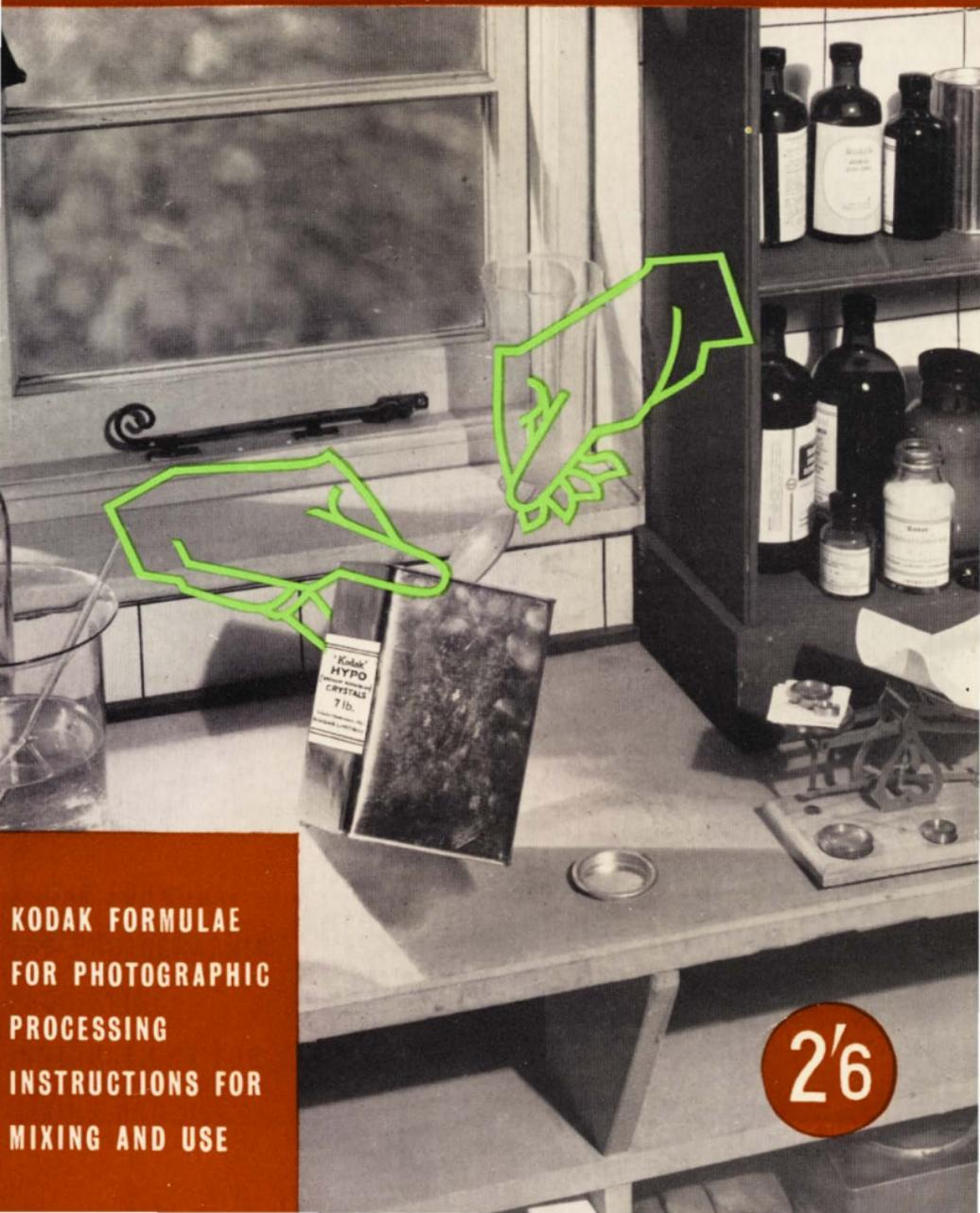


# KODAK CHEMICALS AND FORMULAE

ONE OF A SERIES OF 'KODAK' PHOTOGRAPHIC HANDBOOKS



KODAK FORMULAE  
FOR PHOTOGRAPHIC  
PROCESSING  
INSTRUCTIONS FOR  
MIXING AND USE

2/6

● THIS 'KODAK' HANDBOOK is punched for binding, with others of the series, in a convenient ring binder that will shortly be made available.

