Physical Science
Pretest 3.1 **Use NOTE book or loose leaf.**

1. a. 330 grams of Coke contains 42.0 g of sugar. What is the mass percent of sugar? (2m)

Note that the Coke is the entire solution = total mass.
42/330 *100% = 12.7%

b. What is the concentration, in g/L, of sugar in COKE, if we assume that 330 g of COKE is approximately 330 ml? (2m)

C = m/V= 42 g / 0.330 L = 127 g/L
So if you drink an entire liter of regular Coke, you are putting the equivalent of about 25 teaspoons of sugar into your body.

2. How many grams of sugar would be needed to make 100 mL of a solution similar to Kraft's KOOL-AID SPLASH Soft Drink, whose concentration of sugar is 118 g/L? (2m)

m = CV = 118 g/L *(0.100 L) = 11.8 g

3. You just calculated that 3.0 g of LiCl are needed to make 250 ml of a certain solution. Outline a laboratory procedure. Mention the equipment needed. (3 m)

1. Weigh 3.0 g of LiCl on a balance.
2. Dissolve in < 250 ml of water in a beaker.
3. Transfer to a 250.0 ml volumetric flask.
4. Add water to white line and mix.

4. How many grams of NaOH are found in 200 mL of a 0.10 mole/L solution? (2m)

n = CV, where n = number of moles because C is in moles/L
n = 0.10 moles/L*(0.200 L) = 0.020 moles of NaOH
0.020 moles of NaOH (40 g/mole) = 0.8 g of NaOH

5. In the lab, how would you make 200.0 ml of a 3 mole/L solution from 10.0 L of a 4 mole/L solution? Show calculations and outline the three basic steps. (4m)

$C_1V_1 = C_2V_2$
$(4\ mole/L)V_1 = (3\ mole/L)(0.200\ L)$
$V_1 = 0.150\ L$

1. **Pipet 150 ml from the 10.0 L (might be a little big for the average pipet!)**
2. **Transfer to a 200.0 ml flask.**
3. **Add water to white line and mix.**

6. Which of the following is **NOT an electrolyte**? (1m)

(A) $LiNO_{3(aq)}$
(B) $AlN_{(aq)}$
(C) $O_{2(aq)}$
(D) $H^+_{(aq)}$ and $Cl^-_{(aq)}$

(C) The first two are salts and (D) is an acid all of which conduct electricity in aqueous state.

7. Classify as an acid or base.

a. HF_____**acid**_____
b. A sour-tasting substance like citrus fruit____ **acid** _____
c. Lithium hydroxide in water _____**base**_____
d. Rain from SO_2-polluted air_____ **acid** _____
e. A substance that releases hydrogen gas in the presence of Ca_ **acid** ___
f. A non-salty electrolyte that does not feel slippery____ **acid** _____
g. A substance that releases hydroxide ion in water_ **base** ____
h. A substance with a hundred times **less** hydrogen ion than a pH 6 solution_ **base** (pH=8)__
i. A solution that destroys the properties of $KOH_{(aq)}$_____ **acid** _____
j. A solution that turns deep red in the presence of universal indicator or litmus_ **acid** ___

8. Complete the following ionic equations **(some may need balancing):**

a. LiOH → **Li^+** + **OH^-**
b. HX → **H^+** + **X^-**
c. **$Be(OH)_2$** → $Be^{+2}_{(aq)}$ + **2** $OH^{-1}_{(aq)}$
d. **HNO_3** → $H^{+1}_{(aq)}$ + $NO_3^{-1}{}_{(aq)}$

9. **Calculate the pH** of the following solutions: **(show formula and work)**

a. $[H^{+1}] = 0.001$ M

pH = -log[H^{+1}]
=-log[0.001] = 3

b. $[H^{+1}] = 0.04$ M

pH = -log[H^{+1}]
=-log[0.04**] = 1.40**

c. $[H^{+1}] = 5.0 \times 10^{-10}$ M

pH = -log[H^{+1}]
=-log[5.0 X 10^{-10}**] = 9.3**

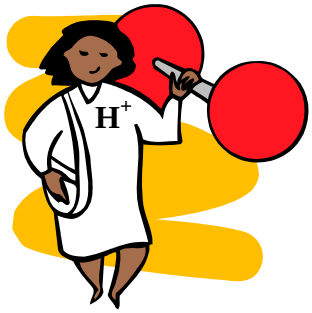
d. a neutral solution (no calculations necessary)
pH = 7

10. Consider two acids:

Solution A: pH = 4.5
Solution B: pH = 3.1

a. Which is the stronger acid?
pH = 3.1

b. How much stronger is it? Show calculations.
Strong/weak = $10^{-3.1}$/ $10^{-4.5}$ = 25 times stronger



11. Here is an excerpt from an actual acid rain research report written in Montreal:
(**Monitoring Urban Precipitation Chemistry in the Ville de Montreal** Alain Leduc
APT Bulletin, Vol. 23, No. 4, Historic Structures in Contemporary Atmospheres (1991), pp. 10-12 doi:10.2307/1504362

Les echantillons les plus frequents proviennent de tempetes venant du sud-ouest et demontrent un pH moyen de 4.07.

Let me translate: "By far the most frequent collections are for storm systems from the southwest, with an average acidity of pH 4.07."

Question: At a pH of 4.07 there are still small amounts of OH^- due to water's contribution. Calculate the ***grams*** per litre of hydroxide at a pH of 4.07.
$[H^+] = 10^{-pH}$
= $10^{-4.07}$ = 8.51 X 10^{-5} moles/L
For any aqueous solution, $[H^+]$ $[OH^-] = 10^{-14}$.
8.51 X 10^{-5} $[OH^-] = 10^{-14}$.
$[OH^-] = 10^{-14}$ /8.51 X 10^{-5} = 1.18 X 10^{-10} moles/L
1.18 X 10^{-10} moles/L(16+1 g)/mole = 2.0 X 10^{-9} g/L

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