

國立中山大學 105 學年度碩士暨碩士專班招生考試試題

科目名稱：生物化學【生醫所碩士班】

題號：427001

※本科目依簡章規定「不可以」使用計算機(問答申論題)

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1. (20 分、每題 4 分) 解釋名詞
 - (a) Citric acid cycle
 - (b) Allosteric enzyme
 - (c) Flip-flop of lipids
 - (d) telomere
 - (e) splicing of RNA
2. (10 分) 請說明蛋白質的四級結構各為何?並說明結構與蛋白質折疊(folding)的關係。
3. (10 分) Proteomics 的研究可分析可能參與疾病的蛋白質，請說明
 - (a) 何謂 Proteomics?
 - (b) 何謂 蛋白質二維電泳 (protein two dimensional electrophoresis)?
 - (c) 質譜儀 (mass spectrometry) 測定蛋白質的原理?
 - (d) 如果以 Proteomics 分析得知在口腔癌細胞某一蛋白質表現增加，如何進一步確認此蛋白質確實與疾病發生具相關性?
4. (10 分) 請說明細胞膜主要的 lipids 種類? 膜蛋白(membrane proteins)的主要特性為何?
5. (10 分) 請說明(1) apoprotein 在脂蛋白(lipoprotein particles)的角色?(2) 血液中主要的脂蛋白種類及功能。
6. (10 分) 目前實驗室有一段 DNA，為某基因 coding region 前方的片段。如何設計實驗證明:
 - (a) 這段區域中真正控制基因表現的序列(sequence)?
 - (b) 如何證明起動子 (transcription factors) 真的結合到此序列?
7. (10 分) 在酵素動力學中，何謂 V_{max} 及 K_m ? 如何測定?
8. (10 分) 說明 polymerase chain reaction (PCR) 的原理。
9. (10 分) 何謂 cell cycle? 說明 cyclin 及 cyclin dependent kinase 如何控制 cell cycle?

試題隨卷繳回

國立中山大學 105 學年度碩士暨碩士專班招生考試試題

科目名稱：細胞分子生物學【生醫所碩士班】

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本測驗計 50 題 (單選題)，每題 2 分。

1. What is a genome? (A) The complement of haploid chromosomes contained in a single gamete or nucleus; (B) The complement of diploid chromosomes contained in a single gamete or nucleus; (C) A length of DNA, contained in the nucleus of cells, which receives and issues chemical instructions regulatory bodily function; (D) An unpleasant personal characteristic which can be blamed on your parents; (E) All DNA contained in your body.
2. Approximately how many genes does the human genome contain? (A) 10,000; (B) 20,000; (C) 30,000; (D) 60,000; (E) 80,000.
3. What percentage of the human genome encodes functional proteins? (A) 1%; (B) 5%; (C) 15%; (D) 35%; (E) 50%.
4. When a sodium channel opens and sodium rushes into a myocyte (heart cell), the cell membrane becomes (A) polarized; (B) depolarized; (C) paralyzed; (D) charged; (E) polymerized.
5. What organelle serves as a primary 'packaging' area for molecules that will be distributed throughout the cell? (A) mitochondrion; (B) vacuole; (C) cytoskeleton; (D) Golgi; (E) endoplasmic reticulum.
6. What is the correct order of these mitotic stages? (A) prophase – metaphase – telophase – anaphase – cytokinesis; (B) prophase – cytokinesis – metaphase – telophase – anaphase; (C) anaphase – prophase – metaphase – telophase – cytokinesis; (D) prophase – metaphase – anaphase – telophase – cytokinesis; (E) prophase – telophase – cytokinesis – metaphase – anaphase.
7. The most abundant macromolecules in cells are (A) polysaccharides; (B) phospholipid; (C) DNA; (D) RNA; (E) proteins.
8. At high temperature, the rate of enzyme action decreases because the increased heat (A) changes the pH of the system; (B) alters the active site of the enzyme; (C) neutralizes the acids and bases in the system; (D) increases the concentration of enzyme; (E) enhance the reaction.

