Biology 121 Workshop 6: Cell Division

1. Fill in the blank with the appropriate phase of the cell cycle. The phases are: G_0, G_1, S phase, metaphase, anaphase, prophase, cytokinesis, telophase, and prometaphase

a._____Most cells that will no longer divide are in this phase.

b._____Sister chromatids separate and chromosomes move apart

c._____Mitotic spindle begins to form

d._____Cell plate forms or cleavage furrow pinches cells apart

e._____Chromosomes replicate

f._____Chromosomes line up at the equatorial plane

g._____Nuclear membranes form around separated chromosomes

h._____Chromosomes become visible

i._____Kinetochore-microtubule interactions move chromosomes to midline.

j._____Restriction point occurs in this phase.

2. In teams of two, <u>without looking at your notes or the book</u>, draw a circle on the table and, using the yarn pieces as chromosomes, take your cell through the phases of mitosis. Once you feel comfortable with this, as a group, diagram this process on the board. Note where the cells are haploid and where they are diploid.

3. Repeat #2 but go through meiosis and draw your diagram on the board adjacent to the mitosis diagram. Again indicate where the cells are haploid and where they are diploid.

4. Looking at your two diagrams, summarize how mitosis is different from meiosis.

5. A cell with diploid number of 6 could produce gametes with how many different combinations of maternal and paternal chromosomes?
a. 6
b. 8
c. 12
d. 64
e. 128

6. a. How many assortments of maternal and paternal chromosomes are possible in human gametes?

b. Why is the variety possible as a result of meiosis and sexual reproduction important in the grand scheme of things?

Tackle these next two question in teams of 2-3 and then see if you can arrive at a group consensus. (A reminder---your fearless leader has not been given these answers so you can only be as sure as your reasoning makes sense!)

7. Suppose you read in the newspaper that a genetic engineering lab had developed a procedure for fusing two gametes from the same person (two eggs or two sperm) to form a zygote. The article mentions that an early step in the procedure is prevents crossing over from occurring during the formation of the gametes in the donor's body. The researchers are in the process of determining the genetic makeup of one of their new zygotes. Which of the following predictions would you make? Justify your choice and explain why you rejected the other choices.
a. The zygote would have 46 chromosomes all of which came from the gamete donor (its one parent) so the zygote would be genetically identical to the gamete donor.

b. The zygote *could* be genetically identical to the gamete donor but it is much more likely that it would have an unpredictable mixture of chromosomes from the gamete donor's parents.

c. The zygote would not be genetically identical to the gamete donor but it would be genetically identical to one of the donor's parents.

d. The zygote would not be genetically identical to the gamete donor but would be genetically identical to one of the donor's grandparents.

8. A mule is the offspring of a horse and a donkey. A donkey sperm contains 31 chromosomes and a horse egg 32 chromosomes, so the zygote contains a total of 63 chromosomes. The zygote develops normally. The combined set of chromosomes is not a problem in mitosis and the mule combines some of the best characteristics of horses and donkeys. However, a mule is sterile. Meiosis cannot occur normally in its testes or ovaries. Explain why mitosis is normal in these cells, but meiosis does not work.