

Uthman Alnuman, ERE

12/9/2016

Coverletter

In this lab I calculated the area (length and width) of a dorm room in Sunset Hall. I then installed a device that I kept running in the room for 2hrs to measure the amount of CO₂ in the room. Using both the room area measurements and the results from the device we installed, to check whether the CO₂ amount in the room is within the recommended average by ASHRAE standards. Later, I created a spreadsheet of all the data collected and illustrated the data in graphs making it easier to interpret it. Lastly, I stated some recommendations to improve the air quality in the room.

| |
|----------------|
| Uthman Alnuman |
| ENGR 115 |
| 10/20/2016 |

| | |
|-------------------------|-----|
| Input Parameters: | |
| Measured Outdoor [ppm] | 490 |
| Assumed Countdoor [ppm] | 400 |
| Correction Factor [ppm] | -90 |
| Room capacity | 3 |
| Analysis | |

| | | | | this(x) | this(y) |
|-------------|------------------|--------------------------|------------------------|---------------------|---|
| Measurement | Date and Time | Actual CO2 Concentration | Hobo CO2 Concentration | Experiment Time[hr] | $\ln ((C_{room}(t)-c_{outdoor}))/((C_o-C_{outdoor}))$ |
| 1 | 10/20/2016 14:43 | 809.3 | 899.3 | 0.016666667 | 0 |
| 2 | 10/20/2016 14:44 | 803.8 | 893.8 | 0.033333333 | 0.013528678 |
| 3 | 10/20/2016 14:45 | 794.6 | 884.6 | 0.05 | 0.03657579 |
| 4 | 10/20/2016 14:46 | 476.5 | 566.5 | 0.066666667 | 1.677157643 |
| 5 | 10/20/2016 14:47 | 419.8 | 509.8 | 0.083333333 | 3.028766446 |
| 6 | 10/20/2016 14:48 | 421.6 | 511.6 | 0.1 | 2.941755069 |
| 7 | 10/20/2016 14:49 | 419.8 | 509.8 | 0.116666667 | 3.028766446 |
| 8 | 10/20/2016 14:50 | 419.8 | 509.8 | 0.133333333 | 3.028766446 |
| 9 | 10/20/2016 14:51 | 403.3 | 493.3 | 0.15 | 4.820525915 |
| 10 | 10/20/2016 14:52 | 400.2 | 490.2 | 0.166666667 | 7.623886296 |
| 11 | 10/20/2016 14:53 | 406.3 | 496.3 | 0.183333333 | 4.17389875 |
| 12 | 10/20/2016 14:54 | 574.2 | 664.2 | 0.2 | 0.854244319 |
| 13 | 10/20/2016 14:55 | 620 | 710 | 0.216666667 | 0.620820837 |
| 14 | 10/20/2016 14:56 | 618.8 | 708.8 | 0.233333333 | 0.626290313 |
| 15 | 10/20/2016 14:57 | 620 | 710 | 0.25 | 0.620820837 |
| 16 | 10/20/2016 14:58 | 654.2 | 744.2 | 0.266666667 | 0.476327025 |
| 17 | 10/20/2016 14:59 | 715.3 | 805.3 | 0.283333333 | 0.260923817 |
| 18 | 10/20/2016 15:00 | 825.1 | 915.1 | 0.3 | -0.037876052 |
| 19 | 10/20/2016 15:01 | 839.2 | 929.2 | 0.316666667 | -0.070506507 |
| 20 | 10/20/2016 15:02 | 916.7 | 1006.7 | 0.333333333 | -0.233014052 |
| 21 | 10/20/2016 15:03 | 949.1 | 1039.1 | 0.35 | -0.293832191 |
| 22 | 10/20/2016 15:04 | 999.7 | 1089.7 | 0.366666667 | -0.381981147 |
| 23 | 10/20/2016 15:05 | 1027.8 | 1117.8 | 0.383333333 | -0.427773261 |
| 24 | 10/20/2016 15:06 | 1109 | 1199 | 0.4 | -0.549407143 |
| 25 | 10/20/2016 15:07 | 1139.5 | 1229.5 | 0.416666667 | -0.591525899 |
| 26 | 10/20/2016 15:08 | 1167.6 | 1257.6 | 0.433333333 | -0.628820381 |
| 27 | 10/20/2016 15:09 | 1209.1 | 1299.1 | 0.45 | -0.681474135 |
| 28 | 10/20/2016 15:10 | 1247.6 | 1337.6 | 0.466666667 | -0.727960443 |
| 29 | 10/20/2016 15:11 | 1303.8 | 1393.8 | 0.483333333 | -0.792159713 |
| 30 | 10/20/2016 15:12 | 1338 | 1428 | 0.5 | -0.829301566 |
| 31 | 10/20/2016 15:13 | 1477.8 | 1567.8 | 0.516666667 | -0.968228822 |
| 32 | 10/20/2016 15:14 | 1474.1 | 1564.1 | 0.533333333 | -0.964789997 |
| 33 | 10/20/2016 15:15 | 1490 | 1580 | 0.55 | -0.979484592 |
| 34 | 10/20/2016 15:16 | 1555.3 | 1645.3 | 0.566666667 | -1.037666946 |

