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| Juliette Cortez |
| ERE 115 |
| LAB 10 @11am |
| Data: 4/1/2016 |

| # | Date Time, GMT-07:00 | CO2, ppm (LGR S/N: 2039574, SEN S/N: 2039574, LBL: Carbon Dioxide) |
|----|----------------------|--------------------------------------------------------------------|
| 1 | 4/1/16 11:48 | 1533 |
| 2 | 4/1/16 11:49 | 1379.7 |
| 3 | 4/1/16 11:50 | 1387.1 |
| 4 | 4/1/16 11:51 | 1417.6 |
| 5 | 4/1/16 11:52 | 1466.4 |
| 6 | 4/1/16 11:53 | 1496.9 |
| 7 | 4/1/16 11:54 | 1525 |
| 8 | 4/1/16 11:55 | 1537.9 |
| 9 | 4/1/16 11:56 | 1562.3 |
| 10 | 4/1/16 11:57 | 1573.9 |
| 11 | 4/1/16 11:58 | 1582.4 |
| 12 | 4/1/16 11:59 | 1592.2 |
| 13 | 4/1/16 12:00 | 1595.2 |
| 14 | 4/1/16 12:01 | 1589.7 |
| 15 | 4/1/16 12:02 | 1435.3 |
| 16 | 4/1/16 12:03 | 1490.2 |
| 17 | 4/1/16 12:04 | 1511.6 |
| 18 | 4/1/16 12:05 | 1454.2 |
| 19 | 4/1/16 12:06 | 1423.1 |
| 20 | 4/1/16 12:07 | 1407.8 |
| 21 | 4/1/16 12:08 | 1396.8 |
| 22 | 4/1/16 12:09 | 1481.7 |
| 23 | 4/1/16 12:10 | 1393.8 |
| 24 | 4/1/16 12:11 | 1402.9 |
| 25 | 4/1/16 12:12 | 1410.9 |
| 26 | 4/1/16 12:13 | 1398 |
| 27 | 4/1/16 12:14 | 1375.5 |
| 28 | 4/1/16 12:15 | 1375.5 |
| 29 | 4/1/16 12:16 | 1366.3 |
| 30 | 4/1/16 12:17 | 1386.4 |
| 31 | 4/1/16 12:18 | 1383.4 |
| 32 | 4/1/16 12:19 | 1391.3 |
| 33 | 4/1/16 12:20 | 1395.6 |
| 34 | 4/1/16 12:21 | 1398.7 |
| 35 | 4/1/16 12:22 | 1399.9 |
| 36 | 4/1/16 12:23 | 1405.4 |
| 37 | 4/1/16 12:24 | 1408.4 |
| 38 | 4/1/16 12:25 | 1409 |
| 39 | 4/1/16 12:26 | 1409.6 |
| 40 | 4/1/16 12:27 | 1410.9 |
| 41 | 4/1/16 12:28 | 1408.4 |
| 42 | 4/1/16 12:29 | 1411.5 |
| 43 | 4/1/16 12:30 | 1414.5 |
| 44 | 4/1/16 12:31 | 1412.1 |
| 45 | 4/1/16 12:32 | 1415.8 |
| 46 | 4/1/16 12:33 | 1416.4 |
| 47 | 4/1/16 12:34 | 1414.5 |

