

一、是非題(40分，每小題2分)

注意：正確請畫○，錯誤請畫×；並請於試卷上「選擇題作答區」依序作答（答案均寫於A欄內。）

1. Evidences now support the view that bacteria and archaea represent two very distinct branches of prokaryotic life.
2. In mammals, the insulating material is associated with the integumentary system and relying mainly on the adipose tissue inside. Adipose cells stockpile fat molecules as a fuel reserve.
3. Within a phylogenetic tree, a clade is defined as a group of species that includes an ancestral species and all its descendants. Monophyletic, paraphyletic and polyphyletic groupings all meet the cladistic criterion.
4. Pattern formation in animals and plants results from different genetic and cellular mechanisms.
5. The contractile vacuole of ciliates, such as *Paramecium*, is an evolutionary adaptation for osmoregulation.
6. Endotherms can use metabolic heat to regulate their body temperature, in contrast ectotherms gain most of their heat from the environment.
7. Water is one of the few substances that are less dense as solid than as a liquid, and its polarity results from the hydrogen bonding.
8. A community's interactions include competition, predation, herbivory, and symbiosis, but disease is not included since it might harm the components.
9. The immense benefits posed by fungi are their ecological services as decomposers, recyclers of organic matter, and great medical value, for example the first antibiotic discovered, penicillin.
10. A gene is a region of DNA whose final product is either a polypeptide or an RNA molecule.
11. Mammalian humoral immunity defends against pathogens and toxins in extracellular fluid, and cell-mediated immunity defends against infected cells, cancer cells, and transplanted tissues.
12. The life cycles of mosses and other bryophytes are dominated by the gametophyte stage. However gametophyte is reduced in seed plants and protected in ovules and pollen grains.
13. Animals move oxygen and carbon dioxide across their respirator surfaces by active transport.
14. The proposed ancestors of mitochondria in eukaryotic cell were aerobic autotrophic prokaryotes.
15. The changes in turgor pressure of plant that open and close stomata result primarily from the reversible uptake and loss of sodium ions by the guard cells.
16. The diet from which a ruminant actually absorbs its nutrients is much richer than the grass the animal originally ate. The extra nutrients are metabolic by-products of symbiotic prokaryotes and protists and also come from digesting these microbes themselves.
17. Parenchyma cells are relatively unspecialized plant cells that retain the ability to divide, perform most of the plant's metabolic functions of synthesis and storage.
18. The Lophotrochozoa consisting of nematodes, arthropods, and other phyla is a taxon of animal phylogeny based mainly on molecular data instead of morphological and developmental comparisons.
19. The basic structure of viruses consists of a genome made of double-stranded DNA, and a protein shell called a capsid. Some viruses have membranous envelopes that help them infect their hosts.
20. A cell should be dead if it has reached metabolic disequilibrium because metabolic equilibrium is one of the defining features of life.

二、問答題(60分，每題15分)

注意：請於試卷上「非選擇題作答區」註明題號，依序作答。

1. 生命是建構於多層次的結構上，請由小到大依序列舉此結構階層(levels of biological organization)，再由同一階層中舉出一例，闡述「一致性」(unity)和「多樣性」(diversity)實為生命的雙重面貌，其間並無矛盾和抵觸。
2. 脊椎動物之淋巴球(lymphocyte)主要分為兩類，請繪圖並標示說明此二者抗原受體(antigen receptor)結構之異同；並請討論導致淋巴球多樣性(lymphocyte diversity)之機制。
3. 何謂逆境(environmental stress)？請問植物對熱逆境和低溫逆境如何反應？
4. 請列舉並概述人類族群對整個生物圈(biosphere)化學循環(chemical cycles)之衝擊與干擾。