

NESA Biochemistry Fall 2001
Review problems for the first exam

Acid/Base chemistry

Complete the following sentences

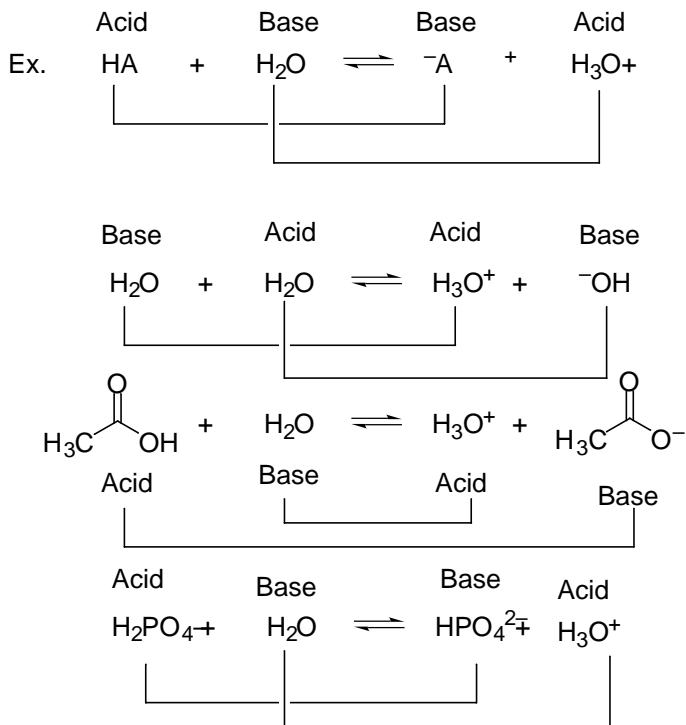
1. H_2CO_3 is a weak acid.
2. The anion of a weak acid is a weak base
3. pH is the measure of a solutions acidity.
4. CH_3COOH and CH_3COO^- are known as a conjugate acid-base pair.

True and False

1. True
2. False
3. False
4. True
5. True

Additional problems:

1. Note the change in the last equation. This one was incorrect on the original sheet.



2. Rank the following acids from strongest to weakest using the given information.

Strongest		Weakest		
Pyruvic acid	Citric acid	Formic acid	Acetic acid	Benzoic acid

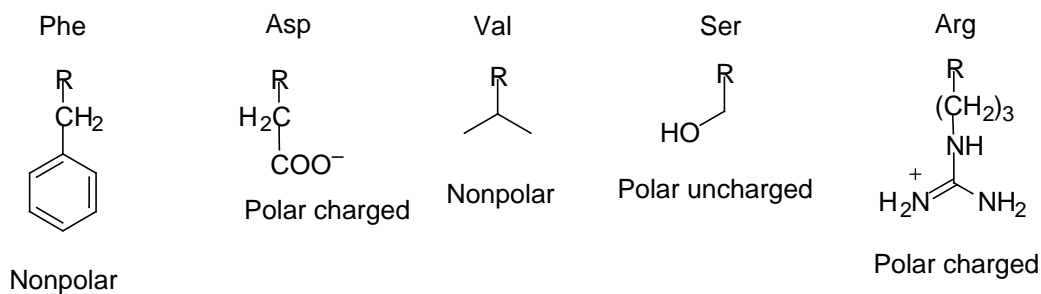
Amino acids

Complete the following sentences

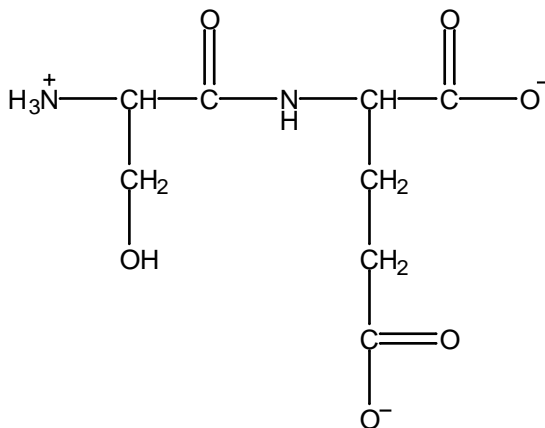
- Two molecules that differ only in the arrangement of groups around chiral carbon are called enantiomers.
- Amino acids exist as dipolar ions called zwitter ions.
- Hydrophobic interactions pull nonpolar sidechains together to exclude water.

Additional problems

1.



2.



Proteins

Complete the following sentences

- The repeating chain of amide bonds in a peptide is called the backbone.
- Tertiary structure refers to how the entire protein is folded and coiled into a specific three-dimensional shape.

3. In secondary structure called a β -sheet, polypeptide chains lineup in a parallel arrangement held together by hydrogen bonds.

True or False

1. False
2. False
3. True
4. False
5. True

Additional problems

1. D
2. A
3.
 - a. Heat
 - b. Mechanical Agitation
 - c. Detergents
 - d. Organic Compounds
 - e. pH change
 - f. Inorganic salts
4. Cys-Lys-Glu-Pro or CKEP