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|----|--------------|--------|
| 48 | 4/1/16 12:35 | 1415.1 |
| 49 | 4/1/16 12:36 | 1417 |
| 50 | 4/1/16 12:37 | 1420 |
| 51 | 4/1/16 12:38 | 1420.6 |
| 52 | 4/1/16 12:39 | 1423.1 |
| 53 | 4/1/16 12:40 | 1424.3 |
| 54 | 4/1/16 12:41 | 1426.7 |
| 55 | 4/1/16 12:42 | 1425.5 |
| 56 | 4/1/16 12:43 | 1431.6 |
| 57 | 4/1/16 12:44 | 1432.2 |
| 58 | 4/1/16 12:45 | 1430.4 |
| 59 | 4/1/16 12:46 | 1431.6 |
| 60 | 4/1/16 12:47 | 1432.8 |
| 61 | 4/1/16 12:48 | 1433.5 |
| 62 | 4/1/16 12:49 | 1430.4 |
| 63 | 4/1/16 12:50 | 1432.8 |
| 64 | 4/1/16 12:51 | 1433.5 |
| 65 | 4/1/16 12:52 | 1434.1 |
| 66 | 4/1/16 12:53 | 1434.7 |
| 67 | 4/1/16 12:54 | 1436.5 |
| 68 | 4/1/16 12:55 | 1435.9 |
| 69 | 4/1/16 12:56 | 1435.9 |
| 70 | 4/1/16 12:57 | 1437.1 |
| 71 | 4/1/16 12:58 | 1435.9 |
| 72 | 4/1/16 12:59 | 1435.3 |
