簡答下列問題，每題十分，所有考題務必在答案卷上作答。

1. Briefly describe the following terms.
   a. Aromatic amino acid
   b. Starch
   c. Hyaluronic acid
   d. Cholesterol
   c. Polymerase chain reaction

2. Describe the primary, secondary, and tertiary structure of a protein. List two experimental techniques that are commonly used for determining the three-dimensional structure of proteins.

3. Describe the basic principles how it is possible to identify proteins by mass spectrometry.

4. A biochemist obtains the following set of data for an enzyme that is known to follow Michaelis-Menten kinetics.

Substrate concentration [S] (M)	Initial velocity V_0 (μM/min)
2.5×10^{6}	84
4.0×10^{6}	120
1×10^{5}	210
2×10^{5}	285
4×10^{5}	336
1×10^{4}	384
2×10^{3}	419
1×10^{2}	420

Estimate the *V*max and *K*m of the enzyme-catalyzed reaction and explain how you determined these two values.

(背面仍有題目,請繼續作答)

5. (A) Rank a series of 18-carbon fatty acids: stearic acid (18:0), oleic acid (18:1), α-linoleic acid (18:2), and linolenic acid (18:3) in order of increasing melting point. (B) Provide a molecular explanation for the trend of these 18-carbon fatty acids can be correlated with the melting point. (C) Draw all the possible triacylglycerols that can be constructed from glycerol, palmitic acid (16:0), and oleic acid. Rank them in order of increasing melting point

6. In humans, the oxidation of fats is quantitatively more important than the oxidation of glucose as a source of ATP. Briefly describe how the oxidation of fatty acids is coupled to ATP formation.

7. What are the major differences in the synthesis and structure of prokaryotic and eukaryotic mRNAs?

8. What gene is unique to retroviruses? Why is the protein encoded by this gene absolutely necessary for maintaining the retroviral life cycle, but not that of other viruses? This protein plays essential roles in molecular cloning. What is the application?

9. Describe the structure and components of a nucleosome and how modification of histone tails can control chromatin condensation.

10. DNA-repair systems are responsible for maintaining genomic fidelity in normal cells. As previous known, UV irradiation causes thymine-thymine dimers. These are usually repaired by the nucleotide excision repair system. Ionizing radiation causes double-stranded breaks in DNA. These breaks are repaired by homologous recombination or DNA end-joining. Briefly describe the nucleotide excision repair system and homologous recombination repair system. Postulate why a loss of function in one or more DNA-repair systems typifies many cancers.