

2011 AP[®] ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTIONS

- (c) In order to model the effects of ocean acidification on coral reefs, some simplifying assumptions can be made. Use the assumptions in the table below to perform the calculations that follow.

Assume that the total global area of corals growing in reefs is $2.5 \times 10^{11} \text{ m}^2$.
Assume that corals grow only vertically and that the average vertical growth rate of corals is 3 mm/year.
Assume that the average density of CaCO_3 in corals is $2 \times 10^3 \text{ kg/m}^3$.

- (i) Calculate the current annual global increase in volume, in m^3 , of CaCO_3 in coral reefs. Show all steps in your calculation.
 - (ii) Calculate the current annual global increase in mass, in kg, of CaCO_3 in coral reefs. Show all steps in your calculation.
 - (iii) Because of ocean acidification, it is expected that in 2050 the mass of CaCO_3 deposited annually in coral reefs will be 20 percent less than is deposited currently. Calculate how much less CaCO_3 , in kg, is expected to be deposited in 2050 than would be deposited if ocean water pH were to remain at its current value.
- (d) Identify and describe one likely negative environmental impact of the loss of coral reefs.
- (e) Identify one environmental problem (other than one due to ocean acidification or loss of coral reefs) that affects marine ecosystems on a global scale.