| 73 | 4/1/16 13:00 | 1434.1 |
| 74 | 4/1/16 13:01 | 1434.7 |
| 75 | 4/1/16 13:02 | 1437.1 |
| 76 | 4/1/16 13:03 | 1434.7 |
| 77 | 4/1/16 13:04 | 1437.7 |
| 78 | 4/1/16 13:05 | 1437.7 |
| 79 | 4/1/16 13:06 | 1435.3 |
| 80 | 4/1/16 13:07 | 1435.3 |
| 81 | 4/1/16 13:08 | 1434.1 |
| 82 | 4/1/16 13:09 | 1436.5 |
| 83 | 4/1/16 13:10 | 1531.1 |
| 84 | 4/1/16 13:11 | 1400.5 |
| 85 | 4/1/16 13:12 | 1392.6 |
| 86 | 4/1/16 13:13 | 1387.7 |
| 87 | 4/1/16 13:14 | 1434.1 |
| 88 | 4/1/16 13:15 | 1379.7 |
| 89 | 4/1/16 13:16 | 1407.8 |
| 90 | 4/1/16 13:17 | 1414.5 |
| 91 | 4/1/16 13:18 | 1418.2 |
| 92 | 4/1/16 13:19 | 1389.5 |
| 93 | 4/1/16 13:20 | 1351.6 |
| 94 | 4/1/16 13:21 | 1409 |
| 95 | 4/1/16 13:22 | 1399.9 |

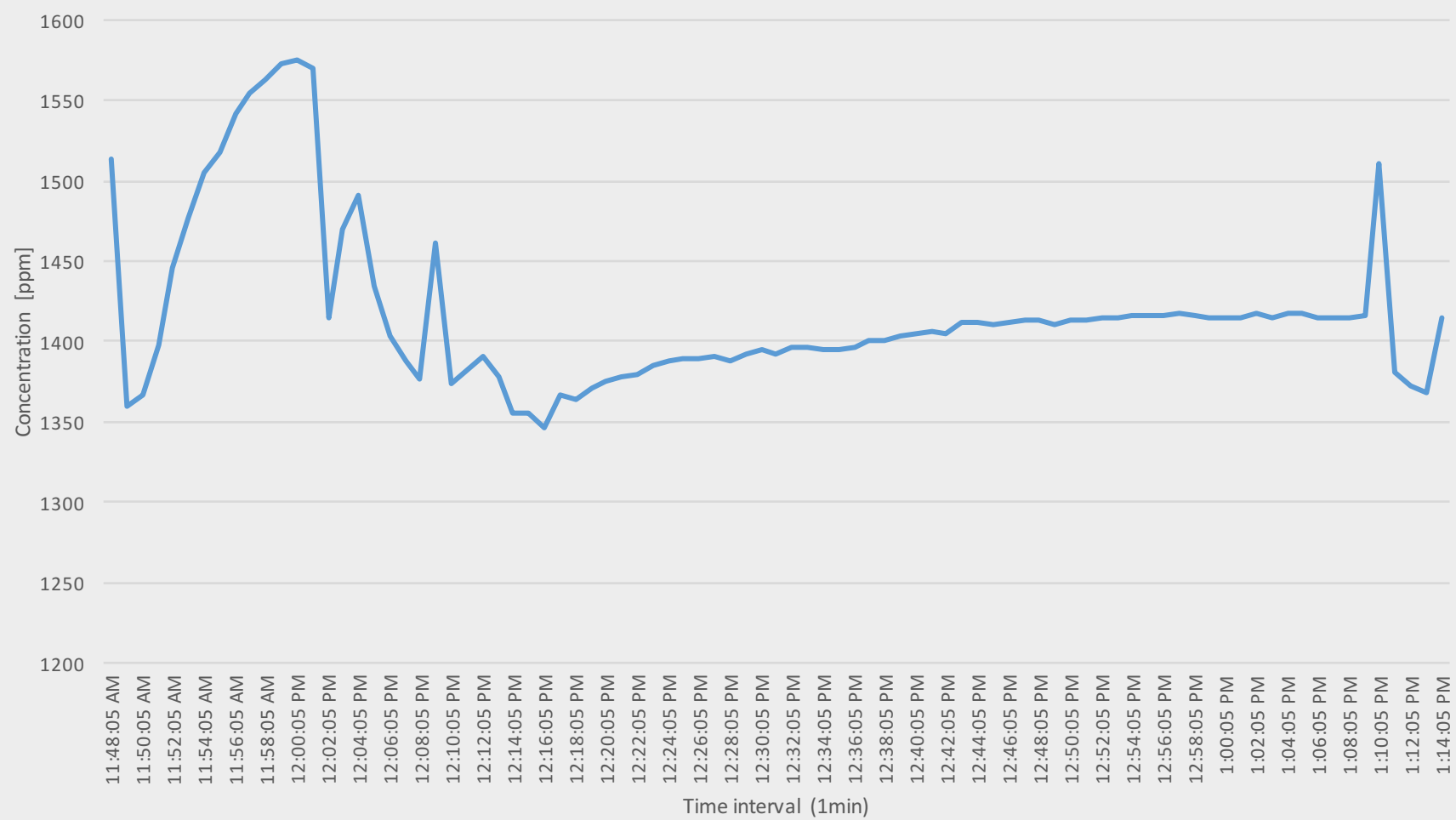
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| Juliette Cortez |
| ENGR 115 |
| Lab 10 @11am |
| DATE: 4/1/2016 |

