6.	a)	Define decomposition potential. Mention its significances.	6	L2	3
	b)	Define throwing power. How is it determined?	5	L2	3
	c)	List any five advantages of electroless plating over electroplating. What are the steps involved in the electroless plating employed for the preparation of printed circuit boards?	9	L2	3

Unit – IV

7.	a)	Give any two differences between temporary and permanent hardness. How can total hardness of water be determined by EDTA method?	8	L2	4
	b)	Define desalination. Explain any two methods of desalination.	8	L2	4
	c)	What are the steps involved in the sol-gel method for nanoparticle synthesis?	4	L1	4
8.	a)	Explain the principle and procedure involved in hot lime soda process.	7	L2	4
	b)	Justify the following i) Presence of $CaSO_4$ in boiler water gives rise to hard scales. ii) Cation exchange column is given an acid wash.	4	L5	4
	c)	50 ml of hard water solution required 21.3 ml of 0.01M EDTA for titration. 50 ml of the same water sample after boiling and filtering, required 12.3 ml of 0.01M EDTA for titration. Calculate total hardness, temporary hardness and permanent hardness.	5	L3	4
	d)	How can nanoparticles be classified based on their dimensions?	4	L1	4

Unit – V

9.	a)	Define chemical fuel. How can the calorific value of a liquid fuel be determined using bomb calorimeter?	7	L2	5
	b)	How does knocking take place in a gasoline engine? Explain giving suitable reactions.	5	L2	5
	c)	What are the advantages of biodiesel over commercially available diesel?	3	L1	5
	d)	Describe nematic and twisted nematic liquid crystals.	5	L2	5
10.	a)	What is cracking? Explain the process of catalytic cracking with a neat diagram.	5	L2	5
	b)	A coal sample with 95% C, 3% H and 2% ash, is subjected to combustion in a bomb calorimeter. Calculate the GCV and NCV of the coal sample, given that the mass of coal sample is 0.6 g. Mass of water in the copper calorimeter is 2.7 kg, water equivalent of calorimeter is 0.65 kg, rise in temperature of water is 2.5 °C, specific heat of water is 4.2 kJ/kg/°C and latent heat of steam is 2454 kJ/kg.	5	L3	5
	c)	Justify the following: i) For a given fuel, GCV is always greater than NCV. ii) Blending gasoline with ethyl fluid helps in reducing knocking.	4	L5	5
	d)	How does the chemical constitution of a molecule affect its liquid crystalline behavior?	6	L2	5

-* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester B.E. (Credit System) Degree Examinations

April - May 2019

18CY110 – ENGINEERING CHEMISTRY

Max. Marks: 100

uration: 3 Hours

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Explain the technique of pearl polymerization. Mention two advantages and two disadvantages.	7	L*2	1	1
	b)	Discuss the effect of polymer structure on the following properties i) Strength ii) Crystallinity	6	L2	1	1
	c)	What are elastomers? Explain the synthesis of butyl rubber and silicone rubber. Mention their applications.	7	L1	1	1
2.	a)	Explain the free radical mechanism involved in the addition polymerization of Polyethylene.	6	L3	1	1
	b)	What is glass transition temperature? How flexibility, branching and molecular mass effect glass transition temperature?	7	L1	1	1
	c)	Write the synthesis and applications of the following: i) Plexi glass ii) Epoxy resin	7	L1	1	1
		Unit – II				
3.	a)	Give the construction of glass electrode and derive the emf for a glass electrode. How is it used to determine the pH of unknown solution?	10	L2	2	1
	b)	Define reference electrode. A cell is constructed by dipping two Fe electrodes in $FeSO_4$ solution. Concentration of the electrolyte in one of the half-cell is 75 times dilute than the other. Construct the cell and derive emf of the cell at 298 K.	4	L3	2	2
	c)	Give the construction and working of calomel electrode.	6	L1	2	1
4.	a)	Explain the following battery characteristics: i) Energy efficiency ii) Voltage iii) Energy Density	6	L2	2	1
	b)	What are secondary batteries? Give the construction and working of Ni-MH_2 battery.	6	L1	2	1
	c)	Differentiate between battery and fuel cells. Explain the construction and working of methanol-oxygen fuel cell.	8	L2	2	1
		Unit – III				
5.	a)	Give an account of electrochemical theory of corrosion taking Fe as an example.	7	L3	3	1
	b)	Justify the following: i) Anodic coating is also called sacrificial coating. ii) Al is passive to corrosion while Zn is not. iii) Nut and bolts should be of same metals.	6	L5	3	
	c)	Write a note on i) Caustic embrittlement and ii) Galvanization	7	L2	3	

P.T.O.

