

# 國立中山大學 107 學年度碩士暨碩士專班招生考試試題

科目名稱：分子生物學【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(選擇題)

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單選題 (每題 2 分, 總計 100 分)。

- (1~4) Choose a correct correspondent organelle in the following questions. (A) Rough Endoplasmic reticulum; (B) Mitochondria (C) Smooth Endoplasmic reticulum; (D) Golgi Apparatus; (E) Lysosome.
1. Which part of cell is responsible for producing ATP?
  2. Which part of cell is responsible for protein degradation?
  3. Which part of cell is responsible for synthesis of fatty acids?
  4. Where is Ribosomes located?
  5. The sodium-potassium pump makes the cell interior more \_\_\_\_\_ by pumping \_\_\_\_\_ sodium ions out of the cell for every \_\_\_\_\_ potassium ions pumped in (A) Negative, 4, 3; (B) Negative, 2, 3; (C) Positive, 3, 2; (D) Positive, 2, 3; (E) Negative, 3, 2.
  6. Which is the marker enzyme of lysosome? (A) Cytochrome c; (B) COX-2; (C) SOD2; (D) Acid phosphatase; (E) Actin.
  7. Of the following molecules, which would NOT be expected to be moved across a membrane by simple diffusion? (A) Fatty acids; (B) Glucose; (C) Oxygen; (D) Water; (E) NO.
  8. What is the major component of mitosis filament in cell division? (A) Actin fiber; (B) Microtubule; (C) Desmosome; (D) Myosin; (E) Lamin.
  9. Which enzyme of the Krebs (TCA) cycle is different from the others with respect to its location and where is it located? (A) Succinate dehydrogenase, mitochondrial matrix; (B) Malate dehydrogenase, mitochondrial matrix (C) Succinate dehydrogenase, inner mitochondrial membrane; (D) Malate dehydrogenase, inner mitochondrial membrane. (E) None is correct.
  10. The outer membrane of the mitochondria has large channels surrounded by a beta barrel, which is similar to E. coli OmpF, called (A) Porins; (B) Cardiolipin; (C) Proton pump; (D) Cytochrome complex; (E) ATP synthesis.
  11. Which of the following techniques would be most useful in testing the ability of transcription factors to bind to gene promoter? (A) Gel filtration; (B) S1 mapping; (C) EMSA; (D) Confocal Microscope; (E) Northern blotting
  12. In two-dimensional electrophoresis, which statement is **correct**? (A) Isoelectric focusing electrophoresis is the first dimension; (B) Non-denatured proteins are required for the electrophoresis; (C) SDS is avoided in second dimension electrophoresis; (D) DNA contamination does not interfere the result; (E) the voltage used in second dimension is higher than first dimension.
  13. Which is most abundant in common cell plasma membrane? (A) Cholesterol; (B) Phospholipids; (C) Sphingomyelin; (D) Triglycerides; (E) Glycolipid.
  14. Which peptide segment is removed after the conversion of proinsulin to insulin? (A) A peptide; (B) B peptide; (C) C peptide; (D) D peptide; (E) E peptide.
  15. Which of the following chemical components of the blood is mainly responsible for transporting exogenous (dietary) triglyceride from the intestine following a meal. (A)

