Dr. Reichler's Bio 311D class time:_____ Print Name:_____KEY_____
Exam #1 February 6, 2008

Read each question carefully and don't hesitate to ask if a question seems unclear. If possible, answer each question in the space provided, but if needed, continue on the back. If you use a drawing as part of your answer, be sure to also include a written explanation. **For any inheritance problem, you must show your work to receive partial credit.** These questions have specific answers, although for some, more than one answer is possible. To receive full credit you must clearly and fully answer the question being asked. The points for each question are noted in parentheses totaling 103 points.

1. Using rules one and two of Strong Inference answer the following question: What is the genetic relationship between these two human alleles of a gene, F= drives quickly and S= drives slowly (this is a hypothetical example)? (15 pts)
Propose two or more hypotheses and at least one experiment to eliminate the hypotheses.
Hypo's- F is dominant. F and S are codominant. S is dominant.
Expt- Cross true-breeding individuals for F and S and see what phenotype the heterozygous offspring have.

2. Using data obtained showing a similarity between identical twins that grew up in different families, researchers claim to show that a trait is purely genetic. Did they correctly use Strong Inference? Why or why not? (10 pts)
No, they are trying to prove an idea, not disprove.

3. How could crossing-over occur without any effect on the genotypes of the gametes? (10 pts)
If the alleles were the same, homozygous.

4. How many DNA double helices are in a human cell that has finished meiosis I but not meiosis II? Explain. (10 pts)
46, the 23 pairs are replicated before meiosis so it starts with 92 chromosomes, and then the pairs are divided during meiosis I which leaves 46.

5. If you wanted to study a gene on the mitochondrial DNA, how could you obtain a large group of people with the same mitochondrial DNA? (10 pts)
Look for people who are maternally related.

6. If cat sex determination is the same as humans and a gene regulating cat tail length is on the X chromosome with two alleles "long tail" and "short tail" that have incomplete dominance, would you ever find a male cat with a medium length tail? Why or why not?
(Show your work to receive partial credit.) (10 pts)
No, males only have one X chromosome. In some unusual circumstances such as XXY, there could be males with medium tails.

7. John has AB blood type and Jane has A blood type. They both have free earlobes, and they are

both heterozygous for free versus attached earlobes. Their first child has B blood type and free earlobes. If these two genes are on two different chromosomes, what is the probability that their next child will have A blood type and attached earlobes? (Show your work to receive partial credit.) (15 pts)
John is AB, Jane is AO (we know this because they had a child with B blood type), and they are both Ee for earlobes with E being the dominant free earlobes. For A blood type there is a 1/2 chance, for attached earlobes 1/4. Multiply these probabilities to get 1/8.

8. There are 30 mapping units between genes E and N and 45 mapping units between genes N and D. The order of these genes is E-N-D. You cross a heterozygous individual, Ee:Dd, (whose parents were EE:DD and ee:dd) with a homozygous recessive individual, ee:dd, and you obtain 100 offspring. (Show your work to receive partial credit.) (10 pts)

a) Which genotypes would be recombinant?
Ee:dd and ee:Dd

b) How many recombinant offspring do you expect?
50. These genes are 75 m.u. apart, but there cannot be more than 50% recombinants.

9. According to the data we looked at in class, are the <u>environmental</u> factors affecting male and female sexuality the same or different? Why? (10 pts)
Different. Males are affected by older male siblings, but females do not seem to show any older sibling affect.
Or
Similar. Raised in utero testosterone levels have an affect on both male and female sexuality.

Bonus: Are differences in finger length thought to be related to a cause or effect of sexuality? (3 pts)
Since this happens in utero, it must be a cause, not an effect. Fetuses don't have a sexuality.