

Australian Biota 2 (10900)– BIOL 1015, Uni of South Australia, School of NBE
Final Exam: 21 November 2006 (Value=20%) (all questions of equal value) QUESTION SHEET

Read each question carefully, several times, then choose the best answer or use short answers, where indicated. Please answer all questions on the answer sheet, using *pencil* to either put an “X” on the letter with the best choice of answer or write answers where the is space provided. Two hours allowed.

IMPORTANT NOTE: PLACE ANSWERS ONLY ON the **ANSWER SHEET** PROVIDED

PART I – Ecological Theory (1-25)

1. Distribution of related species on distant continents (eg. southern beech, marsupials, frogs) is used as evidence of:
 - a. convergent evolution
 - b. Earth’s history of plate tectonics and continental drift separating Gondwana
 - c. genetic mutations in response to similar latitudes and climates
 - d. creation theory
2. Evolution of Australian vegetation with fire was probably associated with what geological event around 37 million years ago?
 - a. a flaming meteorite that changed the climate instantly
 - b. separation of Australia & Antarctica, developing the Southern cold, dry ocean current
 - c. periodic comets causing four ice ages
 - d. the rise of human burning regimes
3. New species can arise in a population by all these methods EXCEPT:
 - a. geographic barriers which give rise to separate, allopatric species
 - b. non-random breeding preferences which create sympatric species
 - c. mutants and hybrids which are very successful and can reproduce
 - d. natural variation in populations due to the normal frequency of alleles
4. Convergent evolution explains how look-alike species can arise in different parts of the world if:
 - a. unrelated organisms can perform analogous functions in similar niches
 - b. homologous features diverge from a common ancestor
 - c. related species can independently evolve similar features
 - d. similar appearance implies relatedness by adaptive radiation
5. Natural selection in populations can lead to species extinction if:
 - a. unsuccessful alleles are removed from the gene pool
 - b. mate selection, rather than random mating, leaves some individuals without mates
 - c. feeding preferences change to allow sharing of resources
 - d. defective genes become fixed by genetic drift, as population numbers decline
6. What type of evolution explains mutual dependency of two unrelated species:
 - a. convergent evolution
 - b. parallel evolution
 - c. co-evolution
 - d. stochastic events
7. In two sympatric species of mud snails, *Hydrobia*, the two species avoid competition by
 - a. cooperative behaviour
 - b. resource partitioning by changing food types
 - c. living in separate sites
 - d. remaining in dense groups for defense against predators.

8. Managers should target the conservation of isolated, meta-populations, rather than the broader population distribution on a map because:
- the larger population is the unit of evolution
 - fixing of poor genes by genetic drift in fragmented populations may cause local extinction, hence the loss of genetic variability in the larger population
 - taxonomic species should be well researched before conservation is put in place
 - in a stochastic event, the entire population could be wiped out.

9. Calculate biodiversity of the best bird habitat, out of three different locations. Survey results are:

Species present	Site 1	Site 2	Site 3
white-winged chough	27	6	2
Murray magpie	2	6	3
New Holland honeyeater	3	6	6
spotted pardalote	6		4
superb fairy-wren	2		3

- .67
 - 670
 - .77
 - .51
10. At the three sites above, which habitats are most similar?
- sites 2 and 3
 - sites 1 and 3
 - sites 1 and 2
 - sites 3 and 2
11. Optimum planting density of crops is calculated by the $-3/2$ self-thinning rule, which says:
- only $2/3$ of a population will survive if density is too high
 - population growth rates are independent of density
 - less than $3/2$ of a population will ever reach their optimum growth potential
 - competition for nutrients limits growth at a density where productivity drops at the steep slope of $-3/2$
12. Why would you NOT harvest when a population size is at the maximum growth rate ($1/2 K$)?
- Because the surplus is stable at the maximum population growth rate
 - the hunting effort is too great, as there are too few individuals
 - the maximum sustainable yield is a precarious state and growth rates can decline rapidly
 - because sustainable harvest is at the equilibrium point at population sizes below $1/2 K$.
13. K-type species have population growth curves that could be described as:
- population growth rates $\gg 1$
 - exponential, and over-exploiting the resources
 - fast-breeding, numbers explode beyond the site resources, population crashes
 - S-curves that level out at the carrying capacity of the habitat, which limits survival.
14. The definition of niche is:
- the range of environments of a species, biotic and abiotic factors limiting success (Hutchinson 1950)
 - the role an organism performs in a functioning ecosystem (producers & consumers) (Elton 1927)
 - the feeding strategy of an organism (herbivore, carnivore)
 - all of the above.