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- Apoprotein (apolipoprotein); (B) Chylomicron; (C) Lipoprotein lipase; (D) Oxidized low density lipoprotein; (E) High density lipoprotein.
16. In an experiment, cells are subjected to radiant energy in the form of x-rays. Which of the following cellular enzymes protects the cells from this type of injury? (A) Phospholipase; (B) Glutathione peroxidase; (C) Endonuclease; (D) Lactate dehydrogenase; (E) Actin.
17. A 55-year-old woman develops a breast mass. A biopsy reveals a carcinoma. Immunoperoxidase stains for protease cathepsin D and matrix metalloproteinase-9 are markedly positive. Which of the following characteristics is most likely to be predicted by this finding? (A) Angiogenesis; (B) Invasion; (C) Monoclonality; (D) Aneuploidy; (E) Differentiation.
18. In description of Okazaki fragments, which is **correct**? (A) Albumin fragment digested by trypsin; (B) Short, single-stranded DNA fragments; (C) A kind of shRNA; (D) Z-DNA; (E) DNA fragments in apoptosis.
19. Which of the following statements about antibody is **correct**? (A) The 5 classes of immunoglobulin is IgA, IgD, IgG, IgM, and IgO; (B) All circulating immunoglobins are monomer; (C) IgD is responsible in allergic reactions; (D) IgG is the main serum antibody; (E) After antigenic challenge, the first antibody made is IgA.
20. Which is the **non-protein component** that forms part of an active enzyme? (A) Apoenzyme; (B) Holoenzyme; (C) Zymogen; (D) Isoenzyme; (E) Coenzyme.
21. Feedback inhibitors bind to the (A) Allosteric site; (B) Active site; (C) Substrate; (D) Cofactor; (E) a and b.
22. Which is the correct sequence of phases in cell cycle? (A) G1-G2-S-M; (B) S-G1-G2-M; (C) M-G1-G2-S; (D) G1-S-G2-M; (E) G1-S-M-G2.
23. Which combination is correct in cell cycle control? (A) G1 phase: CYCLIN D/CDK1; (B) G2 phase: CYCLIN B/CDK2; (C) M phase: CYCLIN A/CDK1; (D) S phase: CLCLIN B/CDK2; (E) All above answers are wrong.
24. Which of following statements about cell cycle is **correct**? (A) The contraction of microtubules to separate sister chromatids occurs in prophase; (B) The central alignment of chromosomes by the spindle microtubules occurs in metaphase; (C) The development of the nuclear envelope occurs in anaphase; (D) DNA starts being replicated in prophase; (E) cell creating ribosomes for protein synthesis in S phase.
25. Which of the following binds outside to nucleosome core and form chromatsome? (A) Histone H1; (B) Histone H2A; (C) Histone H2B; (D) Histone H3; (E) Histone H4.
26. A patient with delayed mental acuity is shown to have an enzyme deficiency of Histone Acetyltransferase (HAT) activity. What is the most likely outcome of this patient's deficiency, at the level of gene expression? (A) Ubiquitination of histones H3 and H4 and increased overall transcription; (B) Fragmentation of poorly protected chromosomal DNA and reduced transcription; (C) Activation of histone H3 and H4 gene expression; (D) Reduced transcription rates because nucleosomes occupy promoters; (E) Uncoupling of transcription and translation in neurons.

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27. Which of the following statement about keto bodies is correct? (A) Produced in kidney; (B) The smell of acetoacetate and/or acetone in breath is a common feature in ketosis; (C) High insulin/glucagon ratio result ketosis; (D) Individuals who follow a high-carbohydrate diet will develop ketosis; (E) Low acetyl CoA levels in the mitochondria.
28. In Clathrin mediated endocytosis, which statement is correct? (A) Kind of pinocytosis; (B) no energy is needed in this process; (C) All vesicles uncoat before fusing to target organelle; (D) Triskelion is composed by clathrin and AP adaptor protein; (E) Clathrin coat is co-transported and degraded in lysosome.
29. In what plasma membrane domain is lipid rafts generally found. (A) Cholesterol-rich domain; (B) PI rich domain; (C) PS rich domain; (D) PE rich domain; (E) evenly distributed.
30. Which is the general structure of G protein coupled receptors? (A) Dimer; (B) 7 transmembrane domains; (C) rich glycosylated; (D) high molecular weight; (E) tyrosine kinase activity.
31. Which combination of "cytoskeleton/ major component" are correct? (A) Microfilaments/actin; (B) Sacomere/beta-catenin; (C) microtubule/ketatin; (D) nuclear wall / actin; (E) Intermediate filament /tubulin.
32. Which one is NOT regarded as a signaling molecule (A) epinephrine; (B) insulin; (C) CO<sub>2</sub>; (D) NO; (E) glutamate.
33. The conversion of ammonia into a less toxic substance produces (A) ketone bodies; (B) urea; (C) nitrate; (D) acetyl-CoA; (E) water.
34. How can the methylation of histone H3 in the nucleosomes upstream of a gene inhibit the transcription process? (A) H3 methylation increases access of RNA polymerase and transcription factors to the DNA template. (B) Methylated H3 inhibits RNA polymerase; (C) Methylated H3 inhibits transcription factors; (D) Methylation of histone H3 promotes chromatin compaction and decreases access to the DNA template; (E) a and d.
35. The breakdown of glycogen in which organ/tissue is required for the maintenance of blood glucose? (A) skeletal muscle; (B) pancreas; (C) liver; (D) adipose; (E) tissue.
36. Which of the following carbohydrates can be transported across the absorptive cells of the intestinal surface? (A) starch, sucrose, lactose; (B) glycogen, maltose; (C) glucose, fructose, galactose; (D) amylase, maltose, lactose; (E) galactose, amylase.
37. Which of the following enzymes is a target for protein kinase A? (A) glycogen synthase; (B) glycogen phosphorylase (C) phosphorylase kinase; (D) a and b; (E) a and c.
38. In fission yeast, wee1- mutants are smaller than normal cells because: (A) the mutant wee1 protein fails to remove a phosphate from Cdk (cdc2 kinase); (B) the mutant wee1 protein adds a phosphate to Cdk (cdc2 kinase), thereby inactivating Cdk and allowing mitosis to occur too early; (C) the mutant wee1 protein fails to add a phosphate to Cdk (cdc2 kinase), which allows the Cdk to become active and initiate mitosis early; (D) a and b; (E) a and c.
39. List whether the following 3 molecules are polar or nonpolar: CH<sub>2</sub>Cl<sub>2</sub>, ICl<sub>3</sub>, CO<sub>2</sub>

