

Cell Biology 282b MIDTERM EXAM # 2

EXAM CODE 333

March 19th, 2006

READ INSTRUCTIONS CAREFULLY:

1. **NO QUESTIONS** can be asked of the proctors. 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 NATSCI 145) or 002 (11:30am lecture NCB 101)
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!!!

1. During mitosis in animal cells

- A) nuclear membrane breakdown occurs after metaphase. ✗
- B) the centrioles replicate after metaphase. ✗
- C) the nuclear DNA is replicated after metaphase. ✗
- ☒ D) anaphase occurs after metaphase. ✓
- E) lamin disassembly occurs after metaphase. ✗

2. Which of these statements about the ECM is NOT true?

- A) The ECM can contain collagen and elastin. ✗
- B) The ECM can be cleaved by MMPs. ✗
- C) The ECM is found outside of cells. ✗
- ☒ D) The ECM inhibits cell migration.
- E) The ECM can contain glycoproteins and proteoglycans. ✓

3. If ^{→ bundle, actin} thymosin is injected into an epithelial cell it will result in

- A) the cell starting to migrate. ✗
- B) the cell beginning mitosis. ✗
- C) the cell stalling during anaphase. ✗
- D) the cell depolymerising all of its microtubules. ✗
- ☒ E) None of the above.

4. Which one of the following do muscle cells and platelets share?

- A) Dystrophin linked to microtubules. ✗
- B) Selectin bound to p150. ✗
- C) Sarcomere structures. ✗
- ☒ D) Cytoskeletal components bound to transmembrane receptors.
- E) Actin depolymerization required for cell migration. ✗

5. Which of the following is NOT an actin binding protein?

- A) Filamin. ✗
- ☒ B) Peripherin. (TF) ✗
- C) Dystrophin. ✗
- D) Myosin. ✗
- E) Fimbrin. ✗

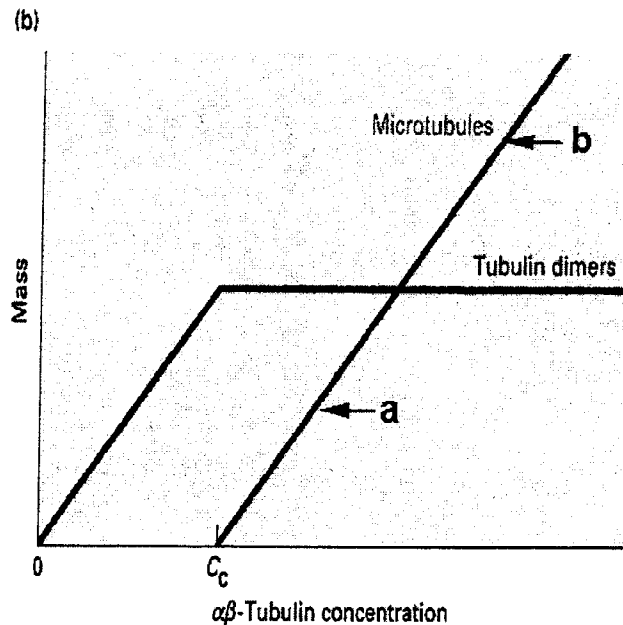
6. Actin filaments are destabilized by:

- A) Phalloidin ✗
- B) Actinomycin D ✗
- C) Colcemid ✗
- ☒ D) Cytochalasin
- E) Taxol ✗

7. With respect to ankyrin, which of the following statements is CORRECT?

- A) Ankyrin is only associated with microfilaments.
- B) Ankyrin is only associated with intermediate filaments.
- C) Ankyrin is associated with intermediate filaments and microfilaments, but not microtubules.
- D) Ankyrin is associated with microfilaments in desmosomes.
- ☒ E) Ankyrin is associated with membranes.

The following graph was presented in class and describes how critical concentration plays a role in microtubule polymerization. Questions 8 and 9 refer to this graph.



8. In the above graph points **a** and **b** represent

- A) different concentrations of tubulin dimers. ✗
- B) different concentrations of tubulin monomers. ✗
- C) different concentrations of γ -tubulin. ✗
- ☒ D) different lengths of microtubules.
- E) different stages in the cell cycle. ✗

9. In the above graph the concentration of tubulin dimers in the cell

- A) is lower at **a** vs **b**.
- B) is higher at **a** vs **b**.
- ☒ C) is the same at **a** and **b**.
- D) is zero at point **a**, as only monomers exist.
- E) is zero at point **b**, as only monomers exist.

