

Chemistry

PRACTICE PACKET

Unit 3: Periodic Table

H																	He																												
Li	Be											B	C	N	O	F	Ne																												
Na	Mg											Al	Si	P	S	Cl	Ar																												
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																												
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																												
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																												
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo																												
<table border="1"> <tbody> <tr> <td>Ce</td> <td>Pr</td> <td>Nd</td> <td>Pm</td> <td>Sm</td> <td>Eu</td> <td>Gd</td> <td>Tb</td> <td>Dy</td> <td>Ho</td> <td>Er</td> <td>Tm</td> <td>Yb</td> <td>Lu</td> </tr> <tr> <td>Th</td> <td>Pa</td> <td>U</td> <td>Np</td> <td>Pu</td> <td>Am</td> <td>Cm</td> <td>Bk</td> <td>Cf</td> <td>Es</td> <td>Rm</td> <td>Md</td> <td>No</td> <td>Lr</td> </tr> </tbody> </table>																		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Rm	Md	No	Lr
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Regents Chemistry

Periodic Table Intro

Name _____

-
1. Which list includes elements with the most similar chemical properties?
A) O, S, Se B) Br, Ga, Hg
C) Cr, Pb, Xe D) N, O, F
2. Which element has chemical properties that are most similar to the chemical properties of sodium?
A) calcium B) lithium
C) beryllium D) magnesium
3. The chemical properties of calcium are most similar to the chemical properties of
A) Ar B) K C) Mg D) Sc
4. Which two elements have the most similar chemical properties?
A) Be and Mg B) Na and P
C) Ca and Br D) Cl and Ar
5. Which statement identifies the element arsenic?
A) Arsenic has an atomic number of 33.
B) Arsenic has a melting point of 84 K.
C) An atom of arsenic in the ground state has eight valence electrons.
D) An atom of arsenic in the ground state has a radius of 146 pm.
6. Which statement explains why sulfur is classified as a Group 16 element?
A) Sulfur reacts with most metals.
B) Sulfur is a yellow solid at STP.
C) A sulfur atom has 6 valence electrons.
D) A sulfur atom has 16 neutrons.
7. Which list consists of elements that have the most similar chemical properties?
A) Mg, Al, and Si B) K, Al, and Ni
C) Mg, Ca, and Ba D) K, Ca, and Ga
8. The properties of carbon are expected to be most similar to those of
A) phosphorus B) silicon
C) aluminum D) boron
9. In which set do the elements exhibit the most similar chemical properties?
A) Hg, Br, and Rn B) N, O, and F
C) Al, Si and P D) Li, Na and K
10. All of the atoms of the elements in Period 2 have the same number of
A) valence electrons
B) protons
C) occupied energy levels (shells)
D) neutrons
11. The observed regularities in the properties of elements are periodic functions of their
A) non-valence electrons
B) mass numbers
C) oxidation states
D) atomic numbers
12. Which element has properties most similar to those of fluorine?
A) sulfur B) neon
C) argon D) chlorine
13. Which element is in Group 2 and Period 7 of the Periodic Table?
A) radium B) radon
C) magnesium D) manganese
14. Which is the atomic number of an element in Group 2?
A) 10 B) 13 C) 12 D) 11
15. The elements of the Periodic Table are arranged in horizontal rows according to each successive element's greater
A) atomic mass
B) number of protons
C) number of neutrons
D) atomic radius
16. An atom of an element contains 20 protons, 20 neutrons, and 20 electrons. This element is in Group
A) 4 B) 18 C) 2 D) 1
-

1. How is the periodic table arranged? (According to what?)
By increasing atomic number

2. What do we call the horizontal rows of the periodic table? What do all the elements in a given row have in common?
Rows are called Period. They have the same number of energy levels (shells)

3. What do we call the vertical columns of the periodic table? What do all the elements in a given column have in common?
Vertical columns are called Groups. They have the same number of valence electrons and chemical properties.

4. Which tells us more about an element's properties, its row or its column? Why is this?
The column, they have same chemical properties and valence electrons, which tells us how many bonds an element will form.

