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Respiration BMZ116B Study Guide

- To perform their many tasks, living cells require _____from outside sources.
- Energy enters most ecosystems as _____ and leaves as _____.
- Photosynthesis generates _____ and _____ that the mitochondria of eukaryotes use as _____ for cellular respiration.
- Cells harvest the chemical energy stored in organic molecules and use it to regenerate _____, the molecule that drives most cellular work.
- Respiration has three key pathways: _____, the _____, and _____.

A. The Principles of Energy Harvest

1. Cellular respiration and fermentation are catabolic, energy-yielding pathways.

- The arrangement of atoms of organic molecules represents _____ energy.
- Enzymes _____ the systematic degradation of organic molecules that are rich in energy to simpler waste products with _____ energy.
- Some of the released energy is used to do _____; the rest is dissipated as _____.
- Catabolic metabolic pathways _____ the energy stored in complex organic molecules.
- One type of catabolic process, _____**,** leads to the partial degradation of sugars in the absence of oxygen.
- A more efficient and widespread catabolic process, _____**,** consumes _____ as a reactant to complete the breakdown of a variety of organic molecules.
  - In eukaryotic cells, _____ are the site of most of the processes of cellular respiration.
- Cellular respiration is similar in broad principle to the combustion of gasoline in an automobile engine after _____ is mixed with hydrocarbon fuel.
  - _____ is the fuel for respiration. The exhaust is _____ and _____.
- The overall process is:
  - organic compounds + _____ → _____ + _____ + energy (_____ + _____).
- Carbohydrates, fats, and proteins can all be used as the fuel, but it is most useful to consider glucose.
  - _____ + $6O_2$ → $6CO_2$ + $6H_2O$ + Energy (ATP + heat)
- The catabolism of glucose is _____ with a ΔG of −686 kcal per mole of glucose.
  - Some of this energy is used to produce _____, which can perform cellular work.

2. Redox reactions release energy when electrons move closer to electronegative atoms.

- Catabolic pathways transfer the _____ stored in food molecules, releasing energy that is used to synthesize _____.
- Reactions that result in the transfer of one or more electrons from one reactant to another are oxidation-reduction reactions, or _____ **reactions.**
  - The loss of electrons is called _____**.**
  - The addition of electrons is called _____**.**
- The formation of table salt from sodium and chloride is a redox reaction.