Chemistry 11
Block 3
Science Fair 2018

Science Fair Groups

- Look through all of these presentations and posters
- Choose 2 groups you think should represent our class at the Science Fair

Group 1: Which Fruit Contains the Most Vitamin C?
Members: Eve, Ella, and Jo

Introduction

Vitamin C is one of the most common nutrients. It helps protect against cancers, heart disease, stress, it is part of the cellular chemistry that provides energy. As a teenager, we need enough amount of vitamin C daily to protect us from disease. Due to the importance of vitamin C for our health, as fruits are a main source for us to absorb vitamin C, we want to see which fruit is a better source of vitamin C.

Hypothesis

Lemon contains the most amount of vitamin C because it tastes sour.

Materials

- 250mL×0.02M Potassium Permanganate
- 5mL injector
- 2 vitamin C pills
- 15 ziplock bags
- 16 measuring cylinders
- 1 lemon
- Grapes
- 1 pomelo
- 1 pear
- 1 pomegranate
- 1 buret

Procedure

1. Preparing 5 types of fruits and cut them into pieces.
2. Putting each type of fruits into different ziplock bags.
3. Crushing the fruits into juice.
4. Dropping 5mL Potassium Permanganate solution into measuring cylinders by buret.
5. Pouring each type of juice from ziplock bag to another graduated cylinders.
6. Pouring each type of juice to the Potassium Permanganate solutions.
7. Repeating each steps 2 more times.
8. Observing the color changes of the Potassium Permanganate solutions.
9. Collecting the data.

Which Fruit Contains the Most Amount of Vitamin C?

Designed by Eve Yu, Jo Shen and Ella Han

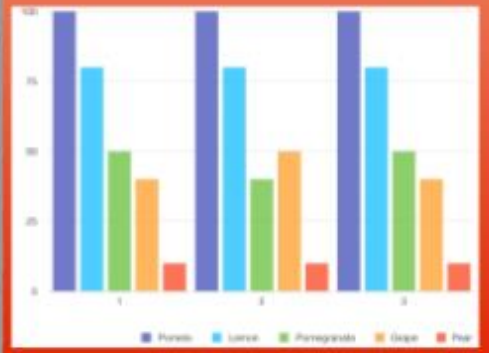
Results and Discussion

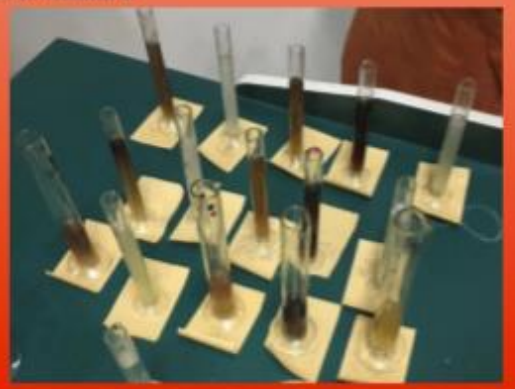
Due to limitations in the amount of chemicals available. Both the amount of potassium permanganate and the amount were limited to 5ml each, so we could observe the changes more easily. In addition, if we use the method of titration, which is only rationing the amount of juice, and dropping potassium permanganate into it until the solution is completely faded, the experiment will be time consuming and expensive because some fruits like pears have only little vitamin c, and we test the pomelo juice, it may only use a few drops, but for pear, it may use over fifty milliliters, so that it will be hard for us to measure in that situation using our equipment.

From the charts, the lemon juice is not the most effective one to fade the potassium permanganate, we can determine that our hypothesis is incorrect. According to a research, all pH levels of fruits include lemon (pH 2.2-2.6), pomelo (pH 2.9 to 3.4), grape (pH 3.3), pomegranate (pH 2.9 to 3.2) and pear (pH 3.6 to 4.0) (Anitei, 2007). As a result, we can infer that the content of vitamin C is not proportional with acidity.

Fruits	Amount of juice added in KMnO4			Amount of KMnO4			The extent of changes in color			Average rank (the amount of vitamin C)
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	
Pomelo	5mL	6mL	5mL	5mL	5mL	6mL	1st	1st	1st	1st
Lemon	6mL	5mL	5mL	5mL	5mL	5mL	2nd	2nd	2nd	2nd
Pomegranate	5mL	6mL	5mL	5mL	6mL	5mL	3rd	4th	3rd	3rd
Grape	5mL	5mL	6mL	5mL	5mL	5mL	4th	3rd	4th	4th
Pear	5mL	5mL	5mL	6mL	5mL	5mL	5th	5th	5th	5th

After the experiment, the graduated cylinder with the pomelo juice and potassium permanganate has the lightest color, and that illustrates the result of our experiment is that pomelo has the most vitamin C. Therefore, the pear, which has the darkest color has the least content of vitamin c.





Conclusion

The Potassium Permanganate solution is pale purple before the reaction. When pouring it into the fruit juice which contains vitamin C, the pale purple disappears. Based on our results, we found the reaction between Potassium Permanganate and vitamin C is:

$$KMnO_4 + HC_6H_7O_6 \rightarrow KC_6H_7O_6 + H_2O + MnO_2$$

Our hypothesis is that comparing with other fruits, lemon will contain the most Vitamins C. Nevertheless, based on the experiment and the analysis, it is proven that pomelo has most Vitamins C instead of lemon. The reason why we are wrong is common sense misleads us, so we thought lemon which has the most acidity is the fruit with the most vitamin C.

