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Concentration Formulas - Hematology RO

Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

A. To make common concentration formulas readily available to laboratory staff.

II. APPROXIMATE NORMALITIES FOR CONCENTRATED ACIDS AND BASES:

Acid Bases	Normalities	Specific Gravity
Hydrochloric (HCL)	12 N	1.19
Acetic (CH_3COOH)	17.4 N	1.06
Nitric (HNO_3)	15-17 N	1.42
Sodium Hydroxide (NaOH)	15-18 N	1.50-1.53
Potassium Hydroxide (KOH)	14 N	1.55
Ammonium Hydroxide (NH_4OH)	15-17 N	0.880
Sulfuric Acid (H_2SO_4)	36 N (18M)	1.84

III. CALCULATIONS AND INTERPRETATIONS:

A. **Formulas for Transposing Units of Concentration**

1. **Preparation of % Solutions**
   X% = X gm / 100 mL H_20 e.g. 10% sucrose = 10 g sucrose / 100 mL water
   -OR-

   X% = X mL diluted to a total volume of 100mL
   = X mL + (100 – mL distilled water)
   E.g., 70% Ethanol = 70 mL absolute + 30 mL water

2. **From One Percentage Solution to Another Percentage Solution: V x % = V x %**
   E.g., 100 mL of 50% isopropyl alcohol from 70% isopropyl alcohol:

100 x 50% = V x 70%

V = $\frac{100\ mL \times 50\%}{70\%}$ = 71.4mL

Thus, 71.4 mL 70% isopropyl + 28.6 mL distilled water = 50%

3. **From Molarity to Normality: N = M x valence**
   From Normality to Molarity: M = N / valence
   From One Normality to Another Normality: V x N = V x N
   E.g., If you need 100 mL of 1 N HCl from concentrated HCl (12N):
   12 N * (x mLs) = N * (100 mLs)

   X mLs = $\frac{1\ N \times 100mL}{12\ N}$

   X mLs = 8.4 mL
   Thus, 8.4 mL concentrated HCl + 91.6 mL distilled water = 1 N HCl.
4. **From Normality to Percent Solution: % = $\frac{N \times molecular\ weight}{valence \times 10}$**
   E.g., If you need 10% H_2SO_4 from concentrated H_2SO_4:
   % = $\frac{N \times M.W.}{V \times 10}$ = $\frac{36 \times 98.08}{2 \times 10}$ = 176%
   Since V x % = V x %, 10% x 100 mL = 176% x (?)
   X mLs = $\frac{10\% \times 100mL}{176\%}$ = 5.68 mL
   Thus, 5.68 mL concentrated H_2SO_4 + 94.32 mL distilled water.
5. **From Molarity to Percent Solution (gm/100 mL): % = $\frac{M \times M.W.}{10}$**
6. **From Percent Solution (gm/100 mL) to Normality: N = $\frac{\% \times valence \times 10}{M.W.}$**
7. **From Percent Solution (gm/100 mL) to Molarity: M = $\frac{\% \times 10}{M.W.}$**

Attachments

No Attachments

Approval Signatures

Step Description	Approver	Date
Hematology Medical Director Designee	Ann Marie Blenc: System Med Dir, Hematopath	2/17/2022
Policy and Forms Steering Committee Approval (if needed)	Gail Juleff: Project Mgr Policy	2/7/2022
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