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120 points  
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Test 1  
Chemistry 121A  
September 27, 1999

**SHOW ALL CALCULATIONS & USE PROPER SIGNIFICANT FIGURES AND UNITS**

$$N_A = 1 \text{ mole} = 6.02 \times 10^{23}$$

**Multiple Choice Questions: Circle the single best answer. No penalty for guessing.**

1. Which SI unit indicates  $10^{-3}$  grams? (4 points)

- A) mg       B) cg       C) tg       D) kg       E) Mg

2. Do the following arithmetic with correct significant figures: (4 points)

$$863 \times (1255 - (3.45 \times 10^8))$$

- A) 761511      B)  $7.6151 \times 10^5$       C)  $7.615 \times 10^5$        D)  $7.62 \times 10^5$       E)  $7.6 \times 10^5$

3. What element has 12 neutrons, 10 protons and 10 electrons? (4 points)

- A)  $^{12}\text{B}$       B)  $^{10}\text{C}$        C)  $^{22}\text{Ne}$       D)  $^{22}\text{He}$       E)  $^{22}\text{Ti}$

4. What is the name of the  $\text{ClO}_4^-$  anion? (4 points)

- A) chlorate      B) chlorite       C) perchlorate      D) hypochlorite      E) chloride

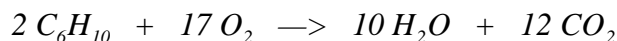
5. How many moles are 44.0 g of  $\text{CO}_2$ ? (4 points)

- A) 1.00      B) 2.00      C) 3.00      D) 44.0      E) 1940

6. A compound is made of only H, C and N. This compound has 3.73% by mass hydrogen, 44.44% by mass carbon and 51.83% nitrogen. What is the empirical formula of this compound? (4 points)

- A)  $\text{H}_4\text{C}_{44}\text{N}_{52}$       B)  $\text{HC}_{11}\text{N}_{13}$       C)  $\text{H}_4\text{CN}$       D)  $\text{HC}_2\text{N}$        E)  $\text{HCN}$

7. Write the balanced chemical equation for the reaction of  $\text{C}_6\text{H}_{10}$  with  $\text{O}_2$  to produce  $\text{H}_2\text{O}$  and  $\text{CO}_2$ . Calculate the mass of  $\text{CO}_2$  produced when 4.305 g of  $\text{C}_6\text{H}_{10}$  is reacted in excess oxygen. (10 points)

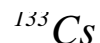


$$4.305 \text{ g C}_6\text{H}_{10} \times (1 \text{ mol} / 82.1456 \text{ g}) \times (12 \text{ mol CO}_2 / 2 \text{ mol C}_6\text{H}_{10}) \times (44.0098 \text{ g CO}_2 / \text{mol CO}_2) = 13.84 \text{ g CO}_2$$

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8. Write out two additional atomic symbols which are isotopes of  $^{132}\text{Cs}$ . (6 points)



9. Name the following ionic compounds. (4 points each)



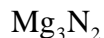
Calcium Nitrate



Carbonic Acid



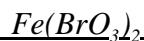
Sodium Sulfate



Magnesium Nitride

10. Write the empirical formula for the following compounds. (4 points each)

iron (II) bromate



lithium phosphate



aluminum oxide



ammonium chloride



11. A Morgan silver dollar has a mass of 26.73 g. By law it was required to contain 90.0 % by mass silver, with the remainder being copper. When the coin was minted in the late 1800's, silver was worth \$1.18 per troy ounce (31.1 g). At this price, what was the value of the silver in the silver dollar? (8 points)

$$26.73 \text{ g MSD} \times (90.0 \% \text{ Ag} / 100.0 \% \text{ MSD}) \times (\$1.18 / 31.1 \text{ g}) = \$ 0.913$$

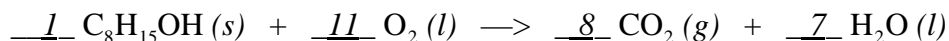
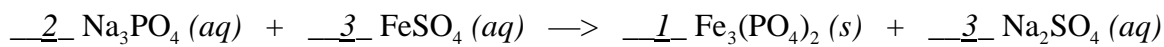
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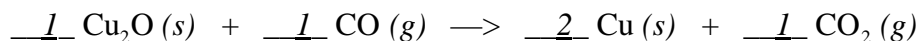
12. Only two isotopes of boron occur naturally:  $^{10}\text{B}$  (mass = 10.013 amu; abundance 19.78%) and  $^{11}\text{B}$  (mass = 11.009 amu; abundance 80.22%). Calculate the average atomic mass (weight) of boron. (15 points)

$$0.1978 \times 10.013 \text{ amu} + 0.8022 \times 11.009 \text{ amu} = 10.81 \text{ amu}$$

13. Balance the following two chemical equations. (10 points)



14. Balance the following equation and calculate the amount of Cu which could be produced by reacting 5.00 g of  $\text{Cu}_2\text{O}$  and 15.00 g of CO. (15 points)



$$5.00 \text{ g Cu}_2\text{O} \times (1 \text{ mol} / 143.0914 \text{ g}) \times (2 \text{ mol Cu} / 1 \text{ mol Cu}_2\text{O}) \times (63.546 \text{ g} / \text{mol}) = 4.44 \text{ g Cu}$$

$$15.00 \text{ g CO} \times (1 \text{ mol} / 28.0104 \text{ g}) \times (2 \text{ mol Cu} / 1 \text{ mol CO}) \times (63.546 \text{ g} / \text{mol}) = 68.06 \text{ g Cu}$$

therefore  $\text{Cu}_2\text{O}$  is limiting reagent and 4.44 g Cu are made!