

Round: 3A

The dominant forms of nitrogen and phosphorous in the ocean are nitrate (NO_3) and phosphate (PO_4^{3-}) respectively.

1. You analyze surface seawater from the equatorial Pacific and find it contains 5 $\mu\text{mol/L}$ nitrate and 1 $\mu\text{mol/L}$ phosphate.

a) If you take this seawater, give it plenty of light, and remove the grazers, which nutrient, N or P, do you expect to be used up first by phytoplankton? Why?

- Nitrate will be used up first (3 pts).
- 1 $\mu\text{mol/L}$ phosphate uses up 16 $\mu\text{mol/L}$ nitrate (2 pts).
- Since there are only 5 $\mu\text{mol/L}$ nitrate in the sample of seawater, N will be the limiting nutrient (2 pts).
- Calculations are based on the Redfield Ratio (106:16:1) (1 pt)

b) What would you expect to observe in terms of nutrient concentrations if the experiment were performed in the dark?

Light is needed for phytoplankton growth (2 pts); in the dark, nutrients will be underutilized (2 pts)

2. When you perform the experiment described above in Question 1a, you may not observe any growth or depletion of N or P. Give two explanations for this.

- *Sample may have come from a depth where light was not available for phytoplankton growth (4 pts)*
- *The area of the equatorial Pacific could lack the nutrient iron (Fe limiting). (4 pts)*