


Name:			
Enrolment No:			
UPES Supplementary Examination, Dec 2023			
Course: Chemistry I Program: B.Tech. Civil + Automotive Design Engineering Course Code: CHEM 1011		Semester: I Time: 03 hrs. Max. Marks: 100	
Instructions: Read all the instructions below carefully and follow them strictly.			
1) Mention Roll No. at the top of the question paper. 2) Internal choice is given in Q. no. 9 & 10. 3) ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	How can you determine the % of C and % of H in any given fuel sample.	4	CO1
Q 2	List out the differences between order and molecularity of a reaction.	4	CO2
Q 3	Can we store 1M CuSO ₄ solution in a Zn container? Justify your answer.	4	CO3
Q 4	The equivalent conductance of NH ₄ Cl, NaOH and NaCl at infinite dilution are 149.7, 247.8 and 126.45 Sm ² eq ⁻¹ , respectively. Calculate equivalent conductance for NH ₄ OH at infinite dilution.	4	CO3
Q 5	A polymer polypropylene was found to have the following compositions. a) -(CH ₂ -C(CH ₃)H)- 400 units 20% b) -(CH ₂ -C(CH ₃)H)- 500 units 30% c) -(CH ₂ -C(CH ₃)H)- 600 units 50% Calculate the number average and weight average molecular masses of the polymer (atomic mass of C = 12, H = 1)	4	CO5
SECTION B (4Qx10M= 40 Marks)			
Q 6	Discuss the four different methods for the determination of order of a reaction.	10	CO2
Q 7	The specific reaction rates of chemical reactions at 25 ^o C and 30 ^o C are respectively 4 x 10 ⁻⁵ and 14 x 10 ⁻⁵ s ⁻¹ . Find the activation energy of this reaction.	10	CO2
Q 8	(i) Differentiate between thermoplastics and thermosetting polymers. (ii) The diffraction pattern of copper metal was measured with X-ray radiation of wavelength of 1.315 Å. The first order Bragg diffraction peak was found at an angle 2θ of 50.5 °. Calculate the d-spacing between the diffracting planes in the copper metal.	5 5	CO5

Q 9	<p>A conductivity cell is filled with 0.02M KCl solution at 25°C. Its specific conductance and observed resistance are $27.7 \times 10^{-3} \Omega^{-1} \text{cm}^{-1}$ and 17Ω, respectively. When the cell is filled with 0.01M solution of another substance, the observed resistance was 57Ω. Calculate equivalent and molar conductance of this substance.</p> <p style="text-align: center;">OR</p> <p>(i) What is Galvanic corrosion. How can it be prevented. (ii) Discuss various factors affecting the rate of corrosion</p>	10	CO3
SECTION-C (2Qx20M=40 Marks)			
Q 10	<p>(i) Exactly 2.9g was weighed in a silica crucible. After heating for one hour at 110°C, the residue weighed 2.528g. The crucible next was covered with a vented lid and strongly heated for exactly 7 minutes at $950 \pm 20^\circ \text{C}$. The residue weighed 1.744g. The crucible was then heated without cover, until a constant weight was obtained. The last residue was found to weigh 0.339g. Calculate the % results of the above analysis.</p> <p style="text-align: center;">OR</p> <p>Given that the energies for H—H, O=O and O—H bonds are 104, 118 and 111 Kcal/mol respectively, calculate enthalpy change of the following reaction:</p> $\text{H}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{g})$ <p>(ii) The following data was obtained in a bomb calorimeter experiment: Weight of the cubicle = 3.649 g, Weight of the crucible + fuel = 4.678 g Water equivalent of the calorimeter = 570 g Water taken in the calorimeter = 2400 g Observed rise in temperature = 2.29°C Cooling correction = 0.054°C Acids correction = 62.6 cal Fuse wire correction = 3.8 cal Cotton thread correction = 1.6 calories. Calculate the gross calorific value of the fuel sample. If the fuel contains 6.5% hydrogen, determine the net calorific value assuming latent heat of condensation as 580 cal/g.</p> <p style="text-align: center;">OR</p> <p>0.257 g of an organic substance was Kjeldahlized by heating with conc. sulphuric acid and then distilled with excess of strong alkali. The ammonia gas evolved was absorbed in 50 ml of N/10 HCl, which required 23.2 ml of N/10 NaOH for neutralization. Determine the % of nitrogen in the substance.</p>	10	CO1

Q 11	<p>(i) A 100 ml sample of water required 13.5 ml of 0.02 M EDTA solution for titration using Eriochrome Black T as indicator. Another 100 ml of water from the same source was boiled and precipitate removed by filtration. The filtrate required 6 ml of 0.02M EDTA for titration. Calculate the total hardness, permanent hardness, and carbonate hardness of water sample.</p> <p>(ii) Discuss the cold and hot lime soda method used for the softening of hard water.</p>	<p>10</p> <p>10</p>	<p>CO4</p>
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