

九十一學年度 生命科學院四所 碩士班研究生招生考試

科目 生理學 科號 0803 共 4 頁第 1 頁 *請在試卷【答案卷】內作答

(1)-(17)請選擇正確答案, (18)-(21)請簡答 (22-26) 問答題 (每題 10 分)

- (1) When increasing amounts of a certain substance are injected in the blood stream of an animal, we start to detect increasing amounts of this substance in the urine after its concentration in the blood reaches above a certain value. This substance is likely (a) actively secreted, (b) actively reabsorbed, (c) passively filtered out of the blood by the excretory organ of this animal. (2%)
- (2) When increasing amounts of a certain substance are injected in the blood stream of an animal, the concentration of this substance in the urine is higher than that in the blood stream. This substance is likely (a) actively secreted, (2) actively reabsorbed, or (3) passively filtered out of the blood by the excretory organ of this animal. (2%)
- (3) The major nitrogen-containing product excreted by most birds is (a) ammonium, (b) uric acid, (c) urea, (4) amino acids. (2%)
- (4) The major nitrogen-containing product excreted by most teleost fishes is (a) ammonium, (b) uric acid, (c) urea, (4) amino acids. (2%)
- (5) Cat medial gastrocnemius muscle consists of muscle fibers of slow-contracting (S), fast-contracting and fast fatiguing (FF) and fast-contracting and fatigue-resistant (FR) motor units. When the force output of this muscle increases from standing to running and to jumping, the sequence (from first to last) of motor units being activated is (a) S, FF, FR, (b) FF, FR, S, (c) S, FR, FF, (d) FF, FR, S. (2%)
- (6) The ranking order of the output forces of the three basic types of muscle fibers of mammals is (1) S>FR>FF, (2) FF>FR>S, (3) FR>S>FF. (2%)
- (7) Which of the following occurs in a rat whose thyroid glands are surgically removed? (a) There is an increase in the plasma level of thyroxine, (b) There is an increase in the release of thyrotropin (TSH) from adenohypophysis, (c) There is a decrease in the release of thyrotropin releasing hormone (TRH) from the hypothalamus, (d) There is a decrease in the number of thyroxine receptors in muscle cells. (2%)
- (8) Vasopressin affects the reabsorption of water in the kidney. Which of the followings is correct? (a) Neurons secreting vasopressin terminates in the kidney, (b) Release of vasopressin is regulated by osmolality of body fluids, (c) The vasopressin-releasing hormone released from the hypothalamus stimulates the secretion of vasopressin from neurohypophysis, (d) All the above. (2%)
- (9) Which of the following is an endocrine gland? (a) Pancreas, (b) Adrenal medulla, (c) Ovary, (d) All the above. (2%)
- (10) The major neurotransmitter released from axonal ends of motor neurons in neuromuscular junction is (a) glutamate, (b) aspartate, (c) GABA, (d) acetylcholine. (2%)
- (11) Some fish produces electric discharges. The electric discharges produced by different fishes can be used in (a) communication, (b) detection, (c) defense and to stun prey, (d) camouflage, (e) increasing swimming speed. (2%)
- (12) Please choose the changes that lead to increases in the propagation velocity of action potentials along an axon: (a) enlargement of the axon diameter, (b) increase the resistance of axonal membrane, (c) introduction of new leakage channels to axonal membrane, (d) wrapping myelin sheath around the axon. (2%)

