



**SCHOOL OF ADVANCED SCIENCES**

**KEY**

**Department of Chemistry**

**Fall Semester 2023-24**

**Continuous Assessment Test – 2**

**Course Code:** BCHY101L

**Duration** : 90 Minutes

**Slot** : C2

**Course Name:** Engineering Chemistry

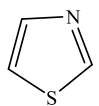

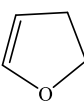
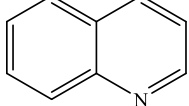
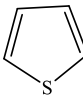
**Max. Marks** : 50

**Class Numbers:** VL2023240106245, 6249, 6253, 6259, 6273, 6277, 6281, 6285, 6289, 6293, 6535

**Faculty Names:** Dr. Mohana Roopan S, Dr. Nawaz Khan F, Dr. Manju S L, Dr. Anand Prabu A, Dr. Sumathi S, Dr. Priyankar Paira, Dr. Rajasekhara Reddy, Dr. Vijayaraghavan R, Dr. Santhakumar K, Dr. Asharani I.V, Dr. Amit Kumar Tiwari

Note: Students are allowed to carry their self-hand written note book and one textbook to the examination.

Q. No	Answer <u>ALL</u> the questions (5 X 10 = 50 Marks)	Marks	CO	BL
1	<p>a. What happens when a thermos flask containing liquid is vigorously shaken? Identify and describe the law of thermodynamics used to explain the above phenomenon</p> <p><b>Solution:</b> When the thermos flask is shaken, work is done on the molecules of the liquid in the flask. And since work is done on the system, its temperature should increase 3 marks</p> <p>This can be explained by first law of thermodynamic 1 mark</p> <p><b>Formula</b> <math>\Delta U = q + w</math> 1 mark</p> <p>b. 1 mole of an ideal gas, maintained at 4.9 atm and at a certain temperature, absorbs heat 2504J and expands to 2 litres. Calculate the entropy change in expansion process.</p> <p><b>Solution:</b> P= 4.9 atm, q = 2504J, V = 2L n= 1 mole  <math>PV = nRT</math>  <math>T = PV/nR</math>  <math>= 4.9 \text{ atm} \times 2 \text{ L} / 0.0821 \text{ Latmmole}^{-1}\text{K}^{-1}</math>  <math>= 119.36 \text{ K}</math> 3 marks</p> <p><math>\Delta S = q/T</math>  <math>= 2504/119.36</math>  <math>= 20.978 \text{ J/K}</math> 2 marks</p>	5+5	CO 2	4
2	<p>a. For the reaction <math>\text{Ag}_2\text{O}(\text{s}) \longrightarrow 2\text{Ag}(\text{s}) + \frac{1}{2} \text{O}_2(\text{g})</math> : <math>\Delta H = 30.1 \text{ kJ mol}^{-1}</math> and <math>\Delta S = 6.06 \text{ JK}^{-1} \text{ mol}^{-1}</math> (at 1 atm). Calculate the</p>	5+5	CO 2	3

	<p>temperature at which <math>\Delta G</math> is equal to zero. Also predict the direction of the reaction at this temperature.</p> <p><b>Solution:</b> <math>\Delta H = 30.1 \text{ kJ mol}^{-1}</math> <math>\Delta S = 6.06 \text{ JK}^{-1} \text{ mol}^{-1}</math> <math>\Delta G = 0</math></p> $\Delta G = \Delta H - T\Delta S$ $0 = \Delta H - T\Delta S$ $T\Delta S = \Delta H$ $T = \Delta H / \Delta S$ $= 30100 / 6.06$ $= \mathbf{4966.99 \text{ K}}$ <p><b>4 marks</b></p> <p><b>The reaction is in equilibrium 1 mark</b></p> <p>b. A reaction has its rate constant value as <math>3 \times 10^{-7} \text{ L mol}^{-1} \text{ s}^{-1}</math> at <math>T = 450 \text{ K}</math> and <math>4.2 \times 10^{-6} \text{ L mol}^{-1} \text{ s}^{-1}</math> at <math>T = 550 \text{ K}</math>. Determine the activation energy of the reaction.</p> <p><b>Solution:</b></p> $2.303 \log k_1 / k_2 = -E_a / R (1/T_1 - 1/T_2)$ $E_a = -2.303 \log k_1 / k_2 \times R / (1/T_1 - 1/T_2)$ <p><b>1.5 marks</b></p> $= -2.303 \log 30 / 4.3 \times 8.314 / (1/450 - 1/550)$ $= \mathbf{-40464.12 \text{ J/mol}}$ <p><b>3.5 marks</b></p>			
3	<p>Identify the biocatalyst used in the food industry, to preserve foodstuffs and in the manufacture of beverages. Explain the chemical process and the mechanism</p> <p><b>Solution:</b></p> <p>Enzyme Catalase <b>2.5 marks</b></p> <p>Reaction <math>\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2</math> <b>2.5 marks</b></p> <p>Mechanism Lock and key with explanation <b>5 marks</b></p>	10	CO 2	4
4	<p>Segregate the following compounds into aromatic, non aromatic and antiaromatic and give justification</p> <p>a  b  c  d  e </p> <p><b>Solution:</b> a, e and d –aromatic b- anti aromatic and c –non aromatic <b>3 marks</b></p> <p>Justification <b>2 marks</b></p>	10	CO 1	3
5	<p>a. Identify the indicator used in strong acid and weak base titration, elaborate the synthesis.</p> <p><b>Solution:</b> Methyl orange <b>2 marks</b> Reaction and Mechanism <b>3 marks</b></p>	5+5	CO 1	3

	<p>A patient had consulted a doctor with the following symptoms. He had body pain, elevated body temperature and symptoms of rheumatism. Which drug the doctor would have prescribed? Explain with mechanism the synthesis of the drug synthesis.</p> <p><b>Solution:</b> Aspirin <b>2 marks</b> Reaction and Mechanism <b>3 marks</b></p>			
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