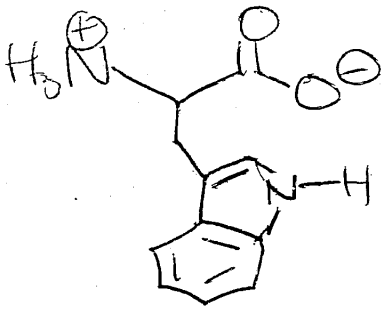
Proteins Part 1

Exercises

1. Indicate the 3-letter abbreviation and draw the skeletal line structure for each of the following amino acids at pH 7.4.

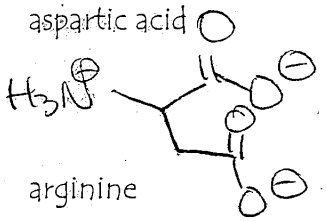
a) tryptophan

Trp



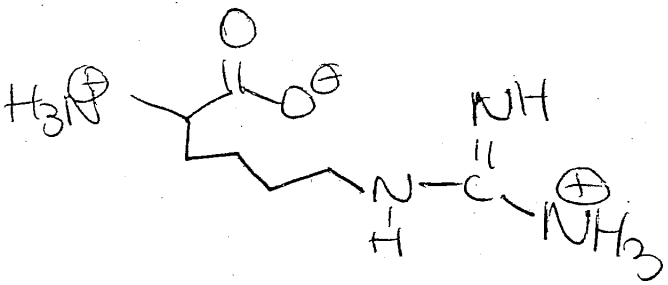
b) aspartic acid

Asp



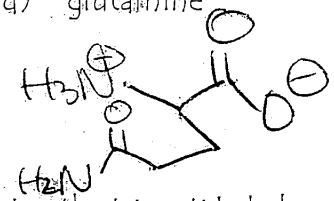
c) arginine

Arg

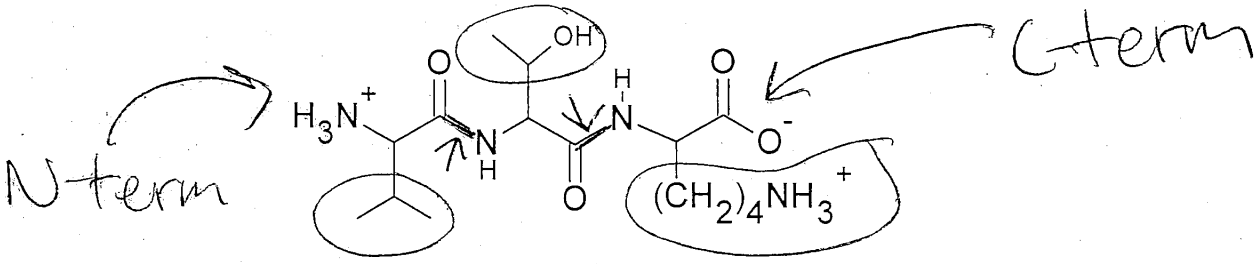


d) glutamine

Gln



2. Use the tripeptide below to answer the following questions.



a) Draw an arrow to each peptide bond.
b) Circle the 3 side chains (R groups) in the following tripeptide.
c) Write the peptide sequence using the 3-letter abbreviations for each amino acid.

Val - Thr - Lys

d) Label the N-terminus and C-terminus

Val

Lys

3. Describe the two types of secondary structure. What do they look like? Where are they found?

α-helix is a spiral & β-Sheets are folded. 2° structure is created by H-bonding btwn aa of backbone that are close to each other. Fibrous proteins have α or β. Globular can have both

4. List the chemical bonds or interactions responsible for maintaining the

a) primary structure of the protein peptide (amide)

b) secondary structure of the protein H-bonding

c) tertiary structure of the protein
disulfide bridge
H-bond
salt bride
ion-dipole
London (Hydrophobic)

d) quaternary structure of the protein same as 3°

5. Which amino acids have R groups that can participate in salt bridge formation at pH 7.4?

Asp, Glu, Lys, Arg, & His

6. Which non-polar amino acid has a side chain that can participate in H-bonding?

Trp

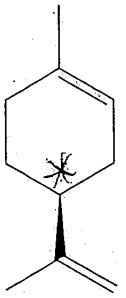
7. List three ways to denature a protein.

heat, agitation, pH change

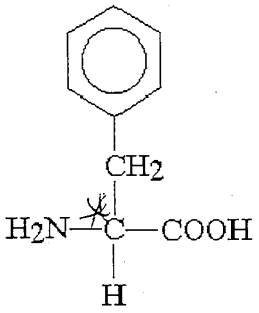
Proteins Part 2

Exercises

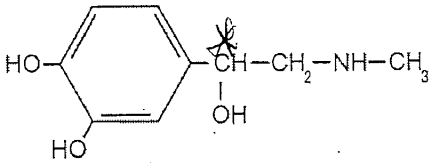
1. Star the chiral carbons.