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| Input Parameters: | |
| Measured C _{outdoor} (ppm) | 420 |
| Assumed C _{outdoor} (ppm) | 400 |
| Correction Factor (ppm) | -20 |

| Analysis: | | | | |
|-------------|------------------------|-------------|--|--------------------------------|
| Measurement | Hobo CO2 Concentration | Time | | Actual CO2 Concentration [ppm] |
| 1 | 1533 | 11:48:05 AM | | 1513 |
| 2 | 1379.7 | 11:49:05 AM | | 1359.7 |
| 3 | 1387.1 | 11:50:05 AM | | 1367.1 |
| 4 | 1417.6 | 11:51:05 AM | | 1397.6 |
| 5 | 1466.4 | 11:52:05 AM | | 1446.4 |
| 6 | 1496.9 | 11:53:05 AM | | 1476.9 |
| 7 | 1525 | 11:54:05 AM | | 1505 |
| 8 | 1537.9 | 11:55:05 AM | | 1517.9 |
| 9 | 1562.3 | 11:56:05 AM | | 1542.3 |
| 10 | 1573.9 | 11:57:05 AM | | 1553.9 |
| 11 | 1582.4 | 11:58:05 AM | | 1562.4 |
| 12 | 1592.2 | 11:59:05 AM | | 1572.2 |
| 13 | 1595.2 | 12:00:05 PM | | 1575.2 |
| 14 | 1589.7 | 12:01:05 PM | | 1569.7 |
| 15 | 1435.3 | 12:02:05 PM | | 1415.3 |
| 16 | 1490.2 | 12:03:05 PM | | 1470.2 |
| 17 | 1511.6 | 12:04:05 PM | | 1491.6 |
| 18 | 1454.2 | 12:05:05 PM | | 1434.2 |
| 19 | 1423.1 | 12:06:05 PM | | 1403.1 |
| 20 | 1407.8 | 12:07:05 PM | | 1387.8 |
| 21 | 1396.8 | 12:08:05 PM | | 1376.8 |
| 22 | 1481.7 | 12:09:05 PM | | 1461.7 |
| 23 | 1393.8 | 12:10:05 PM | | 1373.8 |
| 24 | 1402.9 | 12:11:05 PM | | 1382.9 |
| 25 | 1410.9 | 12:12:05 PM | | 1390.9 |
| 26 | 1398 | 12:13:05 PM | | 1378 |
| 27 | 1375.5 | 12:14:05 PM | | 1355.5 |
| 28 | 1375.5 | 12:15:05 PM | | 1355.5 |
| 29 | 1366.3 | 12:16:05 PM | | 1346.3 |
| 30 | 1386.4 | 12:17:05 PM | | 1366.4 |
| 31 | 1383.4 | 12:18:05 PM | | 1363.4 |
| 32 | 1391.3 | 12:19:05 PM | | 1371.3 |
| 33 | 1395.6 | 12:20:05 PM | | 1375.6 |
| 34 | 1398.7 | 12:21:05 PM | | 1378.7 |
| 35 | 1399.9 | 12:22:05 PM | | 1379.9 |
| 36 | 1405.4 | 12:23:05 PM | | 1385.4 |
| 37 | 1408.4 | 12:24:05 PM | | 1388.4 |
| 38 | 1409 | 12:25:05 PM | | 1389 |
| 39 | 1409.6 | 12:26:05 PM | | 1389.6 |
| 40 | 1410.9 | 12:27:05 PM | | 1390.9 |
| 41 | 1408.4 | 12:28:05 PM | | 1388.4 |
| 42 | 1411.5 | 12:29:05 PM | | 1391.5 |
| 43 | 1414.5 | 12:30:05 PM | | 1394.5 |
| 44 | 1412.1 | 12:31:05 PM | | 1392.1 |
| 45 | 1415.8 | 12:32:05 PM | | 1395.8 |
| 46 | 1416.4 | 12:33:05 PM | | 1396.4 |
| 47 | 1414.5 | 12:34:05 PM | | 1394.5 |
| 48 | 1415.1 | 12:35:05 PM | | 1395.1 |
| 49 | 1417 | 12:36:05 PM | | 1397 |
| 50 | 1420 | 12:37:05 PM | | 1400 |
| 51 | 1420.6 | 12:38:05 PM | | 1400.6 |
| 52 | 1423.1 | 12:39:05 PM | | 1403.1 |
| 53 | 1424.3 | 12:40:05 PM | | 1404.3 |
| 54 | 1426.7 | 12:41:05 PM | | 1406.7 |
| 55 | 1425.5 | 12:42:05 PM | | 1405.5 |
| 56 | 1431.6 | 12:43:05 PM | | 1411.6 |
| 57 | 1432.2 | 12:44:05 PM | | 1412.2 |
| 58 | 1430.4 | 12:45:05 PM | | 1410.4 |
| 59 | 1431.6 | 12:46:05 PM | | 1411.6 |
| 60 | 1432.8 | 12:47:05 PM | | 1412.8 |
| 61 | 1433.5 | 12:48:05 PM | | 1413.5 |

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|----|--------|-------------|--------|
| 62 | 1430.4 | 12:49:05 PM | 1410.4 |
| 63 | 1432.8 | 12:50:05 PM | 1412.8 |
| 64 | 1433.5 | 12:51:05 PM | 1413.5 |
| 65 | 1434.1 | 12:52:05 PM | 1414.1 |
| 66 | 1434.7 | 12:53:05 PM | 1414.7 |
| 67 | 1436.5 | 12:54:05 PM | 1416.5 |
| 68 | 1435.9 | 12:55:05 PM | 1415.9 |
| 69 | 1435.9 | 12:56:05 PM | 1415.9 |
| 70 | 1437.1 | 12:57:05 PM | 1417.1 |
| 71 | 1435.9 | 12:58:05 PM | 1415.9 |
| 72 | 1435.3 | 12:59:05 PM | 1415.3 |
| 73 | 1434.1 | 1:00:05 PM | 1414.1 |
| 74 | 1434.7 | 1:01:05 PM | 1414.7 |
| 75 | 1437.1 | 1:02:05 PM | 1417.1 |
| 76 | 1434.7 | 1:03:05 PM | 1414.7 |
| 77 | 1437.7 | 1:04:05 PM | 1417.7 |
| 78 | 1437.7 | 1:05:05 PM | 1417.7 |
| 79 | 1435.3 | 1:06:05 PM | 1415.3 |
| 80 | 1435.3 | 1:07:05 PM | 1415.3 |
| 81 | 1434.1 | 1:08:05 PM | 1414.1 |
| 82 | 1436.5 | 1:09:05 PM | 1416.5 |
| 83 | 1531.1 | 1:10:05 PM | 1511.1 |
| 84 | 1400.5 | 1:11:05 PM | 1380.5 |
| 85 | 1392.6 | 1:12:05 PM | 1372.6 |
| 86 | 1387.7 | 1:13:05 PM | 1367.7 |
| 87 | 1434.1 | 1:14:05 PM | 1414.1 |

