

## Study Questions for lectures 18-21

1. Name the three major filament systems of the cytoskeleton. Briefly describe the role of each. Give an example of each filament system and where it is used in the cell.
2. Which of the following types of cells would you expect to contain a high density of intermediate filaments in their cytoplasm? Explain your answer.
  - a) *Amoeba proteus* (a free living amoeba)
  - b) skin epithelial cell
  - c) smooth muscle cell in the digestive tract
  - d) *E. coli*
  - e) nerve cell in the spinal cord
  - f) sperm cell
  - g) plant cell
3. Explain the mechanism of muscular contraction using actin, myosin, and ATPase.
  - a. Would a muscle contract in the absence of calcium? Explain.
4. If both the thick and thin filaments of muscle are made up of subunits held together by weak non-covalent bonds, how is it possible for a human being to lift heavy objects?
5. Actin originates from the ARP2/3 complex which can form off of existing actin filaments, how does this play a role in lamellipodial extension?
6. The combined growing and shrinking of a microtubule is called \_\_\_\_\_.
7. In a **growing** microtubule, the rate of \_\_\_\_\_ exceeds the rate of \_\_\_\_\_.
8. Indicate whether each of the following descriptions is true of microtubules, microfilaments, intermediate filaments or none of these. More than one response may be appropriate for some statements.
  - a) Involved in muscle contraction
  - b) Involved in movement of cilia and flagella
  - c) More important for chromosome movements than for cytokinesis
  - d) More important for cytokinesis than for chromosome movements in animal cells
  - e) Most likely to remain when cells are treated with solutions of nonionic detergents or solutions of high ionic strength
  - f) Found in bacterial cells
  - g) Differ in composition in muscle cells versus nerve cells
  - h) Can be detected by immunofluorescence microscopy.
  - i) Play well-documented roles in cell movement
  - j) Assembled from protofilaments

9. True or False or Maybe?

- a) The minus end of microtubules and microfilaments is so named because the subunits are lost and not added there.
- b) The energy required for tubulin and actin polymerization is provided by hydrolysis of nucleoside triphosphate
- c) Microtubules, microfilaments and intermediate filaments all exist in a typical eukaryotic cell in dynamic equilibrium with a pool of subunit proteins
- d) An algal cell contains neither tubulin nor actin
- e) All of the protein subunits of intermediate filaments are encoded by genes in the same gene family
- f) All microtubules within animal cells have their minus ends anchored at the centrosome
- g) As long as actin monomers continue to be added to the plus end of a microfilament, the MF will continue to elongate.

10. Dyneins “walks” toward which end?

Kinesins “walks toward which end?

- a.) How do these walking proteins play a role in vesicle transport, and cell division?

11. What might be the consequences if a cell replicated damaged DNA before repairing it?

12. How are cell cycles regulated?

13. What are cell cycle checkpoints, what are the proteins involved and how do they work?

14. What do you suppose happens in mutant cells that cannot degrade cyclins?

15. What two modifications does a cell use to regulate checkpoints

16. Why do you suppose cells have evolved a special Go state to exit the cell cycle, rather than just stopping in the G1 state at a G1 checkpoint?

17. Question 18-7 in book.

18. M-Phase consists of what stages?

19. What is the difference between apoptosis and necrosis?