Limonene

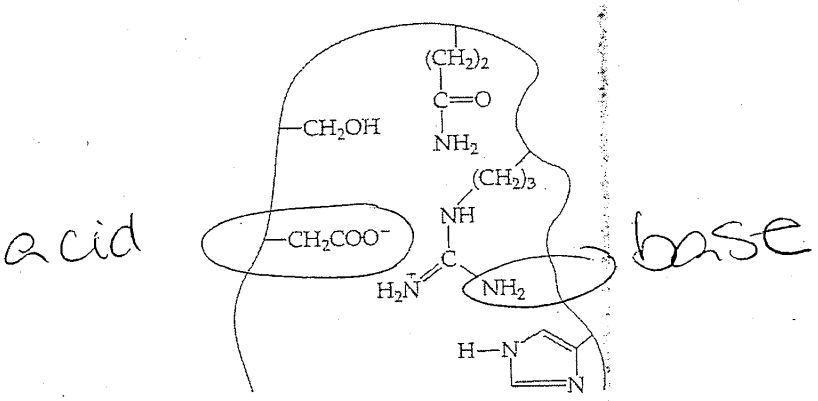


Phenylalanine

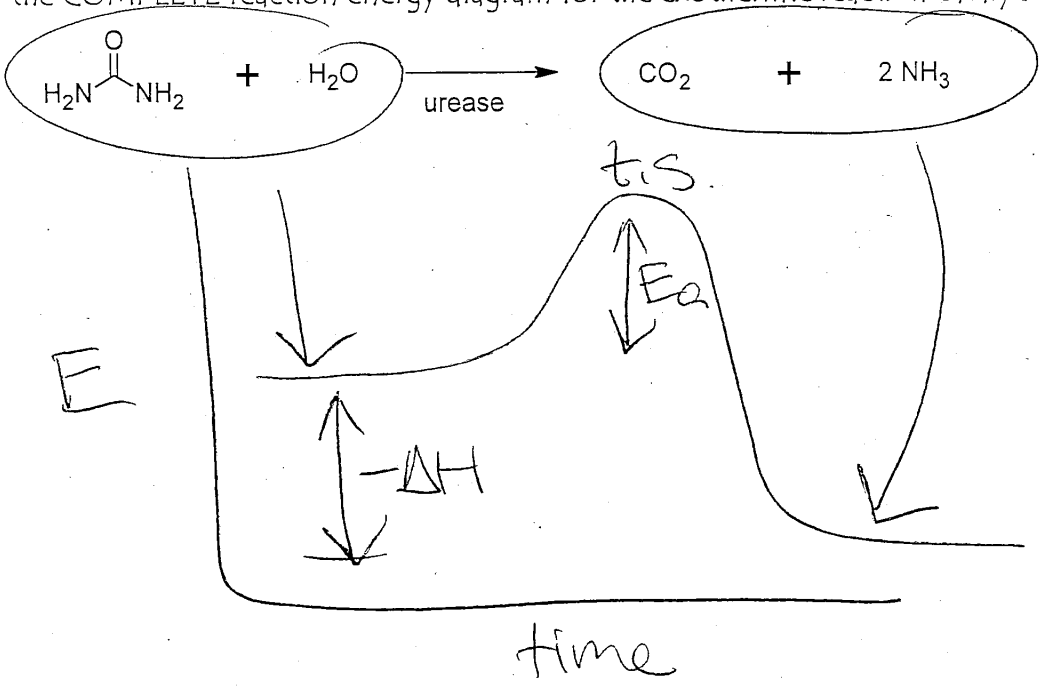


Epinephrine

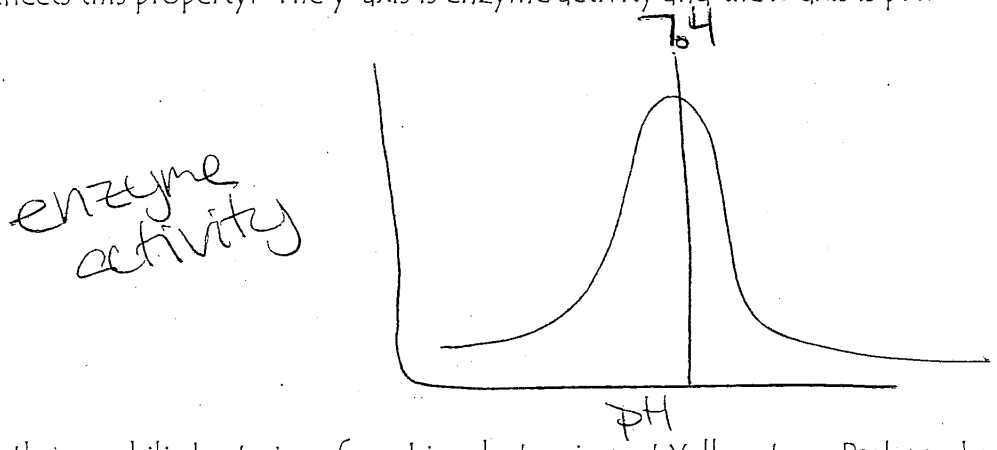
2. Identify the acidic and basic amino acids in the active site below..