| | | | | | |
|----|------------------|--------|--------|-------------|--------------|
| 35 | 10/20/2016 15:17 | 1577.9 | 1667.9 | 0.583333333 | -1.057040087 |
| 36 | 10/20/2016 15:18 | 1593.2 | 1683.2 | 0.6 | -1.069945669 |
| 37 | 10/20/2016 15:19 | 1595 | 1685 | 0.616666667 | -1.071453081 |
| 38 | 10/20/2016 15:20 | 1593.2 | 1683.2 | 0.633333333 | -1.069945669 |
| 39 | 10/20/2016 15:21 | 1582.8 | 1672.8 | 0.65 | -1.061191404 |
| 40 | 10/20/2016 15:22 | 1583.4 | 1673.4 | 0.666666667 | -1.061698547 |
| 41 | 10/20/2016 15:23 | 1577.3 | 1667.3 | 0.683333333 | -1.056530577 |
| 42 | 10/20/2016 15:24 | 1574.2 | 1664.2 | 0.7 | -1.05389396 |
| 43 | 10/20/2016 15:25 | 1573 | 1663 | 0.716666667 | -1.052871465 |
| 44 | 10/20/2016 15:26 | 1568.1 | 1658.1 | 0.733333333 | -1.048685393 |
| 45 | 10/20/2016 15:27 | 1557.7 | 1647.7 | 0.75 | -1.039742174 |
| 46 | 10/20/2016 15:28 | 1550.4 | 1640.4 | 0.766666667 | -1.033416603 |
| 47 | 10/20/2016 15:29 | 1543.1 | 1633.1 | 0.783333333 | -1.027050766 |
| 48 | 10/20/2016 15:30 | 1538.2 | 1628.2 | 0.8 | -1.022754963 |
| 49 | 10/20/2016 15:31 | 1533.3 | 1623.3 | 0.816666667 | -1.018440626 |
| 50 | 10/20/2016 15:32 | 1529.7 | 1619.7 | 0.833333333 | -1.015259006 |
| 51 | 10/20/2016 15:33 | 1524.2 | 1614.2 | 0.85 | -1.010378567 |
| 52 | 10/20/2016 15:34 | 1513.2 | 1603.2 | 0.866666667 | -1.000545646 |
| 53 | 10/20/2016 15:35 | 1511.3 | 1601.3 | 0.883333333 | -0.998837397 |
| 54 | 10/20/2016 15:36 | 1513.2 | 1603.2 | 0.9 | -1.000545646 |
| 55 | 10/20/2016 15:37 | 1505.8 | 1595.8 | 0.916666667 | -0.99387595 |
| 56 | 10/20/2016 15:38 | 1501 | 1591 | 0.933333333 | -0.989525753 |
| 57 | 10/20/2016 15:39 | 1488.8 | 1578.8 | 0.95 | -0.978383068 |
| 58 | 10/20/2016 15:40 | 1478.4 | 1568.4 | 0.966666667 | -0.968785357 |
| 59 | 10/20/2016 15:41 | 1475.3 | 1565.3 | 0.983333333 | -0.965906588 |
| 60 | 10/20/2016 15:42 | 1475.9 | 1565.9 | 1 | -0.966464416 |
| 61 | 10/20/2016 15:43 | 1471.7 | 1561.7 | 1.016666667 | -0.962553068 |
| 62 | 10/20/2016 15:44 | 1463.7 | 1553.7 | 1.033333333 | -0.955060292 |
| 63 | 10/20/2016 15:45 | 1444.8 | 1534.8 | 1.05 | -0.937132375 |
| 64 | 10/20/2016 15:46 | 1441.1 | 1531.1 | 1.066666667 | -0.933584742 |
| 65 | 10/20/2016 15:47 | 1441.1 | 1531.1 | 1.083333333 | -0.933584742 |
| 66 | 10/20/2016 15:48 | 1438.1 | 1528.1 | 1.1 | -0.930699015 |
| 67 | 10/20/2016 15:49 | 1438.1 | 1528.1 | 1.116666667 | -0.930699015 |
| 68 | 10/20/2016 15:50 | 1425.9 | 1515.9 | 1.133333333 | -0.918877172 |
| 69 | 10/20/2016 15:51 | 1425.3 | 1515.3 | 1.15 | -0.918292148 |
| 70 | 10/20/2016 15:52 | 1403.9 | 1493.9 | 1.166666667 | -0.89719931 |
| 71 | 10/20/2016 15:53 | 1400.8 | 1490.8 | 1.183333333 | -0.894106576 |
| 72 | 10/20/2016 15:54 | 1402.7 | 1492.7 | 1.2 | -0.896003257 |
| 73 | 10/20/2016 15:55 | 1407.6 | 1497.6 | 1.216666667 | -0.900878161 |
| 74 | 10/20/2016 15:56 | 1408.8 | 1498.8 | 1.233333333 | -0.902068401 |
| 75 | 10/20/2016 15:57 | 1391.7 | 1481.7 | 1.25 | -0.884972259 |
| 76 | 10/20/2016 15:58 | 1390.5 | 1480.5 | 1.266666667 | -0.883761483 |
| 77 | 10/20/2016 15:59 | 1372.1 | 1462.1 | 1.283333333 | -0.865010296 |
| 78 | 10/20/2016 16:00 | 1303.2 | 1393.2 | 1.3 | -0.791495629 |
| 79 | 10/20/2016 16:01 | 1291.6 | 1381.6 | 1.316666667 | -0.778569218 |
| 80 | 10/20/2016 16:02 | 1263.5 | 1353.5 | 1.333333333 | -0.746545514 |