● The 'Kodak' goods described in this Handbook may not all be immediately available. The nearest Kodak house, or dealer, will give you the latest information.

# CHEMICALS AND FORMULAE

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## Notes on some of the Chemicals mentioned in this Handbook

'DOLMI' is a pure form of diaminophenol hydrochloride, which is also known under the name of 'Amidol.'

'ELON' is a specially purified form of monomethyl paramino-phenol sulphate, a compound which is also known under other names, such as 'Metol,' 'Genol,' etc.

'KODALK' is a new alkali, introduced by Kodak Ltd., intermediate in activity between sodium carbonate and borax. Films developed in a developer in which 'Kodalk' is used as an accelerator will not blister when placed in an acid fixing bath, even at high temperatures.

'KODUROL' is parahydroxyphenyl glycine, also commonly known as glycin.

PYRO is 1 : 2 : 3 trihydroxybenzene, also known as pyrogallol or pyrogallic acid.

Solutions

Storage of  
SolutionsLife of  
SolutionsPacked  
Chemicals

Developers

'Kodalk'  
DevelopersStop and  
Hardening  
Baths

Fixers

Hypo Test and  
Eliminator

Reducers

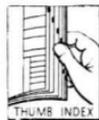
Intensifiers

Toners

Stain  
Removers and  
Cleaners

PRACTICAL NOTES

KODAK FORMULAE



# CHEMICALS AND FORMULAE

PHOTOGRAPHY is essentially a chemical process involving many complex reactions of chemicals in solution. These reactions determine, to a high degree, the properties and quality of the processed images. Therefore, the purity, strength, and uniformity of the chemicals, the quantity of each used, and the manner in which they are combined, are of the utmost importance in achieving results of uniformly high quality.

Because of these facts, and to meet the needs for formulae and chemicals from which uniform results of high quality could be expected, Kodak formulae were evolved and 'Kodak' Tested Chemicals were introduced. In order to ensure accurately balanced solutions, and to save time for the darkroom worker, Kodak Limited makes available many more popular formulae in the form of packed chemical preparations, which need only to be dissolved according to the directions on the package to be ready for use.

Kodak formulae and 'Kodak' prepared chemicals are the result of years of painstaking, exhaustive research and wide practical experience. They are recommended with the confidence that they will assure the finest results possible with the materials for which they are intended.

For convenient and easy reference the formulae given here are grouped according to type, such as developers, fixing baths, toners, etc., and the formulae of each type are listed in numerical order.

## MAKING UP SOLUTIONS

When developers are made up, it is essential to dissolve the constituents in the order given in the formula if undesirable reactions are to be avoided. For instance, if the developing agent is dissolved first, and then the alkali is added, considerable aerial oxidation and formation of coloured oxidation products may occur before the preservative, sodium sulphite, is dissolved. Therefore, the instructions given with the formula should be followed carefully. In the case of formulae containing the developing agent 'Elon,' the 'Elon' should be dissolved first, since it is readily soluble in warm water, but only slightly soluble in sulphite solutions without alkali. After the 'Elon' is completely dissolved the sulphite should be added, followed by the other developing agents, and finally the alkali. In other cases the preservative is dissolved first, then the developing agents, then, after these are completely dissolved, the alkali. Since the potassium bromide has no action on the developing agents, it is immaterial at what stage it is added. When sodium bisulphite appears in the formula, it should be added with the sulphite.

When an acid hardening fixing bath is made up, it is essential that the ingredients be dissolved in the proper order if decomposition of the hypo and precipitation of the alum are to be avoided. The hypo should be dissolved first, then the sulphite, then the acid, and finally the alum. When the hardener stock solution is made up separately, the hardener should be added to the hypo solution slowly, with vigorous stirring, and both solutions must be cold. The preparation of baths containing chrome alum as the hardening agent is even more critical, and the directions should be followed carefully, particularly in regard to the stirring and temperature of the solutions.

Filtering is unnecessary if clear water and clean chemicals are used. However, if there is any sediment or suspension, the solution should be filtered before storage or use.

