

一、選擇題（單選，每題二分，答錯倒扣0.5分）

1. Which is the V/V_{\max} ratio when $[S] = 9 K_M$?

- A. 0.1
- B. 0.2
- C. 0.8
- D. 0.9
- E. 1.0

2. Under what conditions can an enzyme assay be used to determine the relative amounts of an enzyme present ?

- A. At substrate concentrations high relative to K_M .
- B. At enzyme concentration high relative to $[ES]$.
- C. At substrate concentration low relative to K_M .
- D. At enzyme concentration low relative to $[E]$.
- E. At any fixed substrate or enzyme concentration.

3. Allosteric enzymes

- A. usually have only one active site.
- B. usually show Michaelis-Menten kinetics
- C. usually catalyze the last reaction of a metabolic pathway.
- D. are regulated primarily by covalent modification.
- E. usually have more than one polypeptide chain.

4. The Lineweaver-Burk plot, is given by

$$1/V_o = K_M / V_{\max} [S] + 1/V_{\max}$$

To determine K_M from the plot, you would

- A. take the x-axis intercept where $V_o = 1/2 V_{\max}$.
- B. take the reciprocal of Y-axis intercept.
- C. take the reciprocal of X-axis intercept.
- D. multiply the reciprocal of Y-axis intercept by -1.
- E. multiply the reciprocal of X-axis intercept by -1.

(背面仍有題目,請繼續作答)

5. A good transition-state analogue:
- A. is too unstable to isolate.
 - B. binds covalently to the enzyme.
 - C. binds very weakly to the enzyme.
 - D. binds to the enzyme more tightly than the substrate.
 - E. is a noncompetitive inhibitor.
6. In a mixture of the five proteins listed below, which should elute second in a size-exclusion (gel filtration) chromatography ?
- A. cytochrome C. $M_r = 13,000$
 - B. ribonuclease. $M_r = 13,700$
 - C. serum albumin. $M_r = 68,500$
 - D. immunoglobulin. $M_r = 145,000$
 - E. RNA polymerase. $M_r = 450,000$
7. The term specific activity of an enzyme
- A. is the activity (enzyme units) of a specific protein.
 - B. refers only to a purified enzyme.
 - C. is the activity (enzyme units) in a milligram of protein.
 - D. is measured only under $[S] < K_M$.
 - E. refers to protein other than enzyme.
8. In an α -helix, the R groups on the amino acid residues:
- A. alternate between outside and inside.
 - B. cause only right-handed helices to form.
 - C. stack within the interior of the helix.
 - D. are on the outside of the helix.
 - E. generate the hydrogen-bonds that form the helix.
9. An enzyme that catalyzes the joining of two strands of DNA together when supplied with ATP is a member of what general class of enzymes ?
- A. ligases
 - B. transferases
 - C. lysases
 - D. isomerases
 - E. hydrolases

10. Which of the following is likely to be an irreversible inhibitor of acetylcholinesterase ?
- diisopropylphosphofluoridate
 - water
 - mercury
 - ethanol
 - methanol
11. Which of the following statements about proteins is TRUE ?
- Nonpolar amino acid side chains are generally arranged on the surface.
 - Proteins contain either α helical or β pleated sheets alone. α helical and β pleated sheets can not coexist in one protein molecule.
 - Hydrogen bonds are not important in the stability of proteins.
 - Proteins are generally very loosely structures.
 - Globular proteins are generally very compact.
12. Which of the following statements about allosteric control of enzymatic activity is FALSE ?
- Allosteric proteins are generally composed of several subunits.
 - An effector may either inhibit or activate an enzyme.
 - Binding of the effector changes the conformation of the enzyme molecule.
 - Heterotropic allosteric effectors compete with substrate for binding sites.
 - Allosteric enzyme usually does not show Michaelis-Menten kinetics.
13. By adding SDS (sodium dodecyl sulfate) during the electrophoresis of proteins, it is possible to :
- preserve a protein native structure and biological activity.
 - determine a protein isoelectric point.
 - separate protein exclusively on the basis of molecular weight.
 - determine an enzyme activity.
 - determine amino acid composition of a protein.

14. Most peptide bonds in naturally occurring proteins:

- preferentially adopt a trans configuration.
- preferentially adopt a cis configuration.
- show no preference for a cis or trans configuration.
- cannot assume a cis or trans configuration.
- preferentially to assume cis and trans configurations in an alternative way.

