Respiration: Exhaling Carbon Dioxide

Photosynthesis and Respiration

Problem

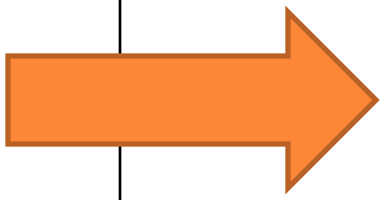
- Is there a relationship between exercise and the amount of carbon dioxide you exhale?

Procedure: Part 1

1. Label one beaker "Beaker 1" and the other as "Beaker 2." Beaker 1 will be the control in the experiment.
2. Bromthymol blue can be used to test for the presence of carbon dioxide. To see how this works fill each beaker with 15ml of bromthymol solution. ***Caution: Bromthymol blue solution can stain skin and clothing. Avoid spilling or splashing it on yourself.***
3. Note and record the color of the solution in both beakers. **SEE DATA TABLE 1**
4. Place a straw in Beaker 2. Gently blow through the straw into the solution until the solution changes colors. ***Caution: Use the straw to breathe out only. Do not suck the solution back through the straw.***
5. Your partner should begin timing when you first blow through the straw and stop as soon as the solution changes color. Record the time that has elapsed.

Data: Part 1

Activity Level	Time to Color Change (seconds)
Resting	
2 min of exercise	

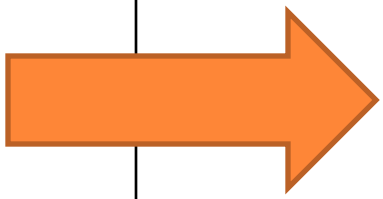


Procedure: Part 2

1. In part 1 you timed the change in color without exercising first. Predict how long it will take the solution to change color if you conduct the test after you exercise. Prediction_____
2. Do some type of physical activity (jumping jacks, run in place or push ups) for 2 minutes without stopping.
3. Place the same straw in Beaker 1. Gently blow through the straw into the solution until the solution changes color. Your partner should begin timing when you first through the straw and stop as soon as the solution changes color.

Data: Part 1

Activity Level	Time to Color Change (seconds)
Resting	
2 min of exercise	



Analyze and Conclude

- Measuring: How long did it take for the solution to change color the first time you did the test (without exercise)?
- Drawing Conclusions: How did exercising affect the amount of time it took for the solution to change color?
- Predicting: What was your prediction in step 5 based upon? Was your prediction accurate?
- Communicating: Write a paragraph that relates the results of your experiment to the process of cellular respiration. Why CO2 produced at greater levels during exercise than when resting?
- **Write the paragraph on the back of this page**: Some plants grow in water: If you added bromthymol blue to the water, do you think it would turn color?

Key Concepts

- When people breathe out **carbon dioxide**, they are removing the **waste** product made in the cell by **respiration**.
- ***C***ellular **respiration** is the process by which the chemical **energy** of "**food**" molecules is released and partially captured in the form of **ATP**.
- **All** organisms and their cells go through **respiration**.
- The **reactants** or ingredients for cellular respiration are **glucose** (sugar) and **oxygen** (O_2).
- **Respiration** happens within cells in the **mitochondria** and **cytoplasm**.

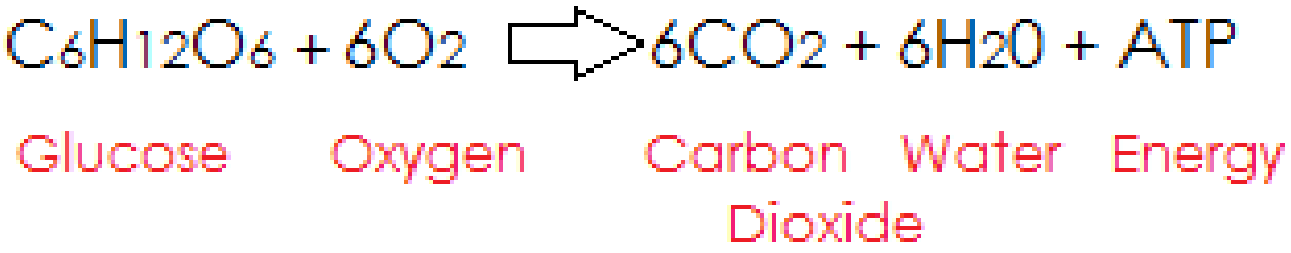
Key Concepts

- **Respiration** is constantly happening because all organisms need chemical **energy** to perform daily activities.
- In the first phase of respiration, **glucose**, the food source, is **broken down** in the **cytoplasm** through chemical reactions.
- The broken down sugar molecule enters the **mitochondria** where it is further broken down in more chemical reactions with **oxygen** gas.
- **ATP**, the **energy** molecule of all living organisms, is produced after the series of chemical reactions.

