

Name Mr. ShankPeriod AP 1,2,3

Pre-AP Chemistry, Grade 10

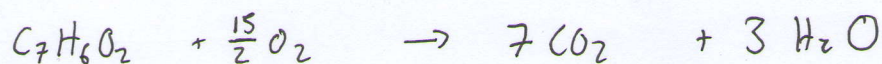
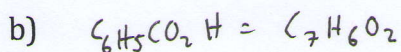
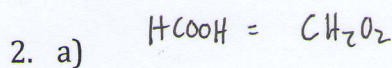
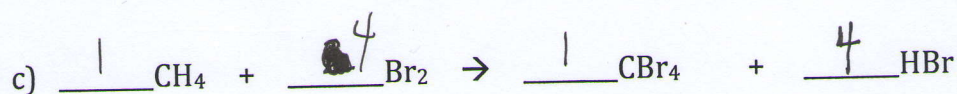
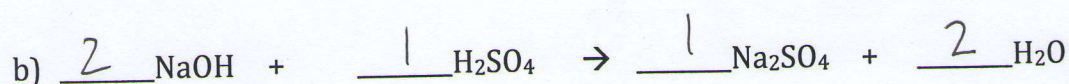
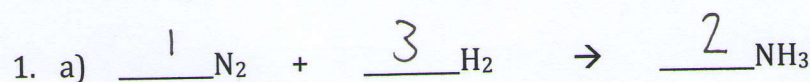
Test 4

Answer Sheet:

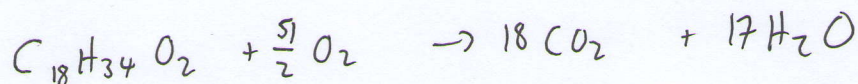
I. Multiple Choice

1. B6. C2. C7. A3. D8. E4. D9. B5. E10. D

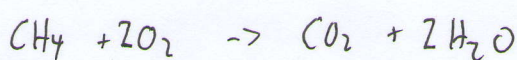
II. Free Response



c)



3.



$$\text{actual yield } 16.043 \text{ g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.0426 \text{ g CH}_4} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol CH}_4} \times \frac{18.0158 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} =$$

$$\frac{18.0156 \text{ g H}_2\text{O}}{36.032 \text{ g H}_2\text{O}} = 0.50 \Rightarrow \% \text{ yield}$$

36.032 g H₂O = theoretical yield

$$\% \text{ yield} = \underline{50\%}$$

$$4. \quad 26.59 \text{ g NO} \times \frac{1 \text{ mol NO}}{30.007 \text{ g NO}} \times \frac{2 \text{ mol NO}_2}{2 \text{ mol NO}} = 0.886 \text{ mol NO}_2$$

$$16.10 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32 \text{ g O}_2} \times \frac{2 \text{ mol NO}_2}{1 \text{ mol O}_2} = 1.006 \text{ mol NO}_2$$

* NO is the limiting reagent *

moles NO₂ produced = 0.886

5. (0.611 moles) $55 \text{ g C}_x\text{H}_y\text{O}_z + \text{O}_2 \rightarrow 24.75 \text{ g H}_2\text{O} + 60.46 \text{ g CO}_2$ (75%) (75%)

theoretical yield H₂O = 24.75 / 0.75 = 33 g H₂O

$$33 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.0158 \text{ g H}_2\text{O}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 3.663 \text{ mol H} \times \frac{1.0079 \text{ g H}}{1 \text{ mol H}} = 3.692 \text{ g H}$$

theoretical yield CO₂ = 60.46 / 0.75 = 80.613 g CO₂

$$80.613 \text{ g CO}_2 \times \frac{1 \text{ mol CO}_2}{44.011 \text{ g CO}_2} \times \frac{1 \text{ mol C}}{1 \text{ mol CO}_2} = 1.832 \text{ mol C} \times \frac{12.011 \text{ g C}}{1 \text{ mol C}} = 22.004 \text{ g C}$$

$$55 \text{ g} - (3.692 \text{ g} + 22.004 \text{ g}) = 29.304 \text{ g O} \times \frac{1 \text{ mol O}}{16 \text{ g O}} = 1.832 \text{ mol O}$$

C_{1.832} H_{3.663} O_{1.832} → CH₂O ⇒ empirical molar mass = 30.027 g/mol

$$\frac{\text{molecular molar mass}}{\text{empirical molar mass}} = \frac{(55 \text{ g} / 0.611 \text{ moles})}{30.027 \text{ g/mol}} \approx 3$$

molecular formula = C₃H₆O₃

Extra Credit

$$x \text{ g CuSO}_4 \cdot 5\text{H}_2\text{O} + y \text{ g MgSO}_4 \cdot 7\text{H}_2\text{O} = 5.020 \text{ g} \quad \begin{bmatrix} 1 & 1 & 5.020 \\ .639 & .488 & 2.988 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 1 & 5.020 \\ 0 & -.151 & -0.2198 \end{bmatrix}$$

$$\frac{m(\text{CuSO}_4)}{m(\text{CuSO}_4 \cdot 5\text{H}_2\text{O})} = 0.639 \quad \frac{m(\text{MgSO}_4)}{m(\text{MgSO}_4 \cdot 7\text{H}_2\text{O})} = 0.488 \quad \rightarrow \begin{bmatrix} 1 & 1 & 5.020 \\ 0 & 1 & 1.455 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & 3.565 \\ 0 & 1 & 1.455 \end{bmatrix}$$

$$0.639x \text{ g CuSO}_4 + 0.488y \text{ g MgSO}_4 = 2.988 \text{ g} \quad \begin{matrix} x = 3.565 \text{ g} \\ y = 1.455 \text{ g} \end{matrix} \quad \frac{3.565 \text{ g}}{3.565 \text{ g} + 1.455 \text{ g}} = 0.71$$

$$x + y = 5.020$$

$$0.639x + 0.488y = 2.988$$

% CuSO₄ · 5H₂O = 71 %