

# 國立中央大學八十八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 共 6 頁 第 1 頁

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3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: 正確答案是 a，其他答案錯誤更正如下

- b) loose connective tissue is a fibrous tissue used for support and elasticity  
c) cartilage is a strengthening tissue found in nose and ears  
d) dense regular connective tissue is a support and elastic tissues such as tendons

1. Which of the following cell types is specifically responsible for humoral immunity

- a) T cells    b) B cells    c) Leukocytes    d) Natural killer cells

2. Which of the following is a major component of our nonspecific defense system?

- a) active immunity              b) inflammation  
c) passive immunity              d) cell-mediated immunity

3. Alzheimer disease is the responsibility of the buildup of

- a) serotonin                      b) endorphins  
c) amyloid protein              d) norepinephrine

4. The most critical problem facing all organisms is the need for

- a) a constant water supply    b) a constant oxygen supply  
c) a constant food supply    d) homeostasis

5. Which of the following glands secretes hormones that enable the body to respond to stress

- a) pancreas                      b) adrenal    c) pineal    d) pituitary

6. An entomologist once estimated that the progeny of a single female fly over six generations would number more than 5 trillion. This calculation requires the assumption that all the progeny survive and reproduce. Which of the following additional assumptions is also required for this kind of calculation ?

- a) All flies produce the same number of progeny    b) All progeny are female  
c) None of the progeny have died by the end of the time period.  
d) None of the progeny mate more than once

7. Genetic drift resulting from a disaster that drastically reduces population size is called

- a) natural selection    b) gene flow    c) a bottle effect    d) a founder effect

8. Which of the following choices correctly pairs a class of sensory receptor with one of the kinds of stimulus it detects ?

- a) electromagnetic receptors---Pressure    b) chemoreceptors---molecular structure  
c) photoreceptor--- sound    d) mechanoreceptors--- infrared radiation

9. The evolution of new species is called

- a) microevolution    b) macroevolution    c) speciation    d) reproductive isolation

10. Which of the following nutrients does not begin undergoing digesting until it reaches the small intestine?

- a) protein    b) fat    c) complex carbohydrate    d) starch

參考用

注意：背面有試題

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## 二、問答題 (每題五分)

1. What are two advantages of breathing air, compared to obtaining dissolved oxygen from water? What is a comparative disadvantage of breathing air?
2. An increase in breathing rate is one symptom of poisoning by acidic substances such as aspirin. Explain how an aspirin overdose would cause breathing rate to increase, and how this increase would help the victim.
3. Describe (a) how AIDS is transmitted and (b) how immune system cells in an infected person are affected by HIV. Why is AIDS particularly deadly compared to other viral diseases?
4. What are the major differences between mitosis and meiosis?

## 三、MULTIPLE CHOICE QUESTION( Only one answer is correct )

請在答案紙上標示題號及其答案

- 1.5分 1) Life is organized in a hierarchical fashion. Which of the following sequences illustrates that hierarchy as it goes upward?
- A) ecosystem, population, organ system, cell, community, molecule, organ, organism
  - B) cell, molecule, organ system, organ, population, organism, ecosystem, community
  - C) organism, organ system, population, organ, community, cell, ecosystem, molecule
  - D) molecule, cell, organ, organ system, organism, population, community, ecosystem
  - E) ecosystem, molecule, cell, organism, organ system, organ, community
- 1.5分 2) A hypothesis
- A) is an explanatory idea that is broad in scope and supported by a large body of evidence.
  - B) is a tentative explanation for a specific phenomenon.
  - C) is the same as a theory.
  - D) is a widely accepted idea about a phenomenon.
  - E) a, c, and d.
- 1.5分 3) The role of a control in an experiment is to
- A) clarify experimental results.
  - B) ensure repeatability.
  - C) prove that a hypothesis is correct.
  - D) both b and c.
  - E) all of the above.
- 1.5分 4) A scientist examines a group of cells under the microscope. She notices the presence of nuclei within these cells. Chemical tests reveal that each cell is surrounded by a wall composed of cellulose. She concludes that the cells come from an organism that is a member of the kingdom
- A) Monera.      B) Plantae.      C) Animalia.      D) Protista.      E) Fungi.
- 1.5分 5) Which of the following statements is correct?
- A) Genes are proteins that produce DNA.
  - B) Differences among organisms reflect different nucleotide sequences in their DNA.
  - C) The DNA of humans is more similar to the DNA of birds than it is to that of apes.
  - D) Each organism has its own unique DNA code.
  - E) Each DNA molecule is a single strand of nucleotides.
- 1.5分 6) Photosynthesis is dependent on
- A) chloroplast structure.
  - B) chlorophyll.
  - C) the arrangement of molecules in the chloroplast.
  - D) light.
  - E) all of the above.

