Ch13

Zihan Zhong

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1 P527 6

1.1 (a)

$$\Delta G'^{\circ} = -RTlnK'_{eq} = -1.68kJ/mol$$

1.2 (b)

$$\Delta G = G'^{\circ} + RTlnQ = -1.68 + RTln\frac{0.5M}{1.5M} = -4.4kJ/mol$$

1.3 (c)

Because $\Delta G'^{\circ}$ changes with diversity of reaction condition like temperature or substrate concentration whereas ΔG is constant because the standard condition is fixed.

2 P528 10

Use the equation:

$$lnQ = ln\frac{[ADP][Pi]}{[ATP]}$$

We can calculate:

lnQ1 = -7.8; lnQ2 = -4.7; lnQ3 = -2.8; lnQ4 = -1; lnQ5 = -3.0

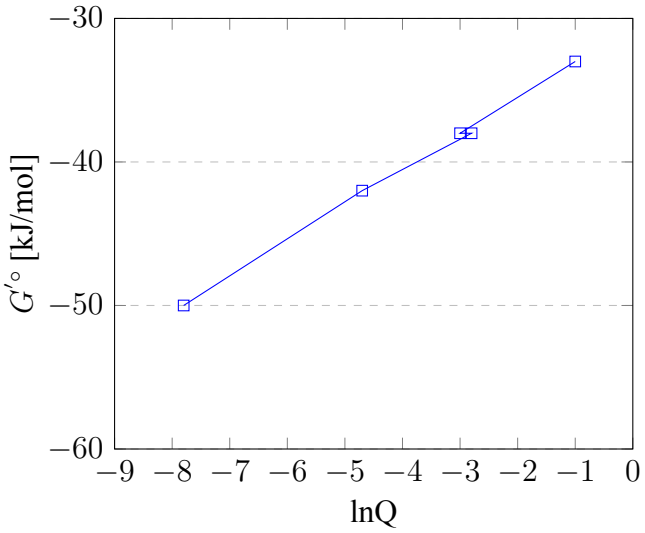
Use the equation:

$$\Delta G = G'^{\circ} + RTlnQ \quad G'^{\circ} = -35.5kJ/mol$$

We can calculate:

$\Delta G1 = -50kJ/mol; \Delta G2 = -42kJ/mol; \Delta G3 = -38kJ/mol; \Delta G4 = -33kJ/mol; \Delta G5 =$

$-38kJ/mol$



According to the figure above, it indicates that if $\frac{[ATP]}{[ATP]}$ is higher, ΔG will also be higher, hence cell tend to maintain high level of $\frac{[ATP]}{[ATP]}$.

3 P530 26

3.1 (a)

NAD+/NADH. Because its E'° is lower.

3.2 (b)

Pyruvate/lactate. Because its E'° is higher hence it tends to accept electons.

3.3 (c)

Lactate.

3.4 (d)

$\Delta E'^{\circ}$ = 0.14V
$\Delta G'^{\circ}$ = -26.1kJ/mol

3.5 (e)

$K'_{eq} = e^{10.5} = 3.63 \times 10^4$

4 Extra questions

Answer the following questions about ATP.

a. How many phosphoanhydride bonds are present?

Two.

b. What kind of chemical linkage is present between the ribose and the triphosphate group?

phosphoester bond

c. How are the negative charges on ATP usually neutralized in the cell?

Neutralized by ions with positive charges.

d. What kind of chemical bond links adenine and ribose?

N-glycosidic bond.