Possible Errors and Solutions

One possible error in the experiment was on several occasions, we will pour a little more potassium permanganate into the graduated cylinder, or add more juice into the solution due to the carelessness. That will cause inaccuracy in our experiment.So we need to use more accurate tools and pay more attention to measure the amount of solutions to reduce the error.

Another possible error may be the time it took to crush the fruits into juice, so that during the process, the vitamin c might be lost along with the air. So, the amount of vitamin c in some fruits might be underestimated.Therefore, a better method to get the juice is to use a juicer.

Due to time constraints, it will take us a long time to wait for all the water drops in the graduated cylinder to dry, sometimes we will give up waiting, instead, we just use paper to swipe it easily, and that will cause water to remain, which may causes error in the experiment. And the better way is to wait them to become completely dry and no water inside at all.

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Group 2: Cabbage or pH Indicator?

Members: Cindy, Levi, Kate

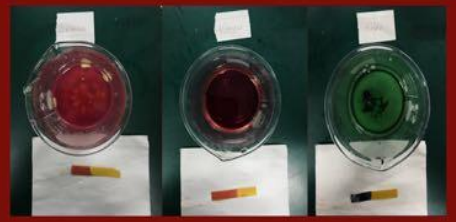
We need

- ☒Purple cabbage x1
- ☒Vinegar x1
- ☒Baking soda x1
- ☒Beakers 50mL x5
- ☒Glass rod x2
- ☒Stopwatch x1
- ☒Various materials for testing (milk, yogurt, banana, coffee, soda, vinegar, lemon)
- ☒pH indicator x1

Procedure

1. Get some pieces of cabbage, put them into boil water to make the cabbage juice.
2. Put different materials into beakers and use pH indicator paper to test the pH value at first.
3. Pull out the paper and put them evenly on the tissue, then pour cabbage juice into each beaker.
4. Use the glass rod to mix and wait for 3 minutes.
5. Observe the color in the cups.
6. Compare the color of cabbage juice as well as the pH indicator paper.

pH	Color
2	Red
4	Purple
8	Blue
10	Blue-green
12	Greenish yellow



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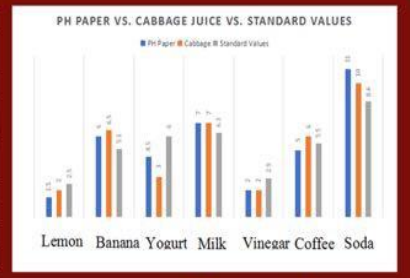
Citation

DATA :D

Cabbage Juice vs. pH Indicator

Materials \ Type	Cabbage Juice (10ml)	pH indicator paper(1 piece)
Yogurt (10ml)	Pink-red ≈ 3.0	4.0
Banana (10g)	Color not change a lot ≈6.5	6.0
Coffee (10ml)	Color not change a lot ≈6.0	5.5
Soda (10g)	Blue-green ≈10.0	11.0
Vinegar (10ml)	Red ≈2.0	2.5
Milk (10ml)	Light blue ≈ 7.0	7.0
Lemon (10ml)	Red ≈2.0	2.5



Cabbage or PH indicator.

KATE TONG
CINDY WANG
LEVI LU

About...

Have you ever think about how the acid-base property of things will affect our daily lives? Do you know that cabbage juice can help discover the acid-base property of different materials? This science fair project was conducted to use cabbage juice as an indicator to compare its result with professional pH indicator to see the juice can indicate to what degree. The experiment was done using the liquid (lemonade, milk, cabbage juice, vinegar, soda) and instruments like beakers and glass rod. Color of cabbage juice can be influenced as the structure of anthocyanins is affected by different acidity and alkaline (Tazzini 7). The independent variable in this experiment is the different kinds of liquid with same amount while the dependent variable is the color of cabbage juice. At the same time, we should control time after we put different juice into the cabbage one.

Discussion

1.EXPLAIN WHY KEY INFORMATION IS IMPORTANT

Based on our data, the color of the cabbage juice indicates the pH value of materials. It can be seen that cabbage juice changes the color for the acid substances to red while it also turns the color to blue/green when the material is alkali. It's quite significant because we can infer the actual pH value of different materials with our juice which means the cabbage juice can effectively distinguish materials. Besides, we control the amount of each independent variables and keep them the same which ensures our measurement to be more accurate.

