請依題號順序作答

一、單選題（每題 2 分，共 96 分）　※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. Which of the following best describes a biome?
(A) A region defined by its weather patterns.
(B) A community of organisms that share a specific ecological niche.
(C) A large ecological area with distinct climate, flora, and fauna.
(D) A specific type of soil in a given region.

2. Which of the following scenarios would likely result in a biome shift within a given region?
(A) A short-term drought lasting one growing season.
(B) An invasive species outcompeting native plants.
(C) The extinction of a top predator in the region.
(D) A long-term increase in average temperature and precipitation.

3. Which factor would most likely determine the boundary between two neighboring biomes?
(A) The diversity of animal species.
(B) Soil pH differences.
(C) A sharp gradient in temperature or precipitation.
(D) Variations in primary consumer populations.

4. In mountainous regions, which of the following most likely explains that we often see species composition differs significantly on the north-facing slope vs. the south-facing slope?
(A) Differences in soil type due to erosion rates.
(B) Variations in solar radiation and moisture availability.
(C) Genetic drift affecting isolated populations.
(D) Historical human land use patterns.

5. If the latitude of a region shifts due to continental drift, which of the following is the most likely long-term ecological impact?
(A) A complete loss of endemic species.
(B) Gradual replacement of existing biomes by new biomes suited to the latitude.
(C) Stability of biomes due to species adapting to new conditions.
(D) Immediate extinction of all species in the region.

6. Why do large-bodied mammals tend to lose heat more slowly than small-bodied mammals?
(A) They have higher metabolic rates per unit body mass.
(B) Their larger surface area to volume ratio retains more heat.
(C) Their smaller surface area to volume ratio reduces heat loss.
(D) They are endotherms, while smaller mammals are ectotherms.

7. Plants in saline environments often accumulate salts in their tissues. What is the primary purpose of this adaptation?
(A) To increase photosynthetic efficiency.
(B) To create an osmotic gradient that prevents water loss.
(C) To deter herbivores by making tissues toxic.
(D) To store energy for periods of drought.

8. How might an ectotherm's metabolic rate change in response to a microclimate shift from shade to direct sunlight?
(A) Decrease due to energy conservation.
(B) Increase as the animal warms and enzymatic activity accelerates.
(C) Remain constant due to thermoregulation.
(D) Fluctuate unpredictably depending on the species.

見背面

9. Which of the following is an evolutionary trade-off?
(A) Rapid reproduction at the expense of survival
(B) Increased genetic diversity within a species
(C) Long lifespans without energy cost
(D) Adaptations that enhance survival without drawbacks

10. Why might an organism's realized niche be smaller than its fundamental niche?
(A) Abiotic factors restrict access to parts of the fundamental niche.
(B) The realized niche only includes resources used in suboptimal conditions.
(C) The fundamental niche is determined solely by biotic interactions.
(D) Competition, predation, and other biotic interactions limit realized niche space.

11. Which of the following best illustrates a case of ecological niche differentiation?
(A) Two closely related bird species foraging on the same tree but at different heights.
(B) One species outcompeting another for the same nesting sites.
(C) A keystone predator increasing ecosystem diversity.
(D) Two unrelated species forming mutualistic associations.

12. What would likely occur if a population were shifted from its native habitat to a similar environment lacking its natural competitors?
(A) The population would likely go extinct due to lack of competition.
(B) The population would expand rapidly, potentially disrupting the new ecosystem.
(C) Evolutionary adaptations would immediately occur to match the new environment.
(D) The population's carrying capacity would remain unchanged.

13. How might phenotypic plasticity benefit a species facing rapid climate change?
(A) It allows immediate genetic adaptation to new conditions.
(B) It enables individuals to adjust their traits within a single generation.
(C) It eliminates the need for natural selection.
(D) It ensures high genetic diversity across populations.

14. What does optimal foraging theory predict?
(A) Animals forage randomly to maximize survival.
(B) Animals select foraging strategies that maximize energy intake per unit effort.
(C) Animals forage in areas where predators are absent.
(D) Animals prioritize food quantity over quality.

15. What is an evolutionary advantage of social behavior in animals?
(A) Increased individual independence.
(B) Reduced competition for food.
(C) Enhanced defense against predators.
(D) Avoidance of disease transmission.