5. Chlorine's chemical properties are most similar to which of the following elements?
 - a. fluorine (F)
 - b. sulfur (S)
 - c. oxygen (O)
 - d. argon (Ar)
6. Are atoms of the elements in the family of noble gases reactive (do they readily form bonds with other atoms)? Why is this?
Unreactive, they have a stable complete set of valence electrons (octet).

7. How are ionic bonds formed?

8. How are covalent bonds formed?

PERIODIC TABLE - The Basics

1. The periodic table was *originally* arranged according to atomic mass
2. Our current periodic table is arranged according to atomic number
3. The periodic table is essentially divided into two types or categories of elements.
Those categories are metals and non-metals
4. The dividing line between these two categories of elements is in the shape of a staircase
5. The elements that border or touch this dividing line are referred to as metalloids
6. Explain why the elements from question #5 have this name:
they have properties of both metals and non-metals
7. The first period on the table in which we see transition metals is period 4
8. The transition metals represent a gradual transition or change from metal
to non-metals
9. The *most* metallic elements on the periodic table are found in the
 - a. upper right
 - b. lower right
 - c. upper left
 - d. lower left
10. The *least* metallic elements on the periodic table are found in the
 - a. upper right
 - b. lower right
 - c. upper left
 - d. lower left
11. Which of the following is NOT a Group I metal?
 - a. Hydrogen
 - b. Lithium
 - c. Sodium
 - d. Potassium
12. Name the only four groups on the periodic table that qualify as families.
Group 1 Alkali metals Group 2 Alkaline Earth metals
Group 17 Halogens Group 18 Noble gases

Regents Chemistry

The Groups/Families on the PT

2. Which element is an alkali metal?
A) zinc B) calcium
C) sodium D) hydrogen
3. Which group contains both metals and nonmetals?
A) 7 B) 3 C) 1 D) 15
5. Which atom has multiple oxidation states and forms an ion that is colored when in solution?
A) Cu B) Zn C) F D) Cl
6. Which group is known as the halogens?
A) 1 B) 2 C) 17 D) 18
7. Which represents the electron configuration of a metalloid in the ground state?
A) 2-8-5 B) 2-3
C) 2-5 D) 2-8-6
8. Aqueous solutions of compounds containing element X are blue. Element X could be
A) sodium B) copper
C) carbon D) sulfur
9. Alkali metals, alkaline earth metals, and halogens are elements found respectively in Groups
A) 1, 2, and 14 B) 2, 13, and 17
C) 1, 2, and 18 D) 1, 2, and 17
10. Which of the following gases is monatomic at STP?
A) hydrogen B) helium
C) chlorine D) oxygen
11. An atom in the ground state has a stable valence electron configuration. This atom could be an atom of
A) Al B) Na C) Cl D) Ne
12. Which group of elements in the Periodic Table contains a metalloid?
A) 1 B) 13 C) 18 D) 7
13. An aqueous solution of XCl_2 contains colored ions. Element X could be
A) Ca B) Ni C) Ba D) Bi
14. Which group contains elements composed of diatomic molecules at STP?
A) 11 B) 2 C) 7 D) 17
15. Which Group 15 element exists as a diatomic molecule at STP?
A) bismuth B) arsenic
C) nitrogen D) phosphorus
16. In which section of the Periodic Table are the most active metals located?
A) lower right corner
B) upper right corner
C) lower left corner
D) upper left corner
17. More than two-thirds of the elements of the Periodic Table are classified as
A) metals B) metalloids
C) noble gases D) nonmetals
18. Which statement explains why neon is a Group 18 element?
A) Neon is a gas at STP.
B) Neon has a low melting point.
C) Neon atoms have a stable valence electron configuration.
D) Neon atoms have two electrons in the first shell.
19. Which of the following Period 3 elements has the least metallic character?
A) Si B) Al C) Na D) Mg
20. Which group in the Periodic Table contains elements that are all monatomic gases at STP?
A) 16 B) 17 C) 18 D) 15

