



QUESTION WORKBOOK

Limiting factors and primary productivity

Photosynthesis and primary productivity · Unit B13

AQA 3.5.1, 3.5.3 · OCR A 5.2.1, 6.3.1 · Edexcel A Topic 5.6 · CAIE 13.2, 18.1

6 questions · 21 marks

PRINT EDITION

SECTION A · Short, 1 to 2 marks

- A1** State what is meant by a limiting factor, and state the units in which primary productivity is measured. [2]

SECTION B · Standard, 3 to 5 marks

- B1** A graph shows the rate of photosynthesis against light intensity, with three curves obtained at three different carbon dioxide concentrations. The curves lie on top of one another at low light intensity and level off at different heights. Explain how to identify the limiting factor in each region of this graph. [4]

- B2** In a grassland the gross primary productivity is $18\,000\text{ kJ m}^{-2}\text{ year}^{-1}$ and the producers lose $6\,000\text{ kJ m}^{-2}\text{ year}^{-1}$ in respiration. The primary consumers accumulate $1\,080\text{ kJ m}^{-2}\text{ year}^{-1}$. Calculate the net primary productivity and the percentage of it transferred to the primary consumers. [4]

B3 Explain why only about ten per cent of the energy in one trophic level reaches the level above it. [4]

B4 A grower runs carbon dioxide enrichment continuously in a glasshouse through a dull week in December and finds no increase in yield at all. Suggest why the enrichment failed to work, and suggest how the system should be run instead. [4]

B5 Explain what is happening to a plant at its compensation point, and explain why a shade plant on a woodland floor can survive there while a sun plant of open ground would not. [3]
