1. **MITOSIS PROBLEM**
   (a) Draw a picture of a diploid cell that has a genome consisting of TWO chromosomes called Chr1 and Chr2. (hint: since it is DIPLOID it will have two copies of Chr1 and two copies of Chr2)

   (b) Draw a picture of your cell with its chromosomes through the 4 stages of mitosis: prophase, metaphase, anaphase, telophase. At the end you should have two diploid cells.

   (c) Are these two cells you have created genetically identical?

   (d) Go back to your drawing in part B and on the metaphase diagram, label the metaphase plate, the centromeres, the centrosomes, the telomeres, the spindle.

   (e) Which cytoskeleton proteins are involved in setting up the spindle? Which are involved in cytokinesis? Where is the kinetochore? Which cytoskeletal component associates with the kinetochore?

   (f) What would happen during mitosis if the centromere was deleted from a chromosome?

   (g) What would happen during mitosis if one chromosome had TWO centromeres?

2. **MEIOSIS PROBLEM**
   (a) Draw a picture of a diploid cell that has a genome consisting of TWO chromosomes called Chr1 and Chr2. (hint: since it is DIPLOID it will have two copies of Chr1 and two copies of Chr2)

   (b) Draw the 4 stages of Meiosis I. On the metaphase diagram, label the metaphase plate, the centromeres, the centrosomes, the telomeres, the spindle.

   (c) Why is Prophase I so important?

   (d) You should now have TWO cells ready to go through Meiosis II. Draw the 4 stages of Meiosis II. At the end, are all four cells genetically identical? Why?

   (e) What are the differences between Metaphase I and Metaphase II in Meiosis?

   (f) How does Metaphase I in Meiosis differ from Metaphase in Mitosis?

   (g) Which is more like Mitosis, Meiosis I or Meiosis II?

3. **Checkpoints Cell Cycle Control**
   (a) Describe the 3 checkpoints we discussed in class? How do they differ from each other?

   (b) Why would a cell in G0 enter back into the cell cycle?

   (c) If a cell possessed a mutation that prevented it from completely replicating its DNA, where would it get stuck in the cell cycle?

   (d) Propose a mechanism by which a cell might check to see if DNA replication was completed (think about what has to interact with each other)

   (e) Describe in basic terms how a cyclin activates a cyclin-dependent kinase (CDK).