

國立宜蘭大學

103 學年度研究所碩士班考試入學

生物化學試題

(生物技術與動物科學系生物技術碩士班)

准考證號碼：

《作答注意事項》

- 1.請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
- 2.考試時間：100 分鐘。
- 3.本試卷共有單選題 50 題，一題 2 分，共計 100 分。
- 4.請將答案寫在答案卷上。
- 5.考試中禁止使用大哥大或其他通信設備。
- 6.考試後，請將試題卷及答案卷一併繳交。
- 7.本試卷採雙面影印，請勿漏答。
- 8.應試時不得使用電子計算機。

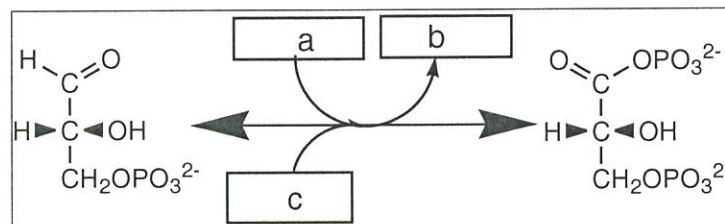
單選題 (共 50 題，每題 2 分)

- () 1. In a mixture of the four proteins listed below, which should elute last in size-exclusion (gel filtration) chromatography?
(A) Immunoglobulin G $M_r = 145,000$
(B) Ribonuclease A $M_r = 13,700$
(C) RNA polymerase $M_r = 450,000$
(D) Serum albumin $M_r = 68,500$
- () 2. Which of the following peptides exhibits the highest UV absorbance at the wavelength of 280 nm?
(A) Thr-Lys-Met (B) Tyr-Trp-Arg (C) His-Ala-Pro (D) Asp-Phe-Glu
- () 3. Edman degradation will:
(A) determine the C-terminal amino acid by using a carboxypeptidase.
(B) cleave the protein into a multitude of smaller peptides.
(C) compare overlapping sets of peptide fragments.
(D) determine the N-terminal amino acid.
- () 4. What is the overall net charge on the peptide Glu-Lys-Ala-Arg at pH 7.0?
(A) +2 (B) +1 (C) 0 (D) -1
- () 5. Coenzymes NAD^+/NADH are commonly used as coupling reactions for enzyme activity assay. Which of the following best describes the measurement of NADH production?
(A) $A_{340 \text{ nm}}$ increases (B) $A_{340 \text{ nm}}$ decreases (C) $A_{595 \text{ nm}}$ increases (D) $A_{595 \text{ nm}}$ decreases
- () 6. Which of the following uncommon amino acids **does not** result from chemical modifications of common amino acid R groups after a protein have been synthesized?
(A) 4-hydroxyproline. (B) 5-hydroxylysine. (C) *N*-methyllysine.
(D) selenocysteine.
- () 7. Which of the following **cannot** be used to determine molecular weight for proteins?
(A) SDS-PAGE (B) Gel filtration (C) Southern blotting (D) Mass spectrometry
- () 8. Prosthetic groups in the class of proteins known as glycoproteins are composed of:
(A) carbohydrates. (B) lipids. (C) metals. (D) phosphates.
- () 9. Which of the following is **not** a major technique used in proteomic research?
(A) Two-dimensional gel electrophoresis (2-DE) (B) Mass spectrometry
(C) Bioinformatics (D) Microarray

- () 10. Determine the amino acid sequence of the following oligopeptide from the experimental data below.
- 1.) *The amino acid composition is found to be [Gly, Lys, Phe, Met, Ser, plus some decomposition products].*
 - 2.) *The peptide has a molecular weight around 700 Da and absorbs at 280 nm.*
 - 3.) *Treatment with carboxypeptidase results in Trp and a pentapeptide.*
 - 4.) *CNBr treatment yields a tetrapeptide and a dipeptide.*
 - 5.) *Trypsin digestion produces an amino acid and a pentapeptide with Met on the amino end.*
 - 6.) *Chymotrypsin digestion yields a dipeptide and a tetrapeptide.*
- (A) Trp-Lys-Met-Ser-Met-Gly
(B) Lys-Met-Ser-Phe-Gly-Trp
(C) Trp-Gly-Phe-Ser-Met-Lys
(D) Lys-Gly-Ser-Phe-Met-Trp
- () 11. Which of the following is true of both hemoglobin and myoglobin?
- (A) Acidic conditions lower the affinity for oxygen.
(B) The Hill coefficient is equal to the number of subunits in the molecule.
(C) Oxygen binding occurs in the cleft where the polypeptides come into contact.
(D) The iron atom of the heme prosthetic group is bound at five of its six coordination sites to nitrogen atoms.
- () 12. In the Lineweaver-Burk plot for an enzyme-catalyzed reaction, the presence of a competitive inhibitor will alter the (A) V_{\max} . (B) intercept on the $1/V$ axis. (C) intercept on the $1/[S]$ axis. (D) curvature of the plot.
- () 13. Which of the following sugar is a non-reducing sugar?
(A) glucose (B) sucrose (C) galactose (D) fructose
- () 14. Lactose (milk sugar) is composed of the following simple sugars:
(A) glucose only (B) galactose and glucose (C) fructose and glucose
(D) galactose and fructose
- () 15. Which of the following is the bond formed between simple sugars?
(A) peptide bond (B) glycosidic bond (C) phosphodiester bond
(D) none of the above

