

Question 1) What is the air exchange rate ( $\lambda$ ) of the room you tested? Be sure to include the units for the air exchange rate in your answer.

Answer 1) The air exchange rate of the room tested is 0.4573/hours.

Question 2) In general it takes  $3/\lambda$  hours to remove a non-reactive chemical from indoor air. Based on this time, what recommendations would you make to the occupants of the room?

Answer 2) I would make the following recommendations to the occupants of the room: keep the window open, use a fan to improve ventilation, and try to avoid using candles or any thing with a flame.

Question 3) Compare your ventilation rate for a typical number of occupants to the ASHRAE recommended ventilation rate. Based on this comparison, are the occupants wasting energy heating and cooling the air or are the occupants being too cheap and not supplying enough air? Justify your answer.

Answer 3) The ventilation rate in the room is  $0.33\text{ft}^3/\text{minute}/\text{person}$  for two people in the room, therefore the occupants of the room are being too cheap and are not supplying enough air because the ventilation rate in the room is super low compared to ASHRAE's standard of  $15\text{ft}^3/\text{minute}/\text{person}$ .

Question 4) Given the ASHRAE standard ventilation standard, what is the maximum number of people you would recommend having in this room at one time? Use your model to determine this number.

Answer 4) I would recommend the maximum number of people in the room be 2, if the window is open.

Chris Bautista
ENGR 115
11:00am-1:50pm
4/1/2016

Input Parameters	
Measured Coutdoor	443.89
Assumed Coutdoor	400.00
Correction Factor	-43.89
Room Volume[ft^3]	86.68
RoomCapacity[people]	2.00

Calculations:	
Air Exchange Rate [1/hr]	0.46
Time to Remove non-reactive chemical [hr]	6.56
Ventilation Rate [ft^3/min/person]	0.33

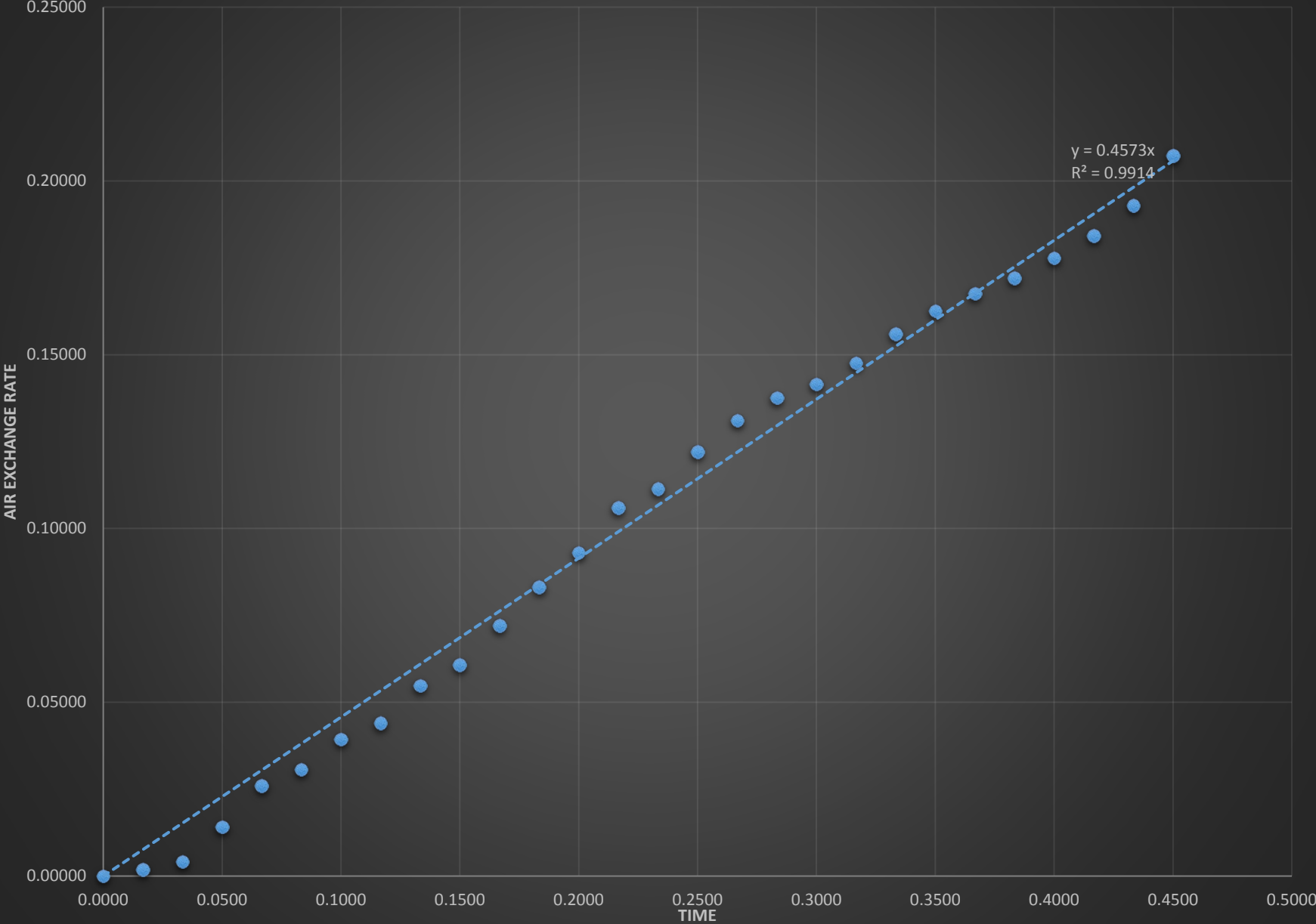
Analysis		
Measurement	Date and Time	Hobo CO2 Concentration
0	4/1/2016 12:23	2058.6
1	4/1/2016 12:24	2055.6
2	4/1/2016 12:25	2051.9
3	4/1/2016 12:26	2036.0
4	4/1/2016 12:27	2017.1
5	4/1/2016 12:28	2009.8
6	4/1/2016 12:29	1996.3
7	4/1/2016 12:30	1989.0
8	4/1/2016 12:31	1972.5
9	4/1/2016 12:32	1963.4
10	4/1/2016 12:33	1946.3
11	4/1/2016 12:34	1929.8
12	4/1/2016 12:35	1915.1
13	4/1/2016 12:36	1896.2
14	4/1/2016 12:37	1888.3
15	4/1/2016 12:38	1873.0
16	4/1/2016 12:39	1860.2
17	4/1/2016 12:40	1851.0
18	4/1/2016 12:41	1845.5
19	4/1/2016 12:42	1837.0

