



國立臺灣海洋大學一〇〇學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目： 生物化學(二)

系所名稱： 生物科技研究所碩士班甲組

1. 答案以橫式由左至右書寫。2. 請依題號順序作答。

一. 共 25 分，選擇題第 1 至 10 題每題 2 分，第 11 題 5 分

1. The binding of hormone to G-protein coupled receptor stimulates the sequence:

- A. binding of  $G_{\alpha}$  (GTP) activates adenylyl cyclase
- B.  $G_{\alpha}$ (GTP) dissociates and re-associates with  $G_{\beta\gamma}$
- C. rapid exchange of GDP for GTP on  $G_{\alpha}$
- D. GTPase of  $G_{\alpha}$  hydrolyzes GTP to GDP
- E.  $G_{\alpha}$  dissociates from  $G_{\beta\gamma}$

- a. B, C, A, D, E
- b. C, E, A, D, B
- c. C, E, B, D, A
- d. D, A, C, E, B
- e. E, A, D, B, C

2. Protein synthesis in bacterial cells usually starts with a:

- a. methionine residue.
- b. formylmethionine residue.
- c. cysteine residue.
- d. valine residue.
- e. phenylalanine residue.

3. The central domain of the \_\_\_\_\_ S ribosomal subunit serves as the decoding center and is composed only of \_\_\_\_\_ S rRNA.

- a. 30; 16
- b. 30; 5
- c. 50; 23
- d. 50; 5
- e. none are true

4. Enzymes that acetylate the  $\epsilon$ -amino group of lysine in the histidine tails are called \_\_\_\_\_ and are involved in \_\_\_\_\_.

- a. histone deacetylases; restoring chromatin to a repressed state
- b. histone acetyltransferases (HATs); initial events in transcriptional activation
- c. histone activases; formation of the de-repression complex
- d. Schiff base formation; promoting the formation of closed complexes
- e. none of the above

5. The DNA-binding proteins that recognize and accurately initiate transcription at specific eukaryotic promoter sequences are called:

- a. Enhancers.
- b. transcription factors.
- c. response elements.
- d. chromatin-remodeling complexes.
- e. all are true.

6. RNA polymerase II:

- a. is located in the nucleolus and transcribes the major ribosomal RNA genes.
- b. is located in the nucleoplasm and transcribes the protein-encoding genes through mRNAs.
- c. transcribes the 5S RNA genes.
- d. transcribes RNA genes associated with tRNA processing.
- e. transcribes tRNA genes and protein transport genes.

7. Prions are defined as:

- a. ions with an inappropriate number of protons.
- b. ions about to form.
- c. ionic proteins that bind DNA.
- d. proteinaceous infectious particles.
- e. particle ions that bind proteins.

8. AZT (3'-azido-2',3'-dideoxythymidine) is a drug that gets incorporated into growing viral DNA and blocks the activity of:

- a. DNA ligase.
- b. DNA polymerase  $\beta$  (beta).
- c. DNA polymerase  $\alpha$  (alpha).
- d. reverse transcriptase.
- e. none of the above.

9. An RNA-dependent DNA polymerase that carries the RNA template with it to synthesize repeats at the 3'-ends of chromosomes is called:

- a. DNA ligase.
- b. telomerase.
- c. DNA polymerase  $\gamma$  (gamma).
- d. topoisomerase.
- e. DNA polymerase  $\beta$  (beta).

10. Enzymes that catalyze the unwinding of DNA double helix are:

- a. topoisomerases.
- b. helicases.
- c. ligases.
- d. gyrases .
- e. polymerases.

11. What is the Shine-dalgarno sequence? What does it do? (5 分)

二. 共 25 分，1 至 5 題每題 2 分，第 6 題 10 分，第 7 題 5 分

1. All are regulatory mechanisms of HMG-CoA reductase EXCEPT:

- a. low [cholesterol] increases mRNA for HMG-CoA reductase
- b. high [cholesterol] increases half-life for HMG-CoA reductase
- c. high [cholesterol] results in lower mRNA for HMG-CoA reductase
- d. phosphorylation by cAMP cascade inactivates HMG-CoA reductase
- e. phosphatases activate HMG-CoA reductase

2. The energy metabolism of the brain is characterized by all the following except

- a. it has no significant energy reserves
- b. its preferred energy source is fatty acids
- c. it exports no fuels
- d. the level of O<sub>2</sub> consumption is independent of mental activity.

3. Fatty acids are released from adipocytes when:

- a. insulin levels are high
- b. glycerol-3-phosphate levels are high
- c. adipose ATP levels are high
- d. blood glucose levels are low
- e. none are true

4. Which of these is able to cross the inner mitochondrial membrane?

- a. Acetyl-CoA
- b. Fatty acyl-carnitine
- c. Fatty acyl-CoA
- d. Malonyl-CoA
- e. None of the above can cross.

