

國立清華大學 100 學年度碩士班入學考試試題

系所班組別：生醫工程與環境科學系 甲組(分子生醫光電組)

考試科目 (代碼)：普通生物學(2505)

*請依題序，順序在【答案卷】作答，每題十分 共 2 頁，第 1 頁

1. Describe and compare how amphibian, bird, and human breath.
2. Draw and compare the dissociation curves for the oxygen binding of human fetus verse adult hemoglobin. Explain the physiological meaning of this difference.
3. Compare antigen recognition processes by B cells verse T cells.
4. What is melatonin, where is it produced, and how is it used to overcome the jetlag?
5. The glia present throughout the vertebrate brain and spinal cord fall into a number of different categories. What are they and what importances of them to CNS functions?
6. Explain how the process of meiosis results in new cells that are NOT identical to the parent cells and creates genetic variation.
7. In watermelons, solid dark green color (G) is dominant to stripes (g). A student crosses two watermelon plants that are heterozygous for melon color (Gg).
 - (1) Please make a Punnett square to show this cross. What are the expected percentages of phenotypes of the offspring?
 - (2) The student's cross produces one hundred watermelon plants. Of those 100 plants, 78 plants produce solid dark green watermelons, and 22 produce striped watermelons. Explain these results based on the Punnett square and predictions you made in part (a).
8. Match the following membrane proteins (1-6) with their functions (A-F):

(1) Channel/carrier proteins	(A) used in cell surface reactions
(2) Protein pumps	(B) binding cells together
(3) Receptor proteins	(C) communication between cells
(4) Enzymes	(D) passive transport across the membrane
(5) Adhesion proteins	(E) active transport across the membrane
(6) Neurotransmitter receptors	(F) hormone binding and recognition

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9. A recent discovery was made about individuals who are resistant to the onset of AIDS after they have been infected with HIV. As we all know, there is genetic variation in the population and this included coding as well as non-coding portions of genome. Some individuals have a chemokine (short protein used in cell to cell communication) that has an altered 3' UT region. In these individuals, the amount of chemokine is higher than in people who do not have the altered 3' UT region.

- (1) Formulate an hypothesis to explain what is being observed.
- (2) Devise an experiment to test your hypothesis.

10. Below are a restriction map of plasmid and a human gene of known sequence. Your task is to clone the human liver cDNA for this gene so that the start codon is closer to Eco RI site than Pst I site of the polylinker, but get rid of the promoter+RBS+Hin insert already in the plasmid. Explain how you would accomplish the cloning using a series of numbered steps. Note that in the plasmid, the (1) refers to the frequency of these sites in the plasmid plus existing insert. In the gene's restriction map, all the relevant restriction sites are indicated if they are present.