2.COMPARE YOUR RESULTS TO OTHER SOURCES

We search all standard values for these materials respectively and conclude that 3 out of 7 have the values that are less than the standard while the rest of them all get higher pH value than the standard ones except for coffee(pH paper). According to the thoughtco.com website, the standard value for lemon is 2.5 while it is 1.5 by using pH paper and 2 using the cabbage juice. For the banana, according to H. Patricia, it is 5.1 for the standard value and we used pH paper to indicated it with a number of 6 while it is 6.5 by the cabbage juice. Based on Meg Campbell, yogurt has a standard value of 6 as we calculate 4.5 by the pH paper and 3 by the cabbage juice. Next, milk has a standard value of 6.3 according to Anne Marie Helmenstine and our measurement both show it is 7. For vinegar, it is 2.9 and we test it with a result of 2 for both pH paper and cabbage juice. Then, coffee has a standard value of 5.5 as we use cabbage juice to test it with a value of 6 and 5 with the pH test paper. Last, according to Samuel Markings the standard value for soda is 8.6 while we get the result of 10 with cabbage juice and 11 with the pH test paper.

3.SOURCES OF ERROR

Firstly, as we pour different material juices into the beakers, some of them may splash into other beakers which may potentially causes the result to be inaccurate. In addition, when we combine the cabbage juice together with water, the solution is diluted which means our result may not be the same as we testing with the pure cabbage juice.

4.RECOMMENDATION ON THE ERRORS

For the first potential mistake, we can move all beakers far away from each other and make sure our hands don't touch the other beakers when squashing. Besides, we can use juice extractor to squash the cabbage so that we can get the purest cabbage juice.

Conclusion

1.WAS YOUR HYPOTHESIS CORRECT?

Yes. Cabbage juice is effective to indicate materials but not as accurate as the commercial indicator (pH paper).

2.WHAT RECOMMENDATIONS CAN YOU MAKE BASED ON WHAT YOU HAVE LEARNED?

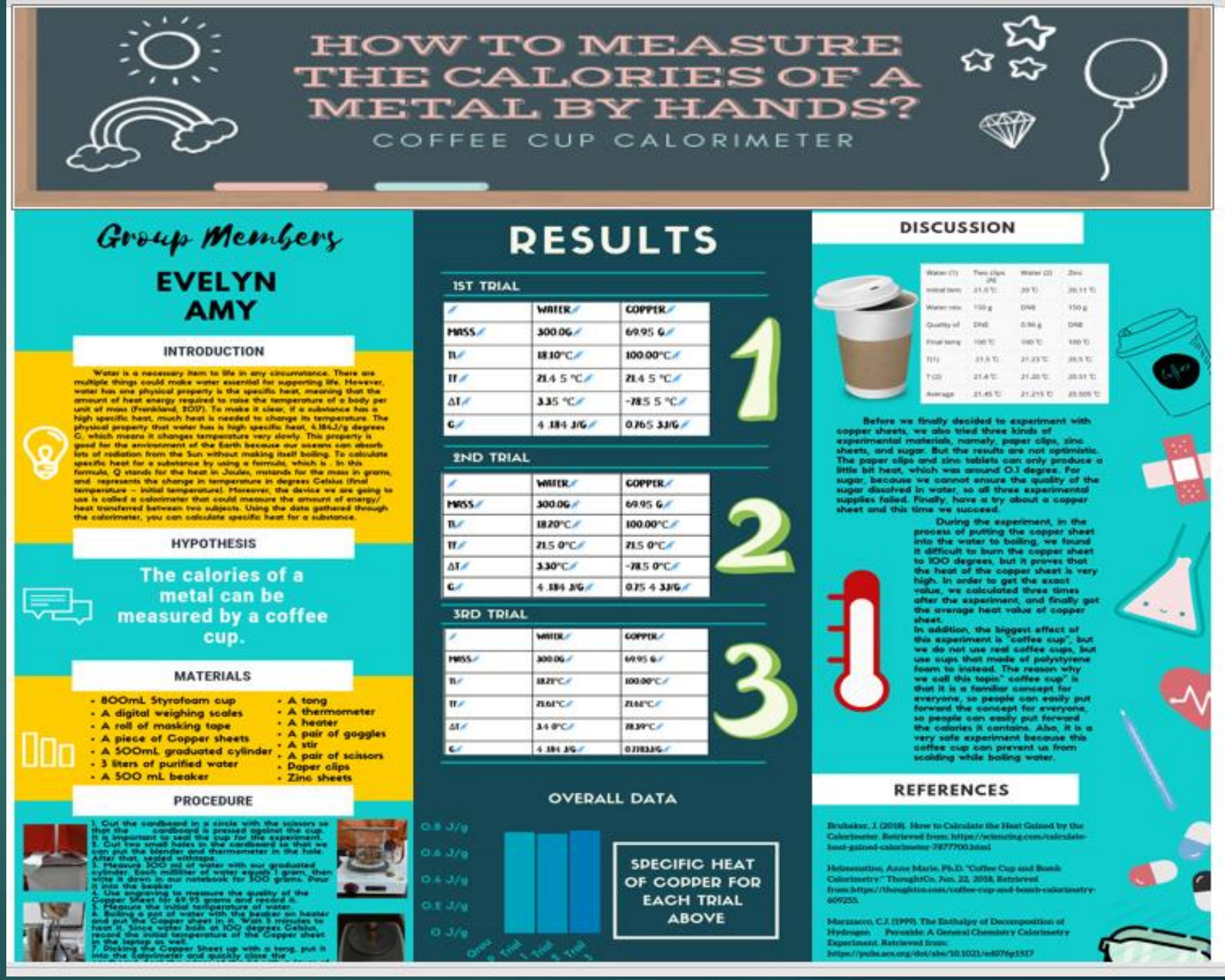
Since our question is related to the effectiveness about cabbage juice and the data has proven us the juice does work, we have learn the importance of measurement accuracy. Some of the advice are making sure all materials have the same variable and try to avoid combining different things together as well as testing them with the same indicator.