| | | | | | |
|----|------------------|--------|--------|-------------|--------------|
| 81 | 10/20/2016 16:03 | 1231.1 | 1321.1 | 1.35 | -0.708301741 |
| 82 | 10/20/2016 16:04 | 1214 | 1304 | 1.366666667 | -0.687511983 |
| 83 | 10/20/2016 16:05 | 990 | 1080 | 1.383333333 | -0.365674153 |
| 84 | 10/20/2016 16:06 | 548.6 | 638.6 | 1.4 | 1.013190251 |
| 85 | 10/20/2016 16:07 | 464.3 | 554.3 | 1.416666667 | 1.850888752 |
| 86 | 10/20/2016 16:08 | 411.2 | 501.2 | 1.433333333 | 3.598534605 |
| 87 | 10/20/2016 16:09 | 434.4 | 524.4 | 1.45 | 2.476391819 |
| 88 | 10/20/2016 16:10 | 422.8 | 512.8 | 1.466666667 | 2.887687848 |
| 89 | 10/20/2016 16:11 | 412.4 | 502.4 | 1.483333333 | 3.496751911 |
| 90 | 10/20/2016 16:12 | 410.6 | 500.6 | 1.5 | 3.653594382 |
| 91 | 10/20/2016 16:13 | 399.6 | 489.6 | 1.516666667 | |
| 92 | 10/20/2016 16:14 | 475.9 | 565.9 | | |
| 93 | 10/20/2016 16:14 | -90 | | | |

Uthman Alnuman
ENGR 115
10/20/2016

Input Parameters:

| | |
|-------------------------|-------|
| Measured Outdoor [ppm] | 490 |
| Assumed Countdoor [ppm] | 400 |
| Correction Factor [ppm] | -90 |
| Volume of the room[ft3] | 1,575 |
| Room capacity[People] | 2 |

Calculations

| | |
|--|-------------|
| Air Exchange Rate[1/hr] | 0.2114 |
| Time to remove non-reactive chemical[hr] | 14.19110691 |
| Ventilation Rate[ft3/min/person] | 2.774625 |