Sodium sulphite, anhydrous, is sometimes specified in Kodak formulae: its advantages over the crystalline form are greater stability, ease of solution and smaller bulk in storage. In those formulae specifying carbonate, the use of 'Kodak' Sodium Carbonate, anhydrous, is recommended. If sodium carbonate crystals are used, the quantities of carbonate given in the formula must be increased to  $2\frac{3}{4}$  times.

## WEIGHTS AND MEASURES—CONVERSION TABLES

**IMPORTANT :** *Kodak Formulae give quantities in both avoirdupois and metric measures. One or other must be used exclusively, never a combination of the two, for the amounts given are not exact equivalents.*

The following tables give all the equivalent values required for converting photographic formulae from one system to the other :—

### Avoirdupois to Metric Weight

Pounds	Ounces	Grains	Grams	Kilograms
1	16	7000	453.6	0.4536
0.0625	1	437.5	28.35	0.02835
		1	0.0648	
	0.03527	15.43	1	0.001
2.205	35.27	15430	1000	1

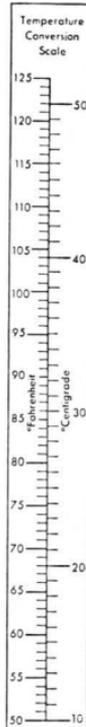
### British Fluid Measure to Metric Measure

Gallons	Quarts	Ounces (Fluid)	Drachms (Fluid)	Cubic Centimetres	Litres
1	4	160	1280	4546	4.546
0.25	1	40	320	1137	1.137
		1	8	28.42	0.028
		0.125	1 (60 minims)	3.55	0.00355
		0.0353	0.282	1	0.001
0.22	0.88	35.3	282	1000	1

NOTE : American gallon = 128 fluid ounces.

### Conversion Factors

Grams per litre multiplied by	0.437	=	grains per ounce
Grains per ounce multiplied by	2.28	=	grams per litre
C.c. per litre multiplied by	0.48	=	minims per ounce
Minims per ounce multiplied by	2.1	=	c.c. per litre



## Measurement of small quantities

When quantities of chemicals under 10 grains or 0.7 gram are included in a formula, they are expressed preferably as a 10 per cent. solution, so many minims, or c.c. of which can be used. This plan avoids expressing the volume in "drops," which is a very uncertain quantity, varying as much as 150 per cent. depending on the way it is measured.

To obtain a 10 per cent. solution of a solid, dissolve 1 ounce of the solid in about 8 ounces of water, and add water as necessary to bring the total volume to 10 fluid ounces, or dissolve 10 grams of the solid to make 100 c.c. of solution.

### The question of "parts"

It is often recommended to dilute a stock solution, say, one to two, or one part stock solution and two parts water. Parts should be taken to mean units of volume, any unit whatever being taken provided that the other quantities are reckoned in the same units of volume. Thus :

For use, take		For use, take
Stock Solution . 1 part	} may mean {	Stock Solution 4 oz.
Water . . . . 4 parts		Water . . . . 16 oz.

### STORAGE OF DEVELOPER SOLUTIONS

The mixed solution should be stored in a tightly corked bottle. Batches of stock solution are best stored in small bottles. When stock is used from a large bottle, the air space is increased each time the bottle is opened, and the chances for aerial oxidation are greatly increased. However, a small air space should be left to avoid loosening of the stopper or bursting of the bottle, as the volume of the solution varies with temperature changes. Glass stoppered bottles are not desirable, as the alkali is apt to make the stopper stick.

Developers which are particularly susceptible to aerial oxidation often are divided into two or three solutions in which the developing agent is kept separate from the alkali, thus reducing oxidation.

The solubilities of most chemicals decrease as the temperature is lowered. As a result, when the more concentrated solutions are stored at low temperatures, there is a tendency for some ingredients to crystallize out. The precipitate which separates under such conditions often contains the most important constituents of the solution. It should not be discarded, but should be redissolved by warming before the solution is used.

All deep tank developers, which are kept in use for a considerable time, should be protected when not in use with a floating lid, to prevent aerial oxidation. After removing the lid, the surface of the developer should be skimmed with a clean blotter to remove any scum each time before the developer is used.

