

**Answer five of the six questions below.**

1. We can sense the smell of perfumes, flowers, or foods because we have specialized systems to respond to these odorant chemicals. For example, it is estimated that human can detect from 10,000 to over 100,000 different volatile compounds. Please explain how can we recognize and distinguish so many odorant molecules at the cellular and molecular levels. (20%)
  
2. The completion of human genome project has open a new era for biomedical researches. Nowadays, numerous genome-wide research projects have been launched to unravel the mysteries of life. Many of them use the so-called "bioinformatics" approach. What is bioinformatics? Give an example to illustrate how can it improve biomedical research? (20%)
  
3. In many cases, people react to the same drug differently. For example, about 95% of patients have no side effect to zileuton (an anti-asthma drug) while less than 5% will develop liver toxicity. The distinct responses to this drug may be due to single nucleotide polymorphism (SNP). What is SNP? Explain how can a single nucleotide difference accounts for significantly different responses among different person? (20%)
  
4. We can put the gene of interest into animals (transgenic animal) or delete gene of interest out of animals (knock-out animal). Please describe how these gene transfer techniques are accomplished. And give one example for each technique. (20%)
  
5. Describe how does a cell respond to oxygen deficiency (hypoxia)? (20%)
  
6. Which area of research do you like to learn in the graduate school? Explain your reason(s). (20%)