

長庚大學107學年度研究所碩士班招生考試試題

系所：生物醫學工程研究所碩士班
生化與生醫工程組

考試科目：生物化學

注意：請詳細閱讀下列試題，並請標明題號依試題順序將答案書寫於答案卷上。

本試題共5頁：第1頁

選擇題（每題2分，共50題，每題僅一正確答案，答錯不倒扣）；本份試題共5頁。

- Which molecule receives the energy from glycolysis and citric acid cycle and transmits the energy to electron transfer chain?
(A) NADH
(B) Pyruvate
(C) ATP
(D) Acetyl-CoA
(E) GTP
- How many NADH is produced in citric acid cycle?
(A) 1
(B) 2
(C) 3
(D) 4
(E) 5
- Which of the following statements about starch and glycogen is NOT correct?
(A) Glycogen is more extensively branched than starch.
(B) Both starch and glycogen are stored intracellularly as insoluble granules.
(C) Both serve primarily as structural elements in cell walls
(D) Amylose is unbranched; amylopectin and glycogen contain many (α 1-6) branches.
- What is the end product of leucine metabolism?
(A) Acetyl-CoA
(B) Pyruvic acid
(C) Oxaloacetic acid
(D) Acetyl carnitine
- Which of the following amino acids carry negative charge?
(A) Serine
(B) Glycine
(C) Aspartic acid
(D) Arginine
- The main function of trypsin is for:
(A) Digestion of carbohydrate
(B) Digestion of lipid
(C) Digestion of peptide
(D) Digestion of DNA
(E) Digestion of RNA
- Energy is generally extracted from phototrophs and chemotrophs by:
(A) Hydrolysis reactions.
(B) Condensation-cleavage reactions.
(C) Oxidative-reduction reactions.
(D) Acid-base reactions.
(E) Phosphorylation reactions.
- Which type of molecule spans the membrane, from its inner to outer surface according to the Fluid mosaic model of cell membranes?
(A) Cholesterol
(B) Phospholipid
(C) Protein
(D) Carbohydrate
(E) All of the above
- Which technique or instrument can be used to determine protein structure?
(A) HPLC
(B) Immunohistochemistry
(C) Northern blot
(D) Protein microarray
(E) X-ray crystallography
- Which of the following techniques is NOT used for protein isolation and purification?
(A) Ion exchange chromatography
(B) Gas-liquid chromatography
(C) Affinity chromatography
(D) Electrophoresis
(E) Membrane separation

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本試題共 5 頁: 第 2 頁

11. The isoelectric point of an amino acid is defined as the pH
(A) where the carboxyl group is uncharged
(B) where the molecule carries no electric charge
(C) of maximum electrolytic mobility
(D) where the amino group is uncharged
12. In nucleoside, sugar is linked to:
(A) Oxygen
(B) Phosphate
(C) Nitrogen
(D) Carbon
13. Which of the following amino acid contain an imidazolium moiety?
(A) Alanine
(B) Cysteine
(C) Valine
(D) Histidine
(E) All of above
14. The positive effector in hemoglobin is:
(A) ATP
(B) H^+
(C) CO_2
(D) Bisphosphoglycerate
(E) Oxygen molecule
15. Which of the following pairs of amino acids would carry a negative charge on their side chain at pH 8.0?
(A) Leucine & Glycine
(B) Histidine & Lysine
(C) Aspartate & Glutamate
(D) Asparagine & Glutamine
16. The major conformation of collagen belongs to:
(A) Turn
(B) Sheet
(C) Helix
(D) Random coil
17. What is the overall net charge on the peptide lys-lys-ser-glu at pH 7.0?
(A) +2
(B) +1
(C) 0
(D) -1
(E) -2
18. A specific molecular structure within an antigen to which a specific antibody binds is as a(n):
(A) Epitope
(B) Fab region
(C) Fc region
(D) MHC site
19. The anaerobic conversion of 1 mol of glucose to 2 mol of lactate by fermentation is accompanied by a net gain of:
(A) 2 mol of NADH
(B) 1 mol of NADH
(C) 2 mol of ATP
(D) 1 mol of ATP
(E) None of the above
20. Which of the following compounds is an essential fatty acid?
(A) Arachidonic acid
(B) Palmitic acid
(C) Oleic acid
(D) Stearic acid
(E) Linoleic acid
21. Of the following inhibitors, the only one that will not block both oxygen consumption and ATP synthesis in normal mitochondria is:
(A) Cyanide
(B) Rotenone
(C) Antimycin A
(D) 2,4-dinitrophenol
(E) Oligomycin

