import matplotlib.pyplot as plt

# Initial values

A = 100.0  # grams

B = 50.0   # grams

C = 0.0    # grams

k1 = 0.008

k2 = 0.002

dt = 0.1   # time step

time = 0.0

# Lists to store values for plotting

time\_list = [time]

A\_list = [A]

B\_list = [B]

C\_list = [C]

# Simulation loop

while A > 0 and B > 0:

    rate = k1 \* A \* B - k2 \* C

    dC = rate \* dt

    # Update amounts

    C += dC

    A -= dC

    B -= dC

    time += dt

    # Store values

    time\_list.append(time)

    A\_list.append(A)

    B\_list.append(B)

    C\_list.append(C)

# Print final result

print(f"Final Time: {time:.2f} seconds")

print(f"A: {A:.2f} g, B: {B:.2f} g, C: {C:.2f} g")

# Plot the results

plt.figure(figsize=(10, 6))

plt.plot(time\_list, A\_list, label='Substance A', color='blue')

plt.plot(time\_list, B\_list, label='Substance B', color='orange')

plt.plot(time\_list, C\_list, label='Substance C', color='green')

plt.xlabel("Time (seconds)")

plt.ylabel("Amount (grams)")

plt.title("Simulation of Chemical Reaction: A + B → C")

plt.legend()

plt.grid(True)

plt.show()