When some acid hardener stock solutions are stored for several weeks, they tend to form a white incrustation of basic aluminum acetate on the inside of the container. This should be ignored as the incrustation usually does not impair the useful properties of the solution.

## KEEPING PROPERTIES AND USEFUL LIFE OF SOLUTIONS

### KODAK FORMULA

### KEEPING PROPERTIES

at 65-70°F of unused solutions  
prepared from formulae

### USEFUL LIFE §

Number of 8 × 10 inch sheets  
processed for *standard time* in  
160 fl. oz. without loss of quality

Developers	GALLON		STOPPERED BOTTLE		USEFUL LIFE §	
	IN DISH	TANK	FULL	HALF FULL	IN DISH	NARROW DEEP TANK
D-1	30 min.	3 hr.	1 month (in 3 solutions)	2 weeks (in 3 solutions)	12	24
D-8	4 hr.	N.R.	2 months	1 month	18	36
D-16	24 hr.	1 month	6 months	2 months	24	48*
D-16R	—	—	6 months	2 months	used as Replenisher only	
D-19b	24 hr.	1 month	6 months	3 months	36	72
D-196R	—	—	6 months	3 months	used as Replenisher only	
D-23	24 hr.	1 month	6 months	2 months	24	36
D-25	24 hr.	1 month	6 months	2 months	20	30
D-25R	—	—	6 months	2 months	used as Replenisher only	
D-32	2 hr.	N.R.	2 months (in 2 solutions)	2 weeks (in 2 solutions)	18 (1:1)	N.R.
D-61a	24 hr.	2 weeks	2 months	3 weeks	used as Replenisher only	
D-61aR	—	—	2 months	3 weeks	24 (1:1)	36* (1:1)
D-72	24 hr.	2 weeks	3 months	1 month	18 (1:2)	Negatives 36 (1:2)
D-76	24 hr.	1 month	6 months	2 months	24	36*
D-76R	—	—	6 months	2 months	used as Replenisher only	
D-82	2 hr.	24 hr.	1 week	2 days	12	24‡
D-156	6 hr.	N.R.	3 months	1 month	Exhaustion affects colour of image. Life depends upon quality required.	
D-158	24 hr.	1-2 weeks	3 months	1 month	24 (1:1)	Negatives 48 (1:1)
D-163	24 hr.	1-2 weeks	3 months	1 month	36 (1:1)	Prints —
D-166	8 hr.	N.R.	3 months	1 month	15 (1:3)	Negatives 30 (1:3)
D-167	—	—	3 months (in 2 solutions)	2 months (in 2 solutions)	36 (1:1)	Prints —
D-170	30 min.	N.R.	3 weeks	N.R.	30 (1:3)	Prints —
D-173	10 hr.	N.R.	2 weeks	2 weeks	16 (1:2)	N.R.
D-177	30 min.	3 hr.	1 month (in 3 solutions)	2 weeks (in 3 solutions)	12	24
D-178	4 hr.	N.R.	2 months	1 month	18	36
DK-15	8 hr.	1 week	3 months	1 month	18	36
DK-20	24 hr.	1 month	6 months	2 months	24	36*
DK-20R	—	—	6 months	2 months	used as Replenisher only	
DK-50	24 hr.	1 month	6 months	2 months	24	48

### Rinse and Hardening Baths

SB-1	3 days	1 month	Indef.	Indef.	90	90
SB-1A	3 days	1 month	Indef.	Indef.	40 (used after D-8) 40	
SB-3	1 day	1 month	Indef.	Indef.	30	30
SB-4	1 day	1 month	Indef.	Indef.	30	30

### Fixing Baths

F-5	1 week	1 month†	3 months	2 weeks‡	120 (W.R.)	120 (W.R.)
F-16	3 days‡	1 week‡	1 week‡	1-2 days	20 (SB-3)	120 (SB-3)
F-52	1 week	1 month	3 months†	3 months†	60 (W.R.)	60 (W.R.)
F-53	—	—	3 months	2 months	90 (SB-3)	90 (SB-3)
F-54	1 week	1 month	3 months	2 weeks	60 (W.R.)	60 (W.R.)
F-54a	1 week	1 month†	3 months†	2 weeks‡	90 (SB-3)	90 (SB-3)
					120 (W.R.)	120 (W.R.)
					120 (SB-3)	120 (SB-3)
					120 (W.R.)	120 (W.R.)
					120 (SB-3)	120 (SB-3)

† Only keeps 2 weeks at temperatures above 75° F.

