Problem Set 4 Answers

MCDB 108B

1. i) A, ii) B, iii) D, iv) E,G, v)E, vi) E.

2. $K_{eq} = 0.1$

3. ΔG^o = -18.5 kcal/mol; therefore 2 mol ATP can be produced.

4. a) F, b) T, c) F, d) T, e) F

5. a) ADP+Pi allows e^- transport (ET), because ET is tightly coupled to phosphorylation (P'n). DNP uncouples ET from P'n; ET thus proceeds in the absence of ADP+Pi. b) most likely due to defective ATP synthase. c) H^+ gradient cannot be made; ET occurs at max. rate.

6. a) The small amount of O_2 consumption corresponds to generation of the H^+ gradient. b) When ADP+Pi are added, the H^+ gradient is dissipated due to the flow of H^+'s thru ATP synthase. ET resumes until ADP+Pi runs out. c) P/O=1. d) Rotenone should have no effect.

7. oligomycin + DNP – O_2 consumption should be observed;
   CN- + DNP –O_2 consumption should not be observed.

8. a) NADH and $FADH_2$ "deal" in e- pairs. Ie. oxidation/reduction involves a 2 e- process. But, O_2 can accept e-s only 1 at time. The Q-cycle converts a 2 e- process to a 1 e- process.
   b) For every 1 turn of the Q-cycle, 2 QH2 participate; 2 e- transferred; 4 H+s pumped: 2 are direct from the matrix, 2 come from complex I.

9. a) pH of the medium will decrease; O_2 consumption is expected. b) pH should not change; O_2 will be consumed. c) pH of the medium should decrease without O_2 consumption.

10. Without rotenone, electrons will be donated from both β-OH-butyrate and succinate. O_2 consumption will be in between that of NADH and $FADH_2$.