

※第四題請於試卷內之「選擇題作答區」依序作答，其餘各題請於試卷內之「非選擇題作答區」標明大題及小題題號依序作答。

(一).寫出指定縮寫之英文全名 (10 分) 例, Coenzyme TPP 之 T- (Thiamine

- |                                      |   |
|--------------------------------------|---|
| 1).Coenzyme NAD 之 N-(                | 2).Influenza virus, H <sub>1</sub> N <sub>1</sub> 之 N-( |
| 3).免疫相關蛋白質 IgG 之 g-(                 | 4).TCA cycle 之 C-(                                      |
| 5).CH <sub>3</sub> -donor, SAM 之 M-( | 6).Coenzyme THF 之 F-(                                   |
| 7).UDPGlc 之 U-(                      | 8).F <sub>0</sub> F <sub>1</sub> ATP synthase 之 o-(     |
| 9).CoQ <sub>10</sub> 之 Q-(           | 10).與神經傳導相關 GABA 之 B(                                   |

(二).說明下列與生物化學相關名詞或物質(請勿只譯成中文了事. 共 20 分)

- |                               |                                   |                                |
|-------------------------------|-----------------------------------|--------------------------------|
| 1).Glycosaminoglycan          | 2).Essential amino acids          | 3).Cori-Cori cycle             |
| 4).Alcohol dehydrogenase      | 5).Fructose 2,6-bisphosphate.     | 6).Glutathione                 |
| 7).Shikimate pathway          | 8).Ttransamination of amino acid. | 9).Cytochrome P <sub>450</sub> |
| 10).Pentose phosphate pathway |                                   |                                |

(三).簡答下列各題 (每題 2 分, 共 20 分)

- Bioenergetics 中所用之  $\Delta G$ ;  $\Delta G'$ ;  $\Delta G_0$ ;  $\Delta G_0'$  四種條件有何不同?
- TCA Cycle is an "Amphibolic" mechanism, 試申其義?
- 「A heart attack used to be diagnosed and monitored by a change of LDH isozyme from heart muscle」試申其義?
- Why does DNA use T (not U) to do base-pairing with A?
- 試寫出 tripeptide: Valyl-Alanyl-Tyrosine 之結構式 (三者之 R-group 分別為: isopropyl-, methyl-及 phenol-)
- 「Abzymes are potential tools in biotechnology」試申其義? (Abzyme from antibody and enzyme)
- 寫出「Forces that stabilize the tertiary structure of proteins」四種。
- 鳥類對 N-compound 代謝排泄主要為 urea, uric acid, ammonia 之何者? 為什麼?
- 試寫出 ATP 之英文全名, 畫出其結構式。並說明何以 ATP 為「high energy compound」?
- 簡述植物如何進行澱粉(starch)生合成?

(四). 選擇題(單選，每題 2 分，答錯不扣分) ※ 本大題請於試卷內之「選擇題作答區」依序作答。

- The most important contribution to the stability of a protein's conformation appears to be the:
  - entropy increase from the decrease in ordered water molecules forming a solvent shell around it.
  - maximum entropy increase from ionic interactions between the ionized amino acids in a protein.
  - sum of free energies of formation of many weak interactions among the hundreds of amino acids in a protein.
  - sum of free energies of formation of many weak interactions between its polar amino acids and surrounding water.
  - stabilizing effect of hydrogen bonding between the carbonyl group of one peptide bond and the amino group of another.
- Which of the following best represents the backbone arrangement of two peptide bonds?
  - $C_{\alpha}-N-C_{\alpha}-C-C_{\alpha}-N-C_{\alpha}-C$
  - $C_{\alpha}-N-C-C-N-C_{\alpha}$
  - $C-N-C_{\alpha}-C_{\alpha}-C-N$
  - $C_{\alpha}-C-N-C_{\alpha}-C-N$
  - $C_{\alpha}-C_{\alpha}-C-N-C_{\alpha}-C_{\alpha}-C$
- The major reason that antiparallel  $\beta$ -stranded protein structures are more stable than parallel  $\beta$ -stranded structures is that the latter:
  - are in a slightly less extended configuration than antiparallel strands.
  - do not have as many disulfide crosslinks between adjacent strands.
  - do not stack in sheets as well as antiparallel strands.
  - have fewer lateral hydrogen bonds than antiparallel strands.
  - have weaker hydrogen bonds laterally between adjacent strands.
- Analysis of x-ray diffraction data yields a(n) \_\_\_\_; analysis of 2D NMR data yields a(n) \_\_.
  - electron density map; count of hydrogen atoms in the molecule
  - shadow of protein's outline; estimate of protein's molecular volume
  - table of interatomic distances; electron density map
  - electronic density map; table of interatomic distances
  - 3-d protein structure; 2-d protein structure
- Experiments on denaturation and renaturation after the reduction and reoxidation of the —S—S— bonds in the enzyme ribonuclease (RNase) have shown that:
  - folding of denatured RNase into the native, active conformation requires the input of energy in the form of heat.
  - native ribonuclease does not have a unique secondary and tertiary structure.
  - the completely unfolded enzyme, with all —S—S— bonds broken, is still enzymatically active.
  - the enzyme, dissolved in water, is thermodynamically stable relative to the mixture of amino acids whose residues are contained in RNase.
  - the primary sequence of RNase is sufficient to determine its specific secondary and tertiary structure.
- In the binding of oxygen to myoglobin, the relationship between the concentration of oxygen and the fraction of binding sites occupied can best be described as:

- A) hyperbolic.  
B) linear with a negative slope.  
C) linear with a positive slope.  
D) random.  
E) sigmoidal.
7. An allosteric interaction between a ligand and a protein is one in which:
- A) binding of a molecule to a binding site affects binding of additional molecules to the same site.  
B) binding of a molecule to a binding site affects binding properties of another site on the protein.  
C) binding of the ligand to the protein is covalent.  
D) multiple molecules of the same ligand can bind to the same binding site.  
E) two different ligands can bind to the same binding site.
8. Which of the following parts of the IgG molecule are *not* involved in binding to an antigen?
- A) Fab  
B) Fc  
C) Heavy chain  
D) Light chain  
E) Variable domain
9. Enzymes differ from other catalysts in that only enzymes:
- A) are not consumed in the reaction.  
B) display specificity toward a single reactant.  
C) Fail to influence the equilibrium point of the reaction.  
D) form an activated complex with the reactants.  
E) lower the activation energy of the reaction catalyzed.
10. Which of the following statements about a plot of  $V_0$  vs.  $[S]$  for an enzyme that follows Michaelis-Menten kinetics is *false*?
- A) As  $[S]$  increases, the initial velocity of reaction  $V_0$  also increases.  
B) At very high  $[S]$ , the velocity curve becomes a horizontal line that intersects the y-axis at  $K_m$ .  
C)  $K_m$  is the  $[S]$  at which  $V_0 = 1/2 V_{max}$ .  
D) The shape of the curve is a hyperbola.  
E) The y-axis is a rate term with units of mm/min.
11. Non-steroidal anti-inflammatory drugs (NSAIDs) like aspirin and ibuprofen act by blocking production of:
- A) biological waxes.  
B) prostaglandins.  
C) sphingolipids  
D) vitamin D.  
E) none of the above.
12. An integral membrane protein can be extracted with:
- A) a buffer of alkaline or acid pH.  
B) a chelating agent that removes divalent cations.  
C) a solution containing detergent.  
D) a solution of high ionic strength.  
E) hot water.

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13. The shortest  $\alpha$  helix segment in a protein that will span a membrane bilayer has about \_\_\_\_\_ amino acid residues.

- A) 5
- B) 20
- C) 50
- D) 100
- E) 200

14. Which of the following is not involved in signal transduction by the  $\beta$ -adrenergic receptor pathway?

- A) ATP
- B) Cyclic AMP
- C) Cyclic GMP
- D) GTP
- E) All of the above are involved.

15. Fatty acids are activated to acyl-CoAs and the acyl group is further transferred to carnitine because:

- A) acyl-carnitines readily cross the mitochondrial inner membrane, but acyl-CoAs do not.
- B) acyl-CoAs easily cross the mitochondrial membrane, but the fatty acids themselves will not.
- C) carnitine is required to oxidize  $\text{NAD}^+$  to NADH.
- D) fatty acids cannot be oxidized by FAD unless they are in the acyl-carnitine form.
- E) None of the above is true.

(五). 請有條理及儘可能仔細回答下列問題

1. Formation of "protein complex" (for example, cyclin-CDK complex in the regulation of cell cycle) is frequently observed in biochemical process. (10%)
  - a. Please discuss the benefit for forming protein complex.
  - b. Describe the experimental techniques in discovering and studying protein complex
  - c. Please name an example of protein complex in the metabolism of fatty acid
  - d. Please name an example of protein complex in TCA cycle
2. Solubility of hormones can be related to the cellular localization of their receptors. Please use insulin and estrogen to discuss this. (5%)
3. Protein purification/isolation is essential to the biochemical characterization of a protein. Please discuss the strategy and techniques that may be used for the purification of the following (5%)
  - a. An abundant enzyme
  - b. Recombinant protein with His-tag expressed in *E. coli*.

試題隨卷繳回