Biology 1 Partner 1:

***Respiration Activity*** Partner 2:

 Date:

 Hour:

**The purpose of this experiment is to:**

Define the term indicator

Determine what happens to bromothymol blue in the presence of carbon dioxide

Determine how exercise effects the production of carbon dioxide

**Materials:**

3 Test tubes Bromothymol Blue

Marker Straws

Graduated Cylinder Stop Watch

Water Pipette

**Procedure:**

1. Make a prediction: What will happen to the rate of carbon dioxide production with exercise and how will you be able to tell? Record your answer here:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Using a pipette, add approximately 10ml of water into each of three test tubes.

3. Add 15 drops of bromothymol blue to each tube and tap each tube gently to mix. Label each test tube 1-3.

4. Next choose roles: one student will be the exerciser and one student will be the timer.

5. The exerciser should sit for five minutes without any type of movement or exertion (RESTING).

6. After 5 minutes, while your partner times you, slowly blow air through a straw into the bottom of the test tube.

**DO NOT INHALE THROUGH THE STRAW!!!!!**

7. When the solution changes color to yellow your partner should say stop and note the time. (See table)

8. Next Jog in place or do jumping jacks for 2 minutes.

9. After 2 minutes and while your partner times you, slowly blow air through a straw into the bottom of the test tube 2.

10. Record how long the color change took. (See table)

11. Choose another exercise that you think takes either more or less energy than jogging in place for 2 minutes.

Describe this activity and decide whether it should take more or less energy here:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. Perform this exercise for 2 minutes.

13. After a minute and while your partner times you, slowly blow air through a straw into the bottom of the test tube 3.

14. Record the new exercise time.

Optional: 15. Now switch roles so that your partner completes the same processes. Your partner must do the same exercise for tube 3.

**Data:**

|  |  |
| --- | --- |
| Tube | Time |
| 1 |  |
| 2 |  |
| 3 |  |

Activity for Tube 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Activity for Tube 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Activity for Tube 3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Timer:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Exerciser:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Questions:**

1. What happened to the color of the water/bromothymol blue solution when bubbles were blown through it?

2. What does the change in an indicator’s color represent generally?

3. What was the purpose of the student sitting still for 5 minutes (resting)?

4. Compare your hypothesis with the data collected. Was your hypothesis supported with evidence?

5. What is the effect of exercise on carbon dioxide production?

6. What was the dependent variable in your experiment?

7. What was the independent variable in your experiment?

8. Graph the results of your experiment. Be sure to label each axis and include a title. There is space for your graph at the end of this section.

9. What is cellular respiration (the term for all of the chemical reactions that are needed to get from start to finish)?

10. What is the equation for cellular respiration?

11. What are the reactants in cellular respiration?

12. What are the products of cellular respiration?

13. In which organelle does cellular respiration take place?

14. Draw the organelle and label their associated parts. There is space for your sketch at the end of this section.

15. Muscles cells engaged in vigorous activity build up relatively high concentrations of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

16. Muscle cells in athletes often have more mitochondria than muscle cells in non-athletes. Based on this observation, it can be inferred that the muscle cells in athletes…

 (circle the correct answer)

(a) have a smaller demand for cell proteins than the muscle cells of non-athletes

(b) reproduce less frequently than the muscle cells of non-athletes

(c) have nuclei containing more DNA than nuclei in the muscle cells of non-athletes

(d) have a greater demand for energy than the muscle cells of non-athletes

8. 14.

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