Analysis

| Measurement | Date and Time | Actual CO2 Concentration | Hobo CO2 Concentration | Expriment Time[hr] | $\ln((\text{Croom}(t) - \text{c-outdoor})) / (\text{Co} - \text{C-outdoor})$ |
|-------------|------------------|--------------------------|------------------------|--------------------|--|
| 1 | 10/20/2016 14:43 | 809.3 | 899.3 | 0.016666667 | 0 |
| 2 | 10/20/2016 14:44 | 803.8 | 893.8 | 0.033333333 | 0.013528678 |
| 3 | 10/20/2016 14:45 | 794.6 | 884.6 | 0.05 | 0.03657579 |
| 4 | 10/20/2016 14:46 | 476.5 | 566.5 | 0.066666667 | 1.677157643 |
| 5 | 10/20/2016 14:47 | 419.8 | 509.8 | 0.083333333 | 3.028766446 |
| 6 | 10/20/2016 14:48 | 421.6 | 511.6 | 0.1 | 2.941755069 |
| 7 | 10/20/2016 14:49 | 419.8 | 509.8 | 0.116666667 | 3.028766446 |
| 8 | 10/20/2016 14:50 | 419.8 | 509.8 | 0.133333333 | 3.028766446 |
| 9 | 10/20/2016 14:51 | 403.3 | 493.3 | 0.15 | 4.820525915 |
| 10 | 10/20/2016 14:52 | 400.2 | 490.2 | 0.166666667 | 7.623886296 |
| 11 | 10/20/2016 14:53 | 406.3 | 496.3 | 0.183333333 | 4.17389875 |
| 12 | 10/20/2016 14:54 | 574.2 | 664.2 | 0.2 | 0.854244319 |
| 13 | 10/20/2016 14:55 | 620 | 710 | 0.216666667 | 0.620820837 |
| 14 | 10/20/2016 14:56 | 618.8 | 708.8 | 0.233333333 | 0.626290313 |
| 15 | 10/20/2016 14:57 | 620 | 710 | 0.25 | 0.620820837 |
| 16 | 10/20/2016 14:58 | 654.2 | 744.2 | 0.266666667 | 0.476327025 |
| 17 | 10/20/2016 14:59 | 715.3 | 805.3 | 0.283333333 | 0.260923817 |
| 18 | 10/20/2016 15:00 | 825.1 | 915.1 | 0.3 | -0.037876052 |
| 19 | 10/20/2016 15:01 | 839.2 | 929.2 | 0.316666667 | -0.070506507 |
| 20 | 10/20/2016 15:02 | 916.7 | 1006.7 | 0.333333333 | -0.233014052 |
| 21 | 10/20/2016 15:03 | 949.1 | 1039.1 | 0.35 | -0.293832191 |
| 22 | 10/20/2016 15:04 | 999.7 | 1089.7 | 0.366666667 | -0.381981147 |
| 23 | 10/20/2016 15:05 | 1027.8 | 1117.8 | 0.383333333 | -0.427773261 |
| 24 | 10/20/2016 15:06 | 1109 | 1199 | 0.4 | -0.549407143 |
| 25 | 10/20/2016 15:07 | 1139.5 | 1229.5 | 0.416666667 | -0.591525899 |
| 26 | 10/20/2016 15:08 | 1167.6 | 1257.6 | 0.433333333 | -0.628820381 |
| 27 | 10/20/2016 15:09 | 1209.1 | 1299.1 | 0.45 | -0.681474135 |
| 28 | 10/20/2016 15:10 | 1247.6 | 1337.6 | 0.466666667 | -0.727960443 |
| 29 | 10/20/2016 15:11 | 1303.8 | 1393.8 | 0.483333333 | -0.792159713 |
| 30 | 10/20/2016 15:12 | 1338 | 1428 | 0.5 | -0.829301566 |
| 31 | 10/20/2016 15:13 | 1477.8 | 1567.8 | 0.516666667 | -0.968228822 |
| 32 | 10/20/2016 15:14 | 1474.1 | 1564.1 | 0.533333333 | -0.964789997 |
| 33 | 10/20/2016 15:15 | 1490 | 1580 | 0.55 | -0.979484592 |
| 34 | 10/20/2016 15:16 | 1555.3 | 1645.3 | 0.566666667 | -1.037666946 |
| 35 | 10/20/2016 15:17 | 1577.9 | 1667.9 | 0.583333333 | -1.057040087 |
| 36 | 10/20/2016 15:18 | 1593.2 | 1683.2 | 0.6 | -1.069945669 |
| 37 | 10/20/2016 15:19 | 1595 | 1685 | 0.616666667 | -1.071453081 |
| 38 | 10/20/2016 15:20 | 1593.2 | 1683.2 | 0.633333333 | -1.069945669 |
| 39 | 10/20/2016 15:21 | 1582.8 | 1672.8 | 0.65 | -1.061191404 |
| 40 | 10/20/2016 15:22 | 1583.4 | 1673.4 | 0.666666667 | -1.061698547 |
| 41 | 10/20/2016 15:23 | 1577.3 | 1667.3 | 0.683333333 | -1.056530577 |
| 42 | 10/20/2016 15:24 | 1574.2 | 1664.2 | 0.7 | -1.05389396 |
| 43 | 10/20/2016 15:25 | 1573 | 1663 | 0.716666667 | -1.052871465 |
| 44 | 10/20/2016 15:26 | 1568.1 | 1658.1 | 0.733333333 | -1.048685393 |
| 45 | 10/20/2016 15:27 | 1557.7 | 1647.7 | 0.75 | -1.039742174 |
| 46 | 10/20/2016 15:28 | 1550.4 | 1640.4 | 0.766666667 | -1.033416603 |
| 47 | 10/20/2016 15:29 | 1543.1 | 1633.1 | 0.783333333 | -1.027050766 |
| 48 | 10/20/2016 15:30 | 1538.2 | 1628.2 | 0.8 | -1.022754963 |
| 49 | 10/20/2016 15:31 | 1533.3 | 1623.3 | 0.816666667 | -1.018440626 |
| 50 | 10/20/2016 15:32 | 1529.7 | 1619.7 | 0.833333333 | -1.015259006 |
| 51 | 10/20/2016 15:33 | 1524.2 | 1614.2 | 0.85 | -1.010378567 |
| 52 | 10/20/2016 15:34 | 1513.2 | 1603.2 | 0.866666667 | -1.000545646 |
| 53 | 10/20/2016 15:35 | 1511.3 | 1601.3 | 0.883333333 | -0.998837397 |
| 54 | 10/20/2016 15:36 | 1513.2 | 1603.2 | 0.9 | -1.000545646 |
| 55 | 10/20/2016 15:37 | 1505.8 | 1595.8 | 0.916666667 | -0.99387595 |
| 56 | 10/20/2016 15:38 | 1501 | 1591 | 0.933333333 | -0.989525753 |
| 57 | 10/20/2016 15:39 | 1488.8 | 1578.8 | 0.95 | -0.978383068 |
| 58 | 10/20/2016 15:40 | 1478.4 | 1568.4 | 0.966666667 | -0.968785357 |
| 59 | 10/20/2016 15:41 | 1475.3 | 1565.3 | 0.983333333 | -0.965906588 |
| 60 | 10/20/2016 15:42 | 1475.9 | 1565.9 | 1 | -0.966464416 |
| 61 | 10/20/2016 15:43 | 1471.7 | 1561.7 | 1.016666667 | -0.962553068 |
| 62 | 10/20/2016 15:44 | 1463.7 | 1553.7 | 1.033333333 | -0.955060292 |
| 63 | 10/20/2016 15:45 | 1444.8 | 1534.8 | 1.05 | -0.937132375 |
| 64 | 10/20/2016 15:46 | 1441.1 | 1531.1 | 1.066666667 | -0.933584742 |
| 65 | 10/20/2016 15:47 | 1441.1 | 1531.1 | 1.083333333 | -0.933584742 |
| 66 | 10/20/2016 15:48 | 1438.1 | 1528.1 | 1.1 | -0.930699015 |
| 67 | 10/20/2016 15:49 | 1438.1 | 1528.1 | 1.116666667 | -0.930699015 |
| 68 | 10/20/2016 15:50 | 1425.9 | 1515.9 | 1.133333333 | -0.918877172 |
| 69 | 10/20/2016 15:51 | 1425.3 | 1515.3 | 1.15 | -0.918292148 |
| 70 | 10/20/2016 15:52 | 1403.9 | 1493.9 | 1.166666667 | -0.89719931 |
| 71 | 10/20/2016 15:53 | 1400.8 | 1490.8 | 1.183333333 | -0.894106576 |
| 72 | 10/20/2016 15:54 | 1402.7 | 1492.7 | 1.2 | -0.896003257 |
| 73 | 10/20/2016 15:55 | 1407.6 | 1497.6 | 1.216666667 | -0.900878161 |
| 74 | 10/20/2016 15:56 | 1408.8 | 1498.8 | 1.233333333 | -0.902068401 |

