**GENERAL HUMAN BIOLOGY – YEAR 11**

**TASK 1 – RESPIRATION PRACTICAL**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 6%**

**DATE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ MARK: \_\_\_\_\_ / 38 = \_\_\_\_\_ %**

***BACKGROUND INFORMATION***

Respiration is the chemical reaction in the cell which releases energy from the oxidation of glucose. There are two types of respiration: aerobic and anaerobic.

* **Aerobic respiration** occurs in the presence of oxygen. Glucose is completely broken down to carbon dioxide and water. It is the only reaction in the body that uses elemental oxygen. The first part of this reaction is called glycolysis where the glucose molecule is split into two pyruvate molecules. These are then metabolised into carbon dioxide and water releasing most of the available energy in glucose.
* **Anaerobic respiration** occurs when oxygen is not available. Glucose is broken down to pyruvate (glycolysis) but then the pyruvate is converted to lactic acid and carbon dioxide. Much less energy is released in anaerobic respiration because the energy is still tied up in the chemical bonds in the lactic acid molecule. Lactic acid can build up in tissues and can cause cramps or muscle stiffness the day after strenuous exercise.

***AIM***

To measure the rate of aerobic and anaerobic respiration

***MATERIALS***

* Safety glasses
* 4 x labels
* 4 tsp dried yeast
* Tape measure
* 50 mL measuring cylinder
* 1 tsp sugar-substitute sweetener
* 4 x balloons, stretch the balloons before using
* 4 x 100 mL conical flasks
* Warm tap water
* 2 tsp sugar
* Containers of ice cubes
* Ruler

***PROCEDURE***

1. Label the conical flasks 1-4 and with names and date

2. Flask 1 – add 20mL of warm water and 7g of yeast

3. Flask 2 and 3 – to each bag add 20mL of warm water, 7g of yeast and 7g of sugar

4. Flask 4 – add 20mL of warm water, 7g of yeast and sweetener

5. Smell the contents of each flask before sealing it

6. Gently mix the contents of each flask for 30 seconds

7. Seal the flask by placing a balloon over the neck of the flask

8. Measure the circumference of the each balloon after you place it on the flask. Record in your table.

9. Place flasks 1, 2 and 4 in the sun. Place flask 3 in the fridge or ice container

10. Measure the amount of gas produce in 5 minute intervals by measuring the circumference of the balloon

11. Record the amount of gas produced by each balloon in the Table

12. Draw a graph of your results on the grid

13. Carefully remove the balloon from each flask and smell the contents

***RESULTS & DISCUSSION***

1. Fill in your results in the table below [4 marks]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Flask | Circumference (cm) of balloon at different time intervals (minutes) | | | | | Odour of flasks | |
| 0 | 5 | 10 | 15 | 20 | Start | End |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |

2.Graph your results on the separate graph paper [6 marks]

3. In which flask(s) did respiration occur? What evidence do you have for your answer? [3 marks]

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4. What was the purpose of including flask 1 in the experiment? What does it allow you to do?

[2 marks]

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5. What was the gas that accumulated in the flasks? [1 mark]

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6. What was the difference in the set-up of flasks 2 and 3? What does this tell you about respiration, explain your answer? [3 marks]

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7. What happened in flask 4? Explain why this happened with reference to the respiration equation

[2 marks]

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8. What is the difference between sugar and sweetener? [2 marks]

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9. Which flask do you think released the most energy? Explain why you think so.

[2 marks]

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10. Which flask(s) had a different odour? Explain why the odours changed in some bags and not others. [2 marks]

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11. This experiment shows the production of carbon dioxide from anaerobic respiration. If the yeast had been respiring aerobically, how would the amount of gas produced in the bags change ? Explain your answer [2 marks]

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Both animals and plants respire anaerobically. During anaerobic respiration animals produce lactic acid whilst plants produce alcohol.

Except for red blood cells, which can only respire anaerobically (thus sparing the oxygen they carry), anaerobic respiration provides only a temporary energy supply for tissues that have energy needs above their aerobic ability.

Anaerobic respiration can only occur for a limited time (longer in skeletal muscles and shorter for the heart) when the ratio of oxygen supply to oxygen needed falls below a critical level. Anaerobic respiration is an emergency procedure that provides some energy until the emergency (oxygen deficiency) has passed. Increased lactic acid concentrations contribute to muscle fatigue.

12. Explain what may happen if human cells produced alcohol as a product of anaerobic respiration instead of lactic acid. [2 marks]

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13. Suggest why cardiac muscle of the heart has a lower lactic acid tolerance than skeletal muscles.

[2 marks]

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14. Using your results, determine the rate at which carbon dioxide was produced for each flask.

(Hint: Change in amount of gas produced/change in time) [3 marks]

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15. Does the rate of carbon dioxide production indicate the rate of respiration occurring in the flask? Explain your answer. [2 marks]

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