

試題請務必連同試卷交回。

單選題 (每題 2 分)

SIMPLE-CHOICE QUESTIONS

Identify the correct statement. Gain two points for each correct answer.

1. With respect to microtubules during mitosis:
 - (A) Polar ejection force contributes to the movement of chromosomes toward the spindle midline during congression.
 - (B) The action of kinesin heavy chain on astral microtubules is thought to contribute to Anaphase B motions.
 - (C) Kinetochores attach to the minus ends of microtubules.
 - (D) Kinetochore microtubules depolymerize rapidly at their plus ends during Metaphase.

2. Concerning cell-cell junctions:
 - (A) Adherent junctions provide an impermeable barrier across epithelial sheets.
 - (B) Associations between cadherins are disrupted in the presence of high calcium concentrations.
 - (C) Tight junctions "zipper" cells together by associating with bundles of actin filaments to form an "adhesion belt"
 - (D) Cadherins are involved in linkages to both microfilaments and intermediate filaments through associations with different accessory proteins.

3. Concerning collagen:
 - (A) Collagen subunits are formed by the dimerization of collagen proteins via a standard alpha-helical coiled coil.
 - (B) The amino acid repeat structure of collagen is such that proline residues are found at the center of the collagen helix, where stacking of proline rings promotes subunit association.
 - (C) Collagen must be processed by proteases before it can assemble into collagen fibrils.
 - (D) Cross-linking between collagen fibrils occurs between glycines of the triplet repeat.

4. The codons 5' ACA 3', 5' ACU 3' and 5' ACC 3' can all be read by the anticodon:
 - (A) 5' GGU 3'
 - (B) 5' IGU 3'
 - (C) 5' UGU 3'
 - (D) 5' UGI 3'

5. In mammals, E2F functions to:
 - (A) Activate cyclin E and Cdk2 mRNA synthesis and inhibit Rb phosphorylation.
 - (B) Activate E2F, cyclin E and Cdk2 mRNA synthesis.
 - (C) Inhibit both cyclin E mRNA synthesis and Rb phosphorylation.
 - (D) Activate cyclin E and Cdk2 mRNA synthesis and inhibit E2F mRNA synthesis.

6. Concerning protein folding and stability:
 - (A) Molecular chaperones utilize the energy of ATP hydrolysis to "massage" proteins into a stable structure.
 - (B) Molecular chaperones assist in protein folding by first binding to hydrophilic regions of newly synthesized proteins.

(背面仍有題目,請繼續作答)

- (C) Only misfolded proteins are degraded by the proteasome pathway, and they are degraded only after the covalent addition of a ubiquitin molecule.
- (D) Proteins are targeted for destruction in the proteasome by the linkage of the N-terminus of ubiquitin to the carboxyl group of Asp to form an isopeptide linkage.
7. Dolichol is needed for:
- (A) detoxification via cytochrome P450.
- (B) regulated secretion.
- (C) DNA replication.
- (D) N glycosylation in the RER.
8. An organelle that is unusual in that it imports proteins (oxidative enzymes) synthesized in the cytoplasm via membrane-bound import receptor proteins is the:
- (A) peroxisome
- (B) mitochondrion
- (C) endoplasmic reticulum
- (D) lysosome
9. Nuclear lamins:
- (A) are made of actin and myosin
- (B) are a type of intermediate filament that can disassemble
- (C) are found inside the Golgi apparatus
- (D) are made of tubulin and dynein
10. Alcohol and small lipids pass directly through the cell membrane because they can
- (A) interact with the membrane's proteins.
- (B) prevent facilitated diffusion.
- (C) interact with the membrane's carbohydrates.
- (D) dissolve in the lipid bilayer.
11. A nucleotide does not consist of a
- (A) phosphate group.
- (B) polymerase.
- (C) 5-carbon sugar.
- (D) nitrogenous base.
12. The DNA of chromosomes is coiled around special proteins called
- (A) nucleosomes.
- (B) chromatids.
- (C) chromatin.
- (D) histones.
13. Which of the following statements is NOT true of mitosis?
- (A) A single nucleus gives rise to two identical daughter nuclei.
- (B) The centromeres divide at the onset of anaphase.
- (C) Homologous chromosomes synapse in prophase.
- (D) The daughter nuclei are genetically identical to the parent nucleus.

14. Cells lining the surface of animals are part of a tissue type known as
(A) connective tissue
(B) nervous tissue
(C) epithelial tissue
(D) muscle tissue
15. What is the instrument which can evaluate the fluorescence associated with a large number of individual cells relatively quickly?
(A) Flow cytometer
(B) Confocal microscope
(C) Spectrophotometer
(D) Scanning electron microscope

複選選擇題 (每題 2 分, 全對才給分)**MULTIPLE-CHOICE QUESTIONS**

Identify the correct statements. Note that more than one statement are correct in each question. Gain two points for each correct question.