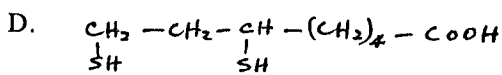
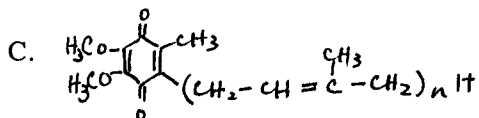
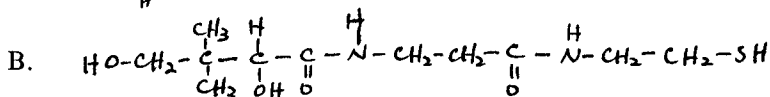
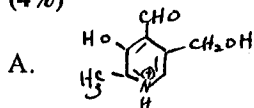
二、配合題 (每題一分, 答錯倒扣0.25分)

Match each statement below with most appropriate vitamin (15-18) (4%)

- Thiamine
- Riboflavin
- Pyridoxine
- Folic acid

- A vitamin that is converted to a coenzyme which participates in the decarboxylation of α -keto acids.
- A vitamin that is converted to a coenzyme which is used in a large number of oxidation-reduction reactions.
- A vitamin that is converted to a coenzyme which participates in one carbon transfer reactions.
- A vitamin that is converted to a coenzyme which is used in transamination, oxidation and decarboxylation of amino acids.

Match the structures below to the compounds named in problems 19 - 22: (4%)



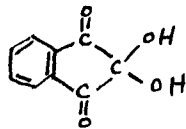
(背面仍有題目, 請繼續作答)

19. Lipoic acid
20. Co Q (ubiquinone)
21. Pyridoxal
22. Pantothenic acid

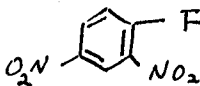
The following reagents are used to determine the structure of proteins.
Match the compounds and the descriptions of these chemicals (23-26) (4%)

- A. It is used to identify the NH_2 -terminal residue of a protein.
- B. It is used to quantitate the amino acids.
- C. It is used to identify the COOH -terminal residue of a protein.
- D. It is used to sequence the amino acid one by one from the NH_2 -terminal.

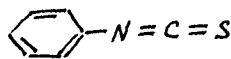
23. ninhydrin



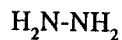
24. Sanger's reagent



25. Edman reagent



26. hydrazine



Match each of the following compounds with its biological role (27-33) (7%)

- A. vitamin A
- B. vitamin D
- C. vitamin E
- D. vitamin K
- E. gangliosides
- F. prostaglandins
- G. terpenes

27. the smell of flowers in spring
28. mediates pain and inflammation
29. blood clotting
30. prevention of oxidative damage
31. vision

32. important component of myelin membranes
33. Ca^{2+} and phosphate metabolism

三、簡答題及問答題

34. Please describe the "RNA world" hypothesis. (3%)
35. Lysosomes contain many degradative enzymes used to degrade complex molecules transported to these organelles. How do the cells containing lysosomes prevent these enzymes from degrading themselves? (3%)
36. Which type of lipids among triacylglycerols and phosphoglycerides is capable of spontaneously assembling into bilayer structures found in biological membranes and explain what are the forces that drive bilayer formation. (3%)
37. Describe the molecular aspects of fatty acids that contribute to different melting points and hydrophilicity. (3%)
38. Only one stereoisomer has been selected for almost exclusive use in organisms among basic precursor molecules, for example, L-amino acids, D-sugars and so forth. Prebiotic synthesis must have produced D, L-mixtures of these compounds, so that both isomers were available in equal abundance to the earliest organisms. Could you propose a reasonable general explanation for why the use of only one isomer should have prevailed, assuming that there is no intrinsic difference in biological fitness between D and L forms of the same molecule. (3%)
39. Please describe types of lipoproteins and their physiological significance in brief. (3%)
40. Processing of mRNA in eucaryotic cell, including 5' end capping, 3' end polyadenylation, and splicing are complex processes. Describe (a) the RNA sequence required for cis-splicing of mRNA, (b) the splicing machinery (proteins or snRNA) (c) the mechanism of splicing procedure. (9%)

41. Explain the following terms: (6%)
(a) somatic cell gene therapy
(b) programmed cell death (apoptosis)
(c) SOS response in *E. coli*
42. Describe the initiation of translation in *E. coli* (5%)
43. Peptidoglycan is an important structural component in bacteria cell wall.
Describe the structure of peptidoglycan and cell wall in bacteria. (5%)
44. Explain the following terms used in carbohydrate: (10%)
(a) glycoside
(b) mutarotation
(c) anomer
(d) aminosugar
(e) glycosaminoglycan