetry? note on Morse potential energy. do you understand by depolarization ratio? note on: Birge-Sponer extrapolation.	16
Q.3	Ans a) b)	wer th Expla molec What select	<b>ne following.</b> in diagrammatically that H <sub>2</sub> O molecule is Abelian whereas NH3 cule is non-Abelian. mean by rigid and non-rigid molecule? Discuss rotational spectra and tion rules of rigid diatomic linear molecules.	06 10
Q.4	Ans a) b)	<b>wer th</b> Descr Descr	<b>ne following.</b> ribe the concept of polarizability in Raman scattering. ribe in detail rotational fine structure of electronic-vibration transitions.	06 10
Q.5	Ans a) b)	<b>wer th</b> What iii) wa State spect	<b>ne following.</b> is spectroscopy? Define i) frequency, ii) wavelength and ivenumber and give their units. Frank-Condon Principle. Describe intensities of vibrational-electronic ra for various states.	06 10
Q.6	Ans a) b)	wer th What How v chara	<b>ne following.</b> is Raman Effect? Describe classical theory of Raman Effect. we can use the Grand Orthogonality Theorem to construct the cter table for the C <sub>3V</sub> point group.	06 10
Q.7	Ans a)	wer th Expla the po	<b>ne following.</b> in the rule of mutual exclusion and its converse. Sketch and explain plarizability ellipsoids of various modes of vibration of CO <sub>2</sub> molecule.	08
	b)	For a length	linear triatomic molecule explain the method of determining band is by isotopic substitution of any one atom.	08

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Seat No.									Set	Ρ
M	.Sc.	(S	emes	ster - I	V) (Ne PH	ew) (CE YSICA	BCS) Ex L CHEI	cami MIST	ination: March/April-2024	
512	atist	ICa		cnanio	cs and	i irreve	ersidie	Iner	modynamics (MSC11401)	
Day & Time: (	Date 03:00	: Th ) PN	nursda M To C	ay, 09-0 )6:00 P	)5-2024 M				Max. Marks	: 80
Instruc	ction	IS: 7	1) Q. N 2) Atte 3) Figu	Nos. 1 a empt an ure to ri	and. 2 a ly three ight indi	re comp questio cate full	oulsory. ns from ( marks.	Q. No	o. 3 to Q. No. 7	
Q.1 A	<b>(</b>	Cho	oose d	correct	alterna	ative.				10
	-,	1)	For e a) c)	very ro J+1 J-1	tational	level 'J'	, corresp	ondir b) d)	ng degeneracy is 2J+1 2J-1	
	:	2)	The r a) c)	nagnitu 10 <sup>2</sup> to 1 to 10	ide of th 10 <sup>4</sup> )	ne rotatio	onal parti	tion f b) d)	function is of the order of 10 to 10 <sup>2</sup> 10 <sup>30</sup> to 10 <sup>32</sup>	
		3)	Acco	rding to	Dulong	g-Petit la	aw, for a	monc	patomic crystal, Cv is	
		,	cal/K/	/mol.		-				
			a)	R 3R				d)	2R ¼ R	
		4)	The t	ranspo sents	rt pheno	omenon	of one d	imens	sional system is J = LX, J	
			a) c)	driving gradie	force nt			b) d)	flux transport coefficient	
		5)	At the	e stead	y state a	all the fl	ows corre	espor	nding to unrestricted forces	
			vanis a)	h. This Priaoa	statem ine's pr	ent belo inciple	ngs to	b)	 Le Chatelier's principle	
			c)	Heiser	nberg's	principle	e	d)	All of these	
		6)	Ferm respe	ions are ect to th	e those e excha	species ange of	s whose v particles.	vave	functions are with	
			a) c)	symmo spheri	etric cal			b) d)	antisymmetric linear	
		7)	Whic	h of the	followi	ng is ex	act differ	ential	?	
			a) c)	dS dE				b) d)	dH All of the above	
	:	8)	What a) c)	is the i 25:75 50:50	ratio of	para to (	ortho hyc	lrogei b) d)	n at room temperature? 75:25 0:100	
	9	9)	The v	alue of	Maxwe	ell- Boltz	mann co	nstar	nt 'β' is given by	
			a) c)	k⊺ 1/k				b) d)	1/kT kT²	
	1	0)	The s	symmet	ry numl	ber of he	etero nuc	lear o	diatomic molecules is	
			a)	0				d)	1	
			C)	2				u)	U	

	B)	<ul> <li>Fill in the blanks OR Write true/false.</li> <li>1) The unit of partition function is</li> <li>2) The specific heat is highest for hard element. [True/False]</li> <li>3) All phase transformation processes are the constant pressure processes. [True/False]</li> <li>4) The magnitude of the translational partition function is of the order of</li> <li>5) What is the probability of drawing a card of a king from a standard pack of 52 cards?</li> <li>6) In an open system, for maximum work, the process must be entirely</li> </ul>	<b>06</b>
Q.2	Ans a) b) c) d)	<ul> <li>swer the following.</li> <li>Calculate the electronic partition function for the OH radical at 298 K. given that there are two double electronic states separated by 139.7 cm<sup>-1</sup>.</li> <li>Illustrate the concept of residual entropy.</li> <li>Evaluate translational partition function Q<sub>trans</sub> for an oxygen molecule (molecular weight 31.99 g mol<sup>-1</sup>) at 273 K when occupying a volume of 22.414 dm<sup>3</sup>.</li> <li>Discuss conservation of energy in an open system.</li> </ul>	16
Q.3	Ans a) b)	swer the following. On the basis of set of basic assumptions, derive the expression for Bose- Einstein statistics. Illustrate the concept of exact and inexact differentials.	08 08
Q.4	Ans a) b)	<b>swer the following.</b> Discuss the concept of reciprocity relations and Onsager theorem. Evaluate the constants, $\alpha$ and $\beta$ , involved in Maxwell-Boltzmann distribution law.	08 08
Q.5	Ans a) b)	swer the following. Define ensemble. Discuss in detail canonical and grand canonical ensembles. Explain entropy production due to heat flow.	08 08
Q.6	Ans a) b)	swer the following. Derive an expression for Fermi-Dirac statistics. Show that $Q_{trans} = (2 \pi \text{ m k T})^{3/2}/\text{h}^3$ .V. Write down the equation for S <sub>trans</sub> .	08 08
Q.7	Ans a) b)	<b>swer the following.</b> Discuss in brief Debye specific heat theory for solids. Discuss in detail electro kinetic effects.	08 08

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No.		Set P							
Μ.	M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 PHYSICAL CHEMISTRY Chemical Kinetics (MSC11402)								
Day & I Time: 0	Date: Sat 3:00 PM	urday, 11-05-2024Max. Marks: 80To 06:00 PM							
Instruc	tions: 1) 2) 3)	Q. Nos. 1 and. 2 are compulsory. Attempt any three questions from Q. No. 3 to Q. No. 7 Figure to right indicate full marks.							
Q.1 A	.) Choo 1)	ose correct alternatives. (MCQ)10If $E_a$ of a reaction is zero, k is equal to (where A is frequency10factor.) (where A is frequencya) infinityb) 0c) Ad) $A-1$							
	2)	The rate constant k and are related by Arrhenius equation.a) temperatureb) dipole momentc) volumed) All of these							
	3)	The molecularity of a reaction A + B +C = products isa) zerob) onec) threed) two							
	4)	Arrhenius equation may be written as a) $d \ln k/dT = E_a/RT$ b) $d \ln k/dT = E_a/RT^2$ c) $d \ln k/dT - E_a/RT$ d) $d \ln k/dT = -E_a/RT^2$							
	5)	If $E_f < E_b$ (Where $E_f$ and $E_b$ are the energies of activation for forwardand backward reaction respectively) then the reaction isa) exothermicb) endothermicc) explosived) chain							
	6)	Which one of the following is a biological catalyst?a)NaClb)KMnO4c)Enzymed)hydrogen per oxide							
	7)	The general mechanism for an enzyme - catalyzed reaction was firstproposed by the scientista)Michaelis and Mentenb)Eyering and Grotthusc)Grotthus and Boltzmannd)Lindemann and Grotthus							
	8)	step is rate determining step for a consecutive reaction.a)Fastb)first in sequencec)last in sequenced)slow							
	9)	<ul> <li>Which of the following will not increase the rate of reaction?</li> <li>a) raising the temperature</li> <li>b) increasing the concentration of the reactant</li> <li>c) increasing the volume of the container a gaseous reaction</li> <li>d) increasing the surface area of a solid reactant</li> </ul>							

Page 1 of 2

06

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10) The reactions having smaller values of energy of activation are

	·			
a)	Fast	b)	Slow	
c)	Steady	d)	) Both a) and b)	

#### B) Write true/false.

- 1) Ostwald's isolation method is used to determine the Boltzmann constant.
- 2) Minimum energy required for molecule to react is called activation energy.
- 3) E<sub>a</sub> value is not affected by use of catalyst.
- 4) Enzyme catalyzed reaction is faster than a metal catalyzed reaction.
- 5) Nuclear disintegration is an example of second order kinetics.
- 6) During decomposition of an activated complex energy is always released.

#### Q.2 Answer the following.

- a) Explain collision theory.
- b) Can the activation energy of a reaction be zero or negative? Explain.
- c) Explain general aspects of chain reaction.
- d) What do you mean by oscillatory reactions?

#### Q.3 Answer the following.

a) Illustrate the kinetics of first order reaction opposed by first order reaction. 06

### b) Solve the problems.

- 1) The velocity constant for second order reaction is  $5.70 \times 10^{-5} \text{ dm}^3 \text{ mol}^{-1} \text{ sec}^{-1}$  at 298 K and 1.64 x  $10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ sec}^{-1}$  at 313 K. Calculate the energy of activation. (R = 8.314 J/K/mol).
- 2) Identify the reaction order for each of the following k values.
  i) 2.70 x 10<sup>-5</sup> sec<sup>-1</sup>
  ii) 5.22 x 10<sup>-3</sup> dm<sup>3</sup> mol<sup>-1</sup> coc<sup>-1</sup>

ii) 5.23 x 10<sup>-3</sup> dm<sup>3</sup> mol<sup>-1</sup> sec<sup>-1</sup>

- iii) 9.27 x 10<sup>-5</sup> mol dm<sup>-3</sup> sec<sup>-1</sup>
- iv) 3.97 x 10<sup>-3</sup> dm<sup>6</sup> mol<sup>-2</sup> sec<sup>-2</sup>
- v) 5.23 x 10<sup>-3</sup> atm<sup>-1</sup> sec<sup>-1</sup>

#### Q.4 Answer the following.

- a) Explain the kinetics and mechanism for consecutive reaction giving suitable example.
- b) What are the characteristics of enzyme catalysis?

#### Q.5 Answer the following.

- a) Explain the use of potential energy surfaces in the study of chemical reaction.
- **b)** Write short note on Lineweaver Burk Plot.

#### Q.6 Answer the following.

- a) What are limitations of Lindemann theory? How they are overcome by RRK theory?
- b) Explain the mechanism of acid-base catalysis.

#### Q.7 Answer the following.

- a) What is an autocatalyzed reaction? Explain its kinetics with a suitable example.
- **b)** Derive equation for rate constant of chain reaction with suitable example.

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No.		Se	t	Ρ					
M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 PHYSICAL CHEMISTRY Molecular Structure-II (MSC11403)									
Day & D Time: 03	0ate: T 3:00 Pl	esday, 14-05-2024 Max. Mar To 06:00 PM	ks:	80					
Instruct	tions:	Q. Nos. 1 and 2 are compulsory. Attempt any three questions from Q. No. 3 to Q. No. 7 Figure to right indicate full marks.							
Q.1 A	) Ch 1)	ose correct alternative. Induced polarization is applicable for molecule. a) Polar b) Non polar c) Linear d) Nonlinear		10					
	2)	Gouy method is useful for determination of of a molecule. a) Polarity b) Bond length c) Magnetic susceptibility d) Dipole moment							
	3)	Oxygen molecule is in nature. a) Diamagnetic b) Ferromagnetic c) Paramagnetic d) Ferrimagnetic							
	4)	<ul> <li>Gyromagnetic ratio is the ratio of</li> <li>a) Magnetic moment to Angular momentum.</li> <li>b) Angular momentum to Magnetic moment</li> <li>c) Potential energy to Angular momentum</li> <li>d) Potential energy to Magnetic moment</li> </ul>							
	5)	Chemical shifts originate froma) Magnetic momentumb) Electron shieldingc) Free induction decayd) Scalar coupling (J -coupling)	)						
	6)	Signal splitting in NMR arises from? a) Shielding b) Spin-spin decoupling c) Spin-spin coupling d) Deshielding							
	7)	In proton NMR spectroscopy, hydrogen bonding results in a) Shielding effect b) Deshielding effect c) Peak splitting d) All of the above							
	8)	Electron spin resonance was discovered by a) Zavoisky b) Block c) Purcell d) Anderson							
	9)	The frequency of the emitted $\gamma$ -ray is given by the equation. a) $h/\Delta E$ b) $\Delta E/vh$ c) $\Delta E/h$ d) $\Delta E \ge h$							
	10	Mossbauer effect only observed in states of matter. a) Gaseous b) Liquid c) Solid d) Fluid							

	B)	<ul> <li>Fill in the blanks.</li> <li>1) The Mossbauer effect based on</li> <li>2) In ESR Spectrum the molecule contains more than one unpaired electron, it gives splitting.</li> <li>3) Debye theory is applicable for molecule.</li> <li>4) The magnetic materials law.</li> <li>5) Nuclei with even number of protons and even number of neutrons will have spin quantum number as</li> <li>6) In NMR spectroscopy sample nuclei is irradiated with</li> </ul>	06				
Q.2	Ans a) b) c) d)	<b>swer the following.</b> Write note on Lennard-Jones potential. The Larmor precession. Limitations of Debye theory. Doppler effect in Mossbauer.					
Q.3	Ans a) b)	wer the following Write note on i) <sup>13</sup> C NMR spectroscopy ii) Double resonance in NMR. Describe how the ESR spectrum helps to study kinetics of electron transfer reactions.	08 08				
Q.4	Ans a) b)	swer the following. Discuss i) Atomic and ionic susceptibility ii) Curie- Weiss law Discuss applications to coordination complexes and complex ions of transition metals as a Ferro and ferri magnetism.	08 08				
Q.5	Ans a) b)	<b>swer the following.</b> Discuss in detail the principle of Mossbauer spectroscopy. What is polar and non-polar molecules? Derive Clausius -Mossotti equation of molar polarization.					
Q.6	Ans a) b)	<b>swer the following.</b> Describe Langevin's classical theory of diamagnetism and paramagnetism. Define the term coupling constant in NMR. Discuss the factors influencing the coupling constant.					
Q.7	Ans a) b)	Swer the following. Discuss in detail the Gouy method of determining magnetic susceptibility. Discuss the various components of ESR spectrometer with schematic diagram. Calculate the "g" value of CH <sub>3</sub> radicals which absorb at 0.329 T in spectrometer operating at frequency 9230 MHz. ( $\beta$ = 9.273 x 10 <sup>-24</sup> JT <sup>-1</sup> ,	08 08				

h =  $6.626 \times 10^{-34}$ Js)

