

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

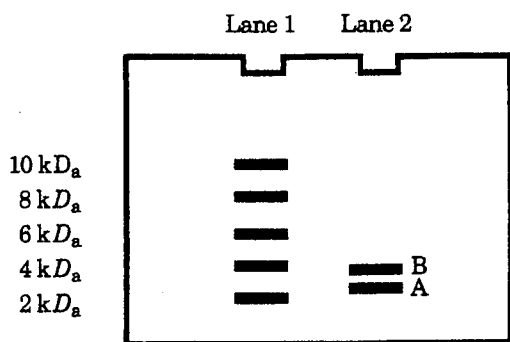
考試日期：0301，節次：2

※ 請務必在答案卷上作答並清楚地註明題號

1. A mixture contains three dipeptides: Glu-Glu, Ala-Lys, and Lys-Lys. Can these three peptides be readily separated from one another on a cation exchange column at pH 1.0? pH 7.0? and pH 14? Explain. (10%)

2. Although gel electrophoresis allows researchers to identify specific protein bands on a gel and provides approximate molecular weights for proteins, it does not provide any information about amino acid sequence. Sequence information is extremely valuable in that can be used to predict protein structure and function. Assume you have isolated a relatively abundant protein, and you want to obtain the amino acid sequence. You perform the following experiments:

a). Addition of dithiothreitol to the protein sample followed by gel electrophoresis results in the protein gel shown below. What can you conclude? (5%)



Lane 1 contains molecular weight markers as indicated to the left of the figure.

Lane 2 contains the DTT-treated, purified protein.

b). Cleavage with chymotrypsin produces the following fragments:

Band A Three fragments: CN, NLQNY, and GIVEQCCHKRCSEY

Band B Two free amino acids and three fragments: F, Y, DPTKM, IACGVRGF, and RTTGHLGKDLVNALY

Cleavage with *Staphylococcus aureus* V8 protease produces the following fragments:

Band A Three fragments: GIVE, YNLQNYCN, and QCCHKRCSE

Band B Three fragments: PTKM, RTTGHLGKGD, and LVNALYIACGVRGFFYD

What is the amino acid sequence of your isolated protein? (5%)

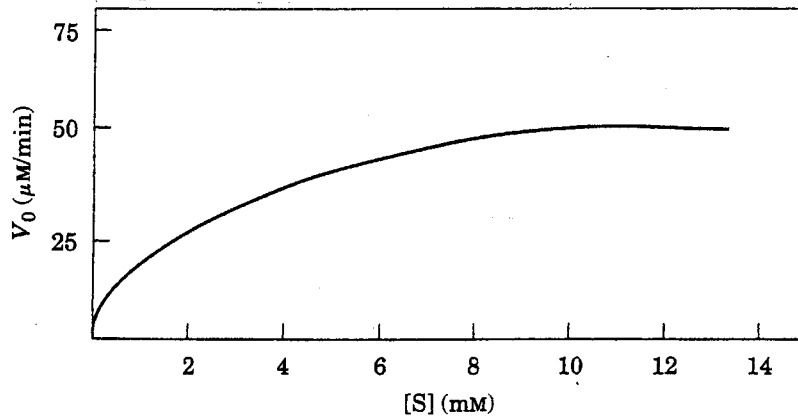
3. How would you generate DNA probe if you have isolated an uncharacterized protein and you want to find out which cells and/or tissues actually express this protein. (10%)

(背面仍有題目,請繼續作答)

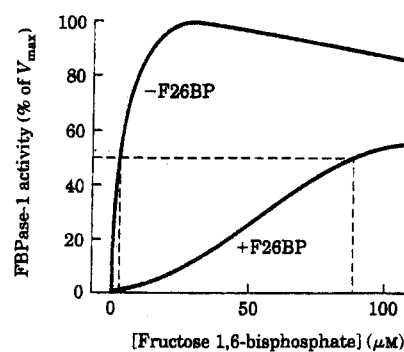
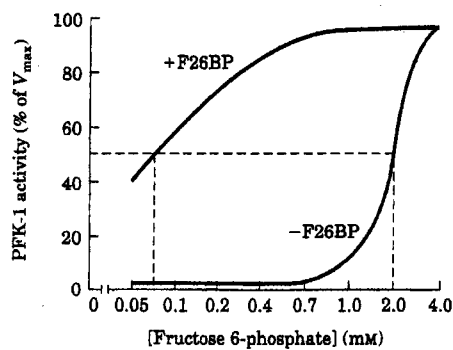
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4. Describe the major differences between domains and motifs. (8%)
5. You wish to characterize a new enzyme that you have isolated. You set up a series of test tubes, each containing 0.1 μM enzyme and various substrate concentrations. You measure the activity of the enzyme in each tube and plot the enzyme activity (V_0) vs. $[S]$. The plot is shown below.



- a). What is the V_{max} for your enzyme with this substrate? (3%)
- b). What is the K_m of your enzyme for this substrate? (3%)
- c). What is the k_{cat} (turnover number) for your enzyme? (3%)
- d). Why does your plot eventually plateau? (3%)
6. Following figures show the respective activity of PFK-1 and FBPase-1 with (+) and without (-) the presence of fructose 2,6-bisphosphate (F26BP). What conclusion can you make? (10%)



7. Calculate the amount of metabolic energy produced from 1 mole of glucose under aerobic condition? (10%)
8. Describe the flow of electrons and protons through the four complexes of the respiratory chain. (10%)

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9. Which two hormones affect the activity of acetyl-CoA carboxylase in fatty acid biosynthesis? Why does this make physiological sense? (10%)
10. Figure shown below shows the comparison of the kinetic properties of hexokinase IV (glucokinase) and hexokinase I. Explain, in terms of enzyme kinetics, why glucokinase is responsible for channeling glucose into the glycogen synthesis pathway in the liver, and why hexokinase I (an isozyme of glucokinase) regulates the entry of glucose into the glycolytic pathway in muscle. (10%)