The Groups/Families on the PT

21. Which period of the Periodic Table contains more metallic elements than nonmetallic elements?
A) Period 1 B) Period 2
C) Period 3 D) Period 4
22. The presence of which ion usually produces a colored solution?
A) F^- B) Fe^{2+} C) S^{2-} D) K^+
23. On the Periodic Table, an element classified as a semimetal (metalloid) can be found in
A) Period 6, Group 15
B) Period 2, Group 14
C) Period 4, Group 15
D) Period 3, Group 16
24. Most of the groups in the Periodic Table of the Elements contain
A) nonmetals and metals
B) nonmetals, only
C) metals and metalloids
D) metals, only
25. The number of atoms in a molecule of helium is
A) 1 B) 2 C) 3 D) 4
26. Which of the following elements has the most pronounced metallic properties?
A) Al B) C C) Rb D) Co
27. The metalloids that are included in Group 15 are antimony (Sb) and
A) N B) As C) Bi D) P
28. Which three elements have the most similar chemical properties?
A) K, Rb, Cs B) O, N, Si
C) Ar, Kr, Br D) B, C, N
29. Which set of properties is most characteristic of transition elements?
A) colored ions in solution, multiple positive oxidation states
B) colored ions in solution, multiple negative oxidation states
C) colorless ions in solution, multiple positive oxidation states
D) colorless ions in solution, multiple negative oxidation states
30. Which pair of Group 15 elements are nonmetals?
A) nitrogen and arsenic
B) arsenic and antimony
C) nitrogen and phosphorus
D) phosphorus and bismuth
31. The *least* active metal of those represented below has an electron configuration abbreviated as
A) 2-8-18-8-2 B) 2-8-2
C) 2-8-18-18-2 D) 2-8-8-2
32. As the elements in Group 15 are considered in order of increasing atomic number, which sequence in properties occurs?
A) metal → metalloid → nonmetal
B) metalloid → metal → nonmetal
C) metal → nonmetal → metalloid
D) nonmetal → metalloid → metal
33. Which element in Period 5 of the Periodic Table is a transition element?
A) Sr B) Ag C) Sb D) Xe
34. Which list of elements contains a metal, a metalloid, a nonmetal, and a noble gas?
A) Be, Si, Cl, Kr B) C, N, Ne, Ar
C) Na, Zn, As, Sb D) K, Fe, B, F
35. Which element is an alkali metal?
A) Al B) Cl C) Mg D) Na
36. Compared to the atoms of nonmetals in Period 3, the atoms of metals in Period 3 have
A) fewer electron shells
B) more electron shells
C) fewer valence electrons
D) more valence electrons

Regents Chemistry

Phases of the Elements

1. Which element is a liquid at STP?

- A) cesium B) francium
C) bromine D) iodine

2. Which element is malleable and a good conductor of electricity at STP?

- A) carbon B) iodine
C) silver D) argon

3. Which Group 15 element exists as diatomic molecules at STP?

- A) bismuth B) phosphorus
C) nitrogen D) arsenic

4. At STP, a 7.49-gram sample of an element has a volume of 1.65 cubic centimeters. The sample is most likely

- A) Ta B) Ti C) Te D) Tc

5. Which element has the greatest density at STP?

- A) silicon B) sodium
C) selenium D) scandium

6. At standard pressure, which element has a freezing point *below* standard temperature?

- A) Ir B) In C) Hg D) Hf

7. Which element is a brittle solid with low conductivity at STP?

- A) aluminum B) argon
C) sodium D) sulfur

8. A 1.0-gram sample of which element will uniformly fill a closed 2.0-liter container at STP?

- A) antimony B) sulfur
C) tellurium D) xenon

9. Which element is a solid at STP and a good conductor of electricity?

- A) iodine B) nickel
C) sulfur D) mercury

10. At STP, which list of elements contains a solid, a liquid, and a gas?

- A) Ba, Br₂, B B) Cr, Cl₂, C
C) Se, Sn, Sr D) Hf, Hg, He

11. At standard pressure, which element has a melting point higher than standard temperature?

- A) Br₂ B) Fe C) Hg D) F₂

12. Given the particle diagram:



At 101.3 kPa and 298 K, which element could this diagram represent?

