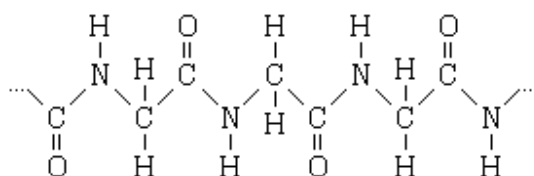


## Exercise 9.46 – Natural macromolecules

**Q946-01** Proteins are macromolecules in which the simplest repeating structural units are

- A. nucleic acids
- B. amino acids
- C. purines
- D. carbohydrates

**Q946-02** Proteins are a class of poly molecules called polypeptides, a simple example of which is represented by the structural formula:



The linkages that hold the repeating units (monomers) together in these polymers are called

- A. amine linkages
- B. carboxylic acid linkages
- C. amide linkages
- D. nucleic acid linkages

**Q946-03** Starting with three different kinds of amino acids, how many different kinds of tripeptide molecules can be made, assuming each amino acid can be used more than once in a molecule if desired?

- A. 3
- B. 6
- C. 9
- D. 27

**Q946-04** Amino acids are neutral molecules if there are as many amine groups as carboxylic acid groups. They do, however react differently with acids and bases. What is the product when 2-aminoethanoic acid reacts with sodium hydroxide.

**Q946-05** What is the product when 2-aminoethanoic acid reacts with hydrochloric acid?

**Q946-06** Proteins may be produced by condensation polymerisation of monomers. Which monomers are used in this reaction?

- A. Esters
- B. Carboxylic acids
- C. Amino acids
- D. Alkenes

**Q946-07** The acid and base groups in amino acids can react with one another to form double ion salts called zwitterions (from the German 'zwei' meaning two). What is the formula of the zwitterion formed by 2-aminoethanoic acid?

## Exercise 9.46 – Natural macromolecules

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**Q946-08** What effect would warming a protein with dilute hydrochloric acid have on the structure?

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**Q946-09** What is the structure of the dimer formed by condensing two molecules of 2-aminoethanoic acid.

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**Q946-10** 2-aminoethanoic acid also has optical isomers. Explain why this is the case.

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