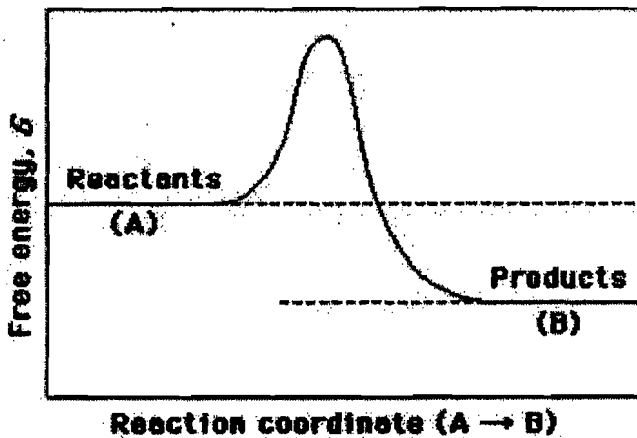**1.**

Reaction coordinate (A → B)

On the reaction (反應)coordinate diagram (座標圖) shown above: (10%)

a) label (標明) the "transition state" and the "overall free-energy change" for the uncatalyzed reaction A → B　　3%

b) Is this an exergonic (釋出能的) or endergonic (吸能的) reaction? 3%

c) Draw (繪製) a second curve (曲線) showing the energetics of the reaction if it were enzyme-catalyzed (催化).　4%

2. Define (解釋) the secondary (2°) structure of a protein (10%)

3. Describe (敘述) the concept of "induced fit" in ligand-protein binding (10%)

4. For a reaction that can take place (發生) with or without catalysis by an enzyme, what would be the effect (作用，影響) of the enzyme on the: (10%)
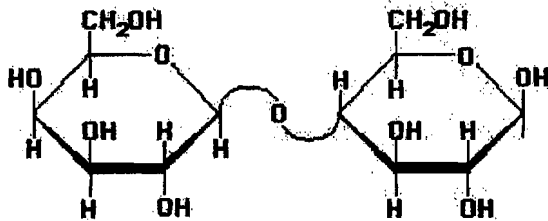
(a) standard free energy change of the reaction? 2%

(b) activation energy of the reaction? 2%

(c) initial velocity of the reaction? 3%

(d) equilibrium constant of the reaction? 3%

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5. A fragment of DNA is sequenced by Sanger's method: (10%)
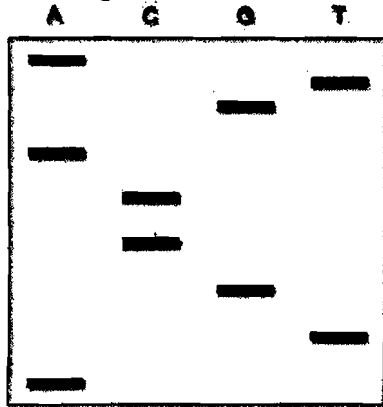
Please write out the complete sequence (序列) of this DNA fragment (5' → 3')

6. In the following (下述的) structure: (10%)

(a) How many of the monosaccharide units are <u>furanoses</u> and how may are <u>pyranoses</u>? 3%
(b) What is the <u>linkage</u> between the two monosaccharide units? 3%
(c) Is this a reducing sugar? 4%

7. A biochemist obtains (得到) the following set of data for an enzyme that is known to follow (依循) Michaelis-Menten kinetics. (10%)

Substrate (基質) Initial(開始的) concentration (mM)	velocity (mmol/min)
1	49
2	96
8	349
50	621
100	676
1,000	698
5,000	699

(A) V_{max} for the enzyme is _____ 5%
(B) K_m for the enzyme is _____ 5%

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8. The composition (成分) of *one* of the strands of a double-helical DNA is: (10%)

     [A] = 30%, and [G] = 24%

     Calculate (計算) the following (下述的)

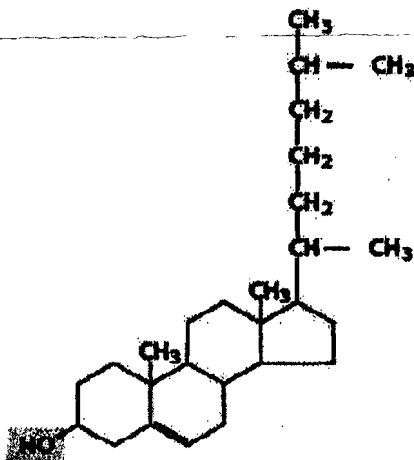   If impossible (無法) to calculate, write "Impossible"

For the *same* strand:

a) [T] = _____ 1%

b) [C] = _____ 1%

c) [T] + [C] = _____ 1%

For the *other* strand:

d) [A] = _____ 1%

e) [T] = _____ 1%

f) [A] + [T] = _____ 1%

g) [G] = _____ 1%

h) [C] = _____ 1%

i) [G] + [C] = _____ 2%

9. (10%)

a) What kind of macromolecule is this? (protein, carbohydrate, nucleic acid, or lipid?) 3%

b) What is the name of this macromolecule? 3%

c) Which kind of food would you find high amount (量) of this molecule? 4%

10. What is isoelectric point (pI)? A protein (pI = 8) in a solution with pH = 6 has net negative or positive charge? (10%)