15. Optimal foraging theory implies that:
 - a. food quantity is more important than food quality
 - b. time spent foraging is less important than food quality
 - c. feeding behaviour is inherited, as inefficient feeders do not survive to breed
 - d. generalist feeders are found in stable environments.

16. Why does over-hunting of social animals sometimes cause population explosions?
 - a. it disrupts the social control of breeding by dominant individuals, which limits population size
 - b. the animals that are left have more food
 - c. smaller populations would be in danger of extinction, and they respond accordingly
 - d. populations experience cycles of growth, regardless of hunting, responding more to weather.

17. Stochastic disasters create ecological disturbances that are:
 - a. cyclic and therefore predictable
 - b. of evolutionary significance, because organisms have time to adapt between events
 - c. of evolutionary significance, because only resistant and resilient individuals survive
 - d. causing reverse evolution.

18. What is the significance of Wallace's line, between neighboring Bali and Lombok?
 - a. it is the isohyet of the ten-inch rainfall, separating desert from rainforest
 - b. the fauna of the two islands are unrelated, as they represent two continental plates converging
 - c. traditional burning has created a distinct line between rainforest and savanna
 - d. climatic differences caused by ocean currents caused divergence in bird species.

19. What is the significance of Darwin's finches, in the Galapagos?
 - a. Darwin developed the principles of animal care and breeding on tropical islands
 - b. finches from different continents converge here for breeding every spring
 - c. rapid evolution took place a century ago, due to nuclear testing
 - d. the finch species evolved on each island, from a common ancestor, according to the food resources of each island.

20. The evolutionary advantage of behavioural instinct, over learned behaviour is:
 - a. instinct ensures instant survival of the fittest individuals, which live to breed
 - b. learned behaviour takes too long, so does not provide any survival benefit
 - c. instinct develops from a complex social group that dominates other groups
 - d. learned behaviour favours the population, not the individual.

21. The relationship between habitat stability and specialist or generalist feeders is:
 - a. specialists require disturbed habitats because they colonise degraded land
 - b. generalists survive best in stable habitats because food is abundant
 - c. stable habitats allow complex food webs to develop, which are made up of specialists
 - d. stable habitats favour generalists, which exploit only limited types of food.

22. The Rivet Hypothesis warns against loss of even seemingly insignificant species because:
 - a. small species may evolve to be very successful and have large populations
 - b. they may be the key link in a food chain, whose survival determines the fate of ecosystems
 - c. small species that go extinct can easily be replaced by analogues
 - d. funding is available to support endangered species more than abundant species

23. Ten essential chemical nutrients necessary to sustain life in all habitats:
 - a. Mn Cu Zn Mo Bo Be Do Me Hg He
 - b. fluoride, cesium, nickel, gold, copper, arsenide, silver, beryllium, tin, zinc
 - c. C H O P K N S Ca Fe Mg

d. C H R I S He F Na Cl

24. In explaining mammal behaviour, what evidence is there that territorial fighting does not control population genetics?
- the dominant male stag that wins the territory, runs off with the harem
 - the dominant male stag that wins the territory, has gene frequencies equal to all other males
 - observers watched mating outside the fighting season
 - mating occurred outside the territory, between different populations.
25. Co-evolution is thought to be a valid theory because:
- the evidence for short-term advantage enables co-dependence between species to develop
 - evolutionary theory predicts that interdependence is necessary in an ecosystem
 - mutualistic partners can survive separately, if necessary
 - mutualistic partners have evolved together over millions of years.

PART II – Australian Ecosystems and their management (26-54)