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22. The coding segments of a stretch of DNA are called:
(A) Promoters
(B) Chromatin
(C) Transposons
(D) Exons
(E) Introns
23. Gel-filtration chromatography separates on the basis of
(A) size and shape using porous beads packed in a column
(B) size using porous beads packed in a column
(C) shape using porous beads packed in a column
(D) All of the above
(E) none of the above
24. Why is the TCA cycle the central pathway of metabolism of the cell?
(A) It occurs in the center of the cell
(B) Its intermediates are commonly used by other metabolic reactions
(C) All other metabolic pathways depend upon it
(D) All of the above
(E) none of the above
25. Which of the following enzyme does not take part in the TCA cycle?
(A) Citrate synthase
(B) Iso-citrate dehydrogenase
(C) Pyruvate dehydrogenase
(D) Malate dehydrogenase
26. Cyclins are proteins that
(A) regulate ability of cells to invade tissue
(B) regulate passage from one stage of cell division to another
(C) regulate apoptosis of damaged cells
(D) none of the above
27. Over 50% of common cancers are associated with damage to a protein, p53. This protein
(A) is a cyclin
(B) is an oncogene
(C) is a tumor suppressor
(D) regulates apoptosis
(E) none of the above
28. Which of the following is not a significant biological oxidizing agent?
(A) FAD
(B) Fe^{3+}
(C) O_2
(D) NAD^+
29. In aerobic respiration, the compound that enters a mitochondrion is
(A) acetyl CoA
(B) oxaloacetate
(C) phosphoglyceraldehyde
(D) pyruvate
30. Which of the following best describes the cholesterol molecule?
(A) Nonpolar, uncharged
(B) Nonpolar, charged
(C) Amphipathic
(D) Polar, charged
31. In the intestine, the dietary fats are hydrolysed by
(A) triacylglycerol lipase
(B) adenylate cyclase
(C) pancreatic lipase
(D) protein kinase
32. In DNA double helix, the two DNA chains are held together by
(A) covalent bonds between the pair of bases
(B) hydrogen bonds between the pair of bases
(C) ionic bonds between the pair of bases
(D) none of the above

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33. Fatty acid synthesis takes place in

- (A) mitochondria
- (B) cell membrane
- (C) cytosol
- (D) endoplasmic reticulum

34. Without telomerase, what would happen to the ends of chromosomes after each round of replication?

- (A) Nothing would happen
- (B) Chromosomes would become progressively shorter
- (C) Chromosomes would get longer
- (D) None of the above

35. Saliva contains all of the following except

- (A) amylase
- (B) bacteria-killing enzymes
- (C) hormones
- (D) antibodies

36. The cleavage specificity of trypsin and chymotrypsin depend in part on the

- (A) size, shape, and charge of the active site or specificity pocket
- (B) proximity of Ser 195 to the active site or specificity pocket
- (C) presence of a low-barrier hydrogen bond in the active site or specificity pocket
- (D) absence of water in the active site

37. Which of the following is false statement with regard to comparison between Serine and HIV proteases?

- (A) Both use nucleophilic attack to hydrolyze the peptide bond
- (B) Both require water to complete the catalytic cycle
- (C) Both forms an acyl-enzyme intermediate
- (D) Both show specificity for certain amino acid sequences

38. Simple nerve reflexes use signaling molecules called

- (A) neurotransmitters
- (B) nitric oxides
- (C) G proteins
- (D) proteases

39. Which of the following is not a type of signaling molecule?

- (A) Testosterone
- (B) Insulin
- (C) Thyroxine
- (D) Adenylate cyclase

40. Which of the following is true about a hydrophilic signaling molecule?

- (A) Its receptor is located in the cytosol of the target cell
- (B) It might trigger a signal cascade that causes some effect in a cell
- (C) Since it can enter the cell, it directly affects some specific cell process
- (D) It is a steroid

41. Which of the following two organelles look most alike structurally?

- (A) Nucleus and vesicle
- (B) Golgi apparatus and smooth endoplasmic reticulum ER
- (C) Vacuole and cytoskeleton
- (D) Lysosome and chloroplast

42. Which of the following structures is expected in a bacterium?

- (A) Nucleus
- (B) Plasma membrane
- (C) Golgi apparatus
- (D) Endoplasmic reticulum
- (E) None of the above

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43. What do dystrophin, utrophin, actin, and tubulin have to do with eukaryotic cell structure and function?

- (A) They are components in the reactions of photosynthesis
- (B) They all participate in the degradation of large amounts of ATP
- (C) They all participate in the production of large amounts of ATP
- (D) They are all embedded proteins in plasma membranes

44. cAMP and cGMP are derived from

- (A) ATP and GTP by the actions of adenylate cyclase and guanylate cyclase respectively
- (B) GTP and ATP by the actions of adenylate cyclase and guanylate cyclase respectively
- (C) ATP and GTP by the actions of guanylate cyclase and adenylate cyclase respectively
- (D) None of the above

45. Which of the following macromolecules are found in the plasma membrane?

- (A) Lipids and proteins only
- (B) Lipids, proteins, and carbohydrates
- (C) Proteins and carbohydrates only
- (D) Proteins only

46. Which of the following is not a necessary component of translation?

- (A) Anticodon
- (B) mRNA
- (C) Ligase
- (D) Amino acid

47. Which of the following amino acid starts all proteins synthesis?

- (A) Glycine
- (B) Proline
- (C) Thymine
- (D) Methionine

48. Proteins contain _____ different amino acids, whereas DNA and RNA are composed of _____ different nucleotides

- (A) 20,64
- (B) 3,20
- (C) 4,20
- (D) 20,4

49. Different DNA polymerases play distinct roles in DNA replication and repair in both prokaryotic and eukaryotic cells. All known DNA polymerases synthesize DNA only in the _____ by the addition of dNTPs to a performed primer strand of DNA.

- (A) positive direction
- (B) 3' to 5' direction
- (C) 5' to 3' direction
- (D) negative direction

50. The enzyme that joins DNA cuts is called

- (A) joinase
- (B) ligase
- (C) DNA phosphorylase
- (D) reverse transcriptase