

## QUESTIONS FOR BIOCHEM PROJECT

### Ch 1 - Chemical Basis of Life

1. Scientific discipline that seeks to explain life at the molecular level  
B \_\_\_\_\_ (Biochemistry)
2. Major types of biomolecules  
Answers:  
A \_\_\_\_\_ A \_\_\_\_\_ (Amino Acid)  
C \_\_\_\_\_ (Carbohydrates)  
N \_\_\_\_\_ (Nucleotides)  
L \_\_\_\_\_ (Lipids)
3. Major Kinds of Biological Polymers  
Answers:  
P \_\_\_\_\_ (Proteins)  
N \_\_\_\_\_ A \_\_\_\_\_ (Nucleic Acids)  
P \_\_\_\_\_ (Polysaccharides)
4. It is the heat content of the system.  
E \_\_\_\_\_ (Enthalpy)
5. It is the measure of how the energy is dispersed within the system  
E \_\_\_\_\_ (Entropy)
6. The term called if a molecule gains an electron  
R \_\_\_\_\_ (Reduction)
7. The term called if a molecule loses an electron through addition of oxygen  
O \_\_\_\_\_ (Oxidation)
8. Organisms that lack discrete nucleus and usually contain no internal membrane systems  
P \_\_\_\_\_ (Prokaryotes)
9. Organisms that have usually larger cells and contain nucleus and other membrane-bound organelles  
E \_\_\_\_\_ (Eukaryotes)
10. Prokaryotic organisms that inhabit extreme environments  
A \_\_\_\_\_ (Archaea)

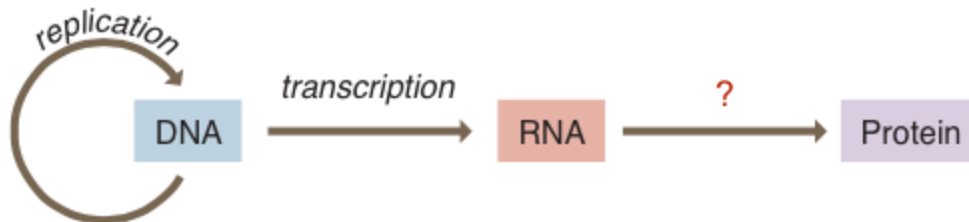
### Ch 2 - Aqueous Chemistry

1. Type of bond that holds the water molecule together  
H \_\_\_\_\_ B \_\_\_\_\_ (Hydrogen Bond)
2. The measure of an atom's affinity for electrons  
E \_\_\_\_\_ (Electronegativity)
3. Electrostatic interactions that occur between particles that are polar but not actually charged, usually weaker than hydrogen bond  
V \_\_\_\_ D \_\_\_\_ W \_\_\_\_\_ (van der Waals)
4. Term for substances that are readily hydrated or "water-loving"  
H \_\_\_\_\_ (Hydrophilic)
5. Term for substances that are relatively insoluble in water or "water-fearing"  
H \_\_\_\_\_ (Hydrophobic)
6. Molecules that have both hydrophilic or hydrophobic portions  
A \_\_\_\_\_ (Amphiphilic or Amphipathic)

7. It is the hydrogen ion concentration in a solution  
p \_ (pH)
8. General Example of a pH level  
A \_ \_ \_ \_ \_ (Acidic)  
B \_ \_ \_ \_ \_ (Basic)  
N \_ \_ \_ \_ \_ (Neutral)
9. A solution the prevents changes in pH when acid or alkali is added to it  
B \_ \_ \_ \_ \_ (Buffer)
10. Having an electrical or magnetic property, consisting of molecules with a dipole moment  
P \_ \_ \_ \_ \_ (Polar)

