Name: Ernest Fong

Class: 5G

Class number: 3

Individual investigation proposal

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| **Research topic:**  How does varying temperature affect the rate of reaction of catalase and decomposition of hydrogen peroxide measured by volume of oxygen gas produced, and determining the activation energy of catalase (potato). |
| **Reason for choice of research topic:**   * Catalase is a very important enzyme that is pervasive in all tissues of eukaryotes * It is responsible for the protection of biomolecules (eg. proteins and DNA) * Anti-oxidant properties are important in preventing long term damage and inflammation of tissues * Catalase is also a very important enzyme in industry as it prevents the oxidation of products such as cheese when applied to the wrapping material * Therefore it is essential that the temperature by which the optimal rate occurs is found, in addition to the activation energy |
| **Independent variable:** temperature 10,20,30,40,50C  **Dependent variable:** Volume of oxygen gas produced measured by gas syringe  **Controlled variables:** Concentration of hydrogen peroxide, concentration of catalase, volume of the reaction solution, Source of catalase (different catalase may have different reaction rates), same gas syringe used |
| Proposed methodology:   1. Preparation of potato tissue    1. Obtain 1.25kg of potato tissue without the skin    2. Use a blender to turn the tissue into a paste like mixture to increase surface area and to ensure that the surface area is even    3. Pour into a beaker and cover with cling film 2. Experimental method    1. Measure out 50g of blended potato tissue and place into a conical flask    2. Measure out 100cm3 of 3% hydrogen peroxide using a measuring cylinder    3. Place the blended potato tissue and the hydrogen peroxide solutions into a water bath at 10C    4. Ensure that the correct temperature is reached, using a thermometer    5. Mix the hydrogen peroxide into the blended potato tissue    6. Immediately secure the gas syringe with the rubber stopper on the conical flask, the gas syringe is secured with a clamp stand    7. Allow the reaction to occur over 1 minute, and measure the    8. Repeat steps 2a-2f for the temperatures of 20,30,40,50    9. Repeat steps 2a-2h for 5 trials |
| Apparatus and equipment: (Please specify the size and quantity)  Blender x 1  Rubber stopper x 5  Gas syringe x 1  Clamp stand x  1  Electronic balance x 1  250 mL measuring cylinder x 1  Thermometer x 1  Water bath x 1  125 mL Conical flask x 5 |
| Chemicals (Please specify the mass / concentration and volume…etc)  500 cm3 3% hydrogen peroxide |
| References found:  <https://www.york.ac.uk/chemistry/schools/chemrev/projects/peroxide/> |