

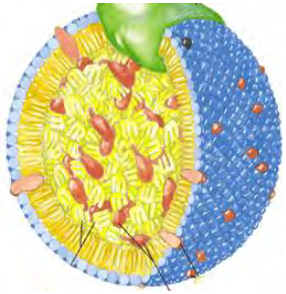


# BIOCHEMISTRY REVIEW

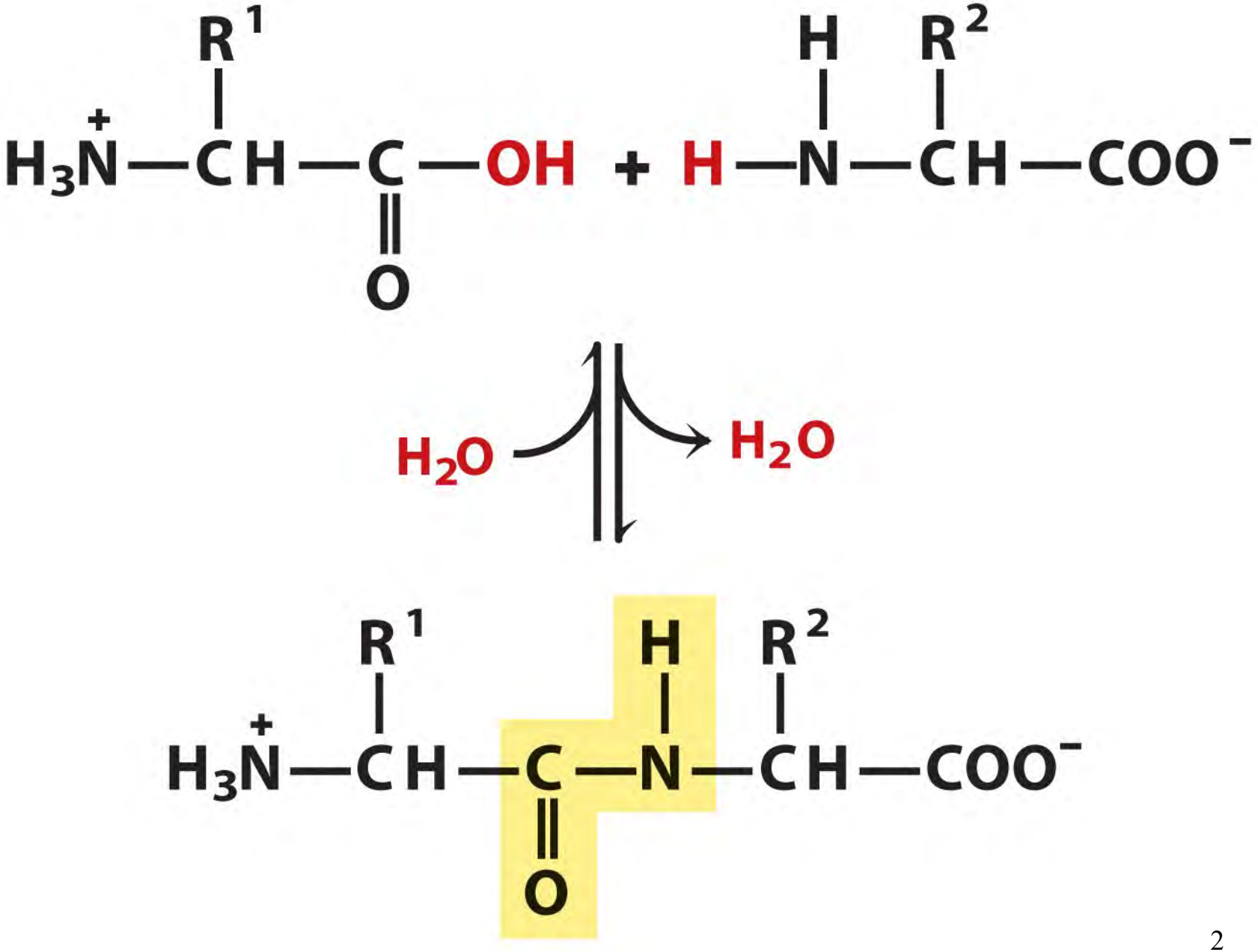
## Overview of Biomolecules