### Ch 3 - From Genes to Proteins

1. The structural units of nucleic acids are called:  
N \_ \_ \_ \_ \_  
Answer: Nucleotide
2. What is the complement (ie. pair) of the nitrogenous base guanine?  
C \_ \_ \_ \_ \_  
Answer: Cytosine
3. What is the main structural difference (ie. functional group) between thymine and uracil?  
M \_ \_ \_ \_ \_ g \_ \_ \_ \_  
Answer: Methyl group
4. What is the linkage between nucleotides called?  
P \_ \_ \_ \_ \_ b \_ \_ \_ \_  
Answer: Phosphodiester bond
5. Complete the central dogma of molecular biology:



- T \_ \_ \_ \_ \_  
Answer: Translation
6. What method provides a relatively easy and rapid way to amplify a segment of DNA?  
P \_ \_ \_ \_ \_ C \_ \_ \_ \_ R \_ \_ \_ \_ \_  
Answer: Polymerase Chain Reaction
  7. What conformation does DNA have?  
A \_ \_ \_ \_ h \_ \_ \_ \_  
Answer: Alpha helix

8. What type of nucleotide contains nitrogenous bases Adenine, Cytosine, Guanine and Uracil?

R \_ \_ \_ \_ \_ a \_ \_ \_

Answer: Ribonucleic acid

9. What carbohydrate structure is the backbone of DNA?

S \_ \_ \_ \_ - p \_ \_ \_ \_ \_ \_ \_

Answer: Sugar-phosphate

10. The short segments of DNA that are copied many times and inserted randomly into the chromosomes are called?

T \_ \_ \_ \_ \_ e \_ \_ \_ \_ \_ \_ \_

Answer: Transposable elements

#### Ch 4 - Protein Structure

1. What biological molecule consists of one or more polypeptides?

P \_ \_ \_ \_ \_

Answer: Proteins

2. Which amino acid group have essentially nonpolar side chains?

H \_ \_ \_ \_ \_ \_ \_

Answer: Hydrophobic

3. The polymerization of amino acids to form a polypeptide chain involves the \_\_\_\_\_ reaction (ie. removal of water molecule)

C \_ \_ \_ \_ \_ \_ \_

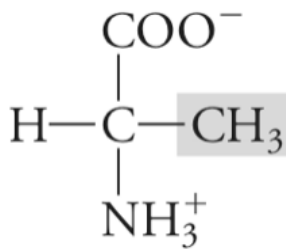
Answer: Condensation

4. What is the resulting amide bond linking the two amino acids called?

P \_ \_ \_ \_ \_ b \_ \_ \_

Answer: Peptide bond

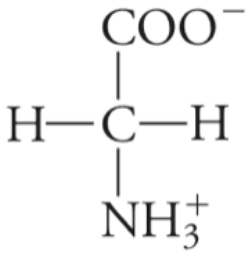
5. Which nonpolar amino acid is this?



A \_ \_ \_ \_ \_

Answer: Alanine

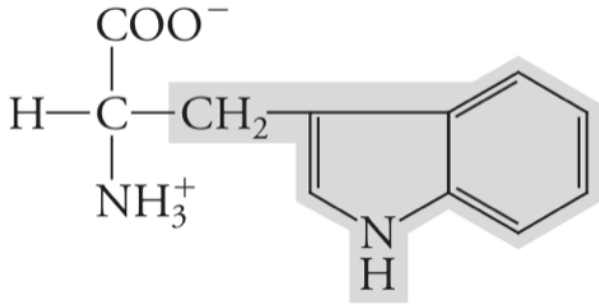
6. Which polar uncharged amino acid is this?



G \_ \_ \_ \_ \_

Answer: Glycine

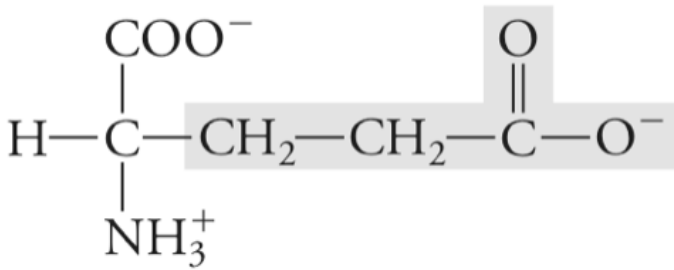
7. Which nonpolar amino acid is this?



