

Spring 1998 Molecular Biology Exam #1 - Learning the Tools

There is no time limit on this test, though I have tried to design one that you should be able to complete within 2.5 hours, except for typing. You are not allowed to use your notes, or any books, nor are you allowed to discuss the test with anyone until Monday Feb. 2, 1998. **EXAMS ARE DUE AT 8:30 ON MONDAY, FEBRUARY 2.** You may use a calculator and/or ruler. The **answers to the questions must be typed on a separate sheet of paper** unless the question specifically says to write the answer in the space provided. If you do not write your answers on the appropriate pages, I may not find them unless you have indicated where the answers are.

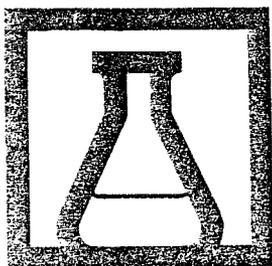
-3 PTS IF YOU DO NOT FOLLOW THIS DIRECTION:

Please do not write or type your name on any page other than this cover page. Staple all your pages (INCLUDING THE TEST PAGES) together when finished with the exam.

Name (please print here):

Write out the full pledge and sign:

How long did this exam take you to complete (excluding typing)?



CHEMISTRY at DAVIDSON

Department of Chemistry

Davidson College

Box 1749

Davidson, N.C. 28036

Chemistry Colloquium

Understanding Solute/Micelle Interactions

Professor Mark F. Vitha

University of Minnesota – Duluth

		Second Position									
		U		C		A		G			
First Position (5' end)	U	UUU] Phe UUC] UUA] Leu UUG]	UCU] Ser UCC] UCA] UCG]	UAU] Tyr UAC] UAA] Stop UAG] Stop	UGU] Cys UGC] UGA] Stop UGG] Trp	U C A G					
	C	CUU] Leu CUC] CUA] CUG]	CCU] Pro CCC] CCA] CCG]	CAU] His CAC] CAA] Gln CAG]	CGU] Arg CGC] CGA] CGG]	U C A G					
	A	AUU] Ile AUC] AUA] Met AUG]	ACU] Thr ACC] ACA] ACG]	AAU] Asn AAC] AAA] Lys AAG]	AGU] Ser AGC] AGA] Arg AGG]	U C A G					
	G	GUU] Val GUC] GUA] GUG]	GCU] Ala GCC] GCA] GCG]	GAU] Asp GAC] GAA] Glu GAG]	GGU] Gly GGC] GGA] GGG]	U C A G					
										Third Position (3' end)	

F

.m.

Presentation in Thurman Room at 4:00 p.m.

* * The Tenth in a Series * *

6 pts.

1. Draw a nucleotide that makes DNA sequencing possible (not an ordinary nucleotide). To receive full credit, you must draw all of the atoms except for the base which you may label with a single letter. Also, label the 5' and 3' ends properly.

6 pts.

2. Draw the structure of a single amino acid. You do not need to include the side chain in your drawing but you do need to include all the other atoms. Also, indicated where the next amino acid would be added onto the one you have drawn.

16 pts.

3. Tell me how you would do the following:

a. 250 mL of a solution that is 123 mM NaCl, 5% SDS (v/v if the stock solution of SDS is 20% w/v), 0.01 M Tris-HCl, pH 7.5. (FW NaCl = 58.44; FW Tris = 121; FW SDS = 288.4)

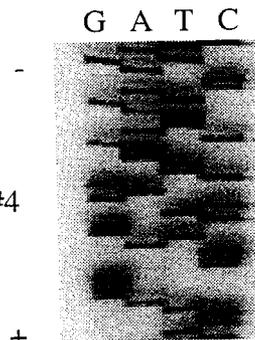
b. Determine the concentration of a stock DNA solution if 1 μ L of the stock was added to 399 μ L of water and this solution had an OD₂₆₀ of 0.038. (1 OD₂₆₀ unit has a concentration of 50 μ g/mL dsDNA.)

c. Using the number you have calculated above, tell me how you would make a 10 μ L solution that contains 100 ng of DNA.

d. Make a solution that is 150 mM NaCl, 2 M KOH (stock solution is 5 M KOH), and 0.1 M SDS.

10 pts.

4. Write down the sequence of this DNA from 5' to 3' (cluster the letters into threes, please)



4 pts.

5. Find the ORF and indicate its location on your sequence for #4 above.

6 pts.

6. Translate this cDNA sequence using the table provided in this test. Translate as much as you can.

6 pts.

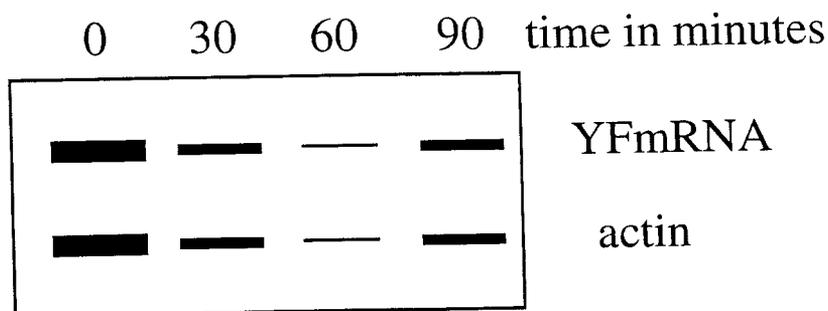
7. Go to the following URL: <www.bio.davidson.edu/Biology/Courses/Molbio/01seq/fluorseq.html>.

a. Answer the question at the top of the page.

b. Is there any sequence shown that is from the plasmid? Explain your answer.

8 pts.

8. Below is a diagram that summarizes some data from a northern blot experiment. Your Favorite mRNA (YFmRNA) from the thymus has been probed at the same time as actin, which is expressed at constant levels at all times and in all cells. Interpret the data as fully as you can. The time indicates how long the cells had been incubated in a drug which alters calcium levels inside cells.



14 pts.

9. Provide the full names for these single letter codes for amino acids:

Y E L L W S M A R I N E Q T

8 pts.

10. Recently it has been learned what the molecular cause is for long term potentiation (LTP), which is the mechanism for memory (true story). It turns out that an ion channel called (NMDA) in the hippocampus is the primary cause for our ability to learn (for this question, let's assume there is only one kind of NMDA in the hippocampus). Explain to me how you would go about cloning the gene that encodes for this particular NMDA - you only need to list the major steps you would do. To receive full credit, you will need to demonstrate to me how you would know you had cloned the right gene.

6 pts.

11. Aliens have in fact landed and are slowly killing all humans. The only way you can tell them from us (i.e. humans) is that their red blood cells glow green when exposed to UV light. Design a vector with an insert that would allow you to have every red blood cell in your body express the reporter gene GFP but no other cell would do this. (Let's assume that once you build this construct, getting it into all of your cells will be taken care of by someone else.) In your design, I want you to draw out every part of the DNA that would be important to the success of building and maintaining this vector. The future of all human beings depend upon your abilities. Good luck.

10 pts.

12. Tell me the function of each of the following in a PCR reaction:

a. Taq b. dNTPs c. DMSO d. 55° C e. 95° C