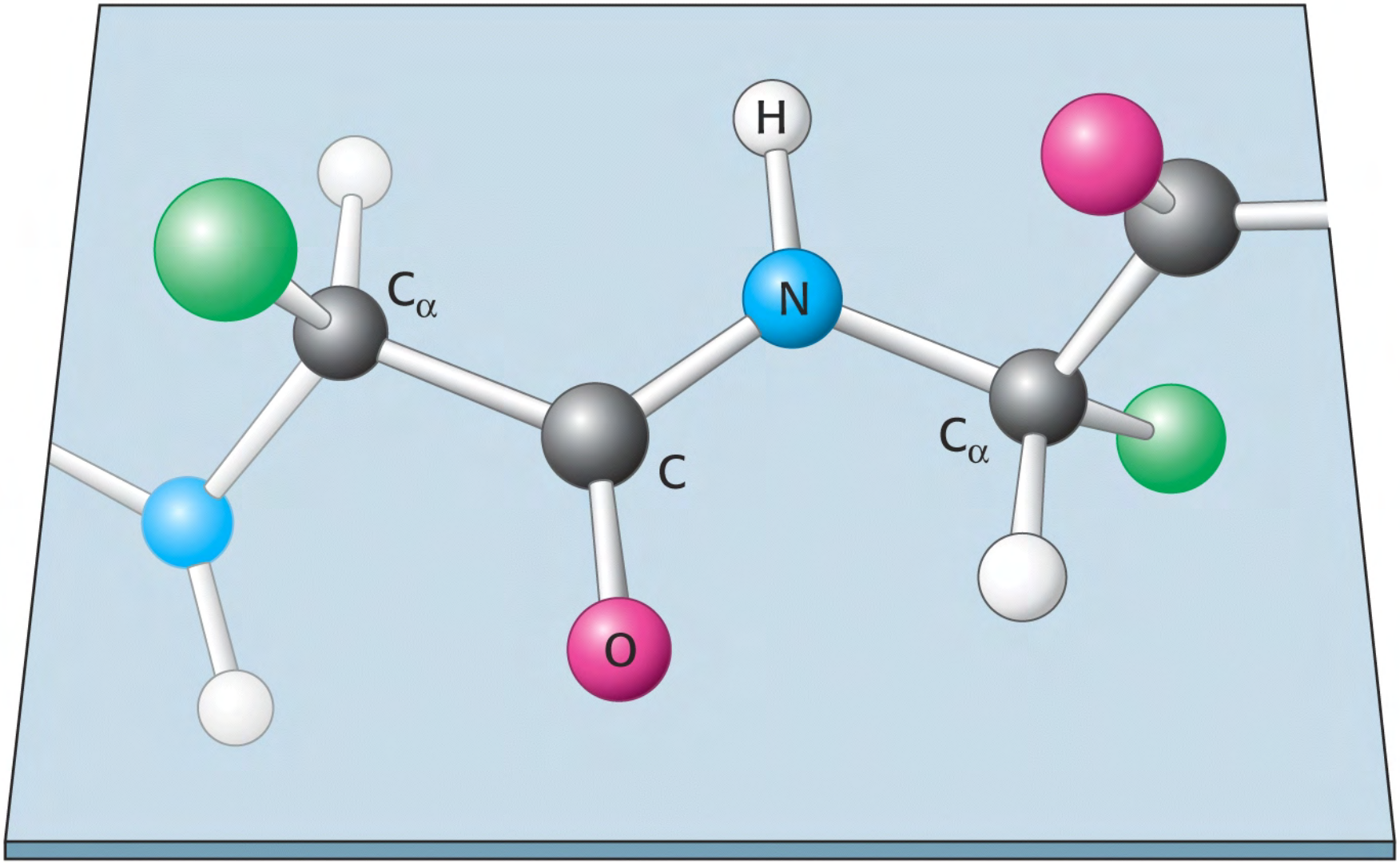
### Chapter 3

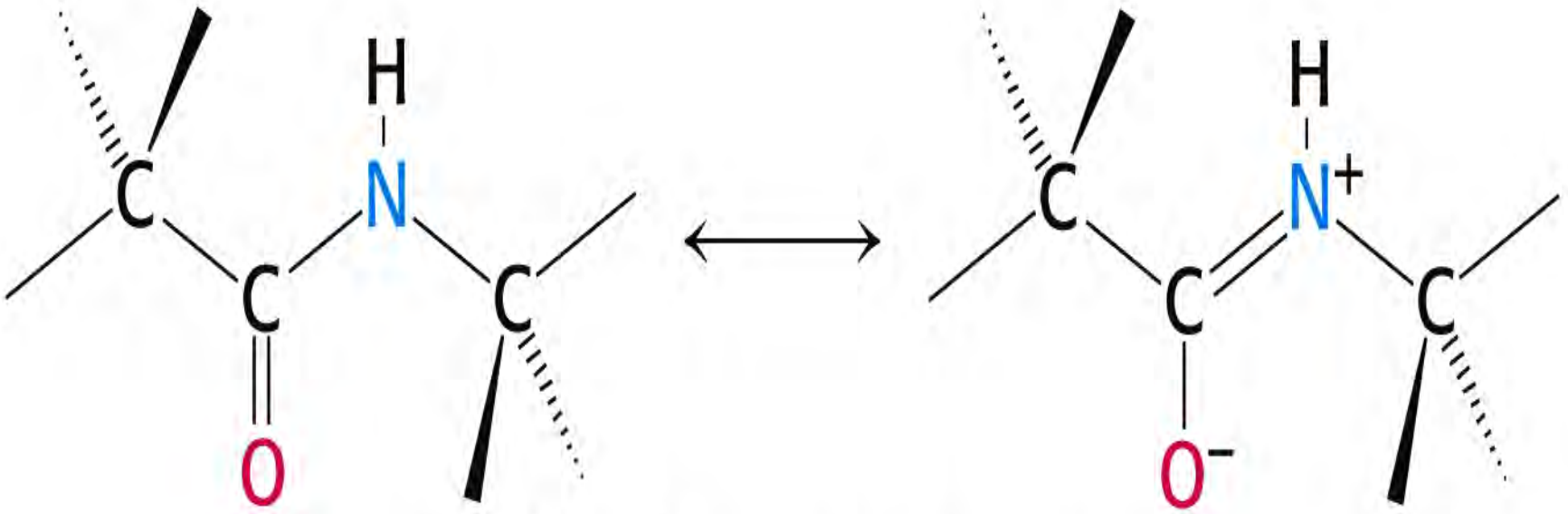
### Peptides



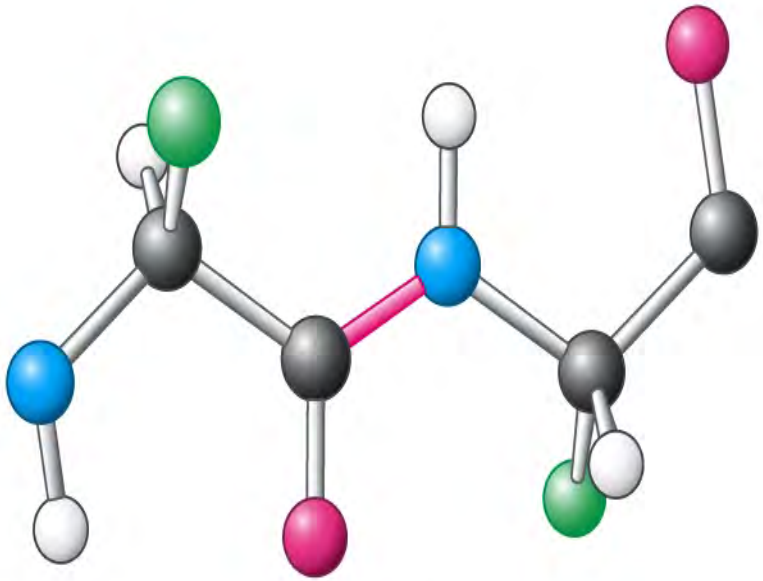