T \_\_\_\_\_

Answer: Tryptophan

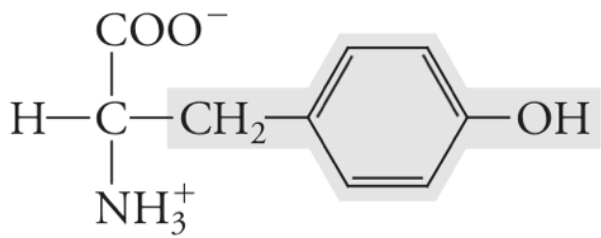
8. Which polar, acidic amino acid is this?



G \_\_\_\_\_

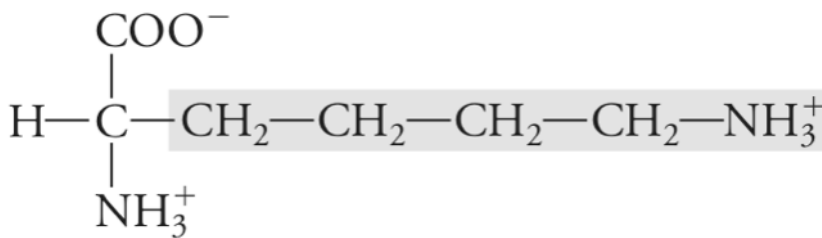
Answer: Glutamate

9. Which group does this amino acid, Tyrosine belong to?



P \_ \_ \_ \_ u \_ \_ \_ \_ \_  
 Answer: Polar uncharged

10. Which group does this amino acid, Lysine belong to?



P \_ \_ \_ \_ b \_ \_ \_ \_  
 Answer: Polar, basic

### Ch 5 - Protein Function

1. Protein that contains a heme prosthetic group that reversibly binds oxygen

M \_ \_ \_ \_ \_

Answer: MYOGLOBIN

2. Conformational state of hemoglobin corresponding to deoxyhemoglobin

T \_ \_ \_ \_

Answer: TENSE

3. Reduction of hemoglobin's oxygen-binding affinity when the pH decreases

B \_ \_ \_ E \_ \_ \_ \_

Answer: BOHR EFFECT

4. Net assembly at one end of a microfilament is balances net dissociation at the other end

T \_ \_ \_ \_ \_

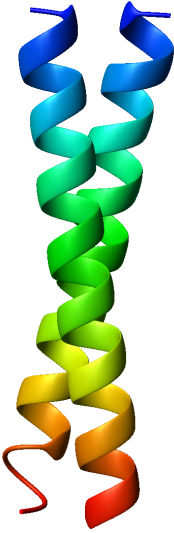
Answer: TREADMILLING

5. Structural proteins that are hollow tubes built from tubulin dimers

M\_\_\_\_\_

Answer: MICROTUBULES

6. Basic structural unit of an intermediate filament which is a dimer of  $\alpha$ -helices that wind around each other



C\_\_\_\_\_C\_\_\_\_\_

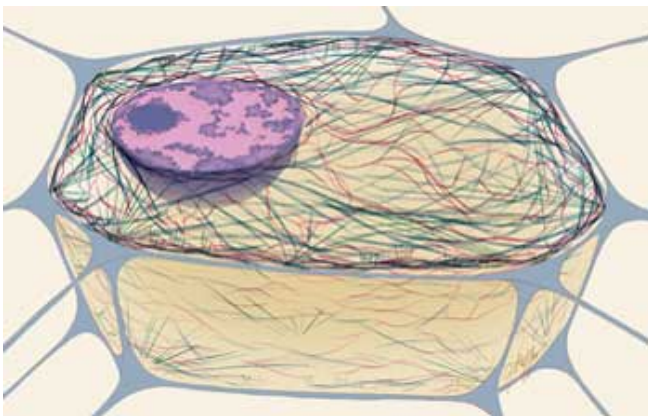
Answer: COILED COIL

7. Most abundant animal protein

C\_\_\_\_\_

Answer: COLLAGEN

8. Intracellular scaffolding consisting of a variety of proteins



C\_\_\_\_\_

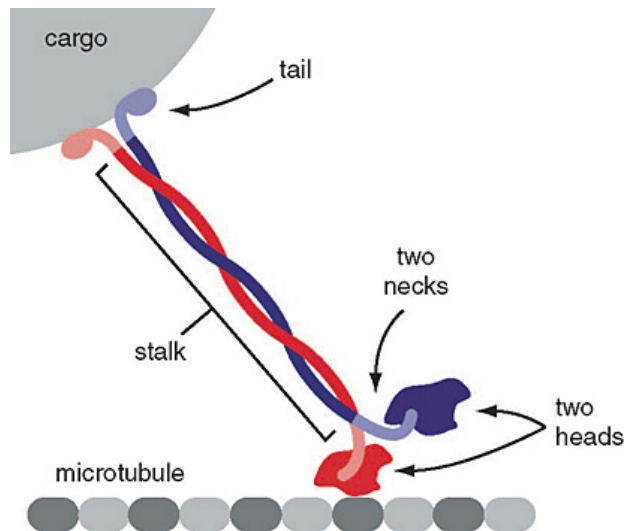
Answer: CYTOSKELETON

9. Proteins responsible for the movement of cells and organelles that operate along tracks provided by cytoskeletal fibers

