

Measurements in Science:

- Determine the correct number of significant digits:
 - $356.56 = \underline{5}$
 - $0.00201 = \underline{3}$
 - $23000 = \underline{2}$
 - $34.000 = \underline{5}$
- Record your answer in the correct number of significant digits:
 - $3.5 + 2.003 = \underline{5.5}$
 - $2.35 \times 1200 = \underline{2800}$
 - $100.50 - 22.445 = \underline{78.06}$
 - $80.626 / 21 = \underline{3.8}$

Atomic Structure:

- List the three subatomic particles, their location, their charge, and their relative size compared to each other:

Particle	Location	Charge	Relative Size (amu)
Proton	Nucleus	+	1
Neutron	Nucleus	0	1
Electron	Electron cloud	-	0

- Name the group each element is a part of, write the number of valence electrons and determine the oxidation number.

A) Nitrogen Nitrogen Family 5 ve ⁻ / -3 ox #	B) Calcium Alkaline Earth Metals 2 ve ⁻ / +2 ox #	C) Chlorine Halogens 7 ve ⁻ / -1 ox #	D) Neon Noble Gases 8 ve ⁻ / 0 ox #	E) Iron Transition Metal # of valence e ⁻ and ox # vary
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Fill in the blanks with the correct terms:

- atomic # is equal to the number of protons in an atom.
- average atomic mass is the average mass of all the isotopes for a particular element.
- mass # is the sum of the protons and neutrons of an atom.
- isotopes are forms of the same element, but different numbers of neutrons.
- ions are atoms that have gained or lost electrons.
- families Vertical columns on the periodic table. All elements in these columns have similar properties.
- periods Horizontal rows on the periodic table. All elements in these rows have same # of energy levels.
- ox # Term for the number of electrons gained lost or shared in order to get an octet.
- valence are the outermost electrons for an atom.
- ionic type of bonding where electrons are transferred. Formed between a metal and nonmetal
- covalent type of bonding where electrons are shared. Formed between two nonmetals.
- % yield The equation for this is (Experimental / Actual) x 100
- metals are to the left of the staircase and have + oxidation numbers. These atoms lose e⁻.
- nonmetals are to the right of the staircase and have - oxidation numbers. These atoms gain e⁻.
- metalloids are the elements that touch the staircase. They have properties of both metals and nonmetals.
- zero the sum of the oxidation numbers in an ionic bond.

49. Determine which molecule of the pair has the greater **bond** polarity, explain why.

- A) Carbon Disulfide or Sulfur Difluoride Sulfur and fluorine have a greater difference in electronegativity, giving it a greater bond polarity.
- B) Boron Trihydride or Ammonia (NH₃)

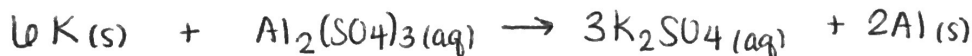
Chemical Reactions:

For the following, balance and classify the reactions:

50. $\underline{2} \text{C}_3\text{H}_8 + \underline{1} \text{O}_2 \rightarrow \underline{6} \text{CO}_2 + \underline{8} \text{H}_2\text{O}$ Rxn type: combustion
51. $\underline{2} \text{HBr} + \underline{\quad} \text{Ca(OH)}_2 \rightarrow \underline{\quad} \text{H}_2\text{O} + \underline{\quad} \text{CaBr}_2$ Rxn type: acid base
52. $\underline{3} \text{Pb} + \underline{2} \text{H}_3\text{PO}_4 \rightarrow \underline{3} \text{H}_2 + \underline{\quad} \text{Pb}_3(\text{PO}_4)_2$ Rxn type: single replacement
53. $\underline{2} \text{AlBr}_3 + \underline{3} \text{K}_2\text{SO}_4 \rightarrow \underline{6} \text{KBr} + \underline{\quad} \text{Al}_2(\text{SO}_4)_3$ Rxn type: double replacement
54. $\underline{2} \text{Hg}_2\text{I}_2 + \underline{\quad} \text{O}_2 \rightarrow \underline{2} \text{Hg}_2\text{O} + \underline{2} \text{I}_2$ Rxn type: single replacement
55. $\underline{2} \text{N}_2\text{O}_5 \rightarrow \underline{\quad} \text{O}_2 + \underline{4} \text{NO}_2$ Rxn type: decomposition

Translate, predict the products, and then balance the equation. Include states of matter!

56. Potassium reacts with Aluminum Sulfate \rightarrow



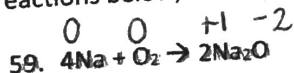
57. Silver Nitride combines with Magnesium Sulfite \rightarrow



58. Phosphoric Acid reacts with Barium Hydroxide \rightarrow

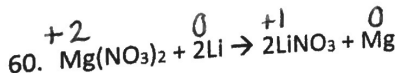


For the reactions below, identify the oxidizing agent, the reducing agent, what has been reduced, and what has been oxidized.



