

系所組別： 生物科技研究所甲、乙組

考試科目： 生物化學

考試日期：0220，節次：2

※ 考生請注意：本試題 可 不可 使用計算機

I. 單選題 (Simple choice)：共 15 題，45 分

1. Following metabolites which one is **not** phospholipid?

- (1) Sphingomyelin
- (2) Phosphatidylinositol
- (3) Phosphatidic acid
- (4) Docosahexaenoic acid

2. Following descriptions about dark reactions in photosynthesis, which one is **not** true?

- (1) The series of reactions are called Calvin cycle.
- (2) Use Rubisco to fix CO₂.
- (3) Consumes NADH and ATP.
- (4) Produce hexose phosphate metabolites.

3. Following descriptions about fatty acid synthesis pathways, which one is true?

- (1) The fatty acid synthase found in plants is a highly structured multi-enzyme complex.
- (2) Malonyl-CoA is one of the major substrates for the synthesis of palmitic acid.
- (3) The synthesis of palmitic acid consumes NADH and ATP.
- (4) Oleic acid (C18:1 Δ^9) is an essential fatty acid for most animals.

4. Following descriptions about DNA, which one is **not** true?

- (1) DNA is deoxyribonucleic acid.
- (2) Adenine and guanine are pyrimidines which attach on 1' carbon of 2'-deoxyribose of DNA.
- (3) Deoxy AMP is one of the monomers of DNA.
- (4) B-form DNA is the common secondary structure of DNA in wet condition.

5. Following descriptions about amino acids, which one is true?

- (1) Tyrosine is the only aromatic amino acid.
- (2) Serine is the only amino acid with hydroxyl group in side chain.
- (3) Cysteine is the only amino acid with thiol group.
- (4) Proline is the only amino acid with cyclic aliphatic side chain.

6. Which one is not immunological method generally used in biochemical researches?

- (1) ELISA
- (2) western blot

(背面仍有題目,請繼續作答)

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- (3) Affinity chromatography which recognizes His-tag in recombinant proteins
(4) Immunoprecipitation
7. Following descriptions about enzymes, which one is **not** true?
(1) Lyases are enzymes catalyzing hydrolytic cleavages.
(2) Isomerases catalyze intramolecular rearrangement.
(3) Transferases catalyze transfer of molecular groups from one molecular to another.
(4) Protein kinase is a kind of transferases.
8. Which enzyme **doesn't** involve in TCA cycle?
(1) Citrate synthase
(2) Fumarase
(3) Acotinase
(4) Malic enzyme
9. Following descriptions about pentose phosphate pathway, which one is **not** true?
(1) Can generate NADPH for reductive biosynthesis.
(2) Can provide ribose-5 phosphate for nucleic acid synthesis.
(3) Produce CO₂.
(4) With hexokinase reaction.
10. 5-phospho- α -D-ribosyl-1-pyrophosphate (PRPP) involves in biosynthesis of metabolites **except**
(1) Tryptophan
(2) Histidine
(3) GMP
(4) Glutamate
11. Following descriptions about glycolysis, which one is **not** true?
(1) The hexokinase is the key enzyme which converts glucose into glucose-6-phosphate.
(2) Generate 2 ATP molecules.
(3) Convert 1 glucose to 2 pyruvates.
(4) Must occur under aerobic condition.
12. Following descriptions about functions of coenymes, which one is **not** true?
(1) FAD participates in oxidation-reduction.

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- (2) CoA involves in acyl-transfer.
- (3) Biotin involves in transamination.
- (4) Thiamine pyrophosphate participates in pyruvate decarboxylase reaction.

13. Following descriptions of 3-D structure of proteins, which one is **not** true?

- (1) α -helix and β -sheet are two most important secondary structures of proteins.
- (2) The formation of disulfide bonds is important for stabilizing the 3-D structure.
- (3) The local regular folding of a polypeptide chain is called quaternary structure.
- (4) The adequate formation of quaternary or tertiary structure is important for catalytic activity of an enzyme.

14. Following techniques which one is **not** commonly used in protein analysis?

- (1) SDS-PAGE
- (2) 2D-gel electrophoresis
- (3) Capillary electrophoresis
- (4) Thin-layer chromatography

15. Following amino acid which one is **not** a commonly post translational modification site of a protein?

- (1) Asn
- (2) Ser
- (3) Tyr
- (4) Ala

簡答題：(Short Essay) 共 8 題，40 分

1. What's the differences between native & SDS-PAGE?
2. Explain how palmitic acid synthesizes from acetyl-CoA and Malonyl-CoA.
3. What's fermentation (in biochemical point of view)?
4. Penicillin is more effective against fast-growing bacteria than slow-growing ones. Explain why.
5. Briefly describe the principle of 2D-gel electrophoresis.
6. How can you determine the GC content and molecular weight (or base pair number) of genomic DNA purified from an unknown bacterium?
7. Please describe the possible functions of phospholipids.
8. It is said that the supplement of *N*-acetyl glucosamine can prevent degenerative arthritis (退化性關節炎). Explain why.

(背面仍有題目,請繼續作答)

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問答題：(Essay)，15 分

The steady-state kinetics of an enzyme are studied in the absence and presence of an inhibitor (inhibitor A). The initial rate is given as a function of substrate concentration in the table below.

[S] (mmol L ⁻¹)	V (mmol L ⁻¹ min ⁻¹)	
	No inhibitor	Inhibitor A
1.25	1.72	0.98
1.67	2.05	1.17
2.50	2.58	1.47
5.00	3.45	1.96
10.00	4.15	2.38

- (a) What kind of inhibition (competitive, noncompetitive, uncompetitive) is involved? (5%)
(b) Determine V_{\max} (5%) and K_M (5%) in the absence and presence of inhibitor.