19. What is the term for a substance that can act as both an acid and a base?

amphoteric.

Fill in the table

[H+]	pH	[OH-]	pOH	Acid, base, or neutral
4.1×10^{-3}	2.4	2.4×10^{-12}	11.6	acid
1.9×10^{-11}	10.7	5.3×10^{-4}	3.3	base
1.4×10^{-12}	11.8	7.0×10^{-3}	2.2	base
1.3×10^{-12}	1.9	7.7×10^{-13}	12.1	Acid
1×10^{-7}	7	1×10^{-7}	7	neutral

Solve the following neutralization reaction problems.

SHOW ALL WORK FOR FULL CREDIT

1. If 50.0 ml of 1.00 M KOH are used in titrating 25.0 mL of HCl, what is the molarity of HCl?

$$\underset{B}{KOH} + \underset{A}{HCl} \rightarrow \underset{salt}{KCl} + \underset{water}{H_2O}$$

$n = M \cdot V = (1.00\,M\,KOH)(.0500\,L\,KOH)$

$= .0500\,mol\,KOH$

$.0500\,mol\,KOH \times \frac{1\,mol\,HCl}{1\,mol\,KOH} = .0500\,mol\,HCl$

$M = \frac{n}{V} = \frac{.0500\,mol\,HCl}{.0250\,L\,HCl} = \boxed{2.00\,M\,HCl}$

2. If 25.0 ml of a 0.400 M HCl solution is required to neutralize 55.0 ml of KOH solution, what is the concentration of the KOH solution?

$$\underset{A}{HCl} + \underset{B}{KOH} \rightarrow \underset{S}{KCl} + \underset{W}{H_2O}$$

$n = M \cdot V = (.400\,M\,HCl)(.0250\,L) = .01\,mol\,HCl$

$.01\,mol\,HCl \times \frac{1\,mol\,KOH}{1\,mol\,HCl} = .01\,mol\,KOH$

$M = \frac{n}{V} = \frac{.01\,mol\,KOH}{.0550\,L\,KOH} = 0.1818\,M = \boxed{0.182\,M\,KOH}$

3. How $\underset{V}{\text{many ml}}$ of $\underset{M}{\text{0.125 M } H_2SO_4}$ would be required to neutralize $\underset{V}{\text{20.0 ml}}$ of $\underset{M}{\text{0.140 M}}$ NaOH?

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

$n = M \cdot V = (.140\,M\,NaOH)(.0200\,L\,NaOH) = .0028\,mol\,NaOH$

$.0028\,mol\,NaOH \times \frac{1\,mol\,H_2SO_4}{2\,mol\,NaOH} = .0014\,mol\,H_2SO_4$

$V = \frac{n}{M} = \frac{.0014\,mol\,H_2SO_4}{.125\,M} = .0112\,L\,H_2SO_4 = \boxed{11.2\,mL\,H_2SO_4}$

Name: Key
Date:
Period:

Review-Acids and Bases

Name these acids and bases:

Carbonic Acid 1. H_2CO_3

aluminum hydroxide 2. $Al(OH)_3$

Nitrous acid 3. HNO_2

hydrofluoric acid 4. HF

hydrophosphoric acid 5. H_3P

CO_3 = carbonate
OH = hydroxide
NO_2 = nitrite
F = fluoride
P = phosphide

Label the Acid, Base, Conjugate Acid, Conjugate Base:

6. $HCN + KCl \rightarrow KCN + HCl$
A B CB CA

7. $NH_3 + KOH \rightarrow KNH_2 + H_2O$
A B CB CA

8. $H_2O + H_2O \rightarrow OH^- + H_3O^+$
A B CB CA

What is the conjugate base?

$H_2PO_4^-$ 9. H_3PO_4

OH^- 10. H_2O

$CON_2H_5^-$ 11. CON_2H_6

Cl^- 12. HCl

NH_2^- 13. NH_3

Is it an ACID or a BASE?

acid 14. pH = 4

base 15. tastes bitter

acid 16. releases H+ ions

neutral 17. pH = 7

base 18. pH = 10