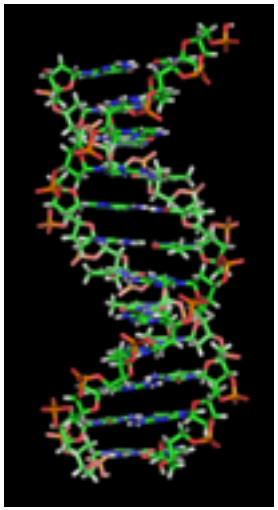


Proteins
CHEM112

Week 8

Dr J Carran

Lab 7

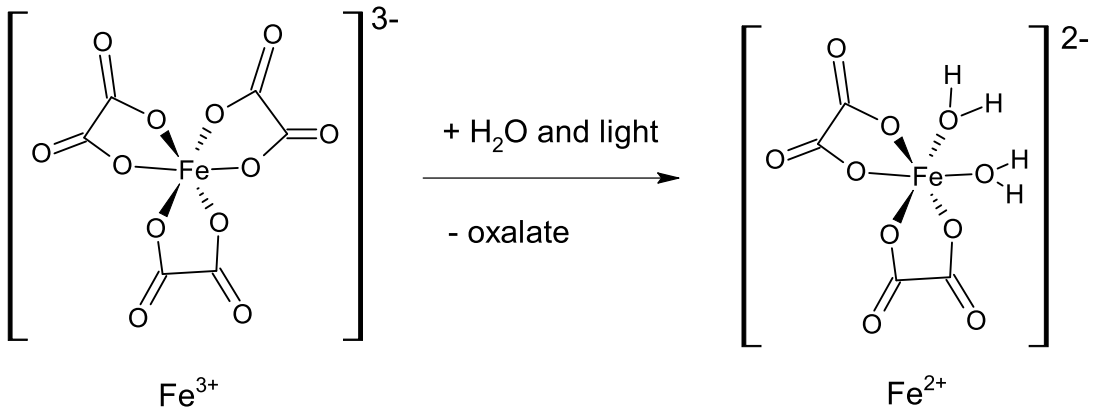
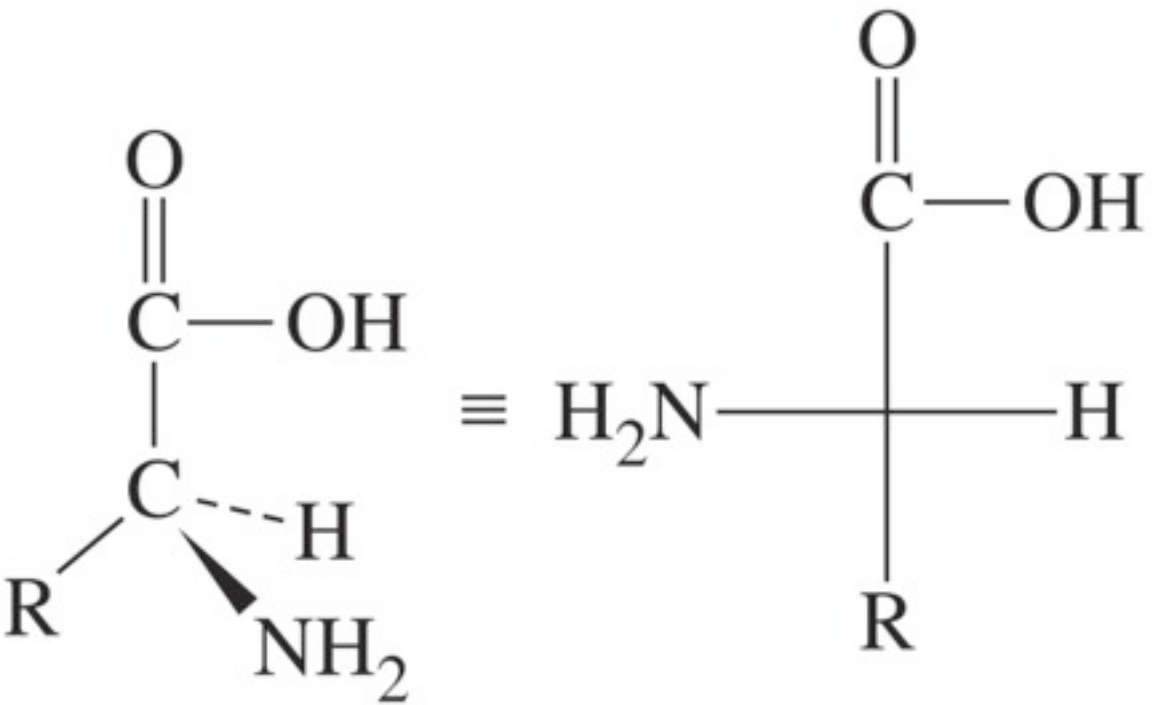


Figure 32: Reduction of tris(oxalato)ferrate(III) (aka ferrioxalate) to diaquabis(oxalate)ferrate(II) ion.

Purpose

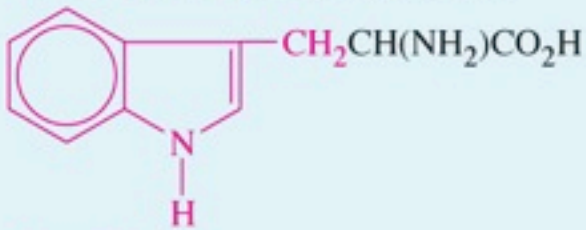
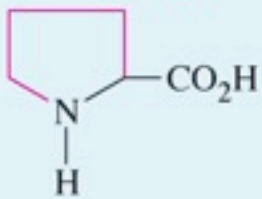
You will prepare and examine the properties of photosensitive solutions (i.e. sensitivity to light and heat). You will gain experience with chemicals that are sensitive to handling and determine its properties by spectrophotometry.

