

國立中山大學九十一學年度轉學生招生考試試題

科目：普通生物(上)【生科系二、三年級】

共 3 頁 第 1 頁

一、Multiple choice: (Choose only the best answer, 60%)

1. A plant cell placed in a hypotonic solution will
A. become flaccid B. become turgid C. lyse D. plasmolyze E. shrivel
2. Noncyclic electron flow in the chloroplast results in the production of
A. ATP only B. ATP and G3p C. ATP and NADPH
D. ATP, NADPH and O₂ E. ATP and O₂
3. How many chromatids would the cell with 24 chromosomes have in the G₂ phase of its cell cycle?
A. 12 B. 18 C. 24 D. 48 E. 96
4. Whose paper on natural selection was presented together with Darwin's abstract to the Linnean Society in 1858?
A. Cuvier B. Hutton C. Lamarck D. Lyell E. Wallace
5. In a population that is in Hardy-Weinberg equilibrium for two alleles, A and a, what would be the frequency of heterozygotes if the allele frequency of a is 0.3?
A. 0.9 B. 0.21 C. 0.42 D. 0.49 E. 0.7
6. Which species concept would be most useful for a field biologist to identify new species in a tropical rain forest?
A. biological B. cohesion C. evolutionary
D. morphological E. recognition
7. The person who study fossil is a?
A. botanist B. geologist C. paleontologist D. physiologist E. taxonomist
8. The half-life of carbon-14 is 5600 years. A fossil that is 22,400 years old would have what amount of the normal proportion of C-14 to C-12?
A. 1/2 B. 1/4 C. 1/8 D. 1/16 E. 1/256
9. Which of the following plant groups is heterosporous?
A. Psilotum B. Lycopodium C. Selaginella
D. Equisetum E. Ferns (water ferns excluded)
10. Which of the following groups is regarded as the ancestor of plants?
A. brown algae B. Euglena C. golden algae
D. green algae E. red algae
11. The protective coat of vascular plant surface made of cork and cork cambium is
A. collenchyma B. endodermis C. fiber
D. periderm E. pericycle
12. A seed is a mature
A. embryo B. flower C. ovary D. ovule E. pollen
13. Plant growth toward light is related to
A. abscisic acid B. auxin C. cytokinin D. gibberellins E. ethylene

國立中山大學九十一年度轉學生招生考試試題

科目：普通生物(上)【生科系二、三年級】

共 3 頁 第 2 頁

14. Which level of ecology considers energy flow and chemical cycling?
A. biosphere B. ecosystem C. community D. organismal E. population
15. Under a normal condition, you will not hear your own heart-beating because of
A. habituation B. imprinting C. insight D. learning E. maturation
16. A tree population within a "climax" community is most likely in the form of
A. exponential growth model B. high reproduction rate
C. increased fecundity D. K-selection E. r-selection
17. Ion diffuse across membranes down their
A. concentration gradient B. electrochemical gradient
C. electrogenic gradient D. electrical gradient E. osmotic gradient
18. Plasmodesmata in plant cells are similar in function to
A. cytoskeletons B. desmosomes C. gap junctions
D. integrins E. tight junctions
19. The innermost portion of a mature plant cell wall is the
A. middle lamella B. plasma membrane C. plasmodesmata
D. primary cell wall E. secondary cell wall
20. Where the glycolysis takes place?
A. cytosol B. mitochondria C. nucleus D. plastid E. ribosomes
21. The reproductive barrier between horse and donkey is a
A. behavioral isolation B. gametic isolation C. hybrid breakdown
D. mechanical isolation E. postzygotic barrier
22. Athlete's foot is caused by a
A. alga B. bacterium C. fungus D. protist E. slime mold
23. How many cotyledons are found in a pine embryo?
A. 0 B. 1 C. 2 D. 3 E. many
24. A vegetation with evergreen shrub majority and fire adapted is usually found in?
A. chaparral B. desert C. savanna D. taiga E. tundra
25. Animal appear to maximize their energy intake-to-expenditure ratio. What is this behavior called?
A. a fixed-action pattern B. learning C. maturation
D. optimal foraging E. territoriality
26. A crow that aids its parents in raising siblings is increasing its
A. altruistic behavior B. certainty of paternity
C. coefficient of relatedness D. inclusive fitness E. reproductive success
27. The most common dispersion pattern of a biological population is.
A. clumped B. dense C. random
D. uniform E. unpredictable

