NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE DUE: \_\_\_\_\_\_\_\_\_\_\_\_

TEACHER: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Year 11 Term 1 – Chemistry**

**HOMEWORK SHEET No. 4 – Atomic Structure and Isotopes**

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| --- | --- |
| /1 | 1. How many moles are in 3.4 x 1023 molecules of H2SO4? |
| /2 | 1. How many molecules are in 25.0 grams of NH3? |
| /2 | 1. How many grams are in 8.200 x 1022 molecules of N2I6? |
| /2 | **4.**  What’s the empirical formula of a molecule containing 18.7% lithium, 16.3% carbon, and 65.0% oxygen? |
| /1 | **5.** If the molar mass of the compound in question 4 is 73.8 grams/mole, what’s the molecular formula? |

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| /3 | **6.\*\*** Aniline,  a  starting  material  for  urethane  plastic  foams,  consists  of  C,  H,  and  N.  Combustion of such  compounds yields: CO2, H2O, and N2 as products. If the combustion of 9.71g of aniline yields 6.63 g H2O and 1.46g N2, what is it’s empirical formula? |
| /2  /2 | **7.** The reaction of aluminium and iron(III) oxide gives off a great deal of heat and light:  2 Al(*s*) + Fe2O3(*s*) → 2 Fe(*s*) + Al2O3(*s*)  **a.** What mass of Fe2O3(*s*) is required to react completely with 1.0 kg of Al(*s*)  **b.** What mass of Fe(*s*) will be produced based on the quantities in a)? |
| /3 | **8.** The Marsh test was used historically to detect arsenic in cases of suspected poisoning:  As2O3(*s*) + 6 H2(*g*) → 2 AsH3(*g*) + 3 H2O(*g*)  A sample contains 640 mg of As2O3. What mass of AsH3 will be isolated from the above reaction? Assume that there is enough (excess) H2 to react with all the As2O3. |
| /2  /2  /2 | **9.**  Titanium (IV) chloride can be made by the following reaction:  2 FeTiO3(*s*) + 7 Cl2(*g*) + 6 C(*s*) → 2 TiCl4(*g*) + 6 CO(*g*) + 2 FeCl3(*s*)     1. If you start with 100.0 g of each reactant, which one limits the reaction? 2. What is the theoretical yield of TiCl4 based on the amounts in a)? 3. If only 70.0 g of TiCl4 is recovered, what is the percent yield of the reaction? |
| /2  /2  /2 | **10.** Hydrazine is used in rocket fuel. It reacts with Oxygen according to the equation below  N2H4(l) + O2(g) → N2(g) + 2 H2O(g)  In a particular rocket engine, 2.29 g of hydrazine and 3.14 g of Oxygen are available to react.  **a.** Identify the limiting reagent and show your calculations  **b.** Determine the mass of unreacted reagent that will be left after the reaction and show your calculations  **c.** Calculate the mass of water produced from the amounts stated in a). |
| /3 | **11.\*\*** A 0.423 g sample of impure Sodium Nitrate (NaNO3) was heated, converting all the Sodium Nitrate to 0.2864 g of Sodium Nitrite (NaNO2) and some Oxygen gas. Determine the percent of sodium Nitrate in the original sample. |