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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B. Tech. Cyber Law  
Subject (Course): Chemistry  
Course Code : CHEM-1002 – Chemistry  
No. of page/s: Two

Semester – I  
Max. Marks : 100  
Duration : 3 Hrs

Instructions- Read all the below mentioned instruction carefully and follow them strictly

- 1) Mention Roll 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) Attempt all the questions.
- 5) Attempt either 12 A or 12 B in section C

Section A ( attempt all FIVE questions)			
1.	What is the potential of a half cell consisting of zinc electrode in 0.01M ZnSO <sub>4</sub> solution at 25°C? E°=0.763V.	[4]	CO3
2.	Calculate the weight of air required for combustion of 3 kg carbon.	[4]	CO1
3.	For the first order gaseous reaction X <sub>(g)</sub> → 2Y <sub>(g)</sub> +Z <sub>(g)</sub> , the initial pressure P <sub>x</sub> is 90mmHg. The pressure after 10 min is 80mm Hg. Calculate the rate constant of the reaction.	[4]	CO2
4.	For nucleophilic substitution reactions, which mechanistic pathway would be preferred in polar solvent and why? Give reasons.	[4]	CO4
5.	Which polymers are preferred to prepare the following commercial goods. Give structures a. Bubble body of helicopters b. Chewing gums c. Mineral water bottles d. Overhead water tanks	[4]	CO5
SECTION B (Attempt all FIVE Questions)			
6.	An edge of cubic cell of NaCl crystal is 6.5x10 <sup>-8</sup> cm. assuming that four molecules of NaCl are associated per unit cell, Calculate its density. Given: Avogadro's number=6.023x10 <sup>23</sup> .	[8]	CO5
7.	Calculate the volume of air required for complete combustion of 1m <sup>3</sup> of gaseous fuel having the composition: CO=47%, CH <sub>4</sub> =10%, H <sub>2</sub> =4%, C <sub>2</sub> H <sub>4</sub> =2%, N <sub>2</sub> =1% and rest is carbondioxide.	[8]	CO1
8.	Show that in case of first order reaction, the time required to complete 99% is twice for	[8]	CO2

	its 90% completion.		
9.	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}' \quad \rightarrow \quad \text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OR}'$ <p>Write the mechanism of the above reaction.</p>	[8]	CO4
10.	Calculate the transference number of $\text{H}^+$ and $\text{Cl}^-$ from the following data obtained by moving boundary method using cadmium chloride as the indicator electrolyte; concentration of HCl solution=0.1M, mass of Ag deposited in the coulometer = 0.1308g, movement of the boundary 5.5 cm and the cross section area of the tube = 1.39 cm <sup>2</sup> .	[8]	CO3
<b>SECTION C (Attempt question number 11 and any one from 12A and 12B)</b>			
11.	<p>a. A sample of coal contains C=90%, H=9% and ash 1%. The following data were obtained when the above coal was tested in bomb calorimeter: weight of coal burnt=0.98 g, weight of water taken=1800g, water equivalent of bomb calorimeter=580g, Rise in temperature=2°C, Fuse wire correction=14 cal, Acid correction=50 cal. Calculate gross and net calorific values of coal assuming that the latent heat of condensation of steam is 580 cal/g.</p> <p>b. If average molecular weight of a polystyrene is 100000, calculate its average degree of polymerization.</p>	12+8 [20]	CO1, CO5
12 A.	<p>a. In Arrhenius's equation for a certain reaction, the value of A and E (activation energy) are <math>4 \times 10^{13} \text{ s}^{-1}</math> and 98.6 kJ/mol respectively. If the reaction is of first order, at what temperature will its half-life period be 10 minutes?</p> <p>b. How can we get the nanoparticles of ZnO by micro-emulsion methods?</p>	10+10 [20]	CO2, CO5
12 B.	<p>a. In Bragg's reflection of X-ray, a reflection was found 30° with lattice plane of spacing 1.87 Å. If this is a second order reflection, calculate the wavelength of X-rays.</p> <p>b. Write two applications of liquid crystals.</p> <p>c. Discuss the mechanism and energy profile of SN<sub>2</sub> reactions.</p>	5+5+10 [20]	CO5, CO5, CO2