



Attempt questions first; check the separate key afterward. Use labelled diagrams where asked. Give scientific reasons; answer key covers closed questions.

A. Very short answers - 1 mark each

1. Define population density.
2. What is natality?
3. What is mortality?
4. Name the growth curve for unrestricted exponential growth.
5. Name the growth curve under logistic growth.
6. What does K denote in the logistic equation?
7. Name an interaction benefiting both species.
8. Name an interaction benefiting one species while harming the other.

B. Short answers / practice - 2 marks each

9. Distinguish individual attributes from population attributes.
10. Explain why biomass or percent cover can sometimes measure density better than numbers.
11. Describe expanding, stable and declining age pyramids.
12. Explain sex ratio as a population attribute.
13. Write the population-change equation including births, deaths, immigration and emigration.
14. Distinguish immigration and emigration.
15. Explain the assumptions of exponential growth.
16. Write and interpret $dN/dt=rN$.
17. Write and interpret the logistic growth equation.
18. Why do real environments impose carrying capacity?
19. Compare exponential and logistic growth.
20. Explain why population growth may slow as N approaches K.

C. Application / reasoning - 3 marks each

21. A population of 100 gains 20 births and 5 immigrants, with 8 deaths and 2 emigrants. Find final size.
22. In a population of 200, 40 births occur in one year. Find per-capita annual birth rate.
23. For $r=0.1/\text{year}$ and $N=500$, find instantaneous exponential growth rate.
24. For $r=0.2$, $N=100$, $K=200$, find logistic growth rate.
25. Describe predation's ecological roles beyond killing prey.
26. Explain prey defences with two examples.
27. State the competitive-exclusion principle and its conditions.
28. Explain resource partitioning with an example.
29. Describe parasitic adaptations and effects on hosts.
30. Distinguish commensalism and mutualism with examples.
31. Name the interaction in an orchid growing on a tree without measurable harm.

D. Extended practice - 5 marks each

32. Compare population-growth models using equations, graphs and assumptions.
33. Explain age structure, birth/death rates and migration with a numerical population case.
34. Compare six ecological interaction types using signs and examples.
35. Discuss how predation, competition and mutualism can shape community composition.

ANSWER KEY - Numerical / closed questions

- 2) Births per unit population per unit time. 3) Deaths per unit population per unit time. 4) J-shaped. 5) S-shaped/sigmoid. 6) Carrying capacity. 7) Mutualism. 8) Parasitism or predation. 21) 115. 22) 0.2/year. 23) 50 individuals/year. 24) 10 individuals per unit time. 31) Commensalism.