1. Concerning glycosaminoglycans (GAGs):
(A) GAGs are formed from repeating disaccharides of GalNAc and GlcNAc
(B) GAGs are able to withstand large compressive forces due to the large amount of water that they absorb.
(C) GAGs are able to withstand large compressive forces because their hydrophobic nature makes them very efficient at excluding water molecules.
(D) GAGs can be found attached to a protein backbone via O-linkages to form proteoglycans.
2. Regarding G-protein linked receptor signaling pathways:
(A) $G_{s\alpha}$ is the only G_{α} type that stimulates the activity of a downstream target enzyme.
(B) G proteins can either activate or inhibit cellular enzymes.
(C) Addition of adrenaline (epinephrine) to a smooth muscle cell containing a beta-adrenergic receptor would activate protein kinase A.
(D) Differences in signaling pathways between different G-protein linked receptors are due to differences in the G proteins that are activated by the receptor.
3. With respect to receptor tyrosine kinase (RTK) signaling pathways:
(A) Receptors with tyrosine kinase activity are activated when they become tyrosine phosphorylated and the phosphorylated tyrosines often serve as ligands for proteins with SH2 domains.
(B) A receptor with a defective catalytic domain can still be phosphorylated by a normal RTK.
(C) Dimerization of receptors is necessary because most downstream substrates must bind to multiple phosphotyrosines.
(D) Tyrosine kinase receptors are more likely to be oncogenes than G_i -linked receptors.
4. Concerning regulation of the cell cycle:
(A) Phosphorylation of cdc2 on a threonine by the CAK protein kinase is necessary for the activation of cdc2.

(背面仍有題目,請繼續作答)

- (B) Ubiquitination of the MPF cyclin is essential for activation of cdc2.
(C) Binding of PCNA by p21 blocks DNA replication.
(D) The wee1 protein kinase inhibits MPF by phosphorylating CAK.
5. A recombinant fusion protein could potentially be used to:
(A) Identify mammalian proteins that interact with the mammalian protein that you are studying.
(B) Determine the subcellular localization of the protein you are studying.
(C) Isolate the gene that encodes your protein of interest (i.e. the protein you have included in your fusion). is permeable to protons.
(D) Rapidly purify large quantities of the protein from a host cell (e.g. from bacteria).
6. Choose true statements:
(A) Fungi possess a nucleus.
(B) Human cells have ribosomes virtually identical (even biochemically) to those of bacteria.
(C) Plant cells possess a cell wall.
(D) Bacterial cells generally possess a cell wall.
7. What does the "S" in 80S ribosome stand for?
(A) Solid
(B) The unit of measure for the sedimentation coefficient.
(C) Svedberg.
(D) Segregation
8. Select correct statements for HAT media from the following:
(A) The components of HAT media are Hypoxanthine, Aminopterin, and Thymidine.
(B) Aminopterin blocks de novo purine and TMP synthesis, forces cell to use salvage pathway
(C) Hypoxanthine provides substrate for purine salvage
(D) Hybrid TK- and HGPRT- cells will survive on HAT medium because one copy of the TK and HGPRT are normal, but TK- and HGPRT cells will die since they will turn Thymidine and Hypoxanthine to toxic compounds, respectively.
9. Phosphorylation of proteins:
(A) requires ATP.
(B) generally occurs on Cys thiol groups.
(C) is generally catalyzed by cellular protein phosphatases.
(D) can induce allosteric transitions.
10. Select correct statements from the following:
(A) The isoelectric point of a protein is a function of the collective effects of the pK's of all of its ionizable groups.
(B) The yeast two-hybrid system allows one to test for interactions between proteins without ever having to purify the proteins.
(C) Two-dimensional gel electrophoresis involves separating proteins by SDS-PAGE, then probing them with an antibody to identify a specific protein.
(D) A transition-state analog is likely to act as an effective enzyme inhibitor.

簡答題 (每題 5 分)

SHORT ESSAY

1. What would be the effect on progression of the cell cycle for the situation that Cyclin D is overproduced?
2. What are the differences between channels and pumps?
3. Discuss how the use of a dense medium can facilitate the separation of cells by centrifugation.
4. List the five basic nutritional requirements for growth of animal cells.
5. What is the relationship between the triplet code in DNA, the mRNA codon and the tRNA anticodon?
6. Give an example of protein processing.
7. What are the major types of cell membrane receptors?
8. Describe how could cells respond to signals from the external environment and the consequence of this event.
9. In the cytoskeleton, the basic motif of filament/tubule formation is monomer polymerization. Why?
10. List five differences between prokaryotes and eukaryotes.