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PHYSICAL CHEMISTRY									
Surface Chemistry (MSC11408)									
Day & Date: Thursday, 16-05-2024         Max. Marks: 80           Time: 03:00 PM To 06:00 PM         Max. Marks: 80								s: 80	
<ul> <li>Instructions: 1) Q. Nos. 1 and 2 are compulsory.</li> <li>2) Attempt any Three questions from Q.No.3 to Q.No.7.</li> <li>3) Figures to the right indicate full marks.</li> </ul>									
Q.1 A) Choose the correct alternatives from the options.								10	
		1)	a) 90.0 c) 82.5	ension of water a Dynes/cm Dynes/cm	t 25°C is b) d)	45.63 Dynes/cm 72.14 Dynes/cm			
		2)	Shapes o a) Visco c) Adso	of drops of a liquid osity orption	d are spherio b) d)	cal because of conductivity surface tension			
		3)	The unit o a) N/m c) Dyne	of surface tensior es/cm	n in CGS sys b) d)	stem is Kg/cm Dynes/m			
	4) Freundlich adsorption isotherm $\frac{x}{m} = kp^{\frac{1}{n}}$ , the value of <i>n</i> at low								
			pressure a) more c) equa	is e than 1 al to 1	b) d)	less than 1 from 0 to 1			
		5)	ldentify th a) Milk c) Salt	ne liquid-liquid en water	nulsion from b) d)	the following. oil sugar solution			
	<ul> <li>6) At critical micelle concentration, the surface molecules</li> <li>a) dissociate</li> <li>b) associate</li> <li>c) become bigger in size due to adsorption</li> <li>d) become smaller in size due to decomposition</li> </ul>								
		7)	Capillary a) 0 c) Doub	rise experiments ble	are preferre b) d)	ed with cont Single finite	act angle.		
		8)	Two capil water is _ a) same b) great c) great d) none	llary tubes of diffe  e in both tube ter in tube of sma ter in tube of larg e of the above	erent diamet aller diamete er diameter	ers are dipped in w	ater. The ris	e of	
		9)	Adsorptio a) goes b) rema c) accu d) none	on is a phenomen into the body of ains close to othe imulates on the si of these	on in which the other su r substance urface of the	a substance bstance e other substance			

- <sup>10)</sup> Freundlich adsorption isotherm is given by the expression  $\frac{x}{m} = kp^{\frac{1}{n}}$ Which of the following conclusions can be drawn from this expression?
  - a) When  $\frac{1}{n} = 0$ , the adsorption is independent of pressure
  - b) When n = 0,  $\frac{x}{m}$  versus p graph is a line parallel to X-axis
  - c) both A and B
  - d) neither A nor B

## B) Fill in the blanks OR State true/false:

- 1) Mercury does not spread on water. [True/False]
- 2) \_\_\_\_\_ are surface active agents that aggregate near or have a strong effect on modifying the interface between two materials.
- 3) A pharmaceutical emulsion is 'normally' a dispersion of liquid within another liquid. [True/False]
- 4) Meniscus of mercury in capillary is \_\_\_\_
- 5) Critical micelle concentration increases with temperature. [True/False]
- 6) Complete the following equation.  $\gamma = \frac{---}{\Lambda A}$

## Q.2 Answer the following.

- a) State and explain Trube's rule
- **b)** Explain the types of adsorption isotherms.
- **c)** Write a note on Herkins-Jura Equation.
- d) Describe gaseous monomolecular film.

## Q.3 Answer the following.

- a) Mention emulsion types and methods of identification of emulsion types.
- **b)** Explain heterogeneous catalysis with suitable examples.

## Q.4 Answer the following.

- a) Discuss theory and energetic of micellization.
- b) Describe Point B method of determination surface area of an adsorbent. The adsorption of nitrogen on silica studied at 77K by Point B method has given the volume of gas corresponding to Point B, reduced to standard condition of P=1 atm and T=273 K. as 40 cc. Calculate surface area of silica if area of nitrogen molecule is 16.2 A°.

## Q.5 Answer the following.

- a) Derive an equation for Langmuir adsorption isotherm. Discuss experimental verification this equation for the given system of adsorbate and adsorbent.
- **b)** What is critical micelle concentration? Discuss surface tension method of determination of cmc of given surfactant.

## Q.6 Answer the following.

- a) What are the solid lubricants? Discuss the mechanisms of hydrodynamic and boundary lubrication.
- **b)** Illustrate the concept of selective wetting.

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### Q.7 Answer the following.

- a) Describe drop weight method of determination of surface tension of liquids.
- b) Derive Kelvin equation which relates surface tension with the vapor pressure of water inside and outside the droplet. The ratio of vapour of droplet to that of water is 2.95 at 27°C. The surface tension of water is 72 x 10<sup>-3</sup> Nm<sup>-1</sup>. Calculate the radius of the droplet.

Seat No.					Set	Ρ		
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Day & D Time: 1	0ate: Frid 1:00 AM	Advance lay, 10-05-2 To 02:00 Pl	024 M	inques	Max. Marks	: 80		
Instruct	tions: 1) 2) 3)	Q. Nos. 1 a Attempt an Figure to ri	and. 2 are compulsory. y three questions from ght indicate full marks	n Q. No.	3 to Q. No. 7			
Q.1 A	) Choo 1)	plays a deciding role in the choice of solvents in liquid-liquid extraction.						
		c) Separ	ration factor	(d (b	Density			
	2)	When the c an affinity f a) mobile	component has a smal or e phase	, ll value c b)	of K, it is supposed to have stationary phase			
		c) no ph	ase	d)	whole solution			
	3)	a) Ultra-t c) GC	nique is a membrane filtration	separati b) d)	on technique. HPLC Solvent extraction			
	4)	A mobile pl a) gas c) liquid	hase cannot be a	 b) d)	plasma and solid both a and c			
	5)	What cann a) nano c) macro	ot be a size of membra porous o porous	ane? b) d)	micro porous all of these			
	6)	The pore s a) 0.000 c) 0.005	ize of RO membranes 5µ ແ	is b) d)	 0.05μ 0.5μ			
	7)	In reverse   a) polar c) isolate	phase HPLC, the mob	ile phase b) d)	e is in nature. non-polar carbonated			
	8)	The electrophoretic mobility denoted as $\mu$ is mathematically expressed						
		as a) VE c) E/V		b) d)	1/EV V/E			
	9)	Electropho a) Tswet c) Trava	resis was developed b t n	b) d)	Saratio Tiselius			
	10)	is a a) Distilla c) Elutio	step involved in gel fill ation n of sample	, tration. b) d)	Extraction Corrosion			
	B)	<ul> <li>Write True/ False.</li> <li>1) Cryptands are compounds having large molecular weights.</li> <li>2) The distribution coefficient is denoted by K.</li> <li>3) Electric field is one of the driving force in membrane separation.</li> <li>4) Whatmann filter papers are commonly used in HPLC for separation.</li> <li>5) Counter current extraction is pioneered by Watson and Crick.</li> <li>6) The membranes are generally made up of cellulose acetate.</li> </ul>	06					
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Q.2	Ans a) b) c) d)	swer the following. Write a short note on electro osmotic flow. Draw a diagram of counter current extraction. What is mean by permeate? Write the applications of HPLC.	16					
Q.3	Ans a) b)	<b>swer the following.</b> Discuss in detail the ultra-filtration technique for separation. Explain principle, experimental procedure and application of capillary electrophoresis.	16					
Q.4	Ans a) b)	<b>swer the following.</b> Discuss the principle and process of zone refining. Explain electrophoresis with its theory and applications.	16					
Q.5	Ans a) b)	swer the following. Write theory and techniques of solvent extraction. Explain solid phase extraction (SPE) and applications of solvent extraction.	16					
Q.6	Ans a) b)	swer the following. Which gels are commonly used in gel permission chromatography? What are the roles of ligand and spacer arms in gel permission chromatography? Discuss in details, high performance liquid chromatography with instrumentation	16					
Q.7	Wri a)	te a short note on. Explain the principle of affinity chromatography. Describe the components involved in affinity medium.	16					

- Write a short note on extraction by chelation.
   Enlist the applications of dialysis. b)

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### M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 **Analytical Chemistry**

Instrumental Methods of Analysis- I (MSC013302)

Day & Date: Monday, 13-05-2024 Time: 11:00 AM To 02:00 PM

Instructions: 1) Question 1 and 2 are compulsory.

- 2) Attempt any Three from Q.3 to Q.7.
- 3) Figure to right indicate full marks.

#### **Multiple choice questions** Q.1 A)

- The DTA plot of calcium oxalate in air shows an upward peak due to 1)
  - a) Formation of calcium oxide
  - Formation of calcium carbonate b)
  - c) Burning of CO
  - Elimination of water d)
- Becquerel discovered radioactivity by using 2)
  - a) Photographic film

c) GM-Counter

- b) radiations damages on skin
  - cloud chamber NaF d)
- Radioactive emission of \_\_\_\_\_ does not change the atomic number. 3)
  - Beta a) Alpha b)
  - c) Gamma d) All of these

#### Helium nucleus is also called as \_\_\_\_ 4)

- a) Gamma particle b) Beta particle
- c) Alpha particle Positron particle d)
- In thermogravimetric analysis, the result obtained appears as a 5)
  - a) Continuous chart
  - b) Continuous parabola
  - c) Continuous circular positions
  - d) Discontinuous chart
- Which of the following is not the characteristic of ion selective 6) electrodes?
  - a) It is fragile
  - b) Easy to use
  - c) Available in different sizes and shapes
  - d) it is insensitive to many ions
- 7) 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
- 8) The current from the redox reaction at the working electrode and the auxiliary electrode is called as \_
  - **Diffusion current** Cathodic current b) a) c)
    - Applied current Faradic current d)

Max. Marks: 80

10

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- The current owing to migration of cations from the bulk of the solution 9) towards cathode due to diffusive force, irrespective of concentration is called as
  - Limiting current a)
- Migration current b)
- c) Diffusion current
- Electric potential d)
- 10) The change in current with the varying voltage gives the plot is known as
  - Chromatogram a)
- b) Voltagram None of these d)
- c) Both a and b

#### Fill in the blanks/Write True/False. B)

- The penetrating power of \_\_\_\_\_ ray is highest among the nuclear 1) radiations.
- 2) In amperometry titration platinum electrode is rotated at
- In high frequency titrimetry is closely related to 3)
- When titration involve radiactive reagent, it is called as . 4)
- 5) Electrogravimetry is similar to
- In solid state membranes, the body of the electrodes are made of 6)

### Q.2 Answer the following.

- Write a short note on amperometry titration curves. a)
- Enlist the advantages and disadvantages of electrogravimetric titrations. b)
- Give the comparative account on TGA and DSC. C)
- d) What are the limitations of the radio chromatography and radioimmunoassay?

#### Answer the following. Q.3

- What are the factors affecting the TGA results? Explain each of them in detail. 08 a)
- Write a detailed note on the neutron activation analysis and give its 80 b) applications.

#### Answer the following. Q.4

- Give principle of DTA technique. Describe its instrumentation in detail. 08 a)
- Enlist various types of the ion selective electrodes. Explain construction and 80 b) working of the glass electrode.

#### Answer the following. Q.5

- Explain principle and various types of the radiometric titrations. 08 a)
- What are the main material components needed in the design of a polymer 08 b) based ion selective membrane? Describe the role of each component in detail.

#### Answer the following. Q.6

- Give the principle of DSC technique. Explain endothermic and exothermic 80 a) DSC peaks with suitable example. 80
- Describe various methods of electro-gravimetric analysis b)

#### Q.7 Answer the following.

- Describe various application of the high frequency titrations. 08 a) 08
- Explain direct and inverse isotopic analysis in detail. b)

Seat No.			Set	Ρ				
M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 ANALYTICAL CHEMISTRY Applied Analytical Chemistry (MSC013306)								
Day & D Time: 1	)ate: We 1:00 AM	ednesday, 15-05-2024 Max To 02:00 PM	. Marks	: 80				
Instruct	tions: 1) 2) 3)	) Q. Nos.1 and 2 are compulsory. ) Attempt any three questions from Q. No. 3 to Q. No. 6 ) Figure to right indicate full marks.						
Q.1 A)	) Choo 1)	ose correct alternative. (MCQ) Conductometer is used to measure of soil a) Ec b) pH c) voltage d) colour		10				
	2)	DDT contains Cl groups.         a) 4       b) 5         c) 3       d) 2						
	3)	$(CH_3)_2N - \tilde{Z}_{-3} - s - \tilde{Z}_{-N} CCH_3)_2$ is the structure ofa) Ziramb) Zinabc) Thiramd) DDT						
	4)	is name of aluminum ore. a) Hematite b) Pyrolusite c) Dolomite d) Bauxite						
	5)	Soil is surrounded bya) atmosphereb) biospherec) hydrosphered) all						
	6)	To take sample from soil, soil is taken from shaped cut. a) L b) O c) V d) C						
	7)	During analysis of nickel from its alloy, nickel is precipitated by _a) EDTAb) DMGc) NH3d) NH4OH	·					
	8)	Oxidation state of Fe in FeCl <sub>3</sub> is a) +3 b) -3 c) 0 d) 6						
	9)	Micronutrients are a) Cu, Fe, Mn b) C, H, O c) C, B, N d) Zn, N, P						
	10)	Acidity of soil is increased bya) NH4Clb) NH2CO NH2c) CaSO4d) Ammonium Sulphate						

		•=	
	B)	<ul> <li>Write the answer</li> <li>1) Name the major elements in bronze.</li> <li>2) Write the principle of cation exchange process.</li> <li>3) Define fertilizer.</li> <li>4) Define ore.</li> <li>5) What is the nature of cream</li> <li>6) Define cosmetics.</li> </ul>	06
Q.2	Ans a) b)	<b>wer the following.</b> Explain Kjeldahl's method to determine nitrogen from soil. How will you estimate phosphorous from soil sample.	16
Q.3	Ans a) b)	<b>wer the following.</b> How will you estimate nitrogen by titrimetric method. Explain moisture determination method from plant by ashing.	16
Q.4	Ans a) b)	<b>wer the following.</b> Explain detail analysis of bronze alloy. How will you, analysis Mn & Cu from alloy.	16
Q.5	Ans a) b)	wer the following. How will you analyse calcium by gravimetric & magnesium by volumetric method from face powder. Explain analysis of Zn & Fe gravimetrically from face powder.	16
Q.6	Ans a) b)	<ul> <li>wer the following.</li> <li>i) Explain processing &amp; storage of plant sample.</li> <li>ii) Explain estimation of DDT from sample.</li> <li>i) Explain estimate of nickel gravimetrically.</li> <li>ii) How will you detect herate &amp; carbonate from cosmetic?</li> </ul>	16
		ii) now will you detect borate & carbonate from cosmetic?	

Seat No.			Set	Ρ					
М.:	M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 ANALYTICAL CHEMISTRY Advanced Analytical Techniques (MSC013401)								
Day & D Time: 0	Date: Thi 3:00 PM	ursday, 09-05-2024 Max To 06:00 PM	. Marks	: 80					
Instruc	tions: 1 2 3	) Q. Nos. 1 and. 2 are compulsory. ) Attempt any three questions from Q. No. 3 to Q. No. 7 ) Figure to right indicate full marks.							
Q.1 A	) Cho 1)	ose correct alternative. In ion chromatography suppressors used in anion analysis is a _ a) anion exchanger b) cation exchanger c) neutral d) All of these		10					
	2)	In SFC mobile phase affinity for the analyte is a function ofa) mobile phase densityb) mobile phase solubilityc) mobile phase viscosityd) all of these	 /						
	3)	In GC-MS ion intensity is measured with a) Intensity meter b) Ion meter c) ion transducer d) electrometer							
	4)	The critical temperature is that temperature above which thephase cannot exita) solidb) liquidc) gasd) none of these							
	5)	GS-MS uses column system. a) capillary column b) open tabular column c) porous layer column d) packed column							
	6)	Critical point of CO <sub>2</sub> gas is         a) 0.47       b) -0.45         c) 0.24       d) -0.40							
	7)	Which of pump is required in flow injection analysis? a) syringe b) reciprocating c) peristatic d) all of these							
	8)	is the normal nebulizer temperature used in LC-MS. a) 125- 150 °C b) 25- 50 °C c) 100- 150 °C d) 250- 300 °C							
	9)	In FIA dispersion of sample is seen by a) diffusion b) conversion c) osmosis d) convection and diffusion	on						
	10)	In LC-MS is the most commonly used interface. a) chopper b) Nebulizer c) vapoursing chamber d) filter							

	B)	Write true/false	06
		<ol> <li>The nebulizer gas and make up gas are introduced coaxially into the beated nebulization region</li> </ol>	
		<ol> <li>At a temperature and pressure above its critical point a substance is called, as super critical fluid.</li> </ol>	
		3) SFC is superior to GC and HPLC.	
		<ol> <li>Gas chromatography provides direct identification of compound.</li> <li>An FIA curve is a plot of the detection signal as a function of temperature</li> </ol>	
		<ul> <li>6) In flow injection analysis the peak heights are influenced by dispersion of sample.</li> </ul>	
Q.2	Ans	swer the following	16
	a)	HPLC-MS technique	
	b)	Atomic spectrometric detection	
	c) d)	Advantages of automation Properties of super critical fluids	
Q.3	Ans	ower the following.	16
	a) b)	Explain in brief instrumentation of super critical fluid chromatography. Explain in brief automated analyzer based on multilayer film principle and its instrumentation.	
Q.4	Ans	swer the following.	16
	a) b)	Explain the principle of ion chromatography and its applications. Explain in brief Environmental speciation by ion chromatography.	
Q.5	Ans	ower the following.	16
	a) b)	Explain in brief instrumentation of ion chromatography. Explain in brief GC-MS technique.	
Q.6	Ans	swer the following.	
	a) b)	Explain in brief automatic elemental analyzer. Discuss the structure determination of biopolymers.	16
Q.7	Ans	swer the following.	16
	a) b)	Explain in brief basic instrumentation and Interfaces of LCMS. Explain the structure of resins used in ion chromatography.	

