

MULTIPLE-CHOICE QUESTIONS 單複選選擇題 答對一個答案得 1 分，答錯一個答案扣 0.5 分。
Identify the correct statements. Note that more than one statement might be correct in each question.
Gain one point for each correct choice and lose 0.5 point for each wrong choice.

- For the differences between prokaryotes and eukaryotes, which statement(s) is (are) wrong?
 - Prokaryotes have cell size about 1~10 μm .
 - Prokaryotes have circular chromosomes.
 - All photosynthetic types of eukaryotes produce O_2 .
 - Prokaryotes are strict anaerobes and eukaryotes are strict aerobes.
- The use of plant cultures for the production of commercially important compounds has several features. These include:
 - novel product synthesis from mutants.
 - greater control over compound production, but not over quality.
 - independence from seasonal factors.
 - biotransformation reactions in plant cell culture never occur.
- Which of the following organelles is (are) not found in a plant cell?
 - centrioles
 - cytoskeleton
 - thylakoids
 - vacuole
- Which of the following organelles is (are) not found in an animal cell?
 - lysosomes
 - chloroplast
 - peroxisome
 - Golgi complex
- Choose the correct statement(s).
 - Signal sequences allowing translocations across the endoplasmic reticulum membrane are rich in basic amino acid residues.
 - Cilia and flagella always have a function in locomotion.
 - The Golgi apparatus is the only route for protein secretion.
 - All microtubule organizing centres show a common structure.
- For culturing animal cells, which of the following is (are) not important nutrients?
 - amino acid
 - minerals
 - phenol red
 - vitamins
- Choose the correct statement(s).
 - The use of aseptic technique can prevent accumulation of unwanted microorganisms in cultures.
 - Plant secondary compounds are produced by primary metabolism.
 - Somaclonal variation amongst plant cells can be a source of mutations bearing useful traits.
 - Plant cell immobilization in culture does not allow cells to grow together in a multicellular way.
- Bacterial cell walls:
 - contain antigens.
 - are synthesized by pathways sensitive to the action of certain antimicrobial compounds.
 - may be removed without destroying cell viability.
 - rich in enzymatic activity.

(背面仍有題目,請繼續作答)

9. Choose the correct characteristic(s) for the designation of animal cells as "normal".
- (A) A diploid chromosomal complement indicating that gross genetic changes have not occurred.
 - (B) Anchorage-independence.
 - (C) A finite life-span
 - (D) Immortalization
10. Choose the true statement(s).
- (A) A lipid bilayer is the fundamental structural component of all cell membranes.
 - (B) Although lipid molecules are free to diffuse in the plane of the bilayer, they cannot flip-flop across the bilayer unless enzyme catalysts called phospholipid translocators are present in the membrane.
 - (C) There is relative excess of phosphatidylserine present on the cytoplasmic face of the bilayer.
 - (D) Glycolipids are never found on the cytoplasmic face of membranes in living cells.
11. Choose the true statement(s).
- (A) Glycolipid molecules have only one oligosaccharide side chain, whereas glycoproteins often have many.
 - (B) Proteoglycans contain more protein than carbohydrate, whereas glycoproteins contain more carbohydrate than protein.
 - (C) Although most proteoglycans are extracellular matrix molecules, integral membrane proteoglycans also exist.
 - (D) The carbohydrate that makes up the glycocalyx is always attached to glycoproteins and proteoglycans that are integral membrane proteins.
12. Choose the true statement(s).
- (A) The plasma membrane is highly impermeable to all charged molecules.
 - (B) Channel proteins (such as the voltage-gated Na^+ channel) transport ions much faster than carrier proteins (such as the Na^+ - K^+ pump), but they cannot be coupled to an energy source; therefore, transport mediated by channels is always passive.
 - (C) Most of the cholesterol in the blood is present in large (22 nm) spherical particles called LDL.
 - (D) Exocytosis and endocytosis both involve membrane fusion but occur on opposite directions relative to the plasma membrane.
13. Choose the true statement(s).
- (A) To ensure a continuous supply of energy from oxidative metabolism, animal cells store fuel in the form of fatty acids and glucose.
 - (B) The net change of disorder in the universe due to a reaction is reflected in the change in free energy associated with the reaction: the larger the increase in free energy (so that ΔG is very positive), the more favored the reaction.
 - (C) The proteins that constitute the respiratory chain all use iron atoms as electron carriers.
 - (D) The molecular mechanism by which electron transport is coupled to proton pumping is likely to be different for different respiratory enzyme complexes.
14. Choose the true statement(s).
- (A) All posttranslational modifications of proteins modify the covalent structure of the proteins.
 - (B) Ubiquitin is an ATP-dependent protease that rapidly cleaves proteins that are marked for degradation.
 - (C) Depending on the individual protein, a signal peptide or a signal patch may direct the protein to the ER, mitochondria, chloroplasts, or nucleus.
 - (D) All secreted proteins follow a similar pathway from ribosomes to the ER to the Golgi apparatus to secretory vesicles to the cell exterior.
15. Choose the true statement(s).
- (A) In mammalian cells the import of proteins into the ER begins before the polypeptide chain is completely synthesized-that is, it occurs co-translationally.

