Polyesters: build the condensation link

Student activity • observation and reasoning

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The question

How do two functional groups extend a chain?

Model a diol reacting with a dicarboxylic acid, identify water loss and draw the polyester repeat unit. Keep both carbonyl oxygens visible.

Equipment

• Booklet, pencil, periodic table and optional molecular model kit

Desk activity only; keep small model pieces away from mouths.

Course coverage: Chemistry only: 4.48C–4.49C. Ethanediol and ethanedioic acid model; no chemical synthesis.

Plan, model or apparatus sketch

Draw a labelled structure or model to explain your reasoning for this lesson.

Method and reasoning

Read the whole sequence before starting

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1. Draw HO–CH_2–CH_2–OH and HO–C(=O)–C(=O)–OH.

2. Mark an acid –OH and alcohol H that combine as water when an ester link forms.

3. Join alternating acid/diol residues through –C(=O)–O– links and leave reactive groups at chain ends.

4. Draw the repeat unit [–O–CH_2–CH_2–O–C(=O)–C(=O)–]$_n$ with continuation bonds.

5. Reverse the unit to recover both monomers and restore their –OH groups.

6. Compare condensation with addition polymerisation; count water for a finite open chain separately from repeat-unit shorthand.

Cleanup

- Return shared equipment and retain corrected reasoning.

Record your evidence

Blank spaces are for your own work

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Reference and task data

For one linear unbranched chain made by joining n diol molecules and n diacid molecules with acid/alcohol ends, there are 2n−1 links and water molecules. Repeat-unit shorthand commonly uses a large-n simplification; it is not a full end-group balance. No oxalic acid or ethanediol is issued.

Task	My structure / working	Reason / correction
Monomer structures		
Repeat unit		
Water / comparison		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Why must the monomers be bifunctional?

2. Identify the two monomers.

3. Name the linkage.

4. What small molecule is eliminated?

5. How many waters form from two diols plus two diacids in one open chain?

6. How does this differ from addition polymerisation?