※ 考生請注意：本試題不可使用計算機

請勿在本試題紙上作答，否則不予計分

Section I. Single Choice (30%)

Choose the best answer in each question

1. During DNA replication, one short and newly synthesized DNA fragment will be first formed on the lagging template strand is:
   (A) Okazaki fragments
   (B) Randam primer
   (C) Suzuki fragment
   (D) Leading strand
   (E) Lagging strand

2. Which of the following element helps bacteria to recruit ribosomes onto mRNA to initiate translation by aligning it with the start codon?
   (A) Shine-Dalgarno sequence
   (B) Kozak sequence
   (C) TATA box
   (D) CCAAT element
   (E) Okazaki fragments

3. Which of the following element is not the basic composition of amino acid?
   (A) carbon
   (B) hydrogen
   (C) oxygen
   (D) nitrogen
   (E) potassium

4. Amino acids consists of amine (-NH2) and carboxylic acid (-COOH), and side-chain specific functional groups. Which amino acid whose side-group links to the α-amino group and thus lacks a primary amino group? / Which amino acid does not have a chiral carbon atom adjacent to the carboxyl group?
   (A) Histidine / Alanine
   (B) Tyrosine / Valine
   (C) Proline / Glycine
   (D) Histidine / Glycine
   (E) Proline / Alanine

(背面仍有題目,請繼續作答)

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5. Which immunoglobulin is first produced in the primary immune response? / Which immunoglobulin plays a pivotal role in allergic response?

(A) IgG / IgA
(B) IgM / IgE
(C) IgD / IgG
(D) IgM / IgG
(E) IgA / IgG

6. The total body iron content of an adult ranges from 3 to 4 grams. In addition to supply iron from dairy foods, iron can also be recycled from:

(A) Monocytes
(B) Lymphocytes
(C) Erythrocytes
(D) Dendritic cells
(E) Epithelial cells

7. Glycolysis is a metabolic pathway to generate ATP as fuel for cellular activity. In aerobic conditions, glucose is converted into two molecules of pyruvate, oxidized into two molecules of acetyl-CoA, and subsequently enter the TCA cycle. In aerobic condition, how many ATP will be finally generated from one molecule of glucose.

(A) 6 ATP
(B) 12 ATP
(C) 24 ATP
(D) 30 ATP
(E) 38 ATP

8. Continue question 5. In aerobic condition, how many ATP will be generated from one molecule of glucose in electron transport chain (ETC).

(A) 6 ATP
(B) 12 ATP
(C) 24 ATP
(D) 30 ATP
(E) 38 ATP

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9. Hemophilia A is an X-linked, recessive disorder caused by a deficiency in the activity of coagulation factor VIII. For a female, her mother is a carrier of hemophilia and her father's genotype is normal. If the female is married to a normal man, what percentage of her sons/daughters will have the phenotype of hemophilia?
(A) sons:daughters=50%: 0%
(B) sons:daughters=50%: 50%
(C) sons:daughters=0%: 50%
(D) sons:daughters=100%: 0%
(E) sons:daughters=100%: 50%

10. Which of the following technique is suitable to separate different proteins by differences in their mean pKa?
(A) Gel-filtration chromatography
(B) X-ray diffraction
(C) Affinity chromatography
(D) Isoelectric focusing
(E) SDS-PAGE

Section II. (70%)

1. Please explain the Wobble hypothesis proposed by Francis Crick. (5 points)

2. You will be a scientist soon. How will you design a series of experiments to prove that protein A is an upstream regulator to up-regulate the expression of protein B? (15 points)

3. Please explain the convergent evolution and give an example. (5 points)

4. Please explain "post-translational modification" and possible function. Try to list 3 kinds of post-translational modifications at least. (10 points)

5. Please draw the structure of acidic and basic amino acids (15 points)

6. Please describe the primary, secondary, tertiary, and quaternary structures of proteins. (10 points)

7. Please explain briefly the following terms: (10 points)
(1) Non-sense mutation (2) Silence mutation
(3) Missense mutation (4) Frameshift mutation