Seat	
No.	

### M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 ANALYTICAL CHEMISTRY

Instrumental Methods of Analysis – II (MSC013402) Day & Date: Saturday, 11-05-2024

Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.

### Q.1 A) Choose correct alternatives.

- 1) Fluorescence emissions are mainly confined to the following transitions.
  - a)  $\pi \to \pi^*$ b)  $\sigma \to \sigma^*$ c)  $n \to \sigma^*$ d)  $n \to n^*$
- 2) Which of the following technique is most sensitive for very dilute suspensions?
  - a) nephelometry
  - c) photometry d) colorimetry
- 3) Which of the following radiation is ionizing radiation?
  - a) infra redb) X-rayc) visibled) microwave
  - The observation of V rows in a material apparend by
- 4) The absorption of X-rays in a material governed by \_\_\_\_\_.
  a) Bragg's law
  b) Beer Lambert's law
  - c) Stefan's law d) Planck's law
- 5) Fluorescence emission occurs from the lowest vibrational level of first excited singlet state. This is a statement of\_\_\_\_\_.
  - a) Kasha's rule b)
    - b) Grotthus Draper lawd) Beer's law

b) refractometry

- 6) Which of the following laws are the principle laws of photochemistry?
  - a) Grothus-Draper and Stark-Einstein law
  - b) Raoult's and Dalton's law

c) Stern-Volmer rule

- c) Raoult's and Henry's law
- d) Lambert's and Beer's law
- 7) Which regions of the light radiations of the visible ultraviolet lying between \_\_\_\_\_ wavelength are chiefly concerned in bringing about photochemical reactions?
  - a) 8000 Å and 2000 Å
  - c) 1000 Å and 2000 Å
- 8) The intensity of the polarized component of light is depends upon \_\_\_\_\_\_
   a) relative refractive index
   b) same scattering angle
  - a) relative refractive indexc) angle of observations
    - d) All of these
- 9) Turbidimetric method is similar to\_\_\_\_
  - a) filter photometryc) fluorometry
- b) colorimetric method
- d) both (a) and (b)

Set

Max. Marks: 80

- b) 19000 Å and 12000 Å
- d) 1500 Å and 1000 Å

		10)	Typic a) c)	cal lifetime for phosphore miliseconds nanoseconds	escence emi b) d)	ssior mic pic	n is croseconds oseconds	
	B)	<b>Fill</b> 1) 2) 3) 4) 5) 6)	in the The s The s Snell The v 3×10 In flue emiss	e blanks OR write True system which shows che spin multiplicity for single I's law is represented as wavelength range of X-ra 0 <sup>14</sup> Hz = cm <sup>-1</sup> orescence quenching pro- sion increases. [True/Fa	/False. miluminescent at state is 3. mays is ocess, the ir lse]	ence [True	is e/False] sity of the fluorescence	06
Q.2	Ans a) b) c) d)	Write Appl Wha Wha (Give	the fo e a no lication It do y It is m en: n :	ollowing. ote on XRF technique. ns of flame photometry you meant by quantum ef olar refraction? Calculate = 1.47 and d = 1.540 g/c	fficiency? Ho e R <sub>M</sub> of carb c)	ow it on te	is estimated? etrachloride at 25°C.	16
Q.3	Ans a) b)	swer Deso Disc	<b>the fo</b> cribe t uss or	bllowing. typical Phosphoroscopes n interaction of X-rays w	s. ith matter.			16
Q.4	Ans a) b)	<b>swer</b> Write Disc	<b>the fo</b> e diffe uss va	<b>bllowing.</b> erent types of excitation s arious types of emission	sources enco spectra.	ounte	ered in emission spectros	<b>16</b> copy.
Q.5	Ans a) b)	swer Write Dese	<b>the fo</b> e on ir cribe t	<b>bllowing.</b> nstrumentation of interfe the principle and working	rometry. J of flame ph	oton	neter.	16
Q.6	Ans a) b)	<b>swer</b> Diag Expl	<b>the fo</b> Iramm ain wi	<b>bllowing.</b> natically explain critical a ith optical diagram spect	ngle principl rofluorophot	e, a ome	basis of refractometry. ter.	16
Q.7	Ans a) b)	swer Deso Write	<b>the fo</b> cribe > e on th	<b>bllowing</b> X-ray production techniq he parameters which infl	ues. uence refrac	tion		16

Seat No.		Set	Ρ						
M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 ANALYTICAL CHEMISTRY Biochemical and Food Analysis (MSC013403)									
Day & [ Time: 0	Date: Tu 3:00 PM	esday, 14-05-2024 Max. Marks: To 06:00 PM	80						
Instruc	<b>tions:</b> 1 2 3	) Question no. 1 and 2 are compulsory. ) Attempt any three questions from Q. No. 3 to Q. No. 7. ) Figure to right indicate full marks.							
Q.1 A	) Choo 1)	An analysis of the set	10						
	2)	Food preservation is classified asa) Artificialb) Chemicalc) Naturald) All of these							
	3)	Minerals present in milk are a) Na & K b) B c) P d) Zn							
	4)	The normal blood glucose in human ranges between mg. a) 40-70 b) 70-110 c) 110-150 d) above 150							
	5)	Method used to determine bilirubin in blood sample is a) Diacetal b) Henary c) Malloy & Evelynl d) Caroways							
	6)	Main two types of snake venom are a) Neurotoxin, cytotoxin b) Denitratoxin, cardiotoxin c) Cardiotoxin, Neurotoxin d) Cytoroxin, Cardiotoxin							
	7)	Substance used for diagnosis, preservation, relief of some disease ina man or animals is called asa) Drugb) Enzymec) Vitaminsd) Hormones							
	8)	Diazepam is used as agent. a) Antidepressant b) Antidiabetic c) Antianxiety d) Antiallergic							
	9)	Progesterone is synthesized from a) Peptide b) Glycogen c) Cholesterol d) Egg							
	10)	Hormones produced in pancreas which regulates the amount of glucose in blood isa) Steroidb) Insulinc) Estroned) Growth hormone							

	B)	<ul> <li>Fill in the blanks.</li> <li>1 Drug which increases activity of various portions of central nervous system is</li> <li>2 Deficiency of vitamin A causes</li> <li>3 Citrus fruits are sources of vitamin</li> <li>4 Fish oil, carrots are the sources of vitamin</li> <li>5 Substance produced by living organism which act as catalyst to bring about specific biochemical reaction is known as</li> <li>6 The term LD stands for</li> </ul>	06
Q.2	Ans a) b) c) d)	swer the following. Write a short note on lodine value. Describe Sample collection and preservation of physiological fluids. Explain in brief Local anesthetics. What is significance of LD 50?	16
Q.3	Ans a) b)	<b>swer the following.</b> Describe in detail food preservation. Explain of estimation of Glucose.	08 08
Q.4	Ans a) b)	swer the following. Explain Polenske value and Elaiden test. Explain the significance of estimation of hemoglobin and bilirubin.	08 08
Q.5	Ans a) b)	<b>swer the following.</b> Describe classification of drugs, impurities. Explain classification of poisons.	08 08
Q.6	Ans a) b)	<b>swer the following.</b> Explain analysis of antianxiety agents: Diazepam. Describe analysis of assay of enzymes.	08 08
Q.7	Ans a) b)	<b>swer the following.</b> Explain in detail dangerous drugs and narcotics. Describe forensic sample storage, sample dissolution.	08 08

Seat No.								Set	Ρ
Μ.	Sc. (	Semes	ter - I Phar	V) (New) (V ANALYT maceutica	CBCS) Exa ICAL CHEN I Analysis	mir /IS <sup>:</sup> (MS	nation: March/April- TRY SC013409)	2024	
Day & I Time: 0	Date: <sup>-</sup> 3:00 F	Thursda PM To 0	y, 16-0 6:00 P	05-2024 M	.,		Max.	Marks	: 80
Instruc	tions	: 1) Q. N 2) Atte 3) Figu	los. 1 a mpt an ire to ri	and. 2 are co by three ques ight indicate f	mpulsory. tions from Q. full marks.	No.	3 to Q. No. 7		
Q.1 A	<b>A) C</b> 1)	hoose ( a) b) c) d)	correct of th Regu Appro Regu Obse	t <b>alternative.</b> The following is lating food sa oving new dru lating tobacco rving cosmet	s not respons afety ugs for sale o products ic product ma	ibilit nufa	y of FDA. acturing		10
	2)	a) c)	is Ash Soap	remaining res	sidue after igr	itior b) d)	n. Precipitate None of these		
	3)	a) c)	is Starc GMP	used to deter h paper	mine water co	onte b) d)	nt. Dissolution test KFR (Karl Fisher Reag	ent)	
	4)	a) c)	is Sodiu Oxalie	used as an a ım hydroxide c acid	ntibacterial aç	gent b) d)	in mouthwashes. Salicylic acid Cinnamic acid		
	5)	) Disi a) b) c) d)	ntegrat efferv dispe uncoa capsu	ion test is ma rescent tablet rsible tablet ated and coat ules	ainly used for				
	6)	into a) c)	is th simple Oxida Cond	ne process by r substances ation ensation	which a che	nica b) d)	al compound breaks dow Decomposition Polymerization	'n	
	7)	) Tab a) c)	let mar Sievir Coati	nufacturing in ng ng	volves	ste b) d)	ps. Packing All of these		
	8)	) If a ther a) c)	drug is i it is ca Supri Adulte	imported und alled as ous erated	der the name _ drug.	whie b) d)	ch belongs to another dr misbranded None of these	ug,	
	9)	) Exp a) c)	iry date day a montl	e of medicine nd month n and year	is expressed	in t b) d)	erms of day and year year only		

		<ul> <li>10) In pharmaceutical industry, light sensitive materials should be stored in vessels.</li> <li>a) steel</li> <li>b) metallic</li> <li>c) plastic</li> <li>d) darkened glass</li> </ul>	
	B)	<ul> <li>Fill in the blanks &amp; rewrite the sentences.</li> <li>1) Arsenic limit test is also known as</li> <li>2) FDA stands for</li> <li>3) Hard gelatin capsule contains% of moisture.</li> <li>4) Oil and water inclusion is called as</li> <li>5) Syrup is saturated solution of</li> <li>6) In limit test, due to addition of brownish colour is produced.</li> </ul>	06
Q.2	Ans a) b) c) d)	<b>wer the following.</b> Write a note on liquid dosage form. Explain injections with suitable example. Explain classification of ointment bases. How personal error can be controlled?	16
Q.3	Ans a) b)	<b>wer the following.</b> Discuss in detail ophthalmic preparation in dosage form. Explain in detail about pharmaceutical raw materials.	10 06
Q.4	Ans a) b)	<b>wer the following.</b> Explain loss on drying and loss on ignition. How personal error is controlled. 0.32 gm of paracetamol [C <sub>8</sub> H <sub>9</sub> NO <sub>2</sub> ] was dissolved in 30 ml 2 N H <sub>2</sub> SO <sub>4</sub> . This solution was titrated with 0.1 N cerric ammonium sulphate using ferroin sulphate indicator gave a burette reading 8.1 ml. Calculate the percentage of paracetamol. [At. Wt.: C-12, H-1, O-16, N-14].	10 06
Q.5	Ans a) b)	wer the following. What is contamination of pharmaceuticals? Discuss in detail about contamination due to process error. Explain labeling procedure in pharmaceutical drug synthesis.	10 06
Q.6	Ans a) b)	wer the following. Explain Limit test for chloride and sulphate. Discuss in detail clinical study in development of new drug.	08 08
Q.7	Ans a) b)	<b>wer the following.</b> Discuss the instrumentation and advantages of Karl Fisher titration. Explain general procedure for tablet manufacturing.	08 08

Seat						Set	Ρ
NO.	1 80	(8)	omostor		amii	ation: March/April 2024	
IV	1.30	. (3	emester - I		MIST	'RY	
			Inorgani	c Chemical Spectros	scop	oy (MSC14301)	
Day & Time:	Date 11:00	e: Fri 0 AN	day, 10-05-2 1 To 02:00 P	2024 M		Max. Marks	: 80
Instru	ctior	<b>າຣ:</b> 1 2 ເ	) Q. Nos. 1 a 2) Attempt an 3) Figure to ri	and 2 are compulsory. y three questions from Q oht indicate full marks	. No.	3 to Q. No. 7	
0.4	•	<u>Oh</u>					40
Q.1	A)	1)	Transitions	involving d-orbitals (d-d t	ransi	tions) is	10
		,	a) laport	e allowed	b)	laporte forbidden	
		0)	c) spin to	orbidden	d)	spin allowed	
		2)	a) high s	am apply to pin complexes	b)	spin allowed transitions	
			c) both a	a & b	d)	low spin complexes	
		3)	The fundam	ental vibrational modes f	or H <sub>2</sub>	O molecule are	
			a) 5 c) 8		b) d)	3	
		4)	The introduc	ction of electronegative g	roup	results in vibrational	
		,	frequency.				
			a) Increa	ised ant	b) d)	decreased zero	
		5)	Analysis of	surfaces can be achieved	d by		
		,	a) UV-PI	ES	b)	ESCA	
		•	c) AES		d)	All of these	
		6)	a) NMR	parable to	b)	Phosphorescence	
			c) Fluore	escence	d)	IR	
		7)	An acoustic	al resonant frequency de	pend	s upon	
			a) Cell le	ength acoustic cell	b) d)	l unable dye laser Chopper	
		8)	PAS provide	es a means for obtaining	UV. v	visible and IR absorption	
		,	spectra of _	 	,		
			a) Solids	;  S	b) d)	Semi solids All of these	
		9)	The simples	st molecule with a low po	tentia	I barrier to inversion is	
		,	a) HĊl	·	b)	OCS	
			c) HCN	<b>,</b>	d)	NH3	
		10)	The inversion a) Increa	on trequency rapidly decr used	ease	s as the barrier height is Decreased	·
			c) Identi	cal	d)	None of these	

	B)	Fill in blanks OR Write True / False	06
		<ol> <li>Unsaturation causes effect on the chemical shift</li> </ol>	
		2) In laser spectrometers detector is used.	
		3) The term symbol for $Cr^{+3}$ ion is	
		<ol> <li>The experimental and theoretical aspects of PES were first pioneered by</li> </ol>	
		5) Scalar coupling is also termed as	
		6) The energy separation of spectroscopic terms is expressed as	
Q.2	Ans	wer the following	16
	a)	Electronic transitions	
	b)	Orthogonality theorem	
	C)	Applications of IR spectroscopy	
	a)	Spin spin coupling	
Q.3	Ans	swer the following	16
	a)	Explain the principle and instrumentation of Auger electron spectroscopy.	
	b)	Explain the local and remote effects in NMR spectroscopy.	
Q.4	Ans	swer the following	16
	a)	Construct and explain the character table for C2v point group.	
	b)	Explain the Morse potential energy diagram.	
Q.5	Ans	swer the following	16
	a)	Distinguish between proper and improper axis of symmetry with example.	
	b)	Discuss in brief the Charge transfer spectra with suitable example.	
Q.6	Ans	swer the following	16
	a)	Explain the Principle of photoacoustic spectroscopy (PAS).	
	b)	Explain the effect of isotopic substitution in microwave spectrum.	
Q.7	Ans	swer the following	16
	a)	Explain the occurrence of stokes and antistoke lines in Raman spectrum of	
		molecule.	
	<b>h</b> )	Evaluin the Classification of malegulas in point groups	

