

CHU 3139

BIO CHEMISTRY (2006/07)

Assessment test - II Answer guide

(1) (i)  $\Delta G^\circ = -RT \ln K_{eq}$   
 $\Delta G^\circ = - (8.314 \text{ J mol}^{-1} \text{ K}^{-1}) (298 \text{ K}) (\ln 1.97)$   
 $\Delta G^\circ = - 1.7 \text{ kJ mol}^{-1}$

(ii) At a given temperature, the value of  $\Delta G^\circ$  for any reaction is fixed and defined for a standard condition.  $\Delta G$  will change.  $\Delta G$  can be calculated for any set of reactants and product concentrations.

$$\Delta G = \Delta G^\circ + RT \ln k$$
$$\Delta G = (-1.7 \times 10^3 \text{ J mol}^{-1}) + (8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 298 \text{ K} \times \ln \left(\frac{1.5}{2.0}\right))$$
$$\Delta G = -2413 \text{ J mol}^{-1}$$

(iii)  $\Delta G^\circ = -RT \ln K_{eq}$

$K_{eq}$  value is defined at a particular temperature. When temperature is changed  $K_{eq}$  also changed.  $\Delta G^\circ$  will also change.

(2) (i) This is the process which synthesizes ATP using the free energy generated by the flow of electrons.

(ii) In the glycolysis 2 moles of NADH is formed. Depending on the shuttle, the production of ATP after glycolysis can be varied. When glycerol 3 phosphate shuttle operates 1 NADH molecule produce 2 ATP molecules. When malate aspartate shuttle operates 1 NADH molecule produce 3 ATP molecules. In addition in glycolysis 2 ATP molecules form. All together when glycerol 3 phosphate shuttle is used 6 ATP and malate aspartate shuttle is used 8 ATP.