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9. Cellular membranes (A) have the same phospholipid composition in each leaflet of the bilayer; (B) contain numerous integral proteins that topologically reorient ('flip-flop') in the bilayer; (C) allow unrestricted movement of water soluble molecules between compartments; (D) do not attach to the cytoskeleton; (E) contain domains that support specific functions.
10. Plasma membrane glycoproteins have N-linked oligosaccharides attached to their extracellular, but not their cytoplasmic domains. This reflects (A) absence of sites for N-linked glycosylation in the cytoplasmic domain; (B) selective removal of oligosaccharides attached to the cytoplasmic domain; (C) location of enzymes for transfer of oligosaccharides from dolichol phosphate to proteins in the lumen of the rough endoplasmic reticulum; (D) binding of the cytoskeleton to potential glycosylation sites on the cytoplasmic domain; (E) presence of glycosyltransferases on the external surface of the plasma membrane.
11. Which of the following is/are irreversible? (A) competitive inhibition; (B) non-competitive inhibition; (C) allosteric inhibition; (D) protein and amino acids; (E) DNA and nucleotide.
12. What kind of junctions may protect a damaged cell through chemical gating? (A) tight; (B) gap; (C) adherens; (D) occluding; (E) macular.
13. Paracrine signals (A) are long-lived with widespread effects; (B) are short-lived, but with widespread effects due to cascades; (C) are long-lived, but are acting locally; (D) are short-lived with local effects; (E) such as neurotransmitters, function only intracellularly.
14. Two alleles for pea plant height are designated T (tall) and t (dwarf). These alleles are found on: (A) genes; (B) sex chromosome; (C) ribosome; (D) homologous chromosomes; (E) locus.
15. When histone H1 is incorporated into a nucleosome (A) the nucleosome is about to be moved by a remodeling enzyme; (B) it means that replication of the DNA has just occurred; (C) it increases the probability that condensation of the chromatin will occur; (D) it decreases the probability that condensation of the chromatin will occur; (E) it means that the underlying DNA is probably a core promoter.
16. In genetics, CpG islands or CG islands are genomic regions that contain a high frequency

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- of CpG sites but to date objective definitions for CpG islands are limited. In mammalian genomes, CpG islands are typically 300-3,000 bp in length. They are in and near the region of (A) telomere; (B) centromere; (C) chromatid; (D) stop codon; (E) promoter.
17. DNA polymerase can add nucleotides to (A) a free 3' OH end of a growing DNA chain; (B) a free 5' OH end of a growing DNA; (C) either a 3' or a 5' OH end of a DNA chain; (D) a 5' end of an RNA primer; (E) neither a 3' nor a 5' OH end of a DNA chain.
18. A point mutation that replaces a purine with another purine, or a pyrimidine with another pyrimidine is (A) transition; (B) transversion; (C) missense; (D) nonsense; (E) mutagen.
19. Pairs of cysteine residues (A) can form covalent bonds in the cell cytoplasm; (B) can form covalent bonds after a protein has been exported; (C) are held together by hydrogen bonding; (D) are held together by van der Waals force; (E) are required for beta-sheet formation.
20. Please arrange the following in the proper order in which they occur during recombination: 1, Holliday junction formation; 2, Strand invasion; 3, Branch migration. (A) 1, 2, 3; (B) 2, 1, 3; (C) 2, 3, 1; (D) 3, 2, 1; (E) 3, 1, 2.
21. Which of the following statements about enhancers is TRUE? (A) they are sequences to which activators bind; (B) they are found in the promoter of a gene; (C) they can decrease the rate of transcription by themselves; (D) A and B; (E) A, B, and C.
22. In order to clone eukaryotic DNA into prokaryotic cells (A) DNA with both exons and introns must be used; (B) DNA without introns must be used; (C) RNA with both exons and introns must be used; (D) exons must be removed from eukaryotic DNA; (E) introns must be added back to eukaryotic DNA.
23. Please arrange the following in the proper sequence in which they occur during RNA splicing. 1, Lariat is formed; 2, U2 binds to branch site; 3, 3' splice site is cut. (A) 1, 2, 3; (B) 2, 1, 3; (C) 2, 3, 1; (D) 3, 2, 1; (E) 3, 1, 2.
24. You are working on protein purification and your protein is fused with a GST tag, what kind of method you should use? (A) ion-exchange chromatography; (B) Western blotting; (C) centrifugation; (D) gel-filtration chromatography; (E) affinity chromatography.
25. Which of the following protein has NOT be generated by recombinant DNA? (A)

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collagen; (B) growth hormone; (C) insulin; (D) interleukin; (E) chymosin.

