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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination – December 2016

Program/course: B.Tech.- APE- UP, APE-GAS, Chemical, BAO, Cyber Security & Forensic Science, ASE, ASE-AVE, CS-IT, BFSI, ECom, EL, EE, PSE, EE (Broadband) and EE (IOT)

Subject: CHEMISTRY **Semester-Ist**

Code : CHEM-107 **Max. Marks: 100**

No. of page/s: 3 **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. Internal choice is given for between 12 and 13 in section C**

SECTION-A (4 x 5= 20 Marks)

1. Evaluate the standard enthalpy of formation for glucose using the following data: ($\Delta H°$Combustion of glucose = -2800.8 kJ/mol; $\Delta H°$formation of CO_2 = -393.5 kJ/mol and $\Delta H°$ formation of H_2O = -285.8 kJ/mol).
2. For the hydrolysis of ethyl acetate in aqueous solution, the following results were obtained:

Time(min.)	0	10	20
[$C_2H_5COOC_2H_5$] (in mole/liter)	0.10	0.05	0.025

   Show that it follows pseudo first order reaction, as the concentration of water remains constant.
3. Explain with reason:
   (a) Zinc container can be used to store a silver nitrate solution or not. Explain with suitable reason. Given, $E^o_{Ag+/Ag}$ = 0.80 V and $E^o_{Zn^{2+}/Zn}$ = -0.76 V.
   (b) Deposition of dust and extraneous matter on metal furniture for a long period is undesirable.
4. Explain why racemic mixture is obtained when cis but-2-ene undergoes addition reaction with bromine molecule in CCl_4?
5. Describe different types of polymers based on mode of reaction involved.

SECTION- B (Attempt All Questions) (8 x 5= 40 Marks)

6. (a) Illustrate the method of determination of carbon and hydrogen in coal sample.
   (b) Explain why- (i) Crucible is covered with lid for determination of volatile matter and
   (ii) A minimum amount of moisture is required in a coal sample.
7. The rate constant for the first order decomposition of H_2O_2 is given by the following equation:

$$logk = 15.2 - (\frac{12000}{T})$$

   Calculate the value of E_a for the above reaction and rate constant (k) if its half-life period will be 100 minutes. (Given: R= 8.314 $JK^{-1}mol^{-1}$).

8. (a) Compute the value of equilibrium constant for the reaction at 25 ^{o}C.

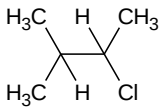
$$Fe^{2+} + Ce^{4+} \leftrightarrow Fe^{3+} + Ce^{3+}$$

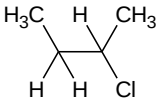
Given, $E^{o}_{Ce4+/Ce3+}$ = 1.44 V and $E^{o}_{Fe2+/Fe3+}$ = -0.68 V

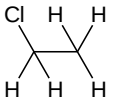
(b) The resistance of a 0.1 N solution of an electrolyte occupying a volume between two platinum electrodes 1.55 cm apart having an area of 5.5 cm^2 is 52 ohm. Estimate the value of equivalent conductance of the solution.

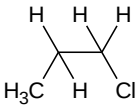
9. (a) Examine the feasibility of nucleophilic substitution in vinyl chloride, allyl chloride, benzyl chloride and chlorobenzene with suitable reasoning.

(b) Arrange the following alkyl halide in increasing order of reactivity towards elimination reaction. (6+2)









10. (a) Apply the concept of vulcanization of natural rubber with the help of chemical reactions?

(b) A polymer has considered to be made of following molecules as per given below-

No. of moles	5	10	10	10
Molecular mass	3000	6000	9000	12,000

Find out the value of $\overline{Mn}$ and $\overline{Mw}$ of the polymer. (3+5)

SECTION- C (20 x 2= 40 Marks)
(Attempt question number 11 and any one from 12-13)

11. (a) Examine the transport number of H^+ ion from the following data obtained by moving boundary method :

Concentration of HCl solution = 0.10 N; weight of Ag deposited in the coulometer = 0.12 g; distance moved by the boundary = 7.5 cm; diameter of the tube = 0.80 cm and equivalent weight of silver = 108

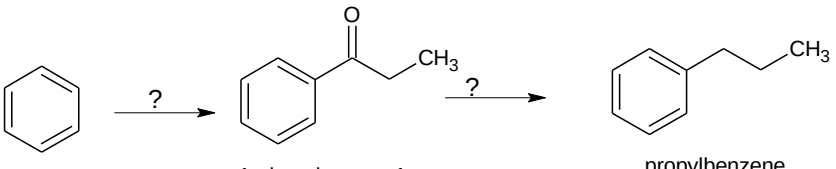
(b) Compound A with molecular formula C_4H_8 [exhibits geometrical isomerism] undergoes bromination to give a compound B with molecular formula $C_4H_8Br_2$ [exhibits optical isomerism] which on reaction with excess of alcoholic KOH with heating gives compound C with molecular formula C_4H_6. The compound C reacts with excess of BrOH to give compound D with molecular formula $C_4H_6Br_2O$. The compound D reacts with C_6H_5MgBr followed by H_2O to give compound E with molecular formula $C_{10}H_{12}Br_2O$. Interpret the above reactions giving the name of each compound.

(c) State the disadvantages of the solution polymerization technique. Explain the technique in which polymer is obtained in the form of beads. (6+8+6)

12. (a) (i) Describe the acid theory applicable to the rusting of iron.

(ii) Discuss the nature of metal oxide layer formed during oxidation reaction.

(b) Complete the following two step synthesis of propyl benzene from benzene labeling suitable reagents, name of the reaction and type of the reaction involved.



1-phenylpropan-1-one propylbenzene

(c) 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? (6+8+6)

13. (a) (i) Calculate the weight and volume of air required for complete combustion of 1 kg of fuel containing 85% C, 2.5% H, 4% O, 2.5% S, 1% H_2O, 0.9% N and rest ash.

(ii) Discuss the significance of isomerization reaction for petroleum industries.

(b) Identify the pressure of oxygen over a sample of NiO(s) at 25 ^{o}C, if ΔG^{o} for the reaction is 211.7 kJ mol^{-1}. $NiO(s) \rightleftarrows Ni\ (s) + \frac{1}{2}\ O_2(g)$

(c) Describe sol-gel synthesis for producing nanomaterials? Explain the same with the help of diagram. (8+6+6)