Na = oxidized because it loses electrons (reducing agent)

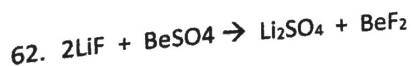
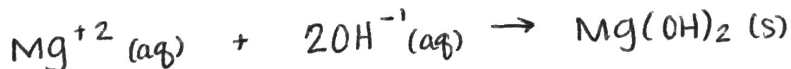
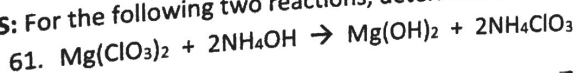
O = reduced because it gains electrons (ox. agent)



Li = oxidized / reducing agent

Mg = reduced / oxidizing agent

HONORS: For the following two reactions, determine the Net Ionic Reactions:



NO reaction

21. Fill in the following table:

NAME	SYMBOL	ATOMIC #	MASS #	PROTONS	ELECTRONS	NEUTRONS	CHARGE
Nickel-59	$^{59}_{28}\text{Ni}$	28	59	28	28	31	0
Strontium-88	$^{88}_{38}\text{Sr}^{+2}$	38	88	38	36	50	+2
Phosphorous-33	$^{33}_{15}\text{P}^{-3}$	15	33	15	18	18	-3

Periodic Trends and Light:

22. Explain the difference between electronegativity and electron affinity. In what directions on the periodic table do they both increase? Electronegativity is the tendency for an atom's nucleus to attract electrons from ANOTHER atom into a chemical bond, whereas electron affinity is the amount of energy needed to gain an electron. They both increase from left to right and bottom to top.
23. Define ionization energy. In what directions on the periodic table does it increase? Ionization energy is the amount of energy required to remove an electron. 1st ionization energy increases from left to right and from bottom to top.
24. Identify the element that has the highest: A) electronegativity, B) atomic radius, and C) ionization energy.
 A) Fluorine B) Francium C) Helium

25. When an atom becomes a cation, what happens to its # of electrons and its overall radius? When an atom becomes an anion, what happens to its # of electrons and its overall radius? Cations lose electrons and so their atomic radius decreases because they have less energy levels. Anions gain electrons and their atomic radius increases because electrons are repelling in the same energy level.

26. Describe the complete process in which an atom of sodium would give off light, as they do in many streetlights.
 ① An electron must absorb energy to jump from the ground state to excited state.
 ② When an electron falls from the excited state to a lower energy level, it releases energy.
 ③ Energy is released in the form of a photon (VISIBLE LIGHT)

27. HONORS: Using the equations $c = \lambda\nu$ and $E = h\nu$ if a ray of light has a wavelength of $7.00 \times 10^{-7} \text{ m}$, what is the frequency of this wave? What is the energy of this wave, where h is Planck's constant and $= 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$?

$$c = \lambda\nu$$

$$3.00 \times 10^8 \frac{\text{m}}{\text{s}} = (7.00 \times 10^{-7} \text{ m})\nu$$

$$\nu = 4.29 \times 10^{14} \text{ s}^{-1}$$

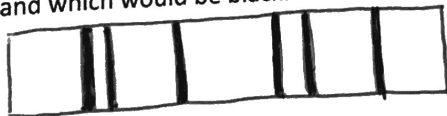
$$E = h\nu$$

$$E = (6.626 \times 10^{-34} \text{ J}\cdot\text{s})(4.29 \times 10^{14} \text{ s}^{-1})$$

$$E = 2.84 \times 10^{-19} \text{ J}$$

28. Each element gives off a unique set of spectral lines which show the individual colors of light given off by the atom. Sketch what a set of spectral lines would look like from an absorption spectrum and an emission spectrum. Label which parts would be colored and which would be black.

Absorption



Emission



↑ each colored line is the wavelength of visible light we see when an electron FALLS from excited state to ground state (high → low energy level)

Naming and Bonding:

41. Name the following compounds: Determine if they are Ionic and if a Trans. Metal is present, Covalent or an Acid.
- A) $\text{CaBr}_2 =$ Calcium bromide B) $\text{NiP} =$ Nickel (III) phosphide C) $\text{N}_3\text{O}_7 =$ trinitrogen heptaoxide
 D) $\text{AlF}_3 =$ Aluminum fluoride E) $\text{H}_2\text{S} =$ hydrosulfuric acid F) $\text{CuBr}_2 =$ Copper (II) bromide
 G) $\text{KNO}_3 =$ potassium nitrate H) $\text{CCl}_4 =$ Carbon tetrachloride I) $\text{S}_2\text{F}_3 =$ disulfur trifluoride
 J) $\text{H}_2\text{SO}_4 =$ sulfuric acid K) $\text{ZnI}_3 =$ zinc (II) iodide L) $\text{H}_2\text{PO}_3 =$ phosphorous acid
 M) $\text{B}_2\text{Br}_5 =$ diboron pentabromide N) $\text{Mn}(\text{ClO}_4)_2 =$ manganese (II) perchlorate O) $\text{HCl} =$ hydrochloric acid

42. Write the correct formulas for the following compounds:

- A) Lithium Sulfite = Li_2SO_3 B) Iron (II) Phosphide = Fe_3P_2 C) Tetrasulfur Pentafluoride = S_4F_5
 D) Phosphoric Acid = H_3PO_4 E) Barium Nitride = Ba_3N_2 F) Hydronitric Acid = H_3N
 G) Copper (III) Iodide = CuI_3 H) Aluminum Phosphate = AlPO_4 I) Calcium Oxide = CaO
 J) Barium Oxide = BaO K) Gallium Hydroxide = $\text{Ga}(\text{OH})_3$ L) Silicon Heptabromide = SiBr_7
 M) Ammonium Phosphate = $(\text{NH}_4)_3\text{PO}_4$ N) Sulfurous Acid = H_2SO_3

Molecular Geometry and Intermolecular Forces

43. An attraction between two molecules due to a small difference in electronegativity is dipole-dipole
 44. When there is an unequal sharing of electrons within a molecule, it is said to be polar
 45. When a molecule has perfect symmetry and all bonding regions are the same, it is considered nonpolar
 46. **HONORS:** A special type of dipole-dipole interaction that involves OH, FH and NH bonds. Hydrogen Bonding
 47. **HONORS:** An intermolecular force achieved when electrons temporary shift is called London Dispersion

48. Draw the Lewis Dot for each molecule. Determine if the Bonds are polar or nonpolar, and if the Molecule is polar or nonpolar. **HONORS:** Write what type of intermolecular bonding each of these examples will have and why?

