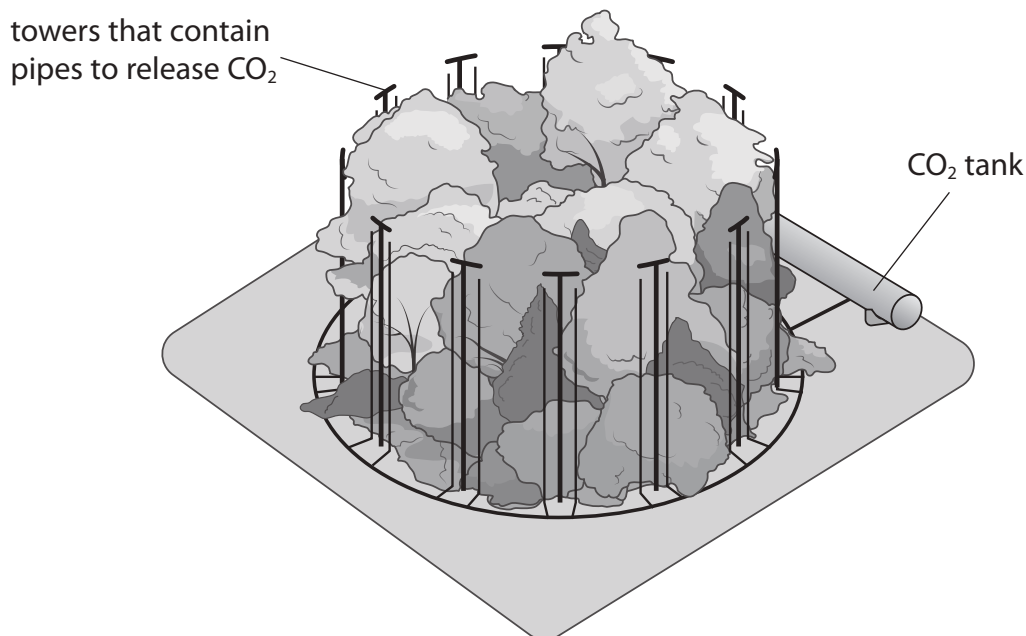


Answer ALL questions.

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

The FACE Programme



The global concentration of carbon dioxide (CO₂) in the atmosphere has risen by 35% since 1800. It is higher now than at any time in the past 25 million years and is predicted to increase further by 2050.

- 5 Free air carbon dioxide enrichment (FACE) is when scientists increase the concentration of CO₂ in the air surrounding crop plants. A typical FACE plot is circular and surrounded by a ring of pipes. These pipes release CO₂ at the base of the plant and all the way to the top of the plant. Wind direction, wind speed and CO₂ concentration are measured at the centre of each plot. A computer uses this information to maintain a high concentration of CO₂.
- 10 Plants do not just respond to increasing CO₂ in the atmosphere. They can also change the concentration of CO₂ by increasing the amount they absorb. Much of what we used to know about plant responses to rising CO₂ came from studies in glasshouses. However, in FACE experiments the effect of increasing CO₂ can be studied in a natural environment. This should provide a better idea of how plants and ecosystems will respond to higher global concentrations of CO₂.
- 15

- One of the effects of higher concentrations of CO₂ is an increase in the rate of photosynthesis. FACE experiments were done in various parts of the world using different plant species. In these experiments, raised CO₂ concentrations increased the rate of photosynthesis by about 40%. CO₂ concentrations also affect how open stomata are. Open stomata allow CO₂ to diffuse into leaves for photosynthesis, but also allow water to escape from leaves. Plants respond by changing how open their stomata are as a compromise. As CO₂ concentrations increase, plants can maintain a high rate of photosynthesis with a lower rate of transpiration. Growth with raised CO₂ decreases water loss by about 22%. This can have consequences for the water cycle of entire ecosystems.
- 20
- 25

In FACE experiments, dry mass production increased by about 30%. This increased growth leads to a greater yield in crops such as wheat, rice and soybean.

