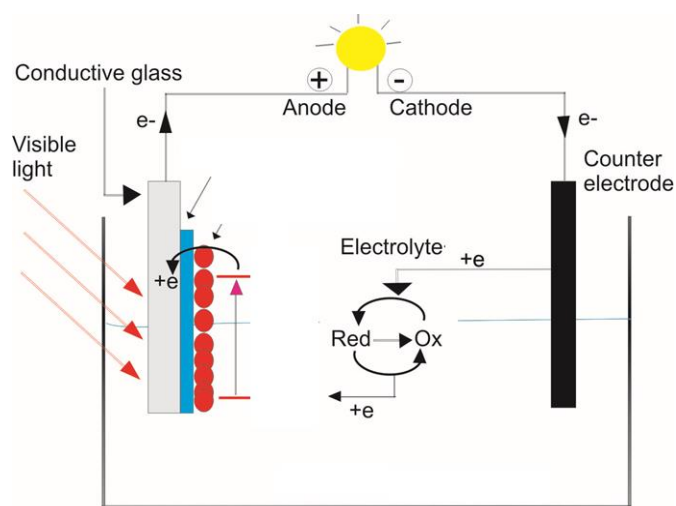


Model QP- Engineering Chemistry

Name of Examination		Final Assessment Test (FAT), Winter 2021-22 Semester, (June 2022)			
Course Code:	BCHY101L	Course Title:	Engineering Chemistry	School: SAS	

General Instructions (if any):

Part	Q. No.	Sub-division	Question Text	Marks	Unit / Module No.	Blooms Level	CO
A	Answer ALL questions :			Total Marks for the section: 10 x 3 = 30 M			
	1.		<p>Calculate the standard free energy change for the formation of NO(g) from N₂(g) and O₂(g) at 298 K:</p> $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2 \text{NO}(\text{g})$ <p>given that $\Delta H^\circ = 180.7 \text{ kJ}$ and $\Delta S^\circ = 24.7 \text{ J/K}$.</p> <p>Is the reaction spontaneous under these conditions?</p> <p>What happens to the reaction if the temperature is increased to 8000 K?</p>	3	1	6	3
	2.		Highlight the function of chlorophyll in photosynthesis.	3	2	1	1
	3.		Evaluate the stability of carbocations based on inductive and resonance effects taking suitable examples.	3	3	5	5
	4.		List out the limitations of photovoltaic cells and suggest a method(s) to overcome them.	3	4	3	5
	5.		Outline the roles of individual constituents present in a composite material with an appropriate example.	3	5	2	2
	6.		<p>Calculate the crystallite size of a material using the following data:</p> <p>Shape factor (k) = 0.99; X-ray wavelength (λ) = 0.188 nm; Peak position (2θ) = 34° and Full width at half maximum (β) = 2.6468°</p>	3	6	5	4
	7.		Identify and a short description of a suitable method for decorative coating of aluminium on a plastic support.	3	7	3	3
	8.		If 5.0 g of material 'X' decomposes in 25 minutes, the mass of unreacted 'A' remaining is found to be 0.975 g. Calculate the half-life of this reaction if it follows first-order kinetics?	3	1	4	3
	9.		"Lithium is the most suitable metal for the construction of efficient batteries, but not for catalysis reactions." Justify the statement.	3	4	5	5
	10.		Compare the structure of proton exchange membrane fuel cell (PEMFC) with solid-oxide fuel	3	7	4	4

		<p>of components and working of this cell.</p> <p>Can we use KCl solution as an electrolyte here? Justify.</p> 				
15.		<p>How do dopants increase the conductivity of polymers? Explain the mechanistic aspects using a suitable example.</p> <p style="text-align: center;">OR</p> <p>How are nanoparticles prepared by a top-down approach? Briefly discuss the limitations of this technique.</p>	10	5	2	5
16.		<p>Explain the important components and working principle of the X-ray diffraction (XRD) spectrometer with a neat diagram.</p> <p style="text-align: center;">OR</p> <p>Discuss the working principle, limitations and applications of UV-Visible spectrophotometry.</p>	10	6	3	4
17.		<p>a) Explain the working principle and regeneration of ion-exchange resins in water softening with a neat sketch. (8 M)</p> <p>b) “Are ion-exchange resins better than zeolites in terms of water softening?” Justify the statement. (2 M)</p> <p style="text-align: center;">OR</p> <p>Explain the working of a Bomb calorimeter with a neat sketch and the corrections in the calculation of the calorific value of solid fuels.</p>	10	7	5	3