R1
H3N+—CH—C—OH
O
+
H—N—CH—COO−
H
R2
H2O
H2O
R1
H3N+—CH—C—N—CH—COO−
H
R2
O

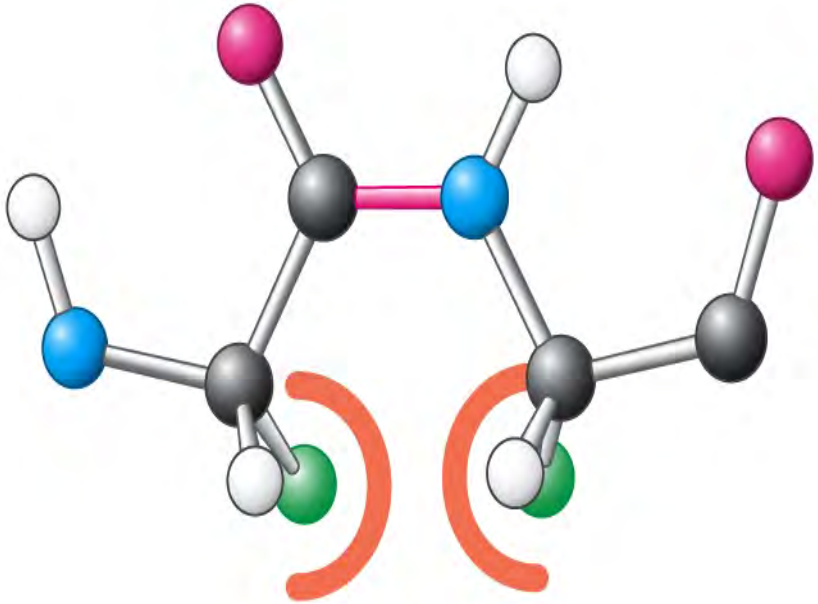

H
N
Cα
C
O