**b)** Explain the Classification of molecules in point groups.

	M.So	c. (Se	eme	ster - III) (New) (CBCS) Inorganic Ch	Examiı emistr	nation: March/April-2024 V	ŀ
				Co-ordination Chemist	ry – I (	MSC14302)	
Day Time	& Dat e: 11:(	te: Mo 00 AM	nday To (	v, 13-05-2024 02:00 PM		Max. Mark	s: 80
Insti	ructio	o <b>ns:</b> 1) 2 3	) Q. I ) Atte ) Figi	Nos. 1 and 2 are compulsory. empt any three questions fron ures to the right indicate full n	n Q. No. narks.	3 to Q. No. 7.	
Q.1	A)	Cho 1)	<b>ose</b> Whi dist	<b>correct alternative.</b> ich metal complex ion is expe ortion?	ected to	be subject to a Jahn-Teller	10
			a)	[Cr (OH <sub>2</sub> ) <sub>6</sub> ] <sup>3+</sup>	b)	[Cr (NH <sub>3</sub> ) <sub>6</sub> ] <sup>2+</sup>	
			c)	[Cr (CN) <sub>6</sub> ] <sup>3-</sup>	d)	[Cr(bpy)3] <sup>2+</sup>	
		2)	The a) b) c) d)	filling of molecular orbital tak The Aufbau Principle Pauli Exclusion Principle Hund's rule of maximum mu All of the mentioned	kes place ultiplicity	e according to	
		3)	The con a)	substance that increases the sumed is element	e rate of b)	reaction but is not itself catalyst	
		4)	c) Ace a) b) c) d)	copolymerizer etic acid is produced by olefin hydrogenation olefin polymerization Monsanto acetic acid proce None of these	d) _ <sup>.</sup> ess	none of above	
		5)	Will a) c)	kinson's catalyst is TiCl₄ + AlEt₃ [Rh (PPh₃)₃ Cl])	b) d)	ZrO4 TiO4	
		6)	Whi a) c)	ich magnetic have negative s Diamagnetic materials Ferromagnetic materials	usceptib b) d)	oility? Paramagnetic materials All of the above	
		7)	Unc in T a) c)	der conditions of heatir GA. First order Third order	ng, deco b) d)	mposition usually take place Second order Dynamic	
		8)	One a) c)	e of the following is TA instrur TGA 2950 FTIR	ment b) d)	UV-3600 Spectrum 100	
		9)	The a) c)	e CFSE for a high-spin $d^4$ octa $-0.6\Delta_{oct}$ $-1.6\Delta_{oct} + P$	ahedral ( b) d)	complex is $-1.8\Delta_{oct}$ $-1.2\Delta_{oct}$	

### Seat No.

Set Ρ

		<ul> <li>10) Which calibrant is used in DTA?</li> <li>a) Glass beads</li> <li>b) Silicon carbide</li> <li>c) Alumina</li> <li>d) All of these</li> </ul>						
	B)	<ul> <li>Fill in the blanks OR Write True/False.</li> <li>Basic source of magnetism</li> <li>Oxidation of ethylene to acetaldehyde is earned out by</li> <li>Zigler-Natta catalyst is</li> <li>Transition metals are complexes act as</li> <li>Nickel (II) ion has unpaired electrons.</li> <li>In industrial processes, transition elements and their oxides are used as</li> </ul>	6					
Q.2	Ans a) b) c) d)	wer the following. Spectrochemical series Diamagnetism. Decarboxylation of B keto acids. Factors affecting TGA curve.						
Q.3	Ans a) b)	<b>1</b> Explain the different between CFT and MOT Write a brief note on current and future trends in catalysis.	6					
Q.4	Ans a) b)	<b>1</b> Discuss the factors affecting stability of ternary complexes. Explain the tetrahedral structure involving sigma bonding with MO diagram.	6					
Q.5	Ans a) b)	<b>1</b> Explain the structure of [Ni (CN) <sub>4</sub> ] <sup>2-</sup> on the basis of VBT. Explain in brief diamagnetism and paramagnetism with suitable example.	6					
Q.6	Ans a) b)	<b>1</b> Explain the determination of magnetic susceptibility by Gouy method. Explain the factors affecting DTA curve.	6					
Q.7	Ans a)	The following. Draw the DTA curve for CaC <sub>2</sub> O <sub>4</sub> . 2H <sub>2</sub> O and explain mechanism of the determined of t	6					

**b)** Explain the Octahedral structure involving sigma bonding with MO diagram.

Seat No.		Set F	>						
М.:	M.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2024 INORGANIC CHEMISTRY Nuclear Chemistry (MSC14306)								
Day & I Time: 1	Date: W 1:00 A	/ednesday, 15-05-2024 Max. Marks: 8 M To 02:00 PM	0						
Instruc	tions:	1) Q. Nos.1 and 2 are compulsory. 2) Attempt any three questions from Q. No. 3 to Q. No. 7 3) Figure to right indicate full marks.							
Q.1 A	<b>() Ch</b> 1)	oose correct alternative.1In fast breeder nuclear reactor, the fuel used isa)ull -239b)ull -232b)ull -233b)ull -234b)ull -235b)ull -235b)ull -236b)ull -236b)ull -237b)ull -238b)ull -238b)ull -238b)ull -238b)ull -238b)ull -	0						
	2)	The Liquid drop model of nucleus was developed by a) Bohr, Wheeler b) Fermi c) Chadwick d) Rutherford							
	3)	The commonly used material for shielding is a) lead or concrete b) lead and tin c) graphite d) thick galvanized sheets							
	4)	If the mass of reactant is 8.02636 and mass of product is 8.02813, then the nuclear reaction is a) Endoergic b) Exoergic c) Elastic d) None of these							
	5)	What is B.E/A of He nucleus which has B.E. 28 MeV? a) 14 MeV b) 7 MeV c) 28 MeV d) 9.87 MeV							
	6)	The unit of reaction cross-section is a) cm <sup>3</sup> b) Barn c) N/m d) Joule m <sup>2</sup>							
	7)	Nuclear fusion reaction is also known as reaction. a) thermonuclear b) elastic scattering c) stripping reactions d) None of these							
	8)	Which of the following is used to measure the rate of nuclear disintegration?a) Cyclotronb) Mass spectrographc) Cold chamberd) Geiger-Muller counter							
	9)	The act of measuring or estimating radiation doses is known asa) Dosimetryb) Colorimetryc) Photometryd) None of these							
	10)	<ul> <li>The stopping power is the rate of energy loss per unit length of matter is referred as</li> <li>a) LET</li> <li>b) EC</li> <li>c) EZ</li> </ul>							

	B)	Fill in the blanks: 1) Even-even nuclides (both Z and A even) have zero intrinsic spin and parity.	06
		<ol> <li>The range of N/Z ratio for stable nuclei is</li> <li>The first plant set up in India for the production of heavy water is at</li> <li>The packing fraction of 7N14 isotope whose mass is 14.003 a.m.u.is</li> <li> model corresponds to the magic numbers.</li> <li>Nuclear reactions induced by X-rays or g-photons of high energy are referred as reactions.</li> </ol>	 
Q.2	Ans a) b) c) d)	wer the following. Write a note on magnetic moments of odd mass numbers nuclei. Explain radiolysis of aqueous solution with suitable examples. What is Packing fraction? Write about nuclear reactors in INDIA.	16
Q.3	Ans a) b)	<b>wer the following.</b> What is nuclear cross section? And explain different types of nuclear reactions. Give a brief account of general aspects of reactor design.	16
Q.4	Ans a) b)	wer the following. Write nuclear configuration, spin and parity of <sub>29</sub> Cu <sup>63</sup> and <sub>78</sub> Pt <sup>195</sup> Discuss about the heavy water manufacturing in India.	16
Q.5	Ans a) b)	<b>swer the following.</b> Discuss about Chemical solutions to environmental problems biodegradability. Discuss about the ionizing and non-ionizing radiations on living things.	16
Q.6	Ans a) b)	<b>swer the following.</b> Explain Liquid drop model. Derive semi-empirical mass equation. Explain the stability of nucleus w.r.t mass defect, B.E, N/Z ratio.	16
Q.7	Ans a) b)	<b>wer the following.</b> Explain the construction and working of pressurized water reactor. What is threshold energy of a nuclear reaction? Give Bohr's hypothesis of compound nucleus for nuclear reaction.	16

Seat No.		
М	.Sc. (Semester - I	V) (New) (CBC

S) Examination: March/April-2024 **INORGANIC CHEMISTRY** Instrumental Techniques (MSC14401)

Day & Date: Thursday, 09-05-2024 Time: 03:00 PM To 06:00 PM

Instructions: 1) Question 1 and 2 are compulsory.

- 2) Attempt any three questions from Q.3 to Q.7
- 3) Figures to the right indicate full marks.

#### Q.1 A) **Choose Correct Alternative.**

- Neutron diffraction technique was developed by 1)
  - b) B.N. Brockhouse

b) Methylation

- a) C.G. Shall c) Both a & b d) J. Karle
- In the schematic DTA sequence having reversible and irreversible 2) changes, starting with the hydrated material, which of the following steps occurs first on heating?
  - a) Esterification
  - c) Rehydration d) Dehydration
- What is the temperature required for the decomposition of CaCO<sub>3</sub> in 3) degree Celsius?
  - a) 200 b) 500
  - d) 1200 c) 900
- 4) TMA is also known as
  - a) dilatometry b) volumetry
    - c) TGA d) All of these
- The number of ESR lines for triphenyl methyl radical are . 5)
  - a) 7 b) 20
  - c) 3 d) 196
- Which of the following is used as detector crystal in ESR spectrometer? 6)
  - b) Silicon tungsten rectifier a) Silicon rectifier d) Silicon quartz rectifier
  - c) Silicon boron rectifier
- The temperature below which the single Mossbauer line splits into six 7) lines because sharp decrease in electron density at the nucleus is called
  - a) Curie point
  - c) Transition point
- 8) Mossbauer study is the study of  $\gamma$ -rays and subsequent reabsorption.
  - a) transmission

c) Visible region

c) emission

b) absorption d) None of these

b) Neel point

d) None of these

- The region in which NQR spectra are observed is 9)
  - a) Radio frequency region
- b) Microwave region
- d) IR region

SLR-HF-70

Set

Max. Marks: 80

		c) Stephan' law d) All of these	
	B)	<ul> <li>Fill in the blanks OR write true/false</li> <li>1) Geiger tube cannot be used to measure the energy of</li> <li>2) The absorption of X-rays is governed by</li> <li>3) Mossbauer performed an experiment of recoilless absorption and emission in solids</li> <li>4) The magnetic interaction between the electron spin and nuclear spin in the same molecule is known as</li> <li>5) The removal of degeneracy of states by the internal magnetic field of paramagnetic electrons are known as</li> <li>6) TMA involves measurement of penetration,, contraction and extension of material as a function of temperature.</li> </ul>	)6
Q.2	Ans a) b) c) d)	<b>wer the following.</b> Explain in brief Mössbauer effect. Give the applications of NQR spectroscopy. What is the difference between DTA and DSC? Write the applications of X-ray diffraction.	16
Q.3	Ans <sup>r</sup> a) b)	<b>wer the following.</b> Explain the splitting of NQR spectra in nucleus having spin I=1 and I=2 and show the observed NQR transitions. Explain in brief determination of lattice parameters.	16
Q.4	Ans <sup>r</sup> a) b)	wer the following. What is mean by thermo mechanical analysis (TMA)? Give a schematic representation of thermo mechanical analyzer. A first order reflection from (111) planes of a cubic crystal observed at glancing angle 11.2° using $Cu \cdot K\alpha$ radiation. Calculate the length of the side of unit cell.	16
Q.5	Ans a) b)	<b>wer the following.</b> Explain the principle and application of neutron diffraction technique. Explain the factors affecting the magnitude of g value in ESR spectrum.	16
Q.6	Ans a) b)	<b>wer the following.</b> Discuss the theory of X-ray diffraction, giving a schematic diagram of instrumentation involved. Explain quadrupole splitting and hyperfine interaction in Mössbauer spectroscopy with suitable example.	16
Q.7	Ans <sup>r</sup> a) b)	wer the following. What is thermal analysis? Describe the principle and working of TGA. Explain the use of Mössbauer spectroscopy in the determination of bonding in iron complexes.	16

Seat No.					Set	Ρ
Μ	l.Sc.	(S	emester - IV) (Ne INO Co-ordinatio	w) (CBCS) Exam RGANIC CHEMIS on Chemistry – II	ination: March/April-2024 STRY (MSC14402)	
Day & Time:	Date 03:00	e: Sa D PN	turday, 11-05-2024 I To 06:00 PM	,	Max. Marks:	80
Instru	ctior	is: ^	) Q.Nos.1 and 2 are ) Attempt any three ) Figure to right indi	compulsory questions from Q. N cate full marks.	o. 3 to Q. No. 7	
Q.1	A)	Cho 1)	ose correct alterna According to VBT th SN <sup>1</sup> reactions. a) ns np3 nd <sup>2</sup>	ntive. e complexes with b)	(n-1) $d^2$ ns np <sup>3</sup>	10
		2)	C) IIS NP2 Nd <sup>2</sup> Optical isomerism is a) [Ni (CO)4] c) [Pt (NH <sub>3</sub> )4] <sup>2+</sup>	s shown by b) d)	[Ni (CN)4] <sup>2-</sup> [Co(en)3] <sup>3+</sup>	
		3)	Which stable interm a) square pyram c) trigonal	ediate is formed duri idal b) d)	ng SN <sup>1</sup> Substitution? tetrahedral octahedral wedge	
	,	4)	Which of the followii a) F <sup>-</sup> c) CO	ng acts as π-acid liga b) d)	and? O <sup>2-</sup> NH3	
		5)	The optically active a) centre of symi c) an improper a	molecule must have metry b) xis d)	 plane of symmetry None of these	
		6)	In a photochemical absorb a pho to form the products a) Single c) Half	reaction, each molec ton of radiation caus b) d)	ule of the reacting substance ing the reaction and is activated Double All of these	
		7)	During SN <sup>1</sup> (CB) me a) cis product c) both cis and tr	echanism the TBP int b) ans product d)	ermediate gives product. trans product None of these	
		8)	Electron transfer is f system are a) Pi acceptors c) Neutral	ast if the co-ordinate b) d)	ed ligands present in the Pi donors All of these	
		9)	Unimolecular nucleo a) dissociative m c) solvation mec	ophilic substitution fo echanism b) hanism d)	llows associative mechanism SN1(CB) mechanism	

