Lesson 4

PROTEIN AND AMINO ACIDS

Protein

Protein is present on every nutrition label, and part of many of the foods we eat. Eggs are rich in protein, so are all types of meats, even wheat flour is composed of 7-15% protein (the remaining ~70-80% is starch).

The “protein” on a nutrition label represents a *mixture* of many different types of individual protein *molecules.*

Each individual protein is a *macro*molecule comprised of building blocks called **amino acids.**

Nutrition Facts

8 servings per container

Serving size **2/3 cup (55g)**

Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Amino acids

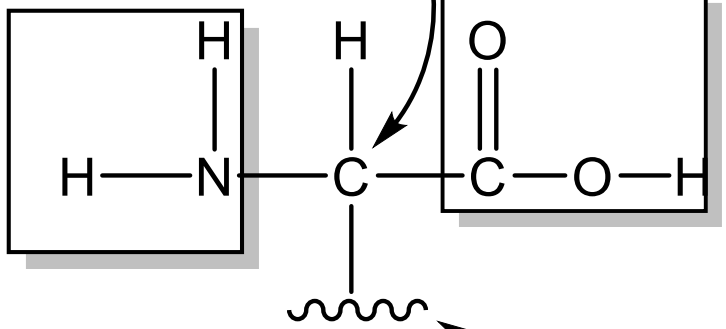
Why do you think this type of molecule is called an amino acid?

The Anatomy of an Amino Acid

this C is called the *alpha carbon*

this group of atoms is called an *amino* group

this group of atoms is called a *carboxylic acid*



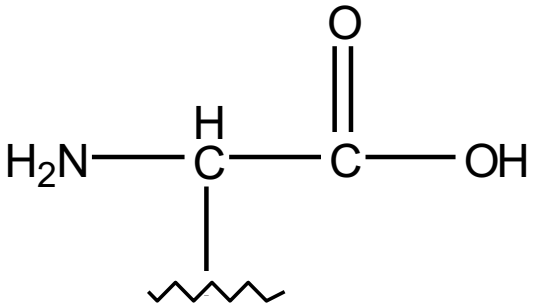
squiggly line means that the molecule has been "cut off" at this point for simplicity

Be able to RECOGNIZE the chemical structure of an amino acid

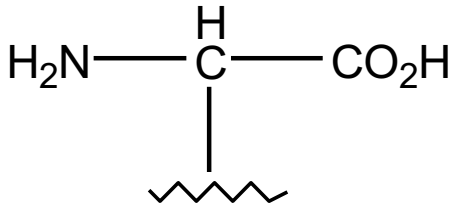
Fig. 1-28

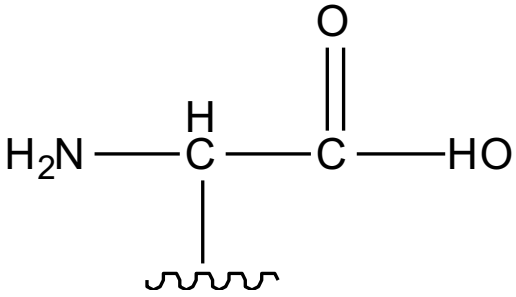
Amino Acid structure

An **amino acid** could also be represented with either or both of the abbreviated structures shown below.



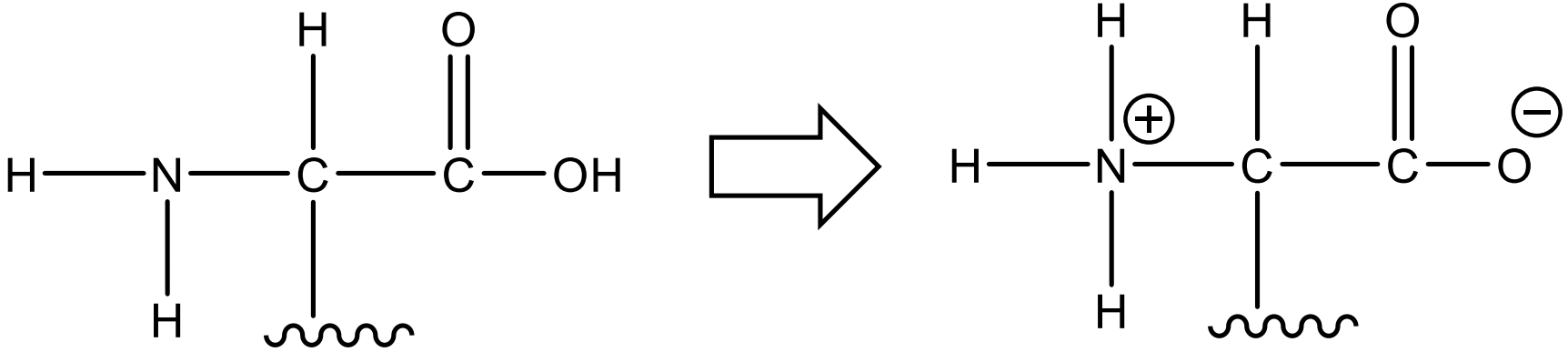
can be futher abbreviated to...