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- (A) nonpolar, nonpolar, nonpolar; (B) nonpolar, nonpolar, polar; (C) polar, nonpolar, polar; (D) polar, polar, nonpolar; (E) polar, polar, polar.
40. Type II diabetes is the result of insensitivity to \_\_\_\_\_. Transgenic mice in which the \_\_\_\_\_ gene was knocked out resulted in improved sensitivity to the hormone. (A) epinephrine; protein kinase C; (B) insulin; insulin receptor; (C) glucagon; protein tyrosine phosphatase (PTP); (D) insulin; protein tyrosine phosphatase (PTP); (E) glucagon; glycogen synthase.
41. Which of the following statements about the action potential is **false**? (A) The rapid depolarization phase is caused by the entry of potassium ions; (B) During the repolarization phase, sodium channels close and potassium channels open; (C) During the depolarization phase, membrane potential becomes positive; (D) In the after-hyperpolarization phase, membrane potential approaches the potassium equilibrium potential; (E) None of these statements is false all are true.
42. Following damage to the DNA by ionizing radiation, the ATM protein phosphorylates \_\_\_\_\_ proteins, which then phosphorylate p53. The p53 protein induces expression of the \_\_\_\_\_ gene, which binds to Cyclin/CDK and arrest cell cycle. (A) MAP kinase, P16; (B) Chk2, P21; (C) Mdm2, Pten; (D) Akt, APC; (E) Beta-catenin, PKA.
43. DNA microarrays can be used to study (A) The clustering of expression of genes in time and space; (B) The DNA sequence of multiple chromosomes; (C) The DNA sequence of multiple genomes; (D) Chromosomal rearrangements; (E) Chromosomal abnormalities
44. Why proteomics is useful? Because of (A) About 50% or more of polyadenylated RNAs that do not encode proteins, and noncoding RNAs (ncRNA), or transcripts of unknown functions (TUFs); (B) Splicing of a transcript that may encode several proteins; (C) Degradation of mRNAs; (D) Post-translational modifications; (E) All likely.
45. In cell nuclear active import and export, which statement is **correct**? (A) Ran GEF localized in cytoplasm, (B) Importin contain an NES region; (C) ATP is needed in this process; (D) GTP is needed in this process; (E) no energy expenditure.
46. Which kind of protease is critical in apoptosis? (A) Trypsin; (B) Caspase; (C)Metalloprotease; (D) Secretase; (E) Lysozyme.
47. Which statement is **Not** correct? (A) Paralogs: the gene for Huntington disease has a paralog in bacteria; (B) Orthologs: homologous genes in different species; (C) Paralogs: homologous genes in a species; (D) Homologs: homologous genes; (E) Homologs: can be orthologs for paralogs.
48. The first two bases and the last two bases in the splicing signal consensus sequence are (A) GT-AG; (B) GU-AG; (C) CU-AG; (D) GU-AC; (E) GT-TG.
49. The size of human genome is \_\_ bps (A)  $3 \times 10^6$ ; (B)  $3 \times 10^7$ ; (C)  $3 \times 10^8$ ; (D)  $3 \times 10^9$ ; (E)  $3 \times 10^{10}$ .
50. What is the topic of 2017 Nobel prize in Physiology or Medicine: (A) RNA interference; (B) iPS: mature cells can be reprogrammed to become pluripotent; (C) Molecular mechanisms controlling the circadian rhythm; (D) Reverse transcriptase; (E) Telomerase.