Cα



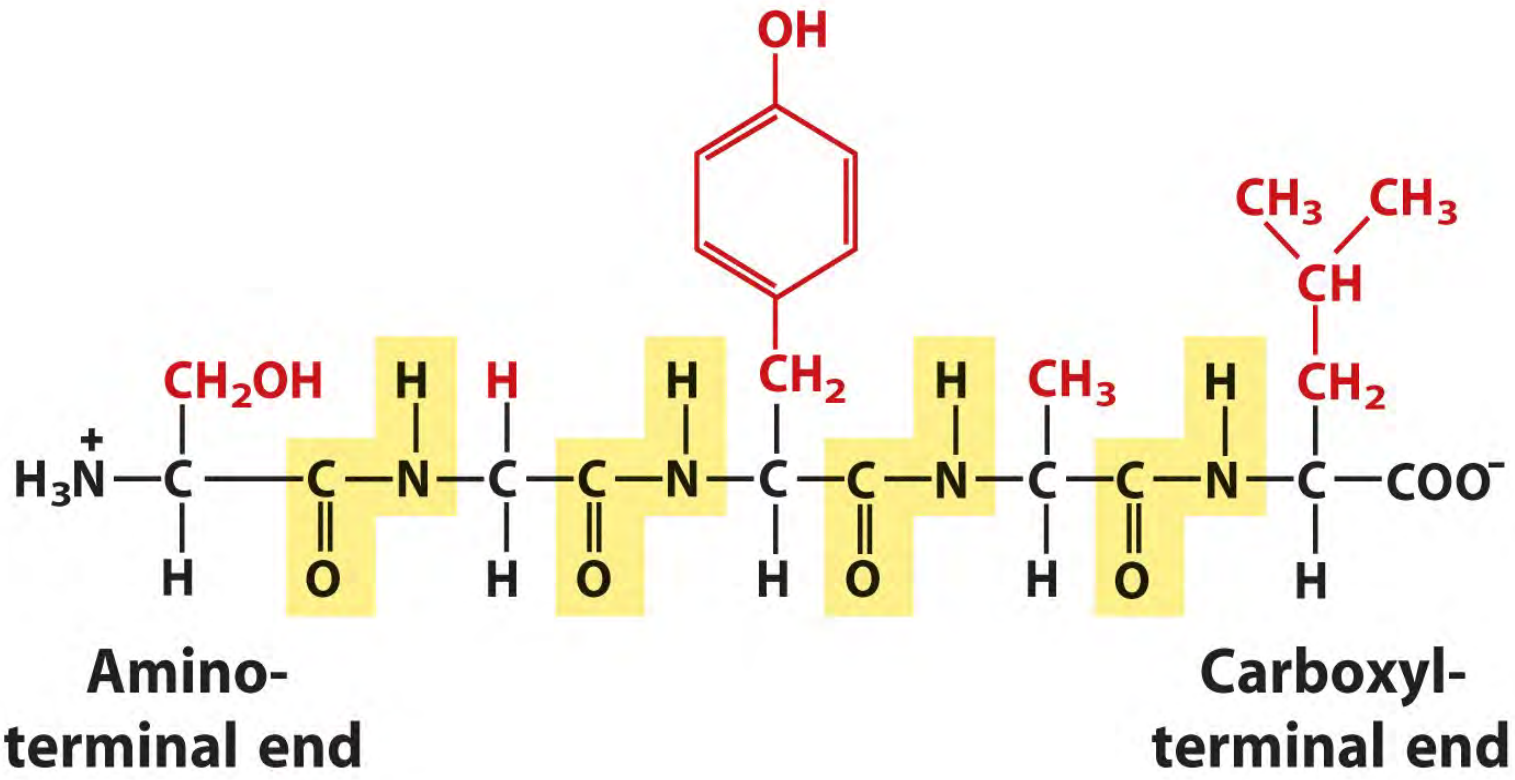

**Peptide bond resonance structures**



Trans

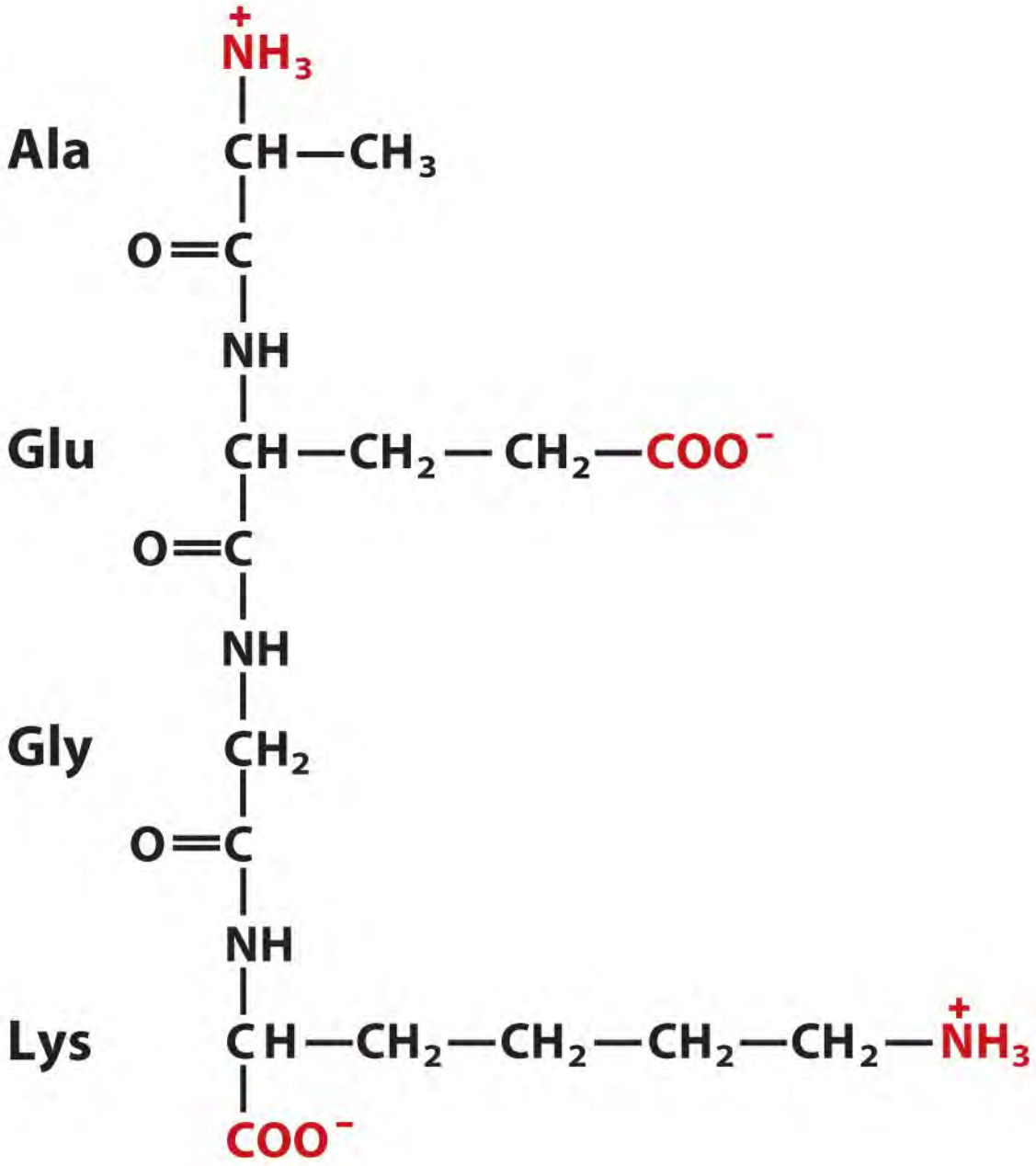


Cis


OH
CH3 CH3
CH
CH2OH
H
H
H
CH2
H
CH3
H
CH2
H3N+
C
C
N
C
C
N
C
C
N
C
C
N
C
COO-
H
O
H
O
H
O
H
O
H
Amino-
terminal end
Carboxyl-
terminal end