CO2 Emission



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| Juliette Cortez |
| ENGR 115 |
| Lab 10 @11am |
| DATE: 4/1/2016 |

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|-------------------------------------|--------|
| Input Parameters: | |
| Measured C _{outdoor} (ppm) | 420 |
| Assumed C _{outdoor} (ppm) | 400 |
| Correction Factor (ppm) | -20 |
| Room Volume [ft ³] | 1538.7 |
| Room Capacity [People] | 5 |

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| Calculations: | |
| Air Exchange Rate[1/hr] | 1.0864 |
| Time to remove non-reactive chemical [hr] | 2.7614 |
| Ventilation Rate [ft ³ /min/person] | 5.5721 |

| Analysis: | | | | | | |
|------------------|------------------------|-------------|--------------------------------|----------------------|-----------------------------------------------------|--------|
| Measurement | Hobo CO2 Concentration | Time | Actual CO2 Concentration [ppm] | Experiment Time [hr] | $-\ln((C_{room}(t)-C_{outdoor})/(C_0-C_{outdoor}))$ | |
| 0 | 1589.7 | 12:01:05 PM | 1569.7 | 0.000 | | 0.0000 |
| 1 | 1435.3 | 12:02:05 PM | 1415.3 | 0.017 | | 0.1416 |
| 2 | 1490.2 | 12:03:05 PM | 1470.2 | 0.033 | | 0.0889 |
| 3 | 1511.6 | 12:04:05 PM | 1491.6 | 0.050 | | 0.0691 |
| 4 | 1454.2 | 12:05:05 PM | 1434.2 | 0.067 | | 0.1231 |
| 5 | 1423.1 | 12:06:05 PM | 1403.1 | 0.083 | | 0.1537 |
| 6 | 1407.8 | 12:07:05 PM | 1387.8 | 0.100 | | 0.1690 |
| 7 | 1396.8 | 12:08:05 PM | 1376.8 | 0.117 | | 0.1802 |
| 8 | 1481.7 | 12:09:05 PM | 1461.7 | 0.133 | | 0.0969 |
| 9 | 1393.8 | 12:10:05 PM | 1373.8 | 0.150 | | 0.1833 |
| 10 | 1402.9 | 12:11:05 PM | 1382.9 | 0.167 | | 0.1740 |
| 11 | 1410.9 | 12:12:05 PM | 1390.9 | 0.183 | | 0.1659 |
| 12 | 1398 | 12:13:05 PM | 1378 | 0.200 | | 0.1790 |
| 13 | 1375.5 | 12:14:05 PM | 1355.5 | 0.217 | | 0.2023 |

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| Juliette Cortez | |
| ENGR 115 | |
| Lab 10 @11am | |
| DATE: 4/8/2016 | |
| QUESTIONS | ANSWERS |

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| Question 1: 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 of the canyon dorms was 1.0864/hr |
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| 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? | The amount of time to remove non-reactive chemicals from the indoor air was 2.7614/hr. Thus, I would recommend that the occupants of the room leave a window open and try to limit their exposure to CO ₂ by not having more than 5 people in the room and limit the time spent in the room to just at night. |
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| <p>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</p> | <p>The recommended ventilation rate is 15 ft³/min/person and for this experiemnt there were 5 people in the dorm. With 5 people in the room the ventilation rate was about 5.5 ft³/min/person which is actually really below the standard. I adjusted my calculations to 2 persons in the room and the ventilation rate cahnged to 14 ft³/min/person. Therefore, for the canyon dorms it is best to have 1 or 2 persons in a room, any more will make the ventilation rate extremely low. I believe the dorms are not supplying enough air since the recommended ventilation rate is 15 and even with a usual 2 person domr room the ventilation rate still does not reach 15 ft³/min/person.</p> |
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| <p>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.</p> | <p>As I stated in the previous answer, I adjusted the room capacity number and found that 2 persons in this room barely gets to about 14 ft³/min/person. Thus, I would recommed only having 2 persons in the room at a time.</p> |
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Determining the Air Exchange Rate for Canyon Dorm