- A) Ag B) Rn C) Xe D) Kr

13. Which of these elements has the *lowest* melting point?

- A) Li B) K C) Na D) Rb

14. Which element of Group 17 exists as a solid at 25°C and standard pressure?

- A) chlorine B) iodine
C) bromine D) fluorine

15. What is the total number of elements in Group 17 that are gases at room temperature and standard pressure?

- A) 1 B) 2 C) 3 D) 4

16. Which group contains an element that is a liquid at room temperature?

- A) 11 B) 12 C) 3 D) 4

17. Which element in Period 4 is a gas at 0°C and 1 atmosphere?

- A) krypton B) bromine
C) zinc D) calcium

18. Which group contains an element that is a liquid at STP?

- A) 11 B) 12 C) 1 D) 2

19. Which elements are gases at STP?

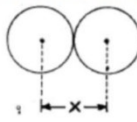
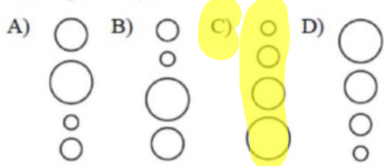
- A) chlorine and fluorine
B) iodine and fluorine
C) chlorine and bromine
D) iodine and bromine

Regents Chemistry

Atomic/Ionic Radius & Allotropes

- Atoms of which of the following elements have the *smallest* atomic radius?
A) P B) Si **C) Cl** D) S
- The distance across an atom of an element in the solid phase is 256 pm. The atomic radius of an atom of this element is closest to
A) 64 pm **B) 128 pm**
C) 512 pm D) 256 pm
- Solid samples of the element phosphorus can be white, black, or red in color. The variations in color are due to different
A) nuclear charges
B) atomic masses
C) ionization energies
D) molecular structures
- Which ion would have the *smallest* radius?
A) Ca^{2+} B) Ba^{2+}
C) Sr^{2+} **D) Mg^{2+}**
- What occurs as the atomic number of the elements in Period 2 increases?
A) The nuclear charge of each successive atom increases, and the atomic radius decreases.
B) The nuclear charge of each successive atom decreases, and the atomic radius decreases.
C) The nuclear charge of each successive atom increases, and the atomic radius increases.
D) The nuclear charge of each successive atom decreases, and the atomic radius increases.
- As the elements of Group 16 are considered in order from top to bottom, the covalent radius of each successive element increases. This increase is primarily due to an increase in
A) atomic number
B) the number of protons occupying the nucleus
C) the number of occupied electron shells
D) mass number
- The radius of a calcium ion is smaller than the radius of a calcium atom because the calcium ion contains the same nuclear charge and
A) fewer electrons B) more protons
C) fewer protons D) more electrons
- The two forms of oxygen, $\text{O}_2(\text{g})$ and $\text{O}_3(\text{g})$, have
A) different molecular structures and identical properties
B) different molecular structures and different properties
C) identical molecular structures and identical properties
D) identical molecular structures and different properties
- As atomic number increases within Group 15 on the Periodic Table, atomic radius
A) decreases, only
B) increases, only
C) decreases, then increases
D) increases, then decreases
- At STP, both diamond and graphite are solids composed of carbon atoms. These solids have
A) different crystal structures and the same properties
B) different crystal structures and different properties
C) the same crystal structure and the same properties
D) the same crystal structure and different properties
- Which statement best compares the atomic radius of a potassium atom and the atomic radius of a calcium atom?
A) The radius of the potassium atom is larger because of its smaller nuclear charge.
B) The radius of the potassium atom is smaller because of its smaller nuclear charge.
C) The radius of the potassium atom is larger because of its larger nuclear charge.
D) The radius of the potassium atom is smaller because of its larger nuclear charge.
- An atom with the electron configuration 2-8-2 would most likely
A) decrease in size as it forms a positive ion
B) increase in size as it forms a positive ion
C) decrease in size as it forms a negative ion
D) increase in size as it forms a negative ion

