

21/23

Cell Biology 282b Midterm #2

Code 222

March 18th, 2007

READ INSTRUCTIONS CAREFULLY:

1. The proctors **WILL NOT** address questions regarding the exam. If issues arise with specific questions, they will be dealt with at a later date.
2. Completely fill in the bubbles with an ordinary lead pencil. Marks made with a ballpoint pen or felt tip marker will NOT be detected. Do not make stray marks and completely erase errors.
3. Print your name and course in the blanks on the top of the SCANTRON sheet.
4. STUDENT NUMBER: **Print** the digits of your student number in the squares provided. **Mark** the corresponding bubble in the column below each printed digit.
5. SECTION: Fill in your course section:
001 (1:30pm lecture) or 002 (11:30am lecture)
6. CODE: Fill in the exam code you are writing (top of this sheet).
7. Mark the one best choice from the alternatives provided for each question.
8. There are 35 questions in this test. Check your paper to ensure all questions are present. It is your responsibility to transfer all answers from the examination paper to the SCANTRON sheet WITHIN THE TWO HOUR time period.
9. THE SCANTRON sheet MUST be handed in at the end of the examination. You may keep the question booklet.
10. Wrong answers WILL NOT be deducted from your score.

****NOTE****

When filling in the SCANTRON answer sheet, failure to **PROPERLY** include and "bubble in" your student number, section or exam code will result in a loss of 5% from your exam grade. Be sure to triple check!!!

Q1. The major pool of γ -tubulin in animal cells is associated with

- a. axoneme
- ☒ b. pericentriolar matrix
- c. mitotic spindle
- d. plasma membrane
- e. (+)end of microtubules

Q2. Which drug can stabilize the cytoskeleton?

- ☒ a. colchicine
- ☒ b. cytochalasin B
- ☒ c. phalloidin
- d. none of the above
- e. any of a,b, and c

Q3. The sarcoplasmic reticulum must have membrane proteins that can:

- ☒ a. release and pump Ca^{2+}
- b. bind to tropomyosin and troponin
- ☒ c. undergo action potentials
- d. contract
- e. promote cell adhesion

Q4. Which signals best tell a moving cell where its front is?

- ☒ a. high Rho activity and high Ca^{2+}
- ☒ b. high cdc42 activity and low Ca^{2+}
- ☒ c. high myosin II activity and low Ca^{2+}
- ☒ d. low Rac activity and low Ca^{2+}
- ☒ e. high cdc42 activity and low Rac activity

Q5. (+) and (-) ends of microfilaments have different C_c values, C_c (+end) and C_c (-end) respectively. What will happen with microfilaments at a concentration of G-actin above C_c (-end)?

- ☒ a. filaments will grow at the both ends
- b. filaments will grow only at the (-) end
- c. filaments will grow only at the (+) end
- d. filaments will depolymerize
- e. the length of filaments remains the same (treadmilling)

Q6. Which factors/structures/events from the following list are involved in chromosome capture: (1) microtubule polymerization at the (+)end, (2) microtubule depolymerization at the (+)end, (3) polar microtubules, (4) dynein, (5) CENP-E, (6) intermediate filaments, (7) kinetochore, (8) microfilaments, (9) ankyrin.

- a. 1, 3, 6, 8, 9
- b. 1, 2, 3, 4, 5, 7
- c. 2, 3, 4, 7, 8
- d. 3, 4, 5, 7, 9
- e. 1, 2, 4, 5, 7

1, 2, 4, 5, 7

Q7. To visualize the microtubule networks in human fibroblasts, you use immunofluorescent staining with anti- β -tubulin antibodies. What kind of cell morphology and intracellular staining can you expect to see if the cells were pretreated with colchicine?

→ depolymerize MT

- a. cell become rounded but no staining is visible
- b. rounded cells and diffused staining
- c. rounded cells and microtubule networks
- d. elongated cells with projections and microtubule networks
- e. elongated cells with projections and diffused staining

Q8. Adhesive interactions are usually associated with specific cytoskeleton systems. Which adhesive contacts link to intermediate filaments?

- a. focal adhesions
- b. adherence junctions
- c. gap junctions
- d. tight junctions
- e. desmosomes

Q9. Which proteins can be found within Z disks of the muscle sarcomere?

- a. keratin and plectin
- b. tropomodulin and peripherin
- c. CapZ and lamin
- d. desmin and CapZ
- e. vimentin and CapZ

Q10. Early in prophase, the centrosomes start to migrate to different poles of a mitotic cell. This migration is coordinated by motor proteins interacting with:

- a. polar and astral microtubules
- b. cortical actin networks
- c. microfilaments
- d. spindle microtubules
- e. intermediate filaments

Q11. What is the unique property of selectins in comparison with other CAMs?

