Reg. No. :							
Question Paper	Со	de:	910	04			

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

First Semester

Mechanical Engineering

19UCY104 - ENGINEERING CHEMISTRY

(Common to Chemical Engineering)

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1.	Which one of the following pair of atoms most likely to form an ionic bond? CO1-I					
	(a) Na & F	(b) C & C	(c) N & F		(d) F & F	
2.	Which among the	Which among the following is weakest bond?				
	(a) Covalent bond	d (b) Ionic bond	(c) Metallic bond	l	(d) Hydrog	en bond
3	The electronic con	nfiguration of an atom v	with atomic numbe	er 8 is		CO1-R
	(a) $1s^2 2s^2 2p^3 3s^1$	(b) $1s^2 2s^2 2p^1 3s^2 3$	p^1 (c) $1s^2 2s^1 2p^6$	⁵ 3s ¹	(d) $1s^2 2s^2$	$2p^4$
4.	The unit of rate co	onstant for a second ord	ler reaction is			CO2-R
	(a) mol / S	(b) mol / l^2 / S	(c) mol / 1 / S		(d) lit / mol	e / S
5.	What type of rewater?	action takes place wh	en an acid dissol	ves in		CO2-R
	(a) Exothermic	(b) Endothermic	(c) Substitution	(d) Dis	placement R	Reaction
6.	Temporary Hardness of water can be removed by CO					
	(a) Boiling	(b) Sedimentation	(c) Solvent Extra	ction	(d) Filtratic	n
7.	Hardness in water	r expressed in terms of	equivalent of			CO3-R
	(a) CaCl ₂	(b) MgCl ₂	(c) CaCO ₃		(d) MgCO ₃	
8.	During the galvar	nic corrosion the noble i	netal act as			CO4- R
	(a) Anode	(b) Cathode	(c) Catalyst	(d) Co	rroding meta	1

