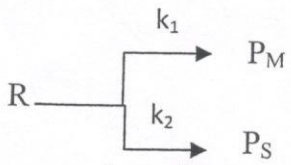
AUTUMN MID SEMESTER EXAMINATION-2019

Subject: Chemistry (CH-1007)

Full Marks: 20 **Time: 1.5 Hours**

*Answer any **Four** questions including Question No. **1** which is compulsory. The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.*

Q. No		Marks
1		1X5
(a)	Both ΔH and ΔS are positive in a reaction. Under what conditions will the reaction be spontaneous ?	
(b)	Calculate the free energy change accompanying the compression of 5 moles of CO_2 at 57 °C when the pressure changes from 5 atm to 50 atm assuming ideal behavior of CO_2.	
(c)	Differentiate catalyst and promoter using a suitable example.	
(d)	The activation energy for the decomposition of a gas is 80 kJ. What fraction of total gas molecules possess energy ≥ 80 kJ at 500K ?	
(e)	What do you mean by intermediate and how it helps in the determination of rate of complex reactions ?	
2		2.5X2
a	Pb-212 ($t_{1/2}$, 10.6 hr) decays to Bi-212 ($t_{1/2}$, 60.5 min), while Bi-212 decays to Po-212.Calculate the time at which daughter element will have maximum activity?	
b	At 300 °C, the half life for a 1st order reaction is 350 min. The activation energy of the reaction is 100 kJ/mole. Calculate the time required for 90% completion of the reaction.	
3		2.5X2
a	For the following parallel reaction,  Show that, $(k_1 + k_2) = \frac{1}{t} \ln (\frac{R_0}{R_t})$; where each entity has its usual meaning	
b	Enzyme catalysed reaction is 1st order with respect to substrate. Explain?	
4		2.5X2
a	Show that $\Delta G = \Delta H + T \left(\frac{d\Delta G}{dT}\right) p$	
b	16g of H_2 and 32 g of He are mixed at 1 atm pressure. Calculate the entropy of mixing per mole of the mixture formed assuming ideal behavior of the mixture.	
5		2.5X2
a	In a liquid vapour equilibrium system, develop the relation using Clapeyron-Clausius equation.	
b	The free energy change for a given reaction is –90 kJ at 25 °C and –85 kJ at 35 °C. Calculate the change in enthalpy for the reaction at 30 °C.	