

Elemental Properties Review Worksheet

Test Topics: Periodic Table, Atomic Theory, Physical/Chemical Properties, Atom, Isotopes, Average Atomic Mass

Periodic Table

1. List the element symbols for the following atoms: chlorine, potassium, magnesium, sulfur, aluminum, phosphorus.
2. List the seven metalloids. What distinguishes them from metals and nonmetals?
3. What is the only metal that can be a liquid in nature in its pure form? Nonmetal?
4. What are the eleven elements that are gases when pure in nature?
5. What are the seven diatomic elements? What does it mean to be a diatomic element?
6. How do we determine the number of protons, neutrons and electrons in an atom?
7. What do all atoms of the same element have in common?

Atomic Theory

8. Fill in the chart below:

Model/Experiment	Scientist Name	Discovery
Cathode Ray Tube		
Gold Foil Experiment		
Solar System Model		
Quantum Mechanical Model		

9. What was the biggest problem with Bohr's model of the atom?
10. On what is the Quantum Mechanical Model based?
11. What are the charges, relative masses, and locations of the three subatomic particles?
12. What are four characteristics of the nucleus?
13. What is the charge of the nucleus?
14. What holds the nucleus of an atom together?

Physical/Chemical Properties

15. You discover what you think is a pure elemental sample in nature. You observe that the sample is a very brittle solid, a poor conductor of electricity, and that it has a low melting point. What type of element could this be?
16. Label the following as a physical or chemical change.
 - a) Photosynthesis
 - b) Evaporating alcohol.
 - c) Leaves turning brown in the fall.
 - d) Oxidizing a penny.
 - e) Dissolving sugar in water.
 - f) Freezing water into ice.
 - g) Breaking glass.
 - h) Baking cookies.

Atoms

17. Why is an atom neutral?
18. Why are valence electrons different from all other electrons?
19. How do you determine the number of valence electrons that an atom has?
20. List the number of valence electrons for each of the following atoms: chlorine, potassium, magnesium, sulfur, aluminum, phosphorus.
21. Draw the Lewis electron dot structure for each of the following ATOMS: chlorine, potassium, magnesium, sulfur, aluminum, phosphorus
22. Fill in the chart below for the corresponding ATOMS:

Element Name	Element Symbol	Proton Number	Mass Number	Neutron Number	Atomic Number	Electron Number
Barium						
	Fe					
		53				

Isotopes and Weighted Atomic Mass

23. How are two isotopes of the same atom the same? different?
24. Two of the following species are isotopes of each other. Select the isotopes then briefly explain on what basis you selected them:

25	25	26	27
Al	Mg	Si	Al
13	12	14	13

25. What is the difference between the mass number and the atomic mass of an element?
26. Naturally occurring neon is a mixture of three isotopes with the following isotopic masses and natural abundances:

<u>Isotope</u>	<u>Natural Abundance (%)</u>
Neon-20	90.51
Neon-21	0.27
Neon-22	9.22

Calculate the atomic mass of neon.

Neon-20	90.51
Neon-21	0.27
Neon-22	9.22

Ions

27. How do you determine the number of electrons an atom will gain or lose?
28. How do you determine which type of ion that an atom will form?
29. What type of ions do metals form? Cation/Anion, Positive/Negative, Bigger/Smaller than their neutral atom? Why would this happen?
30. What type of ions do nonmetals form? Cation/Anion, Positive/Negative, Bigger/Smaller than their neutral atom? Why would this happen?
31. Which element in period two is most likely going to gain an electron?
32. Which element in period four is most likely going to lose an electron?
33. Draw the Lewis electron dot structure for each of the following IONS: chlorine, potassium, magnesium, sulfur, aluminum, phosphorus.
34. List the symbols for the following IONS: chlorine, potassium, magnesium, sulfur, aluminum, phosphorus.
35. For each of the following sets of data, give the correct nuclear symbol:
- a. #n = 45
#p = 35
#e = 36
- b. #n = 81
#p = 56
#e = 54

36. Fill in the chart below:

Element	Group #	Metal or Nonmetal	Anion or Cation	Nuclear Symbol
Strontium				
Iodine				
Arsenic				
Cesium				
Oxygen				
Xenon				
Gallium				

Periodicity

37. Why does atomic size increase as you move down a group on the periodic table?
38. Why does atomic size decrease as you move from left to right across a period?
39. Which of these atoms has the smallest radius? K, Cl, Br, Ca
40. From left to right in period three, Na, Mg, Al, and Si...
- a. Which element is most metallic?
- b. Which element has the smallest atomic radii?
- c. Which element has the lowest electronegativity?
- d. Which element has the highest ionization energy?
41. Which atom has the higher electronegativity?
- a. Na or Mg

b. K or Br

c. F or Cl

42. Arrange each list of atoms in order of decreasing ionization energy:

a. Cs, Li, K, Rb

b. Cl, Si, P, Ar

c. S, F, Sr, Ge

43. Circle the correct atom or ion:

a. Larger atomic radius: Rb, Ca, Ne, or S

b. Larger radius: S or S²⁻

c. Larger radius: Mg or Mg²⁺

d. More electronegative: Ca, As, or N

e. More electronegative: Cl, Sb, or Ba

f. Greater ionization energy: Ge, Sr, or Be

g. Greater ionization energy: Bi, Ba, or Cs

Bonding

44. List three properties that distinguish between ionic and covalent bonds.

45. List four properties of metallic bonds.

46. Be able to draw the Lewis Dot structures, like NaCl (ionic) and CCl₄ (covalent) compounds.

47. Complete the table:

	ionic bonds	covalent bonds	metallic bonds
Types of atoms in bond			
What the electrons do			