

## Final Assignment

Consider this a homework assignment in that you may spend time as you see fit, read what you need, look up terms in a dictionary, consult with me, etc.. You should also think of it as an exam, in that it is an opportunity for you to show that you have mastered the material of this course.

If enough students express interest, we can schedule a review session during which we discuss these topics.

The approximate length of each answer is indicated by the word number in parentheses. Type your answer in Word, highlight it, and use Tools/Word count to find out how long it is. (Use these numbers as a guide to see that you are in the right ballpark. Don't do any heroic editing to try to match the number exactly.)

If you find you need to use references, document them properly, including page numbers in our 3 books that you find useful.

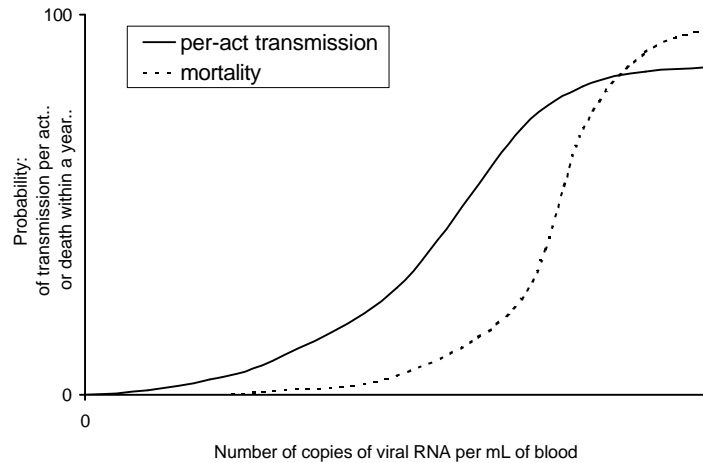
Email your answers to me or put a printed copy of them in my mailbox (first floor Clapp, outside Biology Department office) by the last day of finals.

1. Revise your original definition of gene. Explain your revision. (75-100 words)
2. Define dominance, first in terms of patterns of inheritance, and second, in terms of biochemistry or molecular biology. Then explain the factor(s) determining the frequency of an allele in a population. (100-150 words)
3. In the 1960's, there was great hope that the insecticide DDT would make the eradication of malaria possible. Hope faded as mosquitoes became resistant to it. Explain DDT resistance in *Anopheles* mosquitoes in terms of natural selection. (75-125 words)
4. Why are non-coding regions of DNA used in forensic analysis? What is mitochondrial DNA and why is it used in phylogenetic analysis? (75-150 words)
5. Distinguish between a prion, a virus, a bacterium, and a protist (oh, all right: a non-plant, non-animal, non-fungal eukaryote). Which one(s) can do mitosis? Explain why or why not. Give an example of a pathogen in each category, using its proper scientific name. (100-175 words)
6. Define "clade". From page 1 of your Parasites handout, what is the smallest clade that includes all the protist parasites listed in the handout? (30-50 words)
7. Distinguish between the virulence and prevalence of a disease. Can one be high and not the other? Explain. (50-75 words)

8. Consider the hypothetical disease Virus, which replicates inside white blood cells, and is only transmitted sexually:

Here is a graph showing the probability of V transmission in a single act of intercourse and the probability of death within a year, both as a function of number of viruses present in the infected partner.

There are 2 strains of V: A, which reproduces extremely rapidly inside its host, and B, which reproduces very slowly inside its host.



Which strain is most likely to be fatal sooner? Explain.

VA and VB are introduced into two populations. In both populations, people have sex 100 times a year, but in Pop 1, they have 100 one-night stands, and in Pop 2, they only switch partners once every 10 years. What is the maximum number of possible transmissions per year of Virus in Pop 1? in Pop 2?

What is the criterion of evolutionary success for a pathogen? Which strain of V will more likely achieve that success in Pop 1? Explain. Which strain will more likely achieve that success in Pop 2? Explain. (150-200 words)

9. Why has explaining the origin of sex been such a problem for evolutionary biologists for the past century? (60-90 words)

How does thinking about disease help resolve this problem? (100-150 words)

10. What is the advantage to having 2 sexes (instead of some other number)? (30-60 words)