This abbreviated structure is incorrect. Why?

Amino Acid Zwitterions

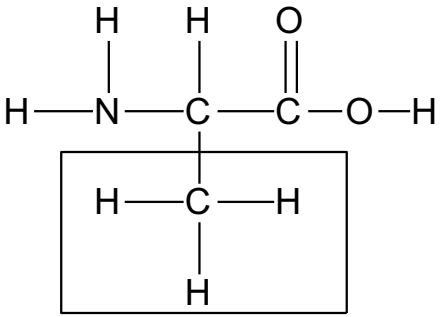


This form of the amino acid is called a *zwitterion*? (Zwitter is German for hybrid)

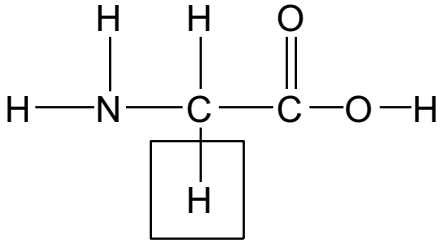
Count electrons. What has changed to make the zwitterion?

Amino acid side chains

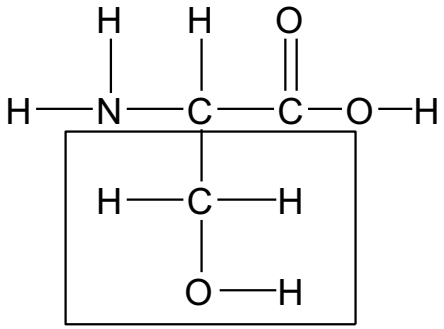
Alanine



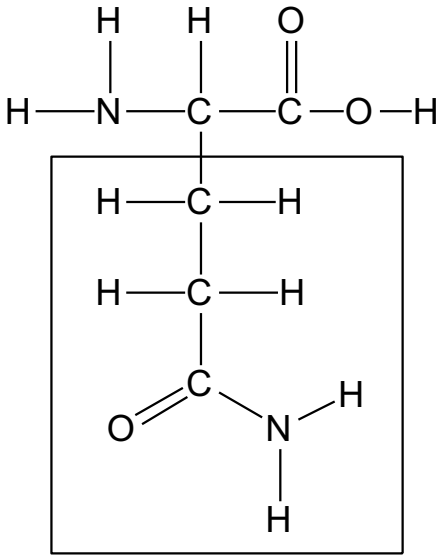
Glycine



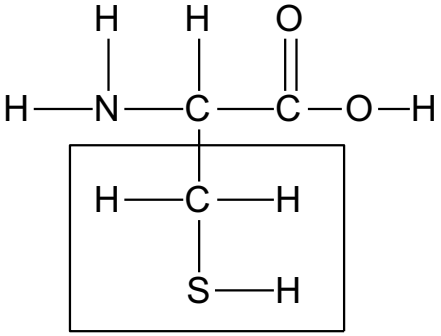
Serine



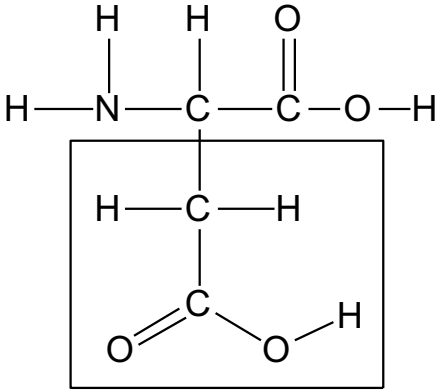
Glutamine



Cysteine



Aspartic Acid



Amino Acid Abbreviations

Name	3 letter abbrev	One letter abbrev	Name	3 letter abbrev	One letter abbrev
Alanine	Ala	A	**Leucine**		L
Aspartic Acid	Asp	D	**Lysine**		K
Asparagine	Asn	N	**Methionine**		M
Arginine	Arg	R	**Phenylalanine**		F
Cysteine	Cys	C	**Proline**		P
Glycine	Gly	G	**Serine**		S
Glutamic Acid	Glu	E	**Threonine**		T
Glutamine	Gln	Q	**Tryptophan**	Trp	W
Histidine	His	H	**Tyrosine**		Y
Isoleucine	Ile	I	**Valine**		V

Amino acids are essential

Essential Amino Acids and Some Food Sources

Food	*Missing Essential Amino Acid*
Eggs, Fish, Meat	none
Beans	methionine, tryptophan
Corn	lysine, tryptophan
Wheat & Rice	lysine
Peas	methionine
Almonds & Walnuts	lysine, tryptophan

Fig. 1-1