

**Multiple choice questions – 4 points each.**

1. *Reduction division* refers to the overall outcome of which following cellular process?
- a. mitosis
  - b. meiosis
  - c. cytokinesis
  - d. binary fission
  - e. cell cycle
2. Molecules that are *mirror images* of each other, but would otherwise be unable to fit into the same mold are best described as:
- a. structural isomers
  - b. geometric isomers
  - c. optical isomers or enantiomers

Name a biologically important molecule as an example of this:

3. A *backcross* is necessary to determine the genotype of which of the following when analyzing a monohybrid cross?
- a. homozygote
  - b. heterozygote
  - c. hemizygote
  - d. gamete
  - e. zygote
4. Of the following, which structure makes the largest contribution to *total* membrane surface in a eukaryotic cell?
- a. nuclear envelope
  - b. endoplasmic reticulum
  - c. transport vesicles
  - d. golgi apparatus
  - e. lysosomes

5. *Microfilaments* provide a critical function during of which one of the following subphases of M phase?
- telophase
  - cytokinesis
  - metaphase
  - prophase
  - anaphase
6. When comparing the different levels of protein structure, which are affected by *disulfide bond* interactions?
- primary
  - secondary
  - tertiary
  - quaternary
  - all of the above
7. The stimulation to cause cells to divide can come from both internal and external controls, which of the following would be considered an *internal* mitotic inducer?
- hormones
  - growth factors
  - cyclin dependent kinase or Cdk
  - cyclin-Cdk complex
  - None of the above
8. Lipids are a diverse group of primarily hydrophobic molecules. Which of the following compounds are *not* considered lipids?
- testosterone
  - polyunsaturated fats
  - phosphatidylcholine
  - triacylglycerol
  - glucosamine

9. The *formation* of a primary lysosome occurs at what point during the progression of the endomembrane system?
- a. rough ER
  - b. smooth ER
  - c. cis side of golgi apparatus
  - d. trans side of golgi apparatus
  - e. outer nuclear envelope
10. When *different* genes interact to control the expression of a single trait, this is considered an example of what type of genetic inheritance?
- a. epistatic
  - b. polygenic
  - c. codominant
  - d. polymorphic
  - e. pleiotropic

**True or False – 4 points each**

- \_\_\_\_\_ 11. Tetrads are aligned at the center of the cell along the metaphase II plate.
- \_\_\_\_\_ 12. Kinesin and Dynein are both important motor molecules that interact directly with intermediate filaments.
- \_\_\_\_\_ 13. The formation of a cell plate is important during cytokinesis in plant cells.
- \_\_\_\_\_ 14. Metaphase is the longest of the mitotic stages.
- \_\_\_\_\_ 15. Centrosomes are necessary for proper spindle formation in both plants and animals.

**Short answer – Number of points in parentheses.**

**16. (12 points)** Name the *specific* type of bond or linkage associated with the following monomers. Briefly describe the functional groups &/or molecules which may be linked by these bonds *AND* name the associated *polymer*.

**A. monosaccharides –**

**B. amino acids –**

**C. nucleotides –**

**D. fatty acids and glycerol –**

**17. (4 points)** What overall type of “*reaction*” is responsible for the polymerization of all the above of macromolecules?

- 18. (5 points)** Why are most cells microscopic? What would be the problem if cells typically had a very large volume?
- 19. (5 points)** What are the two forces involved with a “Reynolds number” and what disadvantages does this concept have for a small animal such as a bacterium?
- 20. (8 points)** Microtubules are important components of the cytoskeleton. **(a)** What are the subunits or components used to construct microtubules and how is this done? **AND** **(b)** briefly describe four cellular processes (other than meiosis and mitosis) that require microtubules?

- 21. (8 points)** Briefly describe each of Mendel's Laws of inheritance *AND* at what stage during meiosis do we now know is responsible for each, respectively.
- 22. (9 points)** What are the three different modes for the introduction of genetic variation during sexual reproduction and briefly how does each process work?
- 24. (9 points)** For each of the three modes of variation described above, briefly discuss how each impacts our understanding of Mendelian genetics.

**25. Extra Credit (progressive point bonus, i.e., first one wrong and game over):** Name up to four *semi-autonomous* organelles **AND** correctly describe each one's cellular function:

**A. (1 point) –**

**B. (2 points) –**

**C. (4 points) –**

**D. (8 points) –**