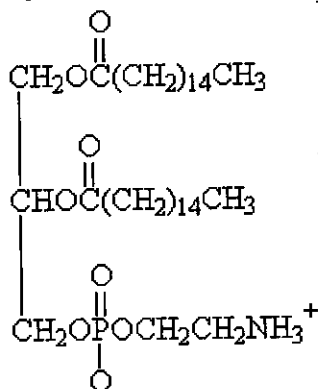


1. Answer the following:

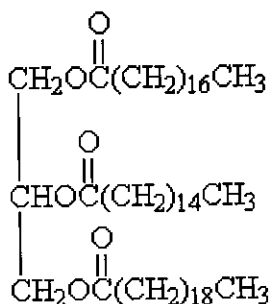
- a. Which lipids have a lower melting point, saturated or unsaturated? unsaturated
- b. Indicate four important functions of lipids:
- i. structure of cell membranes ii. energy storage and transport  
 iii. protective coatings iv. metabolic regulation
- c. Which of the following lipids are saponifiable lipids? Circle the correct ones.  
 i. glycerophospholipids ii. steroids iii. triglycerides iv. waxes
- d. What is an essential fatty acid? Cannot be synthesized by the body
- e. What is the name of the type of reaction that applies to each of the following? The choices are: saponification, hydrolysis, hydrogenation, dehydration, esterification. There can be more than one choice for a reaction.
- i. Glycerol with 3 molecules of a fatty acid. dehydration, esterification  
 ii. A triglyceride with water in the presence of an acid. hydrolysis (acid)  
 iii. A triglyceride with aqueous NaOH. base hydrolysis, saponification  
 iv. An unsaturated fatty acid with hydrogen. hydrogenation
- f. Give two examples of substances that are steroids: cholesterol, estrogen, progesterone
- g. Which fats and oils come from plants? unsaturated animals? saturated  
 (The choices are saturated or unsaturated)
- h. For each of the following identify the hydrophobic and the hydrophilic end of the molecule:
- i. glycerophospholipid : fatty acid C-H backbone hydrophobic  
 phosphate and amino alcohol end hydrophilic
- ii. soap:  $\text{CH}_3(\text{CH}_2)_{13}\text{COO}^- \text{Na}^+$  hydrophobic  
hydrophilic

2. Identify the type of lipid for each of the following. The choices are: wax, steroid, triglyceride, and glycerophospholipid:

a. glycerophospholipid

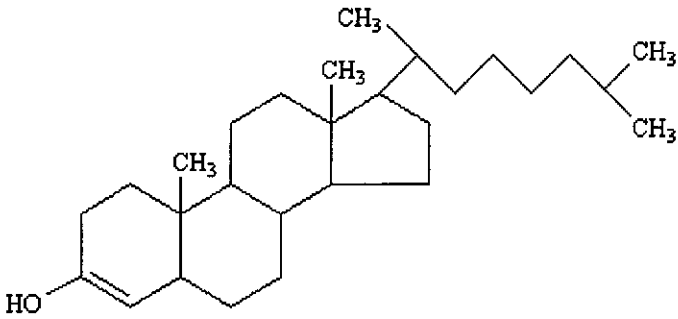


b. triglyceride



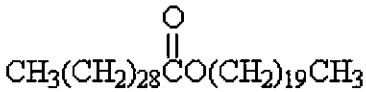
c.

steroid



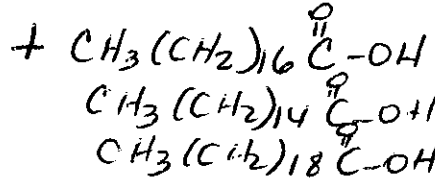
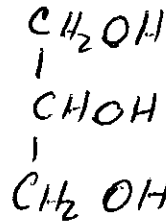
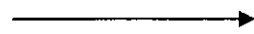
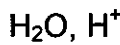
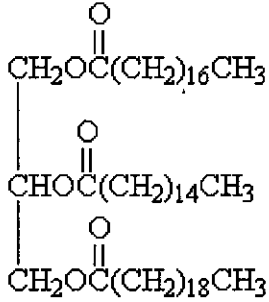
d.