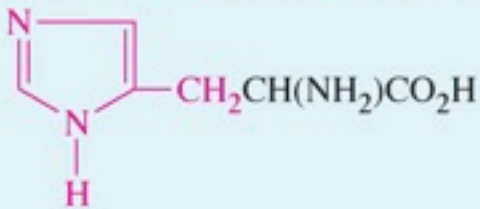
28-4 Proteins



An L-amino acid

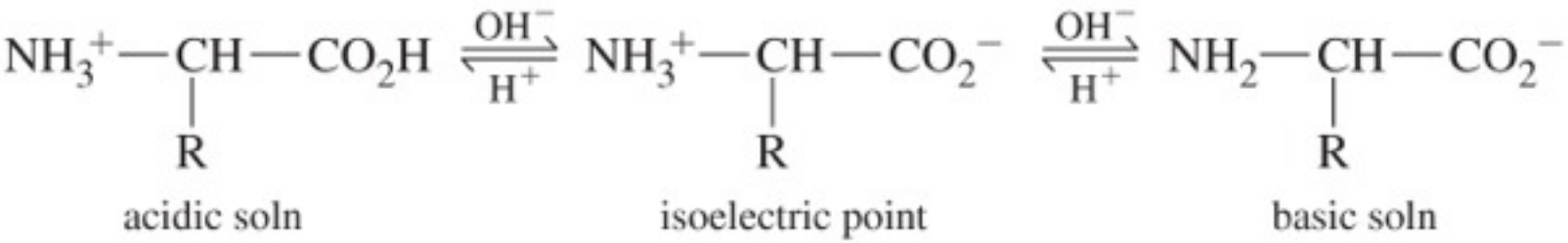
TABLE 28.3 Some Common Amino Acids

Name	Symbol	Formula	p*I*[a]
Neutral Amino Acids			
Glycine	Gly	$HCH(NH_2)CO_2H$	6.03
Alanine	Ala	$CH_3CH(NH_2)CO_2H$	6.10
Valine[b]	Val	$(CH_3)_2CHCH(NH_2)CO_2H$	6.04
Leucine[b]	Leu	$(CH_3)_2CHCH_2CH(NH_2)CO_2H$	6.04
Isoleucine[b]	Ileu or Ile	$CH_3CH_2CH(CH_3)CH(NH_2)CO_2H$	6.04
Serine	Ser	$HOCH_2CH(NH_2)CO_2H$	5.70
Threonine[b]	Thr	$CH_3CH(OH)CH(NH_2)CO_2H$	5.6
Phenylalanine[b]	Phe	$C_6H_5CH_2CH(NH_2)CO_2H$	5.74
Methionine[b]	Met	$CH_3SCH_2CH_2CH(NH_2)CO_2H$	5.71
Cysteine	Cys	$HSCH_2CH(NH_2)CO_2H$	5.05
Cystine	$(Cys)_2$	$[SCH_2CH(NH_2)CO_2H]_2$	5.1
Tyrosine	Tyr	$4\text{-}HOC_6H_4CH_2CH(NH_2)CO_2H$	5.70
Tryptophan[b]	Trp		5.89
Proline[c]	Pro		6.21

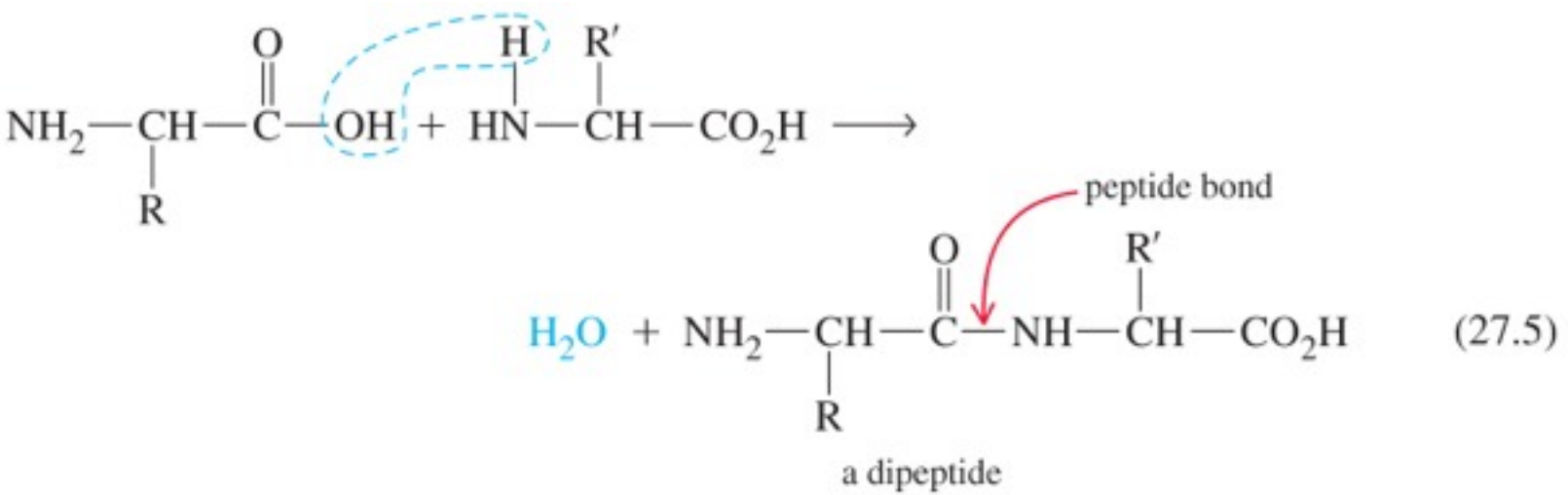
Acidic Amino Acids			
Aspartic acid	Asp	$HO_2CCH_2CH(NH_2)CO_2H$	2.96
Glutamic acid	Glu	$HO_2CCH_2CH_2CH(NH_2)CO_2H$	3.22
Basic Amino Acids			
Lysine[b]	Lys	$H_2N(CH_2)_4CH(NH_2)CO_2H$	9.74
Arginine	Arg	$H_2NC(=NH)NH(CH_2)_3CH(NH_2)CO_2H$	10.73
Histidine	His		7.58

[a]pH of *isoelectric point*.
[b]Essential amino acids. In addition, arginine and glycine are required by the chick, arginine by the rat, and histidine by human infants.
[c]The secondary amino group makes proline an *α-imino* acid. Nevertheless, it is commonly listed with amino acids.

Zwitterion


NH3+—CH(R)—CO2H
OH−
H+
NH3+—CH(R)—CO2−
OH−
H+
NH2—CH(R)—CO2−
acidic soln
isoelectric point
basic soln

Peptides



(27.5)

