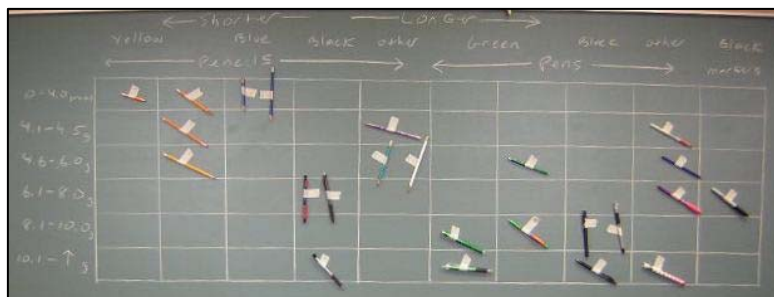


Teacher Notes- “Periodic Pencil Classification- Understanding Chemistry’s Cornerstone”

The periodic table is the cornerstone of chemistry, so it deserves to be taught well. But it can be very intimidating to someone who has never studied it. This activity is designed to help students not just overcome their fear of all the strange letters and numbers on the table, but to appreciate how well the periodic table summarizes and groups elements with similar properties.

In today’s lesson students will progressively organize a group of pens and pencils into a chart using a scheme they devise themselves. The table they end up with will relate in many ways to the periodic table.



Materials:

2-rolls of masking tape

4-balances

1-periodic table wall chart in your room (or the page number in your book having one)

1-pencil from your principal (optional)

1-digital camera (optional)

a few pieces of candy (optional)

PowerPoint

Beforehand:

1. Draw the chart you see to the right on your chalkboard. It is 10 columns across by 6 columns tall. Ideal individual square size is 20 cm wide x 10 cm high.



Start with the perimeter box- 200 cm long (which is exactly 2 meter sticks) by 60 cm high. Make your tick marks, then connect with lines. As you’re deciding where to put this on your chalkboard, leave room at the top and left side for labels. Draw it the afternoon before since it takes about 20 minutes to do. You’ll be so much more relaxed the next morning knowing it’s already done (if the custodians didn’t erase it!).

2. Set up the balances.
3. If possible, hang a large periodic table near the table you just drew on the chalkboard. You’ll be referring to both tables today frequently.

4. Have a table or desk in the front of the classroom where students can lay their pen, pencils, and markers at the beginning of the activity. And since students will make several trips to the chalkboard to move their pens, pencils, and markers, clear that walkway as much as you can of chairs and cords.
5. This activity can adapt to be used with classes that run 25-45 minutes. It is presented in its barest form, so there's plenty of room to add to it. At the end is a list of "accessories", which are further topics you can add on which will lengthen and deepen the discussion. Leave 10 minutes at the end to give students a chance to retrieve their pencils and complete question #1 for homework.

Procedure:

1. Have a couple of student helpers go around the room and give each student about 2 inches of masking tape.
2. Introduce the lesson:

“Students, some people believe that Dmitri Mendeleev’s idea in 1869 to arrange the 60 known elements at the time in a system we still use was one of the single greatest ideas of all time. He did it by increasing mass, but then added a twist. He noticed a cycle that repeated every 8th element. When he arranged the elements by increasing mass and this cycle he came up with the basis of a periodic table that we still use today. It’s simple but brilliant.

You may be sitting there looking at the periodic table, and all you see are letters and numbers that don’t mean anything to you.... at least yet.*¹

I need each one of you to donate a pen, pencil, or marker to science today. Don’t worry, you’ll get it back. In fact, you’ll be putting your name on it, so don’t hesitate to choose your good one. If you brought more than 1 to class today, choose which you think is the *most unique*. After all, your pens and pencils will be representing the elements, and there are some very unique elements.”

3. Have students write their name on the piece of masking tape they’ve been given.
4. Next, tell your class that in the next 2 minutes they need to:
 - weigh their pen, pencil, or marker using a balance
 - write the mass on their tape
 - wrap the tape around their pen, pencil, leaving half of the sticky part exposed so it can stick to the chalkboard (demonstrate this so the idea “sticks”)
5. When the pens, pencils, and markers are all ready have each student lay theirs on the table in front of the classroom.
6. If you’re taking pictures of each step from today’s activity (to review with tomorrow) get your first shot now. If you have a digital camera, at least get a shot of the final table at the very end to show all your classes what each others’ looked like.



7. Referring to the table full of pens, pencils, and markers, say:

“How much order would you say is here among all these? (mixed responses, but mostly “none” and “random”)

You’re right. There is almost no order here. The reason I say *almost* no order is because each of you chose the place to lay your pen, pencil, or marker. The only way this could be any more random would be if I threw them all up in the air and let them drop. But let’s use the word “random” to describe these, because they still are.