九十一學年度 生命科學院四所 碩士班研究生招生考試

科目 生理學 科號 0803 共 4 頁第 2 頁 *請在試卷【答案卷】內作答

- (13) Bats use the echoes of the sound they emit to obtain information about the environment. The Doppler shifts and delay of echoes can be related to (a) relative velocity and size, (b) range and size, (c) elevation and relative velocity, (d) relative velocity and range of the target, respectively. (2%)
- (14) The warm receptors in our skin (a) can or (b) cannot transmit the pain caused by heat when the temperature of the skin reaches above 50°C. (2%)
- (15) To make the osmotic pressure of their blood equals to or slightly higher than that of sea water, the blood of marine elasmobranchs-sharks and rays- contain large amounts of (a) ammonium, (b) glycerol, (c) glycine, (d) urea. (2%)
- (16) The possible source of water for animals includes: (a) drinking, (b) uptake via body surface, (c) water in food, and (d) oxidative water (or metabolic water). (2%)
- (17) Different sensory organs convey different kinds of sensory information to the brain and spinal cord by (a) action potentials of different kinetics and magnitudes, (b) electric waves mediating by different ions, (c) action potentials of the same nature and magnitude, (d) action potentials and different forms of transient electrotonus. (2%)
- (18) Please give an example to illustrate how sensory receptor neurons can use "lateral inhibition" to enhance the contrast between the amounts of stimuli falling on two adjacent receptor neurons. (4%)
- (19) The oxygen consumption of subjects doing knee bending with a short pause in the squatting position is higher than that of subjects doing knee bending without making any pauses. Please explain. (4%)
- (20) Please describe the sequence of events in the stimulation and contraction of muscles in response to the arrival of action potentials in the neuromuscular junctions. (4%)
- (21) Please describe the differences between chemical synapses and electrical synapses in the nervous system. (4%)

九十一學年度 生命科學院四所 碩士班研究生招生考試

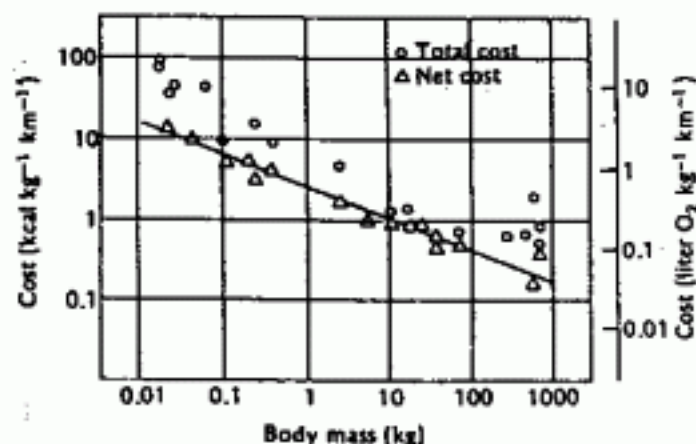
科目 生理學 科號 0803 共 4 頁第 3 頁 *請在試卷【答案卷】內作答

(22-26) 問答題 (每題 10 分): 下列每題附有一圖表及其簡要說明,

請你(妳)解釋圖表之主要意義, 並衍繹圖表可能之生理

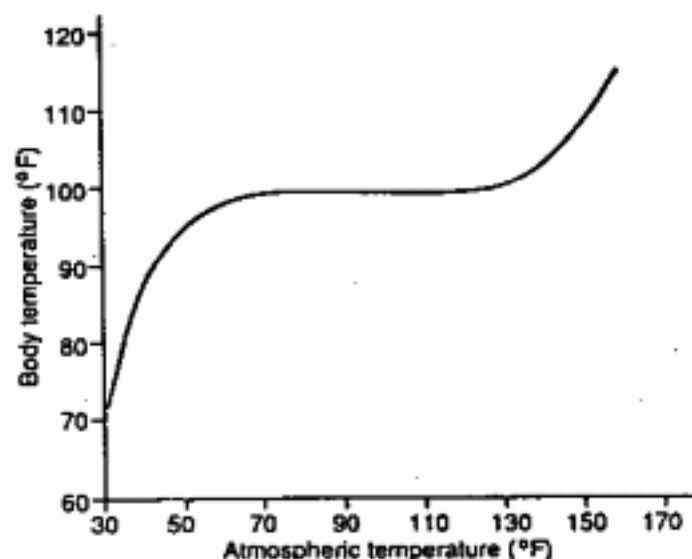
含義或其相關生理調節機制

(22)



