

Chapter 9

Overhead Notes

Please note: This lecture does not follow the same outline found in your book. Use many of the figures to guide you to the correct locations in the text.

Warm up question

I. Overview

- **Energy flow and chemical recycling in the ecosystem.**

- CO₂ and H₂O are recycled

- energy is not recycled, but released as heat

(2 slides)

I. Overview

- Digestion
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- Cellular Respiration
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II. Review of Chapter 8

- **Why do cells need to produce ATP?**
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III. How do cells produce ATP?

- Through the oxidation of organic monomers during cellular respiration.

Question 9.2

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IV. The stages of cellular respiration-
A Preview

- **Aerobic Respiration has 4 major stages**

- 1.
- 2.
- 3.
- 4.

(3 slides)

IV. The stages of cellular respiration-
A Preview

- How is ATP synthesized at these four metabolic stages?

1. Substrate-level Phosphorylation =
2. Oxidative Phosphorylation =

V. Stage 1: Glycolysis

- Glycolysis harvests chemical energy by oxidizing glucose to pyruvate.
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V. Glycolysis

- Part 1: Energy investment phase
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-
-

(2 slides)

V. Glycolysis

- Part 2: Energy payoff phase
- -
- -

(4 slides)

V. Glycolysis

Glycolysis Summary Slide

- ✓
- ✓
- ✓

Question 9.3

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VI. Formation of Acetyl CoA

- Pyruvate transporter moves 2 pyruvates into the mitochondrion.
- Pyruvate Dehydrogenase enzyme
 - 1.
 - 2.
 - 3.

VI. Formation of Acetyl CoA

Acetyl CoA Formation Summary Slide

- For every glucose entering glycolysis:
 - ✓
 - ✓
 - ✓

VII. Citric Acid Cycle

- Also known as the
 -
 -
-
-

VII. Citric Acid Cycle

- Step 1:
- Steps 3 and 4:
- Step 5:

VII. Citric Acid Cycle

- Step 6:

- Step 8:

VII. Citric Acid Cycle

Summary Slide of the Citric Acid Cycle

For every glucose that enters glycolysis:

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-
-
-

Question 9.4

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VIII. Glucose has been completely oxidized to CO_2

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VIII. Overview: Electron Transport and Chemiosmosis

- NADH and FADH_2 transfer electrons to the Electron Transport Chain (E.T.C.)
- ETC is coupled to ATP synthesis through chemiosmosis. (oxidative phosphorylation)

VIII. Overview: Electron Transport and Chemiosmosis

- Membrane and spaces of the mitochondrion:
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 -
 -

VIII. Overview: Electron Transport and Chemiosmosis

- The inner membrane contains lots of surface area to accommodate the many e-transporters.

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IX. Electron Transport Chain (E.T.C.)

- 1.
- 2.
- 3.

IX. Electron Transport Chain (E.T.C.)

- 4.
- 5.

IX. Electron Transport Chain (E.T.C.)

6.

7.

Question 9.5

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X. Chemiosmosis

- Uses the force of the proton gradient to drive ATP synthesis.

- Proton motive force =

X. Chemiosmosis

- 1.
- 2.

X. Chemiosmosis

Oxidative phosphorylation = A mode of ATP synthesis that uses e⁻ from NADH and FADH₂ to convert ADP + P_i to ATP

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Question 9.6

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XI. Anaerobic Respiration (fermentation)

- Anaerobic respiration =
- Does not utilize any process in the mitochondrion.
- Goal...
 - 1.
 - 2.

XI. Anaerobic Respiration (fermentation)

- Alcohol Fermentation

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XI. Anaerobic Respiration (fermentation)

- Lactic Acid Fermentation

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XII. Classification of aerobic and anaerobic organisms

- Strict (obligate) aerobes = Organisms that require O₂ for growth and reproduction.
- Strict (obligate) anaerobes = Microorganisms that grow and reproduce in the absence of oxygen.
- Facultative anaerobes = Organisms capable of growth and reproduction in either aerobic or anaerobic environments.

Question 9.7

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