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Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Advanced Sciences

Department of Chemistry

Fall Semester 2022-23

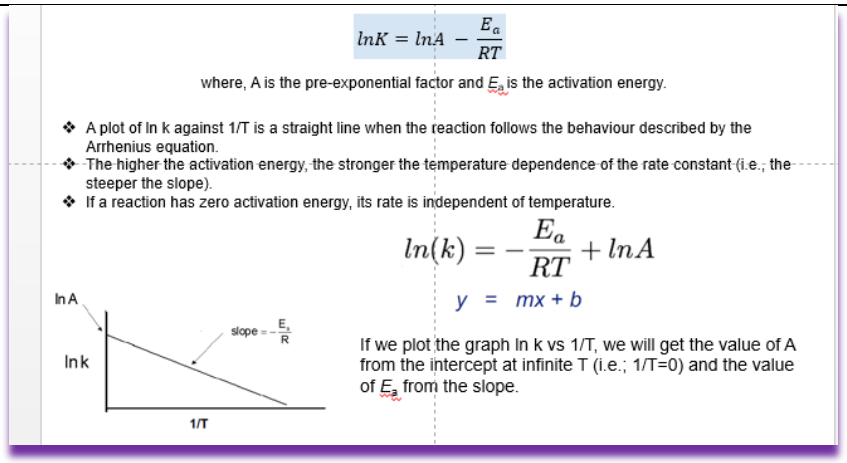
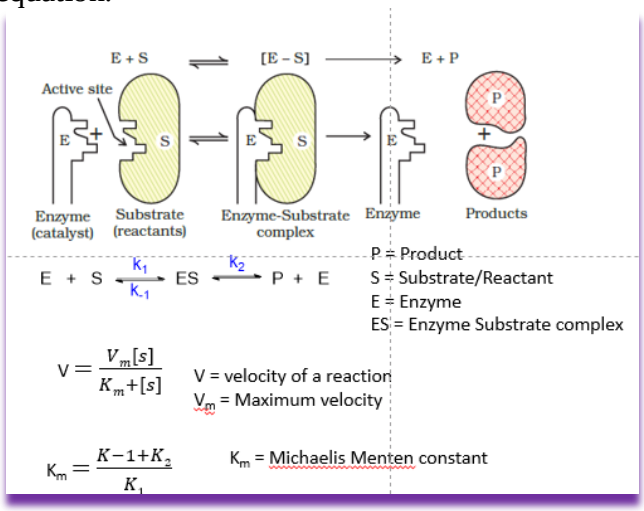
Continuous Assessment Test - II

Course Code : BCHY101L **Duration:** 90 Minutes **Max. Marks :** 50

Course Name : Engineering Chemistry **Slot** : D2

Note: Students are allowed to carry their self-hand written note book/ any other printed material/ textbook to the examination.

Q. No.	Answer ALL the questions (5 X 10 = 50 Marks)	Marks	CO	BL
1	Derive the net work done by a gas in a theoretical engine cycle proposed by Sadi Carnot. Besides, if the efficiency of such engine with a hot reservoir of 320 °Celsius is 30%, what is the temperature of the cold reservoir? $W_I = R T_2 \ln \frac{V_b}{V_a}$ $W_{II} = - C_v (T_1-T_2)$ $W_{III} = R T_1 \ln \frac{V_d}{V_c}$ $W_{IV} = C_v (T_1-T_2)$ Total work done $= R T_2 \ln \frac{V_b}{V_a} - C_v (T_1-T_2) + R T_1 \ln \frac{V_d}{V_c} + C_v (T_1-T_2)$ Total $W = R T_2 \ln \frac{V_b}{V_a} + R T_1 \ln \frac{V_d}{V_c}$ Ans: $\eta = 1 - (T_c / T_h)$ $0.3 = 1 - (T_c/593)$ $Tc = 415K$ (143°C)	10	CO1	BT3
2	a) When 5 moles of an ideal gas expands reversibly and isothermally from 10 L to 100 L at 303K, calculate its entropy change. Ans: $\Delta S = 2.303nR\log(V_2/V_1)$ $\Delta S = 2.303 \times 5 \times 8.314 \log(100/10) = 95.7\ JK^{-1}$ b) List out the necessary experimental data required to evaluate the activation energy. Which equation is applicable to calculate it showing the appropriate plot?	5 + 5	CO2	BT2

				
3	a) Substrate specificity is the distinctive feature of the biocatalysis. Write the significance and mechanism of this catalysis with a rate equation.  b) Could Grätzel cells be an alternative to conventional photovoltaic technology? Explain. Ans: Draw the setup and compare with the conventional one	5 + 5	CO3	BT1
4	a) This component can be connected to batteries to regulate the power they supply and also considered as electrical equivalents of flywheels in machines. Find out this component mentioning its function and differentiate with batteries. Ans: Supercapacitors – Function and comparison with batteries b) Show that the 'pulling from the melt' method provides high-pure semiconducting materials with a neat diagram. Ans: Single crystal growth of silicon Czochralski Technique - with a neat diagram	5 + 5	CO3	BT6
5	This storage device made its way from cell phones and laptops to	10	CO5	BT2

	automobiles, and this budding power system intakes gaseous small molecules to give away electricity. Identify both energy devices and brief about them with appropriate cell reaction. Ans: Li-ion secondary battery and Hydrogen-oxygen Fuel cells			

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