

110 學年度學士後醫學系招生考試

生化概論 試題

Choose one best answer for the following questions

【單選題】每題 1 分，共計 30 分，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。1~15 題為普通生物，16~30 題為生化概論。

(C) 16. Which of the following cell conditions involves reverse transcriptase activity?

- (A) replicate DNA lagging strand (B) replicate DNA leading strand
 (C) replicate viral RNA (D) replicate DNA in SV40 virus
 (E) replicate mRNA

(A) 17. Which of the following chemicals is allosteric activator of carbamoyl phosphate synthetase I?

- (A) *N*-Acetylglutamate (B) Citrulline (C) Ornithine
 (D) Aspartate (E) Glutamine

(B) (E) 18. Which of the following metabolites is produced by uracil degradation?

- (A) Uric acid (B) β -Alanine (C) Carbamoyl phosphate
 (D) β -Aminoisobutyrate (E) Ammonia

(B) 19. The 5'→3' exonuclease activity of *E. coli* DNA polymerase I is involved in _____ during DNA replication.

- (A) proofreading (B) removal of RNA primers
 (C) sealing of nick (D) formation of Okazaki fragments
 (E) formation of a nick at the origin

(C) 20. Glutamate is metabolically converted to α -ketoglutarate and NH_4^+ in mitochondria matrix of hepatocyte by a process described as _____.

- (A) hydrolysis (B) transamination (C) oxidative deamination
 (D) one-carbon transfer (E) thiolysis

(D) 21. Posttranslational modification of proteins may include the followings **EXCEPT**

- (A) adding disulfide bridge.
 (B) adding cofactors and prosthetic groups.
 (C) cleaving the nascent peptide.
 (D) adding a signal sequence at the N-terminus.
 (E) adding oligosaccharides in endoplasmic reticulum.

(B) 22. Which one of these characteristics is **FALSE** for the α -helix in protein?

- (A) There are 3.6 amino acids per turn.
 (B) There is a requirement for glycine in every third amino acid residue.

- (C) A H-bond forms between the carbonyl oxygen of the n^{th} amino acid residue and the amide proton of the $(n + 4)^{\text{th}}$ amino acid residue.
- (D) Proline is typically not found in the α -helix.
- (E) A single turn of the helix extends about 5.4 \AA along the long axis.
- (C) 23. Which form of tetrahydrofolate is used in the enzymatic transfer of formyl group, as in purine synthesis and in the formation of formyl-methionine in prokaryotes?
- (A) N^5 -Formyl-tetrahydrofolate (B) N^5 -Formimino-tetrahydrofolate
(C) N^{10} -Formyl-tetrahydrofolate (D) $\text{N}^5, \text{N}^{10}$ -Methenyl-tetrahydrofolate
(E) Tetrahydrofolate
- (C) 24. Hydroxylation of proline residues in collagen is catalyzed by prolyl 4-hydroxylase. The enzymatic action of prolyl 4-hydroxylase requires: ① Ascorbic acid; ② α -Ketoglutarate; ③ Cu^{2+} ; ④ ATP; ⑤ Fe^{2+}
- (A) ①,②,③ (B) ①,②,④ (C) ①,②,⑤ (D) ①,③,④ (E) ①,④,⑤
- (A) 25. Which of the following reactions requires vitamin K?
- (A) carboxylation of glutamate (B) ADP ribosylation of tyrosine
(C) methylation of arginine (D) oxidation of cysteine
(E) amidation of C-terminus of the polypeptide
- (D) 26. Which of the following proteins plays a dual role in modulating protein folding and conformation of steroid hormone receptors in eukaryotic cells?
- (A) CroES-CroEL complex (B) Hsp60 (C) Prefoldin
(D) Hsp90 (E) Chaperonin
- (C) 27. By completing β -oxidation of fatty acid with odd number of carbons, _____ will enter the citric acid cycle. ① acetyl-CoA; ② malate; ③ α -ketoglutarate; ④ succinyl-CoA
- (A) ①,② (B) ①,③ (C) ①,④ (D) ②,③ (E) ③,④
- (E) 28. Which of the following tools is **NOT** used to quantify the level of gene expression?
- (A) real-time RT-PCR (B) RNase protection assay (C) Northern blotting
(D) Western blotting (E) Southern blotting
- (E) 29. Enzymes are potent catalysts because they _____.
- (A) are consumed in the reactions they catalyze
(B) are very specific and the converted products cannot return to substrates
(C) drive reactions to completion, while other catalysts drive reactions to equilibrium
(D) increase the equilibrium constants for the reactions they catalyze
(E) lower the activation energy for the reactions they catalyze