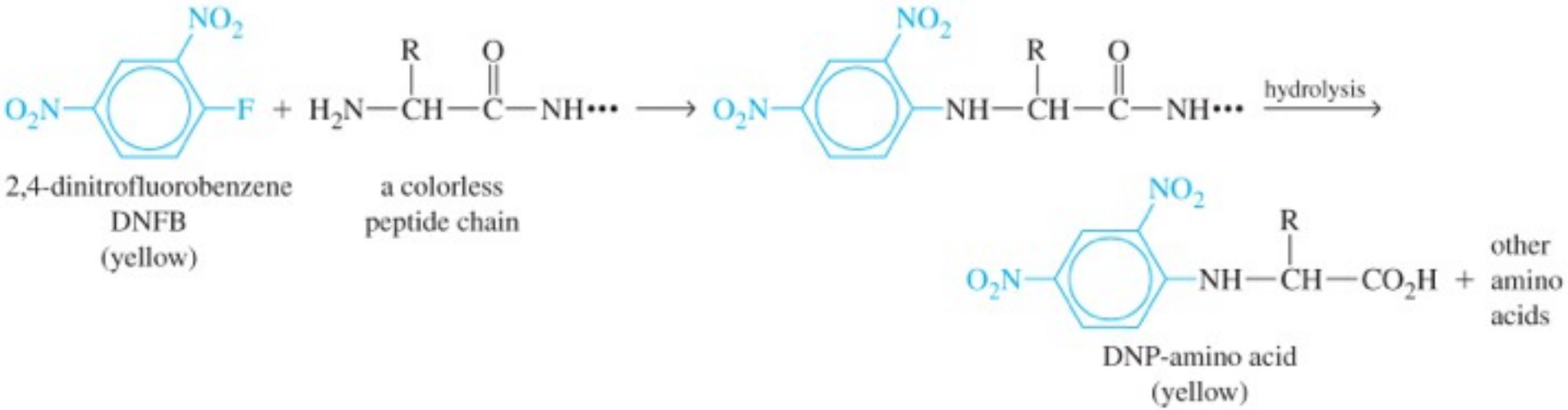


FIGURE 28-10

Experimental determination of amino acid sequence

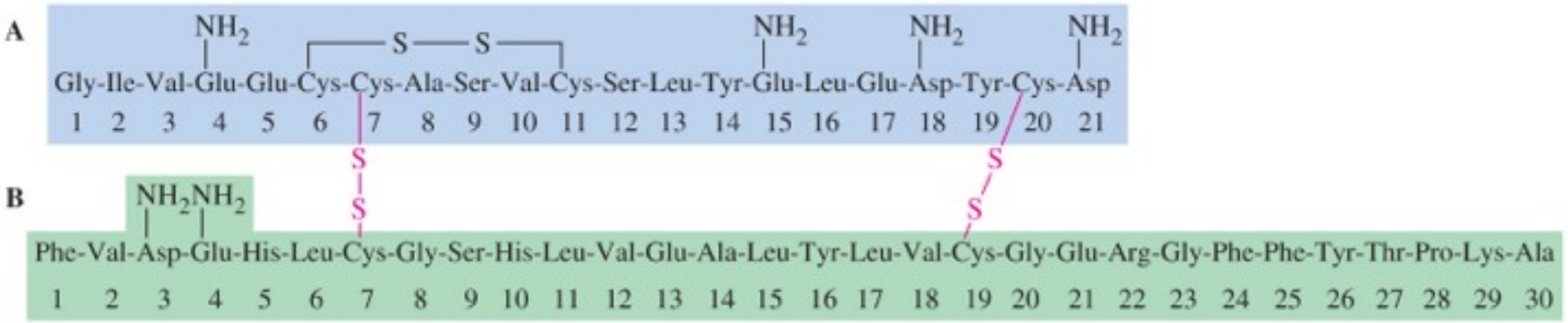
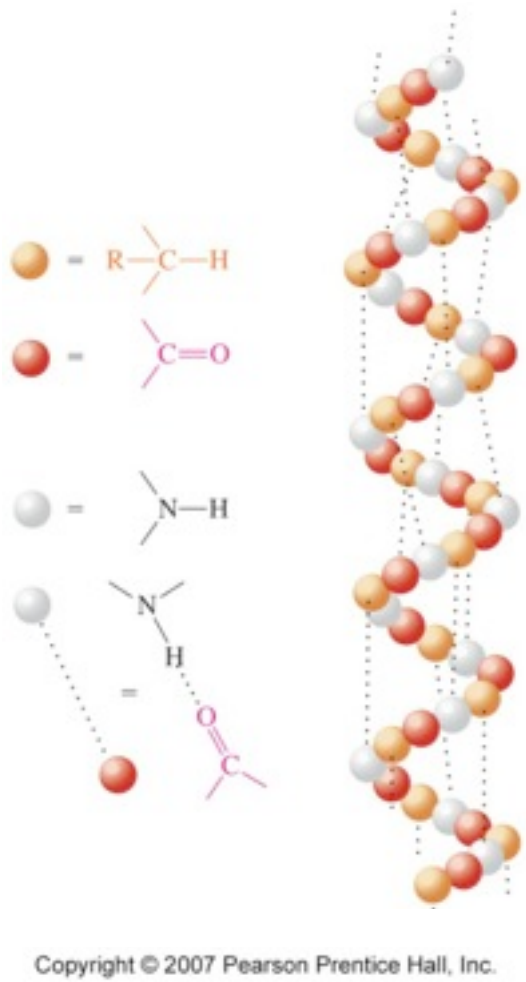


