

※注意：請於試卷「選擇題作答區」依題號作答。※

一、單選題（每題2分，40%）

- Of the following functions, which is most important for the glycoproteins and glycolipids of animal cell membranes?
(A) facilitated diffusion of molecules down their concentration gradients
(B) active transport of molecules against their concentration gradients
(C) maintaining the integrity of a fluid mosaic membrane
(D) maintaining membrane fluidity at low temperatures
(E) a cell's ability to distinguish one type of neighboring cell from another
- In addition to ATP, what are the end products of glycolysis?
(A) CO₂ and H₂O (B) CO₂ and pyruvate (C) NADH and pyruvate
(D) CO₂ and NADH (E) H₂O, FADH₂, and citrate
- Caffeine is an inhibitor of phosphodiesterase. Therefore, the cells of a person who has recently consumed coffee would have increased levels of _____.
(A) cAMP (B) GTP (C) adenylyl cyclase
(D) activated G proteins (E) phosphorylated proteins
- Which of the following are primarily responsible for cytokinesis in plant cells?
(A) kinetochores (B) Golgi-derived vesicles (C) centrioles and basal bodies
(D) actin and myosin (E) cyclin-dependent kinases
- Which of the following occurs in meiosis but not in mitosis?
(A) Chromosome replication (B) Production of daughter cells (C) Condensation of chromatin
(D) Synapsis of chromosomes (E) Alignment of chromosomes at the equator
- Which of the following is an example of polygenic inheritance?
(A) Pink flowers in snapdragons (B) The ABO blood groups in humans
(C) Skin pigmentation in humans (D) White and purple flower color in peas
(E) Huntington's disease in humans
- What kind of chemical bond is found between paired bases of the DNA double helix?
(A) ionic (B) hydrogen (C) covalent (D) sulfhydryl (E) phosphate
- A part of the promoter, called the TATA box, is said to be highly conserved in evolution. Which might this illustrate?
(A) The sequence does not mutate. (B) The sequence is found in many but not all promoters.
(C) The sequence evolves very rapidly. (D) Any mutation in the sequence is selected against.
(E) The sequence is transcribed at the start of every gene.
- Genomic imprinting, DNA methylation, and histone acetylation are all examples of _____.
(A) epigenetic phenomena (B) chromosomal rearrangements (C) karyotypes
(D) genetic mutation (E) translocation.

見背面

10. Why are viruses referred to as obligate parasites?
(A) Viral DNA always inserts itself into host DNA.
(B) They invariably kill any cell they infect.
(C) They must use enzymes encoded by the virus itself.
(D) They can incorporate nucleic acids from other viruses.
(E) They cannot reproduce outside of a host cell.
11. DNA microarrays have made a huge impact on genomic studies because they _____.
(A) can be used to eliminate the function of any gene in the genome
(B) can be used to introduce entire genomes into bacterial cells
(C) allow physical maps of the genome to be assembled in a very short time
(D) allow the expression of many or even all of the genes in the genome to be compared at once
(E) dramatically enhance the efficiency of restriction enzymes.
12. What is proteomics?
(A) the linkage of each gene to a particular protein
(B) the study of the full protein set encoded by a genome
(C) the totality of the functional possibilities of a single protein
(D) the study of how amino acids are ordered in a protein
(E) the study of how a single gene activates many proteins
13. Natural selection is based on all of the following except _____.
(A) genetic variation exists within populations
(B) the best-adapted individuals tend to leave the most offspring
(C) individuals who survive longer tend to leave more offspring than those who die young
(D) populations tend to produce more individuals than the environment can support
(E) individuals adapt to their environments and, thereby, evolve
14. A trend toward the decrease in the size of plants on the slopes of mountains as altitudes increase is an example of _____.
(A) a cline (B) a bottleneck (C) relative fitness (D) genetic drift (E) geographic variation.
15. Which mutation should least require realignment of homologous regions of a gene that is common to several related species?
(A) 3-base insertion (B) 3-base deletion (C) 1-base substitution
(D) 1-base deletion (E) 4-base insertion
16. Which of the following obtain energy and use, in part, to fix CO₂ by oxidizing inorganic substances?
(A) photoautotrophs (B) photoheterotrophs (C) chemoautotrophs
(D) parasitic chemoheterotrophs (E) chemoheterotrophs that perform decomposition
17. Which of the following is an ongoing trend in the evolution of land plants?
(A) decrease in the size of the leaf (B) reduction of the gametophyte phase of the life cycle
(C) replacement of roots by rhizoids (D) elimination of sperm cells or sperm nuclei
(E) increasing reliance on water to bring sperm and egg together

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國立臺灣大學 111 學年度碩士班招生考試試題

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18. A species of fish is found to require a certain water temperature, a particular oxygen content of the water, a particular depth, a rocky substrate on the bottom, and a variety of nutrients in the form of microscopic plants and animals to thrive. These requirements describe its _____.
- (A) dimensional profile (B) home base (C) prime habitat
(D) ecological niche (E) resource partition
19. The total biomass of photosynthetic autotrophs present in an ecosystem is known as _____.
- (A) standing crop (B) gross primary productivity (C) net primary productivity
(D) trophic efficiency (E) secondary productivity
20. Which of the following is a method of predicting the likelihood that a species will persist in a particular environment?
- (A) source-sink analysis (B) effective population size (C) minimum viable population size
(D) extinction vortex (E) population viability analysis

※下列題目請標明題號，依序作答於試卷內「非選擇題作答區」。可用中文或英文作答※

二、解釋名詞 (每題 4 分，20%)

- (1) The Ct value of a RT-PCR experiment
- (2) Introduced species
- (3) Carrying Capacity
- (4) Secondary growth of land plants
- (5) Codominance

三、問答題 (每題 10 分，40%)

- (1) 請說明 CRISPR/CAS9 基因編輯技術的功用，以及對自然界的可能影響。(10 分)
- (2) 請比較 C3、C4 與 CAM 植物在固碳過程中的差異。(10 分)
- (3) 請分別說明海生的軟骨魚類與硬骨魚類如何維持體內水分與離子的恆定。(10 分)
- (4) 生物復育 (bioremediation) 與生物強化 (biological augmentation) 是生態復育過程中常用的方法。請分別說明它們代表的意義。(10 分)

試題隨卷繳回