- (D) 30. What is the major apo-lipoprotein and lipid in high-density lipoprotein (HDL)?
- (A) ApoB-48, cholesterol ester (B) ApoB-100, phospholipid
(C) ApoE, free cholesterol (D) ApoA-I, phospholipid
(E) ApoA-II, cholesterol ester

【單選題】每題 2 分，共計 120 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。31~60 題為普通生物，61~90 題為生化概論。

- (B) 61. Ribonucleotide reductase catalyzes the reduction of ribonucleotides to deoxyribonucleotides. Which of the following cofactors are essential for the activity of ribonucleotide reductase?
- ① NADPH; ② Thioredoxin; ③ NADH; ④ Glutaredoxin; ⑤ Tetrahydrofolate
- (A) ①,②,⑤ (B) ①,②,④ (C) ①,③,⑤ (D) ②,③,⑤ (E) ②,③,④

送分 62. In eukaryotic matured mRNA, which one of the following statements is **FALSE**?

- (A) Both 5' and 3' ends contain a free 3-OH group on ribose.
(B) Intron is removed in the matured RNA.
(C) Poly(A) tail is added to 3' end in matured RNA.
(D) Methylation can be found on 5' end.
(E) Splicing needs snRNAs.

(D) 63. A cell that is unable to synthesize or obtain tetrahydrofolate would probably be deficient in the biosynthesis of _____.

- (A) dGMP (B) dCMP (C) dAMP (D) dTMP (E) dUMP

(B) 64. Pompe disease is a glycogen storage disease caused by defect in _____.

- (A) glycogen phosphorylase (B) lysosomal α -1,4-glucosidase
(C) glycogen branching enzyme (D) glucose-6-phosphatase
(E) phosphorylase kinase

(E) 65. Which of the following statements about allosteric regulation are **CORRECT**? ① Substrate is a heterotropic allosteric modulator. ② Allosteric regulation can increase or decrease the catalytic activity of enzymes. ③ Allosteric enzymes typically have oligomeric structure. ④ The activity of some allosteric enzymes is regulated by feedback inhibition. ⑤ Allosteric modulators cannot induce conformational change of allosteric enzymes.

- (A) ①,②,③ (B) ①,②,④ (C) ①,③,④ (D) ①,③,⑤ (E) ②,③,④

(D) 66. Which of the following statements about ribozyme are **CORRECT**? ① Peptidyl transferase is a ribozyme. ② Aminoacyl-tRNA synthetase is a ribozyme. ③ The substrate of ribozyme is RNA.

④ Hammerhead ribozyme is involved in trans-splicing reaction. ⑤ RNase P is a ribozyme.

- (A) ①,②,③ (B) ①,③,④ (C) ①,④,⑤ (D) ①,③,⑤ (E) ②,④,⑤

(C) 67. Which of the following statements about microRNAs (miRNAs) are **CORRECT**? ① miRNAs originate from exogenous dsRNA. ② miRNAs form a perfect complementary to its target mRNA. ③ Some miRNAs can functionally inhibit mRNA translation. ④ Some miRNAs can promote mRNA decay. ⑤ miRNAs are transcribed by RNA polymerase III.

- (A) ①,⑤ (B) ②,③ (C) ③,④ (D) ②,④ (E) ③,⑤

(A)(C) 68. Which of the following statements about glycogen is **FALSE**?

- (A) Glucose-6-phosphate is released from nonreducing ends of the glucose polymer by the action of the enzyme glycogen phosphorylase.
 (B) In glycogen breakdown, it involves sequential phosphorolytic cleavages of $\alpha(1\rightarrow4)$ bonds.
 (C) Glycogen is the storage polysaccharide in skeletal and liver cells.
 (D) Glycogen is a polymer of glucose in $\alpha(1\rightarrow4)$ linkages with $\alpha(1\rightarrow6)$ linked branches.
 (E) The breakdown of glycogen in skeletal muscle ultimately enters glycolysis to generate ATP.