國立中山大學九十一學年度轉學生招生考試試題

科目：普通生物(上)【生科系二、三年級】

共 3 頁 第 3 頁

28. Which of the following is the most serious threat to biodiversity?
A. commercial harvesting B. competition from exotic species
C. habitat destruction D. overexploitation E. pollution
29. Chemosynthetic bacteria found around deep-sea vents are examples of
A. chemical cycling B. decomposers C. decomposers
D. secondary productivity E. upwellings that make nutrients available
30. A serious effect of the thinning of the ozone layer is
A. acid precipitation B. an increase in UV radiation reaching earth
C. a reduction in species diversity D. cultural eutrophication
E. global warming

二、Answer the following questions:

1. Draw a schematic diagram of a plant root cross section with structures and routes of water transport identified. (20%)
2. Summarize Darwin's theory of natural selection. (20%)

國立中山大學九十一學年度轉學生招生考試試題

科目：普通生物(下)【生科系二、三年級】

共 3 頁 第 1 頁

一、Multiple choice: (Choose only the best answer, 60%)

1. Primary lymphoid tissue includes:

- A. thymus B. spleen C. tonsil D. adenoid E. lymph node

2. Which of the following animals has a gastrovascular cavity?

- A. bird B. hydra C. mammal D. insect E. nematode

3. Pregnancy tests are based on the detection of which of the following hormones?

- A. HCG B. FSH C. GnRH D. estrogen E. progesterone

4. Impulses leave a neuron via the:

- A. dendrites B. nucleus C. axon D. cell body E. myelin sheath

5. Which kingdom consists of eukaryotes that nourish themselves mainly by decomposing organic material?

- A. Monera B. Protista C. Plantae D. Fungi E. Animalia

6. You start a batch culture of bacteria with 5 bacterial cells, how many bacterial cells will be present after 6 hours if the generation time of this bacterium is 20 minutes?

- A. 5×2^{18} B. 2×2^{18} C. 2×10^{18} D. 5×10^{18} E. 5×2^6

7. The developmental process of which of the following animals involves a process called incomplete metamorphosis?

- A. starfish B. butterfly C. spider D. crayfish E. grasshopper

8. An organ that is characteristic of mollusks is the

- A. chelicera B. mandible C. radula D. nematocyst E. parapodium

9. Cartilage is which of the following types of tissues?

- A. Adipose B. Epithelial C. Nervous D. Connective E. Reproductive

10. Which would you utilize as the insert source to produce a bacterial DNA library?

- A. cDNA B. mDNA C. mRNA D. plasmid DNA E. genomic DNA

11. The notochord is derived from the:

- A. ectoderm B. mesoderm C. endoderm D. neural tube E. neural crest

12. All of the following animal groups have evolved terrestrial life forms *except*:

- A. Mollusca B. Crustacea C. Reptilia D. Arthropoda E. Echinodermata

13. Nerve nets are characteristic of:

- A. annelids B. insects C. flatworms D. cnidarians E. vertebrates

14. The terms anterior and posterior only apply to animals that:

- A. have a true coelom B. have a digestive system C. have bilateral symmetry
D. form planula larvae E. undergo schizocoelous development

15. Proton pumps of bacteria probably functioned first for:

- A. pH regulation B. ATP synthesis C. photosynthesis
D. reduction of CO_2 E. oxidation of food