	10)	In pho a) c)	otochemical rea ultraviolet and only visible	actions, absorpti visible	on of b) d)	ra vis	radi dio sible and	ations tak d x-rays	kes place.	
В)	Fill 1) 2) 3) 4) 5) 6)	in the The racalled The s The ra The ra bridgi The ra metal A bea	blanks OR W eactions which I ymmetric mole ate of change of ate of electron ng Ligand. ate of electron ion. ion.	rite True/False. are caused by h cule contains of specific rotatic transfer increase transfer depende	neat a  on wit es wit es wit s upo	and h w th ir on th e of	in abse aveleng ncrease ne f rays.	nce of ligh oth is know in the _ of the c	nt is wn as of the entral	<b>06</b> 
Ans a) b) c) d)	swer Exp Disc Writ Exp	the fo lain in cus the te note lain in	<b>llowing.</b> brief racemisa Substitution re on Base hydro brief reaction i	tion reactions in eaction. olysis. n non-aqueous s	octał solve	hed nt.	ral com	plexes.		16
Ans a) b)	wer Wha Defi pho	<b>the fo</b> at is th ine the tocher	<b>llowing.</b> e role of bridgi photochemist nistry.	ng ligand in inne ry. Explain the c	er sph oncep	ere pt o	electro f quantu	n transfer ım yield ir	mechanisn າ	<b>16</b> ו?
Ans a) b)	b <b>wer</b> Diso dich Diso ans	the fo cuss th proism cuss th wer wi	<b>llowing.</b> ne relationship curves. ne mechanism th examples.	between opticall of outer sphere e	y rota electr	ator on f	dispers transfer	ion and ci . Illustrate	ircular 9 your	16
Ans a) b)	Disc com Exp che	the fo cuss th pplexes lain ac lation a	<b>llowing.</b> ne types of nuc s. cid hydrolysis o and steric facto	leophilic substitu f Co (III) comple ors.	ition r xes b	reac by c	ctions in onsideri	octahedr	al of	16
Ans a) b)	<b>wer</b> Exp Exp	<b>the fo</b> lain in lain th	<b>llowing.</b> brief photoche e polarization t	mistry of metallo heory of trans ef	ocene ffect.	<del>)</del> .				16
Ans a) b)	wer Writ com Exp com	the fo te the e plex. lain th plexes	<b>llowing.</b> evidences to su e mechanism i s.	upport SN2 reac nvolved in isome	tion n erisati	nec ion	hanism reactior	of square	e planner edral	16

Q.2

Q.3

Q.4

Q.5

Q.6

Q.7

Seat				7				Cat	
No.								Set	Ρ
Μ	.Sc	. (Se	mester Chomi	- IV) (New) (CB( INORGANIC	CS) Exa C CHEN	am MIS	ination: March/A TRY	April-2024	
Day & Time: (	Date 03:0	e: Tue 0 PM	esday, 14- To 06:00	05-2024 PM		711a	15 (10130 14403)	Max. Marks	: 80
Instru	ctior	<b>1s:</b> 1) 2) 3)	Q.Nos.1 Attempt a Figure to	and 2 are compuls any three questions right indicate full n	ory s from Q narks.	.no.	3 to Q.no.7		
Q.1 A	4)	<b>Choo</b> 1)	D <b>se corre</b> Electrical a) 10 <sup>-1</sup> c) 10 <sup>-1</sup>	ct alternative. (MC l conductivity of ins ${}^{0}(\Omega - mm)^{-1}$ ${}^{0}(\Omega-m)^{-1}$	C <b>Q)</b> sulators i	s th b) d)	e range 10 <sup>-10</sup> (Ω-cm) <sup>-1</sup> 10 <sup>-8</sup> (Ω-m) <sup>-1</sup>		10
		2)	Flow of e a) The c) Cry	electrons is affected rmal vibrations stal defects	l by the t	follo b) d)	wing Impurity atoms All of these		
		3)	The space a) 74% c) 68%	ce occupied in bcc a % %	arranger	men b) d)	t is 70% 60.4%		
		4)	The relat a) tricl c) hex	ions a≠b≠c and α inic agonal	$\neq \beta \neq \gamma$	bel b) d)	ongs to the system. trigonal cubic		
		5)	An eleme atoms in a) 12.0 c) 48.0	ent having bcc struc these cells is 08×10 <sup>23</sup> 68×10 <sup>23</sup>	cture has <sup>.</sup>	s 12 b) d)	2.08 × 10 <sup>23</sup> unit cells 24.16×10 <sup>23</sup> 12.08×10 <sup>22</sup>	. The no of	
		6)	$\begin{array}{c}  \text{is} \\ \text{electrical} \\ \text{a)}  \sigma = A \\ \text{c)}  \sigma = A \end{array}$	the temperature de conductivity struct exp(-E/2RT) exp(-E/RT)	ependen ure.	b) d)	Arrehenius equation $\sigma$ =A exp(-2E/RT) $\sigma$ =2A exp(-E/RT)	of	
		7)	Crystals dipole mo a) Pyro c) Ferro	may align themselv oment, exhibit o-electricity ro-electricity	ves in ar ·	b) d)	dered manner, so the Piezo-electricity Antiferro electricity	ere is a net	
		8)	Average a) 10 <sup>-1</sup> c) 10 <sup>12</sup>	frequency of atomi	c vibrati	ons b) d)	in a solid (in Hz) 10 <sup>-13</sup> 10 <sup>13</sup>		
		9)	The width a) 1 c) 2.5	n of a carbon nanot	tube is _	b) d)	_ nm. 1.3 10		
		10)	Following a) Twi c) Sur	g is not the 2-dimen n boundary face	nsional ir	npe b) d)	rfection. Dislocation Grain boundary		

			_
	В)	<ul> <li>Fill in the blanks OR Write True/False</li> <li>1) Theoretical strength is about times to average real strength of a material.</li> <li>2) Stacking fault energies are in the range of</li> <li>3) Average frequency of atomic vibrations in a solid (in Hz)</li> <li>4) A solid having irregular shape is called solid.</li> <li>5) solids are also called giant solids or network solids.</li> <li>6) Schottky defect is noticed in</li> </ul>	06
Q.2	Ans a) b) c) d)	<b>wer the following.</b> Write note on co-precipitation techniques. Discuss in detail magnetic bubble memory device. Write note on Thin films Explain in brief organic Semiconductors.	16
Q.3	Ans a) b)	<b>wer the following.</b> Explain the formation of spin glasses. What are the challenges and opportunities of nanotechnology?	6
Q.4	Ans a) b)	<b>wer the following.</b> Write different method for making nanomaterials. Explain in brief combustion method. Explain the energy conversion from fission and fusion reactions.	16
Q.5	Ans a) b)	<b>wer the following.</b> Explain Langevin's theory of paramagnetism. List the types of defects that occur in the crystalline solids and give an example of each.	16
Q.6	Ans a) b)	<b>wer the following.</b> What are normal, inverse and random spinels? Explain the general structure of spinels. Discuss any one method of manufacturing of nanomaterials.	16
Q.7	Ans a) b)	<b>wer the following.</b> Discuss the mechanism of ionic conduction. Explain ceramic technique used for synthesis of solid-state materials.	6

Seat No.						Set	Ρ
М.	Sc.	(Sen	nester - l' Appli	V) (New) (CBCS) Exar INORGANIC CHEM ed Inorganic Chemist	nin IIST rv (	ation: March/April – 2024 RY MSC14408)	ı
Day & Time:	Date 03:0	e: Thu 0 PM	rsday, 16-( To 06:00 F	05-2024 PM		Max. Marks	: 80
Instru	ctior	18: 1) 2) 3)	Q. Nos. 1 Attempt ar Figure to r	and. 2 are compulsory. ny three questions from Q. right indicate full marks.	No.	3 to Q. No. 7	
Q.1	A)	Choc 1)	Ose correc Oxidation a) acetic c) wack	<b>t alternative.</b> of ethylene to acetaldehyd c acid process cer's process	e is b) d)	carried out by polymerization arene coupling	10
		2)	Polymers a) Micro c) Sub-	are o-molecules micromolecules	b) d)	Macromolecules None of these	
		3)	Zeigler - N a) Vinyl c) Propy	latta catalyst is used in the acetate ylene	poly b) d)	ymerisation of Vinyl chloride Styrene	
		4)	Which of t of renewal a) Solar c) Theri	he energy has the greates ble energy? r energy mal energy	t pot b) d)	ential among all the sources Wind Energy Hydro-electrical energy	
		5)	Which is n produced? a) Hydro c) Coal	nost common source of en ? oelectricity	ergy b) d)	<sup>,</sup> from which electricity is Wind energy Solar energy	
		6)	In what for a) Ultra c) Elect	rm is solar energy is radiate violet radiation fromagnetic waves	ed fr b) d)	om the sun? Infrared radiation Transverse waves	
		7)	Solar radia a) Insola c) Diffus	ation received at any point ation se Radiation	of e b) d)	arth is called Beam Radiation Infrared rays	
		8)	Insolation a) wher c) at nig	is less In the sun is low ght	b) d)	when the sun right above head at sun rise	d
		9)	Industrial ( a) High c) Mode	catalysts should have	b) d)	surface area. Low None of these	
		10)	The nano a) Magr	particles from iron and pall nets	adiu b)	Im are used to produce Magnetic lens	·

- c) Magneto meters
- d) Magnetic storage devices

	B)	<ul> <li>Fill in the blanks OR Write true/false.</li> <li>1) The synthesized nano particles from have been found to self-arrange automatically.</li> <li>2) The extensively used nano particles as catalyst is</li> <li>3) Quantum dots can be used in</li> <li>4) Nano crystalline materials synthesised by sol-gel technique in a foam like structures called</li> <li>5) Inorganic polymers, in general, are stronger, harder and more brittle than the polymers.</li> <li>6) The borophosphate glasses are used for manufacturing lenses.</li> </ul>	06
Q.2	Ans a) b) c) d)	wer the following. Discus the heterogeneous catalysis. Write note on Photovoltaic cell. Explain in brief Inert gas rule. What are the types of inorganic polymers?	16
Q.3	Ans a) b)	<b>wer the following.</b> Explain the lon exchange method for making nanomaterials. Give the advantages of geothermal energy.	16
Q.4	Ans a) b)	<b>wer the following.</b> Write different method for making nanomaterials. Explain in brief combustion method. Explain the energy conversion from fission and fusion reactions.	16
Q.5	Ans a) b)	<b>wer the following</b> Write the general properties of inorganic polymers. Write the applications nanomaterials.	16
Q.6	Ans a) b)	<b>wer the following</b> What are organosilicones? Discuss various types of silicones. What are organometallic compounds? How they are classified?	16
Q.7	Ans a) b)	<b>wer the following.</b> Outline the various characterization techniques for nanomaterials. Explain in detail X-ray diffraction technique. Give a brief account of boron-based polymers.	16

			Advanced Organic Uner	nistry – i	(1150012301)	
)ay Time	& Dat e: 11:(	te: Fri 00 AN	iday, 10-05-2024 / To 02:00 PM		Max. Marks	: 80
nstı	uctio	ons: 1 2 3	<ol> <li>Q. Nos. 1 and 2 are compulsor</li> <li>Attempt any three questions fr</li> <li>Figure to right indicate full mar</li> </ol>	ry. om Q. No. ⁺ks.	3 to Q. No. 7	
Q.1	A)	<b>Cho</b> 1)	<b>Dose correct alternative.</b> In Wolff rearrangement,	_ has been	formed by rearrangement of	10
			a) nitrene c) both a) and b)	b) d)	ketene None of these	
		2)	$ \begin{array}{c}                                     $			
			а)	b)	он сно	
			c)	d)	None of these	
		3)	The formation of alkenes by ba p- toulenesulfonylhydrazo-nes a) Bomford-Steven's reaction c) Heck reaction	se catalyse of aldehyde n b) d)	ed decomposition of es and ketones is known as Stille reaction Ugi reaction	
		4)	In Henry reaction, nitroalkanes a) α - hydrogen c) γ - hydrogen	should hav b) d)	$\beta = \underline{\qquad}$ . $\beta$ - hydrogen $\delta$ - hydrogen	
		5)	Migrating aptitude of groups for a) ethyl > allyl > phenyl c) allyl > ethyl > phenyl	r Wittig rea b) d)	rrangement is allyl > phenyl > ethyl phenyl > ethyl > allyl	
		6)	In Hoffmann-Loffler-Freytag rea a) $\alpha$ - hydrogen c) $\gamma$ - hydrogen	action, N-ha b) d)	aloamines should have eta - hydrogen $\delta$ - hydrogen	
		7)	Which of the following is act as a) nitric oxide	inhibitor in	free radical reactions?	

- c) benzoquinone
- d) All of these

Set

Ρ

### Seat No.

#### M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 PHÁRMACEUTICAL CHEMISTRY and Organia Chamistry I (MSC012201)

### Q



### B) Write True or False for the followings.

- 1) The coupling of alkene with a halide or triflate in the presence of Pd(0) catalyst to form a new alkene is known as Heck reaction.
- 2) SeO<sub>2</sub> is primarily used for the oxidation of allylic C-H fragment.
- 3) Amides on treatment with sodium hypobromite gives primary amines.
- 4) DDQ is used as a powerful hydrogenating agent.
- 5) DCC is used as powerful dehydrating agent commonly used for the preparation of amides, esters and anhydrides.
- 6) Wagner-Meerwein rearrangements are common in many reactions involving carbene as intermediate.

### Q.2 Answer the following.

- a) Discuss Baylis-Hillmann reaction.
- b) Write a note on Pummerer rearrangement.
- c) Predict the product with illustration:



d) Predict the product; give the name and mechanism of following reaction:



06

### Q.3 Answer the following.

- a) Discuss Mukaiyama reaction and give its application.
- **b)** Write note on Hunsdiecker reaction.

### Q.4 Answer the following.

- **a)** Discuss the followings:
  - 1) Peterson's synthesis
  - 2) Duff reaction
- **b)** Discuss the Eschenmoser fragmentation with mechanism and give its applications.

### Q.5 Answer the following.

- a) Discuss mechanism at an aromatic substrate in free radical substitution reaction.
- **b)** Predict the products with its mechanism and name the following reactions:



### Q.6 Answer the following.

- a) Discuss the Smiles rearrangement with illustration.
- **b)** Explain Hoffmann-Loffler-Freytag reaction with suitable example and mechanism.

### Q.7 Answer the following.

- **a)** Write a brief note on:
  - 1) Lithium dialkylcuprate
  - 2) Trimethylsilyl iodide
- **b)** Write a brief note on:
  - 1) Sandmeyers reaction
  - 2) auto-oxidation

16

16

16

16

Set

# M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 **Pharmaceutical Chemistry**

Chemistry of Bioactive Heterocycles (MSC012302)

Day & Date: Monday, 13-05-2024 Time: 11:00 AM To 02:00 PM

**Instructions:** 1) Q. Nos.1 and 2 are compulsory.

- Attempt any Three questions from Q.No.3 to Q.No.7.
- 3) Figures to the right indicate full marks.

#### Q.1 A) Choose correct alternative (MCQ).

a) Furan

- Which of the following is a six membered ring? 1)
  - a) Pyridine
  - c) Furan d) Thiophene
- 2) Which of the following five membered rings is most resonance stabilized?

**Pyrrole** 

b) Thiophene

b)

- c) Pyrrole d) Pyridine
- 3) What is the reactivity order in the following five membered heterocyclic compounds?
  - a) Pyrrole b) Furan
  - c) Thiophene d) Pyridine

NaNH,

Toulene, 100°C

4) What is the name of the following reaction?

NH2 **Riemer tiemann reaction** a) Gattermann reaction b) c) Friedal craft reaction d) Chichibabin reaction 5) Isoquinoline on reaction with NaNH<sub>2</sub>. liq. NH3 gives as product. a) 1-Amino isoquinoline b) 2-Amino isoquinoline c) 3-Amino isoquinoline Na-salt of isoquinoline d) Electrophilic aromatic substitutions in thiophene takes place at 6) positions. 1 2 a) b) d) 2 and 3 c) 3 7) 2- Aza naphthalene is the name of a) Pyridine Quinolone b)

- c) Isoquinolined d) Indole
- Quinoline is 8) compound.
  - a) Homocyclic b) Heterocyclic
    - c) Aliphatic d) Saturated

Max. Marks: 80



06

16

16

16

16

- 9) Thiophene on sulfonation at room temperature gives \_\_\_\_\_.
  - a) Thiophene-2-sulfonic acid
  - b) Thiophene-3-sulfonic acid
  - c) Both a) and b)
  - d) None of these
- 10) Identify the reaction condition for the following reaction-



#### B) Fill in the blanks.

- 1) Pyridine has delocalized Pi-molecular orbital containing \_\_\_\_\_
- 2) Furan containing functional group is known as furfural.
- 3) Pyrazole is membered heterocyclic compound.
- 4) Isoquinoline on reaction with soda amide in liq. Ammonia gives \_\_\_\_.
- 5) Pyrrol on heating with methyl chloride in presence of sodium methoxide \_\_\_\_\_ formed.
- 6) Benzimidazole contain \_\_\_\_\_ nitrogen atom.