N.R.—Not recommended.

‡ Only keeps for 2 days at temperatures above 75° F.

W.R.—Water rinse between development

\* Life greatly increased by the use of replenisher.

and fixing.

§ Longer life can be obtained if conditions of use are modified, and if some change in quality can be tolerated.

Approximate roll film equivalents in determining useful life of processing solutions:—

2 No. 127 Rolls = one 8 × 10 sheet.

1 No. 620 or 120 Roll = one 8 × 10 sheet

1 No. 135 Roll (36 exp.) = one 8 × 10 sheet.

1 No. 616 or 116 Roll = 1½ sheets 8 × 10

## 'Kodak' Chemical Preparations

Kodak Limited makes available a wide variety of developers, fixing baths, toners, etc., in prepared form. For efficient, standard solutions, the photographer need only dissolve the powders or dilute the liquid with the proper volume of water, according to directions printed on the package.

### SOME 'KODAK' PACKED DEVELOPERS

D-61a 'Kodak' Negative Developer Powder	General dish or tank developer for plates and films.
D-61aR 'Kodak' Replenisher Powder . . . . .	Replenisher for D-61a developer in tank use.
D-76 'Kodak' Fine-Grain Developer Powder	'Elon'-hydroquinone-borax dish or tank developer for fine-grain negatives with highest emulsion speed.
D-76R 'Kodak' Replenisher Powder . . . . .	Replenisher for D-76 developer in tank use.
DK-20 'Kodak' Extra Fine-Grain Developer Powder . . . . .	Normal contrast dish or tank developer for extra fine grain images on films or plates.
DK-20R 'Kodak' Replenisher Powder . . . . .	Replenisher for DK-20 developer in tank use.
'Kodak' Tropical Developer Powder DK-15	General negative developer for tropical conditions (75°-95° F.).
D-19b 'Kodak' Developer Powder . . . . .	High contrast dish or tank developer for X-ray film and paper and general clinical, aerial, infra-red and industrial record photography.
D-19bR 'Kodak' Replenisher Powder . . . . .	Replenisher for D-19b developer in tank use.
'Kodaline' Developer Powder . . . . .	'Elon'-hydroquinone developer recommended for 'Kodaline' and other process materials.
'Kodalith' Developer Powder . . . . .	For extreme contrast process work with 'Kodalith' materials.
'Kodak' Maximum Contrast Developer Powder D-8 . . . . .	Extreme contrast developer for process materials, etc.
'Kodak' Press Contrast Developer . . . . .	Concentrated single-solution developer, suitable for rapid development of plates, films and papers.
'Kodak' Time-Standard Developer Powder	The standard developer for large-scale tank processing of films employing systematic developer replenishment.
'Kodak' Professional Time-Standard Developer Powder . . . . .	
'Kodak' Pyro-Soda Developer Powder D-177	A pyro-soda dish developer for plates and films.
'Kodak' Developer Powders (Pyro-Soda) for 'Kodak' Roll Film Tanks . . . . .	Pyro-soda developer for small amateur film tanks.
'Kodak' Quick-Finish Developer . . . . .	High speed processing for recording or press work with normal materials, or with special film.
'Kodinol' Developer . . . . .	Highly concentrated dish or tank developer, of the para-aminophenol type. For use with almost any type of film, plate or paper.
'Kodak' Bromide Developer . . . . .	Concentrated developer for bromide, 'Bromesko' and 'Velox' papers.
'Kodak' Special Developer Powder D-163	A universal developer for papers, giving normal or high contrast; suitable also as a dish developer for negative materials. Recommended for tropical use.
'Kodak' Special Developer D-163 . . . . .	
'Velox' Developer Powder . . . . .	Normal developer for 'Velox' paper, giving blue-black image tone.
'Velox' Developer . . . . .	
'Kodak' Warm Tone Developer Powder D-156 . . . . .	Normal contrast developer for 'Bromesko' and 'Kodura' paper, giving an image of medium warm tone.
'Kodak' Extra Warm Tone Developer Powder D-166 . . . . .	Developer for 'Bromesko' and 'Kodura' papers and L-5 Warm Tone Lantern Plates, giving warmer tones than D-156.
'Kodak' Dolmi Developer Powder D-170 . . . . .	Developer for bromide papers (alternative to D-163).
'Kodak' Dental X-Ray Developer . . . . .	Tank developer for use with dental X-ray films.
'Kodak' X-Ray Ultra-Rapid Developer Powder . . . . .	For the development of X-ray films in the surgical theatre.

