Enrolment No:	UPES

End Semester Examination May 2019

Course: Chemistry **Sub Code:CLNL-1071**
Programme: B.Sc LLB **Semester: II**
Time: 3 hrs. **Max. Marks:100**

Instructions: Read all the below mentioned instructions carefully and follow them strictly

1) Write your **Enrolment No**. at the top of the question paper
2) Do not write anything else on the question paper except your roll number
3) **ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY**
4) **Internal choice is given for question number 12**
5) CO1, CO2, CO3, CO4 & CO5 mentioned in the last column stand for course outcomes and are for official use only

Section - A (attempt all **FIVE** Questions**)** **(20 marks)**

1.	Compare the solid, liquid and gaseous fuel on the basis of their properties	**[4]**	**CO3**
2.	Standard reduction electrode potential of four metals A, B, C and D are -1.2 V, +0.5 V, 0.0 V and -3.0 V respectively. Arrange these metals in the order of their **decreasing reducing power**, explaining with suitable reason.	**[4]**	**CO3**
3.	Wire mesh corrodes faster at the joints. Why?	**[4]**	**CO4**
4.	Explain a suitable polymerization technique that you will suggest for polymerization of water insoluble monomer.	**[4]**	**CO4**
5.	What is a sacrificial anode? Mention its role in corrosion control.	**[2+2]**	**CO5**

SECTION - B (Attempt all **FIVE** Questions) **(40 marks)**

6.	Describe the proximate analysis by drawing a **neat sketch only**. **Mention each term and analysis temperature** used on the figure. A samples of maize waste powder was analysed by proximate analysis by a chemical student of UPES in the chemistry lab. The observed results were as follows. Moisture content-12%; volatile content-18%. If the initial weight of the samples was 0.80 gm, find out the amount of moisture content (**in gm**), volatile content (**in gm**), carbon content (**in gm**) and ash content (**in %**) content, provided that at the end of the experiment the residual ash was found to be 80.0 mg.	**[4+4]**	**CO1**
7.	A sample of water contains following impurities: $Mg(HCO_3)_2$ = 146 mg/L, $CaCl_2$ = 111 mg/ L, $MgSO_4$ = 240 mg/ L, $Ca(NO_3)_2$ = 82 mg/ L. Calculate the quantity of lime (74% pure) and soda (90% pure) needed for softening 2000 L of water.	**[4+4]**	**CO2**
8.	What is zeolite? How is it used in purification of water? Give reasons.	**[5+3]**	**CO3**
9.	Explain the bulk polymerization technique. How it is different from emulsion polymerization.	**[8]**	**CO4**

10.	Discuss in details the method of preparation of nanoparticles using **sol gel method** by drawing a **suitable sketch**.	**[4+4]**	**CO5**
	SECTION - C **(40 marks)** **(Question No. 11 is Compulsory; Attempt either 12A or 12B)**		
11.	**i.** A sample of fuel oil analysis is as follows: 85% C, 6% H, 4.5% S, 2% O and 2.5% ash. This oil was employed for heating in a furnace with 30% excess air. Calculate the amount of air used per kg of fuel.	**8**	**CO3**
	ii. Explain the Calgon process for softening of hard water.	**8**	**CO4**
	iii. The first order diffraction of X-rays from a certain set of crystal planes occurs at an angle of 11.8^{o} from the planes. If the planes are 0.281 nm apart, predict the wavelength of the X-rays used?	**4**	**CO5**
12A.	**i.** What are different methods to improve the octane number of the fuel. How does isomerisation help in improving fuel quality?	**4+4**	**CO1**
	ii. What are electrically conducting polymers? Explain with examples	**4+4**	**CO2**
	iii. Classification of polymers can be done in various ways. Discuss the classification of the polymers based on their thermal response.	**4**	**CO5**
	OR		
12B.	**i.** Explain the principle of fractional distillation. Arrange various fractions obtained during fractional distillation of crude oil in an increasing order of their boiling points using a suitable diagram	**2+6**	**CO1**
	ii. Which type of corrosion is more prevalent in sea water? Explain in detail.	**8**	**CO2**
	iii. What is the effect of dilution on specific, molar and equivalent conductance?	**3+1**	**CO5**

