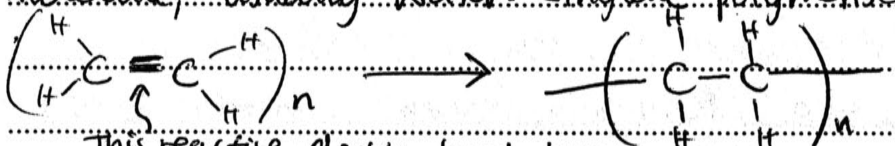
Question 30 (8 marks)

(a) $\boxed{\text{Compare}}$ the process of polymerisation of ethylene and glucose. Include relevant chemical equations in your answer. **3**

Ethylene undergoes addition polymerisation, while glucose undergoes condensation polymerisation. ~~Wh~~ Both reactions involve the combining of monomers, but condensation polymerisation expells a small molecule, usually water. Ethylene polymerises accordingly:



This reactive double bond breaks

ethylene polyethylene

Glucose polymerises to form complex sugars such as starch.

Question 30 continues on page 22

Question 30 (continued)

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

1. Low Density Polyethylene: Weak dispersion forces exist in the branched chains of LDPE. Therefore melting and boiling points are quite low. Branching side chains does not allow close compaction; Thus LDPE is soft, flexible and malleable, often used for clingwrap + plastic bags.

2. Poly Vinyl Chloride: The chloride atom is very heavy. Since dispersion forces increase with molecular weight, dispersion forces are much greater and harder to overcome. Thus, melting point and boiling point are higher. Also, this results in a much harder and brittle plastic, often used in pipes and guttering.

3. Poly Lactic Acid: Made from starches converted to PLA by bacteria: Lactobacillus. Since the structure is made from organic compounds, PLA is biodegradable. (so) It can be placed in a living organism in surgery and not require removal, since it can naturally break down.

End of Question 30

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