Data analysis – viscosity

Economics

Introduction

My aim it to find out the different types of liquids are more or less viscous than each other and why. Some liquids flow more easily than others do. For example, honey is very " thick" and flows very slowly. Water is thin and flows very quickly. So honey is more viscous than water. Liquids that are made up of small molecules have a low viscosity and liquids with long chain molecules (such as plastics) have a much higher viscosity. The viscosity of materials generally decreases with increasing temperature. A definition of viscosity; " Viscosity is a measure of a fluid's resistance to flow.

It describes the internal friction of a moving fluid. A fluid with large viscosity resists motion because its molecular makeup gives it a lot of internal friction. A fluid with low viscosity flows easily because its molecular makeup results in very little friction when it is in motion. Gases also have viscosity, although it is a little harder to notice it in ordinary circumstances. "

1. As temperature increases, the average speed of the molecules in a liquid increases and the amount of time they spend " in contact" with their nearest neighbours decreases. Thus, as temperature increases, the average intermolecular forces decrease. The exact manner in which the two quantities vary is nonlinear and changes abruptly when the liquid changes phase.

2. I am going to use the following alcohols: Ethanol Propanol Butanol Pentanol Hexanol Heptanol Octanol Decanol

As there are many of them I am not going to use all of them, only a couple, because it would take time doing all of them, also we don't have a lot of time

in our lesson. Aim: My aim is to find out why some liquids flow more freely than others I am also going to investigate the different alcohols.

Hypothesis

I predict that the more carbon molecules it has the less viscous it is. So it would take longer to flow. It is because of the types of alcohol. For instance Propanol is less viscous than Octanol.

Preliminary experiment

I carried out a preliminary experiment with different alcohol for each experiment. We did this experiment only once just to get an idea of which experiment seemed the best for us to do. The results are shown in the table way below.

Aim

The aim of this was to find out which experiment we wanted to do and which seemed the best to us also which one was fairer and would be easier for us to do and explain why we chose the experiment we did.

Prediction

Once I saw ourteachershow us the experiment I thought the Tilt Test would actually be ' cool' to do but I didn't want to make my mind up just yet so I tried all of them out. I predict that once you go down to the alcohols with the more carbon lengths are more viscous.

Apparatus used
- Alcohols;
- Ethanol (2),

- Propanol (3),

- Butanol (4),

- Pentanol (5),

- Hexanol (6),

- Heptanol (7),

- Octanol (8),

- Dectanol (10))

For Tilt Test

- White tile

- Clamp Stand

- Pipette

- Gloves

- Stopwatch

- China graph Pencil

For Glass Tubing

- Clamp Stand

- Blue Tack Air Bubble

- Stopwatch

- Gloves

- Clamp Stand

For Ball Bearing

- Ball

- Test Tube

- Bung

- Test Tube Rack

- Stopwatch

- Gloves

Method

Ball bearing:

1. Hold the bung with your thumb and turn it.

2. Quickly time the time taken for the ball to move up.

3. Write down the time taken.

Tile Test:

1. Mark the tile from the top horizontally same for the bottom.

2. Get the alcohol and put a drop at the top before the black line so you can measure it easily.

3. . Time the time taken for the liquid to flow down at your finish line.

4. Then write down the time taken.

5. Wipe off the liquid and start again from No. 2.

Glass Tubing

1. Turn the tube upright by holding the clamp not the tube.

2. Time the time taken for the bubble to move up

3. Write down the time taken.

Results

Ball Bearing:

For ball bearing it was really hard to time the amount of time it took to fall as it was really fast. So we could write down our results quick enough.

Conclusion: We chose to do ball bearing as it was really fast and we hardly had any time to time it also because thought it was an unfair test as we couldn't time it probably and we could get it wrong.

We chose not to do glass tubing because it was hard turning the clamp stand around plus it was really slow and took long to time. We chose to do tilt test as it seemed the fairest test out of the 3. Also we could change a few things so it would be fairer, like mark a point on the pipette so we get the same amount of alcohol on the tile etc. and wipe of the liquid later. Plus it would be good for a group of 3 as there are 3 jobs that we could do like putting the alcohol on the tile, timing the time taken for it to go pass the finish line also to note down the time taken and draw the table.

Real Experiment

Apparatus used and Justification:

- Alcohols;

- Ethanol (2),

- Propanol (3),

- Butanol (4),

- Pentanol (5),

- Hexanol (6),

- Heptanol (7),

- Octanol (8),

- Dectanol (10)

White tile – We used this as it would be clearer to see than a black tile.

Clamp Stand – To keep the tile in the same position to keep it a fair test.

Pipette – to keep the measurements of the alcohol on the tile.

Gloves – To not get any of the liquid on our hands and also because of the safety.

Stopwatch – To time the length of the time taken for the liquid to travel down the tile and it seems fair as we aren't doing it in our heads because we could count slowly or faster than an actual second.

China graph Pencil – It is easier to see and to stop the pencil from dissolving as the marks did this.

Method

1. Mark the tile from the top horizontally same for the bottom.
2. Get the alcohol and put a drop at the top before the black line so you can measure it easily.
3. Time the time taken for the liquid to flow down at your finish line.
4. Then write down the time taken.
5. Wipe off the liquid and start again from No. 2.

Conclusion

We marked the pipette so we got the same amount of solution each time to keep it a fair test. We kept the tile at the same height; we changed the types of alcohols. We thought it wouldn't be fair if we left the alcohol on the tile so we wiped it off after every alcohol we used even if we had to use the same alcohol we still wiped it as it would be unfair because that alcohol would've had more liquid so it could make it faster or even slower.

We also kept the maker at the same starting and ending point. We had 3 people in our group, so we did the experiment 3 times so it was fair as we would be changing around what everyone did for instance, putting the liquid on the tile, timing th length it take = s for the alcohol to come down and also

writing the time taken down. It was goo as if someone did it wrong we wouldn't done it again but with a different person doing something different.

Evaluation

We were all safe as we used gloves so the alcohol didn't touch our fingers. We tied our hair back so it wasn't flying around everywhere.

We put our chairs under the table so no one got hurt and we had more room. We made sure the clamp stand was in the middle of the table so it doesn't fall on anyone's foot. We also made sure that the tile wasn't loose so it wouldn't fall. I'd say we were 99. 9% safe! The tile wouldn't stay on so it was at different length but one of us held it steady as one of the sides were up and the other was on the table. We measured it every time we used a different alcohol so it was at the same height each time. Next time we could just put it steady on one angle then measure it instead of doing it the other way.

I guess my results are about right as my range bars ion my graph are quite close together, some more than others. So they are quite accurate. I think there are two outliers which are Propan 2-ol (2nd Try) and Octanol (1st Try). It was probably a silly mistake that we did, or it could've been the temperature of the room. We all did try the experiment and we did different things such as timing the amount taken for the alcohol to go down, getting the liquid in the pipette and putting it down on the tile and also noting down the time taken.

One of us could've timed it before or after the alcohol was put on the tile, either that or the amount was too much or too less. Also some of them did

evaporate when it nearly got to the end. I think from a scale from 1-10 my results would be a 6 with 10 being the most accurate and 1 being inaccurate. Next time I could measure the temperature and go into a room with no windows and nothing that's going to affect the temperature so it's always the same temperature. I could use the same pipette each time.

References

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