M \_\_\_\_\_ P \_\_\_\_\_

Answer: MOTOR PROTEINS

10. Microtubule-associated motor protein that transports cargo by moving processively along a microtubule track



K \_\_\_\_\_

Answer: KINESIN

## Ch 6 - How Enzymes Work

1. Cleavage by water

H \_\_\_\_\_

Answer: HYDROLYSIS

2. Substance that participates in a chemical reaction yet emerges in the end in its original form

C \_\_\_\_\_

Answer: CATALYST

3. Area of the enzyme where the substrate binds

A \_\_\_\_\_ S \_\_\_\_\_

Answer: ACTIVE SITE

4. Multiple enzymes catalyzing the same reaction

I\_ \_ \_ \_ \_

Answer: ISOZYMES

5. Point of highest energy in a reaction coordinate diagram

T\_ \_ \_ \_ \_ S\_ \_ \_ \_

Answer: TRANSITION STATE

6. Chemical catalytic mechanism in which a proton is transferred between the enzyme and substrate

A\_ \_ \_ - B\_ \_ \_ C\_ \_ \_ \_ \_

Answer: ACID-BASE CATALYSIS

7. Interconvertible isomers that differ in the placement of a hydrogen and a double bond

T\_ \_ \_ \_ \_

Answer: TAUTOMERS

8. Compound in which the carbon atom bears a negative charge

C\_ \_ \_ \_ \_

Answer: CARBANION

9. An electron-rich group in search of an electron-poor center, which is usually the catalyst in covalent catalysis

N\_ \_ \_ \_ \_

Answer: NUCLEOPHILE

10. Phenomenon in which enzyme undergoes a pronounced conformational change to fully enclose substrate upon binding

I\_ \_ \_ \_ \_ F\_ \_

Answer: INDUCED FIT

## Ch 7 - Enzyme Kinematics and Inhibition

1. Types of Inhibition

- a. C\_ \_ \_ \_ \_ (Competitive)
- b. N\_ \_ \_ \_ \_ (Noncompetitive)
- c. M\_ \_ \_ \_ (Mixed)