Atomic/Ionic Radius & Allotropes

13. Which list of elements from Group 2 on the Periodic Table is arranged in order of increasing atomic radius?
- A) Ba, Ra, Sr B) Be, Mg, Ca
C) Ca, Mg, Be D) Sr, Ra, Ba
14. As the elements in Period 2 of the Periodic Table are considered in succession from left to right, there is a decrease in atomic radius with increasing atomic number. This may best be explained by the fact that the
- A) number of protons increases, and the number of shells of electrons increases
B) number of protons decreases, and the number of shells of electrons remains the same
C) number of protons increases, and the number of shells of electrons remains the same
D) number of protons decreases, and the number of shells of electrons increases
15. Which list of elements is arranged in order of increasing atomic radii?
- A) Sc, Ti, V, Cr B) Sr, Ca, Mg, Be
C) Li, Be, B, C D) F, Cl, Br, I
16. Which characteristics both generally *decrease* when the elements in Period 3 on the Periodic Table are considered in order from left to right?
- A) metallic properties and atomic radius
B) metallic properties and ionization energy
C) nonmetallic properties and ionization energy
D) nonmetallic properties and atomic radius
17. Which ion has the largest radius?
- A) Ca^{2+} B) Na^+
C) K^+ D) Mg^{2+}
18. Which elements atoms have a larger atomic radius than atoms of silicon?
- A) sulfur B) chlorine
C) carbon D) sodium
19. An Mg atom differs from an Mg^{2+} ion in that the atom has a
- A) larger radius B) larger nucleus
C) smaller radius D) smaller nucleus
20. The diagram represents two adjacent atoms of sulfur. Distance X is closest to
- 
- A) 127 pm B) 63.5 pm
C) 208 pm D) 190 pm
21. Which of the following particles has the smallest radius?
- A) K^0 B) Na^+ C) Na^0 D) K^+
22. When a fluorine atom becomes an ion, it will
- A) gain an electron and decrease in size
B) lose an electron and decrease in size
C) gain an electron and increase in size
D) lose an electron and increase in size
23. Which grouping of circles, when considered in order from the top to the bottom, best represents the relative size of the atoms of Li, Na, K, and Rb, respectively?
- 
- A) B) C) D)
24. When an atom of phosphorus becomes a phosphide ion (P^{3-}), the radius
- A) decreases B) increases
C) remains the same
25. Which of the following electron configurations represents the element with the smallest atomic radius?
- A) 2-6 B) 2-5 C) 2-7 D) 2-4
26. Which particle has the largest radius?
- A) Cu^{2+} B) Cu C) Se D) Se^{2-}
27. Which of the following ions has the *smallest* radius?
- A) K^+ B) Ca^{2+} C) F^- D) Cl^-

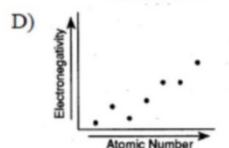
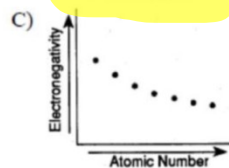
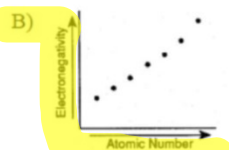
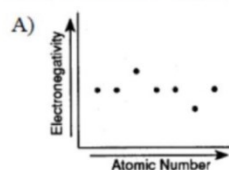
Regents Chemistry Electronegativity/Ionization Energy/Reactivity

- Which general trend is found in Period 3 as the elements are considered in order of increasing atomic number?
A) decreasing atomic mass
B) increasing atomic radius
C) increasing electronegativity
D) decreasing first ionization energy
- Which atom has the *weakest attraction for the electrons in a bond with an H atom*?
A) Cl atom B) O atom
C) F atom D) S atom
- An atom of which element has the greatest attraction for electrons in a chemical bond?
A) As B) Ge C) Se D) Ga
- Which general trend is demonstrated by the Group 17 elements as they are considered in order from top to bottom on the Periodic Table?
A) an increase in nonmetallic behavior
B) a decrease in atomic radius
C) an increase in first ionization energy
D) a decrease in electronegativity
- Atoms of which element have the greatest tendency to gain electrons?
A) iodine B) chlorine
C) bromine D) fluorine
- Based on Reference Table S, atoms of which of these elements have the strongest attraction for the electrons in a chemical bond?
A) Si B) P C) Al D) S
- Which of these elements has the *least* attraction for electrons in a chemical bond?
A) oxygen B) chlorine
C) nitrogen D) fluorine
- The strength of an atom's attraction for the electrons in a chemical bond is the atom's
A) electronegativity B) ionization energy
C) heat of formation D) heat of reaction
- Which of the following elements has the highest electronegativity?
A) Al B) H C) Ca D) K
- The strongest forces of attraction occur between molecules of
A) HI B) HBr C) HF D) HCl
- Which of the following atoms has the greatest tendency to attract electrons?
A) bromine B) barium
C) beryllium D) boron
- Which trends appear as the elements in Period 3 are considered from left to right?
A) Metallic character increases, and electronegativity increases.
B) Metallic character decreases, and electronegativity increases.
C) Metallic character decreases, and electronegativity decreases.
D) Metallic character increases, and electronegativity decreases.
- The ability of carbon to attract electrons is
A) less than that of nitrogen and oxygen
B) greater than that of nitrogen and oxygen
C) less than that of nitrogen, but greater than that of oxygen
D) greater than that of nitrogen, but less than that of oxygen
- Compared to atoms of metals, atoms of nonmetals generally
A) lose electrons more readily
B) have higher electronegativities
C) have lower first ionization energies
D) conduct electricity more readily

