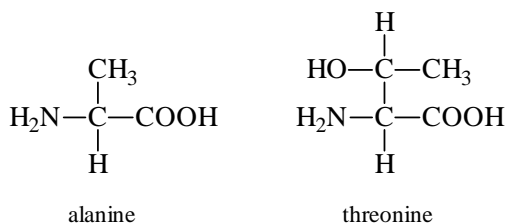


Chapter 25

Biochemistry

Concept Check 25.1

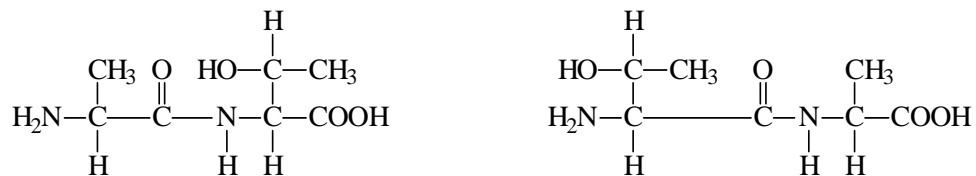
Two common amino acids are



Write the structural formulas of all of the dipeptides that they could form with each other.

Solution

The carboxyl group, —COOH, of either of the amino acids could be bonded through a peptide bond to the amino group, —NH₂, of the other. The structures of these two dipeptides are:



Concept Check 25.2

Noting the three complementary base pairs and which bases are found in DNA or RNA, write the RNA sequence complementary to the following sequence:

ATGCTACGGATTCAA

Solution

In RNA, the bases are adenine (A), guanine (G), cytosine (C), and uracil (U), but not thymine (T). The complementary bases are A and T, A and U, and G and C. So, A in DNA would have U as a complement in RNA; T in DNA would have A in RNA as a complement; G in DNA would have C in RNA as a complement; and C in DNA would have G in RNA as a complement. Here, then, is the RNA sequence complementary to the DNA sequence given in the problem statement:

UACGAUGCCUAAGUU

Conceptual Problem 25.17

It is your job to manufacture polymers from a series of monomer units. These monomer units are called A, B, and C. In this problem you need to “build” polymers by linking the monomer units. Represent the polymer linkages using dashes. For example, -A-B-C- represents a polymer unit made from linking monomer units A, B, and C.

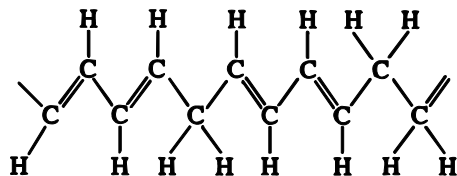
- Build two different homopolymers from your monomer units.
- Build a copolymer from A and B.
- Build a copolymer that is about 33% C and about 66% A.

Solution

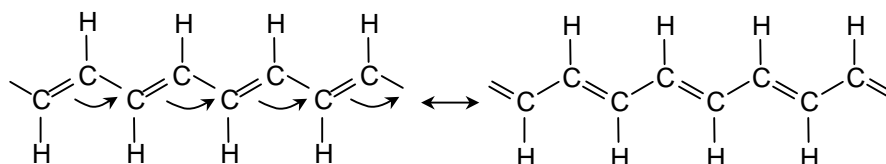
- Since a homopolymer consists of the same monomer units linked together, examples are -A-A-, -B-B-, or -C-C-.
- Since a copolymer contains different monomer units linked together, examples include -A-B-, -B-C-.
- A ratio of 1 C unit to every 2 A units would produce the desired copolymer: -A-C-A-.

Conceptual Problem 25.18

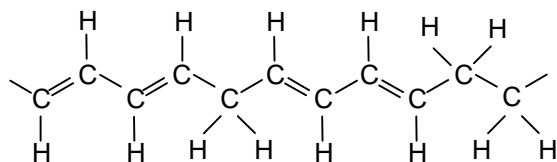
Use resonance formulas to explain why polyacetylene has delocalized molecular orbitals extending over the length of the molecule, whereas the following molecule does not.

**Solution**

Polyacetylene has delocalized molecular orbitals extending over the length of the molecule because double bonds alternate with single bonds over the length of the molecule. Each carbon atom in the chain has one single bond and one double bond to an adjacent carbon atom. The resonance structures are

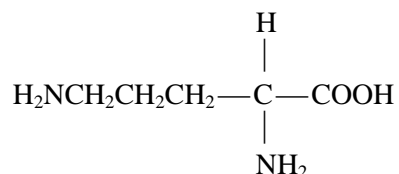


For the molecule in the problem, the pattern of double bonds and single bonds does not alternate regularly over the entire length of the molecule. Some of the carbon atoms do not have a double bond, and there is no delocalization of electrons in these regions.



Conceptual Problem 25.19

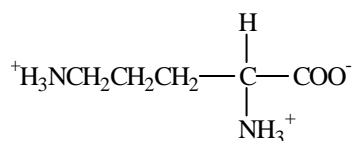
A common amino acid in the body is ornithine. It is involved in the excretion of excess nitrogen into the urine. The structural formula of ornithine is



Write the fully ionized form of the molecule. (Note that there are two ionizable amino groups.)

Solution

The fully ionized form of ornithine is

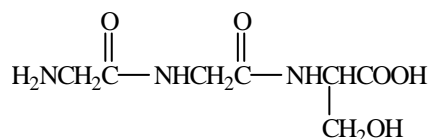


Conceptual Problem 25.20

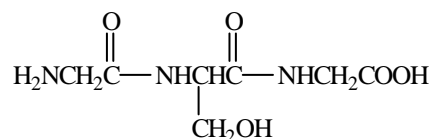
Write the structural formulas of all possible tripeptides with the composition of two glycines and one serine. (See the structural formulas in Table 25.2.)

Solution

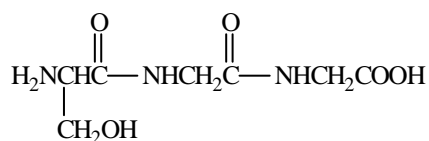
The possible tripeptides with two glycines and one serine are gly-gly-ser, gly-ser-gly, and ser-gly-gly. Here are the corresponding structural formulas:



gly-gly-ser



gly-ser-gly



ser-gly-gly

Conceptual Problem 25.21

What amino-acid sequence would result if the following messenger RNA sequence were translated from left to right?

AGAGUCCGAGACUUGACGUGA

Solution

Mark off the message into triplets, beginning at the left. Then, refer to Table 25.3 to determine which amino acid is represented by each triplet.

AGA | GUC | CGA | GAC | UUG | ACG | UGA

The corresponding amino-acid sequence is Arg-Val-Arg-Asp-Leu-Thr. The triplet UGA is the code to end the sequence.

Conceptual Problem 25.22

Give one of the nucleotide sequences that would translate to the peptide
lys-pro-ala-phe-trp-glu-his-gly.

Solution

Refer to Table 25.3 for the sequences that translate to the different amino-acids.

lys-pro-ala-phe-trp-glu-his-gly

One possible nucleotide sequence is AAA CCU GCU UUU UGG GAA CAU GGU UAA.

The triplet UAA indicates the end of the sequence.