Purpose: Calculation practice with pH and pOH

Warmup, copy and solve:

"For a 0.400 liter liquid that contains 0.000045 moles of H+ find the concentration of H+"

$$\frac{.000045}{.400 \text{ L}} = 1.125 \times 10^{-4} M \; H^+$$

Then find the pH by this:

$$pH = -\log [H+]$$

$$pH = -\log [1.125 \times 10^{-4} M]$$

$$pH = 3.95$$

#1 What are the three possible amounts of

[OH-] and [H+]?

Memorized formula:

$$1 \times 10^{-14} = [OH^-][H^+]$$

When pH is 7, [OH-] = [H+] = 0.0000001 M

When the water is acidic, [OH-] < [H+]

When the water is basic, [OH-] > [H+]

#2 A handy shortcut for pH and pOH.

pH + pOH = 14

#3 If you know only the one with the star, you can find the other three

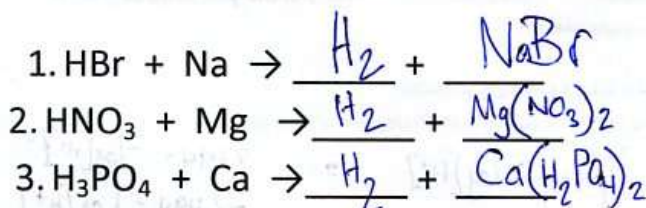| pH	pOH	[H+]	[OH-]
10.4	3.6	⊛ $4x10 - 11$ $4x10^{-11}$	2.5×10^{-11}
17	-3 ⊛	1×10^{-17}	1×10^{3}

Answers

C

Name

Period
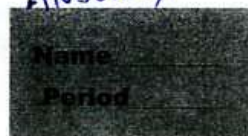
Metal with Acid

Remembering that <u>Acid</u> + <u>Metal</u> → <u>hydrogen gas</u>   +   <u>salt</u>, fill in the missing substances for each reaction below

1. HBr + Na → $\underline{H_2}$ + $\underline{NaBr}$
2. HNO_3 + Mg → $\underline{H_2}$ + $\underline{Mg(NO_3)_2}$
3. H_3PO_4 + Ca → $\underline{H_2}$ + $\underline{Ca(H_2PO_4)_2}$

4. We have three *memorized* math equations which we are using in this chapter. :

Write the equation you have memorized that describes what number you get when you multiply the molarity of H+ by the molarity of OH-	Write the equation you have memorized that describes how H+ molarity is related to pH	Write the equation that you have been using since March to relate moles of solute, volume of solution, and molarity of a solution.
$1 \times 10^{-14} = [H^+][OH^-]$	$pH = -\log[H^+]$	$conc = \dfrac{moles}{volume}$

5. If a solution contains 0.445 moles of HNO_3 dissolved to make 2.3 liters of solution, what is the molarity?

$$\frac{.445\,mol}{2.3\,L} = 0.19\,M$$

6. If a solution of HF has a concentration of 2.3×10^{-6} M, and a volume of 444 mL, how many moles of HF does it have?

$$2.3 \times 10^{-6}\,M = \frac{moles}{0.444\,L}$$

$$1.02 \times 10^{-6} = moles$$

7. ~~In the reaction below, connect the conjugate pairs with a line. Write "acid" or "base" below each of the four substances.~~

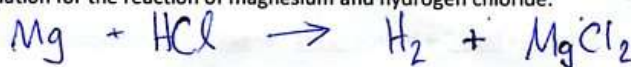$$\sim\!\!NH_4^+ + OH^- \rightleftharpoons HOH + NH_3$$

SKIP #7, #10, AND #13

8. Show what reaction occurs when calcium reacts with HF. Use your periodic table to help you with the charges of the product so that the compound comes out with zero charge.

$$H \cdot F + \cancel{Ca} \rightarrow \cancel{H_2} + \cancel{CaF_2}$$

9. Write the reaction equation for the reaction of magnesium and hydrogen chloride.

$$Mg + HCl \rightarrow H_2 + MgCl_2$$

10. Calculate both the concentration of H+ and of OH- ions at 25 degrees in
    a. pure water

    b. a 10. M solution of NaOH

11. Find the [H+] of a solution at 25 degrees with a pH of

    a. 3.494

    $$pH = -\log[H^+] \quad so \quad 3.494 = -\log[H^+]$$
    $$-3.494 = \log[H^+]$$
    $$antilog(-3.494) = [H^+]$$

    #11(A)

    $$3.206 \times 10^{-4} = [H^+]$$

    b. 1.265

    $$1.265 = -\log[H^+]$$
    $$-1.265 = \log[H^+]$$
    $$antilog(-1.265) = [H^+]$$
    $$0.0543 = [H^+]$$

12. If a solution contains 1.745 moles of HNO_3 dissolved to make 2.3 liters of solution, what is the molarity?

    $$concentration = \frac{1.745 \, mol}{2.3 \, mol}$$
    $$conc = 0.76 \, M$$

13. IN the reactions below if water is behaving as a base, write "BASE', if water is behaving as an acid write "ACID". Or write "NEITHER".

    a. $NH_3 + H_2O \rightarrow NH_4^+ + OH$ _____

    b. $H_2O + NH_2 \rightarrow NH_3 + OH$ _____

    c. $H^+ + H_2O \rightarrow H_3O^+$ _____

    d. $H + H_2O \rightarrow H_2 + OH$ _____

SKIP #7, #10, AND #13