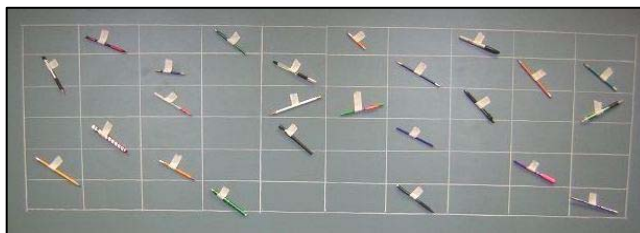


What year did I say Mendeleev created the periodic table? (1869).

Good! And before there was a periodic table, what do you think it was like trying to keep track of the 60 or so elements that were known of at that time without any chart like this? (chaotic)

So that’s where we are. These pens and pencils right now are a pre-1869 chaotic mess.”*2

8. Now have students come up and put their pen, pencil, or marker in any square they choose on the chalkboard. Make sure they don’t hurry, and not to cry if someone else takes the square they wanted. Give the last 2 or 3 students a piece of candy as a reward for their patience (make sure they aren’t diabetic).



9. If you’re taking digital pictures, take #2 now. From now on, take another each time a change is made on the board.
10. When students sit down, they’ll be studying their chart, already thinking about ways to organize and group. Give them a good minute of observation time before speaking (you’ll need that time to anticipate the next few steps). Ask:

“So, is having the pens and pencils up there on the chart any better than having them on the table? (*most will answer ‘no’, but listen for one or two yes’s.*)

I think so too! It’s still a random mess, but what is it about the chart that makes it just a little better? (they each have their own square).

Good. We’ll call this an organized mess.”*3

Obviously we need more order. You’ve had some time to think, so tell me how you’d like to start organizing your chart. What would be the best way to start organizing? (*ideas: by color, whether it’s a pen, pencil, or marker, by mass, length, eraser or not, cap or not, mechanical pencil or not, brand, if it’s been chewed on*)”

(end of Teacher Notes preview)

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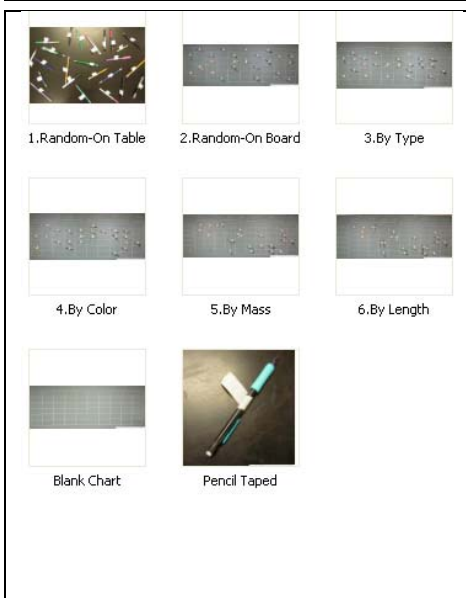
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◆ Drawings & Pictures

◆ Quick Notes

◆ 4 homework questions and answer key



Teacher *Quick Notes*- "Periodic Pencil Classification"

Materials:
 1-roll of masking tape
 4-balances
 1-periodic wall chart in your room (or the page number in your book having one)
 1-pencil from your principal (optional)
 1-digital camera (optional)
 a few pieces of candy (optional)

Beforehand:
 1. Draw the chart on your chalkboard. It's 10 columns wide (each 20 cm across) by 6 columns high (each 10 cm high).
 2. Set up the balances.

Procedure:
 1. Have a student helper go around the room and give each student about 2 inches of masking tape.
 2. Weigh pens and pencils, and put information on tape sticking to it.
 3. Ask everyone to come up front and lay their writing instrument on a front table. Discuss.
 4. Have students put pens and pencils on the chalkboard. Discuss.
 5. Separate by type. Discuss.
 6. Separate by mass. Discuss.
 7. Separate by color. Discuss.
 8. Hand out the 4-question homework assignment (located in the "Resources" folder) and give students remaining time to get started on it in case they have questions.

ANSWERS- Homework Questions-Periodic Pencil

1. Draw a rectangle that is 6 lines high. This represents the periodic table on the board that we made today (don't put all the boxes inside). Put the same labels on around it that we had on our table.

Suggested:

	pencil	pen	marker
yellow	red	black	other
red	blue	other	red
blue	other	red	blue
black	other	red	blue
other	red	blue	black

2. Now add to your chart two other ways we could have classified the pens, pencils, and markers. Be creative!
 ...whether the pen clicks or not, pencil has eraser/not, been chewed on, by length, etc...

3. How similar was the pen or pencil next to yours compared with one 5 or 6 rows away (i.e. which was more different- those closer or further away)?
 Pens/pencils right next to yours will be very similar. Besides being the same type of implement, it will be similar in color and mass. The further from it you go on the table, the more different they become- types change, as do masses and color.

4. Look at a periodic table in your book and compare it with the one we made today in class. Name something they both have in common.
 Both periodic tables are arranged by increasing mass, so mass increases as you go down. They are also similar in that everything immediately surrounding it will be similar to it.