10. With respect to size, which statement is NOT true?

- A) Microtubules can be 100's of μm s in length. ✗
- ☒ B) A β -tubulin monomer is 8nm in length.
- C) Flagella can be 100's of μm s in length. ✗
- D) Microfilaments are 7-9nm in diameter. ✗
- E) A protofilament singlet is 24nm in diameter. ✗



11. Which is/are typically found in cilia?

- A) Axonemal tubulin.
- B) Axonemal kinesin. ✓
- ☒ C) Axonemal dynein. —
- D) A and C. —
- E) A, B and C. ✗

12. The COMPLETE mitotic apparatus consists of

- ☒ A) aster and spindle microtubules.
- B) aster and polar microtubules.
- C) polar and spindle microtubules.
- D) spindle and kinetochore microtubules.
- E) kinetochore and aster microtubules.

13. With respect to the cell signals that are involved with cell migration

- ☒ A) cdc42 is needed for filopodia formation.
- B) cdc42 and rac are needed for microvilli formation.
- C) cdc42, rac and rho are needed for actin polymerization.
- D) A and B are correct.
- E) A, B and C are all correct.

14. If you add cytochalasin to cultured mammalian cells that have just entered metaphase what will happen?

- A) The cells will arrest in metaphase.
- B) The cells will cease its metabolism and die.
- ☒ C) The cells will arrest at cytokinesis.
- D) The cells will arrest at anaphase A.
- E) The cells will arrest at anaphase B.

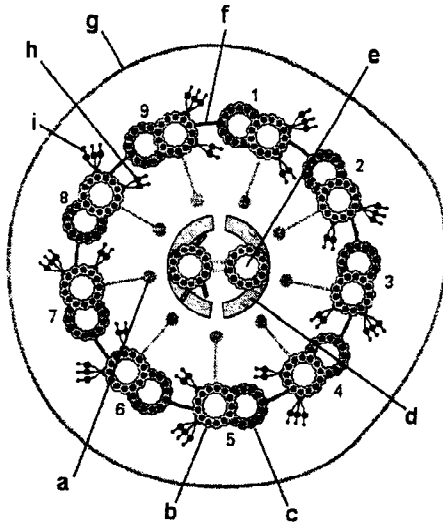
15. Microfilaments

- ☒ A) play a role in animal cell cytokinesis. ✓
- B) are arranged as 13 microfilaments in a tube. ✗
- C) are the main structure of flagella. ✗
- D) are the main structure of the mitotic apparatus. ✗
- E) All of the above. ✗

16. What CANNOT affect cytoskeleton polymerization?

- A) Temperature. ✓
- B) Subunit concentration. ✓
- C) Availability of energy (ATP or GTP). ✓
- D) Phase of the cell cycle. ✓
- ☒ E) Chromatin translation.

Questions 17 and 18 refer to the following diagram.



17. In the above diagram which is/are a (-) end directed motor?

- A) f ☐
- B) b ☐
- C) b and c ☐
- D) a and h ☐
- ☒ E) h and i

18. In the above diagram which is/are not protein(s)?

- A) b and c ☐
- B) a ☐
- C) g ☐
- ☒ D) g and d
- E) h and i ☐

19. A migrating cell expressing $\alpha 1 \beta 1$ integrins stops migrating when it reaches a new substrate.

Migration stopped because

- ☒ A) no more collagen substrate was available.
- B) no more fibronectin substrate was available. ☐
- C) no more laminin substrate was available. ☐
- D) no more lamin substrate was available. ☐
- E) no more carbohydrate substrate was available. ☐

20. A γ -tubulin antibody is added into a plant cell where it labels hundreds of individual spots within that cell. This labelling pattern indicates that
- A) plant tubulin dimers are composed of α and γ subunits. \times
 - B) plants have many basal bodies. \times
 - C) plants have hundreds of centrioles.
 - ☒ D) plants have many MTOCs.
 - E) plant cell walls are supported by microtubules. \times
21. Which event OCCURS at the kinetochore?
- A) Microtubule branching. \times
 - B) Microtubule polymerization.
 - C) Formation of a MTOC. \times
 - D) Binding of γ -tubulin to the microtubules. \times
 - ☒ E) Microtubules bind to DNA.
22. Order the following skeletal muscle contraction events in the correct sequence:
- \times (1) the sarcomere shortens
 - (2) ATP is hydrolyzed
 - γ (3) Ca^{2+} binds to troponin
 - (4) myosin contacts F-actin
 - (5) F-actin moves
 - (6) tropomyosin moves
 - (7) Ca^{2+} is released from the sarcoplasmic reticulum. \times
- Handwritten note: } 4-5
- A) 7-3-6-2-4-1-5 \times
 - B) 7-6-4-2-5-1-3 \times
 - C) 7-3-6-4-5-2-1
 - D) 7-6-2-3-4-5-1 \times
 - ☒ E) 7-3-6-2-4-5-1
23. Which of the following experimental observations proves that chromosomes can move by polymerization of tubulin subunits?
- A) Energy is expended in the process of chromosome movement. \times
 - ☒ B) Chemicals that block tubulin subunit interactions also block chromosome movement.
 - C) Chromosomes move by sliding past one another. \times
 - D) Chromosomes are individually attached to microtubules.
 - E) Chromosomes are bound by MAPs.
24. A spontaneous mutation occurs with troponin such that it can bind to, but no longer release calcium. If a muscle cell containing this mutation is triggered to contract by a nerve impulse
- A) myosin II will bind to tropomyosin.
 - B) myosin II cannot bind to actin.
 - ☒ C) myosin II is not prevented from binding to actin.
 - D) the A bands will decrease in size.
 - E) the Z disks will be pushed apart.

