

Trends Handout

name: _____

There are 7 trends on the periodic table that we will follow. Using your periodic table, answer all of the questions on Loose leaf paper, staple questions on the back please. Think hard.

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

Trend #1 atomic mass

9. State the the group trend for atomic mass. Why does this trend exist?
10. State the period trend for atomic mass. Why does this trend exist?
11. How can you explain what happens at the atomic masses decreasing at the Co to Ni, and at 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. State the GROUP TREND for 1st Ionization Energy.
31. State the PERIOD TREND for 1st Ionization Energy.
32. Which part of the whole table have the highest and lowest 1st Ionization Energy values? Why?
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.

Draw and fill in this chart for electron configurations and atom sizes. State the group trend for cation sizes.

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?

Draw and fill in this double chart for the electron configurations of atoms and anions in periods 2 and 3

Period 2	N	O	F
Electron config			
Anion config			
Period 3	P	S	Cl
Electron config			
Anion config			

39. State the period trend for anion size.

40. Why does this trend decrease across the period?

41. Compare the size of any metal atom to its CATION. Which is bigger, an atom or a cation?

42. Compare the size of any nonmetal atom to its ANION. Which is bigger, an atom or an 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. The most metallic element of them all is _____.
52. The most non-metallic element of them all is _____.
53. When comparing, which is most metallic: silver, zirconium, or cesium
54. When comparing, which 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 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 greater!)

59. Another example are the two forms of _____ called _____ and _____ .
- 60.