Iron	corrodes fast	er in		CO	04 - R				
(a) I	Hard water	(b) Soft water	(c) Demineralized water (d) Distilled w	vater				
In e	in electro plating the article to be plated is subjected to pickling, this is to CO4- R								
(a) Remove grease			(b) Increase the rate of plating	(b) Increase the rate of plating					
(c) I	c) Remove the oxide scale (d) Get a bright deposit								
		PART – I	B (5 x 2= 10Marks)						
State Paulis exclusion principle					CO1- R				
Define Order of reaction					CO2- R				
. Calgon conditioning is better than phosphate conditioning - Justify					CO3- Ana				
List out the salts responsible for the hardness of water					CO3- R				
Define Dry corrosion					CO4- R				
		PART	– C (5 x 16= 80Marks)						
(a)	(a) (i) Describe the characteristic properties of covalent compounds.			. CO1- U	(8)				
(ii) Discuss hydrogen bonding with its consequences.				CO1- U	(8)				
			Or						
(b)	(i) Write the theory.	basic postulates an	nd limitations of valance bond	CO1- U	(8)				
	(ii) Explain the following	the hybridization i g molecule	nvolved and predict the shape for	CO1- U	(8)				
	(a) CH ₄								
	(b) C ₂ H ₄								
(a)	(i) Derive th where the re	e integrated rate ec actants are same co	quation for a second order reaction procentration.	n CO2-U	(8)				
	(ii) Write a r	notes on Redox rea	ction with an example.	CO2- U	(8)				
			Or						
(b)	(i)Deduce the reaction.	he expression for	the rate constant of first orde	er CO2-U	(8)				
	(ii) Define the affect the rat	he term rate of rea e of reaction.	ction, Discuss various factors that	ut CO2-U	(8)				
	Iron (a) I In el (a) I (c) I State Defi Calg List Defi (a) (b) (a)	Iron corrodes fast (a) Hard water In electro plating (a) Remove greas (c) Remove the or State Paulis exclu Define Order of re Calgon condition List out the salts re Define Dry corros (a) (i) Describe (ii) Discuss R (b) (i) Write the theory. (ii) Explain the following (a) CH ₄ (b) C ₂ H ₄ (a) (i) Derive the where the re (ii) Write a re (ii) Write a re (ii) Define the reaction. (ii) Define the reaction. (iii) Define the reac	Iron corrodes faster in (a) Hard water (b) Soft water In electro plating the article to be plating (a) Remove grease (c) Remove the oxide scale PART – I State Paulis exclusion principle Define Order of reaction Calgon conditioning is better than plating List out the salts responsible for the Define Dry corrosion PART – (a) (i) Describe the characteristic plating (ii) Discuss hydrogen bonding (b) (i) Write the basic postulates and theory. (ii) Explain the hybridization in the following molecule (a) CH4 (b) C ₂ H4 (a) (i) Derive the integrated rate expression for reaction. (ii) Write a notes on Redox read (b) (i)Deduce the expression for reaction. (ii) Define the term rate of read affect the rate of reaction.	Iron corrodes faster in (a) Hard water (b) Soft water (c) Demineralized water (c) In electro plating the article to be plated is subjected to pickling, this is (a) Remove grease (b) Increase the rate of plating (c) Remove the oxide scale (d) Get a bright deposit PART - B (5 x 2= 10Marks) State Paulis exclusion principle Define Order of reaction Calgon conditioning is better than phosphate conditioning - Justify List out the salts responsible for the hardness of water Define Dry corrosion PART - C (5 x 16= 80Marks) (a) (i) Describe the characteristic properties of covalent compounds (ii) Discuss hydrogen bonding with its consequences. Or (b) (i) Write the basic postulates and limitations of valance bond theory. (iii) Explain the hybridization involved and predict the shape for the following molecule (a) CH ₄ (b) C ₂ H ₄ (a) (i) Derive the integrated rate equation for a second order reaction where the reactants are same concentration. (ii) Write a notes on Redox reaction with an example. Or (b) (i)Deduce the expression for the rate constant of first order reaction. (ii) Define the term rate of reaction, Discuss various factors tha affect the rate of reaction.	Iron corrodes faster inCorr(a) Hard water(b) Soft water(c) Demineralized water(d) Distilled waterIn electro plating the article to be plated is subjected to pickling, this is toCorr(a) Remove grease(b) Increase the rate of plating(c) Remove the oxide scale(d) Get a bright depositPART – B (5 x 2= 10Marks)COI-Define Order of reactionCO2-Calgon conditioning is better than phosphate conditioning - JustifyCO3-List out the salts responsible for the hardness of waterCO3-Define Dry corrosionCO4-PART – C (5 x 16= 80Marks)CO1-(i) Describe the characteristic properties of covalent compounds. (ii) Discuss hydrogen bonding with its consequences. OrCO1-U(b) (i) Write the basic postulates and limitations of valance bond theory.CO1-U(ii) Explain the hybridization involved and predict the shape for the following moleculeCO1-U(a) (i) Derive the integrated rate equation for a second order reaction. (ii) Write a notes on Redox reaction with an example.CO2-UOrOrOr(b) (i) Write a notes on Redox reaction with an example.CO2-UOrOrOr(b) (i) Deduce the expression for the rate constant of first order affect the rate of reaction.CO2-U affect the rate of reaction.				

18. (a) How is hardness of water determined by the complexomteric CO3-U (16) method? Write the necessary calculation

Or

- (b) (i) Explain the process of scale and sludge formation in boilers. CO3- U (8)
 (ii) With the help of a neat diagram, explain the reverse osmosis CO3- U (8) method for desalination of brackish water
- 19. (a) (i) Calculate the temporary, permanent and total hardness of a CO3-U (8) sample water containing $Mg(HCO_3)_2=73mg/lit$, $Ca(HCO_3)_2 = 162 mg/lit$, $MgCl_2 = 95 mg/lit$, $CaSO_4 = 136 mg/lit$, Atomic weight: Ca = 40, Mg = 24, C = 12, S = 32, O = 16, H = 1, Cl = 35.5.

(ii) Describe the demineralization of water by an ion exchange CO3-U (8) process in detail.

Or

- (b) Give Principal of Zeolite process ? Write advantages , CO3-U (16) disadvantages, and limitation of Zeolite process.
- 20. (a) (i) Explain the rusting of iron on the basis of electrochemical CO4-U (8) theory of corrosion (ii) Briefly describe various components of paint and their CO4-U (8) functions.

Or

(b) (i) Write a short notes on CO4- U (8)
(a) Concentration cell corrosion
(b) Wire fence corrosion
(ii) Discuss the mechanism of dry corrosion CO4- U (8)