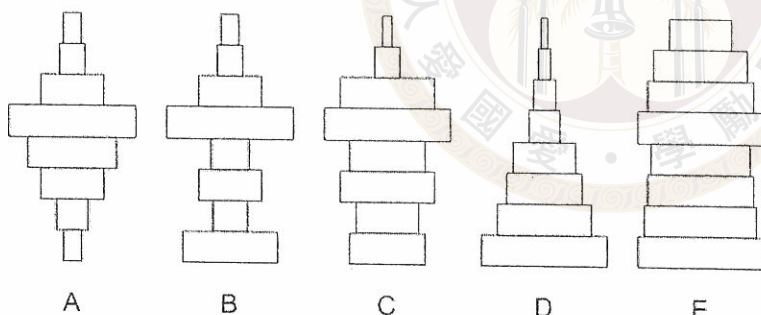


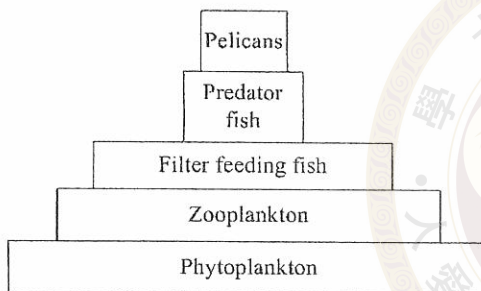
(一) 選擇題 (單選，每題 2 分，共 40 題)

- The DNA of an elephant and the DNA of a cherry tree will probably differ in all of the following respects except the  
 A) kinds of genes for which the DNA codes. B) kinds of nucleotides utilized in forming DNA.  
 C) number of DNA molecules. D) length of DNA molecules. E) sequence of DNA nucleotides.
- Humans are a(n) \_\_\_\_\_ species.  
 A) prokaryotic B) unicellular C) multicellular D) single stranded DNA E) eukaryotic
- All of the following may be associated with mating behavior except  
 A) aggressive behavior. B) releaser pheromones. C) search image.  
 D) territoriality. E) visual communication.
- Wild Japanese monkeys were fed wheat that was scattered on the beach. This required the monkeys to collect that wheat one grain at a time from among the sand grains. One monkey discovered that by throwing a handful of sand and wheat into the ocean, the sand would sink and the wheat would float. She could then easily collect the wheat. Soon, other monkeys in the troop were separating the sand and the wheat in the same manner. The learning technique employed by other monkeys in the troop is  
 A) Classical conditioning. B) Imprinting. C) Instinct.  
 D) Observational learning. E) Trial-and-error learning.
- Some species of birds that migrate at night use the night sky as a compass. If juvenile birds are raised under an artificial night sky with no stars (or with major stars missing) for several months after hatching, they are unable to migrate in the correct direction.  
 A) Associative learning B) Extinction C) Habituation  
 D) Imprinting E) Maturation
- A group of interbreeding individuals occupying the same area is best called  
 A) a community. B) a population. C) an ecosystem.  
 D) a society. E) a symbiotic relationship.
- Which of the above populations is experiencing the fastest growth?



- All of the following are involved in the regulation of blood glucose concentration except  
 A) glucagon. B) insulin. C) the liver.  
 D) melatonin. E) the pancreas.
- All of the following populations would likely result in a uniform dispersion pattern except  
 A) nesting penguins on a small beach. B) territories of bears in a forest.  
 C) perennial shrubs (of a given species) growing in a desert habitat.  
 D) tropical trees (of a given species) in a tropical rain forest. E) lions on the savanna.
- A population of 500 that experiences 55 births and 5 deaths during a one-year period. What is the reproductive rate for the population during the one-year period?  
 A) 0.01/year B) 0.05/year C) 0.1/year D) 50/year E) 55/year
- Which of the following would normally contain blood with the least amount of oxygen?  
 A) The left ventricle B) The left atrium C) The pulmonary veins  
 D) The pulmonary arteries E) Capillaries that line the small intestine
- Hemophilia is inherited as a sex-linked recessive trait. A woman without hemophilia has a hemophiliac father. If she marries a man without hemophilia, what is the probability that their child will be a boy with hemophilia?  
 A) 0% B) 25% C) 50% D) 75% E) 100%

