Dr. Reichler's Bio 311D class time:_____ Print Name:_____KEY_____
Exam #1 February 11, 2009

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: Why are male common pheasants, a bird, an average of 1.5 times bigger than females? (10 pts)
Devise multiple hypotheses and then at least one experiment to disprove at least on of the hypotheses. Example: Hypo's- Male common pheasants compete with each other for the ability to mate. Female common pheasants prefer to mate with larger males. Male common pheasants must protect the nest from predators. Expt- Observe male common pheasants during mating season to see if they fight. OR Present female common pheasants with different sized males and see who they mate with. OR check the paternity of common pheasant chicks, and see if there is a correlation between number of offspring fathered and size.

2. Is the first or second cell division of <u>meiosis</u> more critical for producing genetically unique gametes? Why? (8 pts)
Meiosis I is when both crossing-over and independent assortment take place.

3. Would a disease that killed only male pipefish or one that killed only female pipefish cause a more significant <u>decrease</u> in pipefish reproduction rates? Why? (8 pts)
A decrease in males would have a more significant impact on pipefish reproduction. Male pipefish are more limiting for reproduction. The eggs must be placed inside their pouch, and when the pouch is full, they cannot have more offspring.

4. You are reviewing the data from the twin study looking at Body Mass Index (BMI), and you notice one set of identical twins that grew up in <u>different</u> families and have radically different BMI's. Does this invalidate the hypothesis that BMI has some genetic component? Why or why not? (8 pts)
No, the environments that these 2 twins grew up in could have been radically different, and that had a much stronger affect than their genetic similarities.

5. A cell that has **not** replicated its DNA successfully completes meiosis and produces genetically unique gametes. How is it possible to generate genetically diverse gametes without replicating the DNA first? (8 pts)
DNA replication is needed so that crossing-over can produce both parental and recombinant offspring.

6. Is the inheritance of sex-linked traits in males or females more <u>similar</u> to the inheritance of mitochondrial DNA? Why? (8 pts)
Males, like mtDNA, males receive their x chromosome only from mom, also, males are haploid for the mtDNA and x chromosome.

7. You want to verify a report that two genes, A and Z, are 135 map units apart. <u>Including A and Z</u>, what is the minimum number of genes that you would need to look at to verify the map unit distance between A and Z? Why? (show your work to receive partial credit) (8 pts)
4. You can only experimentally measure 49 mu at a time. A (49mu) G (49mu) P (37mu) Z

8. You sample thousands of panda bears for nose color, which you know is regulated by a single gene. You find that pandas have either a brown nose, a black nose, or a red nose. Give **two** explanations for how nose color is inherited in panda bears. (show your work to receive partial credit) (8 pts)
Any two of: Incomplete or Codominance with 2 alleles and the heterozygous individuals having a different phenotype. There could be 3 alleles.

9. Sam, a panda bear with a long tail, mates with Mo, a panda with a short tail, and they have 10 offspring. Five of their offspring have short tails, and five have long tails. Could Sam and Mo's parents have had the same length tail? Why or why not? (show your work to receive partial credit) (8 pts)
No, either Sam or Mo is herterozygous and the other is homozygous recessive. There fore at least one parent must have had the dominant allele and others homozygous recessive.
OR
Yes, they could all have been heterozygous and had the dominant phenotype leading to Sam or Mo being heterozygous and the other homozygous.

10. Colorblindness is a recessive allele carried on the X chromosome. Joan's biological father and mother both have normal vision, but Joan is colorblind. Why is this unusual, and how is it possible? (show your work to receive partial credit) (8 pts)
Joan must be heterozygous receiving the normal allele from dad and the recessive allele from her heterozygous mom, so she should not be colorblind. If the X chromosome with the dominant, normal allele is inactivated in Joan's eyes, she will be colorblind.

11. A heterozygous panda bear with round ears and long legs mates with a homozygous panda with pointy ears and short legs. They have 100 offspring with the following phenotypes: 35 have round ears and long legs, 35 have pointy ears and short legs, 15 have round ears and short legs, 15 have pointy ears and long legs. What are the <u>phenotypes</u> of the heterozygous panda bear's parents? (show your work to receive partial credit) (10 pts)
The parents are both homozygous for both genes. One has both dominant phenotypes, round ears and long legs. The other has the recessive pointy ears and shot legs. Since the recombinants have a mix of dominant and recessive phenotypes, then the heterozygous panda has both dominant alleles on one chromosome and the recessive alleles on the other paired chromosome.

12. Panda bears can be big draws at zoos, but no one wants to see an ugly panda bear. Gene B codes for bowed legs, which are recessive, gene C codes for crossed eyes which are dominant, and gene S codes for very smelly, which is recessive. You know that the two pandas in you zoo are heterozygous for all three genes. If you mate your two pandas to each other, what is the probability of getting a panda that has bowed legs, cross-eyes, and smells bad? (show your work to receive partial credit) (8 pts)
0.25x0.75x0.25=0.047
OR
1/4x3/4x1/4=3/64

Bonus: Based on the results from the experiments looking at the affects of smoking on children who were born via *in vitro* fertilization, what can you infer about the <u>genes</u> that increase the likelihood of smoking and anti-social behavior? (3 pts)
They might be closely linked, near each other on the same chromosome. Since it is likely for women to inherit the alleles of these 2 genes together.