國立中央大學八十七學年度碩士班研究生入學試題卷

所別：生命科學研究所　不分組　科目：普通生物學　

※不用抄題，但須註明題號。

一、選擇及訂正題[下列每題四個答案，請選出正確之答案(單選題)，並指出或訂正其他答案的錯誤]；可用中文作答，每題 4 分。

例. Which of the following connective tissues is specialized for storage ?

a) adipose　b) loose connective tissue　c) cartilage　d) dense regular connective tissue

Ans: *a*　b) a fibrous tissue used for support and elasticity　c) a strengthening tissue found in nose and ears

d) a support and elastic tissues such as tendons

1. Which organ system has the following functions: protection from injury, excretion, temperature control, reception of external stimuli, and defense against microbes ?

a) urinary system　b) lymphatic system

c) skeleton system　d) integumentary system

2. According to the sliding-filament model

a) actin and myosin filaments slide by each other

b) one sarcomere glides by another

c) the dark portions of the striations shorten and the light portions lengthen

d) the myofilaments swell, resulting in the thickening of the entire muscle fiber

3. Alzheimer disease is the responsibility of the buildup of

a) serotonin　b) endorphins

c) amyloid protein　d) norepinephrine

4. The functioning unit of the kidney is the

a) nephron　b) Bowman's capsule

c) glomerulus　d) loop of Henle

5. Which of the following is considered to be the main switch to control the immune system ?

a) memory cells　b) helper T cells　c) killer T cells　d) B cells

6. When phagocytes begin attacking foreign cells, they

a) destroy the entire cell

b) destroy the entire cell but save the antigens that are fragmented and placed on the surface of the phagocytes

c) destroy all markers or antibodies of the foreign cell so that it can no longer function

d) convert the dangerous foreign cells into harmless cells by removing their MHC markers

7. The majority of the carbon dioxide in the blood

a) is carried by the hemoglobin molecule

b) is dissolved in the blood plasma

c) is carried by the bicarbonate ion

d) changes proportions depending on metabolic condition

8. ATP is necessary for muscle contraction

a) to allow the heads to release from the binding sites

b) to allow the heads to bind to the binding sites

c) to prevent the formation of lactic acid that results in fatigue

d) none of the above

9. The circulatory system of humans does all but which one of the following ?

a) production and destruction of blood cells　b) transport of gases

c) maintaining body temperature

d) providing a method of distributing hormones

10. Veins differ from arteries in that they

a) are reservoirs for blood and contain more blood than arteries

b) lack valves that are found in arteries

c) have higher blood pressure to contend with than arteries

d) have a layer of smooth muscles that arteries lack

11. Peristalsis

a) refers to the contraction of smooth muscles in the digestive tract

b) is independent of neural or hormonal control

c) involves chewing food in the mouth

d) refers only to the contraction of the sphincter that allows food to enter and leave the stomach

12. There must be more than two different organs involved in the digestive process because

a) the structure of one organ would be insufficient space to allow digestive to occur

b) there are too many enzymes and hormones for one organ to be sufficient

c) some proteolytic enzymes require acid conditions while others require an alkaline environment to function

d) the digestive process must be compartmentalized to allow enough time for digestion of complex compounds to occur and for their products to be absorbed

13. Nonspecific responses are usually triggered by

a) antigens　b) tissue damage　c) interleukins　d) enzymes

注意：背面有試題

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二、單選題: (每題二分)

1. Diversity is a hallmark of life. Biologists have so far identified and name how many different species?
a) 50,000 b) 1.5 million c) 30 million d) 300 million

2. Fossil evidence indicates that prokaryotic cells first existed on the Earth
a) 3500 years ago b) 3.5 million years ago c) 3.5 billion years ago d) 3.5×10^{12} years ago

3. What do both mitochondria and chloroplasts have in common?
a) ATP is produced b) DNA is present c) ribosomes are present d) only b and c are correct e) a,b,c are all correct

4. Of the following, which cell structure would most likely be visible with a light microscope that had been manufactured to the maximum resolving power possible?
a) mitochondria b) microtubule c) ribosome d) largest microfilament e) nuclear pore

5. An organism with a cell wall would have difficulty doing which process?
a) diffusion b) osmosis c) active transpport d) phagocytosis e) exocytosis

6. You are conducting research on nerve cells. During an experiment, you administer an electrical stimulation to the cells. The probable result of this stimulation will be
a) start the membrane water pump b) open gated channels
c) cause increased saturation of phospholipid tails d) result in increased membrane fluidity and asymmetry

7. You eat a cheeseburger and a fresh salad) Which of the following molecules in your food is not normally oxidized in aerobic respiration to generate ATP?
a) sucrose b) lipids c) nucleic acids d) proteins e) amino acids

8. Photorespiration lowers the efficiency of photosynthesis by removing which of the following from the Calvin cycle?
a) CO_2 b) glyceraldehyde phosphate c) ATP d) ribulose bisphosphate

9. In a plant cell, where is ATP synthase located?
a) thylakoid membrane b) plasma membrane c) inner mitochondrial membrane d) a and c e) a, b, and c

10. Plant physiologists often incubate plant tissue in an extract of termite gut to dissolve the cell wall. After this incubation treatment, the structure left is called
a) the parenchyma b) a guard cell c) a companion cell d) the endodermis e) a protoplast

11. Why is nitrogen fixation such an important process?
a) nitrogen fixation can only be done by certain prokaryotes b) fixed nitrogen is most often the limiting factor in plant growth
c) nitrogen fixation is very expensive in terms of metabolic energy d) nitrogen fixers are sometimes symbiotic with legumes

三、問答題

1. Describe how the properties of phospholipids make these molecules well suited for plasma membranes? (3 分)

2. Provide evidence to substantiate the hypothesis that eukaryotic cells evolved from prokaryotic cells. (6 分)

3. Compare and contrast photophosphorylation and oxidative phosphorylation. (6 分)

4. In the human genome project, pieces of human DNA are stored in *Escherichia coli* or yeast. What is the purpose of this activity? (3 分)

5. How do you think the impact of recombinant DNA technology on both the basic research in life sciences and biotechnology? (8 分)