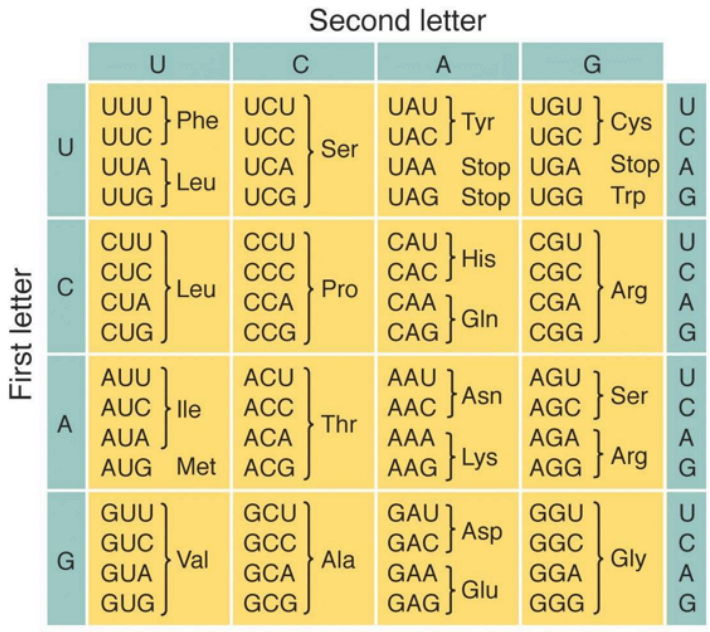
Exam II

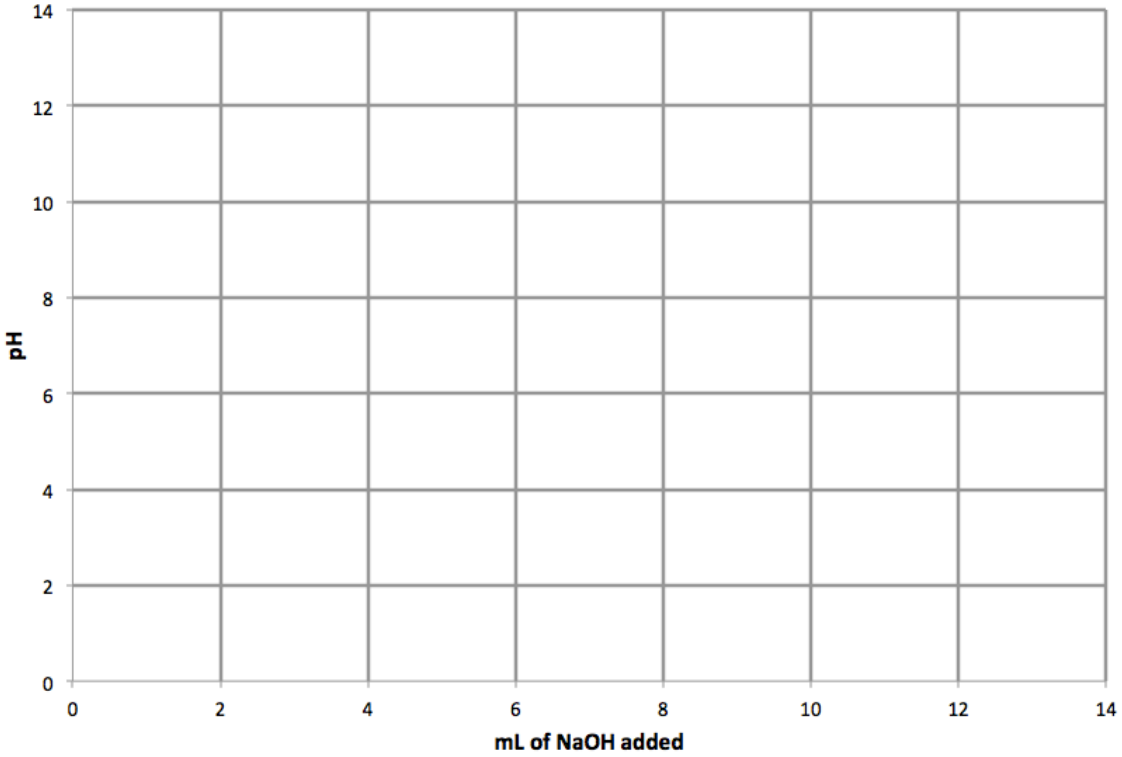
Name: _____

glycine	2.35; 9.78
alanine	2.35; 9.87
valine	2.29; 9.74
leucine	2.33; 9.74
isoleucine	2.32; 9.76
methionine	2.13; 9.28
proline	1.95; 10.64
phenylalanine	2.20; 9.31
tryptophan	2.46; 9.41
serine	2.19; 9.21
theronine	2.09; 9.10
asparagine	2.14; 8.72
glutamine	2.17; 9.13
tyrosine	2.20; 9.21
cysteine	1.92; 10.70
lysine	2.16; 9.06; 10.54
arginine	1.82; 8.99; 12.48
histidine	1.80; 9.33; 6.04
aspartic acid	1.99; 9.90; 3.90
glutamic acid	2.10; 9.47; 4.07

C	12.01 g mole^{-1}
H	1.008 g mole^{-1}
N	14.01 g mole^{-1}
O	16.00 g mole^{-1}



1.) Draw a theoretical titration curve of Trp on the grid below. Assume the titration starts at pH 1 and that the end point is reached by the time that 14 mL of NaOH have been added.

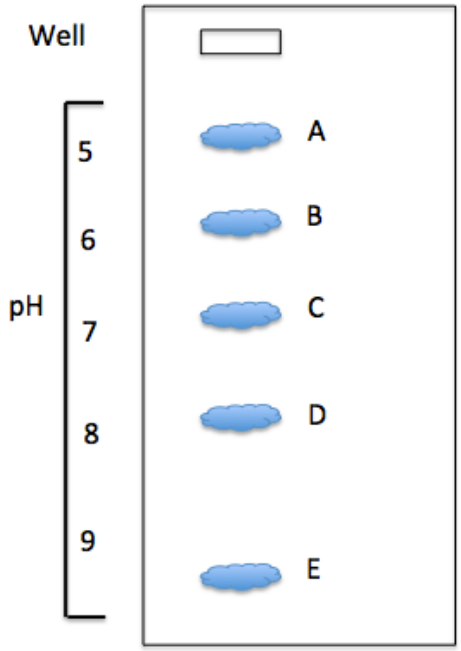


2.) Draw all of the predominate forms of Trp at pH 9.26 indicating the correct stereochemistry around the alpha-carbon by using solid and striped wedges (triangles) for appropriate bonds (as in organic chemistry). Determine what percent of the total Trp molecules are in each form.

3.) Draw the peptide GERMANY?

4.) Circle <u>all</u> the peptide bonds within the peptide drawing.

5.) The image below could be the result of an isoelectric focusing gel, which contains a pH gradient (as indicated). If a mixture of five peptides including the peptide GERMANY were loaded into the well, which band (A, B, C, D, or E) contains the peptide GERMANY?



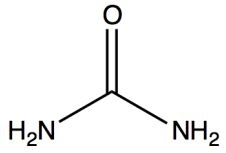
6.) Indicate the sign (positive or negative) of the applied electrical potential on <u>each</u> end of the gel which would separate the peptides as drawn.

7.) If the following mRNA were translated by the ribosome starting at the 5' end, how many amino acids would the resulting peptide contain?

5'- UAUAAUGCAAUGCGGGAAGGCUGAUCACUCCCA-3'

8.) If the mRNA in *question 7* was completely matured by a eukaryotic cell, would it contain introns, exons, introns and exons, or neither introns or exons?