#### Q.2 Answer the following.

- a) Discuss aromaticity of pyrrole and thiophene.
- **b)** Write any two electrophilic aromatic substitution reactions of thiazole and isothiazole.
- c) Isoxazole is less basic than oxazole -Explain.
- d) Write a note on morphine.

#### Q.3 Answer the following.

- a) Write any two synthetic methods of furan and their chemical reactions.
- **b)** Write note on synthesis of benzofuran with mechanism and their applications.

#### Q.4 Answer the following.

- **a)** Discuss the synthesis of indole with mechanism and their chemical reactions.
- **b)** Discuss the synthesis of imidazole and pyrazole and their applications.

#### Q.5 Answer the following.

- a) Discuss chemical reactions of pyridine.
- **b)** What is quinolone and isoquinoline? Write synthetic methods with examples.

### Q.6 Answer the following.

a) Predict the product and give its mechanism.



**b)** Discuss the synthesis of azitidine and thietane with chemical reactions.

### Q.7 Answer the following.

- a) Discuss the synthesis and tetrazine in detail.
- **b)** Write any two methods of synthesis of pyrimidine and their chemical reactions.

16

Seat	
No.	

### M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2024 PHARMACEUTICAL CHEMISTRY Drug Development (MSC012306)

Day & Date: Wednesday, 15-05-2024 Time: 11:00 AM To 02:00 PM

Instructions: 1) Question no. 1 and 2 are compulsory.

- 2) Attempt any three questions from Q. No. 3 to Q. No. 7.
- 3) Figure to right indicate full marks.

#### Q.1 A) Choose correct alternative.

- The science which deals with the drug and their action on human 1) body is called
  - a) Physiology c) Pharmacology
- b) Pathology Microbiology d)
- The protein structures that are expressed within the cell membranes 2) and interact with endogenous signaling molecules or some drugs to initiate an intracellular response are called as
  - a) Enzymes b) Hormones d) Receptors
  - c) Ligands
  - A negative value of  $\sigma$  for a substituent signifies that
- 3) a) It is electron donating It is hydrophobic b)
  - c) It is hydrophilic
- 4) Among the following is a source for obtaining drugs.
  - a) Animals and plants Micro-organisms b)
  - c) Synthetic origin d)
- 5) In pharmacokinetics, the acronym ADME stand for
  - a) Absorption, Distribution, Metabolism, and Excretion
  - b) Administration, Differentiation, Metabolism, and Excretion
  - Absorption, Disintegration, Metabolism, and Efficacy c)
  - Administration, Distribution, Metabolism, and Efficacy d)
- Among the following compounds have desirable properties to 6) become a drug.
  - a) Fit drug

7)

b) Lead d) All of the above

Cheminformatics

c) Fit compound The identification of drugs through the genomic study is called .

d)

- a) Genomics b) **Pharmacogenetics**
- c) Pharmacogenomics
- The most significant protein involved in the binding with the drug is \_. 8)
  - a) Albumin
  - Glycoprotein b) Globulin c) Lipoprotein d)

Max. Marks: 80

10

- All of the above

It is neutral

d)

06

16

16

16

- 9) The drug concentration between Minimum Effective Concentration and Maximum safe concentration is called as \_\_\_\_\_.
  - a) Pharmacological response
  - b) Area under curve
  - c) Peak response
  - d) Therapeutic range
- 10) The volume of distribution (Vd) relates \_\_\_\_\_
  - a) The amount of drug in the body to the concentration of drug in plasma
  - b) An unchanged drug reaching to the systematic circulation
  - c) Daily dose of an administered drug
  - d) An administered dose to a body weight

#### B) Fill in the blanks.

- 1) The combined effect of two drug effect is higher than either individual effect is called as \_\_\_\_\_.
- 2) \_\_\_\_\_ is a measure of the fraction of administered dose of a drug that reaches the systematic circulation in the unchanged form.
- 3) The symbol 'P' in QSAR equation represent \_
- 4) Margaret Dayhoff developed the first protein sequence database called \_\_\_\_\_.
- 5) \_\_\_\_\_ refers to the study of the entire set of expressed proteins in the cell.
- 6) \_\_\_\_\_ software programme is used to determine the Verloop steric parameter.

#### Q.2 Answer the following.

- a) Explain Lipinski rule of 5.
- b) Discuss the drugs and their sources.
- c) Write a note on lead molecule.
- d) Explain the terms: LD50, ED50, IC50, MIC

#### Q.3 Answer the following.

- a) Explain bioavailability of drug and major factors affecting drug bioavailability.
- b) What is dose-respose relationship? Explain the potency and efficacy of the drug.

#### Q.4 Answer the following.

- a) What are molecular descriptors? Explain the methods of molecular
   descriptor selection.
   b) Explain in detail the combined effect of drugs administered together in the
   06
- b) Explain in detail the combined effect of drugs administered together in the **06** body.

#### Q.5 Answer the following.

- a) Explain the development of Cimetidine on the basis of physio-chemical properties.
- b) What is pharmacokinetics? Explain in detail the process of drug absorption.

### Q.6 Answer the following.

- a) Define and classify molecular docking and discuss various steps involved in 10 the flexible docking.
- b) Write an account on metabolism for the drug administered in the body. 06

#### Q.7 Answer the following.

- a) What are receptors? Explain the types of receptors in detail.
- **b)** What are the principles of drug action? Discuss the mechanism involved in drug action.

Seat	
No.	

### M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 PHARMACEUTICAL CHEMISTRY Photochemistry and Pericyclic Reactions (MSC012401)

Day & Date: Thursday, 09-05-2024 Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. Nos. 1 and. 2 are compulsory.

- 2) Attempt any three questions from Q. No. 3 to Q. No. 7
- 3) Figure to right indicate full marks.
- 4) Draw neat, labelled diagrams and give equations wherever necessary.

#### Q.1 A) Choose correct alternative.

- The light formed from a chemical reaction is called as \_\_\_\_\_ 1)
  - a) Luminescence b) Bioluminescence
    - d) All the above c) Chemiluminescence
- rearrangement is an extensively studied organic reaction 2) The involving the [3,3]-sigmatropic rearrangement of 1,5-dienes.
  - a) Cope b) Oxy-cope
  - c) Lossen d) Claisen
- The cycloaddition reaction between an electronically excited carbonyl 3) group and a ground state olefin to yield an oxetane is known as reaction.
  - a) Norrish type I
- b) Norrish type II
- c) Paterno-Buchi d) Ene
- Rotation of bond in same direction either clockwise or anticlockwise is 4) known as motion.
  - a) Conrotatory b) Disrotatary
  - c) Transrotatory d) Oscillatory
- In Claisen rearrangement, an allylphenyl ether under thermal condition 5) is converted to an is known as \_\_\_\_\_ rearrangement.
  - a) p-allylphenol b) m-allylphenol
  - c) o-allylphenol d) o/p-allylphenol
- is the major product in Diels-Alder reaction of cyclic diene due 6) to secondary interactions.
  - a) exo b) endo
  - c) cis d) trans
- 7)  $E_2$  or  $\Psi_2$  energy of butadiene has value
  - a)  $\alpha + 0.618\beta$ b)  $\beta + 0.618\alpha$ d) None of these
  - c)  $\alpha 0.618\beta$
- Chelotropic reactions are the sub class reaction. 8)
  - a) Cycloaddition c) Sigmatropic

- b) Electrocyclic ring closing
- d) None of these

Max. Marks: 80

SLR-HF-79
- The homolysis of protonated N-haloamines either thermally or photochemically to form amine salts with halogenated alkyl substituents is known as \_\_\_\_\_.
  - a) Norrish type II

b) Norrish type I

c) Paterno-Buchi

- d) Barton
- 10) The cycloheptatrienyl cation is the more stable according to \_\_\_\_\_ theory.
  - a) Dewar's c) Huckel's
- b) Mobiusd) Hund's

### B) Fill in the blanks.

- 1) Huckel's delocalization energy (HDE) for 1,3,5-hexatriene is \_\_\_\_
- 2) The  $\gamma$ -hydrogen abstraction with  $\beta$  bond cleavage to form olefin and enol is known as \_\_\_\_\_.
- 3) The thermal reaction of alkene having an allylic hydrogen with a compound having multiple bonds is known as \_\_\_\_\_ reaction.
- 4) The \_\_\_\_\_ reaction is the concerted interconversion of a conjugated polyene and a cycloalkene.
- 5) The phenomenon in which electron returns to ground state (S<sub>0</sub>) from singlet (S<sub>1</sub>) by liberating energy is known as \_\_\_\_\_.
- 6) The molecular orbitals having *m*-symmetry always give \_\_\_\_\_ motion.

### Q.2 Answer the following

- a) Define the terms:
  - 1) Internal conversion
  - 2) Triplet states (S<sub>1</sub>)
  - 3) Phosphorescence
  - 4) Quantum yield
- b) Identify the following reactions, predict the products.



- c) Explain Suprafacial and antarafacial interactions in cycloaddition reaction.
- d) Write a note on Chemiluminescent reactions.

### Q.3 Answer the following.

- a) How one can account for the opposite stereochemistry in the photochemical 10 cyclisation of a 1,3-butadiene to a cyclobutene than the thermal reaction?
- b) Calculate charge density of the following.



Q.4	0.4 Answer the following.				
	a)	Discuss the classification of sigmatropic rearrangement with suitable examples.	08		
	b)	Give name of the photochemical reactions for ketones. Describe Norrish type I and II reactions with suitable examples.	08		
Q.5	Ans	swer the following.			
	a)	Butadiene-cyclobutene interconversion under thermal condition, conrotatory mode is allowed process, explain by FMO method.	80		
	b)	With the help of correlation diagram and PMO method, show that the Diels-Alder reaction is thermally allowed process.	08		
Q.6	Ans	swer the following.			
	a)	Explain Huckel's molecular orbital theory (HMO) and calculate the Huckel's delocalization energy (HDE) for buta-1,3-diene & hexa-1,3,5-triene.	80		
	b)	What is Paterno-Büchi reaction? Discuss its mechanism along with the stereochemical consequences.	08		
Q.7	Ans	swer the following.			
	a)	Discuss di- $\pi$ methane rearrangement and give its mechanism.	80		
	L ا	Explain the colorison rules derived for cleatropyclic reactions for $(1_{\rm H})$ - and	<b>^</b>		

**b)** Explain the selection rules derived for electrocyclic reactions for  $(4n)_{\pi}$  and  $(4n + 2)_{\pi}$  system by Huckel-Mobius (H-M) method. **08** 

ructic	ons:	1) Q. I 2) Atte 3) Fig	Nos. 1 and 2 are compulsory. empt any three questions from ure to right indicate full marks.	Q. N	o. 3 to Q. No. 7
A)	<b>Ch</b> 1)	oose Syntl a) c)	<b>correct alternative. (MCQ)</b> hons are positively charged neutral	b) d)	1 negatively charged Both a and b
	2)	a) c)	_ cannot be placed at the bridg Double bond Triple bond	jehea b) d)	ad of a bridged ring system. Single bond Sigma bond
	3)	Enac a) c)	plates can be alkylated the $\beta$ -position $\gamma$ -position	th b) d)	rough SN <sub>2</sub> reaction. $\alpha$ -position $\delta$ -position
	4)	The a is a) c)	art of synthetic planning starts v  Metathesis Synthesis	with t b) d)	he final product (target molecule) Retrosynthesis Carbonation
	5)	Mole a) c)	cular formula of perhydro anthr C <sub>24</sub> H <sub>14</sub> C <sub>12</sub> H <sub>12</sub>	acer b) d)	ne is C <sub>14</sub> H <sub>24</sub> C <sub>10</sub> H <sub>10</sub>
	6)	Carb a) c)	oxylic acids by protecting with a anhydride cyanide	alcoh b) d)	nol give ketone ester
	7)	The 9 a) c)	9-methyl-cis-decalin has two four	gau b) d)	che-butane interactions. three five
	8)	Asyn to a) c)	nmetric hydroxylation involves o  triol tetraol	conve b) d)	ersion of a substituted alkene diol dione
	9)	In the ofa)	e case of alcohols, the hydroxy  an ether an acetal	l grou b)	up may be protected by formation an ester All of the above
	10)	A rea	action which predominantly pro	duce	s one of the several possible

Instr

Advanced Organic Chemistry – II (MSC012402) Day & Date: Saturday, 11-05-2024 Time: 03:00 PM To 06:00 PM

No.

Seat

Q.1

## M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 PHÁRMACEUTICAL CHEMISTRY

Max. Marks: 80

- structural isomer is called\_\_\_\_\_.
  - a) regioselectivity
- b) stereoselectivity
- d) All of the above c) chemoselectivity

SLR-HF-80

0

Set Ρ

		•	
	B)	<ul> <li>Write the answer with one sentence.</li> <li>1) What is dihydroxylation?</li> <li>2) What is deprotection reaction?</li> <li>3) What is synthetic equivalents?</li> <li>4) What is bridged ring?</li> <li>5) What is the formula for enentiomeric excess?</li> <li>6) What is stereoselectivity?</li> </ul>	06
Q.2	Ans a) b) c) d)	<b>swer the following.</b> Write note on functional group interconversions. Explain Bredts rule. Explain stereochemical restrictions. Write note on Retrosynthetic analysis.	16
Q.3	An: a) b)	<b>swer the following.</b> Explain organic transformations in chemoselectivity and stereoselectivity. Explain Cram's rule and write industrial applications of asymmetric synthesis.	16
Q.4	An: a) b)	<b>swer the following.</b> Explain protection and deprotection in alkynes. Write note on Michael addition and Robinson's annulation.	16
Q.5	An: a) b)	<b>swer the following.</b> Write note on chiral auxiliaries, chiral reagents and catalysts. Write note on perhydrophenanthrene and perhydroanthracene.	16
Q.6	An: a) b)	<b>swer the following.</b> Write note on use of acetylenes and aliphatic nitro compounds in organic synthesis. Explain protection and deprotection of carbonyls in aldehydes.	16
Q.7	Ans a)	<b>swer the following.</b> Write note on decalin and 9-methyl decalin.	16

**b)** Explain asymmetric epoxidation and asymmetric decarboxylation.

Seat No.	t		Set I	Ρ				
l	M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 PHARMACEUTICAL CHEMISTRY Pharmaceutical Dosage Forms (MSC012403)							
Day a Time	& Da : 03:	ate: T 00 P	uesday, 14-05-2024 Max. Marks: 8 M To 06:00 PM	80				
Instr	ucti	ons:	1) Question no. 1 and 2 are compulsory. 2) Attempt any three questions from Q. No. 3 to Q. No. 7. 3) Figure to right indicate full marks.					
Q.1	A)	<b>Mu</b> 1)	Itiple choice questions.Which of the following is not a semisolid dosage form?a) Pasteb) Creamsc) Ointmentsd) Syrup	10				
		2)	<ul> <li>What is the characteristics of continuous release system?</li> <li>a) Release the drug along the entire length of GIT</li> <li>b) Prolonged their residence in the GIT and release</li> <li>c) Release only at a specific drug</li> <li>d) Release as soon as comes in contact to the saliva</li> </ul>					
		3)	Pre-formulation is about ensuring a) Stability b) safety c) Efficacy d) All of these					
		4)	Rate of sedimentation is high in suspension.a) flocculatedb) deflocculatedc) both a) and b)d) None of these					
		5)	In the preparation of vanishing creams, which types of bases are used generally? a) Water removable bases b) Absorption bases c) Hydrocarbon bases d) None of the above					
		6)	<ul> <li>Which of the following is an ideal characteristic of any pharmaceutical drug/excipient?</li> <li>a) Non-toxic</li> <li>b) Chemical inertness</li> <li>c) Water soluble</li> <li>d) All of the above</li> </ul>					
		7)	Vaginal suppositories are also called asa) Pessariesb) Simple suppositoriesc) Bougiesd) None of the above					
		8)	Powders used for external use area) Dusting powderb) Bulk powderc) Divided powderd) Effervescent powder					
		9)	Which drug delivery system has longest duration of action? a) Nasal preparation b) Implants c) Depot injection d) Transdermal patch					

		<ul> <li>10) Rate determining step for controlled release drug delivery system is</li> <li>a) Drug release from dosage form</li> <li>b) Absorption</li> <li>c) Both a) and b)</li> <li>d) Only a)</li> </ul>				
	B)	<ul> <li>Write True or False.</li> <li>1) Solvents present within a crystal lattice of the drug is other than water, is known as solvates.</li> <li>2) Oral controlled drugs release the drug only inside the intestine.</li> <li>3) Oxygen is used as compressed gas in aerosol system.</li> <li>4) Zero order release kinetics is attained in sustain release system.</li> <li>5) Eye lotions are supplied in diluted form.</li> <li>6) Transdermal drug delivery system can be programmed to deliver a drug for delayed action.</li> </ul>	06			
Q.2	An: a) b) c) d)	swer the following.16Describe the steps involved in sugar coating.What are suspensions? Give the stability of suspension.What are the essential requirements for Parenteral products?Give the approaches to design ion exchange CRDDS.				
Q.3	An: a) b)	<b>1) Swer the following.</b> Give the classifications of ointment bases. Describe recently design transdermal drug release system.				
Q.4	An: a) b)	<b>swer the following.</b> Write a detail note on physio-chemical properties of drug substances in pre formulation study. What are the formulation considerations of ophthalmic preparations?				
Q.5	An: a) b)	<b>swer the following.</b> Describe Parenteral routes of drug administrations. Describe quality control methods and measurements of tablet properties.	16			
Q.6	An: a) b)	<b>swer the following.</b> Discuss principle of working of the aerosol system. Write a note on design of mucosal drug delivery system.	16			
Q.7	An: a)	<b>swer the following.</b> Explain the process of wet granulation in detail.	16			

b) Explain oral drug delivery system.