3.WHAT EXPERIMENTS WOULD YOU WORK ON NEXT BASED?

Our hypothesis is correct since the cabbage juice is able to indicate materials that are highly alkali or acid (yogurt,soda,vinegar and lemon), but doesn't have an accurate measurement on things that are near neutral such as banana and coffee. Besides, if the color of material is too dark it will also influence our judgement of its pH value. The density of the cabbage juice is also a potential element that may influence our result. We suggest to use the juice with higher density by using the blender and avoid the materials with deep color for the future experiments.

Group 3:
Measure The Calories of a Metal

Members:
Evelyn, Amy



Group 4:
Does Temperature Affect pH of a Liquid

Members:
Ruby,
Max,
Sunnie

Does storage temperature affect the pH of liquid?

Methods and Materials

The materials required for this science fair project:

- 6×500ml beakers
- A thermometer
- PH test pen
- Alcohol burner
- Beaker bracket
- Asbestos net
- 100ml orange juice
- 100ml vinegar
- 100ml soup water
- 100ml soda solution
- Matches

Hypothesis

If the temperature be high then the PH will show as more alkalinity. Because the higher the temperature, the higher the polymer movement.

Introduction

We have already learned what the PH is, and as we know the index of hydrogen ion concentration refers to the ratio of the total number of hydrogen ions in the solution to the total amount of matter. Because PH is around our life, the water have PH, the juice have it. And for this project the material is easy to find out. The most important point is there is no dangerous for this experiment. And it can tell people orange juice which in different temperature can taste good. The variables in this experiment are ...

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Experiment:Procedure

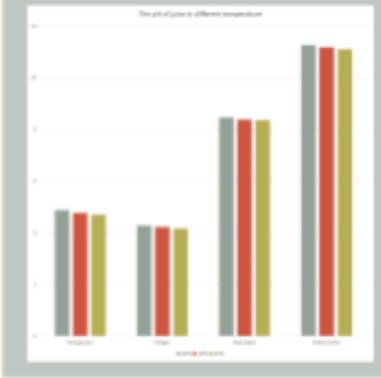
step1. Before you start, pour some orange juice into a cup.
step2. Put the pH paper into the juice.
step3. Record exactly what color it is and if it is very basic, basic, neutral, acidic or very acidic.
Pour one cup of orange juice into a sealed jar or bottle.
step4. Adjust temperature to 30, 40, 50 degrees
step5. Take the orange juice out of storage and put the pH paper into the juice. Depending on what color the pH paper is, the juice should either be very basic, basic, neutral, acidic, or very acidic.
step6.In the same way to experiment the vinegar, soup water and soda solution.

Similar Experiment 2:

Typical pH values for solutions at different temperatures

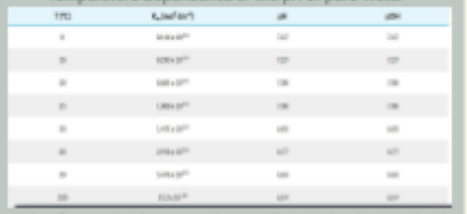
	0°C	25°C	50°C
Acid	2.01	2.00	2.00
Neutral (Water)	7.47	7.00	6.63
Basic	13.80	12.83	12.15

From the table, we can conclude that the effect of temperature is greatest for highly basic solutions.



Similar Experiment 1:

Temperature Dependence of the pH of pure Water



The formula they used:$H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$

We use our data to compared with this sources, we didn't do the pure water in our experiment,but we can see the trend of pH of pure water is as same as us, with the increase of temperature, the pH value of water decreases.

Data and Analysis

Type of Liquid	30C° (PH)	40C° (PH)	50C° (PH)
Orange juice	4.88	4.76	4.70
Vinegr	4.28	4.22	4.16
Soup water	8.46	8.38	8.36
Soda solution	11.26	11.18	11.10

Type of Liquid	30C°-40C° (PH) Difference value	40C°-50C° (PH) Difference value	Average of trials
Orange juice	0.12	0.06	0.09
Vinegr	0.06	0.04	0.05
Soup water	0.08	0.02	0.05
Soda solution	0.06	0.08	0.07
		Average of difference value:	0.065

Discussion

As can be seen from the above chart, with the change of temperature, the PH value of the liquid also changes.

At the same time, we can conclude that the higher the temperature, the higher the acidity of the liquid, and the lower the alkalinity.

For example, when orange juice is at 30 degree C, its PH value is 4.88, when the temperature rises to 40 degree C, the PH value changes to 4.76, and when the temperature reaches 50 degree C, the PH value decreases 0.18 acidity compared with 30 degree C and reaches the highest value in three data. It can be seen that the PH value also changes with the increase of temperature and the PH is more acidic.