16. Which of the following conditions would most likely lead to the evolution of cooperative breeding in a species?
(A) Unpredictable environments where individual survival is high.
(B) High cost of dispersal and low availability of breeding territories.
(C) Strong intraspecific competition for mates.
(D) Low predator pressure and abundant food resources.

17. Which situation best demonstrates a conflict between individual and group fitness in social animals?
(A) A predator attacking a solitary prey animal.
(B) Cooperative nest-building in birds.
(C) A group of lions hunting together.
(D) An individual hoarding food instead of sharing it with group members.

18. What distinguishes learned behavior from innate behavior?
(A) Learned behavior is passed genetically to offspring.
(B) Innate behavior is modified by experience.
(C) Learned behavior arises from environmental interactions and practice.
(D) Innate behavior is influenced by cultural transmission.

接次頁

19. Which factor (or combination of factors) contributes to exponential population growth?
(A) High birth rates and abundant resources
(B) Limited resources and high competition
(C) Density-dependent mortality
(D) Environmental resistance

20. Carrying capacity is defined as:
(A) The maximum reproductive potential of a population.
(B) The largest population size an environment can sustainably support.
(C) The total number of species in an ecosystem.
(D) The number of individuals born each year.

21. What does a Type III survivorship curve indicate?
(A) High mortality rates early in life.
(B) Low mortality rates throughout life.
(C) Consistent mortality rates across all ages.
(D) Extremely long lifespans.

22. What would be the likely consequence of introducing a density-independent factor (e.g., a hurricane) to a stable population at carrying capacity?
(A) Immediate population growth due to increased resource availability.
(B) No change in population size due to density independence.
(C) Temporary decline in population size, followed by recovery if the factor is removed.
(D) Permanent reduction in carrying capacity.

23. How would introducing a strong density-dependent factor (e.g., disease) into a population below carrying capacity affect its growth?
(A) It would have no effect until the population exceeds carrying capacity.
(B) It would reduce the carrying capacity permanently.
(C) It would amplify growth rates by reducing competition.
(D) It would slow growth regardless of population size.

24. Which of the following **CANNOT** be a resource?
(A) Oxygen
(B) Physical space
(C) Light
(D) Day length
(E) All of the above can be resources.

25. Which of the following statements about Connell's classical experiments with intertidal barnacles is true?
(A) In both species, the extent of the distribution of larvae is greater than the distribution of adults.
(B) One species is excluded from the top of the intertidal zone due to sensitivity to desiccation.
(C) One species is excluded from the bottom of the intertidal zone due to competition with the other species.
(D) All of the above
(E) None of the above

26. Which of the following is **NOT** an exploitative relationship?
(A) Parasitism
(B) Parasitoidism
(C) Predation
(D) Herbivory
(E) All of the above are exploitative relationships.

見背面

27. What is the major difference between predation and herbivory versus parasitism and parasitoidism?
(A) Parasitism and parasitoidism are not exploitative relationships.
(B) Most parasites and parasitoids spend their entire lives consuming a single individual, whereas herbivores and predators usually eat at least several different individuals.
(C) Unlike parasitoids and parasites, predators and herbivores usually do not exert strong selective pressures on their food organisms.
(D) Both A and B
(E) Both B and C

28. For an ecological interaction to be a mutualism, the net benefits must
(A) exceed the net costs for both partners.
(B) exceed the net costs for one, but not necessarily the other, partner.
(C) be less than the net costs for both partners.
(D) be less than the net costs for one, but not necessarily the other, partner.
(E) be constant through time.

29. For the species that does not receive benefit, commensalisms are
(A) always obligate.
(B) obligate if there has been much coevolution.
(C) obligate if there has been little coevolution.
(D) obligate mainly in forest communities.
(E) always facultative.

30. The Shannon index measures
(A) interaction strength.
(B) species richness.
(C) species diversity.
(D) the extent of trophic facilitation.
(E) the size of a trophic cascade.

31. A species that has large effects on other species in the community by virtue of its high abundance and biomass is called a(n)
(A) ecosystem engineer.
(B) keystone species.
(C) dominant species.
(D) trophic facilitator.
(E) strong interactor.

32. Robert MacArthur showed that different species of warblers in New England forests
(A) cannot coexist indefinitely.
(B) coexist because they utilize different types of trees.
(C) coexist because they utilize different parts of the same trees.
(D) coexist because they utilize the same trees at different times of the day.
(E) coexist despite utilizing the exact same resources.

