

17) “What is SRY, what is its function” *verbatim from study guide—told you it was coming*. (3pt)

18) The cells in your body each have the same genome. Skin cells, lung cells and retinal cells express many of the same genes but they also each express genes that are specific to that cell type. Explain the regulation of this differential gene expression. Do not invoke signals from outside of the cell. Discuss regulation of gene expression occurring within a cell that allows it to be ‘lung’ and a different cell to be ‘retina’. (6pt)

In lab you have begun a study of gene expression and protein targeting by studying flagella regeneration in an algae. You decide to gather more data and prepare another set of cells for a regeneration study. At different time points you treat the cells with Lugols. You then prepare slides and examine them a binocular microscope that has two 10x oculars and a 60x objective, the condenser is 1/8in below the stage and you are using dark field microscopy.

19) What is the name of the organism you are studying? (include both genus and species) (2pt)

20) Is the algae a prokaryote or a eukaryote? (1pt)

21) What is the total magnification provided by this microscope setup? (2pt)

22) How is an allele different from a locus? (4pt)

23) What are the basic components of a eukaryotic gene? (Include a well-labeled diagram) (Note this is a 5pt question. Long explanations of each feature are not required. A short sentence will suffice.) (5pt)

8) Explain why the mother, child and S1-S2 each have two bands but individual S3 has only one band. Be sure to use appropriate genetic vocabulary. (3pt)

BONUS: Consider samples S4 in the picture above: provide two situations in which S4 could *not* be the child's father. (2pt)

9) Provide two ways that DNA replication is similar to PCR and two ways that the processes differ. (10pt)

+++++

10) Given the severity of the Sickle Cell phenotype provide two reasons that contribute to why the disease has remained in the gene pool. (6pt)

11) Sickle Cell is caused by a change of a glutamate to a valine. What are glutamate and valine? (type(s) of molecule) (2pt)

BONUS: Draw either valine or glutamate (2pt)

12) A couple that is planning to have children comes to you to help determine the chances that their children will have SC. Both parents have a very mild form of the disease.

A) If their first child has SC, what is the probability that their second child will have SC? (3pt) (explain using something similar to 'Their second child has a \_\_\_\_ chance of having SC because.....')

B) What is the probability that two children will have severe SC and that the third will be a carrier? (3pt) (explain in a similar format to that used in A)

13) Describe and name the wildtype version of the protein that has been shown to be responsible for the CF phenotype. Include a well-labeled diagram. (8pt)

14) Briefly describe the three steps involved in translating the 'CF gene'. (100word max, include word count (Word will do this→ tool menu)) (5pt)

15) Where in the cell does the translation of CF take place? (Be specific) (3pt)

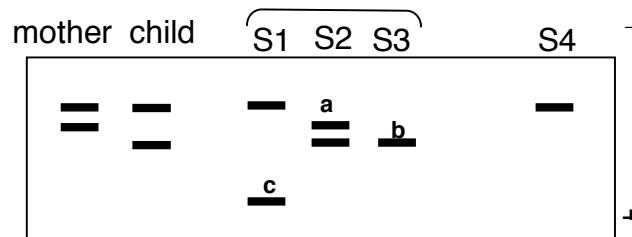
16) Seventy percent of people with CF have the same mutation. What is the mutation and how does this change result in the CF phenotype? (6pt)

In this unit we discussed a number of techniques that can be used to identify and confirm the gene responsible for a particular inherited trait. These techniques included Southern Blot analysis, Northern Blot analysis, Linkage analysis, Pedigree Analysis, Immunocytochemistry, and Transfection.

You are interested in studying ‘multi-taskosis’ a genetically inherited trait that compels an individual to do multiple things at the same time (such as reading homework, listening to their iPod and watching the March basketball tournament, or eating with friends while talking on the phone and recopying lecture notes). You believe that the trait exhibits a dominant inheritance pattern.

- 1) Choose *one* of the techniques listed above. Explain what that technique is and how you could use it to support your hypothesis. (Make certain that your explanation states what results will support your hypothesis.) 5pt
- 2) Choose *a different* technique from the list. Explain how that technique could be used to extend the research you began and increase your understanding of the genetic cause of multi-taskosis. 5pt
- 3) Choose a *final* technique from the list and explain what it is. 3pt

The following questions (#4-9) refer to the VNTR analysis shown below.



- 4) What type of molecule is being examined in this type of analysis? (1pt)
- 5) Three of the bands are labeled a, b, or c. Which band has the smallest molecular weight and how do you know this? (3pt)
- 6) Five different banding patterns are seen in the individuals above. Each was produced in PCR that used the same two primers. Explain how two primers used in the same technique can result in bands of different sizes in different people. (5pt)
- 7) S1- S3 represent samples submitted in paternity tests trying to determine the father of the child whose VNTR pattern is shown. The mother listed is the biological mother. Explain how the data given *supports or excludes* S1 through S3 as being the father. Be sure to discuss each one. (6pt)

## Biology 111: Unit 2 Genetics

March 2006

The review is **DUE Friday March 24<sup>th</sup> before 4pm.** Sign it in at my office. Watson 289. Hand the review to me or slide it completely under the door to my office.

Refer to the syllabus for information about course policies regarding tests and other written assignments.

- There is no time limit for taking the review except for the final due time. It was designed to be completed in 2 hours and I suggest you use that as a guideline but do not wait until the last minute to begin. You must leave time to print and deliver.
- This is a closed-book, closed-note review. Once you have seen any question your review period has begun.
- This page must be the first page of your answer packet. Fill out this page and attach it to the ones containing your answers. The top of each additional page in the packet should contain only your initials and the page number.
- All answers must be typed and in complete sentences unless otherwise indicated. Any accompanying *graphs or figures may be hand-drawn*.
- You may use a calculator for +, -, \*, and / only. To receive full credit all calculations must be included. Calculations/equations may be hand written and do not need to be sentence form. The answer to the question requiring the calculation should be in sentence form.
- Brevity is encouraged. Be sure to completely answer the question asked.

Any questions about the review should be directed to me at [kabernd@davidson.edu](mailto:kabernd@davidson.edu), x2889 or 704 662 9744. Calls to my home must occur before 9:30pm.

Name: \_\_\_\_\_(PRINT)

*Write out the Honor Code Pledge ("On my honor I pledge.....")*

---

---

---

---

Signature: \_\_\_\_\_

This review was completed in \_\_\_\_\_ hours. I began it at \_\_\_\_\_ on \_\_\_\_\_  
time date