

Concepts of Biology

Guided Reading Notes

Chapter 7

1 ATP is Universal

- ATP has the same structure and function in all cells.
- ATP breakdown provides energy for life

2 Glucose Breakdown Releases Energy

7.1 Cellular respiration is a redox reaction that requires O₂

- During cellular respiration, _____ is oxidized to _____ which we breathe out.
- _____, which we breathe in, is reduced to _____.

Draw the diagram of **cellular respiration** found on p. 127

- As oxidation occurs, coenzymes _____ and _____ remove _____ atoms (e⁻ +H⁺) from glucose.
- Slow release _____ allows it to be captured for _____.

7.2 Cellular respiration has four phases—three phases occur in mitochondria

- **Glycolysis** occurs in the _____ and is _____. The **prep reaction**, **citric acid cycle**, and **electron transport chain** (ETC) occur in the _____ and are _____.
- From the overall equation for **cellular respiration**, associate glucose with _____, carbon dioxide with the _____ and the _____ cycle, and oxygen _____ with ETC.
- Both _____ and the _____ produce minimal **ATP** by substrate-level _____, and the _____ produces much _____ when oxygen is available.

3 Carbon Dioxide and Water Are Produced During Glucose Breakdown

7.3 Glycolysis: Glucose breakdown begins

- Energy investment: At the beginning of **glycolysis**, _____ are used to activate _____, which splits into _____.

- **Energy harvesting:** Removal of _____ results in _____ and _____. Four **ATP** results from _____.
- **Result:** net gain of _____ -- _____, _____ --per glucose molecule.
- **Glycolysis** begins with _____ and ends with _____.

Draw the diagram of **Glycolysis** found on p. 127

7.4 The preparatory reaction occurs before the citric acid cycle

- _____ is converted to an **acetyl group**; _____ is made, and CO₂ is given off. Occurs _____ per **glucose**.
- **CoA** carries _____ to _____.

7.5 The citric acid cycle: Final oxidation of glucose products

- **Citrate** _____ and _____ the cycle.
- _____ and _____ are made as CO₂ is released.
- One _____ per cycle (two per glucose) results from substrate-level _____.

7.6 The electron transport chain captures much energy

- **NADH** and **FADH₂** bring _____ to the _____ system.
- _____ are passed from _____ to _____, and energy is captured and used to form _____. Three _____ are made per _____, and two _____ are made per _____.
- _____ is the final acceptor of electrons from the _____. Oxygen is _____.

7.7 The cristae create an H⁺ gradient that drives ATP production

- Complexes in the **cristae** form the _____.
- As electrons move from one complex to another, _____ are pumped into _____, creating an _____.
- **Chemiosmosis:** As _____ flow down the _____ from the _____ to the matrix, _____ is synthesized from _____.

7.8 The ATP payoff can be calculated

- Net gain of _____ in the **cytoplasm**
- _____ from **citric acid cycle**
- _____ from the **electron transport chain** and **chemiosmosis**
- **Total:** Complete glucose breakdown produces a total of _____ or _____ **ATP**

Label this diagram of a **mitochondrion**, and state a **function** for each portion indicated:

4 Fermentation Is Inefficient

7.9 When oxygen is in short supply, the cell switches to fermentation

- **Fermentation** is _____ followed by the reduction of _____ by NADH either to _____ or _____ and CO₂ depending on the organism.
- Fermentation results in only two _____, but provides a quick burst of _____ for short term activity.
- Alcohol or lactate buildup is _____ to cells. In humans, _____ puts an individual into _____ because oxygen is needed to completely _____ it.

Draw the **Fermentation** process found on p. 138

7.10 Fermentation helps produce numerous food products

- _____ are used to make bread and alcohol; _____ are used to make yogurt, sour cream, cheese, pickles, and sauerkraut.

5 Metabolic Pathways Cross at Particular Substrates

7.11 Organic molecules can be broken down and synthesized as needed

- Carbohydrates, fats, and proteins can all be _____ to produce _____ molecules.

- Amino Acids from protein first have to _____, the removal of the _____.
- During _____, molecules from the breakdown pathways can be used to _____. **Example:** Acetyl groups from carbohydrate breakdown can be used to _____.

7.12 Exercise burns fat

- Burning more calories than are taken in results _____.
- Prolong **aerobic exercise** at moderate exertion is _____.