33. Which of the following attributes of a community would tend to lead to higher species richness?
(A) High specialization of species
(B) A broad resource spectrum
(C) High population size in each species
(D) Both A and B
(E) Both B and C

34. The total amount of photosynthesis is referred to as
(A) net primary production (NPP).
(B) gross primary production (GPP).
(C) net photosynthetic production (NPP).
(D) gross photosynthetic production (GPP).
(E) carbon fixation production (CFP).

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35. Which of the following statements about net secondary production is **FALSE**?
(A) In most ecosystems, net secondary production is only a small fraction of NPP.
(B) As a percentage of NPP, net secondary production is usually lower in terrestrial ecosystems than in aquatic ecosystems.
(C) In most terrestrial ecosystems, the highest percentage of net secondary production is associated with detritivores.
(D) Net secondary production depends on the digestibility and nutrient content of the heterotrophs' food.
(E) All of the above are true; none are false.

36. Regarding the global carbon cycle, which is the largest active terrestrial carbon pool?
(A) Soil
(B) Forest
(C) Grassland
(D) Tundra
(E) Rock

37. Which trophic level generates the most dead organic material in most ecosystems?
(A) The first
(B) The second
(C) The third
(D) The fourth
(E) All trophic levels generate about the same amount of organic material.

38. In an average ecosystem, about how much energy is present in the organisms at a given trophic level compared to the organisms at the next higher trophic level?
(A) ten times as much
(B) a tenth as much
(C) twice as much
(D) half as much

39. Nitrogen from detritus is made available for absorption by plants through the process of
(A) nitrogen fixation.
(B) denitrification.
(C) demineralization.
(D) decomposition.
(E) chemical weathering.

40. Where does the majority of the net primary production go?
(A) Being stored in plants after being photosynthesized
(B) Being grazed by herbivores
(C) Being processed by decomposers and detritivores
(D) Being stored in the soil

41. Species that occur in one area, but nowhere else on Earth, are called _____ species.
(A) boreal
(B) local
(C) beta
(D) endemic
(E) invasive

42. Which of the following statements about the equilibrium theory of island biogeography is **FALSE**?
(A) If the extinction rate increases, the number of species on an island should decrease.
(B) At equilibrium, the species composition of the island will not change.
(C) If the immigration rate increases, the number of species on an island should increase.
(D) The theory applies to island-like habitats as well as islands.
(E) All of the above are true; none is false.

見背面

43. Which of the following is **NOT** an axis used by biologists to determine whether, or to what extent, a species is rare?
(A) Local population size
(B) High specificity
(C) Age structure
(D) Geographic distribution
(E) All of the above are used to determine the rarity of a species.

44. Non-native species, such as cats and dogs in Taiwan, that are introduced to new environments, spread far beyond the original point of introduction, and cause damage are called
(A) predators.
(B) pets.
(C) invasive species.
(D) pathogens

45. Compared with the interior, which of the following changes is usually not associated with edges of forests?
(A) Decreased diurnal temperature fluctuations
(B) More light penetration
(C) Decreased humidity
(D) Increased wind speeds
(E) All of the above are associated with edges of forests.

46. Which of the following would be most suited for some degree of human activity such as selective logging?
(A) Biological reserves
(B) Buffer zones
(C) Core natural areas
(D) Both A and B
(E) Both B and C

47. Which number best describes the current CO_2 concentration (ppm) in the atmosphere?
(A) 220
(B) 320
(C) 420
(D) 520
(E) 620

48. Which of the following statements about the nitrogen cycle is **FALSE**?
(A) The nitrogen cycle is tightly coupled to the carbon cycle.
(B) Atmospheric nitrogen exists primarily in the unreactive dinitrogen gas form.
(C) Despite their relatively small size, the land and ocean surface pools of nitrogen have very high biological activity.
(D) Human activities have greatly altered the global nitrogen cycle.
(E) All of the above are true; none is false.

二、填充題（每格 1 分，共 4 分） ※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

Please fill in the correct words from the provided **word pool** to complete the following paragraph, making it a correct statement about life history strategies:

Organisms with **49** life history strategies typically inhabit environments that are **50**, leading them to produce many offspring with minimal **51**, whereas organisms with **52** strategies allocate significant resources to individual offspring and invest heavily in their survival.

Word pool: r-selected, N-selected, P-selected, K-selected, stable, unstable, predictable, unpredictable, communication, niche differentiation, learning, parental care.

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