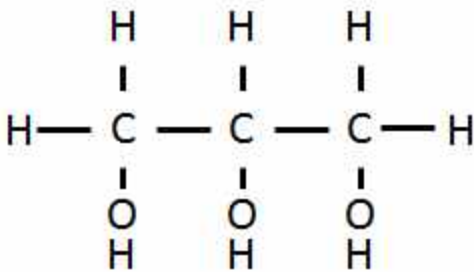


- d. U \_\_\_\_\_ (Uncompetitive)
  - e. P \_\_\_\_\_ (Product)
2.  $K_m$  is also known as the M \_\_\_\_\_ C \_\_\_\_\_ (Michaelis Constant)
3. Kinds of Mechanisms in Bisubstrate Reactions
- a. R \_\_\_\_\_ (Random)
  - b. O \_\_\_\_\_ (Ordered)
  - c. P \_\_\_\_\_ (Pingpong)
4. Types of Reactions
- a. U \_\_\_\_\_ (Unimolecular)
  - b. M \_\_\_\_\_ (Multisubstrate)
  - c. M \_\_\_\_\_ (Multistep)
  - d. N \_\_\_\_\_ (Nonhyperbolic)
  - e. F \_\_\_\_\_ - O \_\_\_\_\_ (First-Order)
  - f. S \_\_\_\_\_ - O \_\_\_\_\_ (Second-Order)
5.  $K_i$  is also known as the I \_\_\_\_\_ C \_\_\_\_\_ (Inhibition Constant)
6. The best known linear transformation of the velocity versus substrate curve is known as a L \_\_\_\_\_ - B \_\_\_\_\_ P \_\_\_\_\_ (Lineweaver-Burk Plot)
7.  $K_{cat}$  is also known as the
- a. C \_\_\_\_\_ C \_\_\_\_\_ (Catalytic Constant)
  - b. T \_\_\_\_\_ N \_\_\_\_\_ (Turnover Number)
8. Means "moving," From the greek word *kinetos*: K \_\_\_\_\_ (Kinetics)
9. The Michaelis-Menten equation was derived by
- a. L \_\_\_\_\_ Michaelis (Leonor) and
  - b. M \_\_\_\_\_ Menten (Maude)
10. Types of Effector
- a. P \_\_\_\_\_ (Positive)
  - b. N \_\_\_\_\_ (Negative)

## Ch 8 - Lipids and Membranes

1. Two types of Fatty Acids
- a. S \_\_\_\_\_ (Saturated)
  - b. U \_\_\_\_\_ (Unsaturated)
2. Protein that has a structure that is fully buried in the lipid bilayer aka Intrinsic Membrane Protein I \_\_\_\_\_ (Integral)
3. Two types of movement by membrane lipids
- a. T \_\_\_\_\_ D \_\_\_\_\_ (Transverse Diffusion) or F \_\_\_\_\_ - F \_\_\_\_\_ (Flip-Flop)

- b. L \_\_\_\_\_ D \_\_\_\_\_ ( Lateral Diffusion)
4. The temperature of transition from an ordered crystalline state to a more fluid state M \_\_\_\_\_ P \_\_\_\_\_ (Melting Point)
5. Long-chain carboxylic acids F \_\_\_\_\_ A \_\_\_\_\_ (Fatty Acids)
6. What is this?



G \_\_\_\_\_ (Glycerol)

7. A protein to which carbohydrate is covalently attached G \_\_\_\_\_ (Glycoprotein)
8. A protein structure consisting of a Beta Sheet rolled into a cylinder B \_\_\_\_\_ B \_\_\_\_\_ (Beta Barrel)
9. Having both polar and nonpolar regions and therefore being both hydrophobic and hydrophilic A \_\_\_\_\_ (Amphiphilic) or A \_\_\_\_\_ (Amphipathic)
10. A model of biological membranes in which integral membrane proteins float and diffuse laterally in a fluid lipid layer F \_\_\_\_\_ M \_\_\_\_\_ M \_\_\_\_\_ (Fluid Mosaic Model)

## Ch 9 - Membrane Transport

### 1) Type of transmembrane channels

V \_\_\_\_\_ -g \_\_\_\_\_ C \_\_\_\_\_ (Voltage-gated Channel)

M \_\_\_\_\_ C \_\_\_\_\_ (Mechanosensitive Channel)

L \_\_\_\_\_ -g \_\_\_\_\_ C \_\_\_\_\_ (Ligand-gated Channel)

