

※ 本大題請於試卷內之「選擇題作答區」依序作答。

*請按順序作答

I. Multiple choice (Only one correct answer for each question, 2 points per correct answer)

1. A biome is characterized primarily by

- A. temperature and moisture.
- B. flora and fauna.
- C. climate and predominate plant types.
- D. global weather patterns.
- E. None of the choices are correct.

2. Which of the following biomes have fertile soils that contain large quantities of organic matter?

- A. tropical rain forest
- B. temperate forest
- C. temperate grassland
- D. All of the choices are correct.
- E. both temperate forest and temperate grassland

3. Which is not considered a reef?

- A. atoll
- B. barrier
- C. fringing
- D. kelp
- E. None of the choices are correct.

4. In the Lotka-Volterra predation model, a prey (host) population in the absence of predators would

- A. grow logistically.
- B. grow exponentially.
- C. decline to extinction.
- D. grow exponentially, and then crash when it has outstripped its own food supply.
- E. The model cannot explain what happens.

5. Nutrient poor soils should favor mycorrhizal fungi that are

- A. more aggressive at obtaining sugars from their plant host.
- B. less aggressive at obtaining sugars from their plant host.
- C. more efficient at extracting sugars from soil.
- D. more efficient at extracting inorganic nutrients from soil.
- E. more efficient at extracting inorganic nutrients from plant root exudates.

6. In most ecological communities, we find

- A. more very common species than moderately common or rare ones.
- B. more rare species than moderately common or very common ones.
- C. no rare species—apparently "rare" species are artifacts of incomplete sampling.
- D. roughly equal proportions of rare, moderately common, and very common species.
- E. more moderately common species than rare or very common ones.

7. Joseph Connell's "intermediate disturbance hypothesis" proposes that

- A. species diversity is lowest at intermediate frequencies of disturbance.
- B. competitive exclusion is fastest at intermediate levels of disturbance.
- C. population growth rates are highest at intermediate frequencies of disturbance.
- D. species diversity is highest at intermediate frequencies of disturbance.
- E. None of the choices are correct.

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8. The most serious human-caused threat to endangered species worldwide is
- A. pollution.
 - B. the introduction of invasive species.
 - C. habitat destruction.
 - D. the pet trade.
 - E. None of the choices are correct.
9. 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.
10. 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.
11. The equilibrium model of island biogeography predicts
- A. small islands, nearer a source of colonists, will support the fewest number of species.
 - B. large islands, nearer a source of colonists, will support the fewest number of species.
 - C. small islands, farther from a source of colonists, will support the fewest number of species.
 - D. large islands, farther from a source of colonists, will support the greatest number of species.
 - E. both large islands, farther from a source of colonists, will support the greatest number of species and small islands, farther from a source of colonists, will support the fewest number of species.
12. 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.
13. 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.
14. "Nitrogen fixation" refers to the conversion of
- A. carbon compounds to nitrogen compounds.
 - B. nitrogen gas (N_2) to ammonia (NH_3).

- C. ammonia (NH_3) to nitrogen gas (N_2).
D. ammonium (NH_4^+) to nitrate (NO_3^-).
E. ammonium (NH_4^+) to nitrite (NO_2^-).
15. 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.
16. An interaction between individuals of different species that benefit both partners is called
A. commensalism. B. predation. C. exploitation.
D. mutualism. E. ammensalism.
17. The potential for evaporative water loss by terrestrial organisms
A. decreases with increased vapor pressure deficit.
B. decreases with decreased vapor pressure deficit.
C. increases with decreased vapor pressure deficit.
D. increases with increased vapor pressure deficit.
E. None of the choices are correct.
18. The photosynthetic response curve is most similar to
A. type 1 functional response curve. B. type 2 functional response curve.
C. type 3 functional response curve. D. None of the choices are correct.
19. The main force in the development and refinement of prey defenses is/are
A. nutrition. B. predators. C. the prey themselves.
D. mate choices. E. All of the choices are correct.
20. Which of the following cannot be determined using a fecundity schedule combined with a life table?
A. per capita rate of increase B. net reproductive rate
C. mean generation time D. dispersal rates
E. geometric rate of increase
21. Density dependent factors include all of the following except:
A. competition. B. disease C. predation.
D. temperature. E. None of the choices are correct.
22. In the logistic model of population growth if $r < 0$ then
A. the population expands. B. the population declines.
C. $N > K$ D. $N = K$
E. both the population declines and $N > K$

23. Which of the following environments for germinating seed is most likely to favor a plant species that makes many small seeds, compared to one that makes fewer larger seeds?
- A. nutrient limitation
B. competition from established plants
C. shade
D. deep burial in soil
E. disturbance
24. 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.
25. The process of evolution toward niche divergence in the face of competition is called _____.
- A. niche displacement
B. niche evolution
C. character displacement
D. character evolution
E. allopatric displacement
26. In Hubbard Brook Experimental Forest, the fraction of available solar energy fixed by primary producers is
- A. approximately 2%.
B. approximately 15%.
C. approximately 50%.
D. nearly all of it.
E. Primary producers do not fix solar energy.
27. An increase about 1,000 years ago in ^{13}C content of human collagen from archeological sites in eastern North America probably records
- A. replacement of vegetables and grains in the diet by meat.
B. replacement of corn by beans and squash in the diet.
C. increasing consumption of corn.
D. increasing levels of ^{13}C in soils.
E. increasing levels of ^{13}C in the atmosphere.
28. The number of trophic levels in an ecosystem is limited by
- A. the number of tertiary consumers.
B. the loss of energy with each transfer between trophic levels.
C. the gain of energy with each transfer between trophic levels.
D. the rate at which organisms can recycle energy within the ecosystem.
E. the rate at which secondary consumers consume their prey.
29. Plants in low nutrient ecosystems tend to
- A. grow slowly and allocate more resources to shoots than roots.
B. grow rapidly and allocate more resources to shoots than roots.
C. grow rapidly and allocate more resources to roots than shoots.
D. grow slowly and allocate more resources to roots than shoots.
E. grow rapidly and allocate equal resources to roots and shoots.

30. 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. Explain the following terms (20 points) ※ 本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

1. Trophic cascade hypothesis (4 points)
2. Metapopulation (4 points)
3. Life history (4 points)
4. Phenotypic plasticity (4 points)
- 5 Principle of allocation (4 points)

III. Question (20 point) ※ 本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

Discuss the ecological impact of climate change to Taiwan in terms of species/population, community and ecosystem levels. (20 points)