**Ala-Gly-Tyr-Gln-Ser-Phe-Lys**

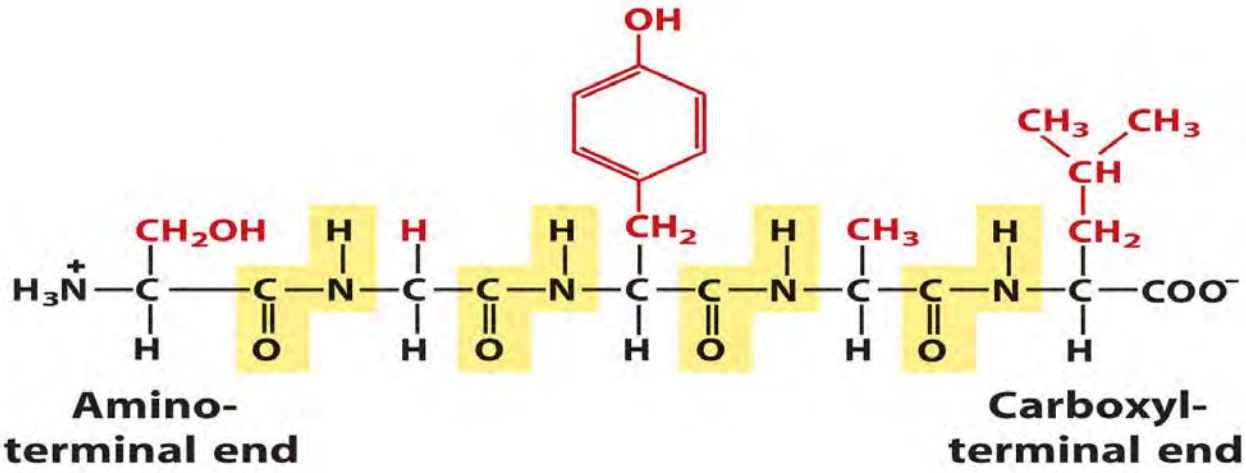
**N-terminal** **C-terminal**


Ala
Glu
Gly
Lys



# Are You Getting It??





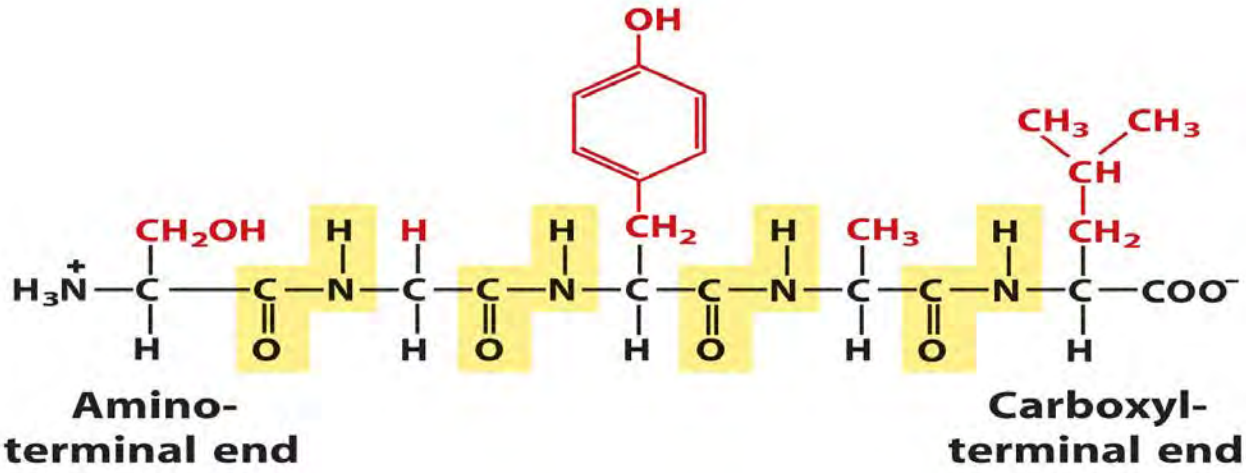

a) How many amino acids are in this peptide?
b) How many pKa values does this peptide have? (include serine)
c) What is the charge at pH = 1?
d) What is the charge at pH = 14?



# Are You Getting It??



## Answer




a) How many amino acids are in this peptide? *5*
b) How many pKa values does this peptide have? (include serine) *4*
c) What is the charge at pH = 1? *+1*
d) What is the charge at pH = 14? *-3*



# Are You Getting It??



**Ala-Gly-Lys-Gln-Arg-Phe-Asp**

a) How many peptide bonds are in this peptide?
b) How many pKa values does this peptide have?
c) What is the charge at pH = 1?
d) What is the charge at pH = 14?