20	4/1/2016 12:43	1825.4
21	4/1/2016 12:44	1816.2
22	4/1/2016 12:45	1809.5
23	4/1/2016 12:46	1803.4
24	4/1/2016 12:47	1795.5
25	4/1/2016 12:48	1786.9
26	4/1/2016 12:49	1775.3
27	4/1/2016 12:50	1756.4

Actual CO2 Concentration [ppm]	Experiment Time[hr]	$-\ln[(C_{\text{room}}(t) - C_{\text{outside}})/(C(0) - C_{\text{outside}})]$
2014.7	0.0000	0.00000
2011.7	0.0167	0.00186
2008.0	0.0333	0.00416
1992.1	0.0500	0.01410
1973.2	0.0667	0.02604
1965.9	0.0833	0.03069
1952.4	0.1000	0.03935
1945.1	0.1167	0.04406
1928.6	0.1333	0.05480
1919.5	0.1500	0.06077
1902.4	0.1667	0.07208
1885.9	0.1833	0.08313
1871.2	0.2000	0.09307
1852.3	0.2167	0.10600
1844.4	0.2333	0.11145
1829.1	0.2500	0.12210
1816.3	0.2667	0.13110
1807.1	0.2833	0.13762
1801.6	0.3000	0.14153
1793.1	0.3167	0.14762

1781.5	0.3333	0.15598
1772.3	0.3500	0.16266
1765.6	0.3667	0.16755
1759.5	0.3833	0.17203
1751.6	0.4000	0.17786
1743.0	0.4167	0.18424
1731.4	0.4333	0.19292
1712.5	0.4500	0.20721

Chart Title



Plot Title: Romero's Room

#	Date Time, GMT-07:00	CO2, ppm (LGR S/N: 10132813, SEN S/N: 10132813, Host Connected)
1	4/1/2016 11:42	807.1
2	4/1/2016 11:43	633.7
3	4/1/2016 11:44	486.6
4	4/1/2016 11:45	468.3
5	4/1/2016 11:46	460.3
6	4/1/2016 11:47	434.7
7	4/1/2016 11:48	456
8	4/1/2016 11:49	707
9	4/1/2016 11:50	1037.2
10	4/1/2016 11:51	1264.3
11	4/1/2016 11:52	1187.4
12	4/1/2016 11:53	1182.5
13	4/1/2016 11:54	1182.5
14	4/1/2016 11:55	1235
15	4/1/2016 11:56	1288.8
16	4/1/2016 11:57	1333.9
17	4/1/2016 11:58	1371.2
18	4/1/2016 11:59	1426.7
19	4/1/2016 12:00	1448.1
20	4/1/2016 12:01	1484.1
21	4/1/2016 12:02	1513.4
22	4/1/2016 12:03	1553.1
23	4/1/2016 12:04	1583
24	4/1/2016 12:05	1617.2
25	4/1/2016 12:06	1656.3
26	4/1/2016 12:07	1691.7
27	4/1/2016 12:08	1731.4
28	4/1/2016 12:09	1752.1
29	4/1/2016 12:10	1771.7
30	4/1/2016 12:11	1806.5
31	4/1/2016 12:12	1824.2
32	4/1/2016 12:13	1845.5
33	4/1/2016 12:14	1859
34	4/1/2016 12:15	1890.1
35	4/1/2016 12:16	1917
36	4/1/2016 12:17	1946.9
37	4/1/2016 12:18	1979.2
38	4/1/2016 12:19	2011.6
39	4/1/2016 12:20	2023.8
40	4/1/2016 12:21	2047
41	4/1/2016 12:22	2056.2
42	4/1/2016 12:23	2058.6
43	4/1/2016 12:24	2055.6
44	4/1/2016 12:25	2051.9
45	4/1/2016 12:26	2036

