

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. Select a correct statement from the following:
 - (A) Signal sequences allowing translocations across the endoplasmic reticulum membrane are rich in basic amino acid residues.
 - (B) Cilia and flagella always have a function in locomotion.
 - (C) The Golgi apparatus is the only route for protein secretion.
 - (D) All microtubule organizing centres show a common structure.
2. All bacteriophages:
 - (A) cause bacteriolysis.
 - (B) contain at least one molecule of nucleic acid.
 - (C) produce genetic changes in their bacterial hosts.
 - (D) all of the above are true.
3. LDL is taken up by cells using:
 - (A) pinocytosis.
 - (B) phagocytosis.
 - (C) receptor-mediated endocytosis.
 - (D) exocytosis.
4. Lipids which are found in biological membranes:
 - (A) are amphipathic.
 - (B) are commonly referred to as triacylglycerols.
 - (C) contain only unsaturated fatty acyl chains.
 - (D) are normally covalently associated with proteins.
5. In a neuron, the resting potential is due, at least in part, to:
 - (A) the $\text{Na}^+\text{-K}^+\text{-ATPase}$ of the plasma membrane.
 - (B) the $\text{Ca}^{2+}\text{-ATPase}$ of the sarcoplasmic reticulum.
 - (C) the volume flux of cations outside the cell.
 - (D) the excess of cations inside the cell.
6. Endonuclease activity is apparent during which of the following?
 - (A) Atrophy.
 - (B) Apoptosis.
 - (C) Differentiation.
 - (D) Necrosis.

(背面仍有題目,請繼續作答)

7. A factor that may prevent cells undergoing apoptosis is:
- (A) Interleukin 3.
 - (B) Nerve growth factor.
 - (C) Bcl-2 protein.
 - (D) Interleukin 2.
8. Cyclins are?
- (A) Protein kinases
 - (B) Proteins that control protein kinases
 - (C) Each cyclin only controls one protein kinase
 - (D) b and c apply
9. Active transport is the movement of molecules across a membrane against its concentration gradient. Cells have evolved several mechanisms to accomplish this. Which of the alternatives below describe these mechanisms?
- (A) A GTP driven glucose transport system and a light driven pump
 - (B) Light driven pumps, ATP driven pumps and coupled transporters
 - (C) ATP driven transport of sugars, and ion driven transport of amino acids
 - (D) All of these are correct
10. The minimal components required for the proper function of a eukaryotic chromosome are?
- (A) Centromere
 - (B) Replication origin
 - (C) Telomere and telomerase
 - (D) All apply
11. You isolate a temperature sensitive mutant of hamster fibroblast which grows at 30° but not at 37°. You determine that one of the enzymes involved in ubiquitination of proteins is defective at 37°. You expect at 37°
- (A) M-cyclin dependant protein kinase to be rapidly degraded.
 - (B) M-cyclin to be rapidly degraded.
 - (C) M-cyclin to be stable.
 - (D) M-cyclin dependant protein kinase to be stable.
12. Upon addition of epidermal growth factor (EGF) to cells, the EGF receptor is phosphorylated at multiple sites on tyrosine residues. This phosphorylation?
- (A) Is irrelevant to signal transduction by EGF
 - (B) Provides sites for activation of other proteins in the cell
 - (C) Each site is specific for a different pathway
 - (D) b and c apply
13. Which of the following events are likely to predispose a cell to become a cancer cell?
- (A) Loss of p53 gene
 - (B) Loss of DNA repair protein
 - (C) Decrease in cellular ATP levels
 - (D) (A) and (B) apply

14. The separation of charged molecules in a pH gradient according to a molecules isoelectric point is known as?
- (A) gel filtration chromatography
 - (B) isoelectric focusing
 - (C) SDS-gel electrophoresis
 - (D) ion-exchange chromatography
15. ATP synthase catalyses the synthesis of ATP by the flux of protons from the proton chemically positive side (high proton electrochemical potential) to the proton chemically negative side. In mammalian mitochondria, the proton positive side is?
- (A) mitochondrial matrix
 - (B) inner membrane space
 - (C) cell cytoplasm
 - (D) Krebs cycle

