PLNT3140 INTRODUCTORY CYTOGENETICS

# MID-TERM EXAMINATION

1 p.m. to 2:20 p.m. Tuesday, October 23, 2007

This examination is worth 100 points, for 15% of the course grade.

Hand in these question sheets along with your exam book.

---

1. (15 points) Give 3 reasons why the eukaryotic cell cycle requires more time and energy than cell division in prokaryotes. Explain each reason.

2. (10 points) G2 was originally referred to as a "resting phase" between S phase (DNA replication) and prophase, when the chromosomes can first be seen in the microscope. Why is this erroneous? In other words, what important events happen in G2?

3. (20 points) In a single sentence, define each of the following:

a) centrosome
b) chromomere
c) chromatin
d) chromosome territory
e) DNA polymerase

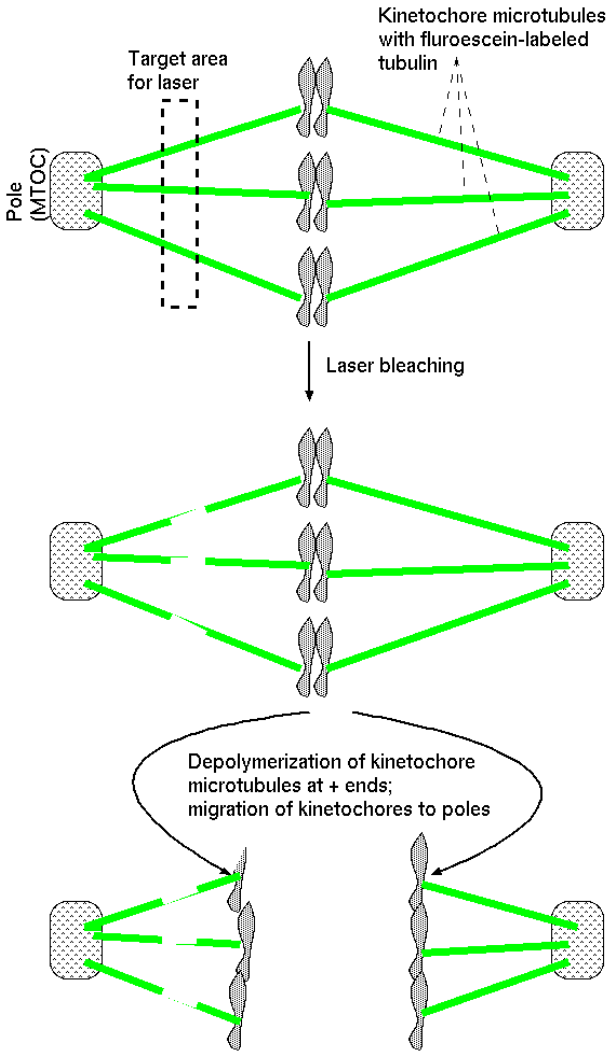
4. (10 points) In meiosis, what is the physical basis for Mendel's Law of independent assortment of traits ie. independent assortment of chromosomes? During which step does this occur?

5. (10 points) Give two reasons why root tip cells are an excellent choice of material for observing mitosis in plants.

6. (10 points) Histones are among the most highly conserved proteins in evolution. For example, Histone H4 is 102 amino acids long, with only two amino acid substitutions found between pea and cow. Other chromatin-associated proteins have numerous mutations, when proteins are comared between distantly-related species. Suggest an explaination for these observations.

7. (5 points) Name five proteins that are imported into the nucleus through the nuclear pore complexes.

8. (10 points) State two alternative hypotheses that could be distinguished by this experiment. What prediction is made by each hypothesis, and which is the correct hypothesis?



9. (10 points) The figure below shows Pulsed Field Gel Electrophoresis (PFGE) of yeast chromosomal DNA. Gels of this type are presented as evidence that support the hypothesis that eukaryotic chromosomes are single DNA molecules.

a. Describe what you would see that hypothesis were <u>false</u>.
b. Why is it necessary to use PFGE, as opposed to a simple agarose gel?