

Unit 3: Respiration PowerPoint Questions

BREATHING VERSUS RESPIRATION

- ✓ Alternation of _____ and _____.
- ✓ Exchange of _____ in which organisms obtain _____ from the air (or water) and release _____.
- ✓ Exchange occurs in lungs (or gills).

CELLULAR RESPIRATION:

- ✓ Harvesting of _____ from food _____ by cells.
- ✓ _____ process (requires oxygen).
- ✓ Occurs inside cells (cytoplasm and mitochondria).

“Respiration” comes from Latin word for breathing.
Breathing and cellular respiration are closely related, but not the same processes.

CELLULAR RESPIRATION BANKS ATP

Write and label reaction below:

What happens to the energy in glucose or other food molecules?

- ✓ Only about _____ of energy is turned into _____
- ✓ The rest is lost as _____ heat.
- ✓ One ATP molecule has about 1% of the chemical energy found in glucose.

CATABOLISM:

Process of _____ larger molecules to _____ ones. Catabolic reactions are _____ and release free _____.

THREE MAJOR CATABOLIC PATHWAYS IN LIVING ORGANISMS

- A. Aerobic (Cellular) respiration
- B. Anaerobic respiration
- C. Fermentation

MAJOR CATABOLIC PATHWAYS

A. Aerobic (Cellular) respiration:

- ✓ Requires _____.
- ✓ Most commonly used _____ pathway.

- ✓ Over _____ reactions. Used to extract _____ from glucose molecules.
- ✓ _____ electron acceptor: _____.
- ✓ Most efficient: _____ of glucose _____ is converted into ATP.

REACTION:**B. Anaerobic respiration:**

- ✓ Does _____ require _____.
- ✓ Used by _____ that live in _____ without _____.
- ✓ Final electron acceptor: _____ molecule.
- ✓ Very _____: Only _____ of glucose energy is converted into _____.
- ✓ Final products: Carbon dioxide, water, and other inorganic compounds.

C. Fermentation:

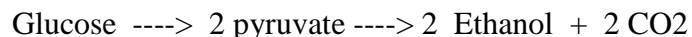
- ✓ Does _____ require _____.
- ✓ Used by _____, bacteria, and other cells when _____ is not available.
- ✓ Final electron acceptor: _____ molecule.
- ✓ Very inefficient: Only 2% of glucose energy is converted into ATP.
- ✓ Products depend on type of fermentation:
 - _____: Used to make cheese and yogurt. Carried out by muscle cells if oxygen is low.
 - _____ fermentation: Used to make alcoholic beverages. Produces alcohol and carbon dioxide.

FERMENTATION OCCURS WHEN OXYGEN IS NOT AVAILABLE

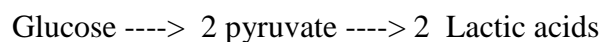
- ✓ _____ normally use _____ respiration to process food.
- ✓ If _____ is _____ available, they use _____, which is less efficient.

Types of fermentation:

Alcoholic fermentation



Lactic acid fermentation

**THREE STAGES OF CELLULAR RESPIRATION**

- A. Glycolysis
- B. Krebs Cycle
- C. Electron Transport Chain

A. Glycolysis: “Splitting sugar”

- ✓ Occurs in the _____ of the cell
- ✓ Does _____ require _____
- ✓ Net result: _____ molecule (6 carbons each) is split into two _____ acid molecules of _____ carbons each.
- ✓ Yield per glucose molecule:
 - 2 ATP (Substrate-level phosphorylation)
 - 2 NADH + 2 H⁺
 - (2 ATP are “invested” to get 4 ATP back)
- ✓ _____ acid diffuses into _____ matrix where all subsequent reactions take place.

Conversion of Pyruvate to Acetyl CoA

- ✓ Before _____ the next stage, pyruvic acid (3C) must be converted to Acetyl CoA (2 C).
- ✓ A _____ atom is lost as _____.
- ✓ Yield per _____ molecule: 2 NADH + 2 H⁺

B. *Kreb’s Cycle*

- ✓ Occurs in the _____ of the mitochondrion
- ✓ A cycle of _____ reactions
 - Reaction 1: Acetyl CoA (2C) joins with 4C molecule (oxaloacetic acid) to produce citric acid (6C).
 - Reactions 2 & 3: Citric acid loses 2C atoms as CO₂.
 - Reactions 4 & 5: REDOX reactions produce NADH and FADH₂.
 - Reactions 6-8: Oxaloacetic acid is regenerated.
 - Carbons are released as CO₂
 - Yield per glucose molecule:
 - 2 ATP
 - 6 NADH + 6 H⁺
 - 2 FADH₂

C. *Electron Transport Chain & Chemiosmosis*

- ✓ Most _____ is produced at this _____
- ✓ Occurs on inner mitochondrial _____
- ✓ Electrons from _____ and _____ are transferred to electron acceptors, which produces a _____ (H⁺) gradient
- ✓ _____ gradient used to _____ synthesis of ATP.
- ✓ Chemiosmosis: ATP synthase allows H⁺ to flow across inner mitochondrial membrane down concentration gradient, which produces ATP.
- ✓ Ultimate acceptor of H⁺ and electrons is _____, producing _____.

NOTE: The electron transport chain ONLY works when OXYGEN is available at the end of the chain to accept the electrons and H⁺ to form water.

Yield of ATP through Chemiosmosis:

- ✓ Each NADH produces 3 ATP
- ✓ Each FAHD2 produces 2 ATP
 - 2 NADH (Glycolysis) x 3 ATP = 6 ATP
 - 2 NADH (Acetyl CoA) x 3 ATP = 6 ATP
 - 6 NADH (Kreb's cycle) x 3 ATP = 18 ATP
 - 2 FADH2 (Kreb's cycle) x 2 ATP = 4 ATP

32 - 34 ATP

These ATPs are made by oxidative phosphorylation or chemiosmosis.

Total Energy from cellular respiration

Process	Substrate Phosphorylation	e-Carrier	Oxidative Phosphorylation	TOTAL
Glycolysis	2 ATP	2 NADH	---> 4 - 6 ATP	6-8 ATP
Acetyl CoA Formation		NADH	---> 6 ATP	6 ATP
Kreb's	2 ATP	6 NADH	---> 18 ATP	24 ATP
		2 FADH2	---> 6 ATP	

Total yield per glucose : 36-38 ATP

