

I. Multiple choices (30%, 2% each)

1. The number of individuals that a particular habitat can support with no degradation of the habitat is called _____. (A) biotic potential (B) survivorship (C) niche (D) carrying capacity (E) community
2. A broad-based pyramid-shaped age structure is characteristic of a population that is _____. (A) growing rapidly (B) at carrying capacity (C) stable (D) limited by density-dependent factors (E) shrinking
3. According to the principle of competitive exclusion, two species cannot continue to occupy the same _____. (A) environmental habitat (B) biome (C) territory (D) range (E) ecological niche
4. An organism's "trophic level" refers to _____. (A) the rate at which it uses energy (B) where it lives (C) what it eats (D) whether it is early or late in ecological succession (E) the intensity of its competition with other species
5. Keystone species are those species _____. (A) whose absence would cause major disruption in an ecosystem (B) that live primarily on or under rocks and stones (C) that have provided key foods and medicines (D) with the largest number of individuals in an ecosystem (E) that none of the above applies to
6. Ospreys and other top predators in food chains are most severely affected by pesticides such as DDT because _____. (A) their systems are especially sensitive to chemicals (B) of their rapid reproductive rates (C) they cannot store the pesticides in their tissues (D) the pesticides become concentrated in their prey (E) they are directly exposed to pesticides in the air
7. Which one of the following processes does NOT increase the concentration of greenhouse gases in the atmosphere _____. (A) using coal to generate electricity (B) increasing the number of cows and sheep to help feed a growing human population (C) burning tropical rain forests to clear land for grazing (D) failing to repair leaks in natural gas pipelines (E) putting salt on roads to prevent ice from forming
8. What is the term for a change in the relative frequencies of alleles in a population over several generations _____. (A) gene pool (B) independent Genetic variation in a population of animals and plants depends mainly on which of the following? (A) mutation (B) sexual recombination (C) the organism being haploid (D)

migration of genes among the chromosomes (E) massive die-offs

9. Human survival literally depends on the produce of _____. (A) angiosperms (B) gymnosperms (C) ginkgoes (D) cycads (E) gnetophytes
10. From the human perspective, which of the following kinds of fungi would be considered the least useful or beneficial ____? (A) mycorrhizal fungi (B) yeasts (C) rusts (D) truffles (E) decomposers
11. Which of the following has no specialized respiratory structures ____? (A) crab (B) earthworm (C) salmon (D) ant (E) snake
12. Viruses and bacteria in body fluids are attacked by _____. (A) cytotoxic T cells (B) antibodies from B cells (C) complement proteins (D) helper T cells (E) antigens
13. When the levels of juvenile hormone (JH) are maintained at artificially high levels, insects will _____. (A) be unable to molt (B) bypass some larval stages and pupate prematurely (C) molt more frequently (D) be unable to advance to a pupal stage (E) develop enlarged prothoracic glands
14. Some salamander and insect populations consist of only genetically identical females. This occurs because _____. (A) males are killed at birth by their mothers (B) a mutation in the population has eliminated the salamander equivalent of the Y chromosome (C) sperm do not fuse with eggs during reproduction, but the eggs develop into embryos anyway (D) a sex-linked, dominant, lethal mutation is fixed in the population (E) of none of the above

II. Short Essays (20%)

1. What is biological magnification? Please give an example. (5%)
2. What is a niche? What are the differences between a niche and a habitat? (5%)
3. Amphibian deformity is widespread in many country of the world. Laboratory experiments have shown that the tadpoles infected by the parasitic trematodes will develop limb deformity in the adults. However, high incidence of amphibian deformity was also found in areas where atrazine (a herbicide) was widely used. Please design an experiment to demonstrate the effect of atrazine on amphibians. (10%)

III. Comprehension (50%)

1. In 1985, Wu Shu-chen was hit by a truck and paralyzed from the waist down. Based on our understanding in neuron-related diseases as follows:

a. Hallmarks of cerebral disease: seizures, blindness (with intact PLR but no menace, can't navigate obstacle course), depression, abnormal behavior with aggression or compulsive behavior or self-mutilation, head pressing, etc. may see altered gait but really large animals don't show much of a change in gait even with major cerebral lesions.

b. Hallmarks of Cerebellar Disease: ataxia, intention, tremor (the key clinical sign in large animals - pathognomonic for cerebellar disease), hypermetria, loss of menace response without blindness

c. Hallmarks of Brainstem Disease:

cranial nerve deficits.V: trigeminal: motor to mm of mastication, sensory to face including cornea

cranial nerve deficits VII: facial motor to facial expression

cranial nerve deficits VIII: vestibular: head tilt, nystagmus, loss of balance occur

d. Hallmarks of Spinal cord: problems in gait, posture, and reflexes. divide into cervical, cervicothoracic intumescence at C6-T2, thoracolumbar cord, lumbosacral intumescence at L4-S2, and caudosacral cord.

Please answer the following questions:

- A. **Accordingly to the hallmarks of several neuron-related diseases, most likely which part of neural system causes the problem of hind limb paralysis? (Please provide your rationale) (5%)**
- B. **Based on our understanding in neuroscience, please explain how central nervous system control body movement. (10%)**
- C. **As presented in this case, please explain how neural activation affects skeletal muscle contractions. (10%)**

2. The tobacco plant is believed to have originated in the Western Hemisphere. The cultivated species most often grown for North American and European tobacco products is tabacum. In addition to nicotine, tobacco contains more than 4,000 chemicals.

Prior to European influence in the Americas, tobacco was used by the Indians of Mexico and Peru for ceremonies and to alleviate hunger pangs (excessive hunger) during famines. Columbus is credited with introducing tobacco into Europe. Tobacco use became widely accepted by the Portuguese, Spanish, French, British, Scandinavians, and even people in Asia.

In general, acute exposure to tobacco causes hypertension (increased blood

(背面仍有題目,請繼續作答)

pressure) and diarrhea (excessively watery and unformed stool). Chronic exposure to tobacco even causes asthma (an inflammatory disorder of the airways, characterized by periodic attacks of wheezing, shortness of breath, chest tightness, and coughing).

Please answer the following questions:

- A. Tobacco has been used for centuries. Based on current information we know, please provide list one positive effect of tobacco in medical application and explain why (8%).
- B. Acute exposure to tobacco causes hypertension. In addition, tobacco increases heart rate. Based on your understanding in Cardiovascular Physiology, please explain how blood pressure is regulated and how tobacco causes the increase in blood pressure. (8%)
- C. Chronic exposure to tobacco causes asthma. Based on your understanding in Respiratory Physiology, please explain 4 lung volumes and 4 capacities which can be measured by Spirometer, and specify a particular lung volume which can be affected by tobacco with your rationale. (9%)