I. 單選題 (2% each, total 30%)

1. Which of the following microscope is the best for visualization of mitochondria?
   A. phase-contrast microscope
   B. fluorescent microscope
   C. light microscope
   D. Transmission electron microscope (TEM)

2. What is the purpose of fetal bovine serum (FBS) in a cell culture experiment?
   A. provide an optimal pH
   B. for detachment of cell
   C. provide growth factors for cell division
   D. provide antibodies to kill bacteria/virus

3. Which of the following equippment can amplify DNA?
   A. electron microscope
   B. flow cytometer
   C. PCR
   D. Next generation sequencer (NGS)

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 properties of cell membrane can be used to detect programmed cell death (apoptosis)?
   A. phophatidyl-choline (PC) can be found in exoplamic face
   B. phosphaidyl-serine (PS) can be found in cytosolic face
   C. cholesterol can be found in both face of cell membrane
   D. phosphatidyl-inositol (PI) can be phosphorylated to be form PIP2

8. Which of the following transporter require ATP?
A. Na/K pump
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 a G1 cyclin?
A. Cyclin A
B. Cyclin B
C. Cyclin C
D. Cyclin D

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. Which of the following is the function of Cyclin D/CDK in cell cycle?
A. deactivate p53
B. deactivate E2F
C. phosphorylate Rb
D. inhibit cell division

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 apoptosis?
A. Caspase
B. Wee1
C. E-cadherin
D. P-glycoprotein

II. 簡答題 **(70%)**

1. What is apoptosis and its pathway? (5%)
2. Describe anchoring junctions and its function in cell-cell/cell-matrix adhesion? (5%)
3. What is the molecular pathway from G1-S transition in cell cycle progression? (5%)
4. What is cancer and how does it arise? (5%)
5. Describe the biological function for (1) dynein (2) dynactin (3) dynamin (4) katanin (5) cofilin (15 %)
6. Explain the breakdown and re-formation of the nuclear envelope during mitosis. What serves as the positional marker for chromatin during cell nuclear envelope re-formation? (15%)
7. Compare and contrast *N*- and *O*-linked glycosylation in terms of (1) the definition (2) the biological meanings (3) location that takes place. (12 %)
8. Please explain the term of "latent gene regulator proteins". Given 1 example of the membrane-bound latent gene regulatory proteins and describe how it exerts its role. (8 %)