9/27/2019.

DILUTIONS

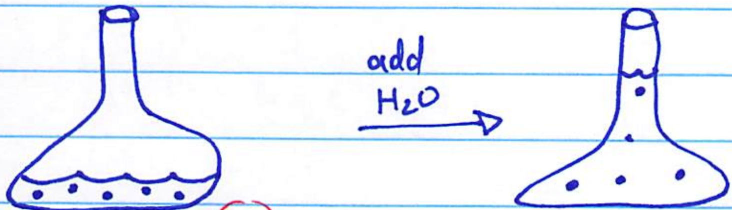
- we normally buy conc. solⁿs + dilute for use!

Dilution equation:

before — after

$$M_1 V_1 = M_2 \cdot V_2$$

M_1 = init conc; V_1 = init vol.; M_2 = final conc; V_2 = final vol.



ex: 52.0 mL (V_1), 12.0 M HCl (M_1) → ? volume (V_2?), 1.50 M HCl (M_2)

$$M_1 V_1 = M_2 V_2$$

✓ ✓ ✓ ?

$$\frac{M_1 V_1}{M_2} = \frac{M_2 V_2}{M_2}$$

$$V_2 = \frac{M_1 \cdot V_1}{M_2} = \frac{12.0\,M \times 52.0\,mL}{1.50\,M} = 416\ mL$$

So, we need to add 364 mL of water! (416 mL − 52.0 mL)

V_1

Q. 150. mL of wate is added to (25.0 mL) of (18.0 M) H_2SO_4. What's new $[H_2SO_4]$?

M_1 — 18.0 M; M_2 — new $[H_2SO_4]$

✓ ✓ ? 175. mL

$$\frac{M_1 V_1}{V_2} = \frac{M_2 \cancel{V_2}}{\cancel{V_2}}$$

no need to convert to L

$$M_2 = \frac{M_1 V_1}{V_2} = \frac{18.0 M \times 25.0 \cancel{mL}}{175. \cancel{mL}} = 2.57 M$$

or $\frac{mol}{L}$

Soln stoichiometry

conv. factor:

g A ⟷ mol A , molar mass

mol A ⟷ mol B , coeff.

vol A ⟷ mol A , molar conc!

ex: What mass of AgCl(s) is made by mixing 2 sol'ns: (1) 10.0 mL of 0.250 M $MgCl_2(aq)$
(2) 20.0 mL of 0.350 M $AgNO_3(aq)$?

$$MgCl_2(aq) + 2AgNO_3(aq) \rightarrow 2AgCl(s) + Mg(NO_3)_2(aq)$$

10.0 mL → (1) molarity → ? mol $MgCl_2$ → (2) coefficients → ? mol AgCl → (3) molar mass AgCl → ? g

20.0 mL → (1) molarity → ? mol $AgNO_3$ → (2) coeff. → ? mol AgCl → (3) → ? g

AgCl
1×Ag = 107.9
1×Cl = 35.45
143.4 g/mol

(1) LR (2) (3)

$$10.0\,mL \times \frac{1\,L}{1000\,mL} \times \frac{0.250\,mol\,MgCl_2}{1\,L} \times \frac{2\,mol\,AgCl}{1\,mol\,MgCl_2} \times \frac{143.4\,g\,AgCl}{1\,mol\,AgCl} = 0.717\,g\,AgCl$$

theoretical yield → 0.717 g AgCl

(1) XS (2)

$$20.0\,mL \times \frac{1\,L}{1000\,mL} \times \frac{0.350\,mol\,AgNO_3}{1\,L} \times \frac{2\,mol\,AgCl}{2\,mol\,AgNO_3} \times \frac{143.4\,g\,AgCl}{1\,mol\,AgCl} = 1.004\,g\,AgCl$$

If we actually made 0.281 g AgCl.

→ % yield?

$$\frac{actual}{theoretical} \times 100 = \frac{0.281\,g}{0.717\,g} \times 100 = 39.2\%$$