**B4 Learning Journey**

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| 1 | **Photosynthesis** is an **Endothermic** reaction which takes place **chloroplasts in** plants.  **Carbon dioxide + Water ----Light--→ Glucose + Oxygen**  **Glucose** is used in five main ways:  For **respiration**  Making **cellulose**  Making **Amino Acids**  Stored as **fats/oils**  Stored as **Starch** |
| 2 | A **limiting factor** is a condition which slows down the rate of Photosynthesis.  There are three factors – the Limiting Factor is the one having **the biggest** **negative affect** on the rate of p/s.  **Temperature** – due to **Enzyme** action (same graph as seen in B2).  **Light** – **energy source** – slopes up and plateaus – factor is no longer limiting.  **Carbon Dioxide** – raw material – slopes up and plateaus. |
| 3 | The conditions for Photosynthesis can be investigated using **Starch testing** of leaves.  Leaves are taken from **variegated** plants that have been kept in light and dark. **Killed** by placing in boiling water.  **Decolourised** by boiling in **alcohol**.  **Iodine** is added – starch will turn Iodine from **brown to blue/black** indicating that photosynthesis has occurred. |
| 4  Required  Practical | **Rate of photosynthesis** can be measured by observing **oxygen** **production**/counting bubbles of Oxygen over a minutes.  **Independent** variable is the **distance** from the light.  **Control** variables – use LED bulb as less **heat emitted**, add Sodium Hydrogen Carbonate so **CO**2 is in excess, same pondweed and same **acclimatization** time.  **Rate p/s (s-1) = 1000/time**  **Light Intensity = 1/d2 (Inverse square)** |
| 5 | **Controlling** Photosynthesis is important as it means we can grow more food. We can **artificially** create conditions to maximise p/s without wasting money by considering the limiting factors in a **greenhouse**:  Mixture of glass trapping heat, **shading**, **ventilation** and heating to get appropriate **temperature**,  Burning of **paraffin** to generate **Carbon Dioxide**,  Use of **lighting** during the night. |
| 6 | **Aerobic respiration** is the **exothermic** chemical reaction by which we get energy from food by **oxidising glucose** completely and occurs in the **mitochondria** of cells.  **It IS NOT BREATHING**.  **Glucose + Oxygen → Carbon dioxide + Water (+Energy)**  **C6H12O6 6O2 → 6CO2 6H2O (2880 kj/mol)**  The energy transferred by respiration is used to:  Build **larger molecules** from smaller ones,  Allow **muscles** to **contract** (in animals),  Keep a **steady internal temperature** (birds + mammals). |
| 7 | **Anaerobic respiration** is the **incomplete** breakdown of glucose due to a lack of oxygen.  In **muscle** cells this produces **Lactic acid** and much less energy is transferred:  **Glucose → Lactic Acid**  **C6H1206 → 2C3H6O3**  In **plants** or **yeast** the breakdown is slightly more complete (transferring slightly more energy) forming **alcohol** – also called **fermentation**:  **Glucose → Ethanol + Carbon dioxide**  **C6H12O6 → 2C2H50H + 2CO2** |
| 8 | During **exercise** muscles **contrac**t more and so have an increased energy requirement so need to complete **more respiration**.  **To supply** the required **glucose** and **oxygen** and **remove waste** products the **pulse rate increases** and we **breathe more deeply** and more frequently.  If there is still **insufficient oxygen** cells switch to **anaerobic respiration** which produces **Lactic acid** which can damage cells causing **fatigue**.  After exercise pulse and breathing rate remain high to **repay the oxygen debt** – getting oxygen to the cells to convert **lactic acids** into **carbon** **dioxide and water**. The quicker this happens the fitter a person is. |
| 9 | **Metabolism** is **the sum of all the chemical reactions** in the body which are completed by enzymes.  **Catabolic** reactions **break down** molecules; respiration and excess protein being broken down into urea.  **Anabolic reactions** are **building** reaction; glucose to starch, amino acids to proteins, glucose to cellulose, glycerol and 3 fatty acids to lipids ad nitrates and glucose to make amino acids. |