26. Forest animals are usually endemic because they:
- are common to many forests across Australia
 - have evolved successful mutualistic relationships in stable, forest habitats
 - can survive in a wide range of habitats in several other local ecosystems
 - are generalist feeders that can adapt to disturbances such as logging.
27. Native grasslands typically have a fire interval of:
- between 1500 and 2000 kilowatts
 - 10 to 30 tonnes per hectare
 - 15 to 50 year frequency, to maintain an overstorey of eucalypts and acacias
 - every 2 to 5 years, to maintain grassy ecosystem diversity and productivity.
28. Bradyspory is a strategy of heathland shrubs for survival, which:
- seals viable seeds inside fire retardant capsules until a very hot fire releases the seed
 - spreads millions of spores in response to heavy rainfall
 - produces spores from sporangia on the underside of leaves
 - holds seeds inside capsules until high rainfall stimulates them to germinate.
29. The azure butterfly, *Ogyris genoveva*, feeds on mistletoe in a coevolved relationship with:
- honey ants *Camponotus* which protect and farm the larvae for the honey glands on the tail
 - predatory ants which keep their numbers down to avoid over-exploiting the mistletoe
 - mistletoe birds, which learn the colour warnings of the distasteful butterfly
 - eucalypt leaves, which they mimic to avoid being eaten by birds.
30. The abrupt ecotone between savanna and rainforest in N. Australia is best explained by:
- soil change, moisture and weather
 - a climatic shift at the Pleistocene-Holocene boundary around 12,000 years ago
 - burning practices of the indigenous people to protect rainforests from devastating fire
 - intense grazing by stock.
31. Heathland species richness is maintained by regular fire cycles of 15-50 years because:
- without fire, it converts to woodland dominated by trees
 - too frequent fires removes shrubs and converts it to grassland
 - many heath species require intense fire to germinate seeds
 - all of these.
32. The mycorrhizal fungus in roots of heathland shrubs, has the vital ecosystem function of:

- a. nitrogen fixation
- b. phosphorous absorption
- c. nutrient storage
- d. decomposition.

33. Grasslands are the most endangered ecosystem mostly because of:

- a. the large proportion of exotic species
- b. the loss of human cultures that evolved with grasslands and burning, since the Pleistocene
- c. overgrazing by kangaroos and other wildlife
- d. invasion by trees, converting them to savannas.

34. The most widespread grass formation in Australia, forming mounds by accumulation of soil in perennial rhizomes is:

- a. hummock grasslands (H) of *Triodia*
- b. tussock grasslands (T) of Mitchell grass, *Astrebla*
- c. ephemeral grasses along watercourses, *Stipa* and *Aristida*
- d. exotic annual pastures of *Lolium* and *Phalaris*.

35. How does the thorny devil survive in the Australian arid zone?

- a. group social behaviour efficiently locates water
- b. it evolved to survive long periods without water
- c. eats ants & drinks dew from channels on its own skin, draining water into the mouth
- d. burrows into the sand and is dormant until rains come.

36. The United Nations program monitoring the conversion of semi-arid shrubland to arid deserts because of human poverty is known as:

- a. global grazing regimes
- b. land use management
- c. desertification
- d. pasture improvement programs.

37. The Lake Eyre dragon has these behavioural patterns for survival on vast inland salt lakes:

- a. it sheds skin quickly when rains arrive
- b. walks lightly on heels to avoid heat; waves briefly as mating display, avoiding predators
- c. flocks together to breed in large numbers
- d. remains dormant along watercourses until rains come.

38. Mulga trees and mulga ants in the arid outback demonstrate their coevolution by this:

- a. trees funnel water to ants
- b. ants bring nitrogen to trees
- c. both signal the coming rains
- d. seed arils and elaiosomes feed ants; ants disperse seeds, attack leaf-eaters and store sap.

39. The ten-inch rainfall line (250mm) is an abiotic factor that defines:

- a. the boundary of a geographic desert, worldwide
- b. the annual evaporation rate of a sclerophyll forest
- c. the ecotone between a forest and a woodland
- d. the abiotic minimum for animal survival in the desert

40. Vegetation zonation on low energy coastlines is caused by:

- a. salt concentrations of 3.5%, which is sea water salinity
- b. human disturbance and dumping of toxic waste
- c. tidal effects and microtopography, which sort soil particles and determine salt concentration

d. complex food webs responsible for nutrient transfer in coastal fisheries.

41. Riparian ecosystems are defined as:

- a. old farmlands returning to their original condition
- b. a distinct band of specialised, aquatic vegetation along a watercourse
- c. not distinguishable from the ecosystems adjacent to a watercourse
- d. the banks of waterways, including floodplains, that are affected by water flow.

42. The topographic land unit that collects all the rainfall that runs off into waterways is:

- a. riparian zone
- b. creek and river system
- c. the catchment
- d. a barrage.

43. A wetland is generally defined as:

- a. land that is covered by water for more than one month in the year
- b. land that has standing water for at least a week
- c. watercourses that have water flowing at regular intervals
- d. any place that has been affected by water at any time.