## SOME 'KODAK' TESTED CHEMICALS

Acetic acid, glacial	Hydroquinone	Silver nitrate
Acetone	Iodine	Selenium powder
Alum potash, powdered	'Kodalk'	Sodium acetate
Alum, chrome	'Kodural'	Sodium bisulphite
Ammonium persulphate	Potassium bichromate	Sodium carbonate (crystals)
Ammonium thiocyanate (sulphocyanide)	Potassium bromide	Sodium carbonate (anhydrous)
Borax	Potassium carbonate	Sodium hydroxide (caustic soda)
Boric acid	Potassium hydroxide (caustic potash)	Sodium thiosulphate (hypo) (crystals)
Calgon (sod. hexameta- phosphate)	Potassium ferricyanide	Sodium thiosulphate (hypo) (anhydrous)
Chalk, French, powdered	Potassium iodide	Sodium metabisulphite
Citric acid	Potassium metabisulphite	Sodium sulphate
'Dolmi' (pure diaminophenol hydrochloride)	Potassium permanganate	Sodium sulphide (crystals)
'Elon' (pure monomethyl paraminophenol sulphate)	Potassium thiocyanate (sulphocyanide)	Sodium sulphite (crystals)
Glycerine	Pyrogallic acid (pyro)	Sodium sulphite (anhydrous)

## SOME OTHER 'KODAK' PREPARATIONS

'Kodak' Acid Fixing Salt with Hardener	Makes a combined acid hardening and fixing bath for films, plates and papers.
'Kodak' Rapid Acid Fixer Powder . . .	Makes a rapid acid fixing bath for use when hardening is not required.
'Kodak' Quick-Finish Fixer Powder . . .	For use in conjunction with Quick-Finish Developer.
'Kodak' X-Ray Rapid Acid Fixer Powder	Makes an acid fixing bath, with or without hardener, for X-ray films and papers.
'Kodak' X-Ray Acid Fixing Salt with Hardener . . . . .	Forms a combined acid fixing and hardening bath for X-ray films and papers.
'Kodak' X-Ray Ultra Rapid Fixing Salt .	For use in conjunction with the X-Ray Ultra Rapid Developer.
'Kodak' Dental X-Ray Fixer Solution . .	For dental X-ray films.
'Kodak' Liquid Hardener . . . . .	Used as an addition to hypo solution, to form an acid hardening fixing bath for films, plates and papers.
'Kodak' Hardener Powder . . . . .	
'Kodak' Tropical Pre-development Hardener Powder . . . . .	Forms a pre-hardening bath for use in processing under tropical conditions.
'Kodak' Wetting Agent . . . . .	Added to developers as a preventative of air-bells and to final rinse baths to avoid water marks after drying.
K.A.F. 'Kodak' Anti-Fog Powder . . . .	For addition to developing solutions when a tendency to chemical fog occurs.
'Kodak' Glazing Solution . . . . .	For print glazing on ferrotype plates or glass.
'Kodak' Selenium Toner . . . . .	A direct one-solution toner for brown tones on warm-tone prints.
'Kodak' Sepia Toner . . . . .	A two-solution sulphide toner for brown tones on prints, lantern slides and transparencies.
'Kodak' Negative Varnish . . . . .	For applying a protective coating to negatives.
'Kodak' Lens Cleaning Solution . . . .	For cleaning the glass surfaces of lenses, filters, etc.
'Kodak' Film Cleaning Fluid . . . . .	For cleaning negatives, ciné film and colour transparencies.
'Kodak' White Ink . . . . .	For inscriptions on albums, prints, lantern slide masks, etc.
'Kodak' Special Retouching Medium . .	For negative retouching.
'Kodak' Opaque and Spotting Medium .	For blocking out negatives or spotting-out pinholes.
'Kodak' Print Spotting Medium (Black or Sepia) . . . . .	Dye solutions for spotting prints. Can be mixed to ensure matching with image tone.
'Kodak' Mounting Paste . . . . .	An adhesive paste for photographic print mounting or for general use.

