Question 30 (8 marks)

(a) Compare the process of polymerisation of ethylene and glucose. Include relevant chemical equations in your answer. **3**

In the polymerisation of ethylene, its monomers add together to form polyethylene without the loss of any atoms:

$[C_2H_4 + C_2H_4]_n \longrightarrow \{C_2H_4 - C_2H_4\}_n$

In the polymerisation of glucose, its monomers add together to form cellulose, losing atoms as they form water molecules and are eliminated from the final product:

$[C_6H_{12}O_6 + C_6H_{12}O_6] \longrightarrow \{C_6H_{10}O_4 - O - C_6H_{10}O_4 - O\}_n + 2H_2O(l)$

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$[C_6H_{12}O_6 + C_6H_{12}O_6]_n \longrightarrow \{C_6H_{10}O_4 - O - C_6H_{10}O_4 - O\}_n + 2H_2O$

Question 30 (continued)

(b) Explain the relationship between the structures and properties of THREE different polymers from ethylene and glucose, and their uses. 5

Low Density Polyethylene has much chain branching, where methyl groups replace hydrogens on the polymer chain, giving it a soft, malleable properties as chains cannot pack tightly together. Polyvinylchloride has much chain stiffening due to the chlorine atoms attached to each of its monomers, giving it a more rigid, harder properties. Polystyrene, similarly has chain stiffening, but also lacks the chain branching of low density polyethylene, making its chains pack together densely to give a brittle polymer, and giving it transparent qualities, unlike the other polymers.

End of Question 30