

CHEM-1094

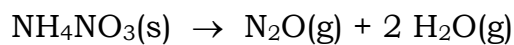
TEST # 3

NAME: \_\_\_\_\_

1. a) Calculate molecular mass of glucose  $\text{C}_6\text{H}_{12}\text{O}_6$  [1] \_\_\_\_\_  
b) Calculate molar mass of glucose. [1] \_\_\_\_\_
2. For 27.0 g of glucose, calculate [8]  
a) moles of glucose \_\_\_\_\_  
b) molecules of glucose \_\_\_\_\_  
c) moles of atoms \_\_\_\_\_  
d) number of atoms \_\_\_\_\_
3. How many ions are there in 20.0 g of  $\text{Al}_2(\text{SO}_4)_3$  (MM=342.3)? [2]
4. A certain experiment requires  $3.01 \times 10^{23}$  atoms of carbon. How many grams of  $\text{C}_6\text{H}_6$  (MM=78.0) must be used to obtain the carbon atoms? [2]

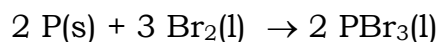
5. Vanillin is a common flavouring agent. It has a molar mass of 152 g/mol and is 63.15 % C and 5.30 % H; the remainder is oxygen. Determine the molecular formula of vanillin. **[5]**

6. Laughing gas, N<sub>2</sub>O (MM=44.0), is made by the careful decomposition of ammonium nitrate (MM=80.0)



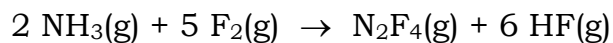
If you begin with 125 g of ammonium nitrate, how many grams of laughing gas can you obtain? **[2]**

7. The reaction of red phosphorus and liquid bromine is given below



12.7 g of  $\text{Br}_2$  (MM=159.8) are reacted with an excess of P (MM=31.0). If 10.9 g of  $\text{PBr}_3$  (MM=270.7) are isolated, what is the % yield of this compound? **[4]**

8. Dinitrogen tetrafluoride,  $\text{N}_2\text{F}_4$  (MM=104), can be produced by the reaction of  $\text{NH}_3$  (MM=17.0) with  $\text{F}_2$  (MM=38.0).

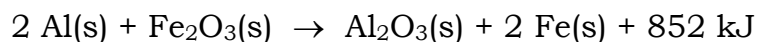


**a)** If 4.00 g of  $\text{NH}_3$  and 14.0 g of  $\text{F}_2$  are allowed to react, which is the limiting reagent? **[4]**

**b)** How many grams of  $\text{N}_2\text{F}_4$  are produced? **[2]**

**c)** How many grams of which reagent, if any, are left unreacted? **[3]**

9. The thermite reaction is given below

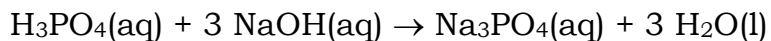


a) Is this exothermic or endothermic reaction? [1] \_\_\_\_\_

b) How many kJ of energy are involved if 20.0 g Al (MM=27.0) is reacted? [2]

c) Calculate the final temperature of 155 g of water, initially at 25°C, if the heat involved in part (b) above is used to heat water. The Specific heat of water is 4.184 J/g °C. [3]

10. 25.00 mL of 0.100 M  $\text{H}_3\text{PO}_4\text{(aq)}$  is titrated against 0.200 M  $\text{NaOH(aq)}$ . How many mL of NaOH are needed to reach the end point? [4]



11. Density of hydrochloric acid solution is 1.145 g/mL and is 25.0% HCl by mass. Calculate the molarity of HCl solution. **[3]**

12. The element magnesium has three stable isotopes with the following masses and abundances:

$^{24}\text{Mg}$	23.9850 amu	78.99%
$^{25}\text{Mg}$	24.9850 amu	10.00%
$^{26}\text{Mg}$	25.9826 amu	11.01%

Calculate the average atomic mass of magnesium from these data. **[3]**