25. A nerve cell functions to cause muscle contraction. This nerve is injected with an antibody that stops myosin V function. The outcome of this injection would be that
- A) the sarcomere within the muscle would be disrupted. ✗
 - ☒ B) the nerve would not be able to transmit signals as it could not transport secretory vesicles. ✓
 - C) the muscle would continuously contract. ✗
 - D) NF-H, NF-M and NF-L within the nerve would disassociate. ✗
 - E) the nerve would contract as myosin V binding to actin would be disrupted, thereby allowing myosin II to bind to the actin. ✗
26. Which one of the following traits do microvilli and cilia share?
- A) Actin bundles.
 - B) Microtubule bundles.
 - C) Involved with movement. ✗
 - D) There is always one per cell. ✗
 - ☒ E) They are membrane bound. ✓
27. Vesicles being carried by dynein are seen moving in both directions within a dendrite (towards and away from the cell body). This movement
- A) is possible because two dynactin heterocomplexes exist, one that can travel to the (+) end and one to the (-) of the microtubule. ✗
 - ☒ B) is NOT possible because only one type of dynein exists. ✓
 - C) is NOT possible because axonemes in dendrites have no polarity. ✗
 - D) is possible because microtubules in dendrites have no polarity. ✗
 - E) is possible because microtubule in dendrites lay in both orientations. ✗
28. A non-migratory cell is injected with active cdc2 kinase. As a result this cell will
- A) form lamellapodia.
 - ☒ B) form filopodia. ✓
 - C) depolymerize its actin microfilaments.
 - D) depolymerize its vimentin intermediate filaments.
 - E) form focal adhesions.
29. You are given a culture dish in which cells are adhering to each other through the use of CAMs. You then add EDTA to the culture. EDTA binds to and removes all calcium from the culture solution. After the EDTA treatment all of the cells remain bound to each other as they did before. From this observation you can conclude that
- A) the cell are all expressing cadherin molecules. ✗
 - ☒ B) the cells are all expressing Ig superfamily CAMs. ✓
 - C) half the cells are expressing N-Cad, while the other half are expressing N-CAM molecules on their surface. ✗
 - D) the cells are adhering to each other using desmosomes. ✗
 - E) the cells are adhering to each other using hemidesmosomes. ✗

30. Which of these statements is FALSE?
A) Desmin is muscle specific. ✗
B) Alpha (α) actin is muscle specific. ✗
C) Myosin II is muscle specific.
D) Keratin is epithelia specific. ✗
E) Laminin is glial cell specific. ✗
31. If actin within a sarcomere is decorated with S1 myosin the "arrow heads" will point to
A) the Z disk.
B) capZ.
C) tropomodulin. ✗
D) A and B.
E) None of the above.
32. Growing microtubule ends are typically associated with
A) a GTP cap.
B) a GDP cap. ✗
C) an ATP cap. ✗
D) γ -tubulin. ✗
E) S1 myosin. ✗
33. Which of these is NOT typically associated with an epithelial cell?
A) E-Cadherin.
B) Focal adhesions. ✗
C) Desmosome. ✓
D) Keratin. ✗
E) Tight junctions. ✓
34. With respect to myosin which statement is NOT correct?
A) Myosin II is muscle type.
B) Myosin light chain binds to cargo.
C) S1 is a fragment of HMM.
D) Myosin II moves faster than myosin I.
E) Myosin I is a monomer.
35. A triplet microtubule has _____ protofilaments.
A) 13
B) 23
C) 26
D) 33
E) 39
- 13
+ 13
+ 13

39