# DEVELOPER FORMULAE

## KODAK FORMULA D-1

Normal-contrast pyro-soda dish or tank developer for plates and films

### Stock Solution A

Metric		Avoirdupois
9.8 gm.	Sodium bisulphite	345 gr.
60.0 gm.	Pyro	4 oz. 350 gr.
1.1 gm.	Potassium bromide	40 gr.
(11 c.c.)	(or 10% solution)	(420 minims)
1000 c.c.	Water to make	80 oz.

### Stock Solution B

210 gm.	Sodium sulphite, crystals	16 oz. 350 gr.
(105 gm.)	(or anhydrous)	(8 oz. 175 gr.)
1000 c.c.	Water to make	80 oz.

### Stock Solution C

200 gm.	Sodium carbonate, crystals	16 oz.
(75 gm.)	(or anhydrous)	(6 oz.)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

**For Dish Development**—Take 1 part A, 1 part B, 1 part C and 7 parts of water. Develop for 5 to 7 minutes 65° F. (18° C.).

**For Tank Development**—Take 1 part A, 1 part B, 1 part C and 11 parts of water. Develop for about 12 minutes at 65° F. (18° C.).

## KODAK FORMULA D-8\*

Single-solution hydroquinone caustic developer for maximum contrast on process materials

### Stock Solution

Metric		Avoirdupois
180.0 gm.	Sodium sulphite (cryst.)	14 oz. 175 gr.
(90.0 gm.)	(or anhydrous)	(7 oz. 90 gr.)
45.0 gm.	Hydroquinone	3 oz. 265 gr.
37.5 gm.	Sodium hydroxide (caustic soda)	3 oz.
30.0 gm.	Potassium bromide	2 oz. 175 gr.
1000 c.c.	Water to make	80 ounces

Dissolve the chemicals in the order given.

For use take 2 parts of stock solution and 1 part of water.

Develop for 2-5 minutes at 70° F.

\*Available as 'Kodak' Maximum Contrast Developer Powder.

**KODAK FORMULA D-16****Normal tank developer** for motion picture positive film

<i>Metric</i>		<i>Avoirdupois</i>
0.31 gm.	. . . 'Elon'	11 gr.
80.0 gm.	. . . Sodium sulphite (cryst.)	6 oz. 175 gr.
(40.0 gm.)	. . . (or anhydrous)	(3 oz. 85 gr.)
6.0 gm.	. . . Hydroquinone	210 gr.
50.5 gm.	. . . Sodium carbonate (cryst.)	4 oz.
(18.7 gm.)	. . . (or anhydrous)	(1 oz. 215 gr.)
0.86 gm.	. . . Potassium bromide	30 gr.
(8.6 c.c.)	. . . (or 10% solution)	(310 minims)
0.7 gm.	. . . Citric acid	25 gr.
1.5 gm.	. . . Potassium metabisulphite	52 gr.
1000 c.c.	. . . Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution.

For Motion Picture Positive film, development time will vary from 5-10 mins. at 65° F. (18° C.) according to the contrast required and the degree of agitation employed.

**KODAK FORMULA D-16R****Replenisher for 'Kodak' developer D-16** to maintain volume and activity of tank developer

<i>Metric</i>		<i>Avoirdupois</i>
0.3 gm.	. . . 'Elon'	11 gr.
80.0 gm.	. . . Sodium sulphite (cryst.)	6 oz. 175 gr.
(40.0 gm.)	. . . (or anhydrous)	(3 oz. 85 gr.)
9.0 gm.	. . . Hydroquinone	315 gr.
100.0 gm.	. . . Sodium carbonate (cryst.)	8 oz.
(38.0 gm.)	. . . (or anhydrous)	(3 oz.)
0.7 gm.	. . . Citric acid	25 gr.
1.5 gm.	. . . Potassium metabisulphite	52 gr.
1000 c.c.	. . . Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution.

