ANSWER ANSWER ANSWER

Round: 6A

1. Starting with the mixing of carbon dioxide and water, write out the balanced, stepwise reactions and the overall balanced reaction that represent the oceanic carbonate buffering system.

Stepwise Equations:

$H_2O + CO_2 \rightarrow H_2CO_3$ *(1 pt)*

$H_2CO_3 \rightarrow H^+ + HCO_3^-$ *(1 pt)*

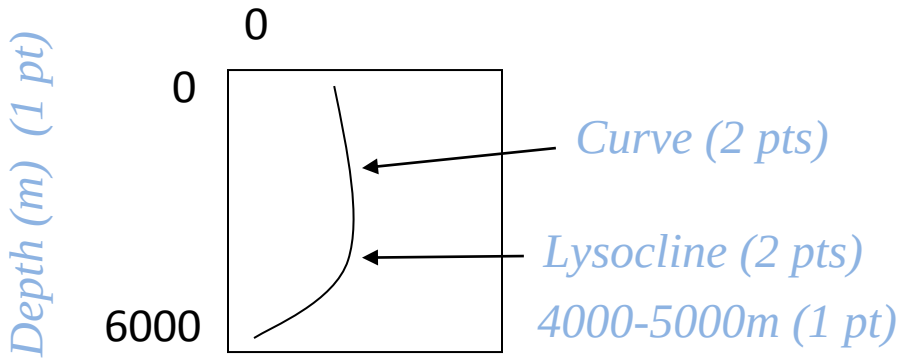
$H^+ + HCO_3^- \rightarrow 2\ H^+ + CO_3^{-2}$ *(1 pt)*

Balanced Equation:

$H_2O + CO_2 \rightarrow 2\ H^+ + CO_3^{-2}$ *(1 pt)*

2. Please plot a vertical profile of calcium carbonate concentration versus water depth in the Atlantic Ocean. Label all axes and indicate the lysocline at an appropriate depth.

Calcium carbonate concentration (2 pts)



3. How would the above plot appear in a more acidic ocean?

The lysocline would be at a shallower depth (3 pts) and the calcite concentrations would be reduced (3 pts)

4. What life stage of a sea urchin is most vulnerable to ocean acidification?

Larval OR Juvenile (2 pts)

References: Sverdrup, K A, A C Duxbury, and A B Duxbury. 2003. An Introduction to the World's Oceans. McGraw-Hill.
Medakovic, D. 2000 Carbonic anhydrase activity and biomineralization process in embryos, larvae and adult blue mussels Mytilus edulis L, Helgoland Marine Res., 54, 1–6.
Raven, J., Caldeira, K., Elderfield, H., Hoegh-Guldberg, O., Liss, P., Riebesell, U., Shepherd, J., Turley, C., and Watson, A. 2005. Ocean acidification due to increasing atmospheric carbon dioxide. The Royal Society policy document 12/05, The Cloyvedon Press, Cardiff, 58 pp.