**ANSWERS: Fermentation**

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| **2018** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | Cracking is a chemical process where the bonds in the larger hexane are broken so that smaller hydrocarbons are produced such as ethene and butane. High temperatures, or catalysts, are needed to break the covalent bonds between the C atoms.    Fermentation of glucose will produce ethanol. Enzymes in yeast turn the glucose into ethanol and carbon dioxide. The enzymes in the yeast are required to act as a catalyst for the reaction, which occurs in warm, anaerobic conditions. | • Describes what cracking is.  OR  Glucose converted into  ethanol. | • Describes the process and links to the conditions required for either process. | • Both processes described, and conditions explained.  AND  Both equations correctly balanced. |

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| **2016** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | Methanol is made from methane in a two (or three) step process.  The first reaction is done at high temperatures (over 800oC) using a nickel catalyst, while the last reaction is done using a Cu-Zn / Cu / Pt catalyst.  ass90932q2d  OR  CH4 + H2O → CO + 3H2 (Ni catalyst)  CO + H2O → CO2 + H2  2H2 + CO → CH3OH (Cu-Zn, Cu, or Pt catalyst)  OR  2CH4 + 3H2O → CO + CO2 + 7H2 (Ni catalyst)  CO + 2H2 → CH3OH (Cu-Zn, Cu, or Pt catalyst)  CO2 + 3H2 → CH3OH + H2O (Cu-Zn, Cu, or Pt catalyst)  Ethanol is made by a process of fermentation, which involves the conversion of a solution of sugar molecules (in water) into ethanol and carbon dioxide in warm, anaerobic conditions using yeast as a catalyst. Yeast is a living organism and requires warmth and moisture to carry out fermentation. Yeast metabolises / converts the sugars into alcohol when there is a lack of oxygen.  C6H12O6 → 2C2H5OH + 2CO2  How do they differ?  The production of ethanol is a one-step process, whereas the production of methanol involves more than one step.  They both involve the use of catalysts, but to produce ethanol it is yeast, a living organism. To produce methanol, a metal (non-living) catalysts is used.  The production of methanol requires high temperatures, but for ethanol it requires warm and anaerobic conditions. | * States heat and Ni and Cu-Zn   OR  yeast and anaerobic / warmth.   * Describes methane converted into methanol   OR  glucose converted into ethanol. | * Explains the conditions required for either process, i.e. both achieved points (yeast and anaerobic, and warmth). * Correct equations for either fermentation or industrial production, but no or incorrect balancing. | * Both processes explained correctly including conditions with 1 statement of difference. * Correctly balanced equations for the production of methanol.      * Correctly balanced equation for the production of ethanol. |

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| **2015** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | Glucose → ethanol + carbon dioxide  C6H12O6 → 2C2H5OH + 2CO2  Fermentation involves the conversion of a solution of sugar molecules (in water) into ethanol and carbon dioxide in warm, anaerobic conditions using yeast as a catalyst. Yeast is a living organism and requires warmth (and moisture) to carry out fermentation. Yeast metabolises / converts the sugars to alcohol when there is a lack of oxygen / via anaerobic respiration. | * Completes word equation.   • States two conditions of fermentation (warm, anaerobic, moisture, yeast catalyst). | * Completes symbol equation (unbalanced).   • Links one condition to the fermentation process. | * Balanced symbol equation for fermentation.   • Explains the fermentation process, including linking yeast to the conditions and products formed. |

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