wax



3. Indicate the products and the name of each of the following reactions:

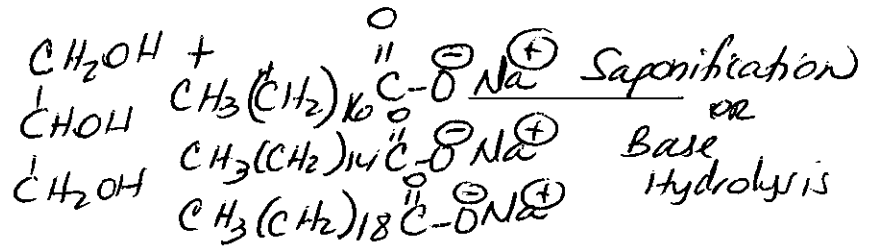
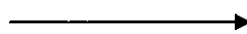
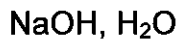
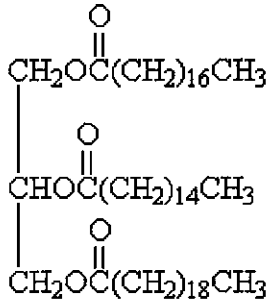
4. a.



Name of the Reaction

acid hydrolysis

b.



Saponification  
or  
Base Hydrolysis

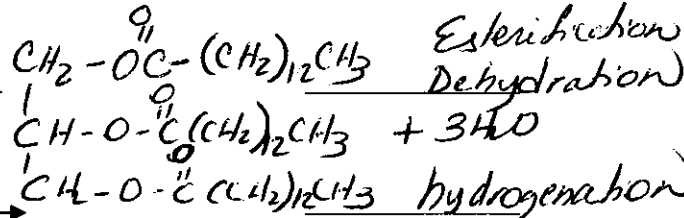
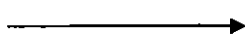
c.  $\text{CH}_2\text{OH}$

|

$\text{CHOH}$

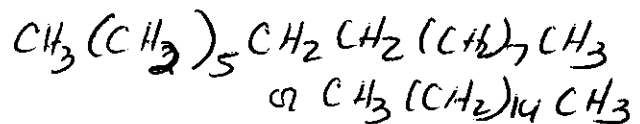
|

$\text{CH}_2\text{OH}$



Esterification  
Dehydration  
hydrogenation

d.  $\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_3 + \text{H}_2$

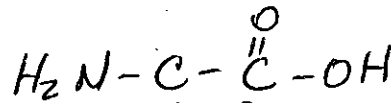


5. List the seven functions of proteins:

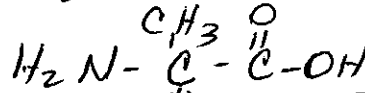
- a. Enzymes (catalysts)
- c. transport + storage of  $\text{O}_2$
- e. Coordinate motion
- g. Structural

- b. Immune Protection
- d. Hormones
- f. Generation + Transmission of Nerve Impulses

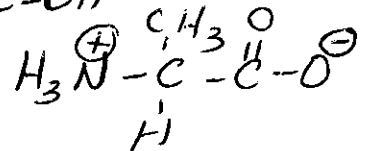
6. What is the structure of the amino acid glycine?



7. What is the structure of the amino acid alanine?

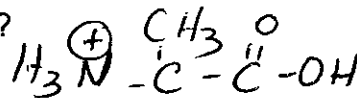


8. Indicate the structure of the zwitterion for the amino acid alanine.

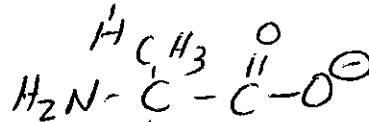


9. The isoelectric point for the amino acid alanine is 6.00.

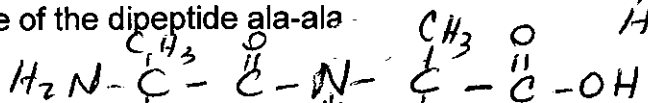
a. What is the structure of alanine at a pH of 5.00?



b. What is the structure of alanine at a pH of 7.00?



