系所組別：藥理學研究所

考試科目：生物化學 考試日期：0223，節次：1

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Part I：50%

A. Chose one of the best answers in the following questions: (3% each)

1. In de novo cholesterol biosynthesis, which of the following enzyme determines the rate of cholesterol synthesis?

A) acetyl-CoA thiolase;
B) HMG-CoA synthease;
C) Squalene synthase;
D) Squalene monooxygenase;
E) HMG-CoA reductase.

2. The regulation of the activity of this "enzyme" described in the previous question 1 is under what kinds of mechanism?

A) The amount of cellular cholesterol regulates the transcriptional activity of SREBP and promotes the transcription of this enzyme;
B) phosphorylation/dephosphorylation of this enzyme modulates its activity;
C) An increase in insulin and thyroxine favors upregulation of its expression while glucagon and glucocorticoids have the opposite effect;
D) The statin drugs reversibly inhibit the enzymatic activity of this protein;
E) All are correct.

3. Gout (痛風) is caused by the disposition of uric acid crystals in the joints. Which of the following metabolic pathways causes overproduction of uric acid?

A) De novo pyrimidine biosynthesis;
B) De novo purine biosynthesis ;
C) Purine degradation ;
D) Pyrimidine degradation ;
E) Purine salvage.

4. Raw egg white (生蛋白) contains a glycoprotein, avidin, which might tightly bind the following one of the vitamines and causes its deficiency in the body:

A) Vitamin A;
B) Vitamin B;
C) Vitamin C
D) Biotin;
E) Pantothenic acid.

（背面仍有題目，請繼續作答）

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5. Mitochondria are the organelles for ATP generation in the cells. Which of the following cells did not have mitochondria?
A) epithelial cells;
B) erythrocytes;
C) lymphocytes;
D) hepatocytes
E) fibroblasts.

6. A teenager, concerned about his or her weight, attempts to maintain a fat-free diet for a period of several weeks. If his or her ability to synthesize various lipids were examined, he or she would be found to be most deficient in the ability to synthesize:
A) prostaglandins;
B) cholesterol;
C) glycolipids;
D) phospholipids;
E) triacylglycerol.

7. A small molecule that decreases the activity of an enzyme by binding to a non-catalytic site is called a(n):
A) competitive inhibitor;
B) irreversible inhibitor;
C) allosteric inhibitor;
D) transition-state analogue;
E) None.

B. Please briefly answer the following question:

1. Describe DNA, RNA, and chromosome and compare their relationship. (9%)

2. Please describe the following terms: (5% each)
A) rRNA, tRNA, and mRNA;
B) siRNA and RNAi;
C) lagging strand DNA synthesis and leading strand DNA synthesis;
D) Frame-shift mutation;

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Part II：50%

A. Short answer questions：Total 35 points

1. Please describe both the functions and the biochemical reactions of the following processes (together with diagrams):

A. Pyruvate dehydrogenase (PDH) reaction (2.5 points)

B. Tricarboxylic acid cycle (TCA cycle) (2.5 points)

2. What are the functions of the following enzymes?

A. Ligase (2.5 points)

B. Transferase (2.5 points)

C. Hydrolase (2.5 points)

D. Oxidoreductase (2.5 points)

3. Please define the following terms in respect to enzyme function regulations:

A. Allosteric regulation (2.5 points)

B. Competitive inhibition (2.5 points)

C. Noncompetitive inhibition (2.5 points)

D. Coenzyme (2.5 points)

4. There are several types of receptors present on the cell surface. Please describe the following types of receptors in details and give one example of each receptor type.

A. Enzyme-linked receptors (2.5 points)

B. Ligand-gated ion channel receptors (2.5 points)

C. Cytokine receptors (2.5 points)

D. G-protein-coupled receptors (2.5 points)

B. Essay：Total 15 points

1. Please describe the process of protein synthesis in details including transcription, post-transcriptional modifications, and translation. In addition, please give examples on how abnormal or incapable of carrying out post-transcriptional modifications will affect the process of protein synthesis. (15 points)