| | | | | | |
|----|------------------|--------|--------|-------------|--------------|
| 75 | 10/20/2016 15:57 | 1391.7 | 1481.7 | 1.25 | -0.884972259 |
| 76 | 10/20/2016 15:58 | 1390.5 | 1480.5 | 1.266666667 | -0.883761483 |
| 77 | 10/20/2016 15:59 | 1372.1 | 1462.1 | 1.283333333 | -0.865010296 |
| 78 | 10/20/2016 16:00 | 1303.2 | 1393.2 | 1.3 | -0.791495629 |
| 79 | 10/20/2016 16:01 | 1291.6 | 1381.6 | 1.316666667 | -0.778569218 |
| 80 | 10/20/2016 16:02 | 1263.5 | 1353.5 | 1.333333333 | -0.746545514 |
| 81 | 10/20/2016 16:03 | 1231.1 | 1321.1 | 1.35 | -0.708301741 |
| 82 | 10/20/2016 16:04 | 1214 | 1304 | 1.366666667 | -0.687511983 |
| 83 | 10/20/2016 16:05 | 990 | 1080 | 1.383333333 | -0.365674153 |
| 84 | 10/20/2016 16:06 | 548.6 | 638.6 | 1.4 | 1.013190251 |
| 85 | 10/20/2016 16:07 | 464.3 | 554.3 | 1.416666667 | 1.850888752 |
| 86 | 10/20/2016 16:08 | 411.2 | 501.2 | 1.433333333 | 3.598534605 |
| 87 | 10/20/2016 16:09 | 434.4 | 524.4 | 1.45 | 2.476391819 |
| 88 | 10/20/2016 16:10 | 422.8 | 512.8 | 1.466666667 | 2.887687848 |
| 89 | 10/20/2016 16:11 | 412.4 | 502.4 | 1.483333333 | 3.496751911 |
| 90 | 10/20/2016 16:12 | 410.6 | 500.6 | 1.5 | 3.653594382 |
| 91 | 10/20/2016 16:13 | 399.6 | 489.6 | 1.516666667 | |
| 92 | 10/20/2016 16:14 | 475.9 | 565.9 | | |
| 93 | 10/20/2016 16:14 | -90 | | | |