- a. mediate homotypic adhesion
- b. mediate heterotypic adhesion
- c. recognize oligosaccharides
- d. bind integrins
- e. expressed only in leucocytes

Q12. Some cytoskeletal proteins are highly conservative, some appear later in the evolution of cytoskeletal systems. In comparison to animal cells, which cytoskeletal proteins or their homologues are NOT found in bacteria?

- a. actin
- b. tubulin
- c. lamin
- d. actin and tubulin
- e. homologues of all animal cytoskeletal proteins are found in bacteria

Q13. In the cell, intermediate filament disassembly is triggered by

- a. subunit phosphorylation in telophase
- b. subunit dephosphorylation
- c. subunit phosphorylation in prophase
- d. filament severing proteins
- e. binding of Ca^{2+} to the subunits

Q14. How many of the following features are common between myosins and kinesins?
motor proteins, ATPase activity, light chains bind cargo, segregate chromosomes, usually form dimers

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

Q15. Anterograde transport of vesicles along an axon is powered by:

- a. kinesin
- b. dynein
- c. myosin
- d. CENP-E
- e. kinetochore

Q16. Which cytoskeletal component does not contribute to cell motility?

- a. microtubules
- b. microfilaments
- c. intermediate filaments
- d. stress fibers
- e. none of the above

Q17. The dynamic instability of microtubules relates to which of the following?

- a. treadmilling of microtubules
- b. time-dependent assembly and disassembly of microtubules
- c. hypothermia-induced depolymerization of microtubules
- d. all the above
- e. none of the above

Q18. Centrioles are barrel-shaped structures of microtubule triplets. How many protofilaments does every centriole have?

- a. 33
- b. 99
- c. 198
- d. 207
- e. 297

9 triplets

23

9

207

Q19. Which of these statements about microtubules (MTs) is FALSE?

- a. An $\alpha\beta$ -tubulin heterodimer is a building subunit of MTs
- b. MTs have a diameter of 24 nm
- c. MTs can be assembled from either α -tubulin or β -tubulin subunits *NO both*
- d. β -tubulin can bind either GTP or GDP
- e. MTs are polar polymers of tubulin subunits

γ tubulin

Q20. Several conformational changes in the myosin head couple ATP hydrolysis to filament movement. Which event is associated with the "power stroke"?

- a. binding ATP to the myosin head
- ☒ b. release of phosphate
- c. release of ADP
- d. release of ATP
- e. binding phosphate to ADP

Q21. You have a fibroblast that is using cell-surface integrins and is migrating across a fibronectin coated dish. What would your observation be if you added excess amounts of RGD peptides (short 3 amino acid long proteins made up of RGD) to the dish? The fibroblast would:

- a. bind tighter to the dish and stop migrating.
- b. not be able to bind to the dish.
- c. express more integrins.
- ☒ d. migrate faster.
- e. lose directionality and migrate randomly. ?

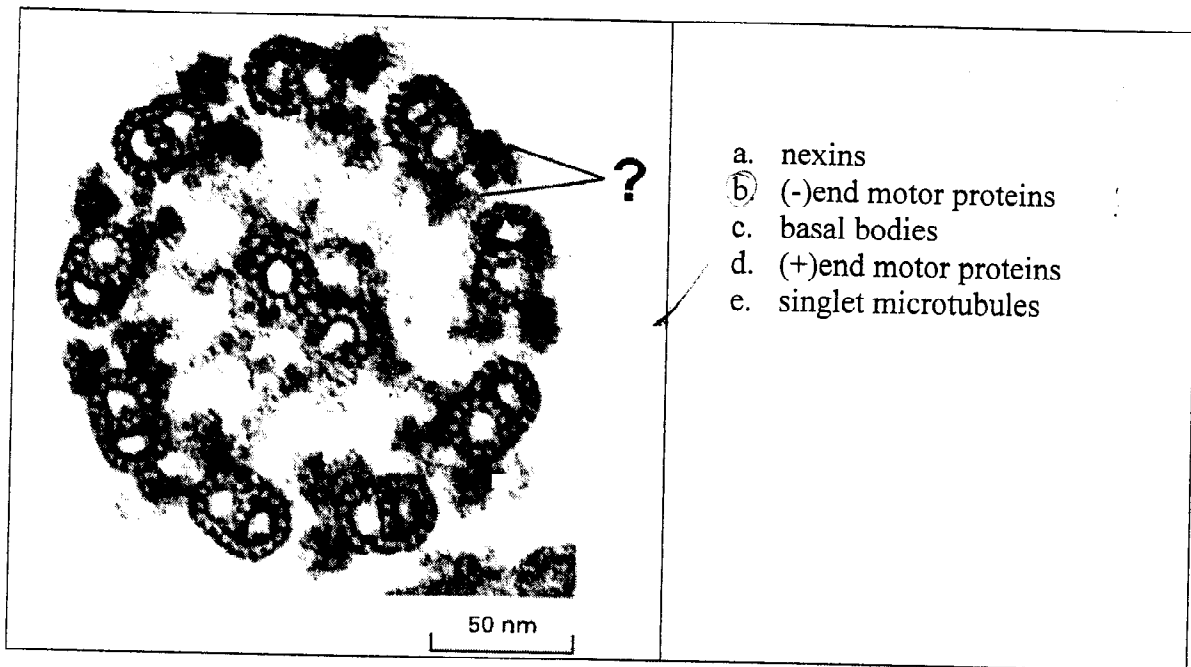
Q22. What most likely would happen if anti-Arp2/3 antibody is microinjected into a cell?

