

Trends Handout

name: \_\_\_\_\_

There are 7 trends on the periodic table that we will follow. Using your periodic table, Table S and your mind. Think.

1. The periodic table has \_\_\_\_\_ groups that go \_\_\_\_\_ and \_\_\_\_\_.
2. The \_\_\_\_\_ rows that go across left to right are called the \_\_\_\_\_.
3. Similar elements are found in the same \_\_\_\_\_.
4. Elements with the same number of electron orbitals are found in the same \_\_\_\_\_.
5. The elements are arranged by increasing \_\_\_\_\_.
6. The atomic number is the \_\_\_\_\_ of \_\_\_\_\_ in the nucleus.
7. Because atoms are neutral, the atomic number also equals the number of negatively charged \_\_\_\_\_.
8. The atomic mass minus the atomic number equals the number of \_\_\_\_\_.

**Trend #1 atomic mass**

9. In a whole sentence, state the group trend for atomic mass.
10. In a whole sentence, state the period trend for atomic mass.
11. How can you explain what happens at the atomic masses decreasing at the Co to Ni, and the Ar to K junctures?

**Trend #2 Atomic Radius or Size** (the atomic radius measured in pico-meters)

Draw and fill in the tables for atomic size for groups 2 and 18 below.

12. State the group trend for atomic radius.

GROUP 2	radius in pm
Be	
Mg	
Ca	
Sr	

GROUP 17	radius in pm
F	
Cl	
Br	
I	

Draw and fill in the tables for atomic size for period 2

	Li	Be	B	C	N	O	F	Ne
Atomic radius in pm								

13. State the period trend for atomic radius.
14. Why do atoms get smaller going across a period?



## Trend #5: 1st Ionization Energy

28. Define 1st Ionization Energy:
29. The unit for first ionization energy is
30. In a full sentence, state the GROUP TREND for 1st Ionization Energy.
31. In a full sentence, state the PERIOD TREND for 1st Ionization Energy.
32. Which part of the whole table have the highest and lowest 1st Ionization Energy values?
33. If you ever forget a TREND, how will you deal with this on the REGENTS?

## Trend #6: Cation and Anion size trends

Atom sizes are listed in Table S as atomic radius. Cations form when metal atoms lose electrons, so that they become isoelectric to noble gases. Not only do they lose electrons, they ALWAYS lose all the electrons in the outermost or valence orbital. Cations are ALWAYS smaller than their atoms. Fill in this chart to help you think.

GROUP 2	Atomic electron configuration	Number of orbitals	Cation electron configuration	Number of orbitals
Be				
Mg				
Ca				
Sr				
Ba				
Ra				

34. Why is this trend increasing?

atom	K	Ca	Sc	Ti
Atom electron config				
Cation electron config				

Draw and fill in this chart going across period 3 and 4. State the period trend for cation size.

35. State the period trend for cation size.
36. Why is this trend decreasing?

## Anion Size

Anions form when nonmetal atoms gain enough electrons to fill up the outermost, or valence orbital. They always have the same number of orbitals as the atoms they form from, but with these extra negative charges all repelling each other, anions are a little bit stretched out as compared to the atoms they come from.

Draw and fill in this chart with the electron configurations of the group 17 atoms and anions.

GROUP 17	Atom electron configuration	Anion electron configuration	# orbitals?
F			Same
Cl			Same
Br			Same
I			Same

37. State the group trend for anion size.


38. Why does this trend increase?


Fill in this chart for the electron configurations of atoms and anions in periods 2 and 3

Period 2	N	O	F
Atom electron config			
Anion electron config			
Period 3	P	S	Cl
Atom electron config			
Anion electron config			

39. State the period trend for anion size.

40. Why does this trend decrease across the period?

41. Put in the > or the < symbol for atomic radius: Atom  Cation

42. Put in the > or the < symbol for atomic radius: Atom  Anion

43. Why are all cations smaller than the atoms they formed from?

44. Why are all anions larger than the atoms they formed from?

## Trend #7 Metallic Properties + Non-Metallic Properties of the Elements

46. The metals on the table are on the \_\_\_\_\_ side of the staircase on the periodic table.
47. The non-metals are on the \_\_\_\_\_ side of the staircase.
48. Where is hydrogen?
49. Metals properties include:
50. Nonmetal properties include:
51. Write the symbol of most metallic element of them all \_\_\_\_\_.
52. Write the symbol of most non-metallic element of them all is \_\_\_\_\_.
53. When comparing, which element is the most metallic: silver, zirconium, or cesium
54. When comparing, which element the is most nonmetallic: chlorine, iodine, phosphorous
55. What are metalloids?
56. List the symbols of all the metalloids (there are seven)
57. What are the 2 exceptions to the metalloids?
58. List the symbols of ALL 22 of the nonmetals, in atomic number order.

## Allotropes

Allotropes are pure forms of an element, but they are bonded differently than other pure forms of that same element. Examples include CARBON that comes in sheets (graphite), hard crystal (diamond), and hollow balls of atoms (Bucky balls of  $C_{60}$  or even greater!)

59. Another example are the two pure forms of \_\_\_\_\_

Name	Formula