**B4.4 Bioenergetics – Knowledge organiser**

|  |  |  |
| --- | --- | --- |
| **Topic 1 – Photosynthetic reaction** | | |
| 1 | **Photosynthesis**  **word equation** | http://www.revisescience.co.uk/main/archive/images/0911photosynthesisequation.gif |
| 2 | **Photosynthesis symbol equation** | light  6CO2 + 6H2O 🡪 C6H12O6 + 6O2  chlorophyll |
| 3 | **Photosynthesis** | **An ENDOTHERMIC reaction in which energy is transferred from the environment to the chloroplasts by light.** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic 2 – Rate of photosynthesis** | | | |
| 1 | **Rate of photosynthesis** | This is affected by temperature, light intensity, carbon dioxide concentration and the amount of chlorophyll. | |
| 2 | **Limiting factors** | Resources that limit the growth, abundance or distribution of an organism. | |
| 3 | **Limiting factor graphs** | **Light**  As the light intensity increases so does the rate of photosynthesis until the rate remains the same.  Picture  **B**  A: light intensity is the limiting factor  **A**  B: CO2 concentration & temperature are the limiting factors | **Carbon dioxide**  As the carbon dioxide concentration increases, so does the rate of photosynthesis, until the rate remains the same.  Picture  **B**  **A**  A: CO2 concentration is the limiting factor  B: light intensity & temperature are the limiting factors |
|  | **Picture**  **A** | **Temperature**  As the temperature increases, so does the rate of photosynthesis. It then reaches its optimum temperature, then the rate of photosynthesis decreases.  **High temperatures** change the shape of enzymes. If the temperature gets too high the enzyme will be **denatured**.  Temperature is the limiting factor. | |
| 4 | **Inverse proportion**  **Economics** | Light intensity obeys an **inverse square law**. This means that if you **double the distance** of the light source from the plant, you **quarter the intensity**.  Limiting factors are important in the economics of enhancing the conditions in greenhouses to gain the **maximum rate of photosynthesis** while still maintaining profit. | |

|  |  |  |
| --- | --- | --- |
| **Topic 3 – Uses of glucose from photosynthesis** | | |
| 1 | **Respiration** | Plants use glucose for **aerobic respiration**. |
| 2 | **Converted to starch** | Glucose gets converted to and stored as **insoluble starch**. |
| 3 | **Produce fats or oil** | Glucose is used to produce fat or oil for storage. |
| 4 | **Produce cellulose** | Glucose is used to produce **cellulose**, which **strengthens the cell wall**. |
| 5 | **Produce amino acids** | Glucose is used to produce **amino acids** for **protein synthesis**. Plants also use **nitrate ions** that are absorbed from the soil. |

|  |  |  |
| --- | --- | --- |
| **Topic 4 – Aerobic & anaerobic respiration** | | |
| 1 | **Respiration** | Can take place in cells either AEROBICALLY (with oxygen) or ANAEROBICALLY (without oxygen), to transfer energy. |
| 2 | **Aerobic respiration** | http://1.bp.blogspot.com/-KzvTKfYlcKI/Uz4hffj72RI/AAAAAAAADpo/nJ_r5e-13tE/s1600/Aerobic+respiration+equation.png |
| 3 | **Anaerobic respiration in muscles** | http://2.bp.blogspot.com/-L2dcPmn83f4/UhQ8BGltduI/AAAAAAAACWs/Pkhgbi2UJvs/s400/Anaerobic+respiration+in+muscles.png  As the oxidation of glucose is incomplete, much less energy is transferred for use. |
| 4 | **Anaerobic respiration (plants & micro-organisms)** | http://1.bp.blogspot.com/-i1w_t5p7X2k/UhQ8BLYcnoI/AAAAAAAACW0/L8PhsY7hKvc/s400/Anaerobic+respiration+in+yeast.png  In yeast cells this is called fermentation and has economic importance in the manufacturing of bread and alcoholic drinks. |

|  |  |  |
| --- | --- | --- |
| **Topic 5 – Response to exercise** | | |
| 1 | **Heart rate** | This increases pumping **MORE** blood around the body. |
| 2 | **Breathing rate** | This increases to take in **MORE** oxygen. |
| 3 | **Breath volume** | This increase to take in **MORE** oxygen in each breath. |
| These increase to supply the **muscles** with **MORE** oxygenated blood for respiration. | | |
| 4 | **Oxygen debt** | If insufficient oxygen is supplied to the muscles, anaerobic respiration takes place. The **incomplete oxidation** of glucose causes a build up of **lactic acid** and an **oxygen debt**. This is the amount of **extra oxygen** the body needs **after exercise** to **react with the lactic acid** and **remove it from the cells**. |
| 5 | **Lactic acid** | Produced during long periods of **vigorous** activity. It causes muscles to become **fatigued** and stops them contracting efficiently. |

|  |  |  |
| --- | --- | --- |
| **Topic 6 – Metabolism** | | |
| 1 | **Metabolism** | The sum of all the reactions in a cell or the body.  The energy transferred by the respiration in cells is used for the continual enzyme controlled processes that synthesise new molecules. |
| 2 | **Metabolism includes:** | **Conversion** of **glucose to starch**, **glycogen** and **cellulose** . The formation of **lipid** **molecules** from a molecule of **glycerol** and 3 molecules of **fatty acids**. The use of **glucose** and **nitrate** ions to form **amino acids** which in turn are used to synthesis **proteins, Respiration,**  **Breakdown** of excess **proteins** to form **urea** for excretion. |