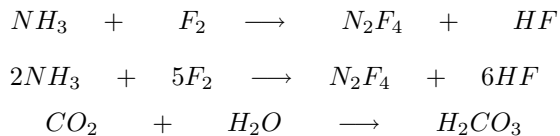
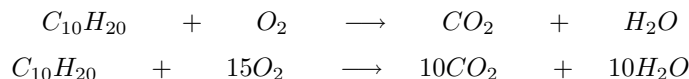


## Honors 203/Chemistry 110 Final Exam Study Questions - Solutions

1. Balance the following equation:



*already balanced.*



2. Complete the following table for neutral atoms:

Symbol	Atomic number	Mass number	number of protons	number of neutrons	Number of electrons
${}^{90}_{38}\text{Sr}$	38	90	38	52	38
${}^4_1\text{H}$	1	4	1	3	1
${}^{39}_{17}\text{Cl}$	39	17	17	22	17

*Note: some of these are not actual isotopes that exist.*

3. Calculate the frequency ( $\nu$ ) of yellow light with a wavelength of 575 nm.

$$\frac{575 \text{ nm}}{1 \text{ nm}} \times \frac{1 \times 10^{-9} \text{ m}}{1 \text{ nm}} = 5.75 \times 10^{-7} \text{ m}$$

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{5.75 \times 10^{-7} \text{ m}} = 5.22 \times 10^{14} /s$$

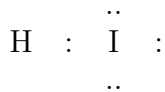
4. Calculate the energy of a photon of orange light with a wavelength of 610 nm.

$$\frac{610 \text{ nm}}{1 \text{ nm}} \times \frac{1 \times 10^{-9} \text{ m}}{1 \text{ nm}} = 6.1 \times 10^{-7} \text{ m}$$

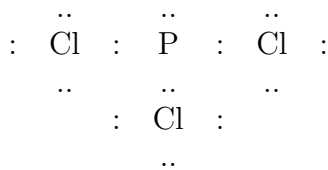
$$E = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34} \text{ J s})(3.00 \times 10^8 \text{ m/s})}{6.10 \times 10^{-7} \text{ m}} = 3.25 \times 10^{-19} \text{ J}$$

5. Draw lewis electron dot structures for:

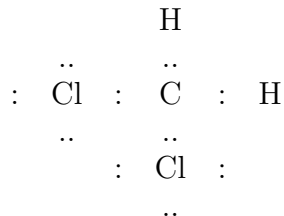
(a) HI



(b) PCl<sub>3</sub>



(c) CH<sub>2</sub>Cl<sub>2</sub>



6. Calculate the molar mass of propane, C
- <sub>3</sub>
- H
- <sub>8</sub>
- .

$$\text{molar mass} = 3(12.01 \text{ g}) + 8(1.01 \text{ g}) = 44.11 \text{ g}$$

7. Calculate the molar mass of Ca(NO
- <sub>3</sub>
- )
- <sub>2</sub>
- .

$$\text{molar mass} = 40.078 \text{ g} + 2(14.01 \text{ g}) + 6(16.00 \text{ g}) = 164.10 \text{ g}$$

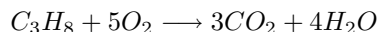
8. How many moles of Ca(NO
- <sub>3</sub>
- )
- <sub>2</sub>
- are there in 100.0 g?

$$100 \text{ g} \times \frac{1 \text{ mole}}{164.10 \text{ g}} = 0.609 \text{ moles}$$

9. Calculate the number of grams in 0.723 moles of Hg
- <sub>2</sub>
- S

$$\text{molar mass} = 200.59 \text{ g} + 2(1.01 \text{ g}) = 202.61 \text{ g}$$

10. Consider the combustion of propane:



- (a) Calculate the net energy change of this reaction.  
 (b) What is the **heat of combustion** of propane?  
 (c) Is energy absorbed or released?  
 (d) Is the reaction endothermic or exothermic?

*Bonds broken in the reactants:*

2 mol C-to-C single bonds	= 1(356 kJ)	= 712kJ
8 mol C-to-H single bonds	= 8(416 kJ)	= 3328 kJ
5 mol O-to-O double bonds	= 5(498 kJ)	= 2490 kJ
Total energy absorbed in breaking bonds		= 6530 kJ

*Bonds formed in the products:*

6 mol C-to-O double bonds	= 6(803 kJ)	= 4818 kJ
8 mol H-to-O single bonds	= 8(467 kJ)	= 3712 kJ
Total energy released in forming bonds		= 8554 kJ

$$\text{Net energy change is } (+6530 \text{ kJ}) + (-8554 \text{ kJ}) = -2024 \text{ kJ}$$

*The overall energy change is negative, characteristic of an exothermic reaction. Heat is released.*

*The heat of combustion is +2024 kJ*

11. (a) Predict the formulas of the ionic compounds that would be formed by the combination of each pair of elements. (b) name each compound.

- (a) Ba and Cl *BaCl<sub>2</sub>*  
 (b) Cs and F *CsF*  
 (c) Ca and N *Ca<sub>3</sub>N<sub>2</sub>*

12. Calculate the molarity of a solution prepared by dissolving 23.1 grams of MgCl
- <sub>2</sub>
- in water and diluting to a total volume of 1.25 L.

$$\text{Molar mass KCl} : 39.10 \text{ g} + 2(35.45) = 110.00 \text{ g}$$

$$\frac{23.1 \text{ g}}{110.00 \text{ g}} \times \frac{1 \text{ mole}}{1} = 0.210 \text{ moles}$$

$$\text{Molarity} = \frac{0.210 \text{ moles}}{1.25 \text{ L}} = 0.168 \text{ M}$$

