

1.9 Handout (Lungs)

For each of the following parameter values, (a) set up a discrete dynamical system for the concentration of a chemical in the ambient air, assuming none of the chemical is present initially in the lungs. (b) Make a cobweb showing four steps. (c) Find the equilibrium concentration, and verify it agrees with γ .

1. $V = 2.0$ L, $W = 0.5$ L, $\gamma = 5.0$ mmol/L

2. $V = 1.0$ L, $W = 0.9$ L, $\gamma = 1.0$ mmol/L

1.10 Handout (Non-linear Dynamics)

1. Again consider the mutation of fast zombies from the slow, meandering zombies. Assume that the slow zombies grow by 15% each day, while the fast ones grow by 30% each day. Write down the discrete dynamical system for the fraction of slow zombies in the total population of zombies. Make a cobweb diagram with four steps of a population with 80% of the zombies initially being slow.
2. Suppose some bacteria in a bacteria colony mutate. Let b_t be the first bacteria, and let m_t be the mutated bacteria. Assume the original bacteria double in population every hour, while the mutated bacteria grows by a factor of 2.5 per hour. Write down a DDS for the fraction p_t of mutated bacteria in the whole bacteria population. Make a cobweb diagram with four steps assuming 90% of the bacteria were unmutated.