1. Pain control is an important issue in clinic, especially for cancer patients,
   (a). list three types of stimulus that cause pain. (6%)
   (b). describe the pain transmission including receptors and neurotransmitters. (8%)
   (c). list three analgesics and explain their actions in detail. (6%)

2. In a 70 kg healthy adult,
   (a). How much is his stroke volume, at resting state? (5%)
   (b). Describe factors affecting stroke volume of heart (5%)
   (c). Draw a normal electrocardiogram (ECG) and relate the waves of ECG to atrial and ventricular action potentials. (5%)
   (d). Discuss and contrast the function roles of calcium channels in the action potential of SA node and ventricular muscle. (5%)

3. The major function of the kidneys is the formation of urine.
   (a). The urine formation begins with glomerular filtration, what is a normal value of glomerular filtration rate (GFR)? How to determine GFR? (5%)
   (b). List factors which cause the decrease of GFR? (5%)
   (c). What is the mechanism of water reaborption in different segments of renal tubule? (5%)
   (d). Explain the causes that result in patients with a high concentration of NH_4Cl in urine? (5%)

4. (a). Describe the anatomical and functional relationship between the hypothalamus and the pituitary gland. (10%)
   (b). Define stress, and list the effects of increased plasma cortisol concentration during stress. (10%)

5. (a). Describe the brain areas in which automatic control of rhythmic breathing. (10%)
   (b). List factors that stimulate ventilation during strenuous exercise. (10%)