※ 注意：請於試卷上「選擇題作答區」依序作答。

I. Multiple choice question (2 points for each question)

1. A positive relationship between area and species diversity is commonly observed for
   a) oceanic islands.
   b) lakes.
   c) wooded mountaintops in the American Southwest.
   d) all of the above
   e) none of the above

2. According to the "facilitation" hypothesis, pioneer species modify the environment in ways that
   a) make it more suitable for their own survival, and less suitable for other species.
   b) make it less suitable for their own survival, but more suitable for survival of other pioneer species.
   c) make it less suitable for their own survival, but more suitable for survival of late-successional species.
   d) make it less suitable for survival of all species.
   e) make it more suitable for survival of all species.

3. The equilibrium model of island biogeography explains diversity on islands as a balance between
   a) speciation and extinction.
   b) immigration and extinction.
   c) speciation and emigration.
   d) immigration and emigration.
   e) speciation and immigration.

4. MacArthur and Wilson hypothesized that larger islands would experience more extinction events because more species present means
   a) more chances for extinctions.
   b) more likelihood of competitive exclusion.
   c) smaller population size of each.
   d) all of the above
   e) only more chances for extinctions and smaller population size of each.

5. For most groups, species diversity most often
   a) increases from the tropics to the poles.
   b) increases from the poles to the tropics.
   c) is low at the equator and the poles, and peaks at temperate latitudes.
   d) is high at the equator and the poles, and lowest at temperate latitudes.
   e) shows no clear relationship with latitude.

6. Concentrations of ozone in earth's atmosphere are highest in the
   a) troposphere.
   b) stratosphere.
   c) mesosphere.
   d) thermosphere.
   e) ozonosphere.

7. Clearcutting at Hubbard Brook Experimental Forest sharply
   a) increased export of nitrate (NO_3^-) in stream water.
   b) decreased export of nitrate (NO_3^-) in stream water.
   c) increased rates of denitrification in soils.
   d) decreased deposition of ammonia (NH_3) from the atmosphere.
   e) increased deposition of ammonia (NH_3) from the atmosphere.

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8. El Niño events
   a) occur when the Southern Oscillation index is high.
   b) occur when barometric pressure is lower in the western Pacific than in the eastern Pacific.
   c) include the appearance of warm currents on the Pacific coast of South America.
   d) are always accompanied by La Niña events at the same time.
   e) are accompanied by westward movement of the location of storm generation in the Pacific.

9. Which of the following make important contributions to nitrogen fixation by human activities?
   a) combustion of fossil fuels
   b) industrial production of nitrogen fertilizers
   c) use of crop rotation in agriculture
   d) all of the above
   e) only (b) and (c)

10. Atmospheric CO_2 concentrations began their most recent steep increase about
   a) 5000 B.C.
   b) 1000 B.C.
   c) 1400 A.D.
   d) 1800 A.D.
   e) 1950 A.D.

11. A biome is characterized primarily by
   a) climate and predominate plant types.
   b) temperature and moisture.
   c) flora and fauna.
   d) global weather patterns.
   e) none of the above

12. Earth's climatic variation is due to
   a) spherical shape of the earth.
   b) earth's axial rotation as it orbits the sun.
   c) uneven heating of the earth's surface.
   d) all of the above
   e) none of the above

13. All of the following statements concerning the hydrologic cycle are true **except**:
   a) It is powered by solar energy.
   b) Flux is determined by evaporation.
   c) Transpiration is not involved.
   d) Reservoirs include lakes, rivers oceans and ice.
   e) none of the above

14. Which of the following is NOT an agent of nitrogen fixation?
   a) mycorrhizal fungi
   b) cyanobacteria (blue-green algae)
   c) bacteria associated with legume roots
   d) lightning
   e) actinomycete bacteria associated with alder roots

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15. In plants, "self-thinning" refers to reduction in
a) the biomass of an individual in response to competition.
b) the total biomass of a population in response to competition.
c) both population density and population biomass in response to competition.
d) population density in response to competition, as population biomass increases.
e) population density due to grazing by herbivores.

16. Which statement about organisms' "niches" is false?
a) The niche summarizes environmental factors influencing growth, survival, and reproduction of a species.
b) The niche concept was developed by Joseph Grinnell and Charles Elton.
c) The "fundamental" niche refers to physical, but not biological aspects of the environment.
d) Interactions such as competition and parasitism may restrict the size of an organism's niche.
e) In the laboratory, two species with identical niches are especially easy to maintain in a mixed culture.

17. During droughts in the Galápagos Islands, the ground finches most likely to survive are those with
a) smaller bodies.
b) smaller bills.
c) earlier maturation.
d) larger bills.
e) larger territories.

18. Mycorrhizal fungi (directly) help their plant partners acquire
a) sugars.
b) sunlight.
c) seed dispersal.
d) soil nutrients.
e) pollination.

19. In most ecological communities, we find
a) more rare species than moderately common or very common ones.
b) more very common species than moderately common or rare ones.
c) more moderately common species than rare or very common ones.
d) roughly equal proportions of rare, moderately common, and very common species.
e) no rare species – apparently "rare" species are artifacts of incomplete sampling.

20. Joseph Connell's "intermediate disturbance hypothesis" proposes that
a) species diversity is highest at intermediate frequencies of disturbance.
b) species diversity is lowest at intermediate frequencies of disturbance.
c) population growth rates are highest at intermediate frequencies of disturbance.
d) competitive exclusion is fastest at intermediate levels of disturbance.
e) none of the above

21. A keystone species is one
a) that makes up a very large proportion of total community biomass.
b) that feeds on a very large fraction of all available prey species.
c) that is fed on by a very large fraction of all predators in its community.
d) whose feeding activities have a disproportionate effect on the structure of its community.
e) that occupies the lowest level (the base) of the food web.

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22. Net primary productivity is the primary productivity of an ecosystem, after subtracting energy lost in
a) dead plant tissues.
b) inedible plant tissues.
c) respiration by primary producers.
d) respiration by primary consumers.
e) inefficiencies of photosynthesis.

23. "Actual evapotranspiration" for an ecosystem refers to the amount of water that
a) is taken up from soils by plant roots.
b) evaporates from soils.
c) is transpired by plants.
d) evaporates from soils *plus* the amount transpired by plants.
e) could evaporate from soils, if they were kept wet at all times.

24. The low productivity of arctic tundra ecosystems results
a) entirely because tundra has low evapotranspiration.
b) entirely because tundra soils are low in nutrients.
c) entirely because tundra soils retain water poorly.
d) because tundra soils have low nutrients and retain water poorly.
e) because tundra has low evapotranspiration and low-nutrient soils.

25. The largest reservoir of phosphorus in most ecosystems is phosphorus
a) in the atmosphere.
b) dissolved in water.
c) in rocks and sediments.
d) bound in animal tissues.
e) bound in plant tissues.

II. Short answers (10 points for each question, you may answer in Chinese)

1. For each of the following, tell whether it **increases** or **decreases** during the succession process:
a) diversity _____
b) species composition _____
c) primary production _____

2. Competition may have significant ecological and evolutionary effects on the niches of species. Please name and briefly describe one ecological effect and one evolutionary effect.

3. Name and briefly describe the ecological processes behind the three major distribution patterns.

III. Essay (20 points for this question, you may answer in Chinese)

Many people feel that global warming does not affect their daily life. Use specific examples to explain how and why humans are affected by global warming.

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