(B) 69. Which of the following statements for Shine-Dalgarno sequence are **CORRECT**?

- ① Shine-Dalgarno sequence is found in prokaryotic mRNA. ② Shine-Dalgarno sequence is a purine-rich sequence. ③ Shine-Dalgarno sequence can base-pair with a sequence of tRNA. ④ Shine-Dalgarno sequence is involved in DNA replication. ⑤ Shine-Dalgarno sequence can base-pair with a sequence of 16S rRNA.

- (A) ①,②,③ (B) ①,②,⑤ (C) ①,③,④ (D) ①,④,⑤ (E) ①,②,④,⑤

(E) 70. Which of the following statements about nitric oxide (NO) are **CORRECT**? ① Cellular NO is produced from lysine. ② Nitroglycerine is an NO donor. ③ Nitric oxide synthase is involved in the production of NO. ④ Adenyl cyclases are receptors for NO. ⑤ NO production in endothelial cells leads to vasodilation.

- (A) ①,②,③ (B) ②,③,④ (C) ③,④,⑤ (D) ①,③,④ (E) ②,③,⑤

(C) 71. Which of the following statements about oxidative phosphorylation are **CORRECT**?

- ① Oxidative of NADPH occurs in mitochondria. ② The production of ATP is driven by electron transport and proton gradient. ③ The process of chemiosmotic coupling is involved in the synthesis of ATP in mitochondria. ④ The production of ATP is mediated by a substrate-level phosphorylation of ADP. ⑤ The electron transport is inhibited by 2,4-dinitrophenol.

- (A) ①,③,⑤ (B) ①,②,③ (C) ②,③ (D) ③,④,⑤ (E) ③,⑤

(E) 72. Which of the following statements about *lac* operon is **CORRECT**? ① The repressor is the protein product of *lac Z* gene. ② The *lac* operon can be turned on by β -galactoside. ③ Repressor binds to the operator and blocks the binding of RNA polymerase to promoter. ④ Isopropyl- β -D-thiogalactoside can bind to Lac repressor to turn on protein expression. ⑤ In the *lac* operon model, the genes within the operon will be expressed if lactose is present in *E. coli*.

- (A) ①,②,③ (B) ①,②,④ (C) ②,③,④ (D) ③,④,⑤ (E) ②,③,④,⑤

- (C) 73. Which of the following statements about glutathione are **CORRECT**? ① Glutathione is an antioxidant. ② Glutathione is a tetrapeptide. ③ Glutathione is not involved in detoxification of xenobiotics. ④ The biosynthesis of glutathione synthesis occurs as a part of γ -glutamyl cycle. ⑤ Oxidized glutathione is reduced by glutathione reductase.
 (A) ①,②,③ (B) ①,③,④ (C) ①,④,⑤ (D) ②,③,④ (E) ①,②,⑤
- (B) 74. Which of the following statements about citric acid cycle is **FALSE**?
 (A) The first reaction is to synthesize citric acid.
 (B) In addition to CTP, NADH and QH_2 are also produced in citric acid cycle.
 (C) The acetyl group of acetyl-CoA is released in the form of CO_2 when it enters citric acid cycle.
 (D) The product of the last step, oxaloacetate, is also the reactant of the first step.
 (E) It occurs in mitochondrial matrix.
- (D) 75. Which of the following statements about amino acids is **CORRECT**? ① Methionine is sulfur-containing amino acids. ② The UV absorbance of phenylalanine at 280 nm is lower than that of tyrosine. ③ Disulfide bond can be reduced by performic acid. ④ The side chain of histidine is an imidazole ring. ⑤ The pI value of arginine is lower than that of lysine.
 (A) ①,②,③ (B) ①,③,④ (C) ②,③,④ (D) ①,②,④ (E) ②,③,⑤
- (E) 76. Which of the following enzymes are aspartate protease ? ① Subtilisin; ② Cathepsin D; ③ HIV-protease; ④ Thrombin; ⑤ Pepsin
 (A) ①,②,③ (B) ①,②,④ (C) ①,②,⑤ (D) ②,③,④ (E) ②,③,⑤
- (A) 77. Which of the following statements for the structure of proteins are **CORRECT**? ① A bond between amino acids is peptide bond. ② Disulfide bonds in proteins are formed by serine. ③ The amino acid sequence is the primary structure of proteins. ④ The coil-coiled motif is the tertiary structure of proteins. ⑤ The quaternary structure of proteins contains two or more polypeptide chains.
 (A) ①,③,⑤ (B) ②,③,④ (C) ②,③,⑤ (D) ①,③,④ (E) ①,②,③
- (A) 78. In order to infect cells, the hemagglutinin of the influenza virus binds with _____ in the cell surface glycoproteins or glycolipids.
 (A) sialic acid (B) gluconic acid (C) *N*-acetylmuramic acid
 (D) uronic acid (E) muramic acid