44. In which catchment does the Mawson Lakes wetlands reside?

- a. Onkaparinga
- b. Dry Creek
- c. Torrens
- d. Barker Inlet

45. *Rhizobium* bacteria are important for life on Earth because of their:

- a. deadly toxins produced in food
- b. decomposition of dead plants and animals
- c. phosphorus absorption for plant roots
- d. fixation of atmospheric N into the nitrogen cycle, inside legume nodules

46. The important ecological role of waterbirds in a riparian habitat is:

- a. rapid cycling of nutrients
- b. taxonomic diversity
- c. a valued source of ecotourism
- d. adaptive radiation

47. Grey mangrove communities occur in a narrow coastal zone controlled by:

- a. daily flushing by tidal flows, preventing buildup of salt
- b. crabs dispersing mangrove seeds
- c. soil type, a heavy, black silt
- d. nutrient poor habitat, where seagrass is not successful

48. The most important wetlands in the world were named because of the:

- a. Catchment Management Act
- b. Global Wetlands of Concern
- c. Ramsar Convention on Wetlands, 1971
- d. Greenfields Wetlands Report.

49. Pyric succession in wet sclerophyll forests of Tasmania:

- a. determines the time after fire required to produce timber logs of mountain ash
- b. is defined as the soil type with high fertility and high P

- c. describes weed management regimes where nutrients are high
- d. is a term used to describe ecotones in rainforests.

50. In the heathlands of sw WA, how would land managers keep wildflowers abundant for the tourism demand?

- a. irrigate wildflower areas to keep them productive
- b. burn every 3-4 years to prevent shrub invasion
- c. encourage forest canopy cover to protect them from wildfire
- d. introduce exotic insect pollinators.

51. What is the estimated fire frequency for the Adelaide Hills sclerophyll woodlands?

- a. 7-10 years, depending on rainfall
- b. 13 years, with cyclic regularity
- c. 15-25 years, depending on the understorey type
- d. >60 years, or preferably never

52. The disturbance regime for fire in any ecosystem is defined as:

- a. the area available for prescribed burning for fuel reduction
- b. the frequency, intensity and season predicted for fire
- c. the amount of erosion damage caused after a fire
- d. the quantity of fuel load and fire danger.

53. In S.A. legal requirements to control listed pest animals and plants are dictated by:

- a. the local Animal and Plant Control Boards (APC Act 1986)
- b. the local Natural Resource Management Boards (NRM Act 2004)
- c. national parks rangers using ecosystem management
- d. the Environment Court

54. Naturalised species are defined as:

- a. native species which occur in undisturbed bushland
- b. exotic weeds to be controlled in crop fields
- c. exotic weeds genetically modified by pesticides
- d. introduced species which are established in and adapted to natural ecosystems

PART III – General knowledge - Short, written answers (55-70)

(Find the correct number on the answer sheet and write short phrases in the boxes.)

55. What ecological services does mangrove leaf litter provide for the fishing industry? _____

56. Sketch the vegetation profile of a sandy dune coastline, showing how succession in space is an indicator of succession in time.

57. Name any traditional term for a land type formed by an old human culture: _____

58. In the progressive degradation of tussock grasslands by intensive grazing, the plant indicators of each stage in the sequence are: a. _____ b. _____ c. _____

59. In grassland ecosystems, what soil dwelling animal recycles most of the available nitrogen? ____

60. Contrast the different rhizome systems of the native grass, coastal *Spinifex sericeus*, against the exotic Marram grass, **Ammophila arenaria*, indicating the dune shapes created.

a. _____ b. _____

61. List four separate strategies of heathland shrubs that ensure survival in a harsh land.

a. _____ b. _____ c. _____ d. _____

62. Name the vegetation stages in pyric succession leading to rainforests in Victoria & Tas.

(a) _____ (b) _____ (c) _____ (d) _____ tall, closed
0 Fire year 12 - 25 years 50 - 70 yrs 100 - 300 yrs *Nothofagus*

63. What is the Plant Species Response Register and why was it developed? _____

64. List four types of plants normally restricted to a riparian zone.

a. _____ b. _____ c. _____ d. _____

65. Give four examples of beneficial functions of exotic weed species. a. _____

b. _____ c. _____ d. _____

66. List four successful strategies of pest species that allow them to dominate a niche.

a. _____ b. _____ c. _____ d. _____

67. Briefly describe what happened to farmlands created by draining natural floodplains (Kissimmee River, Murray River)

68. Name one native plant that is listed as a pest by legislation, stating the reason. _____

69. Describe two principles of restoration ecology that relates to community groups.

a. _____ b. _____

70. Xeric is the term used to describe _____