- (B) Free ribosomes and membrane-bound ribosomes are identical.
- (C) Regardless of the topology of the membrane protein, the amino terminus of a cleaved signal sequence is never exposed to the lumen of the ER.
- (D) N-linked oligosaccharides are much more common on glycoproteins than are O-linked oligosaccharides.
16. Choose the true statement(s).
- (A) All of the sugars in the terminal region of complex oligosaccharides are added in the *trans* Golgi by a series of glycosyl transferases that act in a rigidly determined sequence.
- (B) N-linked oligosaccharides aid in the transport of proteins through the ER and Golgi.
- (C) Proteoglycan core proteins are converted in the Golgi apparatus into proteoglycans by the addition of O-linked glycosaminoglycan chains.
- (D) Exported proteins move unidirectionally through the three compartments of the Golgi and never skip an intervening compartment.
17. Structural proteins are:
- (A) multifunctional proteins.
- (B) integral membrane proteins.
- (C) glycoproteins.
- (D) proteoglycans.
18. Choose the true statement(s).
- (A) Lysosomal membranes contain a proton pump that utilizes the energy of ATP hydrolysis to pump protons out of the lysosome, thereby maintaining the lumen at a low pH.
- (B) Lysosomes are heterogeneous organelles that are found in all nucleated eucaryotic cells.
- (C) Materials taken up by endocytosis fuse directly with lysosomes so that their contents can be digested to small molecules.
- (D) Lysosomal hydrolases are marked for delivery to lysosomes by having mannose 6-phosphate (M6P) groups added to their N-linked oligosaccharides in the lumen of the Golgi.
19. Choose the true statement(s).
- (A) Each chromosome contains a single long DNA molecule.
- (B) In genes from higher eucaryotes, introns are usually larger and more numerous than exons.
- (C) If a DNA-binding protein forms a symmetric dimer, it is likely that the recognition site in the DNA is symmetric as well.
- (D) Histones are relatively small proteins with a very high proportion of positively charged amino acids; the positive charge helps the histones bind tightly to DNA, regardless of its nucleotide sequence.
20. Choose the true statement(s).
- (A) Two distinct types of DNA polymerase are needed in eucaryotes: DNA polymerase alpha on the lagging strand and DNA polymerase delta on the leading strand.
- (B) The two X chromosomes in a female mammalian cell, only one of which is active, are replicated at the same time during the S phase.
- (C) Genes that are active in only a few cell types generally replicate early in the cells in which they are active and later in other types of cells.
- (D) When an S-phase cell is fused with a G₂-phase cell, DNA synthesis is induced in the G₂-phase nucleus; when an S-phase cell is fused with a G₁-phase cell, however, the G₁ nucleus is not stimulated to synthesize DNA.
21. Choose the true statement(s).
- (A) RNA polymerases I, II, and III are each composed of multiple subunits, but none of the subunits are shared by all three polymerases.
- (B) Since introns are largely genetic "junk," they do not have to be removed precisely from the primary

(背面仍有題目,請繼續作答)

transcript during RNA splicing.