- (E) 79. In electron-transport chain, the transferring sequence of the electrons passing from NADH to oxygen is:
- (A) Complex I→Complex III→Complex IV→Complex V
 - (B) Complex I→Complex II→Complex III→cytochrome c→Complex IV
 - (C) Complex I→Q→Complex II→Complex III→cytochrome c→Complex IV
 - (D) Complex I→Complex II →Complex III →Complex IV
 - (E) Complex I→Q→Complex III→cytochrome c→Complex IV
- (D) 80. Which of the following **BEST** explains the "wobble" hypothesis proposed by Francis Crick?
- (A) The genetic code is degenerate in that most amino acids have more than one codon.
 - (B) The genetic code is ambiguous in that each codon can specify more than one amino acid.
 - (C) The anticodon can pair with any part of the corresponding codon.
 - (D) The 5'-base of the anticodon can make non Watson-Crick hydrogen bonds with several different bases at the 3'-position of the codon.
 - (E) Inosine can pair up with C, G, or U.
- (C) 81. Phospholipids show asymmetric distribution on membrane of erythrocytes. Which of the following phospholipids prefer to distribute on the outer leaflet of erythrocyte membrane?
- ① phosphatidylcholine; ② phosphatidylserine; ③ phosphatidylinositol;
④ sphingomyelin; ⑤ phosphatidylethanolamine
- (A) ①,② (B) ①,③ (C) ①,④ (D) ②,③ (E) ②,⑤
- (A) 82. Mammalian phosphofructokinase, the major flux-controlling enzyme of glycolysis, is regulated by ① allosteric activator, fructose 2, 6-bisphosphate; ② allosteric inhibitor, ATP; ③ allosteric activator, AMP; ④ allosteric inhibitor, ADP; ⑤ allosteric activator, Citrate
- (A) ①,②,③ (B) ①,③,④ (C) ①,②,⑤ (D) ①,③,⑤ (E) ①,④,⑤
- (E) 83. Misfolding of protein causes a broad range of disease. Which of the following human diseases linked to misfolding of proteins are **CORRECT**? ① Alzheimer's disease, β -Amyloid peptide ; ② Creutzfeldt-Jakob disease, Prion protein ; ③ Cystic fibrosis, Superoxide dismutase I; ④ Huntington's disease, α -Synuclein; ⑤ Familial amyloidotic polyneuropathy, Transthyretin.
- (A) ①,②,③ (B) ①,②,④ (C) ②,③,⑤ (D) ③,④,⑤ (E) ①,②,⑤
- (B) 84. Which of the following statements about the inhibition of enzyme activity is **FALSE**?
- (A) Transition state analogs can be used as competitive inhibitor.
 - (B) Irreversible inhibition can be analyzed using Michaelis-Menten equation.
 - (C) Increasing substrate concentration can counteract the effect of competitive inhibitor.
 - (D) An uncompetitive inhibition does not affect the slope of the Lineweaver-Burk plot.
 - (E) The irreversible inhibitor is covalently linked with the catalytic residue at the active site of the enzyme.

