Course Materials for Week 7: Cell Division

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Assignment Questions

1. How many cells from the human liver will make an object the size of a pinhead ?

    a. 1 billion
    b. 1 million
    c. 10 million
    d. 100 million
    e. none of the above

2. What does the cell need to complete before dividing? (Select all that apply.)

    a. DNA replication
    b. centriole duplication
    c. sort ribosomes to each side of the mother cell
    d. double the amount of mRNAs
    e. none of the above

3. What are the important sections of the interphase period of the cell cycle, and what happens in each of them?

4. What are the commonly discussed stages in the mitotic period of the cell cycle, and what happens in each of them?

5. Why is chromosome condensation essential for a successful mitosis?

6. What aspects of mitosis appear to be essentially universal among all eukaryotic organisms (select all that apply)?

    a. All spindles use microtubules as their principal fibrous component
    b. All spindles contain some microtubules that interact with kinetochores to organize the chromosomes and exert forces on them
    c. All spindles form into a structure that is roughly symmetric

d. the structural symmetry of the spindle plays out in the motion of the chromosomes to opposite ends of the cell
e. none of the above

7. The plus-end of the microtubule

    a. has the same structure as the minus-end
    b. connect to kinetochores in the mitotic spindle
    c. connect to centrosomes in the mitotic spindle
    d. have proteins that bind and change plus-end dynamics
    e. none of the above

Assignment Answers

1. b
2. a and b
    - G1: cell growth/differentiation before DNA duplication
    - S-phase: DNA synthesis
    - G2: further growth after DNA duplication, allowing the cell to make all components necessary for the cell division process
    - Prophase: chromosomes condense
    - Prometaphase: the now almost condensed chromosomes interact with the forming mitotic spindle and begin to become organized
    - Metaphase: chromosome attachment process goes to completion and each chromosome completes its motion to the midplane of the spindle
    - Anaphase: the duplicated chromosomes separate into two distinct parts and move in opposite directions to the end of the spindle
    - Telophase: chromosomes decondense and go back into the interphase state, nuclear envelope reforms
3. Chromosomes are much longer than the diameter of the cell, chromosomes must condense into a more compact form, why they must condense (e.g. so they can be short enough to move around as objects in the cell)
4. a, b, c, and d
5. b and d