Conclusions

Our hypothesis is incorrect. As can be seen from the chart, the higher the temperature, the lower the PH value. So, it should show more acidity. My recommendation is adjust moderately and prove the experiment according to hypothesis.

In the experiment, we found that the trend of the pH value is not obvious. In order to clearly see the change trend, we should choose more temperatures at different stages in each liquid to make the results clearer.

Research

How to calculate pH value:

Equation for pH
pH is the logarithm of the hydrogen ion concentration of an aqueous (water-based) solution:pH = -log[H+]
log is the base 10 logarithm and [H+] is hydrogen ion concentration in the units moles per liter(Anne, M.H. 2018)

Group Members:

Max Teng
Sunnie Li
Ruby Jing

Group 5: Rusting Conditions of Iron Nails

Members: Yvonne, Jean, Eva

Group 5 Members:

Yvonne Xia

Jean Zhang

Eva Dong

Rusting condition of iron nails

Introduction

Effect of oxygen on rust of iron nail, the different changes that occur in the nail with or without oxygen. When we use metal, it's important to know how they react with different substances for example, water and oxygen. The materials in the experiment are easy to collect in life, and these are common elements in life.

Variables

Independence variable: We will change the contact of oxygen and iron nail.

Dependence variable: The iron nail is chemically altered by contact with both water and oxygen.

Control variable: Same volume of iron nail; Same measuring cup。

Materials

The materials required for this science fair project:

- Three measuring cups
- Three hundred milliliters of water
- Dropper
- iron nail
- Sandpaper

Hypothesis

If nails are only in contact with water or oxygen. Another beaker is in contact with both oxygen and water. Then after resting for a few days, one of the three containers changes. It's because iron nail products rust only when it touches both water and oxygen.

Date=	13.11.2018	14.11.2018	15.11.2018
no.A(beaker)	On the first day of the experiment, there was no significant change in the beaker.	The wire inside the beaker turned slightly black.	Iron wire has obvious changes, rust on the wire.
no.B(beaker)	On the first day of the experiment, there was no significant change in the beaker.	No significant change.	There was still no significant change.
no.C(beaker)	On the first day of the experiment, there was no significant change in the beaker.	Oil is attached to the wire.	There is no change.

Procedure

Experimental materials: 3 nails, 3 beakers, and water experiment process: Put the three nails into the beaker respectively. No addition to a beaker. Add half a cup of water to a beaker b. Fill a beaker no. C with water. Observe phenomena. Experimental phenomena: no rust is found in a and c, and no rust is found in b. Experimental conclusion: iron will rust when it encounters water and air at the same time.

References

http://www.reference.com/science/couse-iron-rust-3db28acdb079b3cc

http://wonderopolis.org/wonder/why-do-some-things-rust

http://en.m.wikipedia.org/wiki/Rust

Result : The wire in beaker A is rusty. Beaker B and beaker C did not change significantly.

Group 6:

Most Efficient Electrolyte of H_2 Production Through Electrolysis

Members:

Lyn and Skyler

The most efficient electrolyte for hydrogen production through electrolysis

BY: Lyn & Skyler

Big Question

From NaCl, baking soda(NaHCO3), NaOH and CaCl2, which one is the most efficient electrolyte for hydrogen production through electrolysis?

Hypothesis

If we use Sodium hydroxide as the electrolyte for water, then the most hydrogen would be produced in limited amount of time because it completely dissociates into ions when it dissolves in water, therefore can conduct more electricity (Blausen staff, 2016).

Introduction

Research

Our experiment intends to find a more efficient electrolyte for producing hydrogen from water.

Principle & Life Applications

Electrolyte is a chemical substance when dissolved in water, it dissociates into electrically charged particles and thus is capable of conducting an electric current, and electrolysis is the method we use to decompose chemical by passing a electric current through a liquid or solution that contains ions ("Electrolysis of water study guide" , 2006). So water certainly needs electrolyte for electrolysis to occur. Our experiment intends to find a more efficient electrolyte for producing hydrogen from water. Hydrogen is important because it offers Earth another fuel source which power vehicles and leave behind no trace of pollution (Polenin, 2017).

- Independent variable: the kind of electrolyte.
- Dependent variable: the amount of hydrogen produced.
- Control variables: the amount of water and electrolyte used in each trial, the limited time and the experimental instruments.

Materials

- 0.5M Iodized table salt (NaCl)
- 0.5M Sodium Hydroxide (NaOH)
- 0.5M baking soda ($NaHCO_3$)
- 0.5M Calcium Chloride ($CaCl_2$)
- Water
- Electrolysis device
- 2 graduated cylinders
- 1 stir rod & ruler
- 12v, 1A battery
- 2 current leads

Procedure

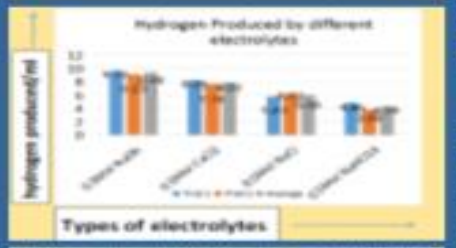
1.Get the device set up.
2. Put 15ml 0.5M NaCl into 80ml water in one beaker. Stir until mixed.
3. Put the mixed solution in the device until it reaches the 0 scale line.
4.Connect the device to the electric source by current leads and turn them on.
5.Observe the water decreased in the negative part of the device and measure the level decreased by a ruler after 20 minutes.
6.Use the volume formula to calculate the amount of water decreased, which is the same as the amount of hydrogen produced.
7.Record the data.
8.Repeat the procedure for other electrolytes and do 2 trials for each electrolyte.
9.Calculate the average of the hydrogen produced by each electrolyte and compare them.

