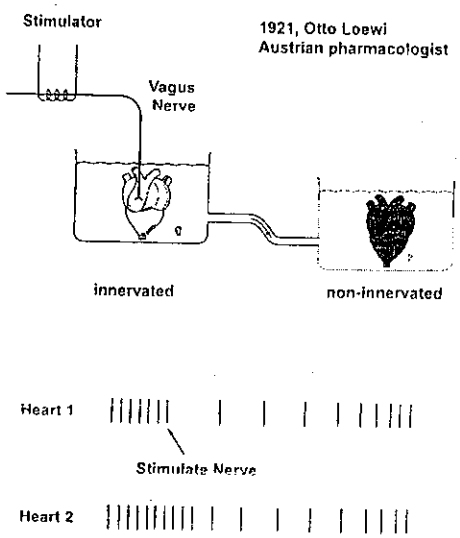
問答題：請任選四題作答，每題 25 分，答題若超過四題者以得分最低的四題計算分數!!

1. In 2000, Sydney Brenner, Robert Horvitz and John Sulston received their Nobel Prize in physiology or medicine for discoveries concerning genetic regulation of organ development and programmed cell death (also terms "apoptosis"). Please give 3 resons for why do some cells die instead of surviving (6 points)? What's the difference between apoptosis and another form of cell death "necrosis" (6 points)? Describe the molecular mechanisms of trophic factor deprivation and death activator-induced apoptoss in detail (13 points).

2. In a classical experiment carried out in 1921, the Austrian pharmacologist Otto Loewi placed a frog heart, innervated by the vagus nerve, in a chamber containing physiological saline, and connected the chamber with another that contained a second, noninnervated heart (Figure 1). The experimental arrangement allowed the saline solutions in which the two hearts were sitting to exchange freely. He then stimulated the nerve, which of course resulted in slowing of the first heart. However, after some delay, Otto Loewi noted that the second heart slowed as well. What's your opinion about this seemly conflicting result? Please describe the underlying mechanism in detail. By the way, conclusions from this and the following experiments awarded Otto Loewi Nobel prize in 1936.

Figure 1



3. Since 1998, when human pluripotent stem cells were first isolated, research on stem cells has received much public attention, both because of its extraordinary promise and because of relevant legal and ethical issues. Underlying this recent public scrutiny is decades of painstaking work by scientists in many fields, who have been deciphering some of the most fundamental questions about life with the goal of improving health. What are stem cells? Give definition for "totipotent" "pluripotent" and "multipotent" stem cells. Why are doctors and scientists so excited about stem cells?

4. How can territoriality function in population regulation? How can territorial behavior affect mating system and reproductive success?

5. What are the various types of biodiversity? How do predators and herbivores affect local species diversity?

6. What is the difference between bottom-up and top-down ecosystem regulation, and how do these two processes interact?

7. Describe the molecular definition of a gene and the molecular structure of genes.

8. What are the features of a virus? Discuss the possible reasons regarding virulence and consequence of the etiologic agent that is responsible for this year's SARS around the world from the biological data already known.

9. Discuss and draw a conclusion from comparing the following two figures (Figures 2 & 3) regarding views of gene expression.

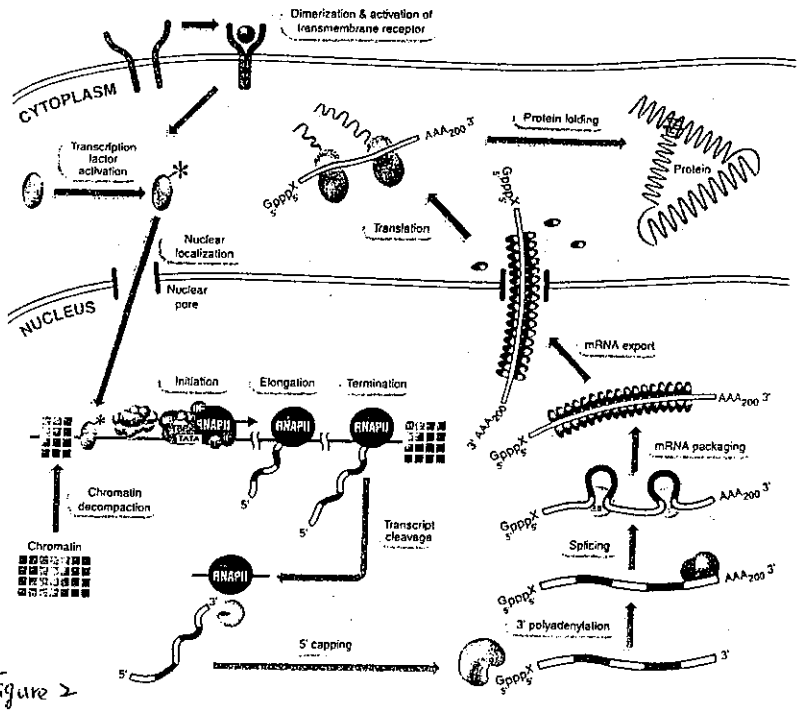


Figure 2

A Traditional View of Gene Expression

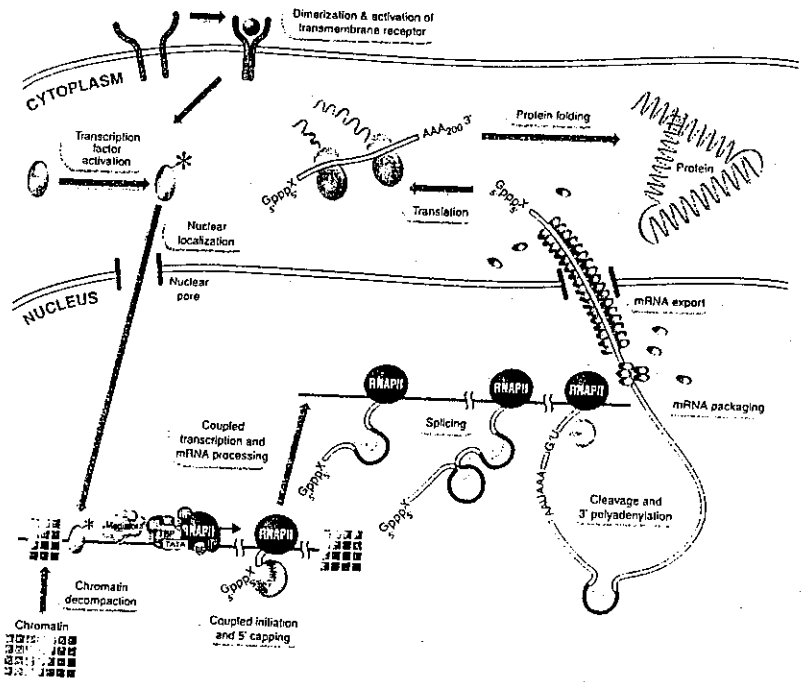


Figure 3

A Contemporary View of Gene Expression