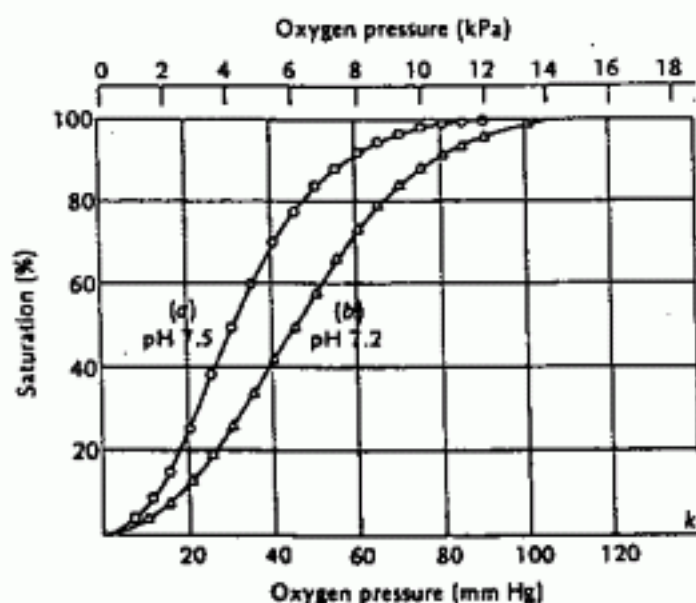
The cost of running for mammals of various body sizes. The net cost designates the cost of moving 1 kg body mass over a distance of 1 km, calculated from the increase in metabolism caused by running (and obtained from slopes of regression lines). The total cost includes the total metabolism while running and is therefore somewhat higher. [Schmidt-Nielsen 1972a]

(23)



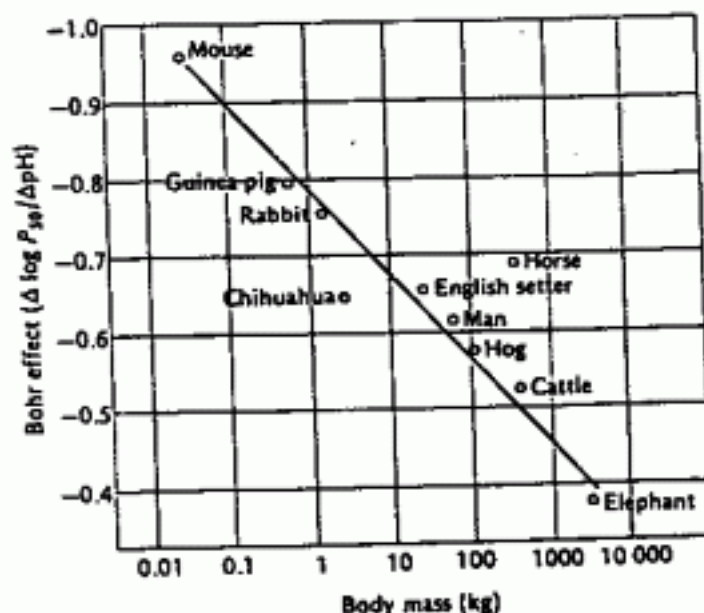
Effect of high and low atmospheric temperature for several hours' duration on the internal body temperature, showing that the internal body temperature remains stable despite wide changes in atmospheric temperature.

