

1. (8 points) Periodic Table

- (a) Name an element in the group called the halogens _____ (name)
- (b) The symbol for the element iron is _____ (symbol)
- (c) The name of the element whose symbol is Pb is _____ (name)
- (d) What transition metal is in Group 6B and in the 4th period? _____ (name or symbol)
- (e) What element has an atomic number of 47? _____ (name or symbol)
- (f) What element has the largest atomic weight in the 5th period? _____ (name or symbol)
- (g) The element Ca is in the group called the _____ (name)
- (h) What element has an atomic weight of 47.88 g/mol? _____ (name or symbol)

2. (19 points) **Naming Compounds**—fill in the blanks in the table

Cation	Anion	Name	Formula
1. NH_4^+		Ammonium carbonate	
2.		Nickel(II) phosphate	
3. Ca^{2+}	Br^-		
4. Fe^{3+}			$\text{Fe}(\text{OH})_3$
5.	CH_3CO_2^-		$\text{Al}(\text{CH}_3\text{CO}_2)_3$
6. Co^{3+}			Co_2O_3
7.		potassium sulfate	å
8.		sodium nitrite	

3. (5 points) Names of nonionic compounds. Supply the name or formula of the indicated compounds.

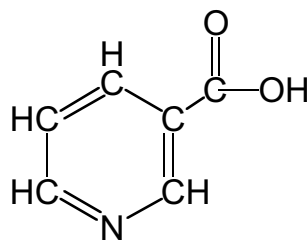
Formula	Name
	Ammonia
	Diphosphorus pentoxide
SO ₃	
	Hydrogen iodide
SiF ₄	

4. (20 points) Atomic Structure and Isotopes

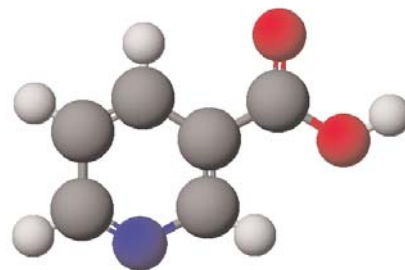
- What is the atomic number of strontium (Sr)? _____
- What is the atomic weight of strontium (Sr)? _____
- How many protons are there in an atom of strontium? _____
- Is strontium a metal, nonmetal, or metalloid? _____
- How many neutrons are there in an atom of ⁸⁶Sr? _____
- The most common ion formed by strontium is _____ and one of these ions would have _____ electrons.
- Strontium has three isotopes with an appreciable abundance: ⁸⁶Sr, ⁸⁷Sr, and ⁸⁸Sr. Which is the most abundant of these three? _____
- If you have 0.235 g of strontium, you have
 - 2.68 x 10⁻³ mol
 - 20.6 mol
 - 268 mol
 - 373 mol
- Suppose you have a piece of strontium containing 3.26 x 10⁻³ mol. How many atoms are there in the piece.
 - 5.41 x 10⁻²⁷ atoms
 - 1.96 x 10²¹ atoms
 - 3.26 x 10²³ atoms
 - 1.85 x 10²⁶ atoms

MOLECULES

1. (16 points) *Nicotinic acid* occurs in minute amounts in all living cells. Appreciable amounts are found in liver, milk, white meat, legumes, and whole cereals.



Nicotinic acid



(a) The *molecular* formula of nicotinic acid is _____

(b) Based on your formula, the molar mass of nicotinic acid is _____

(c) What is the *weight percent* of carbon in nicotinic acid?

◆ Show your work carefully and completely for parts c-f of this question. If no work is shown, no credit is given.

(d) If you have 0.125 g of nicotinic acid, what *amount* of the compound do you have (in *moles*)?

(e) How many *molecules* of nicotinic acid are there in 0.125 g?

(f) How many *C atoms* are there in 0.125 g of nicotinic acid?

5. (3 points) Which sample contains the greatest number of atoms?
- (a) A sample of Cr that contains 8.77×10^{24} atoms
 - (b) 6.87 mole of Al
 - (c) 95 g of Li
 - (c) They all have the same number of atoms.
6. (6 points) Capsaicin, the compound that makes chili peppers hot, has the formula $C_{18}H_{27}NO_3$. Its molar mass is 305.4 g/mol. If you eat 55 *milligrams* of the compound you are consuming
- (a) 1.80×10^{-4} mol
 - (b) 5.50×10^{-3} mol
 - (c) 0.180 mol
 - (d) 5.55 mol
 - (e) none of the above

What is the weight percent of carbon in capsaicin?

- (a) 3.93% C
 - (b) 21.6% C
 - (c) 31.4% C
 - (d) 70.8% C
 - (e) none of the above
6. (3 points) A hydrocarbon (xylene) has the empirical formula C_4H_5 . Its molar mass is 106.1 g/mol. The molecular formula of the compound is
- (a) C_4H_5
 - (b) C_8H_{10}
 - (c) $C_{12}H_{15}$
 - (d) $C_{16}H_{20}$
 - (e) None of the above.

8. (3 points) The hydrocarbon cumene is 89.94% C. Its empirical formula is
- (a) CH_3
 - (b) C_2H_5
 - (c) C_3H_4
 - (d) C_4H_7
 - (e) none of the above
9. (3 points) The mineral cerrusite, PbCO_3 (molar mass = 267.2 g/mol), is a source of lead. What mass of cerrusite will provide 454 g of lead metal? (Assume the cerrusite is pure PbCO_3 .)
- (a) 0.00170 g PbCO_3 required
 - (b) 1.70 g PbCO_3 required
 - (c) 585 g PbCO_3 required
 - (d) 721 g PbCO_3 required
 - (e) none of the above
10. (3 points) In lab experiment like the one you are doing this week, you heat a hydrated salt ($\text{CoCl}_2 \cdot x\text{H}_2\text{O}$) to drive off the water and obtain the anhydrous salt.
- Mass of $\text{CoCl}_2 \cdot x\text{H}_2\text{O}$ = 1.235 g
- Mass of CoCl_2 after heating to drive off the water = 0.674 g
- Molar mass of CoCl_2 = 129.8 g/mol
- The value of x in $\text{CoCl}_2 \cdot x\text{H}_2\text{O}$
- (a) $x = 1$
 - (b) $x = 2$
 - (c) $x = 4$
 - (d) $x = 6$
 - (e) $x = 8$
 - (f) none of the above

11. (2 points) Circle all of the formulas below that are correct.
- (a) AlCl_2
 - (b) KF_2
 - (c) MgS
 - (d) Ga_2O_3
12. (3 points) The mass of 2.50 mol of a compound with the formula ECl_4 , in which E is a nonmetallic element, is 385 g. What is the identity of E?
- (a) C
 - (b) Si
 - (c) Pb
 - (d) Ti
13. (6 points) You combine 1.25 g of germanium, Ge, chlorine, Cl_2 . The mass of product, Ge_xCl_y , is 3.69 g. What is the formula of the product, Ge_xCl_y ?

Show your work completely and clearly. No credit is given if no work is shown.