Cosmic Chemistry: Understanding Elements

Connecting Models and Critical Questions

STUDENT ASSESSMENT ACTIVITY

PROBLEM

Create a model to explain differences in chemical reactivity among certain elements, using the *Characteristics of Elements Data Set*.

Table 1: Characteristics of Elements Data Set

Element	Atomic Number	Period	Group	First Ionization Potential (volts)	Electro-negativity	Boiling Point (°K)	Atomic Radius (Å)	Specific Heat Capacity J/g/°K (at 300°K)
H	1	1	IA	13.598	2.1	20.28	2.08	14.304
He	2	1	0	24.587	0	1.216	( )	5.193
Li	3	2	IA	5.392	0.98	1615	1.55	3.582
Be	4	2	IIA	9.322	1.57	3243	1.12	1.825
C	6	2	IVA	11.26	2.55	5100	0.91	0.709
F	9	2	VIIA	17.422	3.98	85	0.57	0.824
Ne	10	2	0	21.564	0	27.1	0.51	1.03
Na	11	3	IA	5.139	0.93	1156	1.9	1.23
Mg	12	3	IIA	7.646	1.31	1380	1.6	1.02
Si	14	3	IVA	8.151	1.9	2630	1.32	0.7
Cl	17	3	VIIA	12.967	3.16	239.18	0.97	0.48
Ar	18	3	0	15.759	0	87.45	0.88	0.52

Show your calculations and attach graphs.

Questions:

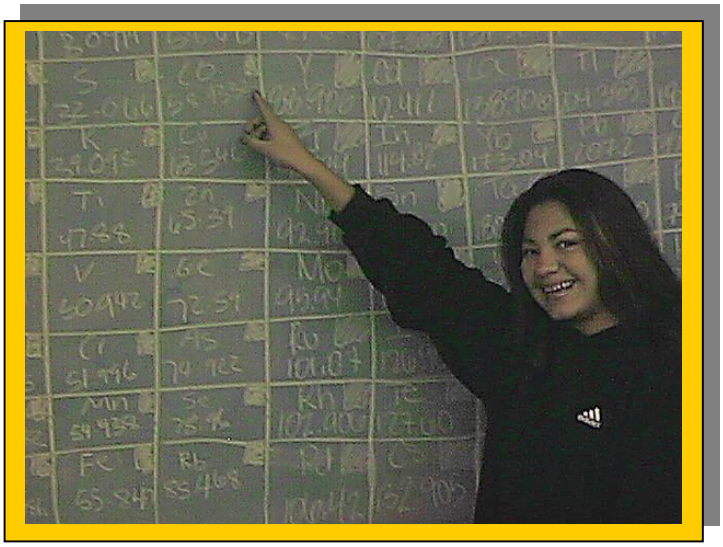
1. a) What were some critical factors identified in the group discussion?
   b) How did you decide on them?
   c) What factor or factors were eliminated? Why?
   d) What critical questions did you ask that led you to an idea for a model?

2. a) What types of information from the data set were useful in addressing the problem? Why was this data useful to solving the problem you faced?
   b) What prior learning about the elements and the periodic table was helpful in making this decision?
   c) How was that information helpful?

3. a) What types of anomalous data did you encounter during your modeling, or discover as a result of the model?
   b) Pose a potential explanation for that anomalous data that is in keeping with your model.

4. Consider the possibility that another element will be discovered in the future that has an atomic mass between that of silicon and chlorine. We want to determine some information regarding this element's characteristics. Use your skills of interpolation to describe this element as thoroughly and accurately as you can. Give the reasoning behind your predictions.

5. Explain your model as you would present it individually to your lab group and classmates. Use the Successful Problem-Solving Process Log and the answers to the preceding questions to inform your explanation.



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