46	4/1/2016 12:27	2017.1
47	4/1/2016 12:28	2009.8
48	4/1/2016 12:29	1996.3
49	4/1/2016 12:30	1989
50	4/1/2016 12:31	1972.5
51	4/1/2016 12:32	1963.4
52	4/1/2016 12:33	1946.3
53	4/1/2016 12:34	1929.8
54	4/1/2016 12:35	1915.1
55	4/1/2016 12:36	1896.2
56	4/1/2016 12:37	1888.3
57	4/1/2016 12:38	1873
58	4/1/2016 12:39	1860.2
59	4/1/2016 12:40	1851
60	4/1/2016 12:41	1845.5
61	4/1/2016 12:42	1837
62	4/1/2016 12:43	1825.4
63	4/1/2016 12:44	1816.2
64	4/1/2016 12:45	1809.5
65	4/1/2016 12:46	1803.4
66	4/1/2016 12:47	1795.5
67	4/1/2016 12:48	1786.9
68	4/1/2016 12:49	1775.3
69	4/1/2016 12:50	1756.4
70	4/1/2016 12:51	1310.7
71	4/1/2016 12:52	1280.8
72	4/1/2016 12:53	1283.3
73	4/1/2016 12:54	1055.6
74	4/1/2016 12:55	486
75	4/1/2016 12:56	456
76	4/1/2016 12:57	448.1
77	4/1/2016 12:58	446.9
78	4/1/2016 12:59	441.4
79	4/1/2016 13:00	440.2
80	4/1/2016 13:01	436.5
81	4/1/2016 13:02	440.2
82	4/1/2016 13:03	437.7
83	4/1/2016 13:04	433.5
84	4/1/2016 13:05	446.3
85	4/1/2016 13:06	454.8
86	4/1/2016 13:07	445.1
87	4/1/2016 13:08	481.1
88	4/1/2016 13:09	Logged
89	4/1/2016 13:09	487.2
90	4/1/2016 13:10	



Stopped (L) End Of File (LGR S/N: 10132813)



Chris Bautista
ENGR 115
11:00am-1:50pm
4/1/2016

Input Parameters	
Measured Coutdoor	443.89
Assumed Coutdoor	400
Correction Factor	-43.89

Analysis		
Measurement	Date	Time
1	4/1/2016	11:42:57 AM
2	4/1/2016	11:43:57 AM
3	4/1/2016	11:44:57 AM
4	4/1/2016	11:45:57 AM
5	4/1/2016	11:46:57 AM
6	4/1/2016	11:47:57 AM
7	4/1/2016	11:48:57 AM
8	4/1/2016	11:49:57 AM
9	4/1/2016	11:50:57 AM
10	4/1/2016	11:51:57 AM
11	4/1/2016	11:52:57 AM
12	4/1/2016	11:53:57 AM
13	4/1/2016	11:54:57 AM
14	4/1/2016	11:55:57 AM
15	4/1/2016	11:56:57 AM
16	4/1/2016	11:57:57 AM
17	4/1/2016	11:58:57 AM
18	4/1/2016	11:59:57 AM
19	4/1/2016	12:00:57 PM
20	4/1/2016	12:01:57 PM
21	4/1/2016	12:02:57 PM
22	4/1/2016	12:03:57 PM
23	4/1/2016	12:04:57 PM
24	4/1/2016	12:05:57 PM
25	4/1/2016	12:06:57 PM
26	4/1/2016	12:07:57 PM
27	4/1/2016	12:08:57 PM
28	4/1/2016	12:09:57 PM
29	4/1/2016	12:10:57 PM
30	4/1/2016	12:11:57 PM
31	4/1/2016	12:12:57 PM
32	4/1/2016	12:13:57 PM
33	4/1/2016	12:14:57 PM