Key Concepts

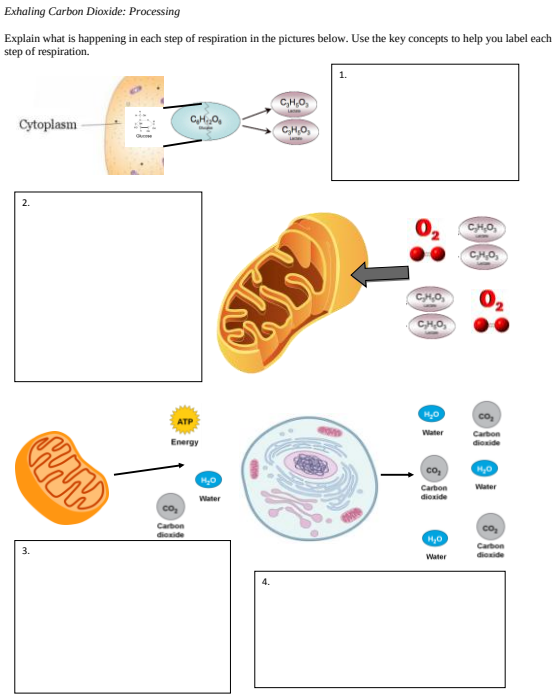
- The **products** of respiration that **leave** the cell as **waste** are **carbon dioxide and water**.
- The more **energy** an organism uses, the more **energy** and **waste products** an organism **produces** to continue high activity events.

Cell Respiration Formula

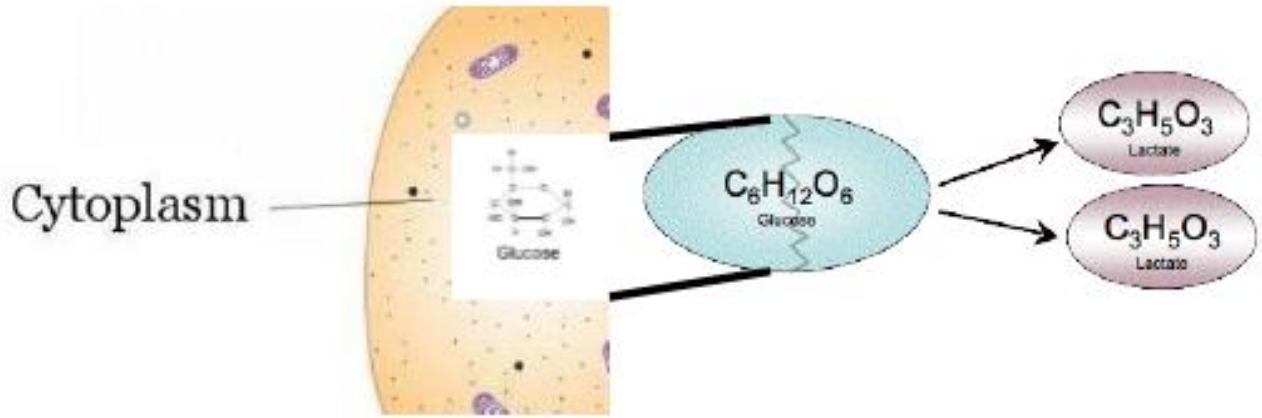


Processing

- Explain what is happening in each step of respiration in the pictures below. Use the key concepts to help you label each step of respiration.



