Chemistry Review Questions – Sophie Lelei

1. In Coca-Cola, there's 200g of sugar per 5000 ml of water. If 15000 ml of Coca-Cola were diluted to a final volume of 50000ml, what would the new concentration be expressed in g/L.

Answer:
$C_1V_1 = C_2V_2$
$(200g/5L)(15L) = C_2(50L)$
$C_2 = 12g/L$

2. What volume (in liters) would an small airplane occupy under normal atmospheric pressure? A typical airplane has an internal volume of 11.3 liters and is filled to a pressure of 200atm with air. (pressure in atmosphere is 1)

$P_1V_2 = P_2V_2$
$(200)(11.3) = (1)(V_2)$
$V_2 = 2260L$

3. The Pallmobile has a volume of 10L. The tire is filled with air to an absolute pressure of 3atm. What volume (in liters) would the air in the tire occupy if it were released into the atmosphere assuming there's no change in temperature? (pressure in atmosphere is 1)

$P_1V_2 = P_2V_2$
$(3)(10) = (1)(V_2)$
$V_2 = 30L$

4. Lemonade has a pH level of 2.29. Determine the hydrogen ion concentration, the hydroxide ion concentration and the pOH.

$[H_3O^+] = 10^{-pH}$ $pOH = 14 - pH$ $[OH^-] = 10^{-11.71}$
$= 10^{-2.29}$ $= 14 - 2.29$ $= 1.95 \times 10^{-12}$
$= 5.13 \times 10^{3}$ $= 11.71$

5. Curl Central is trying to find a shampoo with a low sulfate concentration. If 1.5g of Sulfuric acid reacts with 3.0g of Sodium hydroxide to form Sodium sulfate and water, determine the
    a) Balanced equation
    b) limiting reagent
    c) Mass obtained
    d) Moles of Excess

a) $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

b) $n_{(H2SO4)} = 1.5/98.0734$ $n_{(NaOH)} = 3.0/39.99707$
$= 0.01529$ $= 0.07501$

∴LR

$0.07501/2 = 0.037505$

∴ XS

c) 1 : 1
0.01529 : x
x = 0.01529
m = nM
= 0.01529(2(29.989) + 32.06 + 4(15.9994))
= 2.38g

d) 1 : 2
0.01529 : x
x = 0.03058

XS = 0.07501 - 0.03058
= 0.04mol

6. Serena is riding her bike. The tires are filled to their capacity of 7L and the temperature is 296K. As the weather gets warmer, the temperature inside the wheel becomes 334K. What is the new volume?

$V_1 = 7L$ $V_1T_1 = V_2T_2$
$T_1 = 296K$ $V_2 = V_1T_1 / T_2$
$V_2 = ?$ $V_2 =(7L)(296K) / (334K)$
$T_2 = 334K$ $V_2 = 6.20L$

7. 12 ml of Aluminum Sulfate solution has a concentration of 0.005M. Water was added to make the solution of 50 ml. What's the new concentration?

$$V_1C_1 = V_2C_2$$
$$V_1C_1 / V_2 = C_2$$
$$(0.012L)\ (0.005M) / (0.05L) = C_2$$
$$C_2 = 0.0012M$$

8. Shampoo has a pH level of 5.5. Determine the hydrogen ion concentration, the hydroxide ion concentration and the pOH.

$[H_3O^+] = 10^{-pH}$ $pOH = 14 - pH$ $[OH^-] = 10^{-8.5}$

$= 10^{-5.5}$ $= 14 - 5.5$ $= 3.00 \times 10^{-9}$

$= 3.16 \times 10^{-6}$ $= 8.5$

9. Hydrochloric acid has mass of 2.25g and it reacts with 2.0 g of Magnesium Hydroxide to form water and Magnesium Chloride. Write a balanced equation and find the theoretical mass of the salt.

$$2HCl + Mg(OH)_2 \rightarrow MgCl_2 + 2H_2O$$

$n_{(HCl)} = 2.25/36.4609$ $n_{(NaOH)} = 2.0/58.3196$

$= 0.061709941$ $= 0.03429$

∴ XS

0.061709941 / 2 = 0.03085

∴LR

$$2 : 1$$
$$0.061709941 : x$$
$$2x = 0.061709941$$
$$x = 0.03085$$

$m = nM$

$=0.03085(24.305 + 2(35.453))$

$= 2.94g$

10. On a hot hot hot day it is 41 degrees Celsius outside and the pressure is 102.4kPa. As the sun sets the temperature begins to cool down and it is know only 23 degrees Celsius. What is the pressure

$$T_1P_1 = T_2P_2$$
$$(314.15)(102.4kPa) / (296.15) = P_2$$
$$P_2 = 108.62kPa$$