國立清華大學 107 學年度碩士班考試入學試題

系所班組別：生命科學院甲組、丁組

考試科目（代碼）：細胞生物學(0405、0705)

I. 單選題 (每題 5 分，共 25 分)

1. The flow of genetic information from RNA to DNA can be found in

(A). all organisms

(B). all prokaryotes

(C). all eukaryotes

(D). some viruses

(E). the Archaea

2. Ions can travel directly from the cytoplasm of one animal cell to the cytoplasm of an adjacent cell through _____.

(A). plasmodesmata

(B). tight junctions

(C). desmosomes

(D). gap junctions

(E). adherens junction

3. Researchers investigating the mechanism of vesicular transport assembled a cell-free system that included microtubule tracks, vesicles, and ATP. However, they observed no movement of vesicle transport in this system. What were they missing?

(A). motor proteins

(B). microfilaments

(C). intermediate filaments

(D). mitochondria

(E). phospholipid bilayer

4. If plant cells are grown on media containing radioactively labeled thymine (T) for one generation, radioactively labeled macromolecules will be detected in which of the following?

(A). only in the nucleus

(B). only in the nucleus and mitochondria

(C). only in the nucleus and chloroplasts

(D). only in the mitochondria and chloroplasts

(E). in the nucleus, mitochondria, and chloroplasts

5. Which of the following is the most common pathway taken by a newly synthesized protein that will be secreted by a cell?

(A). rough endoplasmic reticulum (ER) → Golgi →Transport vesicle→Nucleus

(B). Golgi → Rough ER→ Lysosome →Transport vesicle→ Plasma membrane

(C). rough ER→ Golgi→ Transport vesicle→ Plasma membrane

(D). rough ER→ Lysosome→ Transport vesicle→ Plasma membrane

(E). smooth ER→ Golgi→ Transport vesicle→ Plasma membrane

II. 多選題(每題 5 分，共 25 分。計分方式：在 A-E 選項中，每答對一個選項得 1 分；答錯一個選項倒扣 1 分)

6. What are the factors that determine the resolution of a light microscope?

(A). wavelength of light

(B). refractive index

(C). magnification

(D). contrast

(E). aperture of the objective lens

7. About actin microfilaments, which of the following statements are TRUE?

(A). actin filaments allow eukaryotic cells to adopt different shapes and perform different functions

(B). actin filaments polymerization and depolymerization is the major driving force that causes muscle contraction

(C). taxol is a drug that specifically targets actin filaments

(D). during muscle contraction, calcium ion released from sarcoplasmic reticulum binds directly to the actin filaments

(E). lamellipodia and filopodia are actin-rich structures at the leading edge of migrating cells

8. The main differences between DNA and RNA are:
(A). DNA uses A,T,C,G as its nucleotide components, but RNA uses A,U,C,G
(B). DNA contains the sugar deoxyribose, whereas RNA contains the sugar ribose
(C). the reading direction of the nucleotide sequence in DNA is from 5' to 3' end, but the reading direction of RNA is from 3' to 5'
(D). DNA forms anti-parallel double helix, but RNA mainly forms single-stranded structure
(E). the backbone of DNA is formed by phosphodiester bond, but the backbone of RNA is not

9. The endosymbiotic theory describes the origin of
(A). nucleus
(B). endoplasmic reticulum
(C). Golgi complex
(D). chloroplast
(E). mitochondria

10. After transcription, RNA is modified by
(A). capping at the 5' end
(B). formation of hairpin structure
(C). splicing of the precursor RNA
(D). modification of uridine
(E). polyadenylation at the 3' end

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III. 問答題 (每題 10 分，共 50 分)

1) You have discovered a new single-celled organism living in marine sediments. What tools or techniques would you used to determine it is prokaryotic or eukaryotic? How? Perhaps consider the three historical strands of cell biology – cytology, biochemistry, and genetics.

2) How would an inhibitor of membrane fusion differentially affect exocytosis versus endocytosis?

3) Why is it important for the biochemical reactions occurring in peroxisomes to be isolated from the cytoplasm in a separate organelle?

4) When nerve cells establish a voltage across their membrane with a sodium-potassium pump, does this pump use ATP or does it produce ATP? Why?

5) You are studying cells that normally respond to epidermal growth factor (EGF) by increasing their rate of cell division. You measure the cell division rate in normal cells and in cells in which a GTPase activating protein (GAP) for Ras has been knocked down using siRNA. When the two types of cells are exposed to the same concentration of EGF, what differences in response to EGF do you expect? Explain your answer.