34	4/1/2016	12:15:57 PM
35	4/1/2016	12:16:57 PM
36	4/1/2016	12:17:57 PM
37	4/1/2016	12:18:57 PM
38	4/1/2016	12:19:57 PM
39	4/1/2016	12:20:57 PM
40	4/1/2016	12:21:57 PM
41	4/1/2016	12:22:57 PM
42	4/1/2016	12:23:57 PM
43	4/1/2016	12:24:57 PM
44	4/1/2016	12:25:57 PM
45	4/1/2016	12:26:57 PM
46	4/1/2016	12:27:57 PM
47	4/1/2016	12:28:57 PM
48	4/1/2016	12:29:57 PM
49	4/1/2016	12:30:57 PM
50	4/1/2016	12:31:57 PM
51	4/1/2016	12:32:57 PM
52	4/1/2016	12:33:57 PM
53	4/1/2016	12:34:57 PM
54	4/1/2016	12:35:57 PM
55	4/1/2016	12:36:57 PM
56	4/1/2016	12:37:57 PM
57	4/1/2016	12:38:57 PM
58	4/1/2016	12:39:57 PM
59	4/1/2016	12:40:57 PM
60	4/1/2016	12:41:57 PM
61	4/1/2016	12:42:57 PM
62	4/1/2016	12:43:57 PM
63	4/1/2016	12:44:57 PM
64	4/1/2016	12:45:57 PM
65	4/1/2016	12:46:57 PM
66	4/1/2016	12:47:57 PM
67	4/1/2016	12:48:57 PM
68	4/1/2016	12:49:57 PM
69	4/1/2016	12:50:57 PM
70	4/1/2016	12:51:57 PM
71	4/1/2016	12:52:57 PM
72	4/1/2016	12:53:57 PM
73	4/1/2016	12:54:57 PM
74	4/1/2016	12:55:57 PM
75	4/1/2016	12:56:57 PM
76	4/1/2016	12:57:57 PM
77	4/1/2016	12:58:57 PM
78	4/1/2016	12:59:57 PM
79	4/1/2016	1:00:57 PM
80	4/1/2016	1:01:57 PM

81	4/1/2016	1:02:57 PM
82	4/1/2016	1:03:57 PM
83	4/1/2016	1:04:57 PM
84	4/1/2016	1:05:57 PM
85	4/1/2016	1:06:57 PM
86	4/1/2016	1:07:57 PM
87	4/1/2016	1:08:57 PM
88	4/1/2016	1:09:57 PM
89	4/1/2016	1:10:57 PM
90	4/1/2016	1:11:57 PM

Hobo CO2 Concentration	Actual CO2 Concentration [ppm]
807.1	850.99
633.7	677.59
486.6	530.49
468.3	512.19
460.3	504.19
434.7	478.59
456	499.89
707	750.89
1037.2	1081.09
1264.3	1308.19
1187.4	1231.29
1182.5	1226.39
1182.5	1226.39
1235	1278.89
1288.8	1332.69
1333.9	1377.79
1371.2	1415.09
1426.7	1470.59
1448.1	1491.99
1484.1	1527.99
1513.4	1557.29
1553.1	1596.99
1583	1626.89
1617.2	1661.09
1656.3	1700.19
1691.7	1735.59
1731.4	1775.29
1752.1	1795.99
1771.7	1815.59
1806.5	1850.39
1824.2	1868.09
1845.5	1889.39
1859	1902.89

1890.1	1933.99
1917	1960.89
1946.9	1990.79
1979.2	2023.09
2011.6	2055.49
2023.8	2067.69
2047	2090.89
2056.2	2100.09
2058.6	2102.49
2055.6	2099.49
2051.9	2095.79
2036	2079.89
2017.1	2060.99
2009.8	2053.69
1996.3	2040.19
1989	2032.89
1972.5	2016.39
1963.4	2007.29
1946.3	1990.19
1929.8	1973.69
1915.1	1958.99
1896.2	1940.09
1888.3	1932.19
1873	1916.89
1860.2	1904.09
1851	1894.89
1845.5	1889.39
1837	1880.89
1825.4	1869.29
1816.2	1860.09
1809.5	1853.39
1803.4	1847.29
1795.5	1839.39
1786.9	1830.79
1775.3	1819.19
1756.4	1800.29
1310.7	1354.59
1280.8	1324.69
1283.3	1327.19
1055.6	1099.49
486	529.89
456	499.89
448.1	491.99
446.9	490.79
441.4	485.29
440.2	484.09
436.5	480.39

440.2	484.09
437.7	481.59
433.5	477.39
446.3	490.19
454.8	498.69
445.1	488.99
481.1	524.99
	43.89
487.2	531.09
	43.89



## CO2 Concentration Graph