- () 16. Which of the following disaccharides **cannot** be digested by human?
(A) cellulose (B) lactose (C) maltose (D) all of the above.
- () 17. Compared to ribonucleic acid (RNA), deoxyribonucleic acid (DNA) lacks an oxygen at pentose (A) 1st carbon (B) 2nd carbon (C) 3rd carbon (D) 4th carbon.
- () 18. Which of the following amino acid **cannot** be phosphorylated?
(A) Ser (B) Thr (C) Tyr (D) Ala.
- () 19. Which of the following enzyme transfers phosphate groups from high-energy donor molecules, such as ATP, to specific substrates, a process referred to as phosphorylation?
(A) kinase (B) phosphatase (C) lipase (D) polymerase.
- () 20. Which of the following is a polyunsaturated fatty acid?
(A) arachidonic acid (B) lauric acid (C) palmitic acid (D) stearic acid.
- () 21. Which of the following enzyme hydrolyzes phosphatidylinositol 4,5-bisphosphate to produce two second messengers, inositol 1,4,5-triphosphate (IP₃) and diacylglycerol (DAG)?
(A) protein kinase C (B) adenylase cyclase (C) phospholipase C gamma (D) glycogen synthase.
- () 22. Which of the following method detects protein expression?
(A) Northern blot (B) Western blot (C) Southern blot (D) None of the above.
- () 23. Cell membrane is composed of:
(A) lipids (B) proteins (C) sugars (D) all of the above.
- () 24. Which of the following enzymes interconverts an aldose and a ketose?
(A) phosphatase (B) mutase (C) isomerase (D) kinase.
- () 25. In humans, pyruvate can be converted to
(A) acetyl-CoA only (B) lactate only (C) ethanol only (D) acetyl-CoA and lactate
- () 26. The order of compounds in the conversion of glucose to pyruvic acid is as follows: (Fructose-6-phosphate=F6P; Fructose-bisphosphate=FBP; 1,3-phosphoglyceric acid=1,3-PGA; 3-phosphoglyceric acid=3-PGA; PEP = phosphoenolpyruvate)
(A) F6P, FBP, PEP, 1,3-PGA, 3-PGA.
(B) F6P, FBP, 1,3-PGA, 3-PGA, PEP.
(C) F6P, FBP, 3-PGA, 1,3-PGA, PEP.
(D) FBP, F6P, 3-PGA, 1,3-PGA, PEP.

- () 27. Phospholipases break down fats by
 (A) adding a phosphate group to them.
 (B) reducing the double bonds to single bonds.
 (C) hydrolyzing them.
 (D) removing acety-CoA units.
- () 28. The compound uridine diphosphate glucose (UDPG) plays a role in
 (A) glycogen breakdown (B) glycogen synthesis (C) glycolysis
 (D) gluconeogenesis
- () 29. What is the net ATP yield from glucose during glycolysis?
 (A) 1 (B) 2 (C) 3 (D) 4
- () 30. Which group of small molecules best fit the boxes associated with the reaction shown?



	a	b	c
(A)	ATP	ADP	H ₂ O
(B)	NADH	NAD ⁺	P _i
(C)	NAD ⁺	NADH	H ₂ O
(D)	NAD ⁺	NADH	P _i

- () 31. During anaerobic metabolism in bacteria, the carbons of glucose end up in this molecule: (A) CO₂ (B) Ethanol (C) Lactic acid (D) Both CO₂ and ethanol
- () 32. Where in the cell does β-oxidation occur?
 (A) Cytoplasm. (B) Mitochondrial intermembrane space.
 (C) Inner mitochondrial membrane. (D) Mitochondrial matrix.
- () 33. Approximately how many ATP molecules are netted from the complete oxidation of stearic acid (C-18)? (A) 120 (B) 4 (C) 32 (D) 88
- () 34. The committed step in cholesterol biosynthesis is catalyzed by
 (A) HMG-CoA synthase (B) HMG-CoA reductase
 (C) mevalonate kinase (D) squalene monooxygenase