Unit – IV

7.	a)	Explain the determination of dissolved oxygen by Winkler's method.	7	L5	4
	b)	Write a note on boiler corrosion with suitable reactions.	8	L1	4
	c)	Explain the synthesis of ZnO nanoparticles by microwave assisted combustion synthesis.	5	L4	4
8.	a)	Describe electro-dialysis and activated sludge process with suitable diagram.	9	L2	4
	b)	Describe three internal conditioning process for softening of hard water.	6	L4	4
	c)	Explain the nanoparticles synthesized by chemical vapour deposition method.	5	L1	4

Unit – V

9.	a)	Draw a neat diagram with explain the determination of calorific value of liquid fuel using Bomb calorimeter.	7	L2	5
	b)	Define octane number and cetane number? Give the mechanism of diesel knocking in IC engines.	6	L4	5
	c)	Distinguish between thermotropic and lyotropic liquid crystals with example.	4	L4	5
	d)	Write a note on power alcohol.	3	L2	5
10.	a)	A coal sample with 93% C, 5% H_2 and 2% ash is subjected to combustion in a bomb calorimeter. Calculate the gross and net calorific value of coal, if mass of coal sample taken is 0.0095kg, mass of water in the copper calorimeter is 2kg, water equivalent of calorimeter is 0.7kg, rise in temperature of water is 2.8K and latent heat of steam is 2457.182 kJ/kg. Specific heat of water = 4.187 kJ/kg/^{0}K	6	L6	5
	b)	What is chemical fuel? Explain any five reactions involved in reformation.	6	L2	5
	c)	Describe the electro-optic effect of liquid crystals.	8	L4	5

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First / Second Semester B.E. (Credit System) Degree Examinations

Make up/Supplementary Examinations – July 2019

18CY110 – ENGINEERING CHEMISTRY

uration: 3 Hours | Max. Marks: 10(

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

		Marks	BT*	CO*	PO*
	Unit – I				
a)	Describe the polymerization of vinyl monomer by free radical mechanism.	6	L*4	1	1
b)	Illustrate any five factors affecting the glass transition temperature(Tg).	5	L2	1	1
c)	Explain the synthesis and application of following: i) Kevlar ii) Butyl rubber iii) poly carbonate	9	L2	1	1
a)	Write a note on pearl and emulsion polymerization.	8	L2	1	1
b)	Elaborate the structure properties relationship of following i) Plastic deformation ii) chemical resistance and nature of polymeric materials	7	L5	1	1
c)	What are adhesives? Explain the synthesis and applications of epoxy resin.	5	L2	1	1
	Unit – II				
a)	Derive the Nernst equation for the equilibrium at 298K $Cu \rightleftharpoons u^{+2}+2e^{-}$	6	L2	2	1
b)	Calculate the potential of Ag-Zn cell at 298K, if the concentration of Ag^{+} and Zn^{2+} are 5.2×10^{-6} M and 1.3×10^{-3} M respectively. E^{0} of the cell at 298K is 1.5V. Calculate the change in free energy (ΔG) for the reduction of 1mole of Ag^{+}. (1 faraday = $96.5 KJV^{-1}mole^{-1}$)	8	L5	2	2
c)	Define concentration cell. Derive an expression for EMF of a concentration cell.	6	L4	2	1
a)	How does fuel cell differ from a battery? Explain the construction, working and applications of CH_3OH-O_2 fuel cell.	8	L2	2	
b)	Explain the principle involved in flow battery with suitable example.	5	L2	2	
c)	Describe the following battery characteristics: i) Voltage, ii) Power density iii) Electricity storage density	7	L4	2	
	Unit – III				
a)	Explain electrochemical theory of corrosion, taking Fe as example.	7	L2	3	
b)	Describe differential aeration corrosion with suitable example.	6	L4	3	
c)	Explain the mechanism of action of anodic and cathodic inhibiters with example.	7	L2	3	
a)	Define polarization. Describe any five factors affecting the polarization.	6	L4	3	
b)	Discuss the following factors influencing the nature of the deposit: i) Current density, i) Organic additives	8	L6	3	
c)	Give the comparison between electroplating and electroless plating.	6	L5	3	

P.T.O.