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- 1.5分 7) Which of the following statements about radioactive isotopes is (are) true?
- A) The tracers typically used for diagnosing medical problems remain radioactive in the body for a number of years, but give off very low levels of radioactive energy.
  - B) The nuclei of radioactive isotopes are unusually stable, but the atoms tend to lose electrons.
  - C) The energy emitted by radioactive isotopes can break chemical bonds and cause molecular damage in cells.
  - D) When given a choice between radioactive and nonradioactive isotopes of the same atom, living cells are more likely to incorporate the radioactive isotopes in their structures.
  - E) All of the above are true.
- 1.5分 8) Medicines are often administered in pill form. In many cases, the active ingredient of the pill (the drug) is joined to another substance by \_\_\_\_\_. This forms a(n) \_\_\_\_\_, which is stable in the dry environment of a pill bottle but dissociates under the wet conditions of the digestive system to release the drug to the body.
- A) ionic bonds . . . acid
  - B) ionic bonds . . . salt
  - C) polar covalent bonds . . . acid or base (depending on the drug)
  - D) hydrogen bonds . . . base
  - E) covalent bonds . . . salt
- 1.5分 9) What is the fundamental difference between covalent and ionic bonding?
- A) In a covalent bond, the partners have identical electronegativity; in an ionic bond, one of them is more electronegative.
  - B) Covalent bonds form between atoms of the same element; ionic bonds, between atoms of different elements.
  - C) In covalent bonding, both partners end up with filled outer electron shells; in ionic bonding, one partner does and the other does not.
  - D) In a covalent bond, the partners share a pair of electrons; in an ionic bond, one partner captures an electron from the other.
  - E) Covalent bonding involves only the outer electron shell; ionic bonding also involves the next inner electron shell.
- 1.5分 10) Autotrophs
- A) make sugar by using organic raw materials.
  - B) eat other organisms that use light energy to make food molecules.
  - C) make organic food molecules from inorganic raw materials.
  - D) include only the green plants.
  - E) both a and d.
- 1.5分 11) If you expose a photosynthesizing plant to carbon dioxide containing radioactive oxygen, which of the products of photosynthesis will be radioactive?
- A)  $O_2$
  - B)  $H_2O$
  - C) glucose
  - D) glucose and  $O_2$
  - E) glucose and  $H_2O$
- 1.5分 12) The reactions of the Calvin cycle take place in the
- A) cristae.
  - B) thylakoid membrane.
  - C) matrix.
  - D) stroma.
  - E) cytoplasm.
- 1.5分 13) Which of the following are produced during the light reactions of photosynthesis?
- A) ATP, NADPH,  $O_2$
  - B) glucose, ADP, NADP+
  - C) ADP, NADP+,  $O_2$
  - D) glucose, ADP, NADP+,  $CO_2$
  - E) ATP, NADPH,  $CO_2$

參考用

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- 1.5分 14) Why are (most) plants green?
- A) carotenoids reflect green light
  - B) chlorophyll reflects green light
  - C) chlorophyll primarily uses green light as the source of energy for photosynthesis
  - D) chlorophyll absorbs green light
  - E) green is the best color light for plant growth
- 1.5分 15) Research since Mendel's time has established that the principle of the segregation of genes during gamete formation
- A) applies to all sexually reproducing organisms.
  - B) applies to all asexually reproducing organisms.
  - C) applies only to unicellular organisms.
  - D) was invalid.
  - E) applies to all forms of life.
- 1.5分 16) Mendel's principle of independent assortment states that
- A) chromosomes sort independently of each other during mitosis and meiosis.
  - B) independent sorting of genes produces polyploid plants under some circumstances.
  - C) genes sort independently of each other in animals but not in plants.
  - D) each pair of alleles segregates independently during gamete formation.
  - E) both a and d.
- 1.5分 17) What is a testcross?
- A) a mating between an individual of unknown genotype and an individual homozygous recessive for the trait of interest
  - B) a mating between two individuals heterozygous for the trait of interest
  - C) a mating between an individual of unknown genotype and an individual homozygous dominant for the trait of interest
  - D) a mating between an individual of unknown genotype and an individual heterozygous for the trait of interest
  - E) either a or c
- 1.5分 18) Why are sex-linked diseases more common in men than in women?
- A) The sex chromosomes are more active in men than in women.
  - B) Men need inherit only one copy of the recessive allele for the disease to be expressed.
  - C) Women must inherit two copies of the recessive gene for the disease to be expressed.
  - D) Men acquire two copies of the defective gene during fertilization.
  - E) Both b and c.
- 1.5分 19) In plants, vascular tissue that consists of living cells that distribute sugars throughout the plant is called
- A) xylem.
  - B) lichens.
  - C) phloem.
  - D) transport tissue.
  - E) stomata.
- 1.5分 20) Mosses are included in a group of plants called the
- A) bryophytes.
  - B) vascular plants.
  - C) lichens.
  - D) gymnosperms.
  - E) angiosperms.
- 1.5分 21) The type of life cycle seen in plants is called
- A) gametophyte production.
  - B) cyclic reproduction.
  - C) karyogamy.
  - D) haplodiploidy.
  - E) alternation of generations.