- () 35. "Ketone bodies" are formed when
(A) oxaloacetate is converted to acetoacetyl-CoA.
(B) there is a deficiency of acetyl-CoA.
(C) there is not enough oxaloacetate to react with available acetyl-CoA.
(D) an organism consumes excessive amounts of carbohydrate compared to its lipid intake.
- () 36. Which of the following is **not** a function of cholesterol in the human body?
(A) Precursor of steroid hormones.
(B) Energy storage compound.
(C) Precursor of bile salts.
(D) Component of cell membranes.
- () 37. If an amino acid's degradation pathway leads to α -ketoglutarate, is it glycogenic?
(A) Yes.
(B) No.
(C) Only if the organism has a glyoxylate pathway.
(D) Only if the organism does not have a glyoxylate pathway.
- () 38. The initial, common intermediate in purine catabolism for both AMP and GMP is
(A) xanthine (B) hypoxanthine (C) inosine (D) uric acid
- () 39. Semiconservative replication of DNA was established experimentally by
(A) gel electrophoresis
(B) density-gradient centrifugation
(C) ultraviolet spectroscopy
(D) column chromatography
- () 40. DNA footprinting is a technique that allows one to determine
(A) the homology between various DNA sequences.
(B) how proteins interact with each other when bound to DNA.
(C) where proteins bind to DNA.
(D) all of the above.
- () 41. What is the mode of action of puromycin in the inhibition of protein synthesis?
(A) inhibition of peptidyl transferase
(B) termination of the growing polypeptide chain
(C) inactivation of EF-G
(D) dissociation of mRNA from the ribosome

- () 42. The promoter site is:
- (A) the start site for transcription in DNA
 - (B) the binding site for regulatory proteins that stimulate transcription
 - (C) the general region of DNA downstream from the start site
 - (D) the site on DNA at which RNA polymerase binds to initiate transcription
- () 43. The enzyme telomerase uses mechanisms that involve:
- (A) repeating sequences at the telomeres.
 - (B) having RNA oligonucleotides to act as templates as part of the enzyme.
 - (C) allowing the end of the chromosome to get a little shorter each time a cell divides.
 - (D) both repeating sequences at the end of chromosomes and RNA oligonucleotides to act as templates as part of the enzyme.
- () 44. The sequences in eukaryotic DNA known as introns are
- (A) those included in the final sequence of messenger RNA
 - (B) the binding sites for DNA polymerase
 - (C) the binding sites for RNA polymerase
 - (D) the intervening sequences not expressed in the final sequence of messenger RNA
- () 45. The signal sequences that direct proteins to the nucleus are:
- (A) always at the amino terminus of the targeted protein.
 - (B) cleaved after the protein arrives in the nucleus.
 - (C) glycosyl moieties containing mannose 6-phosphate residues.
 - (D) not located at the ends of the peptide, but in its interior.
- () 46. The 5' → 3' exonuclease activity of *E. coli* DNA polymerase I is involved in:
- (A) proofreading of the replication process.
 - (B) formation of a nick at the DNA replication origin.
 - (C) removal of RNA primers by nick translation.
 - (D) formation of Okazaki fragments.
- () 47. An Okazaki fragment is a:
- (A) segment of DNA that is an intermediate in the synthesis of the lagging strand.
 - (B) fragment of RNA that is a subunit of the 30S ribosome.
 - (C) fragment of DNA resulting from endonuclease action.
 - (D) piece of DNA that is synthesized in the 3' → 5' direction.

- () 48. Compared with DNA polymerase, reverse transcriptase:
- (A) does not require a primer to initiate synthesis.
 - (B) makes more errors because it lacks the 3' → 5' proofreading exonuclease activity.
 - (C) introduces no errors into genetic material because it synthesizes RNA, not DNA.
 - (D) synthesizes complementary strands in the opposite direction from 3' → 5'.
- () 49. Which one of the following is true about the genetic code?
- (A) All codons recognized by a given tRNA encode different amino acids.
 - (B) The first position of the tRNA anticodon is always adenosine.
 - (C) Several different codons may encode the same amino acid.
 - (D) The base in the middle position of the tRNA anticodon sometimes permits “wobble” base pairing with 2 or 3 different codons.
- () 50. Post-translational processing of proteins includes all of the following except:
- (A) folding into the 3-dimensional shape.
 - (B) modification of specific amino acids.
 - (C) forming disulfide bonds.
 - (D) all of these can occur after translation is complete.