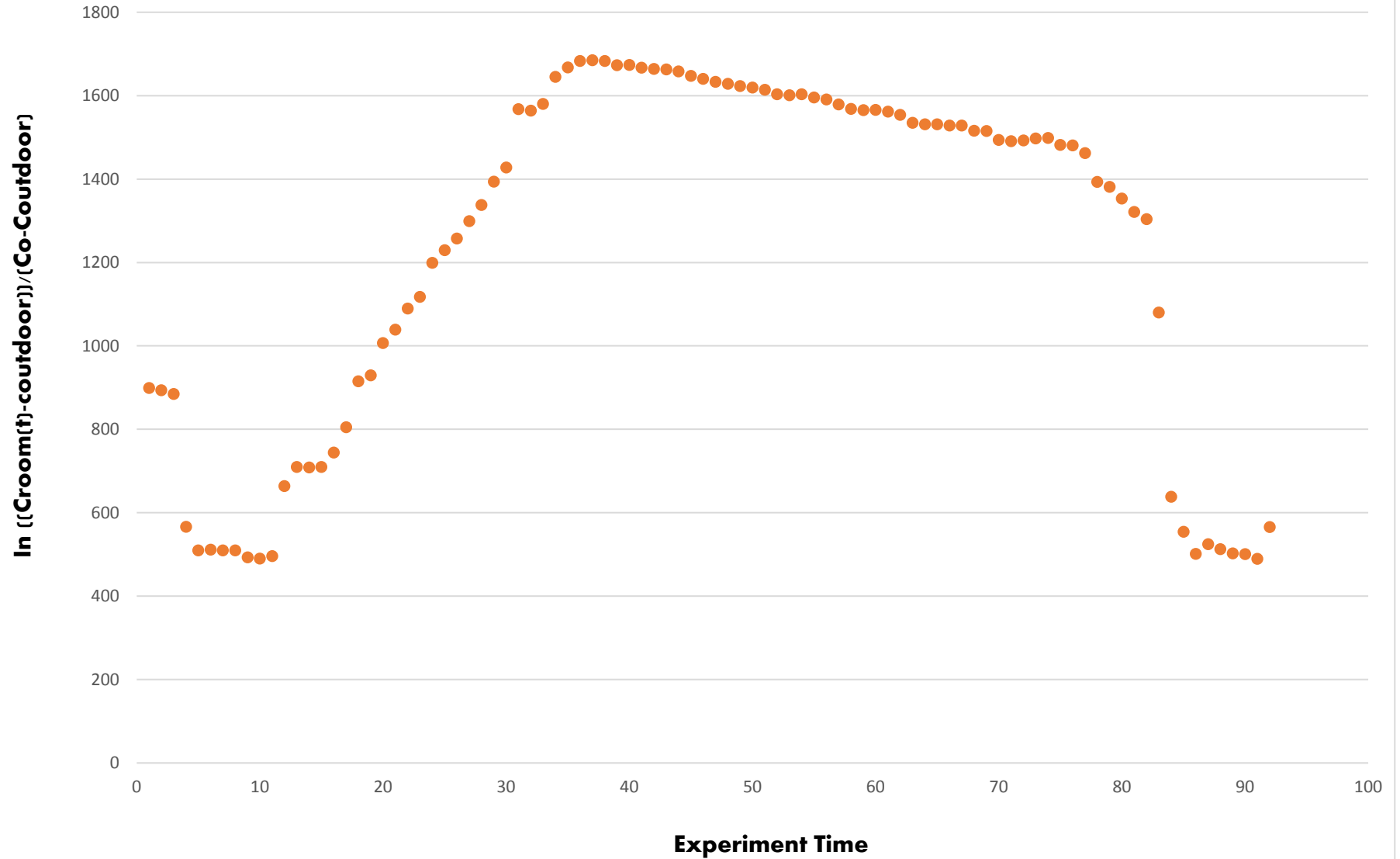
| | | | | | |
|----|------------------|----------|--------|----------|----------|
| 0 | 10/20/2016 15:19 | 44348.64 | 1685 | 0 | -0.03429 |
| 1 | 10/20/2016 15:20 | 44346.84 | 1683.2 | 0.016667 | -0.03322 |
| 2 | 10/20/2016 15:21 | 44336.44 | 1672.8 | 0.033333 | -0.02702 |
| 3 | 10/20/2016 15:22 | 44337.04 | 1673.4 | 0.05 | -0.02738 |
| 4 | 10/20/2016 15:23 | 44330.94 | 1667.3 | 0.066667 | -0.02373 |
| 5 | 10/20/2016 15:24 | 44327.84 | 1664.2 | 0.083333 | -0.02187 |
| 6 | 10/20/2016 15:25 | 44326.64 | 1663 | 0.1 | -0.02115 |
| 7 | 10/20/2016 15:26 | 44321.74 | 1658.1 | 0.116667 | -0.0182 |
| 8 | 10/20/2016 15:27 | 44311.34 | 1647.7 | 0.133333 | -0.01191 |
| 9 | 10/20/2016 15:28 | 44304.04 | 1640.4 | 0.15 | -0.00747 |
| 10 | 10/20/2016 15:29 | 44296.74 | 1633.1 | 0.166667 | -0.003 |
| 11 | 10/20/2016 15:30 | 44291.84 | 1628.2 | 0.183333 | 0 |
| 12 | 10/20/2016 15:31 | 44286.94 | 1623.3 | 0.2 | 0.003014 |
| 13 | 10/20/2016 15:32 | 44283.34 | 1619.7 | 0.216667 | 0.005234 |
| 14 | 10/20/2016 15:33 | 44277.84 | 1614.2 | 0.233333 | 0.008636 |
| 15 | 10/20/2016 15:34 | 44266.84 | 1603.2 | 0.25 | 0.015473 |
| 16 | 10/20/2016 15:35 | 44264.94 | 1601.3 | 0.266667 | 0.016659 |
| 17 | 10/20/2016 15:36 | 44266.84 | 1603.2 | 0.283333 | 0.015473 |
| 18 | 10/20/2016 15:37 | 44259.44 | 1595.8 | 0.3 | 0.0201 |
| 19 | 10/20/2016 15:38 | 44254.64 | 1591 | 0.316667 | 0.023112 |
| 20 | 10/20/2016 15:39 | 44242.44 | 1578.8 | 0.333333 | 0.03081 |
| 21 | 10/20/2016 15:40 | 44232.04 | 1568.4 | 0.35 | 0.037419 |
| 22 | 10/20/2016 15:41 | 44228.94 | 1565.3 | 0.366667 | 0.039398 |
| 23 | 10/20/2016 15:42 | 44229.54 | 1565.9 | 0.383333 | 0.039014 |
| 24 | 10/20/2016 15:43 | 44225.34 | 1561.7 | 0.4 | 0.0417 |
| 25 | 10/20/2016 15:44 | 44217.34 | 1553.7 | 0.416667 | 0.046836 |
| 26 | 10/20/2016 15:45 | 44198.44 | 1534.8 | 0.433333 | 0.059075 |
| 27 | 10/20/2016 15:46 | 44194.74 | 1531.1 | 0.45 | 0.061489 |
| 28 | 10/20/2016 15:47 | 44194.74 | 1531.1 | 0.466667 | 0.061489 |
| 29 | 10/20/2016 15:48 | 44191.74 | 1528.1 | 0.483333 | 0.06345 |
| 30 | 10/20/2016 15:49 | 44191.74 | 1528.1 | 0.5 | 0.06345 |
| 31 | 10/20/2016 15:50 | 44179.54 | 1515.9 | 0.516667 | 0.071466 |
| 32 | 10/20/2016 15:51 | 44178.94 | 1515.3 | 0.533333 | 0.071862 |
| 33 | 10/20/2016 15:52 | 44157.54 | 1493.9 | 0.55 | 0.086085 |
| 34 | 10/20/2016 15:53 | 44154.44 | 1490.8 | 0.566667 | 0.088162 |
| 35 | 10/20/2016 15:54 | 44156.34 | 1492.7 | 0.583333 | 0.086889 |
| 36 | 10/20/2016 15:55 | 44161.24 | 1497.6 | 0.6 | 0.083611 |
| 37 | 10/20/2016 15:56 | 44162.44 | 1498.8 | 0.616667 | 0.08281 |
| 38 | 10/20/2016 15:57 | 44145.34 | 1481.7 | 0.633333 | 0.094285 |
| 39 | 10/20/2016 15:58 | 44144.14 | 1480.5 | 0.65 | 0.095095 |
| 40 | 10/20/2016 15:59 | 44125.74 | 1462.1 | 0.666667 | 0.107601 |

