國立清華大學 105 學年度碩士班考試入學試題

系所班組別：生命科學院甲組、醫學生物科技學程

考試科目（代碼）：細胞生物學(0405、0705)

　*請在【答案卡】作答

Part 1 單選題 (每題 2.5 分，共 25 分，答錯不倒扣。請在【答案卡】作答)

1. What is the correct answer regarding molecular motors?
   (A) Kinesin is important for muscle contraction
   (B) Kinesin moves to the minus-end of a microtubule
   (C) Kinesin needs GTP to move forward
   (D) Myosin moves on microtubules
   (E) Myosin needs ATP to move forward

2. What is the correct answer regarding important cytoskeletal structures?
   (A) Stereocilia are composed of microtubules and axonemal dynein
   (B) Cilia are composed of actin and myosin
   (C) Microvilli are composed of actin and fimbrin
   (D) Lamellipodia are composed of collagen
   (E) Stressfibers are composed of intermediate filaments

3. Regarding the polymerization of actin, what happens at steady-state phase?
   (A) At steady state the concentration of free actin monomers is called critical concentration
   (B) At steady state the critical concentration is 0.2 mM
   (C) At steady state actin filaments grow rapidly
   (D) At steady state actin filaments slowly disassemble
   (E) At steady state a balance between ATP-actin and ADP-actin can be found in the filament

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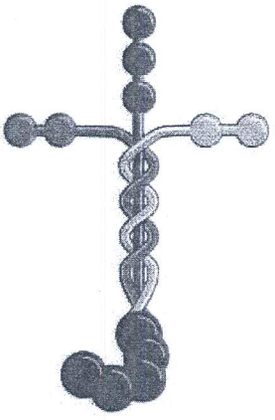
4. What is the name of this ECM molecule: (A) Fibronectin, (B) Laminin, (C) Proteoglycan, (D) Elastin, (E) Keratin



5. What is an MTOC?
   (A) Microtubules attach with their plus-ends to it
   (B) It contains centrioles composed of doublet microtubules
   (C) It is called mitotic complex
   (D) It stabilizes the nucleus via intermediated filaments
   (E) It is a centrosome

6. What is TIRF microcopy?
   (A) It uses two different fluorophores that transfers resonance energy
   (B) It uses a fast rotating spinning disk
   (C) It employs a sharp needle that moves on top of the specimen
   (D) It creates an evanescent wave field
   (E) It uses infrared laser light to penetrate deep into the tissue

7. What is an adherens junction?
   (A) It is important for the interaction between the basal lamina and epithelia cells
   (B) At the adheres belt small molecules can easily pass
   (C) Here, actin interacts with extracellular cadherins and catenins
   (D) It is a tight junction to prevent the flow of any unwanted molecules
   (E) It is a bouton-like structure that interacts with tonofilaments

8. What do alpha-actinin, filamin and fimbrin have in common?
   (A) They have actin binding sites with calponin homology
   (B) They are all important for the formation of a fully functional myofiber
   (C) They exclusively co-exist in filopodia
   (D) All of them form loosen actin networks
   (E) Gelsolin and profilin can form tight interactions with these proteins

9. Which statement is correct regarding muscle function?
   (A) Smooth muscle cells are striated
   (B) Thick filaments are composed of myosin
   (C) The A band of the sarcomere contains mainly thin filaments
   (D) Tropomyosin regulates actin/myosin interactions
   (E) The sarcoplasmic reticulum is an important ATP storage system

10. What is the correct answer regarding mitosis: During _____ microtubules attempt to interact with the kinetochores of condensed chromosomes ("search and capture"). (A) Prophase, (B) Prometaphase, (C) Metaphase, (D) Anaphase, (E) Telophase

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Part 2 問答題 (共 75 分。請在【答案卷】務必依序作答)

1. Please give a short description for the term "endomembrane system". **(3%)**

2. How would you expect the saturation levels of membrane phospholipid fatty acids to differ in plants adapted to cold environments and plants adapted to hot environments? Please explain. **(6 %)**

3. Please provide two different approaches to study an organelle in cells and briefly describe how organelles might be detected and/or identified by these approaches. **(9%)**

4. You have cloned a novel protein X that contains a short peptide KDEL at its carboxyl terminus. **(7 %)**
   (a) What is the possible destination of the protein based on your knowledge learned from the cell biology course?
   (b) What kind of experiment will you design to prove that KDEL is the signal that targets the protein X to the destination you answered in (a)?

5. Please describe (a) how receptor tyrosine kinase acts through Ras-dependent pathway to promote cell proliferation, and (b) how transforming growth factor b receptor pathway inhibits cell division **(15%)**.

6. Please explain how p53 and Rb function as tumor suppressor genes, respectively. **(10%)**

7. Explain why some neurotransmitter reuptake inhibitors can be used to treat patients with neurological disorders. **(7%)**

8. How to operate a patching clamp experiment? What is a patching clamp experiment for? **(8%)**

9. How to calculate the equilibrium potential of Na^+ in cultured neurons? How to measure the equilibrium potential of Na^+ in cultured neurons? **(10%)**