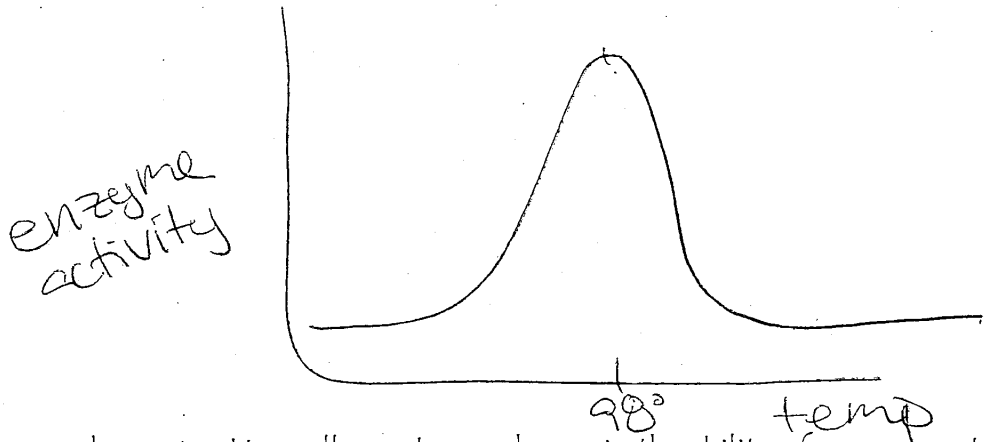
3. Draw the COMPLETE reaction energy diagram for the exothermic reaction catalyzed by urease.



4. The enzyme amylase is found in saliva and operates best near pH 7.4. Draw a graph that best reflects this property. The y-axis is enzyme activity and the x-axis is pH.



5. A thermophilic bacterium found in a hot springs at Yellowstone Park produces an enzyme with an optimum temperature of 98°C. Draw a graph that best reflects this property. The y-axis is enzyme activity and the x-axis is temperature.

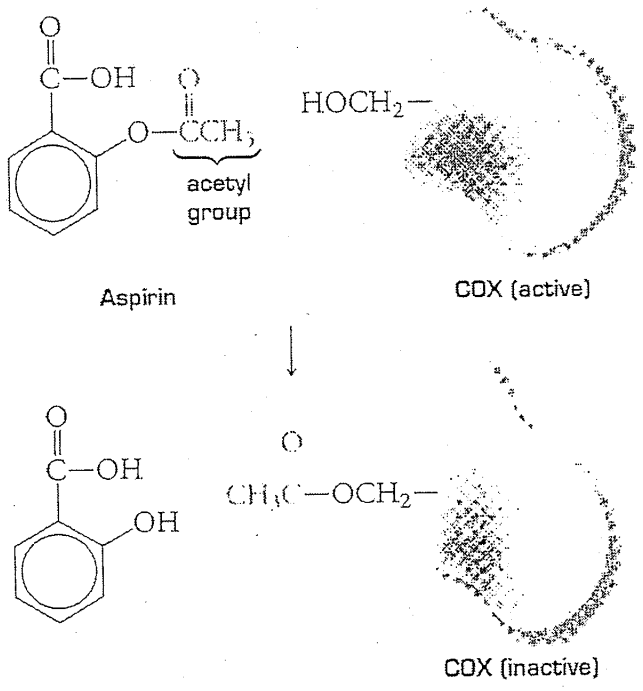


6. Why does a change in pH usually produce a change in the ability of an enzyme to act as a catalyst? Some of the R grp change their charge disrupting the 3° & 4° structure

7. Explain why most competitive inhibitors are structurally similar to a substrate for the enzyme they inhibit, while most noncompetitive inhibitors are not.

The competi inhibitors need to have similar size, shape, & charge distribution w/ the substrate to be able to interact @ the enzymes active site

8. COX enzymes catalyze the production of prostaglandins responsible for pain, fever, and inflammation. Aspirin can block these symptoms by transferring an acetyl group to the COX enzyme and deactivating it as shown in the diagram below.



a) What type of reaction occurs in the diagram above – redox, hydration/dehydration, acyl group transfer, or phosphoryl group transfer?

acyl grp transfer

b) If the transfer of an acetyl group from aspirin to the side chain of a serine residue in a COX enzyme caused a change in the tertiary structure of the enzyme, which interaction was most likely disrupted: an H-bond, salt-bridge, or a disulfide bridge?