國立成功大學 104 學年度碩士班招生考試試題

系所組別：口腔醫學研究所甲組

考試科目：生物化學

考試日期：0212，節次：3

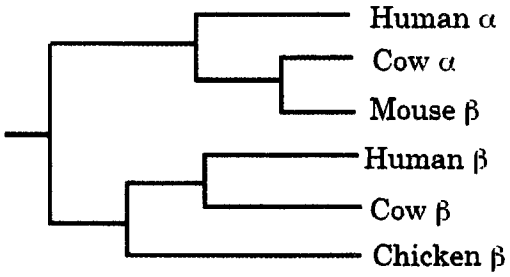
※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、是非題 (24 points)

1. Write "T" or "F" in the blanks below to indicate which statements concerning protein evolution are true or false.

1)____ Because human ß-globin and human α-globin proteins both come from the same organism they must be more similar to each other than either is to ß-globin from sheep.

2)____ The following tree could be consistent with what we know of evolution of globin proteins.



2. Write "T" or "F" in the blanks below to indicate which statements concerning human hemoglobin (Hb) and myoglobin (Mb) are true or false. Assume that all solutions containing Hb also contain an equimolar concentration of 2,3-bisphosphoglycerate (BPG).

1)____ If a solution of Hb in equilibrium with air is diluted with and equal volume of a similar solution without hemoglobin, the fraction saturation of the hemoglobin will decrease. (Θ is independent of [Hb])

2)____ If the pCO_2 in a solution of Hb is decreased from 50 to 20 mm Hg, the oxygen saturation of the hemoglobin will increase.

3)____ In a solution containing Hb and Mb and a fixed total amount of O_2, in which the Hb is initially 30% oxygenated, the introduction of additional BPG would cause a transfer of some O_2 from Hb to Mb.

4)____ In a solution of fetal Hb and adult Hb and a fixed total amount of O_2, in which the adult Hb is initially 30% oxygenated, the introduction of additional BPG would cause a transfer of some O_2 from fetal Hb to adult Hb.

5)____ An increase in the partial pressure of CO_2 in a tube containing Hb that is 30% saturated with O_2 will increase the fraction of Hb that is protonated.

6)____ His146(ß) participates in a salt bridge only in the deoxygenated form of adult Hb. An increase in P_{O_2} over a solution of adult Hb initially at 30% saturation will lead to an increase in the pK_a of this histidine.

(背後仍有題目，請繼續做答)

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二、填入適當答案 (15 points)

In each blank, write the name of a weak interaction that would be likely to occur between the side chains of the two amino acids listed next to the blank (assume an aqueous solution under physiological conditions).

1) _____ Ser and Thr

2) _____ R and D

3) _____ Asparagine and Glutamine

4) _____ Met and L

5) _____ F and W

三、回答下列問題 (61points)

1. Concerning HPLC, please answer the following questions.

1) (4 points) How is the resolution of a column defined?

2) (3 points) HPLC profile

Two proteins, protein A with a partitioning coefficient of 4 (p_1=1/5, q_1=4/5) and protein B with a partitioning coefficient of 3 (p_2=1/4, q_2=3/4) are loaded onto a reverse phase HPLC column. (p is the fraction that stays in the organic solvent. q is the fraction that stays in the aqueous phase.) Which protein will traverse the column faster and exit the column first?

2. (16 points) For each part of this question identify all amino acids being described (from among those normally occurring in proteins) by:

a) giving the one and three letter codes that are used to designate it (them) (note: each question may have more than one correct answer, please give them all) and;

b) drawing the full structure (of **one** correct answer) in the form that would predominate at **pH 14**.

1) An amino acid which is a structural isomer of another amino acid.

2) An amino acid which can absorb ultraviolet light and which has a side chain which can ionize at physiological pH.

3) An amino acid which is commonly the first amino acid in newly synthesized eukaryotic proteins.

4) The most basic of the 20 common amino acids (i. e. its side chain has the highest pK_a value).

3. (15 points) Briefly describe the purpose of each of the following biochemical techniques (e. g. a method to separate carbohydrates on the basis of glucose content). Include a mention of a kind of biochemicals separated by the method.

1) Isoelectric focusing gel electrophoresis.

2) SDS-polyacrylamide gel electrophoresis.

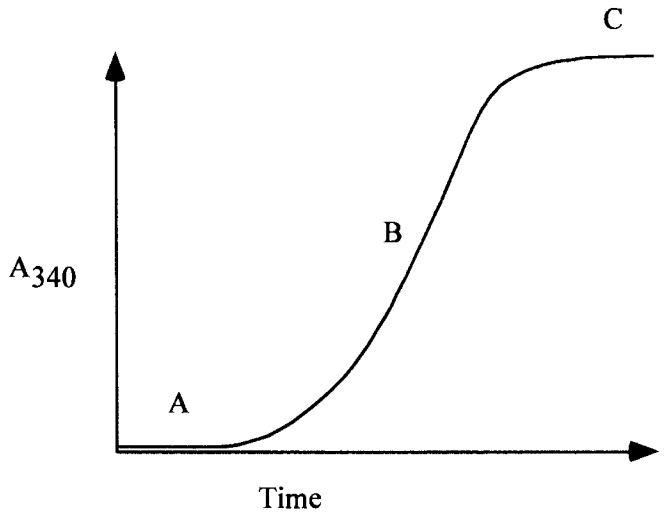
3) Affinity chromatography.

(背後仍有題目，請繼續做答)

4) Ion exchange chromatography.

5) Affinity labeling.

4. (9 points) A solution of tubulin monomers is warmed to 37°C, and the following change in light scattering (measured by A_{340}) is observed:



Explain what is happening at time points "A", "B", and "C".

5. (14 points) The following question has two parts.

1) (8 points) What is the final pH of a solution obtained by mixing 250 ml of 0.3 M acetic acid with 300 ml of 0.2 M KOH? (pK_b of acetate = 9.24). (Show your work!)

2) (6 points) What is the net charge on the acetic acid/acetate molecules at this pH? (Show your work!)