13. A man and a woman have blood types A and B, respectively. Both have one parent with O blood type. What is the probability that the man and woman have a child with O blood type?  
 A) 0%      B) 25%      C) 50%      D) 75%      E) 100%
14. The monarch and viceroy butterflies both have orange wings with the same distinctive black markings. When the monarch caterpillar feeds on milkweed, a toxic plant, it stores the toxins, making both the monarch caterpillar and butterfly unpalatable and toxic. The viceroy caterpillar feeds on nontoxic plants.  
 A) Character displacement      B) Commensalism      C) Mutualism  
 D) Batesian mimicry      E) Müllerian mimicry
15. The mating calls of two species of frogs are different when they occupy the same island. On separate islands, the mating calls are the same.  
 A) Character displacement      B) Commensalism      C) Mutualism  
 D) Batesian mimicry      E) Müllerian mimicry
16. All of the following increase the concentration of CO<sub>2</sub> in the atmosphere except  
 A) photosynthesis.      B) slash-and-burn clearing of tropical rain forests.  
 C) burning of fossil fuels.      D) burning of wood for cooking and heating.  
 E) burning of gasoline.
17. In the following food chain: dinoflagellates→oysters→humans, oysters represent  
 A) detritivores.      B) producers.      C) herbivores.  
 D) primary carnivores.      E) secondary consumers.
18. The following pyramid of biomass:



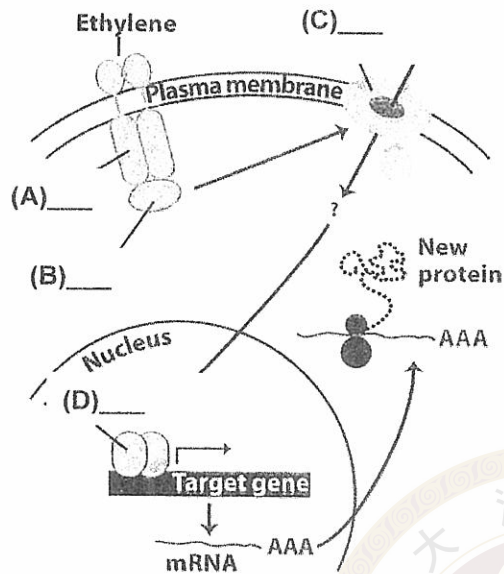
- In which trophic level would the biological magnification of the pesticide DDT be most evident?  
 A) Phytoplankton      B) Zooplankton      C) Filter feeding fish  
 D) Predator fish      E) Pelicans
19. Which of the following generates the formation of adaptations?  
 A) Genetic drift    B) Mutations    C) Gene flow    D) Sexual reproduction    E) Natural selection
20. The B blood-type allele probably originated in Asia and subsequently spread to Europe and other regions of the world. This is an example of  
 A) artificial selection.      B) natural selection.      C) genetic drift.  
 D) gene flow.      E) sexual reproduction.
21. *Cepaea nemoralis* is a land snail. Individual snails have shells with zero to five dark bands on a yellow, pink, or dark brown background. The various shell patterns could have occurred by all of the following except  
 A) convergent evolution.      B) natural selection.      C) a balanced polymorphism.  
 D) chance.      E) mutations.
22. Because of human predation, the sizes of and genetic variation in populations of most whale species are declining.  
 A) Bottleneck      B) Adaptive radiation      C) Directional selection  
 D) Sexual reproduction      E) Sympatric speciation
23. Clown fish hide among the tentacles of sea anemones. Unlike their predators, clown fish are immune to the stinging tentacles. Thus, clown fish are protected within the sea anemones. Sometimes, the clown fish will provide scraps of food to the sea anemones, and at other times, the clown fish will eat some of a fish that is snared by the sea anemones. The relationship between the clown fish and the sea anemone is an example of  
 A) competition.    B) commensalism.    C) mutualism.    D) parasitism.    E) predation.

24. A recently introduced species of seed-eating birds occupies an island where small and large seeds are available. Beak size in the bird population varies from small to large, allowing some birds to be more successful at eating small seeds, while others are more successful at eating large seeds. Birds with intermediate beak size must exert additional effort to eat seeds.
- A) Bottleneck                      B) Adaptive radiation              C) Directional selection  
D) Sexual reproduction              E) Sympatric speciation
25. All of the following are examples of evolution except
- A) mutations in an individual.                      B) changes in an allele frequency in a population.  
C) changes in an allele frequency in a species.              D) divergence of a species into two species.  
E) adaptive radiation.
26. You want to know what fertilizer will allow you to grow the largest tomatoes. You purchase two different fertilizers. You start applying each fertilizer, according to the manufacturer's instructions, to two separate groups of tomato plants. What is missing from your experiment?
- A) a control group with no fertilizer                      B) a control group with both fertilizers  
C) a control group that is given only half the fertilizer amount  
D) a control group of another type of plant (like green beans)  
E) a control group with a third type of fertilizer
27. According to the cell theory, all cells arise from...
- A) inorganic material.                      B) organic material.                      C) petri dish cultures.  
D) preexisting cells.                      E) DNA
28. The two energy-carrying compounds that are obtained from the energy-capturing reactions of photosynthesis and that supply energy to "run" the Calvin cycle are...
- A) ADP and NADP.                      B) ATP and FAD.                      C) ATP and glucose.  
D) ATP, ADP, and AMP.                      E) ATP and NADPH.
29. What happens during photorespiration?
- A) light energy is used to break sugars apart to release energy.  
B) light energy is used to synthesis sugars.  
C) produce sugars, carbon dioxide, oxygen, and ATP.  
D) rubisco binds to carbon dioxide instead of oxygen.  
E) rubisco binds to oxygen instead of carbon dioxide.
30. The vascular bundles of monocot stems are surrounded by bundle sheaths of \_\_\_\_\_ for support.
- A) companion cells                      B) sieve tube elements                      C) sclerenchyma cells  
D) vessels                      E) xylem
31. By definition, a retrovirus is
- A) a virus that has been in the lysogenic state for long periods of time.  
B) another name for a lytic virus.                      C) a DNA virus.  
D) an RNA virus.                      E) a bacteriophage.
32. Red tides are caused by population explosions of
- A) diatoms.                      B) dinoflagellates.                      C) water molds.  
D) euglenoids.                      E) green algae.
33. Lichens are made up of two different kinds of organisms living in a symbiotic relationship. The two organisms are
- A) a protozoan and a fungus.                      B) a fungus and the roots of a plant.  
C) a plant and an animal.                      D) an alga or cyanobacterium and a fungus.  
E) a bacterium and a protozoan.