Volume Formula: Length×Width×Height

Results

Table 1: Hydrogen Produced by different electrolytes

Electrolyte	Hydrogen Produced (ml) Trial 1	Trial 2	Average
NaCl	5.83	6.32	6.08
$NaHCO_3$	4.86	3.89	4.38
NaOH	9.72	9.23	9.48
$CaCl_2$	8.26	7.78	8.02



a)When we put NaOH as the electrolyte in water, it produces the most amount of hydrogen.
b) As the kind of electrolyte change from NaOH(Base), to CaCl2(Salt), NaCl(Salt), then to NaHCO3(Salt), the amount of hydrogen produced decreased.

Discussion

From the data, it can be seen that NaOH produced the most amount of hydrogen when we put it in water, which makes it the most efficient. So it is likely that it was dissociated completely by water and thus can conduct more electricity (Blausen Staff, 2016). The sequence of the 4 electrolytes shows a trend for hydrogen production, which is from base to salt.
We calculated the conductivity of the 4 electrolytes according to the research: NaOH--124.3s/m, CaCl2--87.65s/m. NaCl--83.2s/m. $NaHCO_3$--47.2s/m. So by comparing, NaOH has the highest conductivity and can produce the most hydrogen, which matches our result! According to a similar experiment online, NaOH is also the most efficient, however, CaCL2 was the second efficient in our experiment while it' s the least efficient in Liu' s experiment (Liu, 2018). This difference probably is caused by the difference of temperature..

Sources of error

1.Mis-operation: we connected the device and battery in the wrong position and we didn' t cover the top tightly.
2.Inaccuracy of measurement and calculation: We measures the number using a ruler, which is less accurate.
3.Number of trials: We only did 2 trials for each electrolyte because we didn' t have enough time, which affected the accuracy of results.

Based on the sources of error, I recommend people to figure out the correct method and focus more on details like the rubber plug and the connection position in order to operate the experiment correctly. More trials, more precise tools like graduated cylinders are also suggested in order to get data more accurately.

Conclusion

Based on the result and discussion, it has been proven that NaOH is the most efficient electrolyte for hydrogen production through electrolysis among the 4 electrolytes. So our hypothesis was proven to be correct, however, it' s not accurate enough because all of the 4 electrolytes can be dissociated completely, the highest conductivity of NaOH makes it the most efficient. The effectiveness of the procedure still needs to be improved, we recommend people to use electrolytes with higher concentration to make the reaction happen faster and so that the changes more obvious and people can save a lot of time from it. For further experiment, we' d like to explore how temperature impacts the conductivity of different electrolytes with the same concentration. By the way, in real life, people don' t really use NaOH for hydrogen production applied in several industries due to its high price, NaCl is the best choice (Liu, 2018).

Reference

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Group 7:
How Does Temperature Affect Speed of Molecules

Members:
Sarah,
Annie,
Kua

How does temperature affect the speed of molecules?

Sarah Li, Annie Bi, Kua Guo
BLOCK:3

Introduction

The question for our group is how temperature affects molecular motion. We choose this topic because we wants to know the different change of molecules at different temperatures in non-polar and polar liquid and what the reasons are. According to the results of this experiment, we discovered the ink moves faster in hot water, which means that the molecules move faster in hot water and polar and non-polar cannot combined with each other.

Materials

Alcohol lamp 25￥ &1000L water
Red ink 5￥ & filter paper 10￥
benzene70ML & Thermometer
250ml Beakers
Stopwatch & Dropper

Discussion

Through the first experiment, the faster the red ink diffuses in 80 degrees water, the faster the molecule moves. In the second benzene solution experiment,the red ink is insoluble in benzene， the benzene solution is non-polar, By" like solvent like "rule the red ink is polar. In the end, we used "thin-layer chromatography" to verify the speed of molecule movement at different temperatures. The result is the same as the first experiment.There is another experiment confirm our results, to place 1 drop of yellow and blue food coloring into the hot and cold water. And Patti Galvan and Jim Kessler found that The food coloring will spread faster in hot water than in cold. The colors will combine and turn green in the hot water while the colors will remain separate longer in the cold water. This result is as same as the one that our group have.③Experiment from Steve Davala has the same result,take the same quality of hot and cold water, put the same quality of candy, found that the candy in hot water disappeared first.Through analysis and induction, it is concluded that the higher the temperature, the faster the molecular movement.④we have errors in the experiment, because the price of benzene is high, we only did one experiment.next time, we will prepare enough solutions or change it. And because the temperature is low, the watermay change 2 to 3 degrees.next time, we will keep heating to keep the temperature.