FIGURE 21-11

Amino acid sequence in beef insulin – primary structure

The Structure of Proteins



▲ FIGURE 28-12

•**Secondary structure of a protein – an α helix**

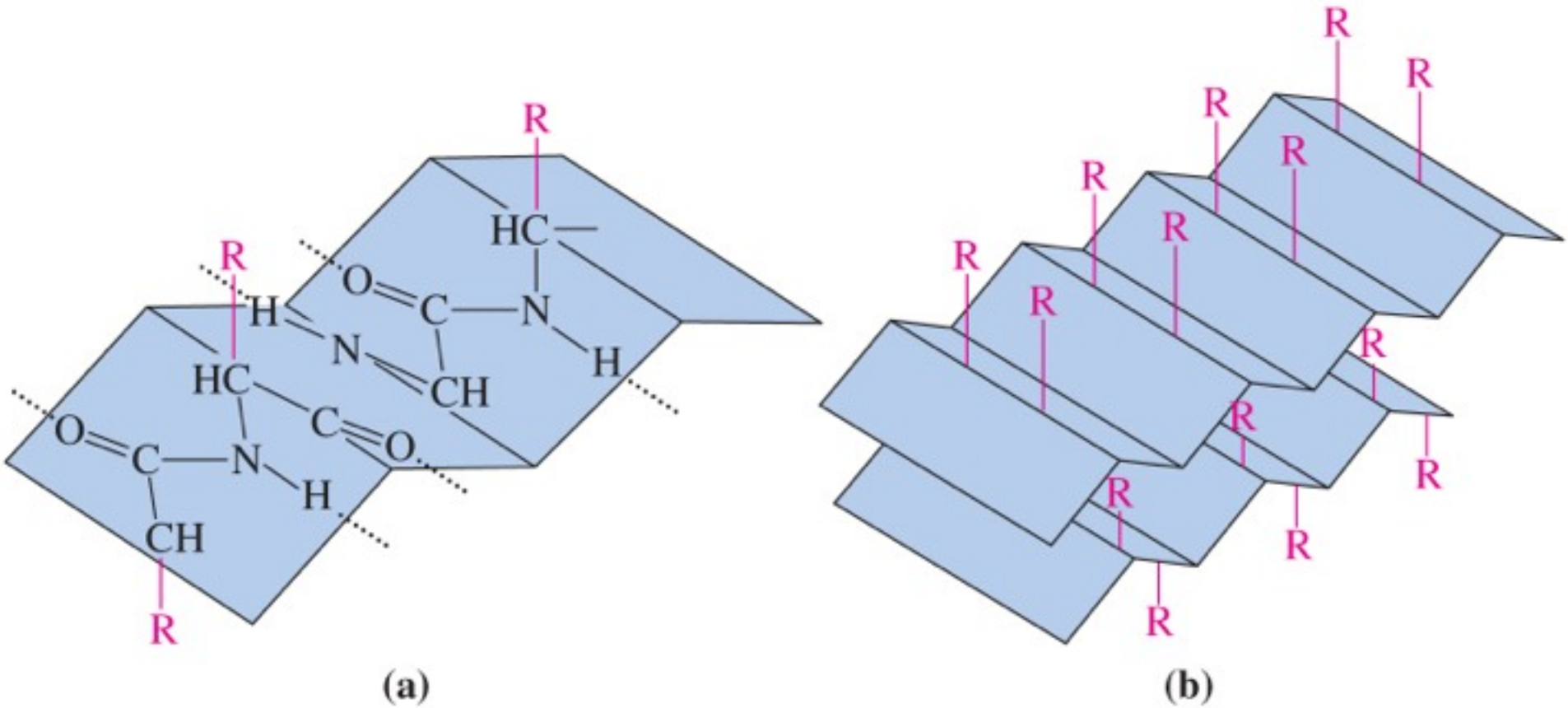


FIGURE 28-13

Pleated-sheet model of β-keratin

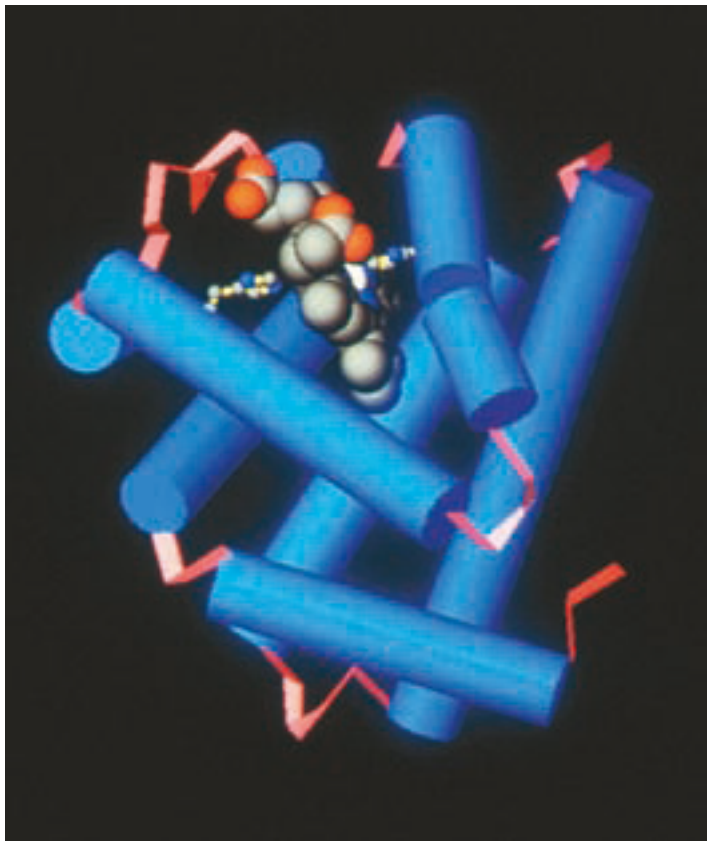