Seat No.	t						Set	Ρ
I	M.Sc	:. (S€	emeste Ph	er - IV) (New) PHARMAC armaceutica	(CBCS) E EUTICAL I Technol	Exar CH ogy	nination: March/April-2024 EMISTRY / (MSC012408)	I.
Day a Time	& Dat : 03:0	e: Th 00 PM	ursday, I To 06:(	16-05-2024 00 PM		0,	Max. Mark	s: 80
Instr	uctio	<b>ns:</b> 1 2 3	) Q. Nos ) Attem <sub>l</sub> ) Figure	s. 1 and 2 are c pt any three qu to right indicat	ompulsory. estions from e full marks.	Q. 1	No. 3 to Q. No. 7	
Q.1	A)	<b>Cho</b> 1)	ose cor Brine i a) hea c) Co	r <b>rect alternativ</b> s at exchanger olant	'e.	b) d)	tower column	10
		2)	The fo phase a) Va c) So	rmation of acet por lid	ic acid throu	gh o b) d)	xidation is done in liquid All of the above	
		3)	assura predet a) val c) rev	is the documer ince that specif ermined specifi idation validation	nted evidenc ic process p cation and c	e wł rodu jualit b) d)	nich provides high degree of ce product meeting its ty characteristics. qualification process validation	
		4)	GMP ( a) a c b) cla c) rec d) All	guidelines provi lean & hygienic rity & control in cords of manufa of these	de the guide c manufactur manufactur acture	lines ring a ing p	s for maintaining area processes	
		5)	a) miz c) mil	s the most impo king ling	ortant state i	n dry b) d)	<i>r</i> granulation. screening slugging	
		6)	The fir is a) ins c) cor	st element of va  tallation qualific ncurrent validat	alidation of n cation ion	iew f b) d)	facilities systems or equipment design qualification process validation	
		7)	Coatin is a) film c) ent	g used to prote <u>-</u> n coating teric coated	ct the tablet	from b) d)	n acidic environment of stomach sugar coating encapsulation	
		8)	Moistu a) dire c) we	re and heat ser ect compressio t granulation	nsitive drug a n	are f b) d)	ormulated into tablets by dry granulation All of these	
		9)	Which a) die c) bot	one of these is filling th a and b	responsible	for l b) d)	hardness of tablet? compression force None of these	

		10)	Wha com a) c)	at size of eo pared with does not de smaller	quipment is batch proce epend on siz	needed in ess? ze b) d)		ontinuous process when larger none of these	
	B)	State           1)         I           2)         0           3)         A           4)         I           5)         I           6)         F	Tru CH GLP API RB P st FDA	te or False stands for I stands for stands for A Stand for In ands for Ind stands for Ind	nternationa Good Labo Active Pharr Istitutional F dian Pharma Food and D	I Conferer ratory Pric maceutica Research I acopoeia. Drug Adulto	nce ces I Ir Bc era	e on Harmonization. s. ngredient. bard. ation.	06
Q.2	Ans a) b) c) d)	Iswer the following.10Describe level of screening.Draw a unit process diagram for monochloroacetic acid.Give details about qualification phases according to WHO.Give the difference between calibration and validation.						16	
Q.3	Ans a) b)	<b>wer th</b> Explai Write a	<b>e fo</b> n ur a no	<b>llowing.</b> hit process o hte on granu	of vinyl chlo ulation meth	oride. 10d.			10 06
Q.4	Ans a) b)	<b>iswer the following.</b> Discuss the typical industrial chlorination process for the preparation of monchlorobenzene. Discuss compression method.						16	
Q.5	Ans a) b)	<b>wer th</b> Descri What a	<b>e fo</b> ibe s are f	<b>llowing.</b> sampling te the types of	chniques in f process va	cleaning alidation?	va	lidation.	16
Q.6	Ans a) b)	wer th Write a Discus	<b>e fo</b> a bri ss th	<b>llowing.</b> ief note on ne factors a	reactors use ffecting on e	ed in API ı chemical p	ma orc	anufacturing unit. ocess.	16
Q.7	Ans a)	wer th Discus Nitron	<b>e fo</b> ss th aphi	<b>llowing.</b> ne typical in thalene.	dustrial nitra	ation proc	es	s for the preparation of $\alpha$ -	16

**b)** Explain validation of standard method in analytical method validation.

Seat No.						Set	Ρ
Μ	I.Sc	:. (Se	mester - III	I) (New) (CBCS) Ex MEDICINL CHEM	amii IIST	nation: March/April-2024 RY	
Day & Time:	Date 11:0	e: Fric 0 AM	Advance lay, 10-05-20 To 02:00 PM	id Organic Chemis 1 1	ry -	Max. Marks	3: 80
Instru	ctio	ns: 1) 2) 3)	Q. Nos. 1 an Attempt any Figure to rig	nd 2 are compulsory. three questions from C ht indicate full marks.	). No.	. 3 to Q. No. 7	
Q.1	A)	<b>Choo</b> 1)	ose correct a The base ca low tempera a) Allyl eth c) Allyl hal	<b>alternative.</b> atalyzed [2,3] - Witting re ature. aers ides	earra b) d)	ngement of occur at Allyl alcohols All three	10
		2)	с ң-сно	() CHBra, PPh3, 2h () n-Bulli then H <sup>CB</sup>	2		
			a) $CH_3CH_2$ c) $H_3C - C$	$OH \\ \Xi = C - CH_3$	b) d)	$CH_{3}C \equiv C - H$ $CH_{3}CH_{2}CHO$	
		3)	In iodolactor of an oxyger a) $C = C$ c) $C \equiv C$	nization reaction there is n and iodine across the	b) d)	one ring formation by the addit bond. C = 0 C = N	ion
		4)	can b Coupling rea a) Boranes c) Boronic	be used as an organome action. s acid	etallio b) d)	component in the Suzuki Boronate ester All three	
		5)	Von-Richter a) nucleop b) electrop c) aromatio d) aromatio	rearrangement is whilic addition whilic substitution c nucleophilic substitution c electrophilic substitution	re	Paction.	
		6)	The factors f a) high ten b) protic so c) weak ba d) All three	favouring the formation nperature and long read olvent ase e	of the	ermodynamic enolates are times	·



5)	R'-5 R2 Ac20 8
6)	() ()-+1c+ con3)2 4,-78° c
	CH3 CONDA CO2 C2H3 @ CH3 CH2CH2 CH2Br (

#### Q.2 Answer the following. 16 Explain the mechanism of Prins reaction with suitable example. a) Explain the mechanism of Stevens rearrangement reaction. b) Give the applications of Trimethylsilyl iodide. C) Discuss the effect of solvent on enolate structure and reactivity. d) Q.3 Answer the following. Discuss different applications of organotin reagents. a) **08** Explain the reaction mechanism of Hoffmann - Loffler - Freytag reaction and 08 b) give its applications. Q.4 Answer the following. Explain with suitable example various applications of complex metal 80 a) hvdrides. Discuss regioselectivity & stereoselectivity in enolate formation from Ketone **08** b) & esters. Q.5 Answer the following. Explain with mechanism synthetic applications of DDG. 80 a) Give reaction mechanism and applications of Suzuki reaction. b) 80 Q.6 Answer the following. Discuss reaction mechanism and applications of Pummerer rearrangement 80 a) reaction. Discuss reaction mechanism and applications of Duff reaction. 80 b) Q.7 Answer the following. Discuss applications & reaction mechanism of periodic acid. 08 a) Discuss alkylation of carboxylic acids and amides. 08 b)

Page 3 of 3

			SLR-HF-8	85
Seat No.			Set	Ρ
M.\$	Sc. (S	emester - III) (New) (CBCS) Examin MEDICAL CHEMISTF	ation: March/April - 2024 RY	
		Chemistry of Bioactive Heterocyc	les (MSC08302)	
Day & I Time: 1	Date: N 1:00 A	londay, 13-05-2024 M To 02:00 PM	Max. Marks:	80
Instruc	tions:	<ol> <li>Question no. 1 and 2 are compulsory.</li> <li>Attempt any three questions from Q. No.</li> <li>Figure to right indicate full marks.</li> </ol>	3 to Q. No. 7.	
Q.1 A	) Mu	tiple choice questions.		10
	1)	Which of the following is the prefix of Nitr	ogen?	
		c) Aza d) Si	la	
	2)	The major product formed in the following	g reaction is	
		Benzene 9_		
		a) off b)	en la contra con	
		c) 04 d) (	He 11	
	3)	Predict the major product of the following	reaction.	
		A 117120 8.		
		a) 🔪 b) 🔨	$\sim$	

0-4H5

Hicz 04

c)

COHS OH

OALC Bar D

d)

Γ



5)

4)

The major product of the following reaction is \_\_\_\_\_.



6) The major product of the following reaction is \_\_\_\_\_.



7) Predict the major product of the following reactions: \_\_\_\_\_.





9) The major product formed of the following reaction is \_\_\_\_\_.



10) Most aromatic nature among the following is \_\_\_\_\_







B) Fill in the blanks.1)

8)



- 2) The suffix \_\_\_\_\_ is used for 3 membered Nitrogen containing saturated compounds.
- 3) \_\_\_\_\_ has more aromatic nature is five membered aromatic heterocyclic having one heteroatom.

b)

d)

- 4) 1, 2 diamino ethane and alkyl nitrite in presence of acid give\_\_\_\_\_
- 5) Electrophilic substitution take place at \_\_\_\_\_ position in pyridine.
  6) 0



#### Q.2 Answer the following

16

- a) Write the two methods for synthesis of Thiirane and Oxiranes.
- **b)** Describe two methods of pyrrole synthesis with mechanism.
- c) Explain chemical properties of Benzofuran and Benzothiophere with two chemical reactions.
- **d)** Explain the mechanism of synthesis of pyridine using 1, 3 dicarbonyl compounds.

#### 16 Q.3 Answer the following. a) Explain various synthesis methods of Pyrrole and furan with mechanism. b) Describe regioselectivity of electrophilic substitution of pyridine in detail. Q.4 Answer the following. 16 a) Explain the methods of synthesis of Pyrimidine. b) What are the various methods for synthesis of Benzoxazole and **Benzothiazoles?** Q.5 Answer the following. 16 a) Explain electrophonic substitution reactions & Indole and Benzofuran. b) Discuss various synthesis methods of Isoquinoline and explain its chemical properties. Q.6 Answer the following. 16 a) Explain the electrophilic substitution reaction of Pyrrole and Pyrrazole. b) Explain the chemical properties of Imidazole in detail. Q.7 Answer the following. 16 a) Describe the Baldwin rule for ring closing reactions. b) Discuss various methods of synthesis of Quinoline.

800	•							
Sea No.	L		Set	Ρ				
	M.Sc. (Semester - III) (New) (CBCS) Examination: March/April - 2024 MEDICINL CHEMISTRY Drug Development (MSC08307)							
Day Time	& Da : 11:	te: We 00 AN	ednesday, 15-05-2024 Max. Marks: I To 02:00 PM	80				
Instr	uctio	o <b>ns:</b> 1 2 3	) Q. Nos. 1and 2 are compulsory. ) Attempt any Three from Q. No. 3. to Q. No. 7. ) Figure to right indicate full marks.					
Q.1	A)	<b>Cho</b> 1)	ose the correct alternatives from the given options.         Pharmacologically active compounds can be divided intomajor         groups.         a) Structurally Specific       b) Structurally non specific         c) Structure active       d) Both a & b	10				
		2)	The term is defined as the rate and extent of absorption of unchanged drug from its dosage form. a) availability b) bioavailability c) systemic availability d) None of these					
		3)	of the following can be a good therapeutic agent when the safe dose range can be greatly extended. a) Full agonist b) Partial agonist c) Inverse agonist d) Full antagonist					
		4)	Most weakly basic drugs (pKa >8) are absorbed from a) Intestine b) Stomach c) Intestine and stomach d) None of these					
		5)	<ul> <li>Which of the following solvents is the most suitable for determining partition coefficients which have relevance for drug transport across biological membranes?</li> <li>a) liquid paraffin</li> <li>b) butanol</li> <li>c) octanol</li> <li>d) heptanes</li> </ul>					
		6)	The minimum inhibitory concentration (MIC) is typically stated ina) Milligrams/ Kilogramb) Liters/ secondc) Milligrams/ milliliterd) Micrograms/ milliliter					
		7)	of the following term is used to describe the dose of a drug required to produce a measurable effect in 50% of the animals tested. a) $ED_{50}$ b) $LD_1$ c) $IC_{50}$ d) None of these					
		8)	of the following is not used as a measure of enzyme activity.a) EC50b) Kic) IC50d) Log P					
		9)	A preliminary requirement for any structure-based drug design technique is the structure of the target. a) 1 D b) 2 D c) 4 D d) 3 D					

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- a) Clearance
- b) Reference
- c) Apparent volume of distribution
- d) Elimination half-life

#### B) Fill in the blanks.

1)	Among other approaches	is effective in reducing the cost,
	duration and attrition rate of the	e drug discovery process.

- 2) The solubility of unionised form of the drug is known as the \_\_\_\_\_ solubility of the drug.
- 3) Addition of non-polar group \_\_\_\_\_ partition coefficient.
- 4) \_\_\_\_\_ term is used to describe the dose of a drug required to kill 50% of a group of animals.
- 5) The biological activity of anticonvulsants and general anesthetics depends on the \_\_\_\_\_ of these drugs only.
- 6) \_\_\_\_\_ is reversible transfer of a drug between the blood and the extravascular fluids and tissues.

### Q.2 Answer the following.

- a) Define the drug and comment on concept of drug.
- **b)** Write a note on Factors affecting bioactivity.
- c) Comment on concept of clearance of drug.
- d) Discuss on LD<sub>50</sub> and ED<sub>50</sub>.

### Q.3 Answer the following. (8+8)

- Explain in details the bioavailability of drug and discuss on Lipinski rule of five.
- **b)** What is mean by Ligand-based drug design. Explain in detail Molecular similarity- based search?