- (C) Unlike cytoplasmic organelles, the nucleolus is not bounded by a membrane.
 - (D) There is no nucleolus in a metaphase cell.
22. For the strategies of gene control, choose the true statement(s).
- (A) A relatively few regulatory elements could generate a large number of cell types by combinatorial gene regulation.
 - (B) Regulation of gene expression by controlling how the primary RNA transcript is spliced or otherwise processed is known as RNA processing control.
 - (C) Whenever a gene regulatory protein binds to its recognition sequence in the DNA, it stimulates transcription of the adjacent gene.
 - (D) Most eucaryotic genes are regulated by the binding of only one or two gene regulatory proteins.
23. Choose the true statement(s).
- (A) RNA polymerase binds to the promoter to start transcription.
 - (B) Eucaryotic gene regulatory proteins are activated or inactivated almost exclusively by the binding of small signaling molecules.
 - (C) CG islands surround the promoters of so-called housekeeping genes.
 - (D) Tissue-specific genes encode proteins needed only in selected types of cells.
24. Choose the true statement(s).
- (A) In procaryotes and eucaryotes transcriptional attenuation is mediated by ribosomes that have stalled during translation of the nascent RNA chain.
 - (B) A change in the site of RNA transcript cleavage and poly-A addition can change the carboxyl terminus of a protein only by adding (or subtracting) amino acids.
 - (C) Long introns between exons provide an increased opportunity for recombination to duplicate exons or link exons from different genes.
 - (D) The absence of introns in procaryotic genes indicates that introns were added to the eucaryotic line some time after the evolutionary separation of procaryotes and eucaryotes.
25. Choose the true statement(s).
- (A) Bacteria do not have a cytoskeleton.
 - (B) Muscle contraction is caused by the sliding of thick filaments past thin filaments, with no change in the length of either filament.
 - (C) Actin polymerization requires ATP, but not the energy of ATP hydrolysis.
 - (D) Muscle contraction occurs when cytosolic Ca^{2+} levels rise due to the opening of Ca^{2+} channels in the sarcoplasmic reticulum.
26. Choose the true statement(s).
- (A) Myosin filaments consist of two α -helices stabilized by hydrophobic interactions.
 - (B) The extraction of myosin from all muscle tissues requires the use of media of high ionic strength.
 - (C) The addition of F-actin decreases the turnover number of myosin-catalyzed hydrolysis of ATP.
 - (D) Creatine phosphokinase can donate its P_i to ADP to replenish muscle ATP.
27. Choose the true statement(s).
- (A) The leading edge of crawling cells and growth cones periodically extends thin sheetlike processes known as lamellipodia.
 - (B) In mature red blood cells actin filaments are attached directly to the plasma membrane.
 - (C) Treadmilling of actin filaments is driven by the energy obtained from ATP hydrolysis.
 - (D) Cytochalasin inhibits the separation of chromosomes at mitosis, suggesting that actin is involved in this process.
28. The myosin molecule may be digested into fragments. Choose the true statement(s).

- (A) One molecule has two 'heads'.
(B) S1 fragments are 'heads'.
(C) There are no light chains associated with 'heads'.
(D) The amino acid termini of the myosin heavy chains are in the 'heads'.
29. Choose the true statement(s).
(A) Microtubules are formed from molecules of tubulin.
(B) Eucaryotic cilia and flagella contain an outer ring of nine doublet microtubules surrounding two single microtubules.
(C) Microtubules are composed almost entirely of multiple subunits of two slightly different polypeptide chains.
(D) Centrosomes usually contain centrioles.
30. Choose the true statement(s).
(A) Microtubules are responsible for regulating cell polarity, cell shape, cell movement, and the plane of cell division.
(B) Addition of colchicine to a culture of growing cells blocks them all in mitosis within a few minutes.
(C) Tubulin requires GTP for polymerization.
(D) All microtubules, even those in cilia and flagella, show dynamic instability.
31. Several drugs stabilize and destabilize microtubules and microfilaments in cells in vitro. Choose the true statement(s).
(A) Colchicine prevents microtubule polymerization.
(B) Taxol causes microtubule depolymerization.
(C) Phalloidin binds only to actin.
(D) Cytochalasin B depolymerizes actin filaments.
32. Choose the true statement(s).
(A) Cytoplasmic intermediate filaments are thought to be essential for cell survival.
(B) Most, if not all, of the enzymes in the cytosol are attached to the cytoskeleton.
(C) The polarized movement of cells is organized by microtubules in some cells and by actin filaments in others.
(D) Membrane recycling occurs almost exclusively at the leading edge of a moving cell.
33. Choose the true statement(s).
(A) Endocrine signaling is relatively slow because it depends on diffusion and blood flow.
(B) Hormones are rapidly removed from the bloodstream by hydrolytic enzymes.
(C) If the same signaling molecule has different effects on different target tissues, the receptors are usually different.
(D) Water-soluble hormones interact with cell-surface receptors, whereas lipid-soluble hormones usually bind to intracellular receptors.
34. Choose the true statement(s).
(A) Cell-surface receptors often carry their ligands into the cell by receptor-mediated endocytosis, but this process is not the basis of their signaling activity.
(B) Catalytic receptors, which act directly as enzymes, usually function as tyrosine-specific protein kinases.
(C) The enzyme glycogen phosphorylase is a protein kinase that is stimulated by cyclic AMP.
(D) Inositol trisphosphate acts by direct stimulation of protein kinase C.
35. Choose the true statement(s).
(A) Cyclic AMP exerts its effects in animal cells mainly by activating an enzyme called A-kinase.
(B) The multipurpose intracellular Ca^{2+} receptor that mediates most Ca^{2+} -regulated processes is calmodulin.