FIGURE 28-14

Representation of the tertiary structure of myoglobin

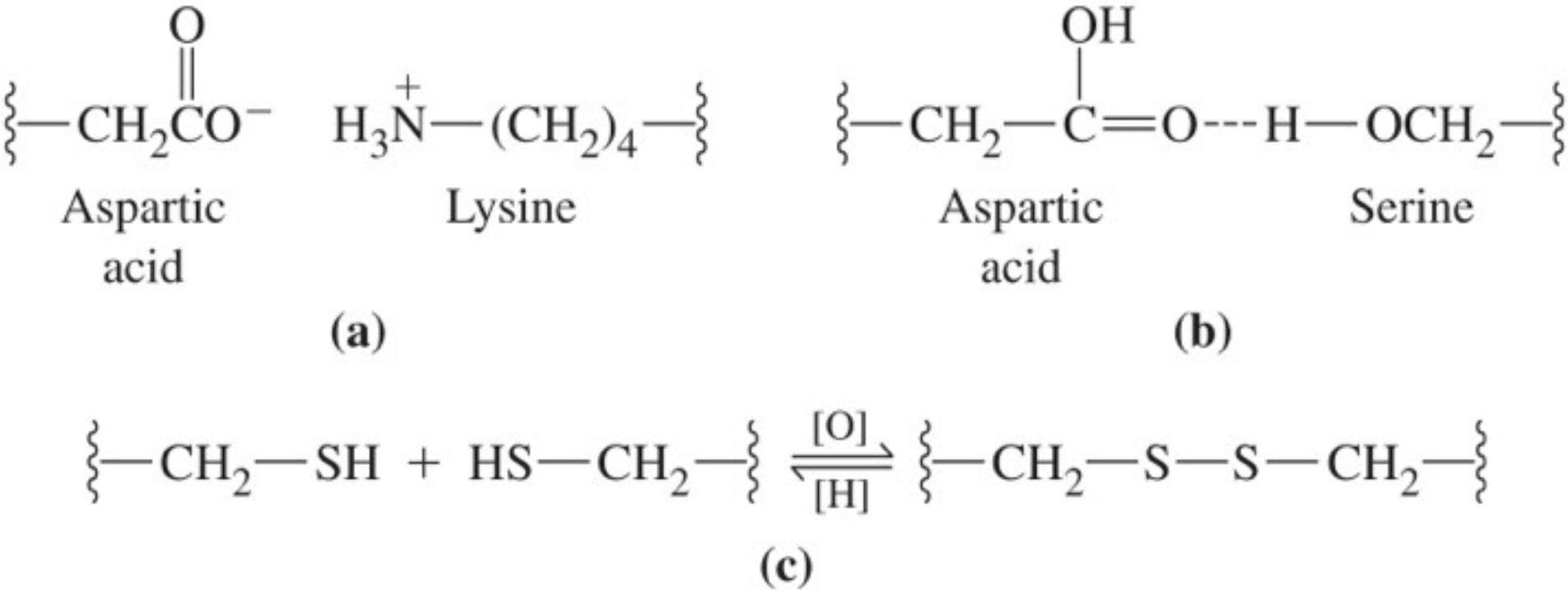


FIGURE 28-15

Linkages contributing to tertiary structure of proteins

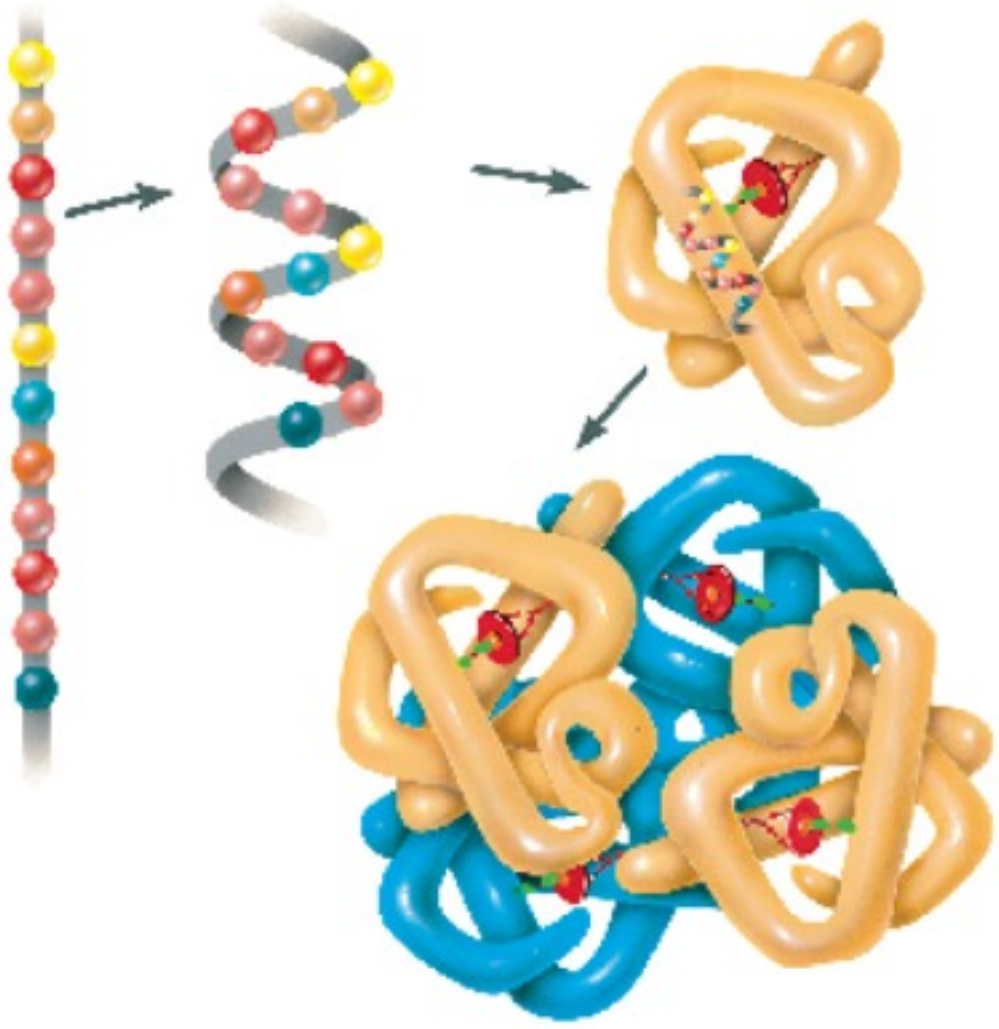
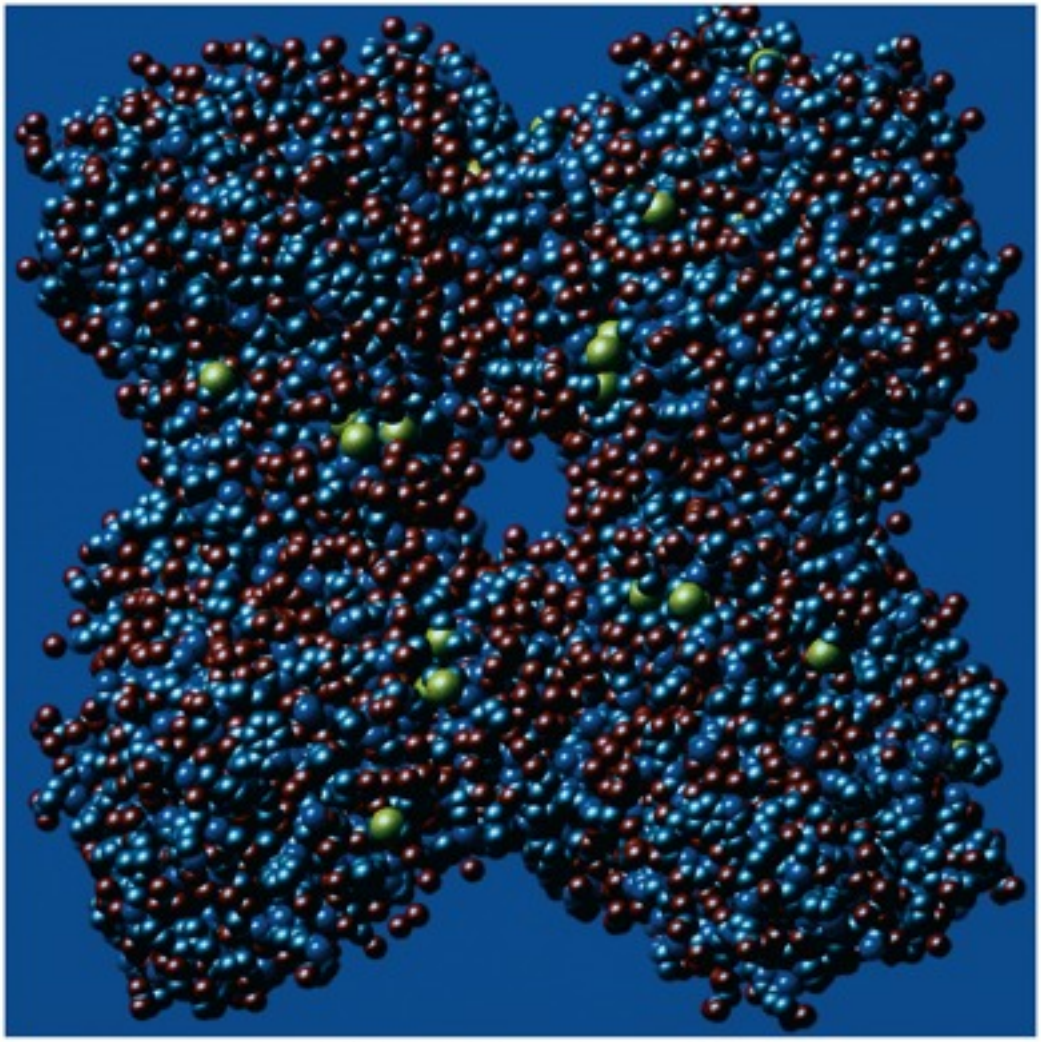


