

國立中山大學九十三年學年度博士班招生考試試題

科目：生物科學【生科系】

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問答題：每位考生必須回答規定的五題問題，每題 20 分；甲組考生必須回答題 1 至題 4 的問題，外加其餘題目中之任何一題（其餘題目作答超過一題者以得分最低的一題計算成績）；乙組考生必須回答題 5 至題 8 的問題，外加其餘題目中之任何一題（其餘題目作答超過一題者以得分最低的一題計算成績）；丙組考生必須回答題 9 至題 12 的問題，外加其餘題目中之任何一題（其餘題目作答超過一題者以得分最低的一題計算成績）。

- (Part A) In liver and muscle cells, the epinephrine-stimulated β -adrenergic receptor induced an elevation of cellular cyclic 3', 5'-adenosine monophosphate (cAMP) level which resulted in the enhancement of glycogen breakdown. Many enzymes are involved in this cAMP-mediated stimulation of glycogenolysis cascade, including cAMP dependent protein kinase (PKA), glycogen phosphorylase and glycogen phosphorylase. Try to explain why cell using such a seemingly overcomplicated pathway when it response to extracellular signal.

(Part B) Receptor tyrosine kinase (RTKs), which bind to peptide/protein hormones, may exist as dimers or dimerize during binding to ligands. What's the functional significance of this dimerization?
- In its most general sense, learning is a process by which humans and other animals modify their behavior as a result of experience or as a result of acquisition of information about the environment. Memory is the process by which this information is stored and retrieved. According to the results updated by scientists, long-term memory involves the formation of elimination of specific synapses in the brain and the synthesis of new mRNAs and proteins. Try to illustrate the molecular mechanisms of long-term memory, for example, long-term potentiation in hippocampus.
- Discuss the role of kidney in controlling plasma osmolarity and blood pressure in mammals.
- Describe the processes of digestion and nutrient absorption after consuming a piece of steak in health young man.
- Term explanation:

(A) photosynthesis	(B) C_4 pathway (CO_2 fixation)
(C) G-protein	(D) fermentation
(E) aquaporin	
- Describe the action mechanism of plant hormones or animal hormones as you know (give one example).

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7. The general rate equation for an ordered, single-displacement reaction where A is the leading substrate is

$$v = \frac{V_{\max} [A][B]}{(K_S^A K_M^B + K_M^A [B] + K_M^B [A] + [A][B])}$$

Write the Lineweaver-Burk (double-reciprocal) equivalent of this equation, and from it calculate algebraic expressions for (a) the slope; (b) the y -intercepts; and (c) the horizontal and vertical coordinates of the point of intersection when $\frac{1}{v}$ is plotted versus $\frac{1}{[B]}$ at various fixed concentrations of A.

8. DNA sequencing showed that a gene sequence for a signal peptide read as follows:

ATG TAG GTA GCC ACT GTC ACT TCC ACC ACC GTT GCT ATT CCA TCA TTC TCA GGC CTT
AAG ACT AAC GCA GCA ACT AAA GTT TAG AGT

This sequence was found to be translated throughout its complementary mRNA sequence. Analyze the DNA sequence carefully and indicate a) why this particular sequence can be translated into a 29 amino acid-peptide from its mRNA? b) What are the most important molecules to help to translate throughout the sequence using its complementary mRNA?

9. Explain in detail that how evolution and ecology influence life histories and social relations of species among plants or animals?
10. Discuss in detail why and how factors influence the number of individuals and the distribution of a species among plants or animals?
11. Use Taiwan vegetation as one of examples; discuss the relationships between biomes and temperature/annual precipitation.
12. Discuss the differences between phenetic, cladistic, and phyletic classification.