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ORGANIC CHEM 340

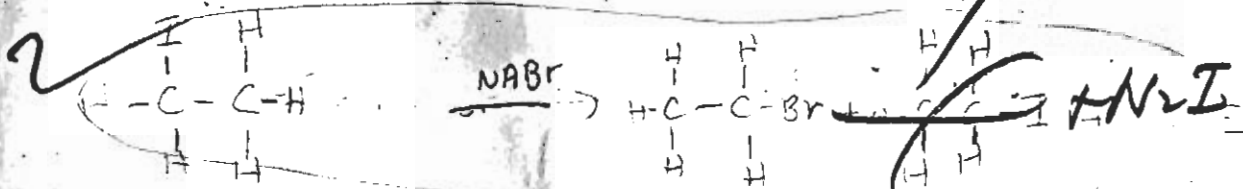
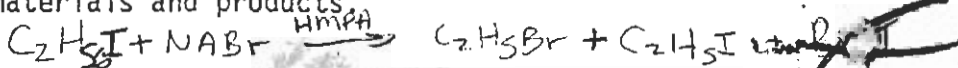
Exam 1

- 1. 0
 - 2. 0
 - 3. 0
 - 4. 17
 - 5. 2
- total 25

SHOW CALCULATIONS FOR ALL PROBLEMS

1) (50 pts) A 1M solution of 1-iodoethane in HMPA (a solvent) reacts with NaBr (also at 1M concentration) to afford a mixture containing 76% bromoethane and 24% iodoethane.

(a) Write the reaction showing the correct structure for starting materials and products



(b) Calculate the equilibrium constant for the reaction. (Watch significant figures)

$C_2H_5I = 565 \text{ g/m}$
 $C_2H_5Br = 107 \text{ g/m}$
 $K_{eq} = \frac{[C_2H_5Br]}{[C_2H_5I]} = \frac{76}{24} = 3.16$

(c) Calculate ΔG° . Use $R=2 \text{ cal/}^\circ\text{-mole}$ and assume ambient temperature (27°C).

$\Delta G^\circ = -2.303(RT \log K_{eq}) = -2.303(2 \text{ cal/}^\circ\text{-mole} \cdot 300 \text{ K} \cdot \log(3.16)) = -1.38 \text{ kcal/mole}$

(d) If $\Delta H = -5 \text{ Kcal/mole}$ what is ΔS ?

$G = \Delta H - T\Delta S$

$-1.38 = -5 - 300(x)$

$0.012 \text{ kcal/kcal} = -12 \text{ e.u.}$
1000 convert to cal

(e) What initial concentration of NaBr would be needed to achieve a 95% conversion of iodoethane to bromoethane? (Starting with 1M iodoethane).