10. Draw the structure of the dipeptide ala-ala.

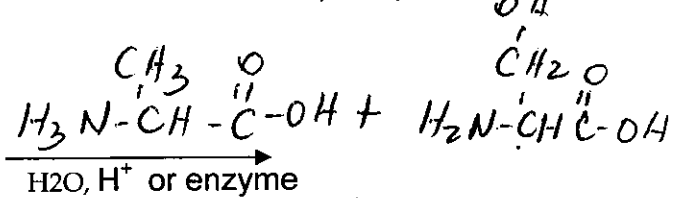
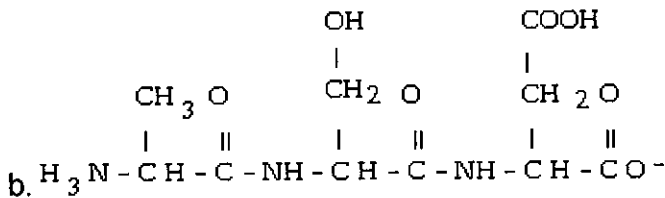
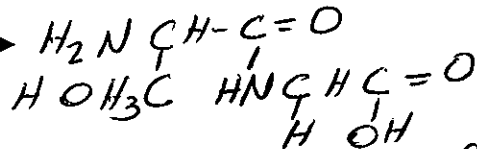
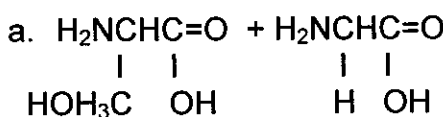


11. Identify each of the following as either primary, secondary, tertiary, or quaternary structures of proteins. Each choice may be used more than once:

- 3° Within a single polypeptide chain, the disulfide linkages which are formed between individual amino acid units.
- 4° Between two identical polypeptide chains for a single protein, the salt bridges which occur between two individual amino acid units.
- 1° The amino acid sequence of a protein.
- 2° The hydrogen bonding between two amino acids in a single polypeptide that gives rise to the  $\alpha$  helix structure of the protein, which is similar in appearance to a telephone coil.
- 4° The hydrogen bonding which occurs between <sup>the R groups of</sup> two amino acids in two different polypeptide chains in a single protein.
- 2° The formation of a  $\beta$  pleated sheet by the hydrogen bonding which occurs between two different but identical polypeptide chains in a protein.

12. The linkages between each of the three carboxylic acids and glycerol in a triglyceride are ester linkages. The linkages between individual amino acids in a polypeptide are amide linkages. (or peptide linkages)

13. Complete the following reactions:



14. What are the five factors that can cause a protein to become denatured?

- Heat, UV radiation
  - Addition of Alcohols \*
  - Reducing Agents
  - pH changes
  - Heavy metals
- \* or organic solvents

15. What happens when a protein becomes denatured? Loses biological activity
16. When a reaction proceeds in the presence of an enzyme that catalyzes the reaction, why does the reaction occur faster than in the absence of the enzyme?
17. List the three steps involved in a reaction of a substrate (S) in the presence of an enzyme (E):
- E + S → E-S
  - E-S → E-P
  - E-P → E+P
18. A cofactor is either a(n) metal ion or a(n) organic compound associated with an enzyme. When an enzyme is associated with a cofactor, the result is a more complex enzyme called a(n) conjugated enzymes.
19. What are the four factors that affect the rate at which enzymes catalyze a reaction?
- substrate concentration
  - enzyme concentration
  - temperature
  - pH
20. Indicate whether the following inhibitions by an inhibitor are competitive or noncompetitive:
- The inhibitor is similar in structure to the substrate. competitive
  - The inhibitor attaches itself to a different part of the enzyme than the substrate does. noncompetitive
  - The addition of additional substrate does not reverse the inhibition. noncompetitive