

國立中央大學104學年度碩士班考試入學試題

所別：生命科學系碩士班 分子與環境生物學組(一般生)
生命科學系碩士班 分子與環境生物學組(在職生)

科目：生物化學I(含代謝)

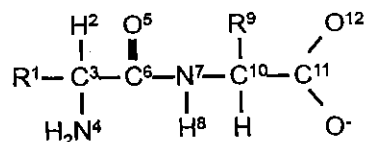
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本科考試禁用計算器

*請在答案卷(卡)內作答

I. 單選題 (每題 3 分)

1. The following figure is a peptide bond between two amino acids, which are in a *trans* configuration. Which atoms lie in a plane?



- I. 1, 2, 3, 4, 6
 II. 3, 5, 6, 7, 8
 III. 5, 6, 7, 8, 10
 (A) I (B) II (C) I & II (D) II & III (E) I, II, III
2. Which of the following amino acid in a protein **cannot** be glycosylated?
 (A) Arginine (B) Threonine (C) Tryptophan (D) Tyrosine (E) Asparagine
3. Which of the following reaction is the first substrate-level phosphorylation for the formation of ATP in glycolysis?
 (A) fructose 1,6-bisphosphate → glyceraldehyde 3-phosphate + dihydroxyacetone phosphate
 (B) glyceraldehyde 3-phosphate → 1,3-bisphosphoglycerate
 (C) 1,3-bisphosphoglycerate → 3-phosphoglycerate
 (D) 3-phosphoglycerate → 2-phosphoglycerate
 (E) phosphoenolpyruvate → pyruvate
4. Which of the following TCA cycle enzyme catalyzes a substrate-level phosphorylation?
 (A) citrate synthase (B) Isocitrate dehydrogenase (C) α-ketoglutarate dehydrogenase
 (D) succinate dehydrogenase (E) succinyl-CoA synthetase
5. Which of the following coenzymes is **not** required in the action of pyruvate dehydrogenase complex?
 (A) ascorbic acid (B) NAD⁺ (C) thiamine pyrophosphate (D) lipoate (E) FAD
6. Which of the following mineral nutrient is directly involved in light absorption during light reaction of photosynthesis?
 (A) Ca²⁺ (B) Mn²⁺ (C) Cu²⁺ (D) Mg²⁺ (E) Fe²⁺
7. The glyoxylate cycle is found in plants but not in animals. The lack of this cycle in animals results in **inability** to
 (A) synthesize oxaloacetate from isocitrate.
 (B) synthesize glutamate from malate.
 (C) perform gluconeogenesis from amino acids.
 (D) perform gluconeogenesis from fatty acids.
 (E) perform CO₂ fixation via the reverse citric acid cycle.
8. Free glucuronic acid in humans may be metabolized
 (A) to glucose and then to glucose 6-phosphate.
 (B) to glycerate and glycerol.
 (C) to diketo-L-gulonate and excreted.
 (D) to myoinositol and then involve in signal transduction pathways.
 (E) to D-xylulose 5-phosphate and then enter the pentose phosphate pathway.
9. The reason why C4 plants can fix relatively more carbon than C3 plants when oxygen concentration near the mesophyll cells is high is that
 (A) the plants do not have RuBP (Ribulose 1,5-bisphosphate) carboxylase.
 (B) they have RuBP carboxylase.
 (C) they utilize a process called photorespiration when oxygen concentration is high.
 (D) the initial CO₂-fixing enzyme uses CO₂ but not O₂ as a substrate.

參考用

注意：背面有試題

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參考用

(E) carbon enters the Calvin cycle directly from the air.

10. Rubisco catalyzes the carboxylation and also the oxygenation of RuBP. The initial products of these reactions include

which of the following?

- (A) Glyceraldehyde 3-phosphate
- (B) 2-phosphoglycolate
- (C) 3-phosphoglycerate
- (D) Glyceraldehyde 3-phosphate & 2-phosphoglycolate
- (E) 2-phosphoglycolate & 3-phosphoglycerate

11. Which of the following enzyme is unique to gluconogenesis in plants?

- (A) glyceraldehyde 3-phosphate dehydrogenase
- (B) phosphoglycerate kinase
- (C) fructose 1, 6-bisphosphate
- (D) PPI-dependent phosphofructokinase
- (E) ATP-dependent phosphofructokinase

12. Which of the following is not involved in the regulation of enzyme activity?

- (A) Covalent modification of enzymes.
- (B) Feedback inhibition/activation of metabolic pathways.
- (C) Interconversion of metabolites such as pyruvate and lactate
- (D) Subunit-subunit interaction of enzymes
- (E) Phosphorylation of enzymes

13. Complete β -oxidation of palmitoyl CoA can produce how many molecules of ATP? Assume 3 molecules for each NADH/H⁺ produced and 2 molecules for each FADH₂

- (A) 61 (B) 86 (C) 96 (D) 102 (E) 131

14. Which of the following fatty acid is essential and serves as a precursor of arachidonic acid in mammals?

- (A) Acetic acid (B) Linoleic acid (C) Oleic acid (D) Palmitoleic acid (E) Stearic acid

15. Which of the following is closest to the pH values of a solution containing 5 mM/L of H⁺ ions?

- (A) 2.3 (B) 3.1 (C) 5.1 (D) 7.5 (E) 8.3

II. 單選題 (每題 3 分)

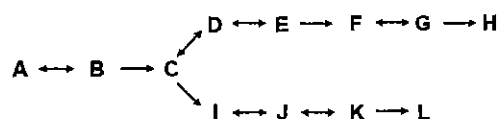
※For questions 1~2 match the term with the appropriate answer.

- (A) Aspartate
- (B) Glutamine
- (C) Glycine
- (D) Serine
- (E) Tryptophan

1. The amino acid contributes two-third of the ring structure of cytidine.

2. The amino acid provides the γ -nitrogen for asparagine biosynthesis.

※For questions 3~4 find the appropriate answer based on the following figure, a schematic representation of a mock metabolic pathway.



3. Under cellular conditions where the concentration of H is in excess of needs, which reaction is most likely going to be inhibited by a feedback allosteric mechanism?

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(A) B to C (B) C to D (C) D to E (D) E to F (E) F to G

4. If the concentrations of both H and L are in excess, which reaction is most likely going to be inhibited by a feedback allosteric mechanism?

(A) A to B (B) B to C (C) D to E (D) E to F (E) C to I

※For questions 5~6 match the term with the appropriate answer.

(A) Complex I

(B) Complex II

(C) Complex III

(D) Complex IV

(E) Ubiquinone

5. The component of the electron transport chain of mitochondria **cannot** pump electron out of mitochondrial matrix

6. The key component of the electron transport chain of mitochondria is inhibited by potassium cyanide.

※Questions 7~8 refer to the following enzymes.

(A) Catalase

(B) Aconitase

(C) Allantoinase

(D) Arginase

(E) Asparaginase

7. A mammalian peroxisomal enzyme

8. An enzyme of purine nucleotide catabolism

※Questions 9~10 refer to the following inhibitors.

(A) Azetidine

(B) 2,4-dinitrophenol

(C) Cycloheximide

(D) Puromycin

(E) Tunicamycin

9. An inhibitor can interfere with the translocation step in protein synthesis

10. An inhibitor for ATP synthesis

III 簡答題 (每題 5 分)

Please describe and compare the following terms

1. Lectin & Selectin

2. Fructose-2,6-bisphosphate & Phosphofructokinase

3. Antenna complex & Photosystem

4. Heme & Chlorophyll

5. Organelle genome & Nuclear Genome

參考用