Enzymes and Vitamins**Complete the following sentences**

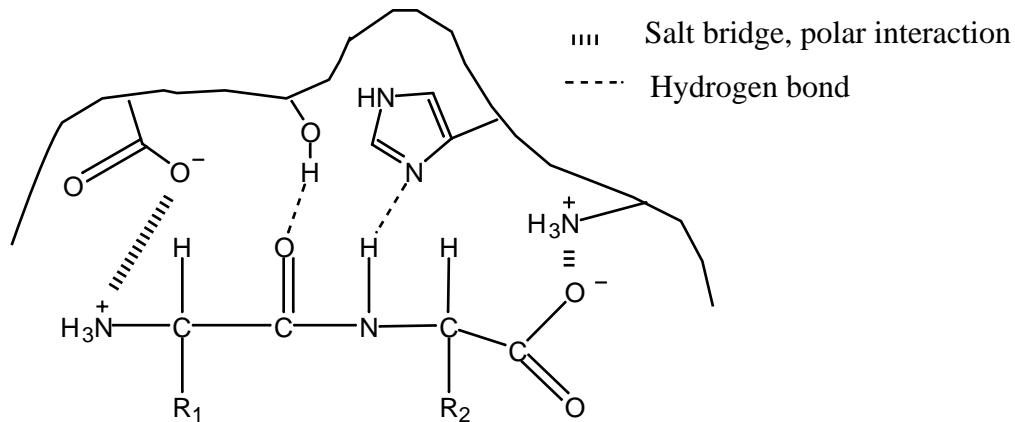
1. Addition of a catalyst increases the rate of a reaction.
2. A reaction that easily proceeds in either direction is equilibrium.
3. A reaction that absorbs heat from the surroundings is an endothermic reaction.
4. For a chemical reaction to occur, reactant molecules must collide.
5. In the induced - fit model of enzyme action, an enzyme can change its shape slightly to fit different substrates.
6. In non-competitive inhibition, an inhibitor changes the shape of an enzyme by binding at a location other than the active site.
7. If the temperature becomes too high, enzymes begin to denature.

True and False

1. False
2. False
3. False

Additional problems

1.



2. (a) competitive (b) non-competitive
3. (a) without enzyme (b) with enzyme

Carbohydrates

Complete the following sentences

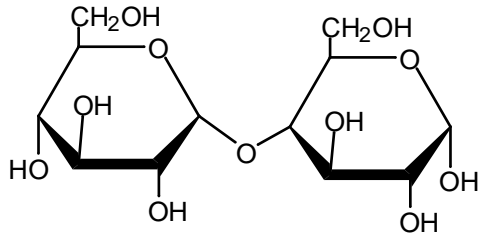
1. A reaction between an aldehyde carbonyl group and an alcohol hydroxyl group in the same molecule yields a hemiacetal.
2. Glycogen is used for food storage in animals.
3. D-Glucose can be classified as an aldohexose.
4. An object with handedness is said to be chiral.

True and False

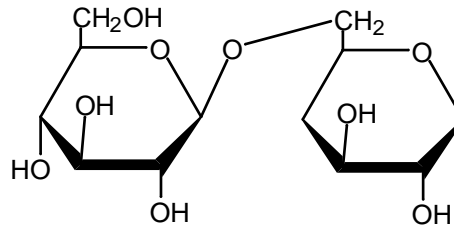
1. True
2. False
3. False. We did not cover diastereomers. The question was meant to be as follows:
Two **enantiomers** rotate plane-polarized light in equal amounts but in opposite directions. True

Additional problems

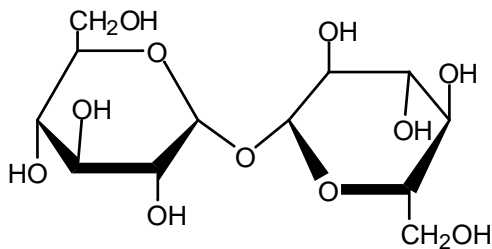
1. Label the glycosidic bonds on the following glucose disaccharides. Ex. $\alpha(1\rightarrow6)$, $\beta(1\rightarrow4)$ etc.



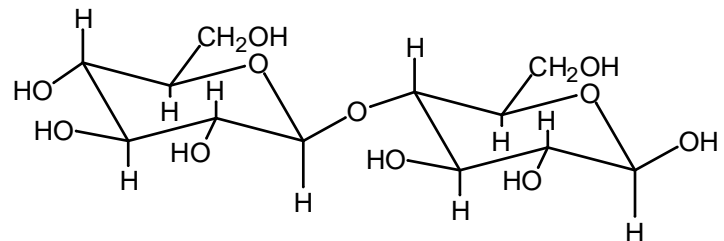
$\alpha(1,4)$



$\beta(1,6)$



$\alpha(1,1)$



$\beta(1,4)$

Lipids

Complete the following sentences

1. A triacylglycerol (or phospholipid) is a mixture of long-chain fatty acid chains.
2. The carboxylate end of a fatty acid is hydrophobic and the organic chain end is hydrophilic.
3. phospholipids, glycolipids, cholesterol, membrane proteins (possible answers) are components of cell membranes.
4. The common model of a cell membrane is called the fluid mosaic model.
5. Clusters of soap molecules in water are called micelles.
6. Phospholipids aggregate in a closed, sheet-like membrane called a lipid bilayer.

True or False

1. False
2. False
3. True. Fats and oils have different portions of saturated and unsaturated fatty acids, resulting in different melting points.
4. False.

Additional problems

1. The triacylglycerol that has the highest melting point has the greatest percent of saturated fatty acids. Of the four fatty acids listed, palmitic acid and stearic acid are saturated, and oleic acid and linoleic acid are unsaturated. Thus, if you add the percentage in the table you arrive at new table. All numbers are percentages.

	Saturated	Unsaturated
A	49.2	47.5
B	28.9	70.8
C	19.5	76.8

2. A – C₁₆ fatty acids: 21.4 % ; C₁₈ fatty acids: 75.3%. By increasing the amount of saturated fatty acids the melting point would increase.
3. Soaps (and detergents) have both hydrocarbon “tails” (hydrophobic) and polar “heads” (hydrophilic), and form micelles, in which the hydrocarbon “tails” surround greasy dirt and aggregate in the center of a cluster. The polar “heads” protrude into the aqueous medium and make the cluster soluble.