5. The rate-limiting step in fatty acid synthesis is:

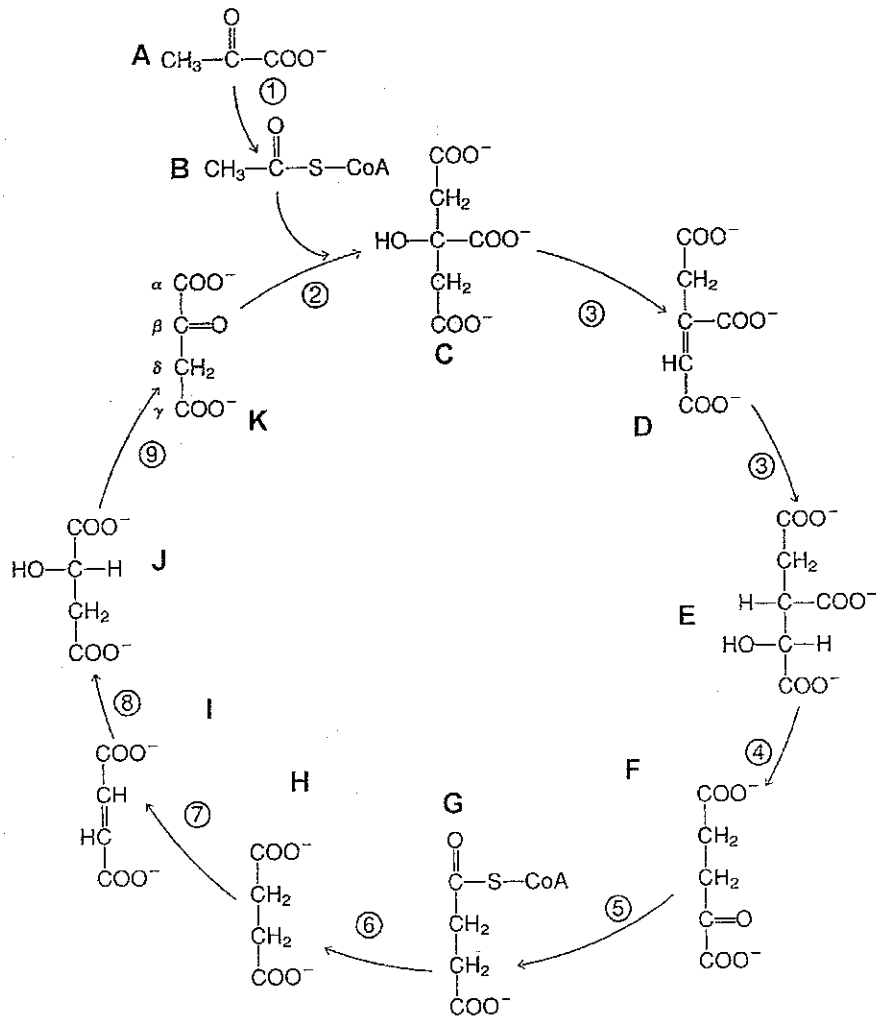
- a. condensation of acetyl-CoA and malonyl-CoA.
- b. formation of acetyl-CoA from acetate.
- c. formation of malonyl-CoA from malonate and coenzyme A.
- d. the reaction catalyzed by acetyl-CoA carboxylase.
- e. the reduction of the acetoacetyl group to a  $\beta$ -hydroxybutyryl group.

6. Describe Steps of beta-oxidation (The four steps are repeated) (10 分)

7. Describe synthesis of 5-Phosphoribosyl-1-pyrophosphate (PRPP) and the first step in purine biosynthesis. (from ribose 5-phosphate to 5-phosphoribosylamine) (5 分)

三. 簡答題共 25 分

1. The following figure represents Citric acid cycle (25 分)



- Name the intermediates: E; G; I; K (7 分)
- Which reactions in the above figure are catalyzed by dehydrogenases? Write down the number and the name of the enzyme. (6 分)
- Which of the reactions require an FAD cofactor? Name the enzymes. (6 分)
- Indicate the decarboxylation reactions and name the enzymes. (6 分)

四.簡答題 (請用中文作答) 共 25 分

- Although sequence comparisons can be made either between two DNA sequences or between two protein sequences, it is usual, wherever possible, to use amino acid sequences in comparisons. Can you explain why? (10 分)
- From a thermodynamic and kinetic perspective, what are the three types of membrane transport processes? (10 分)
- Can you think of any circumstances in which a functioning gene would not show a pattern of codon usage typical of that of the organism from which the DNA was cloned? (5 分)