國立成功大學

112學年度碩士班招生考試試題

編　號：267

系　所：藥理學研究所

科　目：生物化學

日　期：0207

節　次：第 3 節

備　註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Part I 選擇題 (2.5% each)

1. Phenylketonuria is caused by the deficiency of which following enzyme ?
   (A) Aminotransferase;
   (B) Fumarylacetoacetase;
   (C) Maleylacetoacetate isomerase;
   (D) Phenylalanine hydroxylase.

2. Beriberi (腳氣病) is caused by the lacking of ?
   (A) niacin;
   (B) riboflavin;
   (C) pyridoxine;
   (D) thiamin.

3. Administration of aspirin will inhibit the production of ?
   (A) Insulin;
   (B) Leukotriene;
   (C) Prostaglandin;
   (D) Testosterone.

4. Lovastatin is the drug for the treatment of familial hypercholesterolemia because it inhibits which of the following enzyme?
   (A) HMG-CoA synthase;
   (B) HMG-CoA lyase;
   (C) HMG-CoA reductase;
   (D) HMG-CoA isomerase.

5. Which of the following second messenger is associate with plasma membrane?
   (A) cAMP; (B) cGMP; (C) diacylglycerol; (D) IP_3.

6. Which of the following proteins involved in signal transduction is not an integral membrane protein?
   (A) acetyl choline receptor;
   (B) estrogen receptor;
   (C) insulin receptor;
   (D) β-adrenergic receptor.

7. Which of the following ligand will activate a receptor tyrosine kinase ?
(A) epinephrine;
(B) epidermal growth factor;
(C) estrogen;
(D) glucagon.

8. Which of the following description about insulin receptor is **incorrect** ?
(A) insulin receptor is an oncoprotein;
(B) insulin receptor is a dimeric transmembrane protein;
(C) insulin receptor is a tyrosine kinase;
(D) insulin receptor does not activate phosphatidyl inositol-3 kinase by itself.

9. Among 20 amino acids, how many of them contains -OH group in the side chain?
(A) one; (B) two; (C) three; (D) four.

10. Which of the following methods separate proteins by their molecular weight?
(A) gel filtration;
(B) isoelectric precipitation;
(C) ion exchange chromatography;
(D) salting out.

11. Which of the following is not a secondary structure of a protein?
(A) alpha-helix;
(B) beta-pleated sheet;
(C) collagen triple helix;
(D) disulfide bridge

12. Which of the following represents the biding affinity between an enzyme and its substrate?
(A) Vmax; (B) Kcat; (C) Km; (D) Kcat/Km.

13. As a noncompetitor, which of the following description is correct?
(A) Km is not changed;
(B) It has higher binding affinity;
(C) Vmax is not changed;
(D) The structures of noncompetitive inhibitor and ligand are similar.

14. Eukaryotic ribosomes contain 28S rRNA. What does 28S stand for ?
(A) number of sugars;
(B) sedimentation coefficient;
(C) splicing coefficient;
(D) splicing number.

15. Dehydrogenases are enzymes that:
(A) Move hydrogens within the molecules;
(B) Add hydrogens within the molecules;
(C) Transfer hydrogens between substrates;
(D) Transfer hydride ions to NAD^+ (or $NADP^+$) and release a proton.

16. Where are ketone bodies formed in the body ?
(A) Cytosol of muscle cells;
(B) Cytosol of brains cells;
(C) Mitochondria of liver cells;
(D) Mitochondria of muscle cells.

17. What is the final product of glucose metabolism in red blood cells ?
(A) acetyl-CoA; (B) CO_2; (C) lactate; (D) pyruvate.

18. Which of the following chemicals does not directly participate in the synthesis of ATP in cells ?
(A) 1,3-Bisphosphoglycerate;
(B) 3-Phosphoglycerate;
(C) Phosphocreatine;
(D) Phosphoenolpyruvate.

19. Enzymes involved in electron transport chain localize at ?
(A) mitochondrial matrix;
(B) cytosol;
(C) mitochondria outer membrane;
(D) mitochondrial inner membrane.

20. In aerobic electron transportation, the flow of electron terminates at ?
(A) H_2O; (B) O_2; (C) coenzyme Q; (D) NAD^+.

21. How many CO_2 will be released from one cycle of acetyl-CoA entering citric acid cycle (or TCA cycle) ?
(A) 1; (B) 2; (C) 3; (D) 4.

22. In mitochondria, which of the followings is not caused by uncoupling protein ?
(A) Mitochondrial proton gradient is lost;
(B) ATP/ADP ratio is increased;
(C) Heat is generated;
(D) None.

23. Which of following reaction occurs in rhodopsin stimulated by light ?
(A) β-carotene turns into retinal;
(B) retinal is reduced into retinol
(C) cis-retinal is isomerized into all-trans-retinal;
(D) all-trans-retinal is isomerized into cis-retinal

24. Which of the followings has similar chemical structure to hypoxanthine and is used to treat gout ?
(A) allopurinol;
(B) p-aminobenzoate;
(C) 5-fluorouracil;
(D) methotrexate.

25. Which of the following lipoproteins increased might contribute to the enhanced blood cholesterol ?
(A) VLDL; (B) LDL; (C) HDL; (D) All but C.

26. Which of the following enzymes is important for the synthesis of dTMP ?
(A) dihydrouracil dehydrogenase;
(B) dihydrofolate reductase;
(C) xanthine oxidase;
(D) 5'-nucleotidase.

27. Which of the following amino acids is the precursor of epinephrine synthesis ?
(A) glycine; (B) histidine; (C) tryptophan; (D) tyrosine.

28. NADPH generated from the following pathways is needed in the biosynthesis of fatty acid ?
(A) glycolysis;
(B) malic enzyme and pentose phosphate pathway;
(C) oxidative phosphorylation;
(D) TCA cycle.

29. In the pentose phosphate pathway, which of the followings is **not** an intermediate for DNA/RNA ribose formation from glucose ?
(A) glucose-1-phosphate;
(B) glucose-6-phosphate;
(C) ribose-5-phosphate;
(D) 6-phosphogluconate.

30. Atom N in purine and pyrimidine ring is provided from the metabolism of which following amino acids ?
(A) Alanine; (B) Aspartate; (C) Glycine; (D) Glutamate.

Part II. 問答題：25%

1. 試比較 AstraZeneca/Oxford COVID-19 Vaccine 與 Moderna/BNT mRNA Vaccine 的原理. (10%)

2. 試寫出下列 DNA template 所轉錄(transcription)的 RNA 序列 (要標示 5'與 3' end). (5%)
5'-ATG-ATG-CCT-AGG-ATC-CCT-AAG-3'

3. 解釋說明下列名詞: (10%)
a) RT-PCR;
b) siRNA;
c) CRISPR gene editing.