Plot Title: DormRoom Sunset 3rd floor

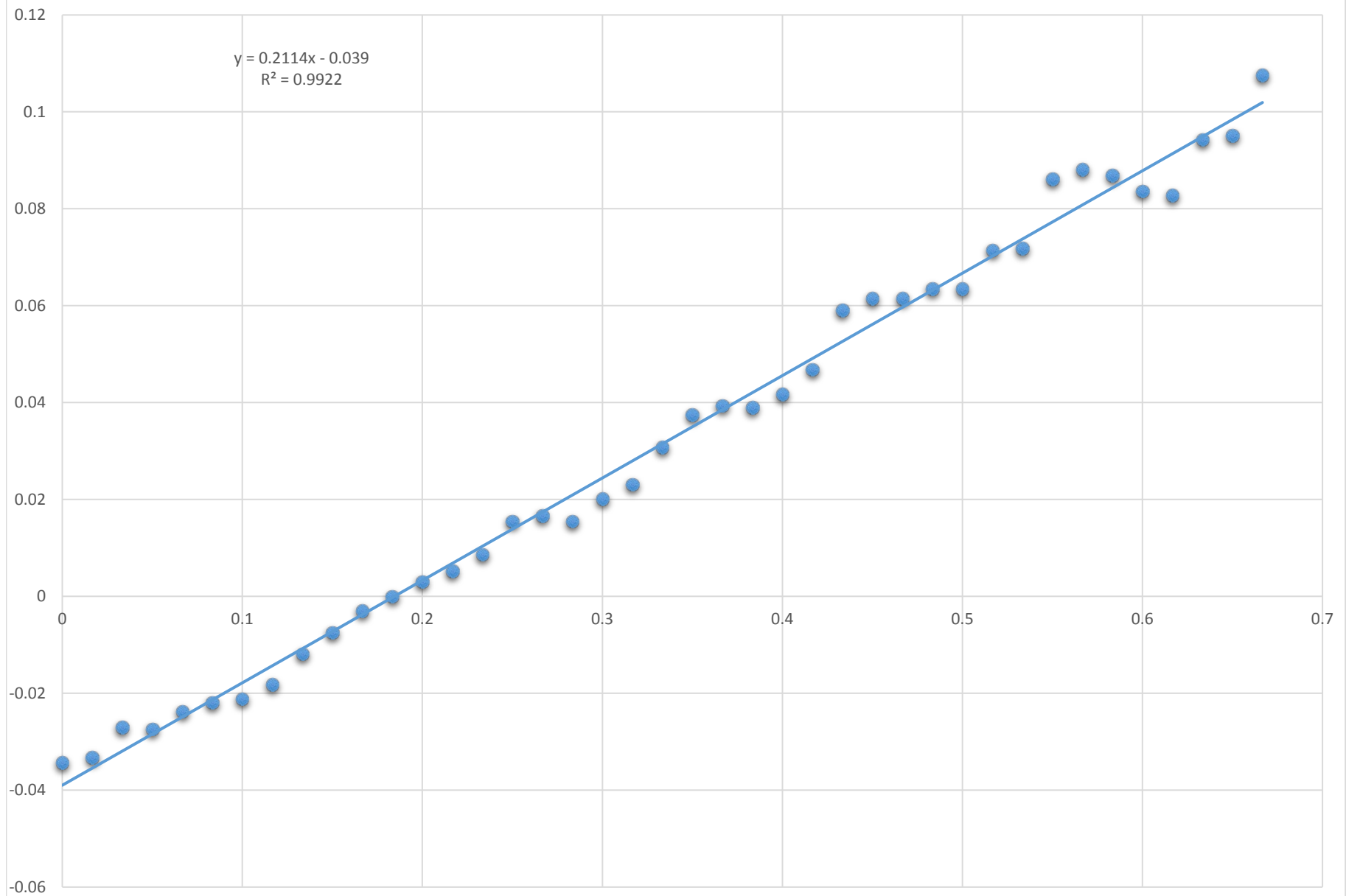
| # | Date Time, GMT-07:00 | CO2, ppm |
|----|----------------------|----------|
| 1 | 10/20/2016 14:43 | 899.3 |
| 2 | 10/20/2016 14:44 | 893.8 |
| 3 | 10/20/2016 14:45 | 884.6 |
| 4 | 10/20/2016 14:46 | 566.5 |
| 5 | 10/20/2016 14:47 | 509.8 |
| 6 | 10/20/2016 14:48 | 511.6 |
| 7 | 10/20/2016 14:49 | 509.8 |
| 8 | 10/20/2016 14:50 | 509.8 |
| 9 | 10/20/2016 14:51 | 493.3 |
| 10 | 10/20/2016 14:52 | 490.2 |
| 11 | 10/20/2016 14:53 | 496.3 |
| 12 | 10/20/2016 14:54 | 664.2 |
| 13 | 10/20/2016 14:55 | 710 |
| 14 | 10/20/2016 14:56 | 708.8 |
| 15 | 10/20/2016 14:57 | 710 |
| 16 | 10/20/2016 14:58 | 744.2 |
| 17 | 10/20/2016 14:59 | 805.3 |
| 18 | 10/20/2016 15:00 | 915.1 |
| 19 | 10/20/2016 15:01 | 929.2 |
| 20 | 10/20/2016 15:02 | 1006.7 |
| 21 | 10/20/2016 15:03 | 1039.1 |
| 22 | 10/20/2016 15:04 | 1089.7 |
| 23 | 10/20/2016 15:05 | 1117.8 |
| 24 | 10/20/2016 15:06 | 1199 |
| 25 | 10/20/2016 15:07 | 1229.5 |
| 26 | 10/20/2016 15:08 | 1257.6 |
| 27 | 10/20/2016 15:09 | 1299.1 |
| 28 | 10/20/2016 15:10 | 1337.6 |
| 29 | 10/20/2016 15:11 | 1393.8 |
| 30 | 10/20/2016 15:12 | 1428 |
| 31 | 10/20/2016 15:13 | 1567.8 |
| 32 | 10/20/2016 15:14 | 1564.1 |
| 33 | 10/20/2016 15:15 | 1580 |
| 34 | 10/20/2016 15:16 | 1645.3 |
| 35 | 10/20/2016 15:17 | 1667.9 |
| 36 | 10/20/2016 15:18 | 1683.2 |
| 37 | 10/20/2016 15:19 | 1685 |
| 38 | 10/20/2016 15:20 | 1683.2 |
| 39 | 10/20/2016 15:21 | 1672.8 |
| 40 | 10/20/2016 15:22 | 1673.4 |
| 41 | 10/20/2016 15:23 | 1667.3 |
| 42 | 10/20/2016 15:24 | 1664.2 |
| 43 | 10/20/2016 15:25 | 1663 |
| 44 | 10/20/2016 15:26 | 1658.1 |
| 45 | 10/20/2016 15:27 | 1647.7 |