- a. microtubules will depolymerize
- ☒ b. microfilament networks will be impaired
- c. intermediate microfilaments will collapse
- d. contractile bundles will shrink
- e. cell will form lamellipodia

Q23. How many of the following stabilize microtubules?
pericentrin; MAPs; α -tubulin; murein; taxol; cadherins

- a. 0
- b. 1
- c. 2
- ☒ d. 3
- e. 4

Q24. This is an electron micrograph of an axoneme. What are the two electron-dense structures (which attached to each doublets) labeled with the question mark?



- a. nexins
- ☒ b. (-)end motor proteins
- c. basal bodies
- d. (+)end motor proteins
- e. singlet microtubules

Q25. What kind of information can be obtained by injecting cells with myosin digested with both papain and chymotrypsin? Identification of:

- a. actin-containing filaments but not their respective polarities
- b. myosin-containing filaments and their respective polarities
- c. myosin-containing filaments but not their respective polarities
- ☒ d. actin-containing filaments and their respective polarities
- e. tubulin-containing filaments and their respective polarities

Q26. Which protein does not participate directly in the attachment of the 2-D cytoskeleton of erythrocytes to the plasma membrane?

- a. ankyrin
- b. glycophorin
- c. band 4.1 protein
- d. band 3 dimer
- ☒ e. troponin

Q27. What is happening with the microtubule cytoskeleton when cells enter mitosis?

- ☒ a. Singlet microtubules transform into doublets and triplets
- ☒ b. Microtubules become more stable
- ☒ c. Cytoplasmic microtubules completely depolymerize
- ☒ d. No principal changes occur with microtubules
- ☒ e. In addition to the cytoplasmic microtubules, spindle microtubules are formed.

Q28. The contractile ring

- ☒ a. contains myosin II
- ☒ b. contains myosin I
- ☒ c. is important for cell locomotion
- ☒ d. is a permanent structure in all eukaryotic cells
- ☒ e. is found in adult skeletal muscle

Q29. What cannot bind to G-actin?

- ☒ a. profilin
- ☒ b. thymosin β 4
- ☒ c. ATP
- ☒ d. phalloidin
- ☒ e. none of the above

30. Which of these statements about cilia and flagella is FALSE?

- ☒ a. cilia and flagella are microtubule-based structures
- ☒ b. a motile cell can have many flagella
- ☒ c. cilia and flagella movements are aroused from sliding of adjacent microtubule doublets against each other
- ☒ d. cilia are shorter than flagella
- ☒ e. cilia and flagella are covered by plasma membrane

Q31. During anaphase we observe that:

- ☒ a. polar and kinetochore microtubules polymerize
- ☒ b. polar and kinetochore microtubules depolymerize
- ☒ c. polar microtubules depolymerize whereas kinetochore microtubules polymerize
- ☒ d. polar microtubules polymerize whereas kinetochore microtubules depolymerize
- ☒ e. the length of both polar and kinetochore microtubules remains the same

Q32. EGTA is a chelating agent that binds calcium ions. You look at the aggregation of cells in suspension and find that cell aggregates can be easily destroyed in response to addition of EGTA. From this observation you can conclude that aggregation of these cells depends on:

- ~~a. integrins~~
- ~~b. ICAM-1~~
- ~~c. fibronectin~~
- ☒ d. cadherins
- e. ICAM-2 *1g binding domains*

Q33. Which is not an actin-binding protein?

- a. cofilin
- b. gelsolin
- ☒ c. vimentin
- d. tropomodulin
- e. CapZ protein

Q34. How does profilin promote actin polymerization into filaments?

- ☒ a. it allows the exchange of ADP for ATP
- ~~b. it cross links the adjacent actin subunits~~
- ~~c. it binds to the minus-end of F-actin~~
- d. it nucleates the formation of new filaments
- e. it competes with thymosin β 4 for the same binding sites

Q35. What statement about muscle contraction is FALSE?

- ☒ a. contraction of both muscle and non-muscle cells depends on Ca^{2+} .
- ~~b. contraction of smooth muscle cells requires myosin phosphorylation.~~
- ~~c. contraction of skeletal muscle does not affect the length of the A band in sarcomers~~
- ~~d. contraction of actin/myosin bundles requires ATP~~
- e. contraction of both muscle and non-muscle cells requires troponin/tropomyosin complex

*↑
NO
phosph.*