

## 臺灣綜合大學系統 105 學年度學士班轉學生聯合招生考試試題

科目名稱	生物化學	類組代碼	D12
		科目碼	D1292

※本項考試依簡章規定各考科均「不可以」使用計算機

本科試題共計 2 頁

問答題 (100 points) 請於答案卷作答，於本試題紙上作答者，不予計分。

1) Translate the following mRNA into a peptide using the standard genetic code: (8 points)

5' -AUGCGGAUCCAUGUACAACUGGACGCAGUACCGUAACGCGAU-3'

2) The figure below shows a newly transcribed mRNA still associated with the template DNA. Draw the stem-loop structure that often forms during termination. (8 points)

3' -GGTCGGGCGGATTACTCGCCCGAAAAAAA-5'  
5' -CCAGCCCGCCUAAUGAGCGGGCUUUUUUUU-3'

3) For the following sequence, indicate the RNA primer that would be needed to start synthesis of the Okazaki fragment. (5 points)

5' -A-A-C-T-A-G-A-C-C-A-G-A-3'

4) A linear DNA molecule was treated with *Pst*I and gave two fragments with sizes of 2150 and 3420 base pairs. The same DNA was treated with *Bam*HI and gave three fragments of 1250, 1930 and 2390 base pairs. Finally, the DNA was treated with both enzymes at the same time and gave fragments of 900, 1250, 1490 and 1930 base pairs. Provide a map of the DNA molecule clearly indicating the restriction sites. (10 points)

5) Inside a cell, glucagon ultimately results in the phosphorylation of a wide variety of enzymes to control their activity. For each of the following enzymes that is phosphorylated in response to glucagon binding, explain what happens to its activity and why that is important (considering the pathway that the enzyme is in and the overall goal of glucagon). (12 points)

Acetyl-CoA carboxylase:

Pyruvate kinase:

Glycogen phosphorylase:

Phosphofructokinase-2:

6) Insulin activates glycogen synthase while glucagon inhibits glycogen synthase. Explain the intracellular mechanisms that are used to bring about this activity. (10 points)

背面有題，請繼續作答。

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- 7) What would be the energy requirements of the urea cycle if both nitrogens of urea came from glutamine (assuming that any NADH made was re-oxidized via electron transport/oxidative phosphorylation)? Explain how this is possible. (10 points)
- 8) For each of the following liver enzymes, indicate what happens to the enzyme (i.e., phosphorylated /dephosphorylated...) when the cell is under the influence of glucagon. Indicate whether the enzyme is activated or inhibited and how that contributes to the overall role of glucagon. (12 points)

PFK-2:

Pyruvate kinase:

Fruc-1,6-BPase:

Glycogen phosphorylase:

- 9) For each of the following tissue types, list the fuel(s) stored, preferred fuel(s) and exported fuel(s) under normal conditions. (12 points)

Tissue	fuel(s) stored	preferred fuel(s)	exported fuel(s)
Brain			
Highly active skeletal muscle			
Heart			
Adipose			

- 10) Draw the following fatty acid: 18:3 $\Delta$ 9,12,15 as it would appear at physiological pH. With reference to the omega carbon, what type of fatty acid is this? Draw the result if this fatty acid underwent partial hydrogenation to produce 18:1 $\Delta$ 11. (8 points)
- 11) Draw a molecule of phosphatidylserine with palmitic acid (16:0) and oleic acid (18:1 $\Delta$ 9) present. Make sure to put the saturated and unsaturated fatty acids in their proper location. (5 points)