**B6 - RESPIRATION**

**6.1 - Aerobic and anaerobic respiration**

**1. Define respiration**

The chemical reactions that break down nutrient molecules in living cells to release energy.

**2. State the uses of energy in the body of humans:**

* Muscle contraction;
* Protein synthesis;
* Cell division;
* Growth;
* The passage of nerve impulses;
* Maintenance of a constant body temperature.

**3. State the word equation for aerobic respiration.**

**5. State the symbol equation for aerobic respiration.**

Glucose + Oxygen Carbon dioxide + Water

C6H12O6  + 6O2 6CO2 + 6H2O

**4. Define aerobic respiration**

The release of a relatively large amount of energy in cells by the breakdown of food substances in the presence of oxygen.

**6. Define aerobic respiration**

The release of a relatively small amount of energy by the breakdown of food substances in the absence of oxygen.

**7. State the word equation for anaerobic respiration in muscles during hard exercise and in yeast.**

In muscles: Glucose Lactic acid

In microorganism yeast: Glucose Alcohol + Carbon dioxide

**8. Describe the effect of lactic acid in muscles during exercise (include oxygen debt - outline only)**

> When exercising vigorously, the blood cannot supply enough oxygen to the muscles for aerobic respiration

> Therefore the muscles respire anaerobically;

> Lactic acid builds up in the muscles and causes cramp;

> The liver breaks down lactic acid with oxygen;

> When you stop exercising, you go on breathing hard to get oxygen to break down the lactic acid;

> This is called an *oxygen debt* because during vigorous exercise you ‘borrowed’ some extra energy, without

‘paying’ for it with oxygen;

> When all the lactic acid has been broken down, your breathing rate & rate of heart beat return to normal.

**9. Describe the role of anaerobic respiration in yeast during brewing and bread-making.**

*Brewing*

* To make beer, yeast is dissolved in a warm liquid containing the sugar maltose;
* The yeast respires anaerobically by a process called fermentation;
* This process produces ethyl alcohol (ethanol) making the drink alcoholic;
* and carbon dioxide which makes the drink fizzy.

*Bread making*

* Yeast is mixed with water and sugar to activate it;
* The mixture is added to flour to make dough, and left in a warm place;
* The dough rises as the yeast respires and releases carbon dioxide, which gets trapped in the dough;
* When the dough is cooked, the high temperature kills the yeast and evaporates any alcohol formed;
* Air spaces are left where the carbon dioxide was trapped, which gives the bread a light texture.

**10. Compare aerobic respiration and anaerobic respiration in terms of relative amounts of energy released.**

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| *Aerobic respiration* | *Anaerobic respiration* |
| Uses oxygen | Does not use oxygen |
| No alcohol or lactic acid made | Alcohol (in yeast and plants) or lactic acid (in animals) is made |
| Large amount of energy released from each molecule of glucose | Much less energy released from each molecule of glucose |
| Carbon dioxide made | Carbon dioxide is made by yeast and plants, but not by animals |