```
final simplex: (array([[6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00, 4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987825e+00,
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936501e+04, 3.59456100e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987825e+00,
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456100e-03, 1.24962710e+00,
                                                                                   \begin{array}{l} 6.83835638e+02,\ 3.24643802e+04,\ 4.73376905e-04,\ 4.94987826e+00,\\ 6.32148081e-01,\ 9.72768210e-01,\ 2.64017386e+00,\ 1.91933916e+00], \end{array}
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00, 1.09654125e+00]
                                                                                   4.08702752e+03, 2.85936501e+04, 3.59456100e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987825e+00,
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
     inducer -> sensor (GFP output)
                                                                                   4.08702752e+03, 2.8593650 e++04Converged 9 e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802<u>e+0</u>4Converged 5e-04, 4.94987826e+00,
                                                       10^{4}
                                                                                  6.32148081e-01, 9.72768210e-01, 2.441796e+00, 1.91933916e+00], [6.18047086e+02, 1.6278856e+0 Converged 79e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936499e+04, 3.59456098e-03, 1.24962710e+00,
                                                   6 \times 10^{3}
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00, 6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                   4 \times 10^{3}
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.$5936500e+04, 3.59456100e-03, 1.24962710e+00,
                                                   3 \times 10^{3}
                                                                                   _6.83835638e+02, 3.‡4643802e+04, 4.73376905e-04, 4.94987826e+00,
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  16<u>18047086e+02,1.6</u>2788566e+04,1.30065379e+03,1.09654125e+00,
408702<del>7</del>92e+03,2.85936500e+04,3.59456099e-03,1.24962710e+00,
                               10-2
                                                            10<sup>-5</sup>
        10^{-4}
                    10-3
                                          10^{-1}
                                                                      10^{-4}
                                                                     inducer -> S -| Output (GFP)
                                                   6 \times 10^{3}
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.$5936501e+04, 3.59456101e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
                                                                                     .32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                   4 \times 10^{3}
                                                                                   6.10047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                     .08792752e+03, 2.85936501e+04, 3.59456100e-03, 1.24962710e+00,
                                                                                   6\83835638e+02, 3.\24643802e+04, 4.73376905e-04, 4.94987826e+00,
                                                   3 \times 10^{3}
                                                                                  6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00], [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                                                                                   4.08702752e+03, 2.85936501e+04, 3.59456100e-03, 1.24962710e+00,
                                                                                  \begin{array}{l} 6.83835638e \pm 07, 3.24643802e \pm 04, 4.73376905e \pm 04, 4.94987825e \pm 00, \\ 6032148981e \pm 01, 19, 72768210e \pm 01, 2.64017386e \pm 00, 1.91933916e \pm 00], \\ [6.18047086e \pm 02, 1.62788566e \pm 04, 1.30065379e \pm 03, 1.09654125e \pm 00, \\ \end{array}
                                                            10^{-5}
                               10^{-2}
                                           10^{-1}
                                                                       10^{-4}
         10^{-4}
                    10^{-3}
       Across all four plots:
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
         RSS (converged)=0.158
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
         RSS (initial)=1.463
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
         RSS (% reduction)=0.903
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00],
                                                                                  [6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
                epsilon Initial guesses
                                                  Converged
                                                                                   4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
              0.000000
                                618.047086 618.047086
                                                                                   6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
              0.000000
                               16278.856600 16278.856600
                                                                                   6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00]), array([0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773
                               1300.653790 1300.653790
              0.000000
                                                                                  0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401,
              0.000000
                                  1.096541
                                                 1.096541
                                                                                  0.15773401, 0.15773401, 0.15773401, 0.15773401, 0.15773401,
      A r 2170.851906
                                 1916.175610 4087.027516
                                                                                  0.15773401, 0.15773401]))
                                 18874.240800 28593.649998
      B r 9719.409198
                                                                                     fun: 0.15773401438570245
                                 0.009030
             -0.005436
                                                   0.003595
                                                                                  message: 'Optimization terminated successfully.'
                                 0.820433
              0.429194
                                                   1.249627
                                                                                    nfev: 4067
              0.000000
                                 683.835638
                                                  683.835638
                                                                                     nit: 2866
              0.000000
                               32464.380200 32464.380200
                                                                                   status: 0
                                  0.000473
              0.000000
                                                   0.000473
                                                                                  success: True
              2.128527
                                  2.821352
                                                   4.949878
                                                                                       x: array([6.18047086e+02, 1.62788566e+04, 1.30065379e+03, 1.09654125e+00,
              0.000000
                                  0.632148
                                                   0.632148
                                                                                  4.08702752e+03, 2.85936500e+04, 3.59456099e-03, 1.24962710e+00,
              0.000000
                                  0.972768
                                                   0.972768
                                                                                  6.83835638e+02, 3.24643802e+04, 4.73376905e-04, 4.94987826e+00,
              0.000000
                                  2.640174
                                                    2.640174
                                                                                  6.32148081e-01, 9.72768210e-01, 2.64017386e+00, 1.91933916e+00])
```

 $10^{4}$ 

 $10^{3}$ 

 $10^{4}$ 

 $10^{3}$ 

 $10^{-5}$ 

Bs

C s

 $N_s$ 

Сr

Νr

Βh

Ch

Fο

Αо

Во

Со

0.000000

1.919339

1.919339