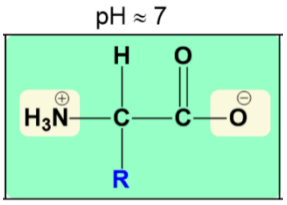
CONCEPT: ZWITTERION

●Common backbone of every free amino acid is predominantly a _____ at physiological pH (~7).

□ *Zwitterion*: dipolar molecules bearing two groups of _____ charge.

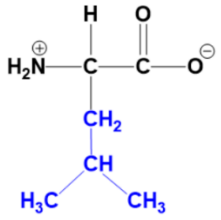
□ Charges are a result of acid/base reactions (___ transfers).

EXAMPLE:

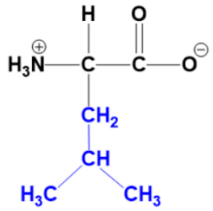


PRACTICE: Which shows the proper structure of Leu at physiological pH?

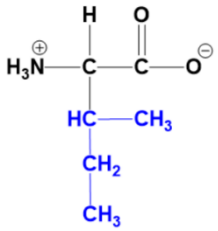
a)



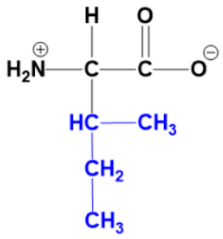
b)



c)



d)



Determining Predominant Amino Acid Structure

●Recall: pK_a is a measure of the strength of an acidic _____; the greater the pK_a, the _____ the acid.

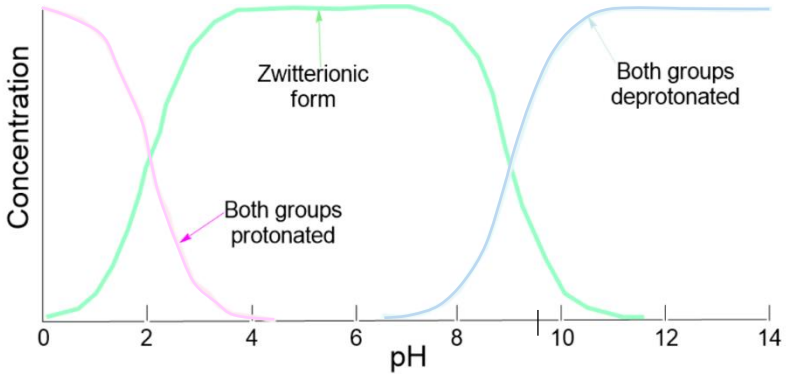
●*Independently* _____ each pK_a to the pH to determine the predominant amino acid structure at any given pH.

□ α-Amino groups have pK_a values that are ~_____ to ~10.5.

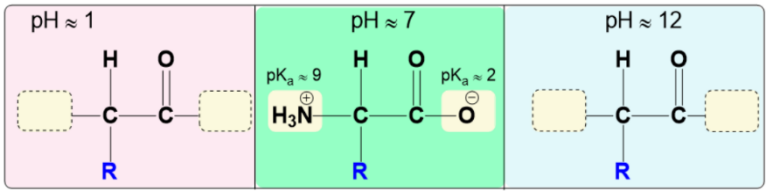
□ α-Carboxyl groups have pK_a values that are ~_____.

EXAMPLE: Fill-in the blanks & determine the predominant amino acid structures & net charges at the given pHs.

Comparing pH to pK_a	Predominate Species	Protonated?
pH = pK_a	[Conj-Base] __ [Conj-Acid]	50% Deprotonated 50% Protonated
pH < pK_a	[Conj-Base] __ [Conj-Acid]	Majority _____
pH > pK_a	[Conj-Base] __ [Conj-Acid]	Majority _____



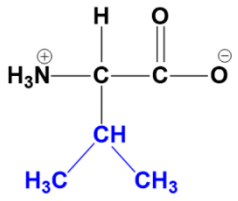
Predominant structures:

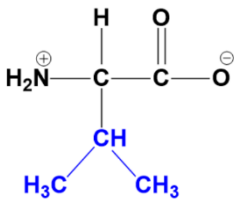


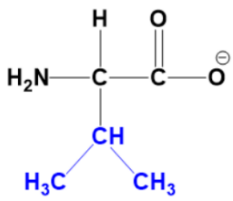
Backbone Net Charge: _____ _____ _____

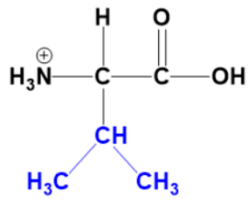
CONCEPT: ZWITTERION

EXAMPLE: At pH 2, which is the predominant structure of Val? (pK_{a1} = 9.62, pK_{a2} = 2.32).

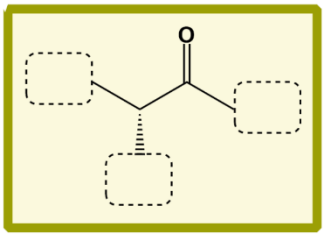
a) 

b) 

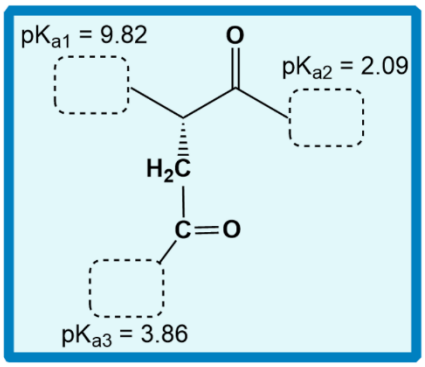
c) 

d) 

PRACTICE: Fill in the groups for the predominant structure of Ala at pH 13?



PRACTICE: Fill in the appropriate groups for Asp at pH 4.3.



PRACTICE: Draw the predominant structure of Arg at pH 6.5? (pK_{a1} = 9.04, pK_{a2} = 2.17, pK_{a3} = 12.48).

PRACTICE: At what pH would an amino acid bear both a neutral -COOH and a $-NH_2$ group?

a) Between pH 0-5. b) Between pH 5-9. c) Between pH 9-14. d) Not likely to occur at any pH.