Bio 122 – Review Answers

***Chapters 1 & 2***

1. Mitosis:
   1. Advantage – The process is quick, and since there is only one duplication and one division of genetic material, there are less chances of making mistakes.
   2. Disadvantage – Each cell’s genetic material is unique, so specialized cells can only make cells of the same type. Cells that don’t undergo mitosis can’t be regenerated if lost.

Meiosis:

1. Advantage – the process creates a cell with a unique set of chromosomes that increase genetic diversity within a population.
2. Disadvantages – the process is longer, has the potential to create more mistakes and can only be performed by cells in reproductive organs.
3. The process of crossing-over occurs in prophase I of meiosis. Homologous chromosomes and their identical pairs (created during the S phase of interphase) come into such close proximity that the genetic material they contain gets physically “tangled” and exchanges places. Each chromosome then leaves with a new, unique combination of genes.
4. The two types of cell regulators are **external** and **internal** regulators.
   1. Internal regulators make sure that all the steps necessary for cell division have taken place before allowing a cell to enter the M phase of mitosis.
   2. External regulators respond to stimuli from outside the cell to determine whether or not to initiate the cell division cycle.
5. Cancer is a disorder of the cell’s regulator’s. It occurs when a cell’s regulators malfunction or a cell does not respond appropriately to its regulators. The usual result in unregulated cell division.
6. Non-disjunction occurs when chromosome pairs fail to separate during meiosis. The result is that one cell will gain an “extra” chromosome, while the other will have one too little.
   1. Down syndrome is an example of non-disjunction in the 21st pair of chromosomes.
   2. Turner and Klinfelter’s syndromes are the result of non-disjunction in the X and Y chromosomes.
7. Cells divide in order to remain efficient. As cells grow, their volume increases exponentially faster than their surface area. This results in a limiting factor – the cell membrane cannot import the nutrients required by the increasing volume, nor can it export the wastes. As the cell stops being efficient, it has two choices: divide or die.
   1. Cells may choose to divide for several reasons, including to replace old or dead cells, to grow the organism in size (increase the number of cells) or to fill in a gap resulting from an injury.
8. a. Haploid: A cell with one set of chromosomes (half the “normal” number).

b. Diploid: A cell with two sets of chromosomes (the “normal” number)

1. Karyotype: A picture of the cell’s chromosomes organized in their homologous pairs, and ordered by size.
2. Cytokinesis: the division phase of the “M phase” of the cell cycle. It is at this time that organelles in the cytoplasm are divided between the two cells.
3. Gametes: An organism’s haploid cells. They are the result of meiosis and also known as “sex cells”.
4. Chromosomes: Defined sections of DNA carrying particular genes.
5. Homologous: 2 chromosomes that are the same linght, carry the same genes but may have different alleles.