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. Which of the following is **NOT** a component of the electron transfer chain of mammalian mitochondria?
- (A) thymine pyrophosphate
 - (B) pyruvate dehydrogenase
 - (C) coenzyme-A
 - (D) alpha-ketoglutarate
2. Select correct statements from the following:
- (A) The use of aseptic technique can prevent accumulation of unwanted microorganisms in cultures.
 - (B) Plant secondary compounds are produced by primary metabolism.
 - (C) Somaclonal variation amongst plant cells can be a source of mutations bearing useful traits.
 - (D) Plant cell immobilization in culture does not allow cells to grow together in a multicellular way.
3. Which of the following macromolecules are made by a condensation reaction?
- (A) proteins
 - (B) nucleic acids
 - (C) polysaccharides
 - (D) phospholipids

4. Like eukaryotes, prokaryotes may contain the following structures:
 - (A) plasma membrane
 - (B) cell wall
 - (C) mitochondria
 - (D) ribosomes
5. The inner membrane of mitochondria:
 - (A) appears smooth on freeze-etch electron micrographs.
 - (B) is rich in the lipid bisphosphatidylglycerol.
 - (C) is permeable to protons.
 - (D) binds the 9 nm diameter coupling factor.
6. SDS-PAGE electrophoresis:
 - (A) separates proteins on the basis of molecular weight.
 - (B) separates proteins on the basis of charge.
 - (C) all proteins in the gel have a net negative charge.
 - (D) the proteins are not denatured.
7. Hyaluronan is:
 - (A) a glycosaminoglycan
 - (B) a proteoglycan
 - (C) synthesized on a protein core
 - (D) composed of repeating disaccharides
8. The hemicellulose polysaccharides of the primary cell wall:
 - (A) are cross-linked by Ca^{2+} bridges
 - (B) are hydrogen bonded to cellulose microfibrils
 - (C) associate together by hydrogen bonds to form fibrils
 - (D) are polysaccharides with glycosyl side-chains
9. Indicate which of the following are examples of homeobox-containing genes in *Drosophila*:
 - (A) maternal-effect genes.
 - (B) segmentation genes.
 - (C) homeotic genes.
 - (D) housekeeping genes.
10. Select correct statements from the following:
 - (A) Cell cycle times vary from one cell to another, with most of the variability occurring in the G_1 phase.
 - (B) In the G_1 phase cells undergo a critical transition called 'START' which is an internal change that marks the onset of DNA synthesis.
 - (C) Apoptosis is always accompanied by cell shrinkage.
 - (D) Necrosis is always accompanied by loss of cell volume control.

簡答題 (每題5分)

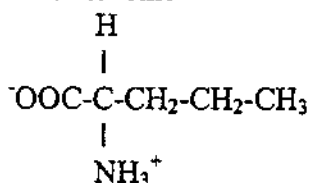
SHORT ESSAY

1. Arrange the following two columns in appropriate pairs linking each organelle to its principal role:
- | | |
|---------------------|------------------------|
| (A) nucleus | (1) ATP synthesis |
| (B) lysosomes | (2) protein synthesis |
| (C) ribosomes | (3) genome |
| (D) mitochondria | (4) glycosylation |
| (E) Golgi apparatus | (5) hydrolytic enzymes |

2. Each type of intermediate filaments is unique to a particular cell type. Arrange the following two columns in appropriate pairs.

(A) Keratin	(1) nerve cells
(B) vimentin	(2) epithelial cells
(C) Desmin	(3) mesenchymal cells
(D) Neurofilament proteins	(4) muscle cells
(E) Glial fibrillary acidic protein	(5) glial cells

3. If the facilitated uptake of leucine and isoleucine by a cell was inhibited by the non-standard amino acid nor-leucine



which other standard amino acid is likely to be carried across the membrane by the same permease as leucine and isoleucine?

4. Explain briefly how an antibody may be used to visualize the distribution of a cytoskeletal protein in a cell.
5. How could you use an inhibitor of cyclic AMP phosphodiesterase to provide evidence that a particular hormone exerted its effect on a tissue by increasing cyclic AMP content?
6. In the description of antibody-antigen binding, it has been suggested that hydrogen bonding and ionic interactions contribute in only a small way to the strength of binding. Suggest a reason for this assumption. (Clue: consider the pH needed to dissociate them.)
7. Give examples of biochemical and cellular processes involved in cell migration.
8. What is a morphogen?
9. What is the definition of 'stem cells'?
10. Write down five instruments or facilities required for general cell cultural experiments.