

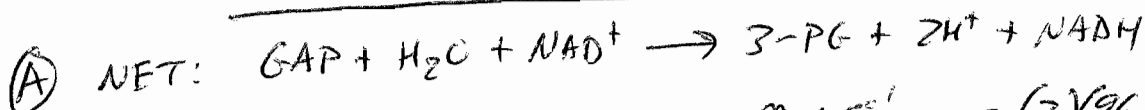
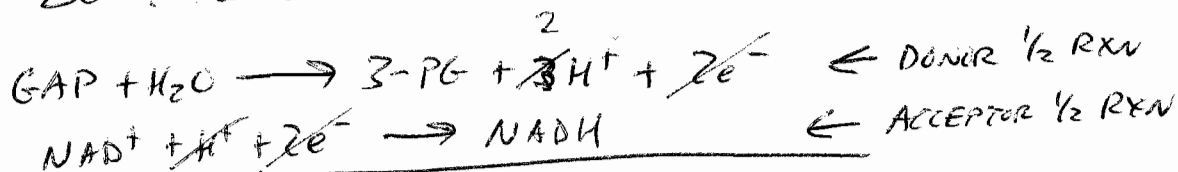
3104/CHEM 472 W08 QUIZ #1 KEY

① $\Delta G = \Delta G^{o'} + RT \ln Q$

$$Q = \frac{[1,3\text{-BPG}][\text{NADH}][\text{H}^+]}{[\text{GAP}][\text{NAD}^+][\text{P}_i]} = \frac{(1.5 \times 10^{-6})(1.7 \times 10^{-5})(0.398)}{(1.9 \times 10^{-3})(1.4 \times 10^{-4})(0.0013)} = 2.93$$

+1 $RT \ln(2.93) = \boxed{+2.78 \text{ kJ/mol}}$

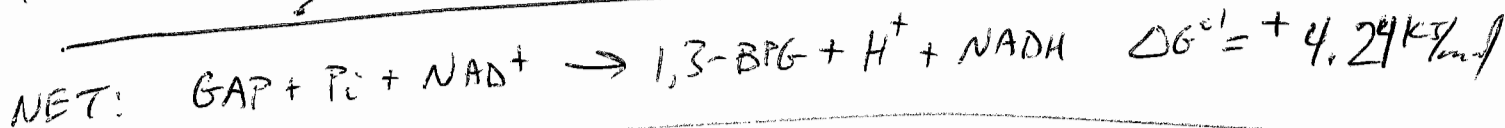
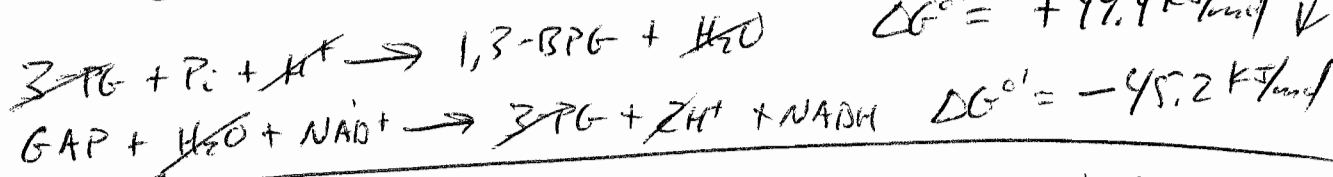
TO GET $\Delta G^{o'}$: FIRST COMBINE GIVEN REDOX $\frac{1}{2}$ RXNS AS FOLLOWS



$\Delta G^{o'}$ FOR THIS RXN = $-nF\Delta E^{o'} = -(2)(96.5 \frac{\text{kJ}}{\text{molV}})(-0.3\text{V} - -0.599\text{V})$

+2 $\Delta G^{o'} = -(2)(96.5 \frac{\text{kJ}}{\text{molV}})(+0.299\text{V}) = \boxed{-45.2 \text{ kJ/mol}}$

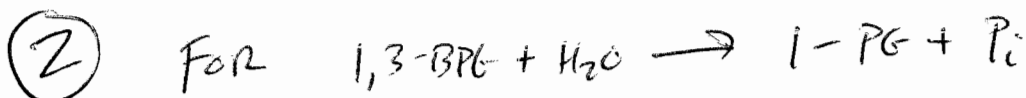
SECOND COMBINE Ⓐ WITH



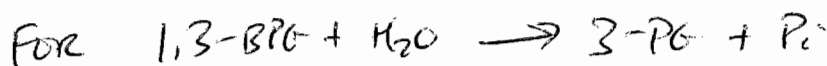
$\therefore \Delta G = \Delta G^{o'} + RT \ln Q = \cancel{+4.24 \text{ kJ/mol}}$

$\Delta G = +4.24 \text{ kJ/mol} + +2.78 \text{ kJ/mol} = \boxed{+7.02 \text{ kJ/mol}}$

+2

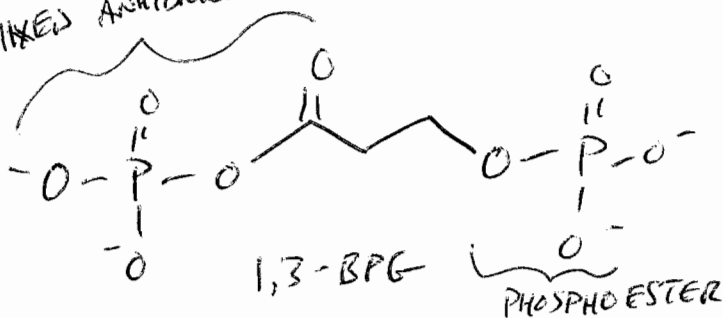


$$\Delta G = \Delta G^{\circ'} + RT \ln \frac{[\text{P}_i][1\text{-PG}]}{[1,3\text{-BPG}][\text{H}_2\text{O}]}$$



$$\Delta G = \Delta G^{\circ'} + RT \ln \frac{[\text{P}_i][3\text{-PG}]}{[1,3\text{-BPG}][\text{H}_2\text{O}]}$$

MIXED ANHYDRIDE



MUST SAY THIS FOR FULL CREDIT

WHEN $[1\text{-PG}] = [3\text{-PG}]$

BOTH $RT \ln Q$ TERMS WILL HAVE THE SAME VALUE; THUS,

$\Delta G^{\circ'}$ WILL DETERMINE WHICH REACTION IS MORE FAVORABLE

From TABLE 16-3 IT APPEARS THAT HYDROLYSIS OF MIXED ANHYDRIDES (1,3-BPG & ACETYL PHOSPHATE) HAVE $\Delta G^{\circ'}$ THAT ARE SIGNIFICANTLY MORE NEGATIVE THAN THOSE FOR PHOSPHOESTERS (G-1-P, F-6-P, G-6-P, Glycerol-3-P); THUS, IT IS REASONABLE TO ASSUME THAT

$\Delta G^{\circ'}$ FOR $1,3\text{-BPG} + \text{H}_2\text{O} \rightarrow 3\text{-PG} + \text{P}_i$ WILL BE MORE (-) THAN $\Delta G^{\circ'}$ FOR $1,3\text{-BPG} + \text{H}_2\text{O} \rightarrow 1\text{-PG} + \text{P}_i$

THE MORE FAVORABLE RXN IS: $1,3\text{-BPG} + \text{H}_2\text{O} \rightarrow 3\text{-PG} + \text{P}_i$

③