FIGURE 28-16

The four levels of protein structure



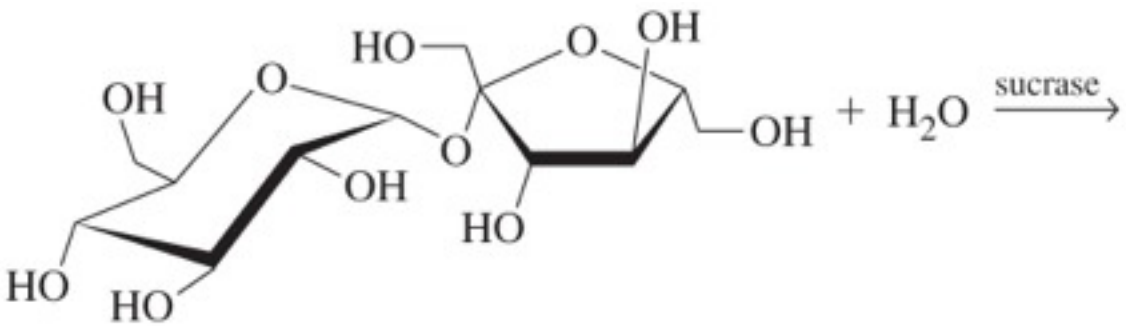
▲ A computer image of the three dimensional structure of ribulose-1,5-biphosphate carboxylase-oxygenase (RuBisCo)

Enzymes

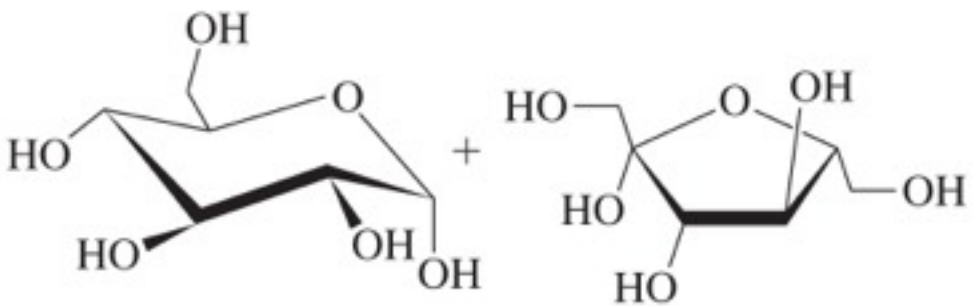
$$E + S \rightleftharpoons ES \rightarrow E + P$$

