7. [13 points] A company designs an air filter for a ship’s engine room that reduces the amount of fumes in the air by \( k \) percent every hour. The machinery in the engine room produces fumes at a rate of 0.02 kilograms per hour. Let \( Q(t) \) be the amount in kilograms of fumes in the room \( t \) hours after the engines are activated. Hence \( Q \) satisfies

\[
\frac{dQ}{dt} = 0.02 - \frac{k}{100}Q.
\]

a. [9 points] Find a formula for \( Q(t) \). Suppose there are no fumes in the air when the engines are activated.

b. [2 points] What is the value of \( Q(t) \) in the long run?

c. [2 points] Air safety regulations require that the concentration of fumes in the air not exceed \( 10^{-4} \) kilograms per liter at any time. If the volume of air in the engine room is \( 10^3 \) liters, for what values of \( k \) are the safety regulations met at all times?