

Chapter 8 Part II – Homework
An Introduction to Metabolism
key

1. In thermodynamics, **discuss** what is the difference between an “open” system versus a “closed” system and which one best reflects living things.
 ½ pt - Open systems obtain resources from outside themselves, closed systems can not.
 ½ pt - Life is an open system and must take energy from outside to offset entropy.

2. Make a chart to **contrast** a system with high free energy versus a system with low free energy for the following factors: work capacity, equilibrium, spontaneity, and stability.

High free energy	high work	moving towards equilibrium	spontaneous	not stable
Low free energy	Low work	away from equilibrium	not spontaneous	stable

3. **Contrast** and **compare** exergonic reactions versus endergonic reactions. Which reaction type matches with catabolic reactions? Which matches with anabolic reactions?
 ½ pt - Exergonic reactions release energy and match catabolic reactions
 ½ pt - Endergonic reactions absorb or require energy and match anabolic reactions.
4. When a cell becomes more ordered, one of the characteristics of life, what must happen in the rest of the universe? Which Law of Thermodynamics does this reflect?
 ½ pt – the amount of Entropy increases
 ½ pt – the second Law of Thermodynamics
5. **Explain** why ATP can store so much energy.
 ½ pt - It takes a great deal of energy to hold the three negatively charged phosphate groups together. They tend to repel each other.
6. A key process in metabolism is the transport of hydrogen ions (H⁺) across a membrane to create a concentration gradient. Other processes can result in an equal concentration of hydrogen ions on each side of a membrane. **Explain** which arrangement of hydrogen ions (unequal concentration or equal concentration) allows work to be done.
 ½ pt – the arrangement where there is an unequal concentration of H⁺ ions allows work to be done.
 ½ pt – the difference in concentration gradient creates a free energy potential (and allows work)