

系所組：生物科技研究所碩士班

日期節次：100年3月19日第1節 09:00-10:30

科目：生物化學

(一) 解釋名詞 (每小題5分, 共30分)

1. Gel filtration
2. 2-D gel electrophoresis
3. western blotting
4. intron and exon
5. isoelectric point
6. cofactor

(二) 請從酵素抑制作用的特性解釋如何應用於喝到假酒(甲醇)病人的醫治上? (8%)

(三) 將 *E. coli* cells 放置於含 lactose 的培養基中培養。請回答在下列情況下 lactose operon 的表現將會有何影響? 請以增加、減少或不變來回答, 並說明原因。(每小題3分, 共12分)

- (1) Addition of high levels of glucose
- (2) A mutation that inactivates β -galactosidase
- (3) A mutation that inactivates galactoside permease
- (4) A mutation that prevents binding of CRP to its binding site near the *lac* promoter

(四) 配合題: (每小題2%, 共14%)

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| a. Cellulose | 1. Retinol; involved in vision |
| b. Vitamin E | 2. Modified polysaccharide used as an anticoagulant |
| c. Heparin | 3. Linear homopolysaccharide of D-glucose |
| d. Vitamin A | 4. Contains a bicyclic ring with two carbonyls (aquinone); involved in blood coagulation |
| e. Glycogen | 5. Antioxidant; reacts with free radicals |
| f. Vitamin K | 6. Found in exoskeleton of insects |
| g. Chitin | 7. Main storage polymer for carbohydrates in animals |

(五) An enzyme catalyzes a reaction at a velocity of $20 \mu\text{mol/min}$ when the concentration of substrate [S] is 0.01 M. The K_m for this substrate is 1×10^{-5} M. Assuming that Michaelis-Menten kinetics are followed, what will the reaction velocity be when the concentration of S is 1×10^{-5} M and 1×10^{-6} M. (8分)

(六) 是非題。若敘述錯誤請訂正。(每小題2%, 共12%)

- (1) All DNA polymerase synthesize DNA in a 5 \rightarrow 3 direction.
- (2) DNA synthesis requires a 5-hydroxyl group on the primer strand.
- (3) Discontinuous DNA synthesis occurs on the leading strand of DNA.
- (4) Enzymes reduce the value of ΔG° for a reaction.
- (5) The V_{\max} value for an enzyme is independent of substrate and enzyme concentration.
- (6) Allosteric enzymes always exhibit sigmoidal plots of V versus S.

(七) 有 A, B, C, D and E, 五段 peptides, 序列如下: (A): Tyr-Lys-Met (B): Gly-Pro-Arg (C): Asp-Trp-Tyr (D): Asp-His-Glu (E): Leu-Val-Phe. 請回答列問題: (每小題2%, 共10%)

- (1) which peptide is most negatively charged at pH 7?
- (2) which peptide will yield DNP-tyrosine when reacted with 1-fluoro-2,4-dinitrobenzene and hydrolyzed in acid?
- (3) which peptide contains the largest number of nonpolar R groups?
- (4) which peptide contains sulfur?
- (5) which peptide will have the greatest light absorbance at 280 nm?

(八) 有一抗生素會抑制原核蛋白質的合成。在此抗生素的存在下, 蛋白質合成起始階段 (initiation) 會發生, 但只有 dipeptide 被合成, 且此 dipeptide 一直與 ribosome 結合。根據上述資訊, 你認為此抗生素阻止了蛋白質合成的哪一個步驟? (6%)