

國立臺北科技大學 100 學年度碩士班招生考試

系所組別：3713 有機高分子研究所甲組

第二節 生物化學 試題 (選考)

第一頁 共一頁

注意事項：

1. 試題 1~5 共 5 題，每題 10 分，配分共 50 分。
2. 試題 6~12 共 7 題，每題 5 分，配分共 35 分。
3. 試題 13 共 1 題，配分共 15 分。
4. 請標明大題、子題編號作答，不必抄題。
5. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. The template strand of a segment of double-stranded DNA contains the sequence: 10p

(5')CTT TGA TAA GGA TAG CCC TTC

- (a) What is the base sequence of the mRNA that can be transcribed from this strand?
- (b) What amino acid sequence could be coded by the mRNA base sequence in (a)

		First letter of codon (5' end)			
		Second letter of codon			
		U	C	A	G
U	U	UUU Phe	UCU Ser	UAU Tyr	UGU Cys
	U	UUC Phe	UCC Ser	UAC Tyr	UGC Cys
	U	UUA Leu	UCA Ser	UAA Stop	UGA Stop
C	C	CUU Leu	CCU Pro	CAU His	CGU Arg
	C	CUC Leu	CCC Pro	CAC His	CGC Arg
	C	CUA Leu	CCA Pro	CAA Gln	CGA Arg
A	A	AUU Ile	ACU Thr	AAU Asn	AGU Ser
	A	AUC Ile	ACC Thr	AAC Asn	AGC Ser
	A	AUA Ile	ACA Thr	AAA Lys	AGA Arg
G	G	GUU Val	GCU Ala	GAU Asp	GGU Gly
	G	GUC Val	GCC Ala	GAC Asp	GGC Gly
	G	GUA Val	GCA Ala	GAA Glu	GGA Gly
G	GUG Val	GCG Ala	GAG Glu	GGG Gly	

2. Two reactions in glycolysis produce ATP. For each of these, show the name and structure of reactant and product, indicate which cofactors participate and where, and name the enzymes.

3. CO₂ is produced in two reactions in the citric acid cycle. For each of these reactions, name and show the structures of reactant and product, name the enzyme, and show how any cofactors participate.

4. Describe the five major groupings of amino acids, and utilize one amino acid per group to build a pentapeptide chain.

5. Describe polymerase chain reaction (PCR) principles and procedure in detail.

6. Explain in molecular terms why humans cannot use cellulose as a nutrient, but goats and cattle can.

7. What are lectins? What are some biological processes which involve lectins?

8. The scheme S → T → U → V → W → X → Y represents a hypothetical pathway for the metabolic synthesis of compound Y. The pathway is regulated by feedback inhibition. Indicate where the inhibition is most likely to occur and what the likely inhibitor is.

9. Describe three of the important features of the α-helical polypeptide structure predicted by Pauling and Corey. Provide one or two sentences for each feature.

10. Describe three of the important features of a β sheet polypeptide structure. Provide one or two sentences for each feature.

11. Below, an RNA molecule is being transcribed from a strand of DNA. Indicate the 5' and 3' ends of the RNA molecule and of the strand of DNA that is complementary to the RNA molecule. In which direction is synthesis occurring?



12. What is meant by endosymbiotic association? How can this concept explain the evolution of eukaryotic cells that are capable of carrying out photosynthesis and/or aerobic metabolism?

13. Define the following items 解釋名詞 (3分/小題 共15分)

- a. exonuclease
- b. protease
- c. type II restriction endonucleases
- d. sticky ends
- e. RNA polymerase