Hypothesis

<1> If we put the ink into both hot non-polar and polar solvents, then the speed of red ink point in filter paper diffuse to reach the line will faster than both cold non-polar and polar solvents. This is because the molecules move faster in higher temperature.
<2>If we point the red ink into both hot water and cold water the speed of red ink diffuse in hot water will faster than ink in cold water

Procedure

I)Pour 50ml water into each of the two beaker.Heat to 80 degrees .Measure the temperature of the ambient water, marked as room temperature.(20-21 degree)
Drop a drop of red ink into the two beakers at the same time.Observe which is the fastest one to dissolve the red ink.
(II))Pour 50ml benzene solvent into one beaker.
Drop a drop of red ink into the beaker. Observe how long does it take to dissolve the red ink.
(III) Cut two filter paper with the same length and size .
Draw a dashed line at a distance of 1 cm from the end of the filter paper and drop a drop of red ink over the it.
Draw a solid line from the location of the dotted line 5cm with pencil, and record as the key line.Heat the water in one of the beaker to 80 degrees.Put the filter paper into hot water and room temperature water, but do not make water pass the dashed line.Observe the time that the red ink pass the key line at different temperature.
*Each experiment will be doing three times and the average value should be calculated.

Conclusions

Through this experiment, it was found that molecules move slowly in cold water and fast in hot water, so our experimental hypothesis was proved correct.

Recommendation:

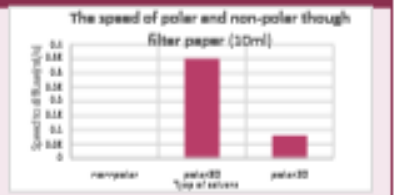
We know that polar and non-polar are mutually exclusive because when we drop a drop of red ink into a beaker filled with benzene,benzene is non-polar, water is polar,but we discovered they are separate from each other, so we can summarize a conclusion from this experiment that is polar and non-polar substances cannot be combined together.

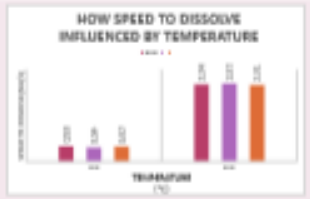
Next step of our experiment:

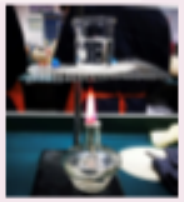
So far, our group has divided the experiment into two parts: the first experiment is the movement speed of red ink in water(H2O); The second experiment was to observe the dispersion rate of red ink in polar and non-polar substance. These two parts makes our experiment more completly.

Results

	Volume (ml)	Temperature (℃)	Time needed to diffuse(s)	Speed to dissolve(ml/s)
Water	50	80	17	2.94
water	50	20	87	0.57
Benzene	50	20	no dissolved	no dissolved







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Group 8: Removing Iodine Stains From Fabric

Members: Emily, Zoe, Burberry

How can we remove iodine stains from fabric?

INTRODUCTION

Are you bothered about your clothes are soiled by iodine stains, and you do not to how to deal with it? It is really hard to clean, but we have a special way to clean it and very quickly. When that happens to you, may you will use laundry detergent or water to clean it, but they can not completely eliminate iodine. So we make this experiment to compare different ways about how to eliminate iodine. In this experiment we prepare water, laundry detergent and sodium carbonate. The independent variables in this experiment are water, laundry detergent and sodium carbonate. The dependent variable is how much iodine has been eliminated by these three matters after mixed with water. So let us begin to do this experiment. .

Hypothesis

If put iodine into $Na_2S_2O_3$ then the iodine will removed, because it can produce the thing $Na_2S_4O_6$ which is no colour.

Materials

The materials required for this science fair project:

- 3 x 250mL beakers
- 3 fabrics
- 1 dropper
- 50g $Na_2S_2O_3$
- 50ml laundry
- 300ml water
- 150ml Iodine
- 1 stir bar
- UV spectrometer

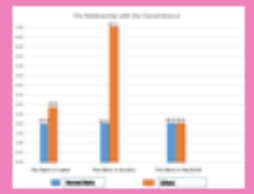
Procedure

1.Mix the solution with the independent variable
The 1st beaker with 200ml pure water.
The 2nd beaker with the normal solution laundry with water about 200ml.
The 3rd beaker with the saturated solution $Na_2S_2O_3$ with water about 200ml.

2.Put the same amount of iodine into 3 fabrics.
3.After full immersion, put three fabrics into different beaker at same time.
4.Wait and observe the result.
5.Collect the fabric and dry it.
6.Put the normal fabric into UV spectrometer at first then put the fabric with different solution into UV spectrometer.
7.Collect data.

Results

	Light transmittance	Absorbance
Normal fabric	02.0	1.708
The fabric in water	02.8	1.734
The fabric in laundry	07.1	1.209
The fabric in $Na_2S_2O_3$	02.0	1.687



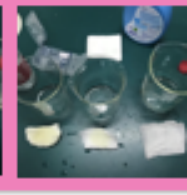
Discussion

Comparing the transmittance and absorbance and the color of the left iodine, $Na_2S_2O_3$ was the most useful in removing the iodine. However, $Na_2S_2O_3$ is not truly remove the iodine. It just produce a new product,$Na_2S_4O_6$. This is a substance which has no color, therefore this creates the illusion that the iodine has disappeared as seen below in the equation:

The $Na_2S_4O_6$ result is different however from water and laundry. Although they all can remove some iodine, water just diluted the iodine. From the knowledge that we learn, iodine is the solute and water is the solvent(Hudson, 2018).
Laundry detergent works by infiltrating alkali into the fibers. It can go inside deeply into the fabric. Over the physical motion(rub) to remove the iodine, but face to some strong stain like iodine, it can't be the perfect method.