A \_\_\_\_\_ (Aquaporins)

P \_\_\_\_\_ I \_\_\_\_\_ C \_\_\_\_\_ (Potassium-ion Channel)

C \_\_\_\_\_ F \_\_\_\_\_ C - C \_\_\_\_\_ (Cystic Fibrosis Cl<sup>-</sup> Channel)

### 2) The difference in the chemical charge across a membrane

M \_\_\_\_\_ P \_\_\_\_\_ (Membrane Potential)

3) Active transporters that mediate transporter ion movement

N\_\_\_\_\_ (Na,K-ATPase)

A\_\_\_\_\_ C\_\_\_\_\_ T\_\_\_\_\_ (ATP-binding Cassette Transporters)

4) Passive transporters that mediate transporter ion movement

U\_\_\_\_\_ G\_\_\_\_\_ T\_\_\_\_\_ (Uniport Glucose Transporters)

R\_\_\_\_\_ B\_\_\_\_\_ C\_\_\_\_\_ T\_\_\_\_\_ (Red Blood Cell Transporters)

P\_\_\_\_\_ (Porins)

5) Classifications of ligands

U\_\_\_\_\_ (Uniport)

S\_\_\_\_\_ (Symport)

A\_\_\_\_\_ (Antiport)

6) Reversal of membrane potential

D\_\_\_\_\_ (Depolarization)

7) Individual, unfolded proteins that spontaneously zip to form a four-helix complex

S\_\_\_\_\_ P\_\_\_\_\_ (SNARE Proteins)

8) Addition of another phosphate group to a phosphorylated phosphatidylinositol is required during the production of a new \_\_\_\_\_.

V\_\_\_\_\_ (Vesicle)

9) Inward folding and budding of the plasma membrane to form a new intracellular vesicle.

E\_\_\_\_\_ (Endocytosis)

10) A neurotransmitter that is released when synaptic vesicles fuse with the plasma membrane.

A\_\_\_\_\_ (Acetylcholine)

## Ch 10 - Signaling

1) Extracellular signals

A\_\_\_\_\_ (Auxin)

C\_\_\_\_\_ (Cortisol)

E\_\_\_\_\_ (Epinephrine)

E\_\_\_\_\_ (Erythropoietin)

G\_\_\_\_\_ H\_\_\_\_\_ (Growth Hormone)

N\_\_\_\_\_ O\_\_\_\_\_ (Growth Oxide)

T\_\_\_\_\_ (Thromboxane)

2) The interaction of different signal transduction pathways through activation of the same signaling components

C\_\_\_\_\_ (Cross-talk)

3) A cell surface receptor whose intracellular domain becomes active as a Tyr-specific kinase as a results of extracellular ligand binding.

R\_\_\_\_\_ T\_\_\_\_\_ K\_\_\_\_\_ (Receptor Tyrosine Kinase)

4) A cell's adaptation to long-term stimulation through a reduce response to the stimulus

D\_\_\_\_\_ (Desensitization)

5) The ability of the cells to monitor population density by detecting the concentrations of extracellular substances

Q\_\_\_\_\_ S\_\_\_\_\_ (Quorum Sensing)

6) GPCR meaning

G P\_\_\_\_\_ - \_\_\_\_\_ R\_\_\_\_\_ (G Protein-coupled Receptors)

7) The level of cAMP determines the level of activity of \_\_\_\_\_

P\_\_\_\_\_ K\_\_\_\_\_ A (Protein Kinase A)

8) The signaling activity of the G protein is limited by the intrinsic \_\_\_\_\_ of the alpha subunit, which converts the bound GTP to GDP

G\_\_\_\_\_ (GTPase)

9) The phosphorylation of kinase by another molecule of the same kinase.

A\_\_\_\_\_ (Autophosphorylation)

10) Compounds derived from the C20 fatty acid arachidonic acid, which act in or near the cells that produce them and mediate pain, fever and other physiological responses.

E\_\_\_\_\_ (Eicosanoids)