



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 an ecosystem.
2. What is gross primary productivity?
3. State the relation between NPP, GPP and respiration.
4. Name organisms chiefly responsible for decomposition.
5. What is detritus?
6. Which ecological pyramid is always upright?
7. Name the first trophic level.
8. Is energy flow through an ecosystem cyclic?

B. Short answers / practice - 2 marks each

9. Compare biotic and abiotic ecosystem components.
10. Explain standing crop and standing state.
11. Distinguish primary and secondary productivity.
12. State major factors affecting primary productivity.
13. Compare grazing and detritus food chains.
14. Explain why food webs are more realistic than isolated chains.
15. Describe fragmentation, leaching and catabolism during decomposition.
16. Differentiate humification and mineralisation.
17. Explain how temperature, moisture and oxygen affect decomposition.
18. Why do lignin-rich materials usually decompose slowly?
19. Explain energy losses between trophic levels.
20. State the ecological 10% transfer approximation and its limitations.

C. Application / reasoning - 3 marks each

21. GPP is 2500 and respiration 1000 $\text{g m}^{-2} \text{yr}^{-1}$. Find NPP.

22. Producers contain 20000 J. Estimate energy at secondary consumers using 10% transfer.

23. A trophic transfer has input 800 J and output 120 J. Find efficiency.

24. Explain why aquatic biomass pyramids can be inverted.

25. Compare pyramids of number, biomass and energy.

26. Why must time be included when representing energy flow?

27. Describe one limitation of ecological pyramids concerning omnivores.

28. Why are decomposers poorly represented in simple trophic pyramids?

29. Can one species occupy more than one trophic level?

30. Explain the functional role of consumers in nutrient movement.

31. Why does a large standing biomass not always imply a high current productivity rate?

D. Extended practice - 5 marks each

32. Describe ecosystem structure and function using a pond example.
33. Explain decomposition stages and controlling factors with a flow diagram.
34. Draw and interpret ecological pyramids, including valid inverted examples.
35. Trace energy through a food web and explain why energy recycling differs from nutrient recycling.

ANSWER KEY - Numerical / closed questions

- 2) Total rate of organic-matter production by producers. 3) $\text{NPP} = \text{GPP} - \text{R}$. 4) Bacteria and fungi. 5) Dead organic matter and associated debris. 6) Pyramid of energy. 7) Producers. 8) No; unidirectional. 21) $1500 \text{ g m}^{-2} \text{yr}^{-1}$. 22) 200 J. 23) 15%. 29) Yes.