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Section - A (Attempt all **FIVE** Questions**)** **(20 marks)**

1.	If an iron nail is pierced in wall, which area of nail will corrode faster and why?	**[4]**	**CO3**
2.	Write the different units of hardness. Also state the relationship between them.	**[2+2]**	**CO1**
3.	What is zeolite? How is it used in purification of water? Give reasons.	**[4]**	**CO4**
4.	Which is the most advanced polymerization tech nique? Explain with reasons	**[2+2]**	**CO2**
5.	Calculate the cell constant if the dimensions of the electrodes are 0.95cm & 1.015cm and the two electrodes are separated by 0.45cm.	**[4]**	**CO3**

SECTION - B (40 marks)
(Question No. 6,7 and 8 are Compulsory; Attempt any one from question numbers 9A & 9B)

6.	i) Discuss the precautions while determining the volatile matter of a coal sample. ii) What is Vulcanization of rubber. Explain its significance iii) Write advantages of hardness of water	**[5+3+2]**	**CO5** **CO5** **CO4**
7.	i) Explain the zeolite method for softening of hard water. ii) What is ion exchange process in terms of water purification? What are its different types? Write disadvantage and advantages of the same.	**[5+5]**	**CO2** **CO4**
8.	i) Which type of corrosion is more prevalent in sea water? Explain in detail. ii) What is the effect of dilution on specific, molar and equivalent conductance?	**[5+5]**	**CO3**
9A.	i) Write the complete note on electrically conducting polymers with examples. ii) Write short notes on the following for improvement of octane number a) Isomerisation b) Aromatisation	**[5+5]**	**CO5** **CO1**

	OR		
9B.	i) Classify polymers based on following and give suitable examples of each a) Final application b) Thermal behaviour ii) Discuss in details differential aeration corrosion and pitting corrosion	**[5+5]**	**CO5** **CO1**
	SECTION - C (40 marks) **(Question No. 10 is Compulsory; Attempt any one from question numbers 11A & 11B)**		
10.	i) A 100 ml sample of water required 27 ml of 0.01 M EDTA solution for titration using Erichrome Black T as indicator. Another 200 ml of water from the same source was boiled and precipitate removed by filtration. The filtrate required 12 ml of 0.01M EDTA for titration. Calculate total hardness, permanent hardness and temporary hardness of water sample. ii) Derive an expression for first order kinetic rate constant. Draw a graph indicting the variation of rate constant with concentration. iii) Explain the suspension and emulsion polymerisation techniques	**[8+7+5]**	**CO4** **CO2** **CO5**
11A.	**i.** Explain the following: a. Iron nails undergo corrosion at the portion inside the wall b. Grills in the windows always corrode at the joints. c.. Corrosion is a spontaneous process. d. Two different ways of coating a surface to protect it from corrosion. **ii.** A sample of water contains following impurities: $Mg(HCO_3)_2$ = 146 mg/L, $CaCl_2$ = 111 mg/ L, $MgSO_4$ = 240 mg/ L, $Ca(NO_3)_2$ = 82 mg/ L. Calculate the quantity of lime (74% pure) and soda (90% pure) needed for softening 2000 L of water. **iii.**Which of the following metals could provide cathodic protection to iron: Al, Zn, Ni, Cu	**[7+8+5]**	**CO3** **CO4** **CO1**
	OR		
11B.	i) The properties of nanoparticles change drastically when they are being formed from macro size. Why? Explain the surface properties of nanoparticles in detail. ii) What do you understand by sodium hexametaphosphate? Explain its action with suitable reactions. iii) Explain the principle and working of Bomb Calorimeter, with suitable diagram.	**[7+8+5]**	**CO3** **CO4** **CO1**