Unit – IV

7.	a)	How is dissolved oxygen in water sample determined by Winkler's method?	7	L2	4
	b)	Mention any two disadvantages of scale formation. Describe the hot-lime soda process for prevention of scale formation.	8	L1, L2	4
	c)	What are nanomaterials? How they are classified?	5	L1	4
8.	a)	Explain the experimental method of determination of permanent hardness of water by complexometric method.	6	L2	4
	b)	Write a note on elecrodialysis method for desalination of water.	5	L2	4
	c)	Describe chemical vapor deposition method for synthesis of carbon nanotubes.	5	L2	4
	d)	Give any four principles of green chemistry.	4	L1	4

Unit – V

9.	a)	Define HCV. On burning 1.15 g of a coal sample in a bomb calorimeter, the temperature of 3.5 kg of water in the calorimeter increased from 26.5°C to 28.5°C. Water equivalent of calorimeter is 0.325 kg. Specific heat of water is 4.187kJ/kg/ °C and latent heat of steam is 2458 kJ/kg. If the fuel contains 4% hydrogen, calculate its higher and lower calorific value.	6	L1, L3	5
	b)	Give an account of mechanism of diesel knocking in IC engine.	6	L2	5
	c)	Describe the electro- optic effect of liquid crystals. Mention any four applications of liquid crystals displays.	8	L2, L1	5
10.	a)	Explain the experimental method of determination of calorific value of a solid fuel using bomb calorimetric method.	6	L2	5
	b)	What is the objective of the reforming of petrol fraction? Discuss various reactions of reforming.	6	L1, L2	5
	c)	Explain the molecular ordering in the following lquid crystal phases (i) Chiral nematic phase; (ii) Smetic phase	8	L2	5

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Programme Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi

First Semester B.E. (Credit System) Degree Examinations

November - December 2019

19CY110 – ENGINEERING CHEMISTRY

Duration: 3 Hours | Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

			Marks	BT*	CO*	PO*
		Unit – I				
1.	a)	Explain suspension polymerization. Mention any two advantages.	6	L*2	1	1
	b)	Give the preparation, properties and applications of (i) Plexiglass and (ii) polycarbonate	9	L3	1	1
	c)	Explain the mechanism of electrical conduction in polyacetylene by oxidative doping.	5	L2	1	1
2.	a)	Explain the addition polymerization of propylene based on free radical mechanism.	6	L2	1	1
	b)	Describe the statement "There is a relation between structure and properties of polymer" by relating the following properties (i) Strength and (ii) Elasticity.	6	L4	1	1
	c)	What are polymer composites? Explain the synthesis and uses of (i) Kevlar and (ii) Carbon fibre	8	L1, L3	1	1
		Unit – II				
3.	a)	What is standard electrode potential? Derive Nernst equation for electrode potential using the equilibrium $Pb^{2+} + 2e^- \rightleftharpoons Pb$ at 298K.	7	L1, L2	2	1
	b)	Consider the cell: $Fe\|Fe^{2+}(0.01M)\|\|Cu^{2+}(0.5M)\|Cu$. The standard electrode potential of iron and copper are – 0.44V and + 0.34V respectively. Write the cell reactions and calculate emf of the cell.	6	L3	2	2
	c)	Mention any two advantages of glass electrode. Explain the experimental method of determination of pH using a glass electrode.	7	L1, L2	2	1
4.	a)	Write a note on Reserve battery.	6	L2	2	1
	b)	Describe the construction, working and applications of Lithium-ion battery.	6	L2	2	1
	c)	Differentiate between flow battery and conventional battery. Explain the construction and working of CH_3OH-O_2 fuel cell.	8	L4, L2	2	1
		Unit – III				
5.	a)	Describe the electrochemical theory for corrosion of iron.	8	L2	3	
	b)	Give reasons: (i) Corrosion occurs in steel pipe connected to copper plumbing. (ii) Nail inside the wood undergoes corrosion.	4	L3	3	
	c)	Explain the following corrosion control methods: (i) Anodizing (ii) Tinning	8	L2	3	
6.	a)	Define polarization. Explain the factors affecting the polarization	6	L1, L2	3	
	b)	Give an account of electroplating of Chromium. Why is Chromium anode not used in electroplating of Chromium	8	L2, L3	3	
	c)	Give a brief account of electroless plating of Cu on PCB.	6	L2	3	

P.T.O.