

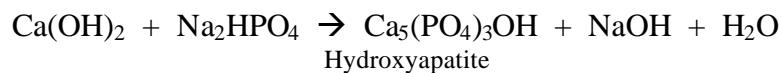


**Chemistry 113 – Chemistry and the Environment**  
**Take-Home Quiz 1 (January 11, 2002)**  
**Due at the beginning of class Monday, January 14, 2002**

4. (8 pts) Determine the molecular weight of a common insecticide which has been found to be a nasty pollutant. It has the formula  $C_5CCH(C_6H_4Cl)_2$ .
5. (10 pts) It has been stated many times that oxygen is 21% of our air by volume. Calculate the percent oxygen by mass.
6. (15 pts) Write balanced chemical equations to represent the following reactions:
- The complete combustion of butyric acid ( $C_4H_8O_2$ ), a compound produced when butter becomes rancid
  - The decomposition of calcium hydrogen carbonate [ $Ca(HCO_3)_2$ ], upon heating, into calcium oxide, dihydrogen oxide and carbon dioxide.
  - A combination reaction between molecular hydrogen and molecular nitrogen to form trihydrogen nitride.

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7. (6 pts) A common reaction in sewage treatment plants to get rid of phosphates is using limewater to precipitate out the phosphate into hydroxyapatite (what your teeth are made out of) as shown below:



Balance this equation.

8. (10 pts) According to your periodic table, the atomic mass of bromine is 79.904 amu. However, no bromine with a mass of ~80 amu is known, rather only masses of 78.9183 amu and 80.9163 amu are known. Determine the number of protons and neutrons in each and calculate the relative abundances of each species.
9. (12 pts) Draw all of the resonance structures of  $\text{N}_2\text{O}_4$  (each N atom is bonded to two O atoms and to the other N atom)

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10. (15 pts) It has been suggested that if you could mark every molecule of water in a tablespoon and dump it in the ocean, come back a year later and withdraw a tablespoon, that you would reclaim one of those marked water molecules. A tablespoon has 10 g of water and there are  $6.02 \times 10^{23}$  molecules in 18 g of water. Also, one source says that there are  $1.34 \times 10^9$  km<sup>3</sup> of ocean water. Consider the density of water to be 1.00 g/mL. Evaluate this proclamation.