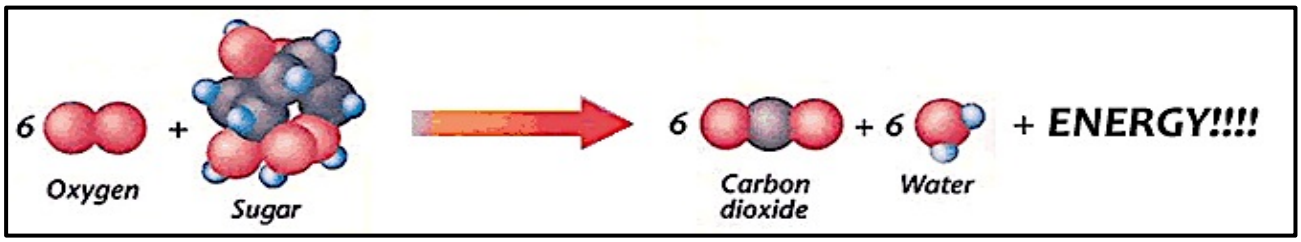
Essential Question: What are the characteristics & structure of living things?

Act 8 – Detecting Respiration in Cells

BACKGROUND: All living things share the same characteristics. Living things:

a. Are composed of one or more cells, which are the basic unit of life.
b. Are organized to do simple and complex functions
c. Get, store and use energy: (ex: make or take in nutrients, do work, & release waste)
d. Keep proper internal balance (this is called homeostasis)
e. Grow
f. Respond to stimulus (ex: move, defend, flee etc.)
g. Reproduce from preexisting cells and each new cell has its own complete set of DNA.
h. Evolve (adapt to environmental conditions over time.)

The Lab: This lab explores how a single-celled fungus, yeast, takes **glucose** ($C_6H_{12}O_6$) through its cell membrane. The yeast then chemically splits the glucose molecules into **carbon dioxide** (CO_2) and **water** (H2O), releasing **energy** that allows the cells to live.



REACTANTS ***--->*** ***PRODUCTS***

Background: The process yeast animals & other non-plant cells use to produce energy is named **cellular respiration**. During this lab you will gather evidence that yeast respire by detecting the CO_2 the yeast release when they respire.

You'll capture the gas emitted by the yeast and bubble it through a solution of water and BTB. If the yeast emits CO_2, the CO_2 will turn the H_2O/BTB solution into **Carbonic acid.** The Carbonic acid will change the shape of the BTB molecule, which **will turn yellow instead of blue**. The more carbon dioxide present, the more yellow the BTB will become. This will give us evidence that yeast is respiring, creating CO_2 as a waste product.

PRE-LAB:

a. Explain how oxygen transfers into the circulatory system: _____

_____

b. Tell where cellular respiration occurs AND tell which organelle breaks down sugars:

_____ AND _____

c. Tell the reactants of cellular respiration. _____ & _____

d. Describe the products of cellular respiration. _____, _____ & _____

Yeast is one of the most important ingredients used in culinary science today. It helps to make beer, raise bread, or can cause an infection that is quite painful.

INSTRUCTIONS: Complete this pre lab.

Step 1: *State* the **purpose** of the investigation.

_____

_____

Step 2: *Identify* the **study subject**, **manipulated variable**, & **responding variable.**

SS =

MV =

RV =

Step 3: Tell your scientific **question**? *("How does/What is… SS + MV affect RV?")*

_____

_____

_____

_____

_____

Step 4: *Identify* the **control** & **experimental trials**.

CT =

ET =

Step 5**:** *State* your **hypothesis**.

IF (ss + mv)_____

_____

THEN (ET + Prediction)_____

_____

_____

COMPARED TO (CT)_____

_____

BECAUSE (WHY, ss, mv, rv)_____

_____

_____

_____

Therefore _____

_____

Step 6: *List* the **controlled variables**, **uncontrolled variables, & types of error** in this experiment.

2 Controlled Variables	**2 Uncontrolled Variables**	**Type of Error**
Minimum of two, other EC	*Only those that affect data*	*Caused by the UCVs listed*
1.	1.	1.
2.	2.	2.
3. EC	3. EC	3. EC

Step 7: ***Record*** **data**.

Data Table 1 – Sugar's Effect on Yeast Respiration

	Before **a. Color** **b. Clarity** **c. Control, Exp. Trial, Test Cup or Color Standard**	**After** **a. Color** **b. Clarity** **c. Control, Exp. Trial, Test Cup or Color Standard**
Cup 2 (yeast + H_2O)		a. b. c.
Cup 3 (yeast + H_2O + sugar)	a. b. c.	a. b. c.
Cup 4 (yeast + H_2O + sugar)	a. b. c.	a. b. c.
Oval Cup (BTB + H_2O)	a. b. c.	a. b. c.
Cup 8 (BTB + H_2O)	a. b. c.	a. b. c.

Step 8: ***Analyze*** **data.**

Use the data above to complete these statements. There is only one correct possible solution for each blank.

1. Respiration occurred in Cup _____ and there is *direct evidence* to support this.
2. Cup _8_ was used as a color comparison for Cup _____.
3. Cup _____ was used as a control. No respiration occurred in the cup.
4. Cup _____ provided *direct evidence* to show that respiration occurred in Cup _4_.
5. Respiration occurred in Cup _____, but I have *no direct evidence* to support this.

Step 9: Conclusion. What conclusions can be drawn after analyzing the data? Use your data above and the checklist below when writing your conclusion.

Use the Headings and Format given below in your write up. Type or neatly write up your final.

___ a. **Conclusive statement** explaining what the experiment shows. ("This experiment shows..")

___ b. **Evidence** to support or reject your hypothesis. (3+ pieces of data as evidence)

___ c. **Analysis of data** (What do the data mean? Compare the experimental data to the control data.)

___ d. **Final Statement** based on your analysis that summarizes findings. ("Therefore…")

___ e. **Error Analysis:** 1. List 2 errors that occurred. 2. Tell each type of error. 3. Describe how each occurred.

___ f. **Learning:** Tell one thing that you learned in this lab about cells by doing this experiment.

a. Conclusive Statement

Notes

Notes