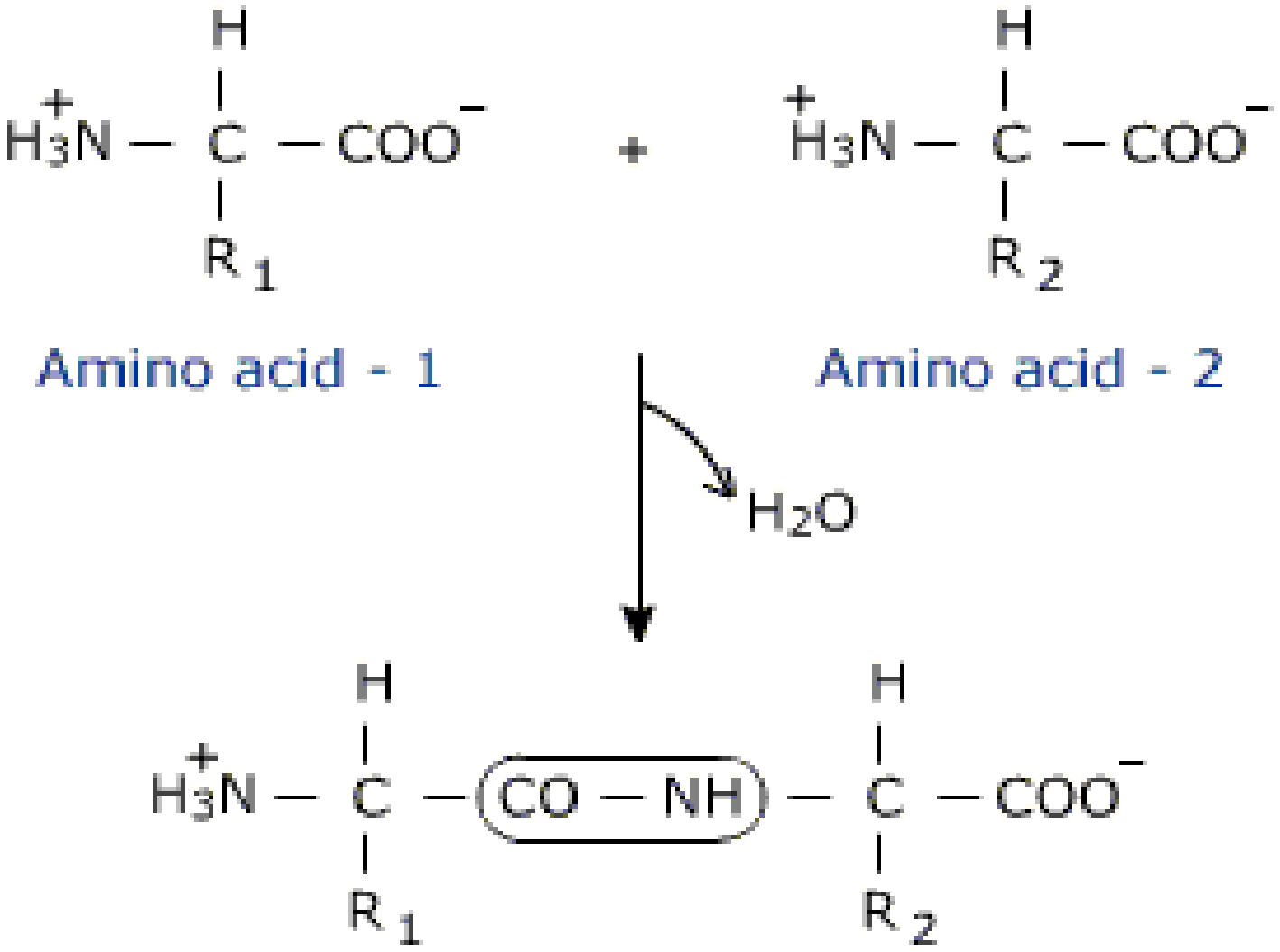
# Are You Getting It??