(24)



Oxygen dissociation curve for pigeon blood: (a) curve determined for normal temperature (41°C), blood P_{CO_2} (35 mm Hg), and pH (7.5) for this bird; (b) curve determined after shifting the pH from 7.5 to 7.2 with unchanged P_{CO_2} . [Lutz et al. 1973]

(25)

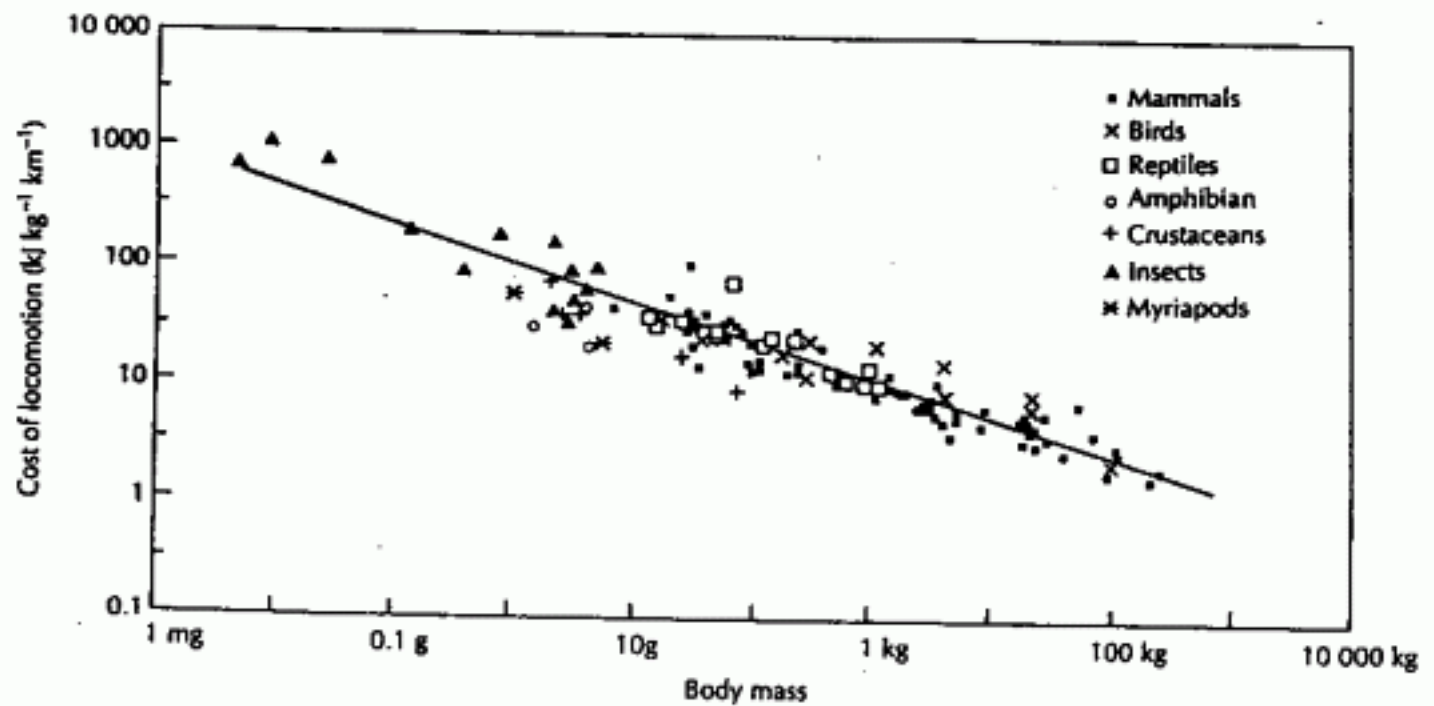


The Bohr shift of hemoglobin in relation to body size. The hemoglobin of small mammals has a greater Bohr shift (i.e., is more acid-sensitive) than the hemoglobin of large mammals and, therefore, can release more oxygen at a given P_{O_2} . [Riggs 1960]

九十一學年度 生命科學院四所 碩士班研究生招生考試

科目 生理學 科號 0803 共 4 頁第 4 頁 *請在試卷【答案卷】內作答

(26)



The cost of transport for animals of various types. To move a given distance small animals, regardless of type, consume more oxygen per unit mass than larger animals. This relationship holds over a wide range of body

sizes and leg numbers, from elephants to centipedes. [Full and Tu 1991]