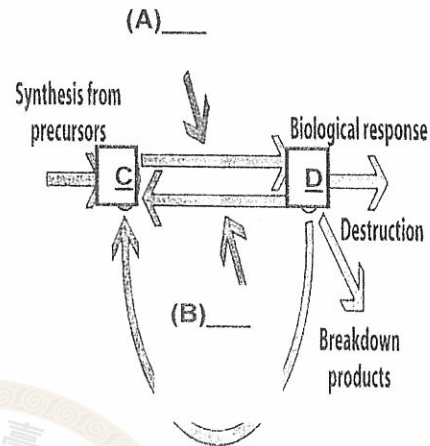
34. Which of the following statements concerning fungi is FALSE?
- A) Some live in the guts of cattle and help them digest cellulose.
  - B) Some form symbiotic associations with ants.
  - C) Some form symbiotic associations with termites.
  - D) Some are free-living decomposers.
  - E) Some are free-living autotrophs.
35. Green algae and plants share all of the following except one. Which is the exception?
- A) Chlorophylls *a* and *b* and carotenoids
  - B) cell walls of cellulose
  - C) stems and leaves
  - D) starch as a storage molecule
  - E) formation of a cell plate during cytokinesis
36. Mosses, hornworts, and liverworts are not considered completely adapted to land because they
- A) have rhizoids.
  - B) do not grow in soil.
  - C) have a dominant sporophyte generation.
  - D) require water as a transport medium for sperm cells.
  - E) have an alternation of generations in their life cycle.
37. The main difference between angiosperms and gymnosperms is that
- A) the gymnosperms are trees and shrubs, while the angiosperms are herbaceous.
  - B) the gymnosperms have double fertilization and the angiosperms do not.
  - C) the angiosperm ovules are completely enclosed and the gymnosperm ovules are not.
  - D) angiosperms are economically important and gymnosperms are not.
  - E) angiosperms are heterosporous and gymnosperms are homosporous.
38. If you cut the tops off of your shrubbery, the shrubs will get bushier. This is because, when you remove the tops, you are removing the source of \_\_\_\_\_ which is preventing the axillary buds from growing.
- A) auxin
  - B) gibberellin
  - C) cytokinin
  - D) ethylene
  - E) abscisic acid
39. Arrange the following five events in an order that explains the mass flow of materials in the phloem. 1. Water diffuses into the sieve tubes ; 2. Leaf cells produce sugar by photosynthesis.; 3. Solutes are actively transported into sieve tubes.; 4. Sugar is transported from cell to cell in the leaf. ; 5. Sugar moves down the stem.
- A) 2, 1, 4, 3, 5.
  - B) 1, 2, 3, 4, 5.
  - C) 2, 4, 3, 1, 5.
  - D) 4, 2, 1, 3, 5.
  - E) 1, 3, 4, 2, 5.
40. In the process of vernalization, the initiation of flowering is in response to
- A) day length.
  - B) night length.
  - C) rainfall.
  - D) season of the year.
  - E) temperature.

(二) 配合題 (8%)

(1) Transcription factor; Protein kinase;  
Membrane protein; Ethylene receptor



(2) Pfr; Red light (660 nm);  
Pr; Far-red light (730 nm)



(三) 問答題：(12%)

- (1) 試比較雙子葉植物的初級生長 (primary growth) 與次級生長 (secondary growth) 之發育的時期與所相關的分生組織。(4分)
- (2) 試就 C<sub>3</sub>、C<sub>4</sub>、與 CAM 植物其構造與生理加以重點比較。(4分)
- (3) 植物學家是如何的運用突變劑 (mutagen) 誘發植株發育異常的突變株，而得以探究植物的發育？另以被子植物花部發育為例加以說明。(4分)