1. Indicate true (T) and false (F) statements below regarding cytoskeletal motor proteins. Your answer would be a five-letter string composed of letters T and F only, e.g. TTTFF.

() All myosin motors move toward the plus end of actin filaments.

() All myosin motors move toward the minus end of actin filaments.

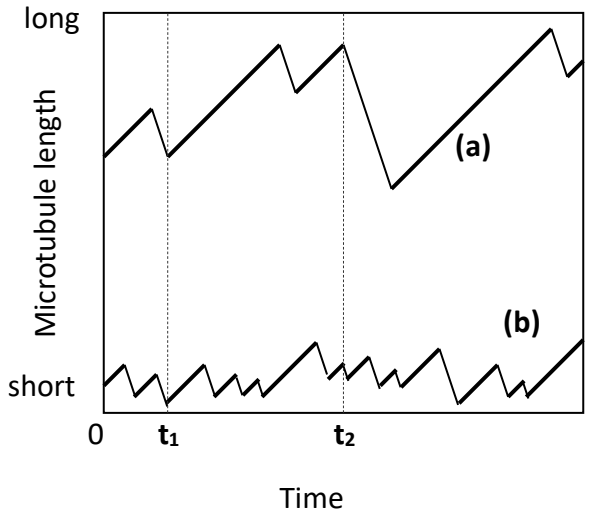
() All kinesin motors move toward the plus end of microtubules.

() All kinesin motors move toward the minus end of microtubules.

() All dynein motors move toward the minus end of microtubules.

2. In the following graph that shows changes in the lengths of two microtubules over time, which time point corresponds to a catastrophe for both microtubules? Which trace corresponds to a microtubule with greater dynamic instability?

A. t_1; trace (a)
B. t_1; trace (b)
C. t_2; trace (a)
D. t_2; trace (b)



3. Indicate whether each of the following descriptions applies to cilia (C), flagella (F), or both (B). Your answer would be a four-letter string composed of letters C, F, and B only, e.g. CCFB.

- () They are short and present at high numbers per cell.
- () They have a whiplike motion that resembles breaststroke in swimming.
- () They are based on the axoneme structure.
- () They are found in the epithelial cells of the human respiratory tract.

4. The function of microtubules depends on their specific spatial organization within the cell. How are specific arrangements created, and what determines the formation and disappearance of individual microtubules? To address these questions, investigators have studied the in vitro assembly of αß -tubulin dimers into microtubules. Below 15µM αß -tubulin, no microtubules are formed; above 15µM, microtubules form readily (Figure 16-26). If centrosomes are added to the solution of tubulin, microtubules begin to form at less than 5 µM (Figure 16-26). (Different assays were used in the two experiments-total weight of microtubules in Figure 16-26A and the average number of microtubules per centrosome in Figure 16-26B-but the lowering of the critical concentration for microtubule assembly in the presence of centrosomes is independent of the method of assay.) A. Why do you think that the concentration at which microtubules begin to form (the critical concentration) is different in the two experiments?

B. Why do you think that the plot in Figure 16-26A increases linearly with increasing tubulin concentration above 15 µM, whereas the plot in Figure 16-26B reaches a plateau at about 25 25µM?

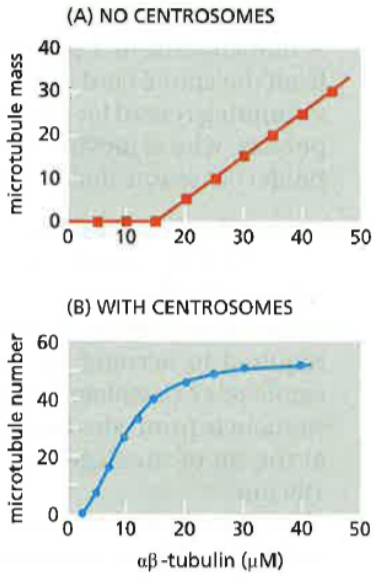


Figure 16–26 Analysis of microtubule assembly (Problem 16–72). (A) Mass of microtubules assembled in the absence of centrosomes as a function of tubulin concentration. Tubulin assembly into microtubules was measured by the increase in solution turbidity. (B) Average number of microtubules per centrosome as a function of tubulin concentration. Concentrations refer to αβ-tubulin dimers, which are the subunits of assembly.

5. What could be a good way identify newly polymerized actin filaments?

6. What can you identify in microtubule with GTP and not a microtubule without GTP?

7 Decide whether each of these statements is true or false, and then explain why.

A) Microtubules determine the shape of the cell's surface and are necessary for whole cell locomotion and drive the pinching of one cell into two.

B) Even though the actin bundles at the cores of stereocilia on the hair cells of the inner ear maintain their stable organization for the entire lifetime of the animal, they are continuously remodeled and replaced on average every 48 hours.

8 In general terms, what are the cellular functions of intermediate filaments, microtubules, and actin filaments?

9: If each type of cytoskeletal filament is made up of subunits that are held together by weak noncovalent bonds, how is it possible for a human being to lift heavy objects?

10: The concentration of actin in cells is 50–100 times greater than the critical concentration observed for pure actin in a test tube. How is this possible? What prevents the actin subunits in cells from polymerizing into filaments? Why is it advantageous to the cell to maintain such a large pool of actin subunits?

11: Why do you suppose it is much easier to add tubulin to existing microtubules than to start a new microtubule from scratch?

12: How does a centrosome "know" when it has found the center of the cell?

13: Actin filaments are said to "push" on the cell membrane to cause it to form a protrusion. But there are problems with a pushing mechanism at both ends of the filaments. When a plus end reaches the membrane and abuts it, how are new subunits added to extend the filament (allowing it to push)? And how is the minus end of the filament anchored so that the filament isn't simply pushed back into the cell's interior? What do you suppose might be the answers to these questions?