

系所組別： 藥理學研究所

考試科目： 生理學

考試日期：0220，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

1. The following questions are about cardiovascular functions. (20%)
  - A. A person with a heart rate of 40 has no P waves but normal QRS complexes on the ECG. Why?
  - B. The following experimental data are obtained for an animal before and after administration of a drug. Before: Heart rate 80 beats/min, and stroke volume 80 ml/beat. After: Heart rate 100 beats/min, and stroke volume 64 ml/beat. If total peripheral resistance remains unchanged, what is the effect of the drug on mean arterial pressure?
  - C. When all of the arterial baroreceptors are denervated in an experimental animal, what happens to its mean arterial pressure?
  - D. What happens to the hematocrit within several hours after a hemorrhage?
2. Answer the following question about a typical neuron. (20%)
  - A. What are the conditions that give rise to the resting membrane potential? Explain. What are the roles of membrane permeability and Na, K-ATPase on the membrane potential? Are they direct or indirect?
  - B. What is the ionic basis of an action potential? Explain in terms of the role of voltage-gated channels and the positive-feedback cycle.
  - C. What are threshold and the relative and absolute refractory periods? Explain in terms of the ionic basis of the action potential.
3. A full-term newborn baby is abnormally small. What is the probable cause? Is it due to deficiency in growth hormone, thyroid hormones, or *in utero* nutrition? (10%)
4. Describe the mechanisms and chemical messengers involved parturition. What are the effects of prostaglandins on the female reproductive system? (10%)
5. Patients with severe uncontrolled diabetes mellitus produce large amount of organic acids. What is the ventilation pattern in these patients and do their arterial PO<sub>2</sub> and PCO<sub>2</sub> increase or decrease? (10%)
6. How does a drug that inhibits the renal tubular secretion of H<sup>+</sup> ions, affect the body's balance of sodium, water, and H<sup>+</sup> ion? (10%)

(背面仍有題目,請繼續作答)

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7. The following experiments were performed on a single-unit smooth muscle in the gastrointestinal tract. a. Stimulating the parasympathetic nerves to the muscle produced a contraction. b. Applying sodium channel blocker led to a failure to contract upon stimulating the parasympathetic nerves. c. Applying an anticholinergic drug, did not prevent the muscle from contracting when the parasympathetic nerve was stimulated. **From these observations, what might one conclude about the mechanism by which parasympathetic nerve stimulation produces a contraction of the smooth muscle?** (10%)
8. The peripheral chemoreceptors are denervated in an experimental animal, and the animal then breathes a gas mixture containing 10 % oxygen. **What changes occur in the animal's ventilation? What changes occur when this denervated animal is given a mixture of air containing 21 % O<sub>2</sub> and 5 % CO<sub>2</sub> to breathe?** (10%)