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- 1.5分 22) The tissue system that acts as a plant's first line of defense against physical damage and infectious organisms is the
- A) sclerenchyma.
  - B) collenchyma.
  - C) ground tissue.
  - D) epidermis.
  - E) vascular tissue.
- 1.5分 23) Flowers bear seeds in protective chambers called
- A) sepals.
  - B) cones.
  - C) stamens.
  - D) antheridia.
  - E) ovaries.
- 1.5分 24) Wholesale commercial production of many horticultural crops makes use of cloning techniques. Which of the following is an advantage of cloning over sexual propagation?
- A) Plants produced by cloning grow more uniformly.
  - B) Cloned plants are healthier and less susceptible to disease.
  - C) Cloning is a simpler procedure and requires no special training.
  - D) Cloned plants are slower growing but have stronger stems.
  - E) Cloning provides more variation in flower color and size.
- 1.5分 25) Which of the following choices best describes the mechanism that causes a stoma to open?
- A)  $K^+$  activates water pumps in the guard cell membrane, which pump water into the cells and make them turgid.
  - B) Loss of  $K^+$  from surrounding epidermal cells creates an environment of negative pressure, which expands the guard cells.
  - C)  $K^+$  enters the guard cells and water follows passively, making the cells turgid.
  - D) Release of  $Ca^{2+}$  from the endoplasmic reticulum causes actin filaments in the guard cells to contract, deforming the cells.
  - E)  $K^+$  leaves the guard cells and water follows passively, making the cells flaccid.
- 1.5分 26) Commercial inorganic fertilizers have greatly increased agricultural productivity. Which of the following can be an advantage of their use compared to organic fertilizers?
- A) Inorganic nutrients bind more tightly to soil particles.
  - B) Inorganic fertilizers increase the water-holding capacity of the soil.
  - C) Nutrients are released faster from inorganic fertilizers.
  - D) It is easier for plants to absorb nutrients in an inorganic form.
  - E) Soil becomes less compacted with inorganic nutrients.
- 1.5分 27) Most plants can absorb and use which of the following forms of nitrogen directly?
- A) nitrate only
  - B) nitrite and nitrate
  - C) ammonia only
  - D) nitrate and urea
  - E) ammonia and nitrogen gas
- 1.5分 28) Which of the following is a potential problem associated with genetically engineered plants?
- A) Disease resistance genes may escape into the wild.
  - B) Engineered plants will be more susceptible to viral and bacterial diseases.
  - C) Engineered plants will be less nutritious.
  - D) It will be difficult to breed engineered plants with natural types.
  - E) Genetically engineered plants will not be able to reproduce on their own.
- 1.5分 29) In the past, all green-bean varieties were vines and had to be grown on poles ("pole beans"). Modern field-grown varieties, however, are dwarf mutants called bush beans. Bush beans grow as small bushes largely because their internodes are short and because they tend to branch close to the apical meristem. Application of which of the following substances might make a bush bean revert to a vine habit?
- A) gibberellin
  - B) abscisic acid
  - C) a cytokinin
  - D) ethylene
  - E) phytochrome

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- 1.5分 30) In many grocery stores, fresh fruits are sold prebagged in plastic bags dotted with holes. The main purpose of the holes is
- A) to prevent buildup of CO<sub>2</sub>.
  - B) to permit the fruit to drain after being washed.
  - C) to facilitate diffusion of ethylene away from the fruit.
  - D) to save plastic.
  - E) to facilitate diffusion of O<sub>2</sub> to the fruit.
- 1.5分 31) A plant that responds to touch with a change in growth movement is exhibiting
- A) phototropism.
  - B) geotropism.
  - C) bolting.
  - D) thigmotropism.
  - E) gravitropism.
- 1.5分 32) In a food chain consisting of phytoplankton → zooplankton → fish → fishermen → sharks, the fishermen are
- A) secondary producers.
  - B) tertiary consumers.
  - C) primary producers.
  - D) secondary consumers.
  - E) primary consumers.
- 1分 33) A biology teacher takes fish, algae, pondweed, invertebrates, and bottom muck from a local pond and establishes them in an aquarium. When the system is stable, the teacher seals it into a large, airtight glass box and leaves the box in a sunny location. After 3 months, the organisms in the aquarium appear alive and healthy. Which of the following statements about the experiment is incorrect?
- A) Some atoms from water molecules have become parts of organic molecules.
  - B) During the 3 months, the biomass of plant life was greater than the biomass of animal life.
  - C) Some of the energy in the system has moved from one organism to another during the 3 months.
  - D) No energy has entered or left the glass box during the 3 months.
  - E) The air in the glass box contains carbon dioxide.
- 1分 34) Which of the following is an ecological problem that can be caused by fertilizing a golf course with phosphorus-rich fertilizer?
- A) Phosphorus can accumulate to toxic levels in animals in the vicinity, especially those higher on the food chain.
  - B) Phosphorus is in short supply worldwide, and using it on lawns is wasteful.
  - C) Too much phosphorus can kill the lawn.
  - D) Too much phosphorus will promote the growth of weeds.
  - E) Much of the phosphorus will be washed away and end up polluting lakes and rivers.

參考用