(背面仍有題目,請繼續作答)

- (C) The enzyme guanylate cyclase catalyzes the formation of cyclic GMP from GTP.
(D) In some cells an increase in cyclic AMP turns on specific genes as a result of phosphorylation of a DNA-binding protein.
36. Choose the true statement(s).
(A) Cell transformation can be caused by a single gene.
(B) The cell transformation assay for oncogenes only detects dominant oncogenes.
(C) Virtually all viral oncogenes correspond either to a natural growth factor or a natural growth-factor receptor.
(D) Normal cells proliferate only when they are firmly attached to the substratum, but the proliferation of transformed cells is markedly inhibited when they are artificially forced to attach to the substratum.
37. Choose the true statement(s).
(A) The basal surface of an epithelial cell is joined to the basal lamina at hemidesmosomes, which link intermediate filaments to the extracellular matrix.
(B) Directional pumping of nutrients across epithelia would be impossible if the proteins on the apical and basolateral surfaces were the same.
(C) Gap junctions connect the cytoskeletal elements of one cell to a neighboring cell or to the extracellular matrix.
(D) The permeability of gap junctions is regulated by the extracellular Ca^{2+} and pH.
38. Integrins:
(A) have two transmembrane subunits.
(B) bind directly to actin.
(C) bind YIGSR peptides.
(D) all have the same β -subunit.
39. Choose the true statement(s).
(A) The collagens are the most abundant proteins in mammals; their distinguishing feature is a triple-stranded helix rich in glycine and proline.
(B) The extracellular matrix is a relatively inert scaffolding that stabilizes the structure of tissues.
(C) The elasticity of elastin derives from its high content of alpha helices, which act as molecular springs.
(D) Cells never bind directly to molecules in the extracellular matrix; instead, they bind indirectly through extracellular adaptor glycoproteins.
40. Choose the wrong statement(s).
(A) The process by which a cell senses a molecule in the external environment and moves along a concentration gradient of the molecule is termed chemotaxis.
(B) Antibodies against E-cadherin block both epithelial cell adhesion and compaction of blastomeres in the early mouse embryo.
(C) One of the difficulties in studying cell-adhesion mechanisms is that almost any antibody directed against cell-surface components will block cell adhesion.
(D) Migrating embryonic cells do not form junctional contacts.
41. Choose the true statement(s).
(A) DNA is the carrier of genetic information in all prokaryotic organisms.
(B) Mitotic chromosomes represent the most highly condensed form of chromatin.
(C) Chromatin is found in the nucleoid.
(D) Ribosomes are formed in the nucleolus.
42. Choose the true statement(s). Gap junctions:
(A) contain the protein connexin.
(B) are connected to tonofilaments.

- (C) attach cells to basal lamina.
(D) are communicating junctions between interconnected cells.
43. The secondary wall of plant cells:
(A) is external to the primary cell wall.
(B) occurs in all mature plant cells.
(C) is composed predominantly of cellulose and lignin.
(D) is deposited after cell death.
44. Repolarization after an action potential occurs:
(A) through opening of Na^+ channels only.
(B) through closure of K^+ channels only.
(C) through opening of Na^+ and closure of K^+ channels.
(D) through closure of Na^+ and opening of K^+ channels.
45. Which one of the following is not essential in the molecular mechanism of light transduction (vision)?
(A) rhodopsin.
(B) 11-cis-retinal.
(C) transducin.
(D) actinin.
46. For immunoglobulin, choose the true statement(s).
(A) IgM are most efficient at agglutinating cells.
(B) IgG stimulates antibody-dependent cellular cytotoxicity.
(C) IgA activates complement.
(D) IgE attaches to mast cells.
47. Which is (are) wrong for the statements of cell-cycle?
(A) Cell-cycle times vary from one cell type to another, with most of the variability occurring in the G_1 phase.
(B) It is not possible to measure the cycle times of cells in the tissues of an animal.
(C) Synchronous populations of cells can be prepared by centrifugation.
(D) When an S-phase cell is fused with an early G_1 -phase cell, the G_1 -phase nucleus immediately begins DNA synthesis.
48. Choose the true statement(s).
(A) The time it takes a cell to pass from the beginning of S phase to the completion of mitosis is more or less constant.
(B) The control of cell division is apparently coupled to the organization of the cytoskeleton.
(C) Loss of growth control in cancer cells is almost always associated with a significant increase in cell adhesiveness.
(D) Cells in G_1 phase grow; cells in G_0 do not.
49. Which of the following is true of stem cells?
(A) They are undifferentiated.
(B) They are not determined.
(C) They are totipotent.
(D) They are responsible for cell regeneration in the liver.
50. The growth cone of a developing neuron has several functions. Which of the following are included?
(A) secretion of nerve growth factor.
(B) attachment to components of the extracellular matrix.
(C) actin filament-based movement.
(D) synthesis of membranes and proteins.