

請清楚標示題號並依序作答於試卷上

1. In the neuromuscular junction, acetylcholine (ACh) binds to nicotinic receptors and opens an ion channel in each receptor protein; both sodium and potassium ions can pass through these channels. (A) Will sodium ions move in or out of the plasma membrane of the muscle fiber? How about potassium ions? (B) What kind of change of membrane potential (depolarization or hyperpolarization) will be produced? Explain the mechanism responsible for it. (10%)
2. Beginning with the rod cells of the retina, describe the process of transduction in a rod cell and the major visual pathway to the central nervous system. If a patient suffers a stroke that destroys the optic tract on the left side of the brain, what kind of visual defects will result? (12%)
3. Thyroid hormones (TH) exert widespread and diverse effects throughout the body. Its secretion is under control of the homeostatic mechanism. (A) What is the major way in which the blood concentration of TH is regulated? (B) A man with symptoms of hypothyroidism is found to have abnormally low concentrations of T_4 , T_3 , and TSH. If he has an intolerance to temperature, is he more sensitive to cold or heat? Why? (C) After an injection of TRH, the plasma concentrations of T_4 , T_3 , and TSH increase. Where is the site of the defect leading to the hypothyroidism? (TSH: thyroid-stimulating hormone; TRH: thyrotropin-releasing hormone) (10%)
4. (A) By what mechanisms does the sinoatrial node (SA node) function as the pacemaker for the mammalian heart? (B) What are the effects of sympathetic and parasympathetic nerves on the heart rate? Which is dominant at rest? (12%)
5. Why mean pulmonary arterial pressure is lower than mean systemic arterial pressure? (5%)
6. During severe exercise, blood concentration of lactic acid is increased. By what mechanism does the increase in arterial H^+ concentration influence ventilation. What is the adaptive value of this reflex? (7%)
7. Explain the following terms (44%)
 - (a) receptor potential
 - (b) luteal phase
 - (c) hyperventilation
 - (d) Frank-Starling mechanism
 - (e) secretin
 - (f) countercurrent multiplier system (kidney)
 - (g) chief cell
 - (h) renin
 - (i) hippocampus
 - (j) gamma motor neuron
 - (k) nociceptor