Question 30 (8 marks)

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

Ethylene...undergoes...addition...polymerisation...while glucose...undergoes...condensation...polymerisation.

While both reactions involve...the combining...of...monomers,

but...condensation...polymerisation...expels...a...small

molecule,...usually...water...Ethylene...polymerises...accordingly:

\[
\text{H}2\text{C} = \text{CH} \quad \text{H}\text{H}
\]

\[
\text{H}2\text{C} = \text{H} \quad \text{H}\text{H}n
\]

This reactive double bond breaks...polyethylene...

Ethylene...polymerises...to...form...complex...sugars...such...as...starch.

Glucose...polymerises...to...form...complex...sugars...such...as...starch.

Question 30 continues on page 22
(b) Explain the relationship between the structures and properties of THREE different polymers from ethylene and glucose, and their uses.

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 do not allow close compaction; thus, LDPE is soft, flexible, and malleable, often used for cling wrap and plastic bags.

2. **Polyvinyl chloride**: The chlorine 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 gutters.

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

End of Question 30