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Condensation polymerisation is another type of reaction whereby a polymer is produced by repeated condensation reactions between monomers. Natural condensation polymers are all formed by elimination of water, although the process involves the elimination of a small molecule. Condensation polymers can be identified because the monomers are linked by ester or amide bonds. These polymers can be formed by various methods such as dicarboxylic acids and diols, dicarboxylic acids and diamines, amino acids. **###ARTICLE**Condensation polymers are formed through a process called condensation, where small atoms are lost from large monomers to create a long chain of monomers. This process results in the formation of water molecules as byproducts. The most important classes of condensation polymers include polyamides, such as nylon 6,6, and kevlar. Condensation polymers are an important class of materials that arise from the condensation reaction between carboxylic acid and alcohol groups. For example, polyethylene terephthalate (PET) is one of the most widely used condensation polymers, commonly abbreviated as PET or PETE, and is seen in various applications in our daily lives. **###ARTICLE**Condensation polymerisation is a process where monomers bond together to form a large molecule, releasing a water molecule in the process. this type of polymerization is common in nature and can be used to create various materials such as polyamides and polyesters. You can form another ester link when another alcohol molecule approaches the right-hand side, and so on. We're building a polymer chain using two monomers here, with the repeat unit containing both of them. Be careful while drawing this, making sure to include all necessary atoms or groups in the repeat unit without any extra bits from the next one. The actual repeat unit may vary depending on where you start drawing it, but what matters is that you include everything needed for repetition, minus anything else. This process is called condensation polymerisation because, during each ester link creation, a water molecule is lost. This differs from addition polymerisation, which joins molecules without losing any part. Looking at an example, the diol typically used in this reaction has two OH groups, usually found in ethane-1,2-diol: HOCH<sub>2</sub>CH<sub>2</sub>OH. Molecules with multiple hydroxyl (-OH) groups are called diols. Another common molecule is benzene-1,4-dicarboxylic acid (terephthalic acid), which contains two COOH groups. The benzene ring's structure can be complex to explain at this level; it has six carbon atoms in a ring with one other atom or group attached to each carbon atom. For the block diagram we've built up, you can replace the pale grey box with CH<sub>2</sub>CH<sub>2</sub> and the dark grey box with the benzene ring. The repeat unit is very common and known as polyester (when used in clothing) or PET (for making drink bottles). In some cases, it's also referred to by the brand name Terylene. When working with polyesters, it's essential to look at past exam papers and mark schemes to understand what questions your examiners will ask. You might be given the formula for the diacid and diol needed, so you'll substitute the required bits into the general block diagram for the repeat unit. In most cases, the diol will be HOCH<sub>2</sub>CH<sub>2</sub>OH, replacing the pale grey box with CH<sub>2</sub>CH<sub>2</sub>. However, if your formula requires a different diol, like HOOCCH<sub>2</sub>COOH (ethanedioic acid), you'll leave nothing between the COOH groups. The repeat unit would then look like this: To accelerate reactions in the lab, we substitute acid with acyl chloride, which replaces the OH group in COOH with chlorine to form COCl, significantly increasing reactivity compared to carboxylic acids. The example illustrates making nylon-6,10 through a simple demonstration, utilizing ClOCC<sub>2</sub>H<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>COCl and H<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>. With 10 carbon atoms in the acyl chloride, this reaction focuses on the small molecule loss of HCl rather than water.

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