- (D) 85. Which of the following enzymes are involved in the purine salvage pathways? ① GMP synthetase; ② Adenine phosphoribosyl transferase; ③ Purine nucleoside phosphorylase; ④ Hypoxanthine-guanine phosphoribosyltransferase; ⑤ Adenylosuccinate lyase
 (A) ①,② (B) ②,③ (C) ③,④,⑤ (D) ②,④ (E) ②,③,④

- (D) 86. Which of the following statements for cholesterol are **CORRECT**? ① Cholesterol is a precursor of lanosterol. ② Cholesterol is a component of cell membrane in human erythrocyte. ③ Cholesterol is a precursor of bile acids. ④ Cholesterol is terpene-based lipid. ⑤ Cholesterol reduces the transition temperature of phospholipids in cell membrane.
 (A) ①,②,③ (B) ①,③,⑤ (C) ①,②,④ (D) ②,③,④ (E) ②,④,⑤

- (C)(D) 87. Which of the following statements is **CORRECT** in DNA repair?

- (A) AlkB is involved in base-excision repair.
 (B) AP endonuclease is involved in mismatch repair.
 (C) ABC excinuclease is involved in nucleotide-excision repair.
 (D) DNA photolyase is involved in direct repair.
 (E) Dam methylase is involved in methyl-directed repair.

- (A) 88. A peptide is digested by chymotrypsin, and the resulting peptides are shown as following: Gly-Asn; Asp-Met-Leu-Phe; Leu-Lys-Trp; Met-Arg-Ala-Tyr. The C-terminal amino acid of the starting peptide (the one cleaved with chymotrypsin) is

- (A) Asn (B) Phe (C) Trp (D) Tyr (E) Gly

- 送分 89. Which of the followings inhibit fatty acid synthesis: ① malonyl CoA; ② glucagon; ③ citrate; ④ phosphorylated acetyl-CoA carboxylase

- (A) ①,②,③ (B) ①,②,④ (C) ①,③,④ (D) ②,③,④ (E) ①,②,③,④

- (E) 90. Which of the following statements about pentose phosphate pathway is **FALSE**?

- (A) The major pathway is to produce five-carbon sugars.
 (B) The major products are two molecules of NADPH and one molecule of ribulose-5-phosphate.
 (C) Oxidation of glucose 6-phosphate to 6-phosphoglucono- δ -lactone is the first reaction.
 (D) It provides ribose-5-phosphate for nucleotide biosynthesis.
 (E) It occurs exclusively in the mitochondria.

生 化

莊老師(施政安)老師提供

1. 總體分析: 試題難易度可分5類

- A. 簡單: 講義內容, 共33題
- B. 太細: 共3題 (第24, 76, 83題)
- C. 爭議: 共5題 (第63, 72, 84, 85, 87題)
- D. 無解: 共1題 (第89題)
- E. 課外: 共1題 (第26題)
可以把握的有 57 分

2. 題目分佈:

A. 基礎篇	題	號
Amino acid, Protein	18, 22, 24, 73, 75, 77, 78, 83	
Nucleic acid	0	
Carbohydrate	0	
Lipid	86	
Enzyme	29, 65, 66, 76, 84, 88	
Membrane	81	
Hb, Mb	0	
B. 代謝篇	題	號
Amino acid	17, 20	
Nucleic acid	23, 61, 63, 85	
Carbohydrate	64, 68, 82, 90	
Lipid	27, 30 89	
TCA cycle	74	
Electron transfer chain	71, 79	
Vitamin	25	
C. 分子生物篇	題	號
Replication	16, 19	
Transcription	62	
Translation	21, 69, 80	
Repar	87	
Gene control	72	
miRNA	67	
Signal transduction	26, 70	
Technique	28	

3. 講義對照:

題 號	講義 回數	頁 數	題 號	講義 回數	頁 數
16	6	238	17	5	110
18	1	124	19	6	35
20	4	101	21	6	198
22	1	228,260, 247	23	4	169
24	1	293	25	1	125
26	課外		27	4	212
28	6	237	29	2	166
題 號	講義 回數	頁 數	題 號	講義 回數	頁 數
30	4	259	61	4	159
62	6	145	63	4	167
64	3	245, 254	65	2	110
66	6	上課筆記	67	6	232
68	3	231	69	6	179
70	5	142	71	4	39-74
72	6	219-220	73	1	119, 144
				3	250
				4	86
74	4	17	75	1	12, 47, 131
76	2	187	77	1	226
78	1	322	79	4	58
80	6	161, 163	81	5	73
82	3	221	83	1	121
84	2	140	85	4	163
86	3	93, 102	87	6	78
88	2	73	89	4	214, 215
90	3	248			

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