

## 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 + \_\_\_\_\_  $\rightarrow$  \_\_\_\_\_ + \_\_\_\_\_ + energy (\_\_\_\_\_ + \_\_\_\_\_).
- Carbohydrates, fats, and proteins can all be used as the fuel, but it is most useful to consider glucose.
  - \_\_\_\_\_ +  $6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy (ATP + heat)}$
- The catabolism of glucose is \_\_\_\_\_ with a  $\Delta G$  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.