**Calculations**

* *Calculations for Rf values:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Solvent System*** | ***Compound*** | ***cm traveled by compound*** | ***cm traveled by solvent system*** | ***Rf values*** |
| **50:50:1** | Acetaminophen | 2.65 | 4.10 | 0.646 |
| Aspirin | 3.80 | 0.927 |
| Caffeine | 1.60 | 0.390 |
| Ibuprofen | 4.00 | 0.976 |
| Pain Reliever (Aspirin) | 3.70 | 0.902 |
| Unknown | 3.70 | 0.902 |
| **20:80:1** | Acetaminophen | 3.10 | 4.30 | 0.721 |
| Aspirin | 3.85 | 0.895 |
| Caffeine | 1.80 | 0.419 |
| Ibuprofen | 4.20 | 0.977 |
| Pain Reliever (Aspirin) | 3.85 | 0.895 |
| Unknown | 3.85 | 0.895 |

* *Calculations for Melting points:*
  + Average temp. for when the 1st drop of liquid appears=>
  + Average temp. for when the whole compound turns liquid=>

**Discussion and Results**

The main goal and purpose of this particular lab was to identify and unknown compound, vial #30, as one of the compounds given to us (which includes Acetaminophen, aspirin, caffeine, and ibuprofen) from the *Experiments Handbook.*

We did two different trials, one involving a 50:50:1 (ethyl acetate: acetic acid) solvent system of hexanes, the second involving 20:80:1(ethyl acetate: acetic acid) solvent system of hexanes. Trial one involved the solvent font traveling all the way up to 4.1 cm, in which the unknown traveled 3.70 cm, similarly to the Pain Reliever (Aspirin) and standard Aspirin, which were 3.70cm and 3.80cm, respectively. In the second trial, the solvent font travelled 4.30cm, in which the unknown compound travelled 3.85cm. This was similar to the Pain Reliever (Aspirin) and the standard (Aspirin), with both traveling 3.85cm along the TLC plate. Based on the data, it can be assumed that the unknown compound was Aspirin. In addition, the reason why these compounds travel upwards and why some travel further up than others is because, the less polar a molecule the further it travels up in the TLC plate.

To further authenticate the assumption, the Rf values could be calculated. In the 50:50:1, the Pain Reliever, the standard Aspirin, and the unknown had 0.902, 0.927, and 0.902 respectively. In addition, in the 20:80:1 trial, the Pain Reliever, the standard Aspirin, and the unknown had 0.895, 0.895, and 0.895 respectively. As stated, in trial one, the Rf was extremely close to the unknown’s while in trial two, the Rf values were identical. Therefore, authenticating the assumption that the identity of the compound is most likely Aspirin.

However, the two different set of values (slight difference) between the trials (50:50:1 and 20:80:1) can be explained through the fact that the 50:50:1 solvent system of hexanes was slightly less polar than that of 20:80:1 solvent system because the compound, ethyl acetate, is a stronger eluder than the hexanes.

Although, one more authentication was required, the Melting point tests. Three trials were conducted, in order to see whether the compound was pure, or impure. The ranges of the melting point (from the start of one drop of liquid till the whole compound being liquid) as stated in the data above. However, in trial one for the melting point, I was unable to actually distinguish when the whole compound actually was completely liquid, therefore there is a wider range. However, if I neglect the trial one, it’s a lot less wide. Thus the average, excluding the trial one, is 133.2 C – 135.75 C. This happens to be within 2 degrees of the literature value of the melting point for Aspirin is 135.00 C. This leads to the statement that the unknown compound was Aspirin and it might’ve been slightly impure with a majority being pure.

The Rf values might be slightly off because of the uncertainties of the scale/ruler used to measure the solvent font and how much the compounds traveled up along the plate. In addition, the line marked was slightly slanted as it was done by hand instead of using a ruler/scale. In order to improve the experiment, the ruler/scale should be used without much uncertainty.