Processing



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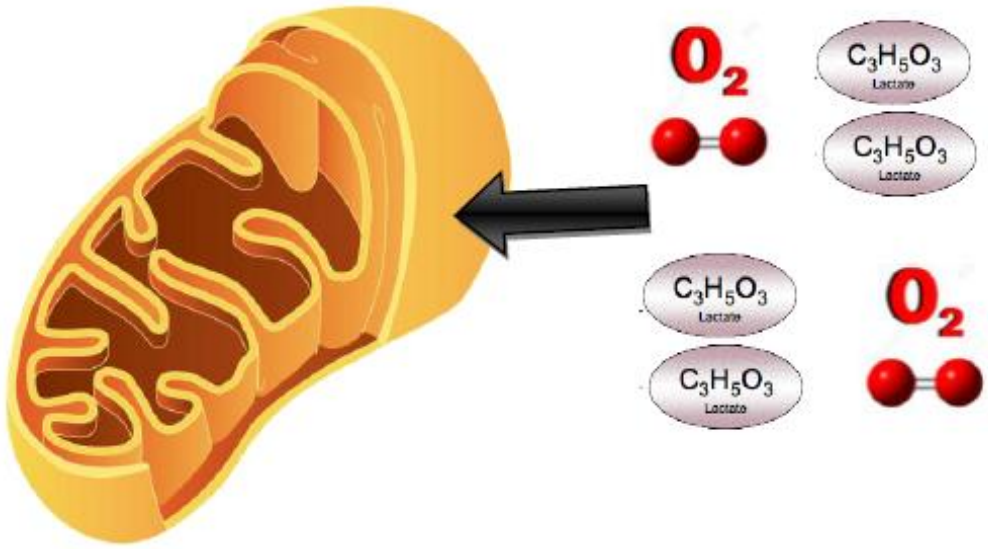
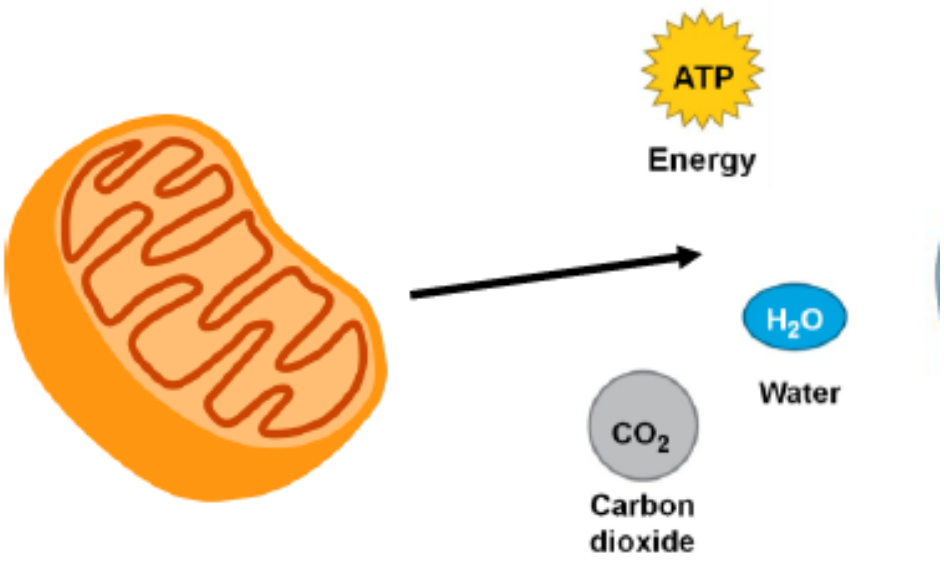
Processing



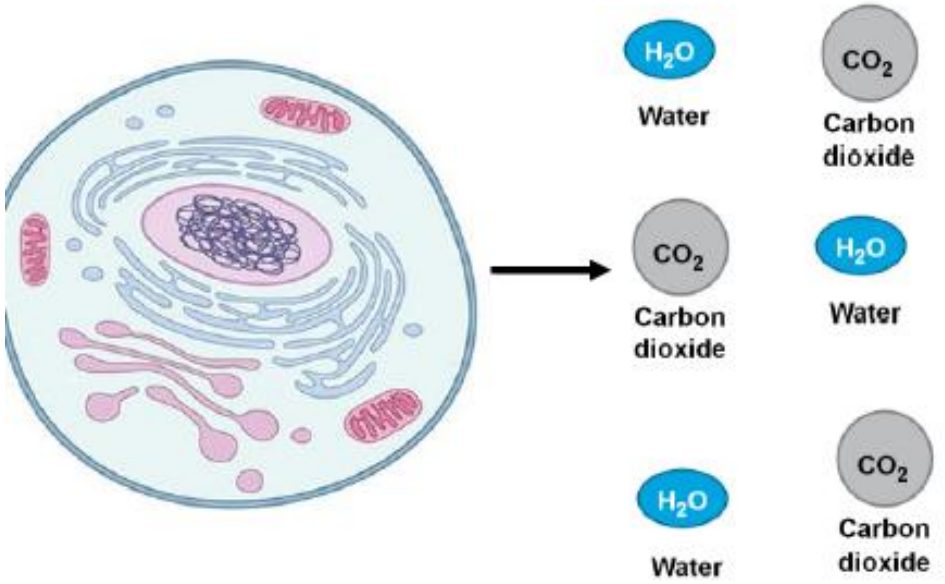
- The broken down sugar molecule enters the **mitochondria** where it is further broken down in more chemical reactions with **oxygen** gas.

Processing



- **ATP**, the **energy** molecule of all living organisms, is produced after the series of chemical reactions.

Processing



- The **products** of respiration that **leave** the cell as **waste** are **carbon dioxide and water**.