Enzymes

$$E + S \rightleftharpoons ES \rightarrow E + P$$

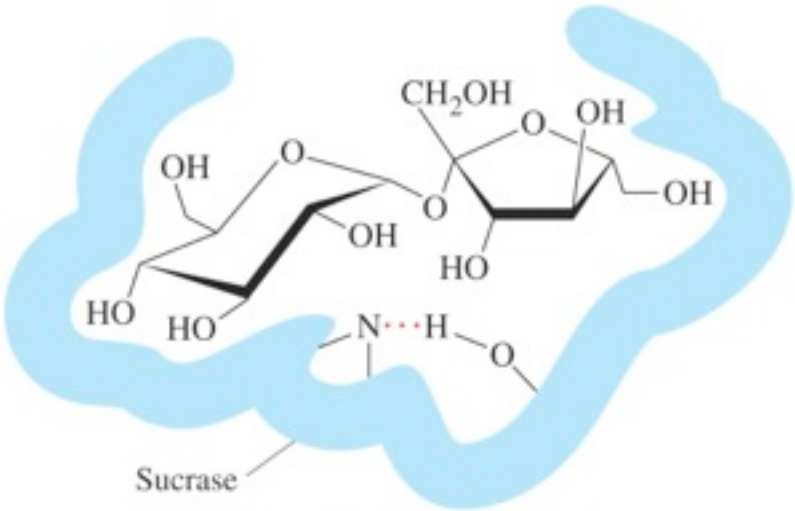


sucrose
$C_{12}H_{22}O_{11}$

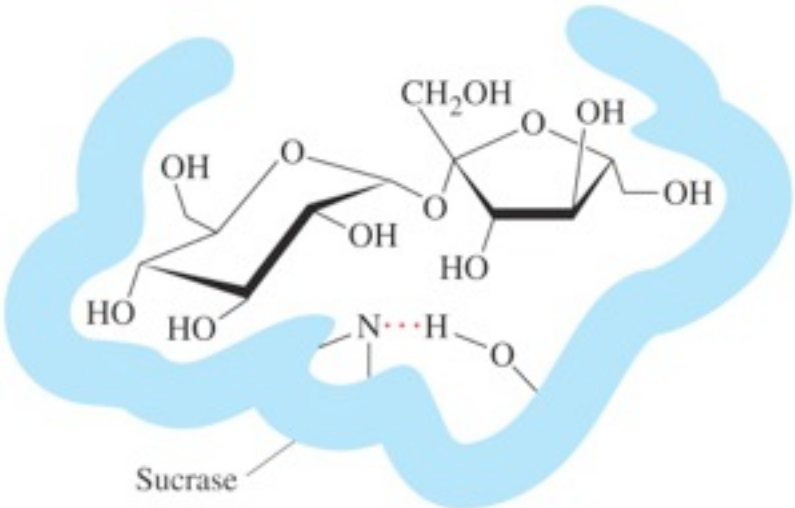


glucose
$C_6H_{12}O_6$

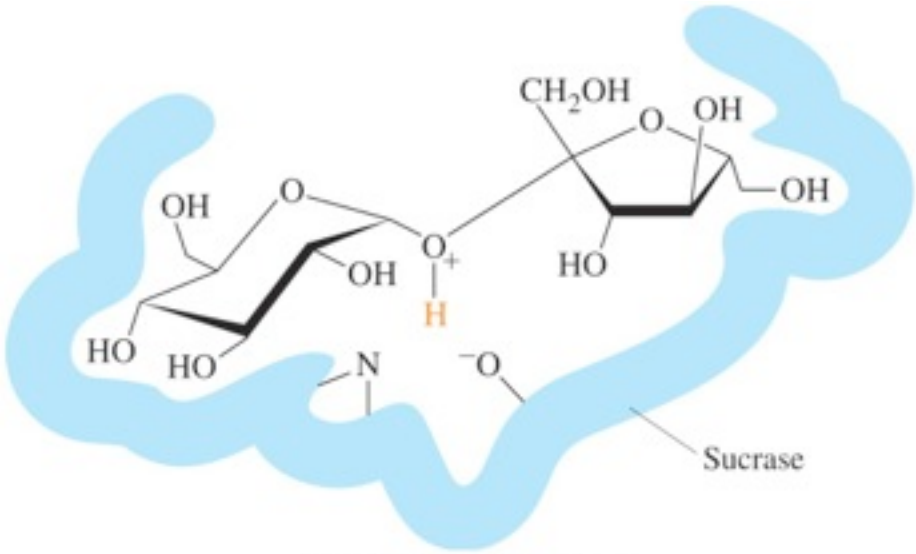
fructose
$C_6H_{12}O_6$



▲ FIGURE 28-19
Sucrase binding a sucrose molecule



▲ FIGURE 28-19
Sucrase binding a sucrose molecule



▲ FIGURE 28-20
Change in enzyme conformation after biding of substrate

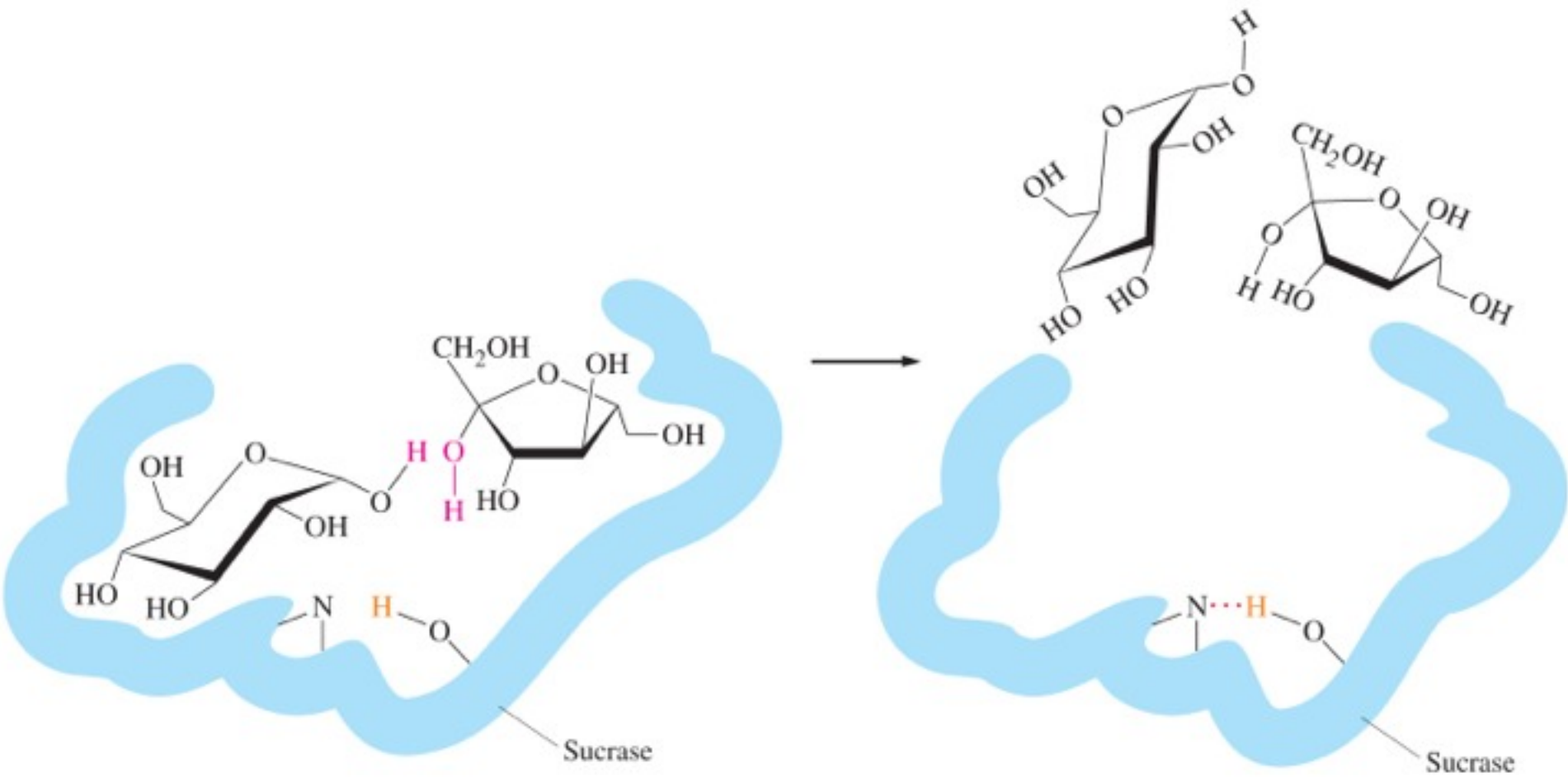
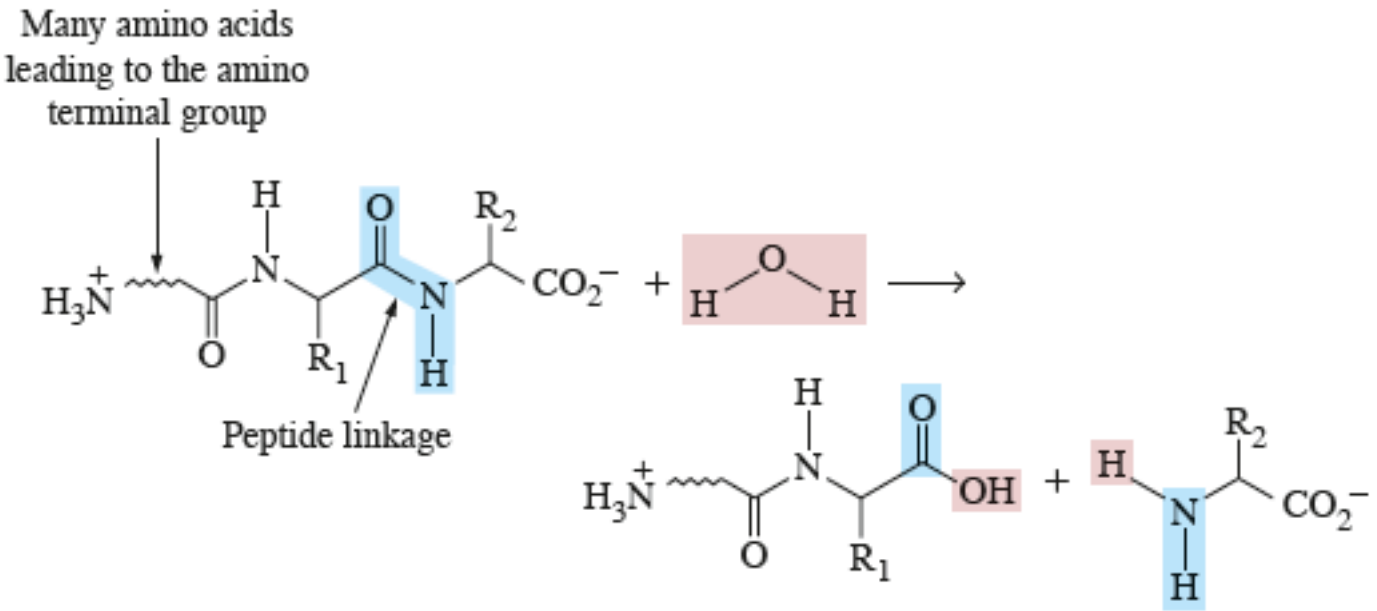