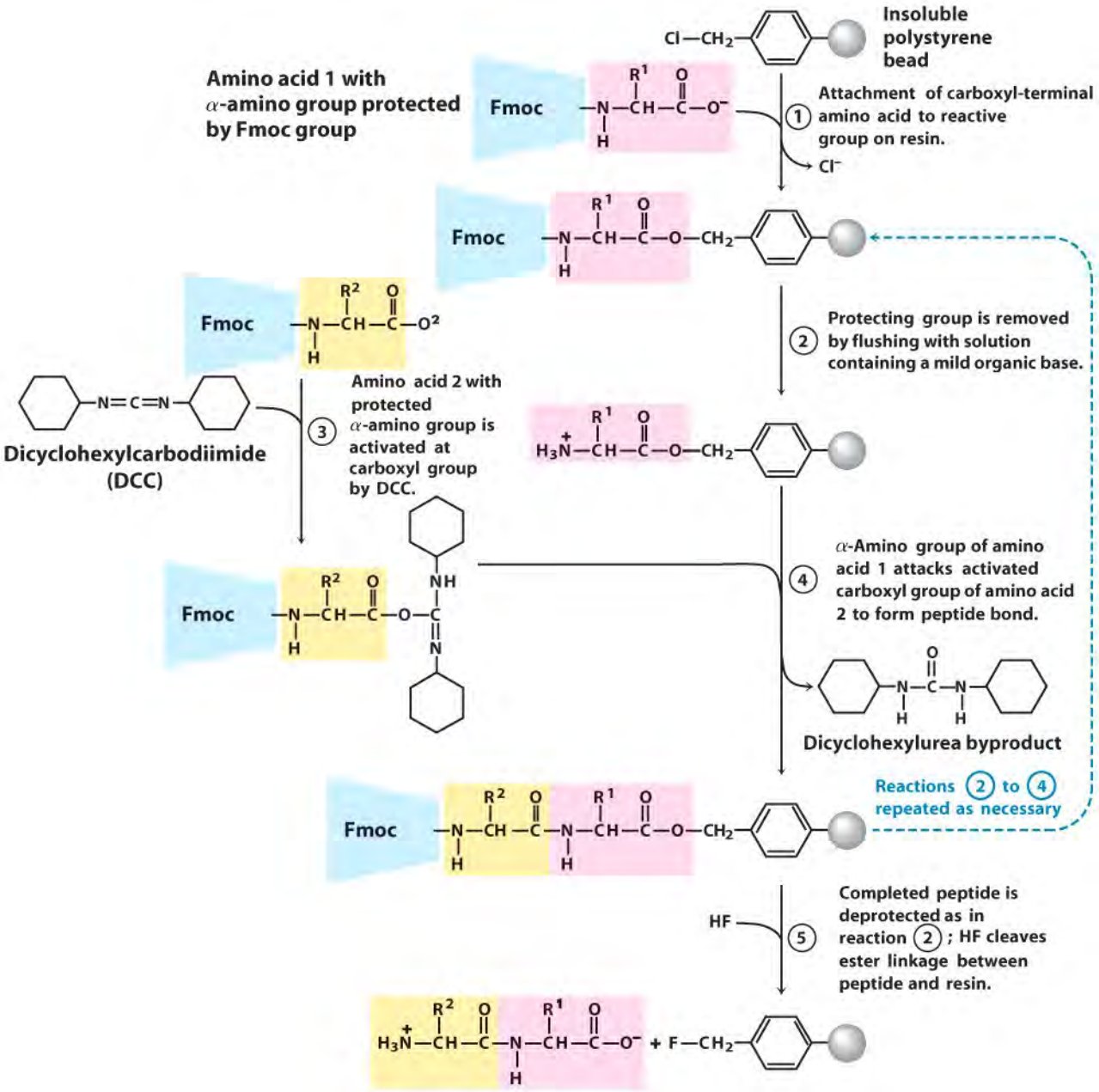


## *Answer*

**Ala-Gly-Lys-Gln-Arg-Phe-Asp**

a) How many peptide bonds are in this peptide? ***6***
b) How many pKa values does this peptide have? ***5***
c) What is the charge at pH = 1? ***+ 3***
d) What is the charge at pH = 14? ***-2***


Amino acid - 1
Amino acid - 2
H2O


Insoluble polystyrene bead
Amino acid 1 with α-amino group protected by Fmoc group
Attachment of carboxyl-terminal amino acid to reactive group on resin.
Protecting group is removed by flushing with solution containing a mild organic base.
Amino acid 2 with protected α-amino group is activated at carboxyl group by DCC.
Dicyclohexylcarbodiimide (DCC)
α-Amino group of amino acid 1 attacks activated carboxyl group of amino acid 2 to form peptide bond.
Dicyclohexylurea byproduct
Reactions 2 to 4 repeated as necessary
Completed peptide is deprotected as in reaction 2; HF cleaves ester linkage between peptide and resin.

## TABLE 3–8 Effect of Stepwise Yield on Overall Yield in Peptide Synthesis

| *Number of residues in the final polypeptide* | *Overall yield of final peptide (%) when the yield of each step is:* | |
|---|---|---|
| | *96.0%* | *99.8%* |
| 11 | 66 | 98 |
| 21 | 44 | 96 |
| 31 | 29 | 94 |
| 51 | 13 | 90 |
| 100 | 1.7 | 82 |