

MCBII

1. Which is not a feature of lamin intermediate filaments (IFs)? (4 pts)
 - A. They are protein polymers.
 - B. They are used by motor proteins to traffic cargo.
 - C. They contain coiled coil domains.
 - D. They are regulated by phosphorylation.

2. What does CLIP170 do to microtubules (MTs)? (4pts)
 - A. It stimulates GTP hydrolysis at the plus end.
 - B. It stabilizes lateral bonds between protofilaments.
 - C. It recruits free tubulin to the plus end of MTs.
 - D. It is a minus-end directed motor protein.

3. What might happen if you replace the tail domain of kinesin 1 with the tail domain of kinesin 2? (4 pts)
 - A. Nothing.
 - B. Kinesin 1 would now traffic Kinesin 2 cargo.
 - C. Kinesin 1 would make larger steps.
 - D. Kinesin 1 would hydrolyze 2 ATP per step taken.

4. Why do you think the rate of microtubule dynamic instability is higher in cells than in vitro? (8 pts)

5. What kind of plus tip binding protein would decrease the stability of the plus end? (4 pts)
- A. A motor protein.
 - B. A GEF that exchanges GDP for GTP.
 - C. A GAP (GTPase activating protein).
 - D. A protein that links MT protofilaments together.
6. Which of the following is NOT a feature shared by both MTs and actin? (4 pts)
- A. Both are polar.
 - B. Both are sensitive to free subunit concentrations.
 - C. Both depolymerize rapidly when their plus end hydrolyzes a nucleotide.
 - D. The plus end is the faster growing end.
7. Secretory vesicles traffic to the plasma membrane using which motor protein? (4 pts)
- A. Kinesin I.
 - B. Dynein.
 - C. Myosin II.
 - D. Clathrin.
8. Describe how you would use FRAP to determine whether tubulin is exchanged more rapidly from the minus end, plus end, or middle of a microtubule. Make sure to describe your experimental setup and the result that you expect to see. (8pts)

MCBII

9. Which of the following is true? (4 pts)?
- A. The MTOC is located at the minus end of the MT.
 - B. In solution, tubulin is a hetero-dimer bound to one GTP.
 - C. A microtubule is formed from 11 protofilaments.
 - D. Answer A and B.
 - E. All of the above.
10. If the critical concentration of the actin minus end is 1 μM and the critical concentration of the plus end is 2 μM , what would happen at 4 μM free actin? (4 pts)
- A. The plus end would lengthen and the minus end would shorten.
 - B. Both ends would shorten.
 - C. Both ends would lengthen.
 - D. The minus end would lengthen and the plus end would shorten.
11. Which of the following is not true about Myosin 5? (4 pts)
- A. It traffics cargo along actin filaments.
 - B. It regulates muscle contraction.
 - C. It hydrolyzes one ATP per step along actin.
 - D. The length of its lever arm determines its step size.
12. Describe an experiment you would perform to demonstrate that COPII vesicles traffic on microtubules. (8 pts)

13. Which of the following is an example of a microtubule organizing center (MTOC)? (4pts)
- A. A centrosome.
 - B. A centriole.
 - C. Gamma tubulin ring complex.
 - D. The growth cone of an axon.
14. Which of the following do NOT have analogous mechanisms for regulating the cytoskeleton? (4 pts)
- A. Katanin and Cofilin.
 - B. Arp2/3 and gamma tubulin ring complex.
 - C. Thymosin B4 and colchicine.
 - D. Profilin and MCAK.
15. What does formin do? (4pts)
- A. It nucleates actin filament formation from the plus end.
 - B. It nucleates actin filament formation from the minus end.
 - C. It binds the actin monomer and prohibits its addition to the filament.
 - D. It nucleates actin branch formation.
16. What happens to tropomyosin and myosin II following Calcium binding to troponin during a single round of muscle contraction? (8pts)

MCBII

17. What would be the effect of breaking an actin filament in half? (4pts)
- A. All ends would rapidly depolymerize.
 - B. The plus ends of both halves would grow.
 - C. It would depend on the concentration of free actin.
 - D. It would depend on the concentration of MCAK.
18. Which statement about actin is false? (4 pts)
- A. Monomeric actin binds ATP.
 - B. It is made of a single filament chain.
 - C. It regulates cell division.
 - D. Actin filament nucleation is required for cell migration.
19. Which of the following is not a function of profilin? (4pts)
- A. It is a nucleotide exchange factor.
 - B. It binds and blocks the plus end of actin monomers.
 - C. It stimulates growth of the plus end of actin filaments.
 - D. It generates branches on actin filaments.
20. How does nocodazole affect microtubule stability? (8pts)