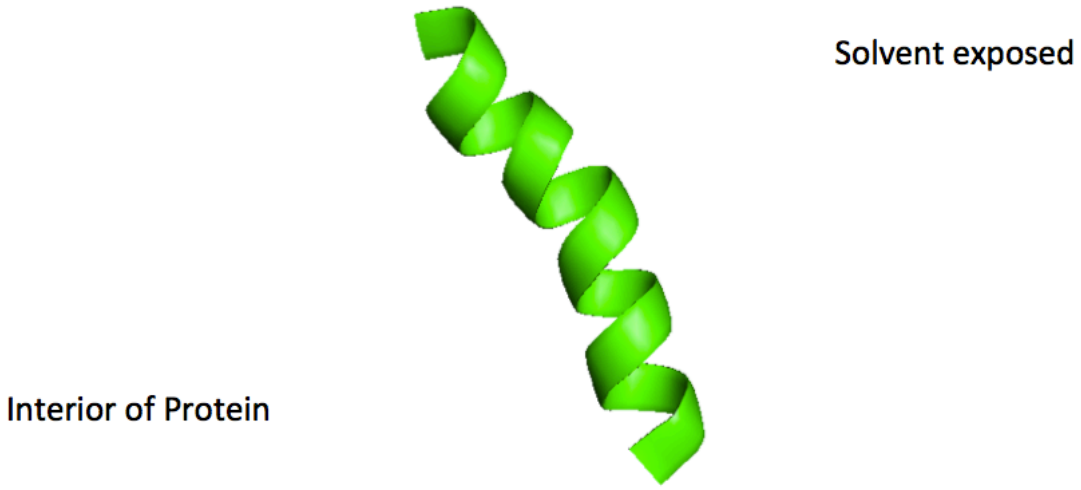
9.) <u>Explicitly</u> describe how to make 500 mL of an 8 M solution of urea.



10.) <u>Explicitly</u> describe how to make 5 mL of the desired solution from the stock solutions:

Desired final solution:	Stock Solutions/liquids:
12.5 uM BSA	100 uM BSA
3.5 M urea	8 M urea
	dH_2O

11.) Imagine that the cartoon helix shown below is on the outer boundary (surface) of a globular protein. One side of the helix is exposed to the solvent while the other side faces the interior of the protein. **Draw the chemical structure of six unique amino acid side chains connected to the helix that you would expect to find exposed to solvent. Identify each by its name or letter designation.**



12.) Identify two types of intermolecular forces acting on side chains of the outer, solvent-exposed protein surface.

13.) Draw the chemical structure of six unique amino acid side chains connected to the helix that you would expect to find oriented towards the interior of the protein. Identify each by its name or letter designation.

14.) Identify two types of intermolecular forces acting on side chains of the interior of the protein.

15.) Imagine that you have just discovered a suicide inhibitor (irreversibly modifies an enzyme which renders it useless) of the enzyme EF-Ts. You add the inhibitor to a culture of bacterial cells. The inhibitor permeates into the cytoplasm. **Explicitly describe the effect you expect the inhibitor to have on the cell.** Make sure to comment on the expected changes in the populations of molecules (for example, but certainly not limited to aminoacyl-tRNAs and free tRNAs) as well as the state of the ribosome and each tRNA site within the ribosome.

16. The mechanism utilized by aminoacyl-tRNA synthetases (Type I or II) involves the hydrolysis of the high potential-energy phosphate ester bond of ATP. **Explicitly, describe the role (chemical necessity) that ATP plays in the aminoacyl-tRNA synthetase mechanism.** [You need to write more than that the reactions are coupled to make the overall process favorable]

Name: _____

This must be completed in 15 minutes.
Time in: _____
Time out: _____

Open the structure of phosphofructokinase (PFK), inhibited in the T-state in PyMol. Using only PyMol [remember that you are bound by the provisions of the Academic Policy Manual], answer the following questions about PFK.

1. F139 is the first residue (N-terminal) of an alpha helix. **What is the last residue (C-terminal) of this alpha helix?**

2. **Is this helix right- or left- handed?**

3. K50 is a residue within a beta strand, which is in turn part of a larger beta sheet. **Is this beta sheet parallel or anti-parallel?**

4. **What are the overall dimensions (length x width x height in Å) of PFK?**

5. **What is the distance between the guanidium group of R211 and the carboxylic acid of 2-phosphoglycolic acid (PGA)?**