### Q.4 Answer the following. (8+8)

- a) What do you mean by Pharmacokinetic model, write down applications and explain in short compartment models?
- **b)** Explain in details the principles of drug action and mechanism of drug action.

### Q.5 Answer the following. (8+8)

- a) Describe in detail any four sources of drug with examples.
- **b)** Explain the Structure activity relationship and Ferguson principle.

### Q.6 Answer the following. (8+8)

- a) What is Drug absorption; explain active transport mechanism of drug absorption?
- b) Explain in details dose response relationship and discuss on drug potency and efficacy.

### Q.7 Answer the following. (8+8)

- a) What is excretion of drugs, enlist the different organ systems involved in it, Write brief on renal excretion of drugs?
- **b)** What is receptor and types of receptor and Explain drug receptor interaction with factor affecting in drug receptor interaction?
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Seat No.			Set	Ρ
М.:	Sc. (Se	mester - IV) (New) (CBCS) Ex MEDICINL CHEN	amination: March/April-2024 IISTRY	
	ata. The	Pharmaceutical Dosage FC	orms (MSC08401)	
Time: 0	3:00 PM	To 06:00 PM	Wax. Warks	: 80
Instruct	tions: 1) 2) 3)	Q. Nos. 1 and. 2 are compulsory. Attempt any three questions from Q Figure to right indicate full marks.	). No. 3 to Q. No. 7	
Q.1 A	) Choo	ose correct alternative.		10
	1)	a) Cream	m. b) Paste	
		c) Solution	d) Gel	
	2)	coatings are employed wher	the drug substance is destroyed	
		a) film	b) sugar	
		c) enteric	d) encapsulation	
	3)	a) tablet manufacturing	b) suspension manufacturing	
		c) cream manufacturing	d) aerosol manufacturing	
	4)	The finished parenteral products an	e subjected to the tests, in	
		a) sterility test	b) clarity test	
		c) leakage test	d) all of the above	
	5)	Ophthalmic preparations are generations are generations	ally act at which acts as the	
		a) optic nerve	b) cornea	
		c) sclera	d) choroid	
	6)	With organic compounds, an increa	se in the number of groups the compound	
		a) methyl	b) ethyl	
		c) hydroxyl	d) carbonyl	
	()	to be its formula.	goals for the product is selected	
		a) material	b) master	
	0)	c) matter	d) None of these	
	0)	a) drug-in-adhesive	b) drug-in-matrix	
		c) rate-limiting membrane	d) All of the above	
	9)	For injections is the most con a) powder	mmon vehicle used. b) solid	
		c) water	d) semi-solid	

10)	The main advantage of biodegradable intraccular implant is	
10)		

- a) They don't have to be removed from body
- b) Product ion cost is comparatively low
- c) They are inert
- d) None of above

#### B) Fill in the blanks.

- is used to introduce the medicated dusting powder into the 1) body cavities.
- 2) A \_\_\_\_\_ is used to produce flexibility and elasticity of the coating and thus provide durability
- 3) are defined as the products containing therapeutically active ingredients dissolved, suspended or emulsified in a propellant or a mixture of solvent and propellant and intended for oral or topical administration into the body cavities.
- Before the formulation of a drug substance into a dosage form, it is 4) essential that it be \_\_\_\_\_ and \_\_\_\_\_ characterized.
- 5) Drugs having shorter and longer can not be formulated as sustained release dosage formulation
- Noves Whitney equation is \_\_\_\_\_. 6)

#### Q.2 Answer the following.

- Describe briefly the solid dosage forms. a)
- Define the term parenteral products. Discuss in brief, the general requirements b) for parenteral dosage forms.
- Define and give example of following ingredients. C)
  - Tablet lubricant
     Levigating agent
     Suspending agent
- Comment on delayed release drug delivery system. d)

#### Answer the following. Q.3

	a) b)	Write in detail about systemic routes of drug administration. Define the term Emulsion. Discuss about the stability of emulsion.	06 10		
Q.4	Ans a) b)	<b>Iswer the following.</b> Elaborate in detail about biphasic liquid dosage forms. What are propellants? Discuss in detail various types of propellants.			
Q.5	Answer the following.				
	a)	<ol> <li>Define excipients and explain selection and mode of action of preservatives.</li> <li>Define Chelating agent and explain the mechanism of drug degradation.</li> </ol>	08		
	b)	Write a note on membrane-controlled system and osmotic system.	08		
Q.6	Ans a) b)	wer the following. Write in detail about design of transdermal patches. Write down the factors affecting on designing of dosage forms and comment on accelerated stability studies.	08 08		
Q.7	Answer the following.				
	a) b)	Explain wet granulation method of tablet manufacturing. What are ointments? Classify different ointment bases used in the preparation of ointment. Describe briefly each base.	06 10		

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### M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 MEDICINL CHEMISTRYS Modern Organic Chemistry (MSC08402)

Day & Date: Saturday, 11-05-2024 Time: 03:00 PM To 06:00 PM

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No.

**Instructions:** 1) Question no. 1 and 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7.

3) Figure to right indicate full marks.

### Q.1 A) Choose correct alternative.

1) Predict the correct option of product.



2) Predict the correct option of major product.



### Max. Marks: 80

10

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3) Predict the correct option of major product.



4) Predict the correct option of major product.





5) Predict the correct option of major product.





COOEt O<sub>2</sub> SAr

d)

HŅ

7)

8)

c)

HN

6) In the following transformation, the correct option is \_\_\_\_\_.

COOEt

02 S

9) Predict the product of the following reaction.



- 10) By partial substitution of surface ligands in the ZIF-8 framework, the surface \_\_\_\_\_ improve to enhance thermal stability of the material.
  - a) Texture b) Morphology
  - c) Hydrophilicity d) Hydrophobicity

#### B) True or False.

- 1) Those reactions including three and more starting materials are classified as Multicomponent reactions.
- 2) The epoxidation of olefins is not stereospecific reaction.
- 3) The chiral reagent approach for asymmetric synthesis always gives product with 100% ee.
- 4) An organic molecule used in MOFs are often referred to as a secondary-building unit.
- 5) The poly-substituted 2-amino-thiophene is the product of Passerini reaction/
- 6) An increase in the number of benzene rings in organic linker could affect the pore size of metal frameworks.

#### Q.2 Answer the following.

- a) Differentiate zeolites, active carbons, and MOFs on the basis of their surface area and porous structure with the help of suitable examples.
- b) Write a note on secondary building unit (SBUs).
- c) Write the product of the Strecker MCR with mechanism.
- d) Write a note on analysis methods of MOF.

#### Q.3 Answer the following.

- a) What is the mechanism of Ugi and Biginelli reaction? Write different
   08 applications of each.
- b) Discuss the mechanism of epoxidation with stereochemistry of major
   08 product. Give justification for major and minor product.



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### Q.4 Answer the following.

- a) Define hydroboration reaction? Discuss stereoselectivity of hydroboration
   08 with small and large reagents with examples.
- b) What are the synthetic routes to metal organic frameworks? Explain solvothermal and solid-state methods of MOF synthesis with suitable diagram.

#### Q.5 Answer the following.

a) Define chiral Pool? Explain the following transformation with stereochemistry.



b) How MCRs are useful for synthesis of heterocycles using Knoevenagel08 reaction?

#### Q.6 Answer the following.

- a) How to confirm the structure of synthesized MOF? Explain the ways for MOF **08** analysis in detail.
- b) What is Felkin Ahn Model? Discuss in details and give justification for the major product of following reaction.

$$\begin{array}{c} Ph \xrightarrow{I}_{H} H \xrightarrow{I. EtMgBr}_{II. H_3O+} Major [?] \end{array}$$

#### Q.7 Answer the following.

- a) How SAMP/RAMP chiral auxiliary useful in the asymmetric synthesis?08 Discuss their applications in enantioselective synthesis.
- b) Discuss Diastereoselectivity of Aldol reactions with examples. 08

### Seat No. M Sc. (Somostor IV) (Now) (CBC)

### M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2024 MEDICINL CHEMISTRY Drug Regulatory Affairs (MSC08403)

Day & Date: Tuesday, 14-05-2024 Time: 03:00 PM To 06:00 PM

4)

### **Instructions:** 1) Question no. 1 and 2 are compulsory.

2) Attempt any three questions from Q. No. 3 to Q. No. 7.3) Figure to right indicate full marks.

### Q.1 A) Choose correct alternative. (MCQ)

- 1) PMDA stands for\_\_\_\_
  - a) Pharmaceutical and medicine division agency
  - b) Pharmaceutical and medical device agency
  - c) Pharmaceutical and method development agency
  - d) Pure medicine development agency

### 2) <u>Categories are perfectly relevant to the ICH topics.</u>

- a) Quality guidelines, safety guidelines, Efficacy and Multidisciplinary
- b) Safety guide lines and Efficacy guidelines
- c) Multidisciplinary guidelines and Quality guidelines
- d) Quality guide lines and safety guidelines
- 3) The structure of ICH consists of.
  - a) Steering committee, The secretariat and Expert working groups
  - b) The Secretariat, Expert working groups and coordinators
  - c) Steering committee, The Secretariat, coordinators and Expert working groups
  - d) The Secretariat, coordinator and Steering committee.
  - \_\_\_\_\_ covers in Intellectual property rights (I.P.) in India.
    - a) Copyrights

c) Trademarks

- b) Patents d) All of the above
- 5) Twenty year validity of every patent is counted from the date of \_\_\_\_\_.
  - a) Invention b) Publish
  - c) Filling of application d) Issue of patent
- 6) \_\_\_\_\_ use to make entry in Batch Manufacturing Record (BMR).
  - a) Quality Control Department
    - b) Production Department
    - c) Quality Assurance Department
    - d) Warehouse Department

### 7) How many main modules are there in CTD?

- a) 4 b) 6
- c) 3 d) 5
- 8) The \_\_\_\_\_ is division of USFDA that monitors most drugs as defined in the Food drug and cosmetic act.
  - a) BLA b) IND
  - c) CDER d) CBER

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Max. Marks: 80

- 9) is the head of department of the Central Drugs Standard Control Organization of the Government of India. b) DCGI
  - a) DDC
  - c) Drug Inspector
    - d) Assistant drug controller

b) Schedule X

d) Schedule P

- of the D & C Act 1940 and Rules 1945 covers the guidelines 10) for clinical trials conduct.
  - a) Schedule D
  - c) Schedule Y
- B) Fill in the blanks.
  - What is the long form of FIFO? 1)
  - Enterprise resource planning (ERP) software used in . 2)
  - 3) CFR stands for
  - The office for registration of Geographical indications for whole of India 4) is located at
  - A high efficiency HEPA air filter used in 5)
  - Therapeutic goods administration (TGA) is the name of regulatory 6) authority in .

### Q.2 Answer the following.

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- Write a note on basic requirements of GMP regulation for pharmaceutical a) industrv.
- b) What is patent? Discuss in brief about Trade Mark.
- Define drug master files and Discuss in brief about types I and II of drug C) master file.
- What is Schedule 'Y'? Discuss in brief about Schedule 'Y' according to drug d) & cosmetic act.

#### Answer the following. Q.3

- What are six quality system in GMP and explain in detail the production 08 a) management system?
- Write a short note on quality culture and pharmaceutical industry and 08 b) Discuss in brief about water and effluent systems with respect to GMP.

#### Q.4 Answer the following.

What is invention? Explain in details about non-patentable, patentable 08 a) inventions and Non-obviousness. 08

Write an overview on Indian patent law Amendment (2005). b)

### Q.5 Answer the following.

- What is Orange book? Discuss in details about Orange book. a)
- Discuss in details about Common Technical Document (CTD) regulatory 80 b) dossier and overall organization of the CTD with five modules.

#### Q.6 Answer the following. Discuss in detail about Schedule 'M' in accordance with GMP and a)

requirement of premises, plant and equipment's. Describe in details about NDA and ANDA approval. b)

#### Q.7 Answer the following.

- Write a note on USFDA (United states food and drug administration) 08 i) a)
  - Explain the pressure differential and what are the different types of air ii) locks in HVAC and what are scrubbers?
- Discuss in details about ICH and explain the steps in ICH process. 08 b)

08

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No.				
I	M.Sc	:. (Se	ester - IV) (New) (CBCS) Examination: March/April-2024 MEDICINAL CHEMISTRY Medicinal Chemistry (MSC08408)	
Day o Time	& Dat : 03:0	e: Thu 00 PM	sday, 16-05-2024 Max. Marks: 8 o 06:00 PM	0
Instr	uctio	ns: 1) 2) 3)	). Nos. 1 and. 2 are compulsory. Attempt any three questions from Q. No. 3 to Q. No. 7 Figure to right indicate full marks.	
Q.1	A)	<b>Cho</b> 1)	acorrect alternative.1Vhich of the following Sulphonamide is used for intestinal infections?a)Sulphadiazinea)Sulphadiazineb)Sulphaguanidineb)Dapsoded)Sulphathiazole	0
		2)	Cefixime is used as agent. a) Antibiotic b) Antiviral c) Anaesthetic d) Antifungal	
		3)	Vhich of the following is an example of NSAIDa) Sulphapyrinb) Streptomycinc) Chloroquined) Diclofenac	
		4)	Iedicines that kill or stop the growth of fungi that cause infections are alleda) Antifungal agentsb) Antibiotics c) Antiviral agentsd) NSAIDs.	
		5)	The type of ring structure present in diazepam isa)Quinuclidineb)Diazepinec)Quinolined)None of the above	
		6)	is the correct statement related with the mechanism of ction of valproic acid. a) Impacts the metabolism of fatty acids b) Impacts the metabolism of vitamins c) Impacts the metabolism of carbohydrates d) Impacts the metabolism of nucleic acid	
		7)	Starting chemicals required for the synthesis of phenytoin are a) Urea b) Phenol c) Benzil d) Both a and c	
		8)	belongs to a class of drugs called sulphonyl ureas. a) Thiopental b) Amitriptiline c) Atenolol d) Tolbutamide	
		9)	Captopril is used as drug. a) Antihistamine b) Antihypertensive c) Antianginal d) Anaesthetic	
		10)	Alaria disease is caused by species of plasmodium.a) 2b) 3c) 4d) 1	

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	B)	<ul> <li>Write True or False</li> <li>The rapeutic use of drug Alprazolam is in treatment of panic disorders.</li> </ul>	06
		<ol> <li>Local anesthetics are drugs that cause reversible block of nerve conduction producing transient localized anesthesia without affecting conciousness</li> </ol>	
		<ol> <li>Chlorpheniramine is an antidepressant drug.</li> <li>Verapanil is used to treat low blood pressure.</li> <li>Cefazolin corresponds to first generation cephalosporin.</li> <li>Clotrimazole is used as antiviral drug.</li> </ol>	
Q.2	Answer the following		
	a) b)	Explain the mechanism of action of Metformin. Write the classification of Anesthetics and explain Structure Activity Relationship (SAR) of Halothane drug.	
	c) d)	Explain synthesis of Chloroquine. Explain mechanism of action of Non-steroidal Antinflammatory Drugs.	
Q.3	Ans a)	wer the following Explain Structure Activity Relationship and write synthesis of Diazepam	08
	b)	Explain the synthesis and mechanism of action of propranolol.	08
Q.4	Ans a)	<b>wer the following</b> Explain the detail classification, SAR and mechanism of action of	08
	b)	Sulphonamides. Explain synthesis, mechanism of action and synthesis of- i) Acyclovir ii) Remdesivir	80
Q.5	Ans	wer the following	
	a)	Explain Structure Activity Relationship and write synthesis of Thiopental	08
	b)	Explain the antidiabetic activity of Insulin and mechanism of action of Pioglitazone.	08
Q.6	Ans	wer the following	
	a)	Define antibiotic agents, classify them and explain synthesis of Ampicillin and Amoxycillin	08
	b)	Explain synthesis and mechanism of Action of- i) Clotrimazole ii) Itraconazole	08
Q.7	Ans	wer the following	
	a) b)	Explain in detail Antimalarial agents. Explain the SAR study and mechanism of action of Diphenhydramine.	08 08