

ARTERIAL SOLUTION STRENGTHS

{Primary Dilution}

1 GALLON SOLUTIONS (128 oz.)

Primary Dilution Strength

INDEX	[a]										[b]	[c]
	1.50%	1.75%	2.00%	2.25%	2.50%	2.75%	3.00%	3.25%	3.50%	5.75%	8.00%	
5	38	45	51	58	65	70	77	83	90	-----	-----	
10	19	22	26	29	32	35	38	42	54	74	102 oz.	
15	13	15	17	19	21	23	26	28	30	49	68 oz.	
18	11	12	14	16	18	20	21	23	25	41	57 oz.	
20	10	11	13	14	16	18	19	21	22	37	51 oz.	
22	9	10	12	13	15	16	17	19	20	34	47 oz.	
25	8	9	10	12	13	14	15	17	18	29	41 oz.	
30	6	7	9	10	11	12	13	14	15	25	34 oz.	
35	5	6	7	8	9	10	11	12	13	21	29 oz.	
36	5	6	7	8	9	10	11	12	12	20	28oz.	

[a] solutions less than 2.0% can produce tissue firmness but may not produce desired level of microbial inactivation.*

2.0% solutions are **bactericidal***

2.0% - 3.0% recommended strength recommended by the armed services

[b] 5.75% strength was the “standard arterial strength” in 1907 !

[c] 3.00% - 8.00% strength is said to be **sporicidal*** (*NFDA Infectious Guidelines 1989)

A standard bottle of arterial fluid contain 16 ounces of arterial fluid or 473.6 ml (1 oz. = 29.6 ml.)

“**Index** – strength of an embalming **fluid**, indicated by the number of grams of pure formaldehyde gas dissolved in 100 milliliters of water. Index usually refers to a percentage; an embalming **fluid** with an index of 25 usually contains 25% formaldehyde gas.”

Question: How many ounces of formaldehyde are contained in a 16 ounce bottle of a 25 index arterial fluid? Ans. 4 ounces (25% of 16oz. = 4oz.) or (25% of 437.6 ml. = 118.2 ml.)

Solution Problems

Formula: **Index X amount of fluid = % solution strength X total amount of solution**

Some General Rules

1. When injecting the un-autopsied body the “general rule” is to begin with mild arterial solutions and if necessary build to stronger solutions. Mild → Strong
2. To increase the strength of an arterial solution you may:
 - a. add more of the arterial fluid you are using
 - b. add a higher index arterial fluid
 - c. do both a and b

21st Century “GREEN Questions:

1. What are the purposes for embalming?
2. How much solution is required to embalm a body? Actual preservative.
3. How preserved is the embalmed body?
4. How long **will** the embalmed body remain in a state of preservation?
5. What is your response when an arranging party asks question #3?
6. How long **should** an embalmed body remain preserved?
7. Will formaldehyde contaminate soil if it should leak from a body and casket?
8. Is formaldehyde a carcinogen?

Preservative (Formaldehyde) Demand

The amount of preservative (e.g. formaldehyde) needed to meet the needed preservative demands of the body. The embalmer's job is to inject sufficient preservative to meet those demands. Examples of bodies, or body areas, requiring a high preservative demand would be - edema, decomposition, uremia, bodies either in and out of rigor mortis, tissue gas, septic infections. It is easy to see it is wiser to “over inject” rather than “under inject” a body. The tissues will combine with the needed amount of preservative.

How much formaldehyde is needed?*

1. 160 pound person = 65.3 *kilograms* in weight
2. 160 pound person = contains 10.7 *kilograms* of total protein (or 10,700 grams of protein)
3. It requires 4.4 (average) grams of formaldehyde to react with 100 grams of protein
4. 10.7 (protein) X 4.4 (formaldehyde) = 470.8 grams of formaldehyde needed
5. 1 US fluid ounce = 29.6 milliliters
(Let us assume you use a 30 index arterial fluid to embalm this body)
6. 16 fl oz = 473.6 milliliters of which 30% is formaldehyde
7. 0.30 (30%) X 473.6 ml = **142.08** grams of formaldehyde
8. You needed 470.8 grams of formaldehyde to preserve the protein in this body

9. $142.08 / 470.8 = 0.3$ or 30% of all the body protein !

10. So you would need at least 3 bottles of a 30 index fluid to embalm all the protein!
["The Mathematics of Embalming Chemistry"; part 1 , Jerome Frederick, PhD ; reprinted from the De-Ce-Co Magazine 1968;60(5). With permission from the Dodge Company.]

How Much Formaldehyde?

If we use a **36 index** arterial fluid (about the strongest available) :

1. What is the strength of a one gallon solution is we use 8 ounces of arterial fluid?

$$\begin{aligned} \text{index X amt. of fluid} &= \% \text{ desired X 128} \\ 36 \text{ X } 8 &= \text{X X } 128 \\ 288 &= 128\text{X} \\ \text{X} &= 2.25\% \end{aligned}$$

2. How much actual **formaldehyde** is contained in this bottle of fluid?

Index = the amount of formaldehyde gas, measured in grams, dissolved in 100 milliliters of water.

36 grams of formaldehyde is dissolved in 100 ml of water
16 ounces or 473 milliliters of liquid is contained in a bottle of arterial fluid
so . . . **$36 \text{ X } 4.73 = 170$ grams of formaldehyde in this bottle of fluid**

3. How much formaldehyde was in the 1 gallon of arterial solution we made using 8 ounces of the 36 index arterial fluid?

Assuming this arterial fluid is a uniform mixture we used half a bottle (8 ounces) so we would have used half of the formaldehyde or **85.0 grams of formaldehyde**

4. What is the amount of this formaldehyde measured in liquid measure?

(1,000 grams(weight) = 1,000 milliliters (water)

(1 fluid ounce = 29.6 milliliters)

In the 16 ounce bottle of arterial fluid?

170 grams of HCHO = 170 milliliters dissolved in HOH

$$\begin{aligned} \frac{170 \text{ ml}}{29.6 \text{ ml}} &= 6 \text{ ounces of formaldehyde in the 16 ounce bottle} \end{aligned}$$

5. In the one gallon of solution we prepared to inject the body how much formaldehyde is used?

Since we only used 8 ounces of arterial fluid this is 50% of the 170 grams of formaldehyde or 85.0 grams of formaldehyde or **85.0 grams = 3 ounces of formaldehyde**
29.6 ml in 1 fluid ounce

Reprinted with permission of Robert G. Mayer. All rights reserved

6. IF WE INJECTED 3 GALLONS OF ARTERIAL SOLUTION INTO THIS BODY , EACH GALLON USING 8 OUNCES OF A 36 INDEX FLUID TO MAKE A 1 GALLON SOLUTION, WHAT IS THE TOTAL AMOUNT OF FORMALDEHYDE INJECTED?

1 AND ½ BOTTLE OF FLUID USED = 255 GRAMS OR ML. OF FORMALDEHYDE

255.0 FORMALDEHYDE = 9 ounces of formaldehyde
29.6 ml. in 1 fluid ounce