

Name \_\_\_\_\_

Section \_\_\_\_\_

## **Properties of Proteins**

Experiment #8

Pre Lab Exercise

1. Draw the chemical structure for the amino acids glycine, tyrosine, cysteine and methionine.
2. Which of the above amino acids is aromatic? What makes it aromatic?
3. Surgical instruments may be sterilized by heating them in boiling water and alcohol can be used to clean the skin before an injection. Explain why these treatments are effective against microorganisms (bacteria) in terms of their effects on proteins. What role do proteins play in the survival of bacteria?

4. Are boiling water and alcohol treatment effective against all types of infectious diseases? If not, what types of diseases are not prevented by these treatments?
  
  
  
  
  
  
  
  
  
  
5. Egg white and milk are often recommended as antidotes against poisoning, especially if heavy metals have been ingested. Explain why these foods may be effective antidotes against heavy metals.
  
  
  
  
  
  
  
  
  
  
6. Spilling nitric acid on the skin will cause the skin to turn yellow. Explain why.
  
  
  
  
  
  
  
  
  
  
7. Which of the amino acids in proteins contain(s) a phenolic group?
  
  
  
  
  
  
  
  
  
  
8. Which of the amino acids in proteins contain sulfur?

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**Properties of Proteins**

Experiment #8

Data &amp; Report Sheet

Part A. Precipitation of Casein from Milk and Albumin from Egg White.

Record your observations regarding clumping of proteins and whether the clumps settle quickly to the bottom of the tube or remain suspended in the tube for a long time. You should also indicate whether the solution (especially egg white solution, which is clear to begin) becomes cloudy (i.e., small white aggregates) or whether there are large aggregates or clumps.

Vinegar	Mercuric Chloride	Lead Nitrate
Boiling Water Bath	Perchloric Acid	Ethyl Alcohol

A-1. How do you explain any differences between the behavior of egg albumin and casein with respect to precipitation by vinegar and precipitation by heating in boiling water? Think about what happens when you place an egg in boiling water or when milk is heated.

Part B. Xanthoproteic Test for Aromatic Groups.

Record the color of the solution after heating with concentrated nitric acid and then after making the solution alkaline with sodium hydroxide. Try to indicate differences in the shade or intensity of color.

Test Sample	Color with nitric acid	Change after adding sodium hydroxide
Egg White Soln		
Milk		
Tyrosine		
Tryptophan		
Glycine		

B-1. Explain why any of the test samples show no color changes.

Part C. Biuret Test.

Indicate the colors observed for each of the test solutions when  $\text{Cu}^{2+}$  is added.

Egg White Solution	Milk	Glycine

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- C-1. Explain the differences in the color observed for each of the test solutions (recorded in the table above). What color is indicative of a positive biuret test? What color indicates a negative biuret test?

Part D. Millon's Test for Phenols.

Indicate the colors observed for each of the test solutions when Millon's reagent and sodium nitrite are added and whether there is any clumping or precipitation.

Glycine	Tyrosine	Egg White (with $\text{NH}_4\text{Cl}$ )	Egg White (No $\text{NH}_4\text{Cl}$ )	Milk

- D-1. Explain the observed colors and precipitate in each of the amino acid or protein samples.

- D-2. Would you expect this test to be useful for the analysis of protein in urine? Explain why or why not. Hint: Why did you add ammonium chloride to one of the samples?

Part E. Sulfur Test.

Record the observed changes in each solution after adding sodium hydroxide and lead nitrate to each sample.

Egg White Solution	Cysteine	Methionine

E-1. Although both cysteine and methionine contain sulfur, why would they react differently in this test?

Some of the tests you have performed have been used in the past as tests for protein in urine. Why might a physician be interested in determining whether a patient has protein in the urine? What does protein in urine indicate?