Conclusion

Through this experiment, we successfully proving our idea : $Na_2S_2O_3$ is the fastest and most effective substance to let iodine disappearance. But I think we also need to improve something in this experiment ,such as the dose of the $Na_2S_2O_3$ and the laundry detergent, these two data are not very strict , we just put these two by feeling. If we improve this that we can get more accurate result. Also we can try this experiment in different environment conditions , because molecules react faster in relatively hot environments, so we need to try in different environment.



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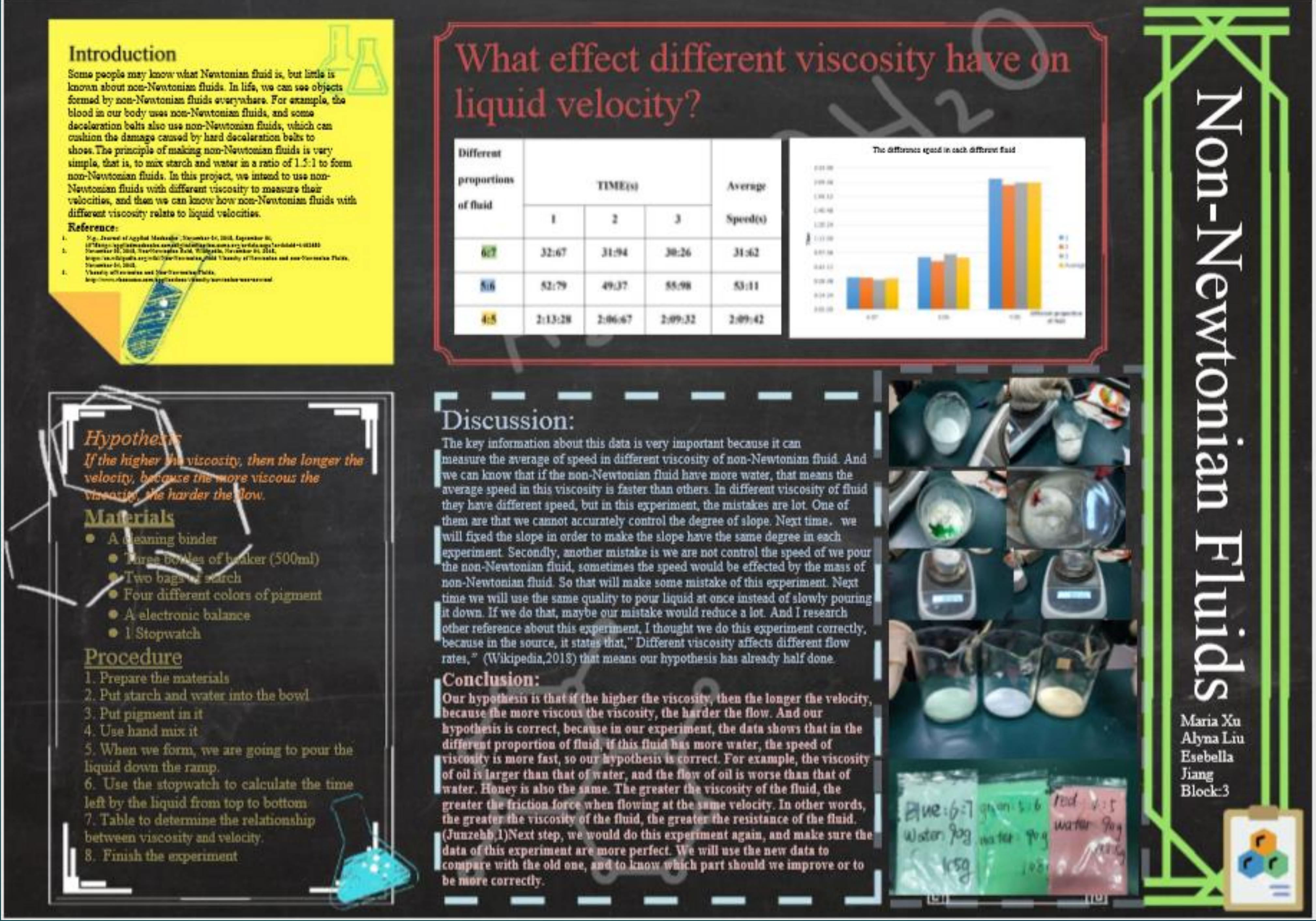
Name

Emily Liu, Zoe Xi, Burberry Ma

Group 9: Non-Newtonian Fluid Viscosity

Members: Esebella, Alyna, Maria



Time to decide!

- In tomorrow's class you will anonymously (匿名地) choose **two** of these to go to the Science Fair!