16. The HIV virus compromises the immune system by primarily attacking the
A. B cells B. L cells C. helper T cells
D. cytotoxic T cells E. suppressor T cells
17. A shared characteristic of chordates is the:
A. notochord B. skull C. hair
D. vertebral column E. four-chambered heart
18. A receptor that detects the position of parts of the body is called:
A. a rod B. a hair cell C. a chemoreceptor
D. a proprioceptor E. a mechanoreceptor
19. Which part of the vertebrate nephron consists of capillaries?
A. Glomerulus B. Loop of Henle C. Distal tubule
D. Bowman's capsule E. Collecting tubule
20. Trypsinogen can be activated by
A. chymotrypsin B. trypsin C. secretin
D. pepsin E. enterogastrone
21. When a person exercises hard, all of the following occur *except*:
A. CO₂ increases B. lactic acid increases C. glycogen increases
D. ADP increases E. blood glucose decreases
22. Jaws first occurred in which of the following classes?
A. Agnatha B. Chondrichthyes C. Osteichthyes
D. Ostracodermi E. Placodermi
23. Which of the following is an endocrine gland?
A. salivary gland B. sweat gland C. mammary gland
D. adrenal gland E. sebaceous gland
24. Which of the following is not a role of bones?
A. protection of internal organs B. providing attachment sites for muscles
C. production of red blood cells D. production of white blood cells
E. production of hormones to regulate calcium levels in body fluids
25. A highly successful parasite:
A. will not harm its host B. may benefit its host
C. will kill its host fairly rapidly D. may survive without its host
E. will be able to feed without killing its host
26. A decrease in the pH of human blood caused by exercise would
A. decrease breathing rate B. increase heart rate
C. decrease cardiac output D. decrease CO₂ binding to hemoglobin
E. decrease the amount of O₂ unloaded from hemoglobin

國立中山大學九十一學年度轉學生招生考試試題

科目：普通生物(下)【生科系二、三年級】

共 3 頁 第 3 頁

27. The metabolic rate of a poikilothermic animal increases:
- A. with increasing in size
 - B. with decreasing in muscular activity
 - C. with increasing in age
 - D. with increasing environmental temperature
 - E. with decreasing in size
28. What does transformation involve in bacteria?
- A. the infection of cells by a phage DNA molecule
 - B. the transfer of DNA from one strain to another
 - C. the type of semiconservative replication shown by DNA
 - D. the creation of a strand of RNA from a DNA molecule
 - E. the creation of a strand of DNA from an RNA molecule
29. Vaccination protects the body against catching a disease because:
- A. it provides antibodies made by another animal
 - B. it makes the disease organism histocompatible with the body
 - C. it provides an enlarged clone of memory cells against that disease
 - D. it builds up an immunological tolerance for the disease antigen
 - E. it releases large amounts of nonspecific defensive secretions
30. Which of the following characterizes parthenogenesis?
- A. an egg develops without being fertilized.
 - B. an organism is first a male and then a female
 - C. an individual may change its sex during its lifetime
 - D. specialized groups of cells may be released and grow into new individuals
 - E. both members of a mating pair have male and female reproductive organs

二、Answer the following questions:

1. Draw a contrasting schematic diagram to compare a T4 phage and an HIV virus with their appropriate structures identified. (20%)
2. Describe the *trp* and *lac* operons and explain how can they work differently if they both based on the binding of a repressor that prevents transcription. (20%)

國立中山大學九十一學年度轉學生招生考試試題

科目：生物化學【生科系三年級】

共 / 頁 第 / 頁

1. Explain the following terms: (35 %)
 - (1) Ribozymes
 - (2) Michaelis-Menten equation
 - (3) Standard free-energy change (ΔG°)
 - (4) Anion-exchange chromatography
 - (5) Gel-filtration chromatography
 - (6) Competitive inhibitors
 - (7) ATP
2. Explain why most molecules in cells are carbon compounds. (5 %)
3. Give specific examples to illustrate any three biological functions of the following biomolecules: (20 %)
 - (1) Carbohydrates
 - (2) Nucleic acids
 - (3) Lipids
 - (4) Proteins
4. Discuss any four differences between biological catalysts (enzymes) and chemical catalysts used by organic chemists. (10 %)
5. Use hemoglobin as an example to illustrate the four distinguishable structural elements of globular proteins and discuss how the four levels of structures are maintained. (15 %)
6. Compare protein hemoglobin and myoglobin in the following aspects: (15 %)
 - (1) Protein structure.
 - (2) O_2 binding curve (oxygen dissociation curve).
 - (3) Binding of O_2 .
 - (4) O_2 binding efficiency at the partial pressure of O_2 found in tissues and lungs.
 - (5) Effect of pH on O_2 binding.