| | | |
|----|------------------|--------|
| 46 | 10/20/2016 15:28 | 1640.4 |
| 47 | 10/20/2016 15:29 | 1633.1 |
| 48 | 10/20/2016 15:30 | 1628.2 |
| 49 | 10/20/2016 15:31 | 1623.3 |
| 50 | 10/20/2016 15:32 | 1619.7 |
| 51 | 10/20/2016 15:33 | 1614.2 |
| 52 | 10/20/2016 15:34 | 1603.2 |
| 53 | 10/20/2016 15:35 | 1601.3 |
| 54 | 10/20/2016 15:36 | 1603.2 |
| 55 | 10/20/2016 15:37 | 1595.8 |
| 56 | 10/20/2016 15:38 | 1591 |
| 57 | 10/20/2016 15:39 | 1578.8 |
| 58 | 10/20/2016 15:40 | 1568.4 |
| 59 | 10/20/2016 15:41 | 1565.3 |
| 60 | 10/20/2016 15:42 | 1565.9 |
| 61 | 10/20/2016 15:43 | 1561.7 |
| 62 | 10/20/2016 15:44 | 1553.7 |
| 63 | 10/20/2016 15:45 | 1534.8 |
| 64 | 10/20/2016 15:46 | 1531.1 |
| 65 | 10/20/2016 15:47 | 1531.1 |
| 66 | 10/20/2016 15:48 | 1528.1 |
| 67 | 10/20/2016 15:49 | 1528.1 |
| 68 | 10/20/2016 15:50 | 1515.9 |
| 69 | 10/20/2016 15:51 | 1515.3 |
| 70 | 10/20/2016 15:52 | 1493.9 |
| 71 | 10/20/2016 15:53 | 1490.8 |
| 72 | 10/20/2016 15:54 | 1492.7 |
| 73 | 10/20/2016 15:55 | 1497.6 |
| 74 | 10/20/2016 15:56 | 1498.8 |
| 75 | 10/20/2016 15:57 | 1481.7 |
| 76 | 10/20/2016 15:58 | 1480.5 |
| 77 | 10/20/2016 15:59 | 1462.1 |
| 78 | 10/20/2016 16:00 | 1393.2 |
| 79 | 10/20/2016 16:01 | 1381.6 |
| 80 | 10/20/2016 16:02 | 1353.5 |
| 81 | 10/20/2016 16:03 | 1321.1 |
| 82 | 10/20/2016 16:04 | 1304 |
| 83 | 10/20/2016 16:05 | 1080 |
| 84 | 10/20/2016 16:06 | 638.6 |
| 85 | 10/20/2016 16:07 | 554.3 |
| 86 | 10/20/2016 16:08 | 501.2 |
| 87 | 10/20/2016 16:09 | 524.4 |
| 88 | 10/20/2016 16:10 | 512.8 |
| 89 | 10/20/2016 16:11 | 502.4 |
| 90 | 10/20/2016 16:12 | 500.6 |
| 91 | 10/20/2016 16:13 | 489.6 |
| 92 | 10/20/2016 16:14 | 565.9 |

CO2 Concentration in Sunset hall Dorm room



Determining the Air Exchange Rate for the sunset



What is the air exchange rate (λ) of the room you tested? Be sure to include the units for the air exchange rate in your answer.

The air exchange rate (λ) in sunset hall dorm room is 0.2114 per hour.

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?

I will recommend to leave the window open most of the time and try to put some plants to reduce CO₂

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

2 female student lives in the room I took the measurements in. the calculated ventilation rate was 2.77 cubic feet per minute per person. After comparing this data with the ASHRAE's standard of 15 cubic feet per minute per person. 2.77 instead of 15 that's horrible! It seems that the HSU and occupants are cheap with the air/ventilation they're using.

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

I recommend one person in the room and try to meet with people outside of the dorm room. This is a much healthier and safer rate than the one calculated with 6 people.