Electronegativity/Ionization Energy/Reactivity

15. Which properties are most common in nonmetals?
- A) high ionization energy and low electronegativity
 B) low ionization energy and high electronegativity
 C) high ionization energy and high electronegativity
 D) low ionization energy and low electronegativity
16. Which element in Group 16 has the greatest tendency to gain electrons?
- A) S B) O C) Te D) Se
17. Of all the elements, the one with the highest electronegativity is found in Period
- A) 1 B) 2 C) 3 D) 4
18. Which element in Period 2 has the greatest tendency to form a negative ion?
- A) fluorine B) neon
 C) carbon D) lithium

19. Which diagram correctly shows the relationship between electronegativity and atomic number for the elements of Period 3?

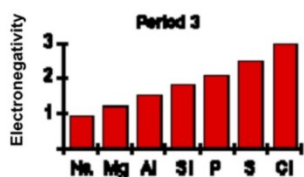


20. Which atom in the ground state requires the *least* amount of energy to remove its valence electron?
- A) rubidium atom B) lithium atom
 C) sodium atom D) potassium atom
21. Samples of four Group 15 elements, antimony, arsenic, bismuth, and phosphorus, are in the gaseous phase. An atom in the ground state of which element requires the *least* amount of energy to remove its most loosely held electron?
- A) Bi B) Sb C) As D) P
22. In the ground state, each atom of an element has two valence electrons. This element has a lower first ionization energy than calcium. Where is this element located on the Periodic Table?
- A) Group 1, Period 4
 B) Group 2, Period 5
 C) Group 2, Period 3
 D) Group 3, Period 4

REVIEW of the PERIODIC TRENDS

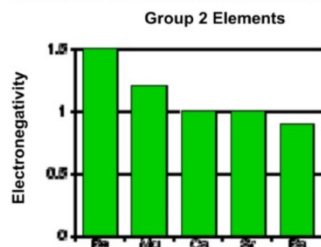
- Describe the trend for atomic radius as you go across a Period.
Across a period, atomic radius decreases.
- What is an explanation for this trend?
Increased nuclear charge pulls electrons tighter to nucleus
- Describe the trend for atomic radius as you go down a group.
Down a group, atomic radius increases
- What is an explanation for this trend?
More energy levels take up more space
- Describe the trend for the 1st ionization energy as you go across a period.
Across a period, ionization energy increases
- What is an explanation for this trend?
Increased nuclear charge pulls electrons tighter to nucleus
- Describe the trend for the 1st ionization energy as you go down a group.
Down a group, ionization energy decreases
- What is an explanation for this trend?
Increased shielding

- Describe the trend illustrated by the graph below and explain why it occurs.



As you move across period 3, electronegativity increases because of an increase in nuclear charge.

- Describe the trend illustrated by the graph below and explain why it occurs.



As you move down a group, electronegativity decreases because of shielding.

11. Describe the trend for metallic character/reactivity as you go across a period.

across a period, metallic character/ reactivity decreases

12. What is an explanation for this trend?

increased nuclear charge

13. Describe the trend for metallic character/reactivity as you go down a group.

down a group, metallic character/reactivity increases

14. What is an explanation for this trend?

increased shielding

15. Describe the trend for reactivity of nonmetals as you go across a period.

across a period, reactivity of nonmetals increases

16. What is an explanation for this trend?

increased nuclear charge

17. Describe the trend for reactivity of nonmetals as you go down a group.

down a group, reactivity of nonmetals decrease

18. What is an explanation for this trend?

increased shielding