

Microbial Genetics Exam I Fall 1996

Your Name: _____

1. What is the chemical group at the 5' end of a molecule of RNA?
2. Which of the following molecules is more likely to fold into a stable stem-loop structure?
a) 5'-GCAUGCCUGCGUCCGUACG-3 b) 5'-GCAUGCCUCUUAGGCAUGC
3. What is the name of the bond formed between:
...purine (or pyrimidine) base and ribose (or deoxyribose)
...amino acids in proteins:
...nucleotides in DNA:
4. Synthesis of proteins from mRNA is called
5. What is the direction of synthesis of a polypeptide chain?
6. What distinguishes the RNA polymerase holoenzyme from the core enzyme?
7. Briefly, what is the difference between a selection and a screen?
8. Would you expect to find a Shine-Dalgarno sequence on a tRNA molecule? Explain your answer.
9. Is this molecule a nucleoside or nucleotide? How do you know?

Would you find this molecule in RNA or DNA? How do you know?

10. a) Briefly, what is the hypochromic effect?

b) What type of plot is shown in the figure at right?

c) What is the designation of the parameters labeled a and b ?

d) Which bacterial strain (A or B) would you predict has the higher %G+C? Explain.

11. Describe the plating technique you could use to distinguish between a wild-type bacteriophage and an extended host-range mutant of that phage.

12. How is it that the CsCl-Ethidium bromide gradient centrifugation technique allows you to separate linear fragments of DNA from small, circular (plasmid) DNA?

13. What is the role and mode of action of lysozyme in a chromosomal DNA isolation procedure? ..of phenol?

14. Provide a molecular explanation for the fact that the four codons for alanine - GCA, GCC, GCG, and GCU - can be translated correctly with only two tRNA molecules.

15. Compare and contrast the hydrogen-bonding (H-bond) patterns of the DNA double helix with those of the protein alpha helix.

16. You are a geneticist trying to isolate auxotrophic mutants of the newly isolated bacterium *B. humble*. You have carried out mutagenesis experiments to the point that you feel confident that one in every 100 or so cells in your suspension is a mutant. Describe how you could use replica plating with complex medium plates and minimal medium plates to isolate colonies of auxotrophic mutants.

b) as a result of your efforts, you now have two suspected auxotrophs. Use the data below, and Table 1 in the appendix, to identify the auxotrophic mutants.

Mutant	Growth on pools:										
	1	2	3	4	5	6	7	8	9	10	11
<i>aux-1</i>	-	+	-	-	-	-	-	+	-	-	-
<i>aux-2</i>	-	-	-	+	-	-	+	-	-	-	-

aux-1: _____

aux-2: _____

c) A third auxotroph (*aux-3*) grew only on pool 5. In general terms, what does this tell you?

d) You proceed to show that your *aux-3* mutant does not require thiamine. You do the platings described in the table below. What is your conclusion about the nutritional requirements of *aux-3*?

Medium supplement	growth
1. val, pro, arg	-
2. val, pro, gly	+
3. val, arg, gly	+
4. pro, arg, gly	-

17. Describe the use of DNaseI footprinting in defining the role of the bacterial promoter.