

I. Multiple choice (2% each, total 30%. Please choose the BEST answer)

1. Which of the following microscope is the best for viewing cells in tissue culture?
 - A. light microscope
 - B. fluorescence microscope
 - C. Phase contrast microscope
 - D. Transmission electron microscope (TEM)
2. Which of the following component provides growth factor in a cell culture experiment?
 - A. Phenol Red
 - B. Fetal bovine serum
 - C. penicillin
 - D. RPMI-1640
3. Which of the following instrument is the Best for identifying cell surface marker?
 - A. Pyrosequencer
 - B. PCR
 - C. NGS
 - D. flow cytometer
4. Which of the followings is correct about animal cell membrane?
 - A. amphiphilic
 - B. protein can diffuse through the membrane easily
 - C. composed of single lipid layer
 - D. contain cellulose cell wall
5. Which of the followings does not exist in animal cell membrane?
 - A. phospholipid
 - B. membrane protein
 - C. cholesterol
 - D. cellulase
6. Which of the following molecule is mainly found in cytosolic face of animal cell membrane?
 - A. Phosphatidyl-choline, PC
 - B. Phosphatidyl-serine, PS
 - C. Cholesterol
 - D. carbohydrate

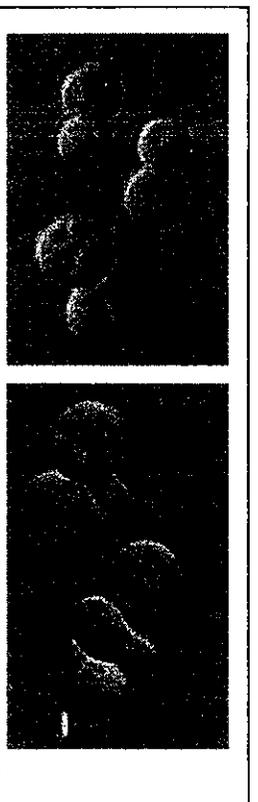
7. Which of the following protein is related to apoptosis?
- A. Caspases
 - B. Ras
 - C. AKT
 - D. Her2
8. Which of the following transporter require ATP?
- A. P-glycoprotein (MDR1)
 - B. Na/glucose symporter
 - C. GLUT2 glucose uniporter
 - D. potassium channel
9. Which of the following transporter does not require ATP?
- A. ABC transporter
 - B. Na/K pump
 - C. acetylcholine-gated Na⁺ channel
 - D. proton pump
10. Which of the following event occur at S phase of the cell cycle?
- A. formation of pre-replicative complexes
 - B. DNA replication
 - C. phosphorylation of Rb
 - D. activation of cyclin D-CDK 4
11. Which of the following is the target of Cyclin D/CDK4?
- A. p53.
 - B. c-Myc
 - C. p16
 - D. Rb
12. At what phase of the cell cycle will chromosome aligned at the equator of the spindle
- A. prophase
 - B. metaphase
 - C. anaphase
 - D. telophase
13. What is Ras?
- A. kinase
 - B. GTP-binding protein
 - C. transcription factor
 - D. growth factor

14. Which of the following is a tumor suppressor gene?
- A. Src
 - B. Ras
 - C. p53
 - D. HER2
15. Which of the following protein is related to drug resistance?
- A. Caspase
 - B. Wee1
 - C. E-cadherin
 - D. P-glycoprotein

II. Short Question

1. What is intrinsic apoptosis? (5%)
2. What is the role of Rb during G1 to S transition? (5%)
3. What is the structural importance of cell membrane during membrane transport? (5%)
4. What epithelial–mesenchymal transition (EMT)? (5%)
5. Please describe the structure of nuclear envelop in animal cells and the sequential events leading to the morphological changes of nuclear envelop during mitosis. (16%)

6. Figure 1 illustrates the morphological change of yeast cells after they receive the mating factor. Please describe the signaling pathway and cellular structure responsible for this morphological change. (16%)



7. Name the classification of coat proteins and the traffic mediated by each class of coat proteins. (12%)
8. How to turn on/off the IκB activity? (6%)