FIGURE 28-21

Completion of the enzyme-catalyzed reaction


Many amino acids leading to the amino terminal group
Peptide linkage

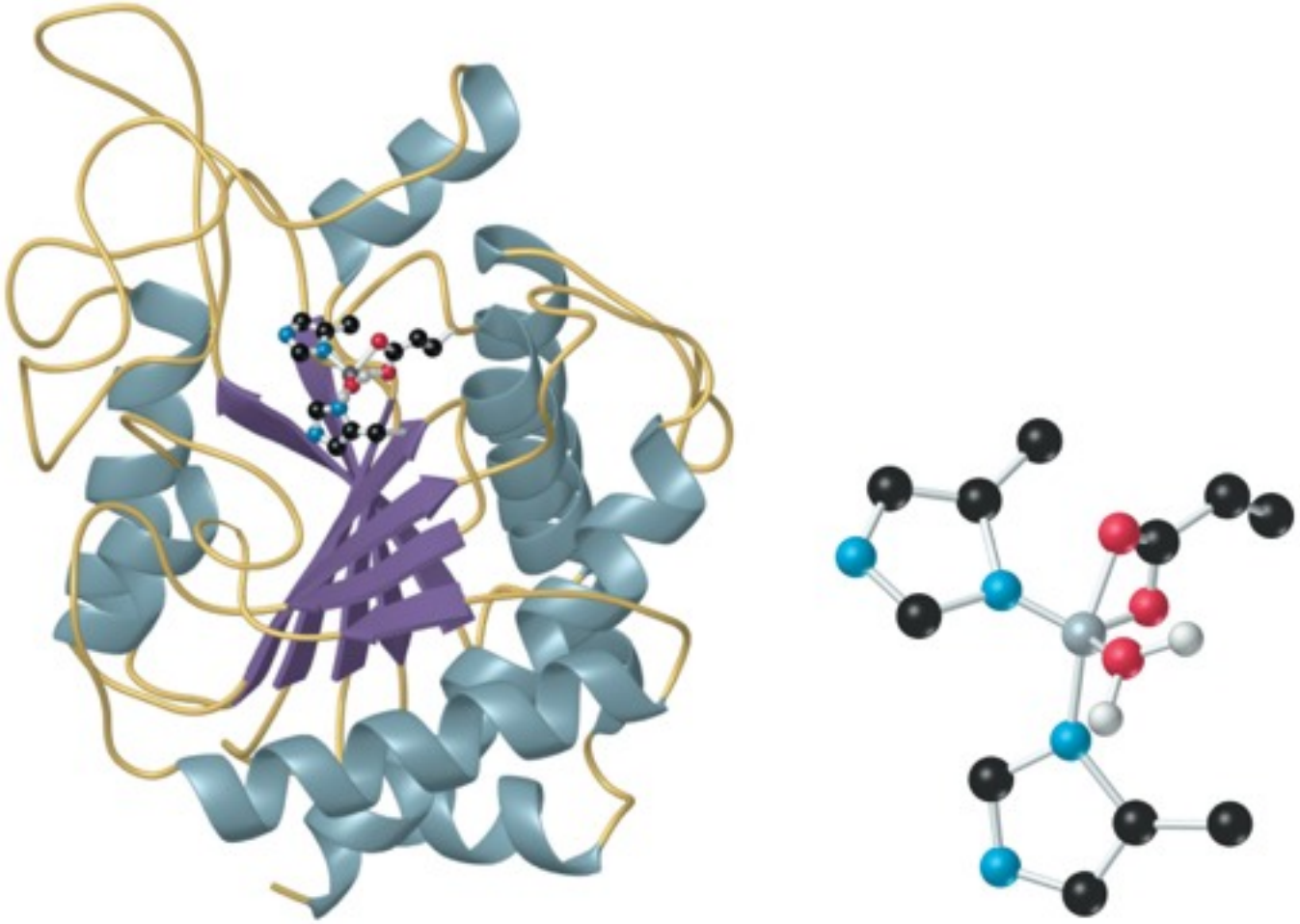


FIGURE 28-22

Structure of carboxypeptidase

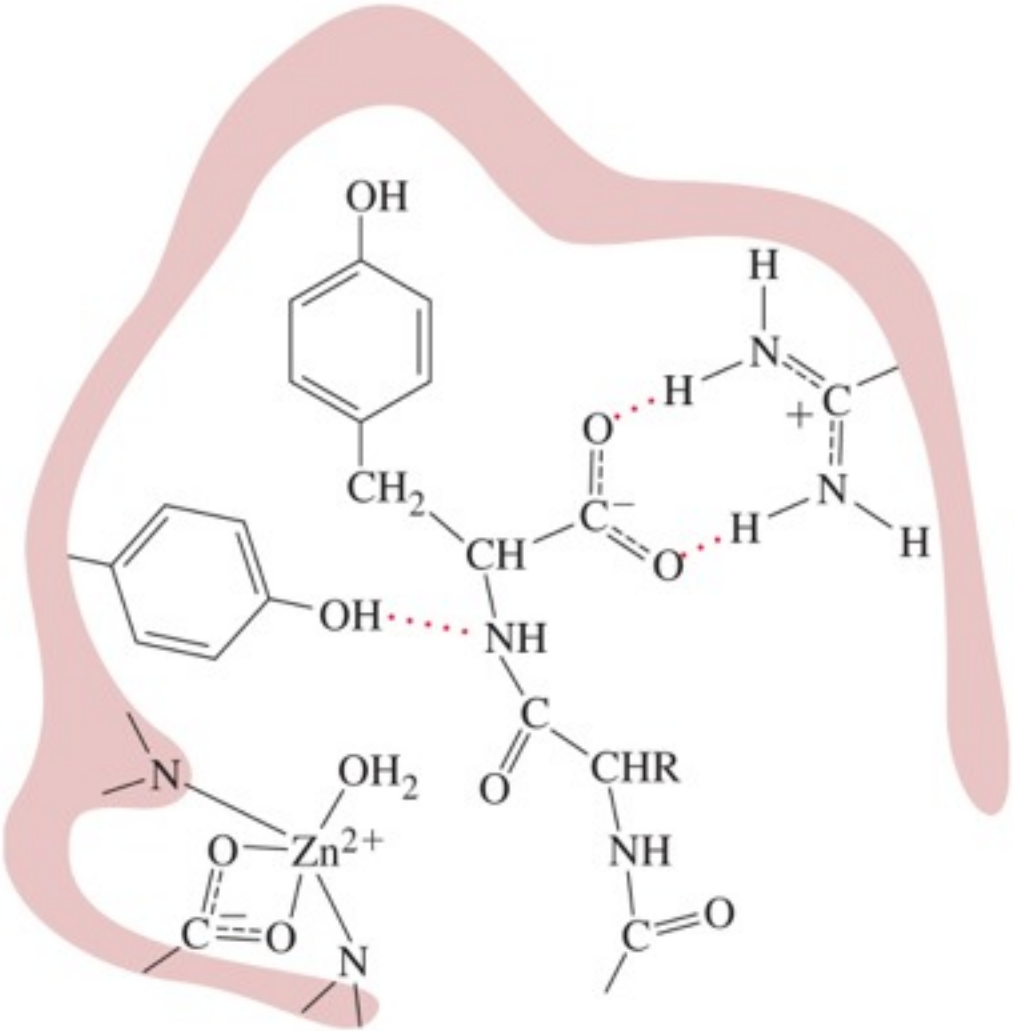


FIGURE 28-23

Binding of protein to the active site of carboxypeptidase