26. The function of a protein in a cell is often dependent on its localization. What name is given to the lipid chains which attach proteins such as small GTPases to the plasma membrane of the cell? (A) A lipid anchor; (B) A lipid tether; (C) a lipid cofactor; (D) a lipid raft; (E) a lipid carrier.
27. The sodium-potassium pump functions to pump (A) sodium ions out of the cell and potassium ions into the cell; (B) sodium ions into the cell and potassium ions out of the cell; sodium and potassium ions into the cell; (C) sodium and potassium ions into the cell; (D) sodium and potassium ions out of the cells; (E) sodium and potassium ions in both directions across the cell membrane.
28. The Japanese puffer fish contains a deadly toxin (tetrodotoxin) that can lead to death due to which of the following reason? (A) this toxin stops action potential; (B) this toxin cause changes in the resting membrane potential; (C) this toxin stops synaptic potential; (D) this toxin kills all RNAs; (E) this toxin kills all proteins.
29. Passage through pores in the nuclear envelope is restricted primarily to (A) proteins, RNA, and protein-RNA complexes; (B) lipids and glycolipids; (C) DNA and RNA; (D) RNA and protein-carbohydrate complexes; (E) marker proteins for plasma membrane.
30. The protein that makes up a nuclear pore is called a (A) transmembrane ring protein; (B) scaffold protein; (C) nucleoporin; (D) channel protein; (E) importins.
31. A major endoplasmic reticulum (ER) chaperone protein critical for protein quality of the ER, as well as controlling the activation of the ER-transmembrane signaling molecules is (A) HSP70; (B) HSPA5; (C) HSP90; (D) MICA; (E) APOB.
32. One important step of autophagy so that organelles can be degraded is fused with (A) endoplasmic reticulum; (B) Golgi apparatus; (C) mitochondrion; (D) lysosome; (E) nucleus.
33. Which one in the following is NOT a form of intercellular signaling (A) ion flux; (B) gap junction; (C) paracrine; (D) synaptic; (E) endocrine.
34. Some signaling molecules that bind to nuclear receptor EXCEPT (A) cortisol; (B) estradiol; (C) folate; (D) vitamin D3; (E) retinoic acid.

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35. Fertilization of an egg by a sperm triggering an increase in cytosolic (A) copper; (B) potassium; (C) sodium; (D) iron; (E) calcium.
36. The JAK-STAT signaling pathway is activated by (A) prolactin; (B) α -interferon; (C) erythropoietin; (D) growth hormone; (E) interleukin 3.
37. Who invented PCR machine? (A) Frederick Sanger (B) Kary Mullis; (C) James Watson; (D) Francis Crick; (E) Barack Obama.
38. Some anticancer drugs are targeting to microtubules, EXCEPT (A) taxol; (B) cisplatin; (C) colchicine; (D) vinblastine; (E) nocodazole.
39. The cell-cycle control system is based on cyclically active protein (A) phosphatase; (B) lipase; (C) restriction enzyme; (D) kinase; (E) protease.
40. The E3 ligase of p27 (CDKN1B), a cyclin-dependent kinase inhibitor which plays an important role in G₁/S transition during cell cycle is (A) SKP2; (B) APC; (C) CDC20; (D) CKS1B; (E) MDM2.
41. Which is a characteristic of apoptosis? (A) cell swelling; (B) nuclear swelling; (C) cell surface blebs; (D) inflammation; (E) cell budding.
42. Which of the following is an example of an effector caspase? (A) caspase 9; (B) caspase 10; (C) caspase 3; (D) caspase 8; (E) caspase 2.
43. Which of the following types of adhesion best describes cadherin function at sites of cell-cell contact? (A) homophilic adhesion; (B) lectin binding to carbohydrate; (C) heterophilic adhesion; (D) hemidesmosome binding to the basement membrane; (E) Intermediate ECM-linker based adhesion.
44. Where can scientists obtain stem cells? (A) only from embryo; (B) only from tissues in the body; (C) only from the brain; (D) only from the blood; (E) from an embryo or tissues in the body.
45. Blood vessels are lined with which of the following types of epithelium? (A) simple squamous epithelium; (B) cuboidal epithelium; (C) stratified squamous epithelium; (D) pseudostratified epithelium; (E) transitional epithelium.

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46. Cancer develops due to damage to your cell's (A) cytoplasm; (B) organelle; (C) cell membrane; (D) DNA; (E) nuclear membrane.
47. New therapies may emerge from our knowledge of cancer biology NOT including (A) treatments can be designed to attack cells that lack p53; (B) go to temples and worship gods as frequent as possible; (C) tumor growth can be choked by depriving the cancer cells of their blood supply; (D) small molecules can be designed to target specific oncogenic proteins; (E) understanding of cancer biology leads toward rational, tailored medical treatments.
48. Immunoglobulin whose levels rise in response to parasitic infections and is described as being a mediator of type 1 hypersensitivity reactions. (A) IgA; (B) IgG; (C) IgE; (D) IgM; (E) IgY.
49. Hybridomas are made from combining (A) monoclonal antibodies with myeloma cells; (B) B cells with specific epitopes; (C) B cells with myeloma cells; (D) T cells with myeloma cells; (E) monoclonal antigens with myeloma cells.
50. Biological waste CANNOT be stored in healthcare settings accessed by the public longer than (A) 4 hours; (B) 8 hours; (C) 24 hours; (D) one week; (E) one month.

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