## KODAK FORMULA D-19b\*

**High-contrast dish or tank developer** for X-ray film and paper, and general clinical, aerial, infra-red, industrial and scientific record photography

<i>Metric</i>		<i>Avoirdupois</i>
2.2 gm.	‘Elon’	77 gr.
144.0 gm.	Sodium sulphite (cryst.)	11 oz. 230 gr.
(72.0 gm.)	(or anhydrous)	(5 oz. 330 gr.)
8.8 gm.	Hydroquinone	310 gr.
130.0 gm.	Sodium carbonate (cryst.)	10 oz. 175 gr.
(48.0 gm.)	(or anhydrous)	(3 oz. 370 gr.)
4.0 gm.	Potassium bromide	140 gr.
(40 c.c.)	(or 10% solution)	(3 oz. 96 minims)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution or diluted as directed in the instructions issued with the material to be developed.

Recommended normal development time for X-ray films—5 minutes at 65° F. (18° C.). (Except for ‘Industrex’ Type D and ‘Crystallex’ film, with which a 7 minute development is recommended.)

\* Available as a ‘Kodak’ Packed Developer Powder.

## KODAK FORMULA D-19bR\*

**Replenisher for ‘Kodak’ D-19b developer** to maintain volume and activity of tank developer

<i>Metric</i>		<i>Avoirdupois</i>
4.0 gm.	‘Elon’	140 gr.
144.0 gm.	Sodium sulphite (cryst.)	11 oz. 230 gr.
(72.0 gm.)	(or anhydrous)	(5 oz. 330 gr.)
16.0 gm.	Hydroquinone	1 oz. 125 gr.
130.0 gm.	Sodium carbonate (cryst.)	10 oz. 175 gr.
(48.0 gm.)	(or anhydrous)	(3 oz. 370 gr.)
7.5 gm.	Sodium hydroxide	260 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

The “D-19b” developer should be maintained at a constant level in the tank by frequent addition of the above replenisher solution.

\* Available as a ‘Kodak’ Packed Developer Powder.

**KODAK FORMULA D-23**

'Elon' fine-grain developer for plates and films; a soft-working developer of simple formula giving normal emulsion speed

<i>Metric</i>		<i>Avoirdupois</i>
7.5 gm.	'Elon'	275 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution.

Develop about 18 mins. at 65° F. (18° C.).

**KODAK FORMULA D-25**

'Elon' extra fine-grain developer—a simple formula for minimum grain in films or plates. (This developer requires 50 to 100% increase in exposure)

<i>Metric</i>		<i>Avoirdupois</i>
7.5 gm.	'Elon'	275 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
15.0 gm.	Sodium bisulphite	1 oz. 110 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution.

Develop about 18 mins. at 77° F. (25° C.).

**KODAK FORMULA D-25R**

Replenisher for 'Kodak' developers D-23 and D-25

<i>Metric</i>		<i>Avoirdupois</i>
10.0 gm.	'Elon'	350 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
20.0 gm.	'Kodalk'	1 oz. 265 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

The developer should be maintained at a constant level in the tank by the frequent addition of this replenisher solution.

## KODAK FORMULA D-32

Hydroquinone caustic-soda dish developer for warm black tones on lantern slides

### Stock Solution A

Metric		Avoirdupois
12.6 gm.	Sodium sulphite (cryst.)	1 oz.
(6.3 gm.)	(or anhydrous)	(220 gr.)
7.0 gm.	Hydroquinone	240 gr.
3.5 gm.	Potassium bromide	120 gr.
(35 c.c.)	(or 10% solution)	(2 oz. 380 minims)
0.7 gm.	Citric acid	25 gr.
1000 c.c.	Water to make	80 oz.

### Stock Solution B

81.0 gm.	Sodium carbonate (cryst.)	6 oz. 210 gr.
(30.0 gm.)	(or anhydrous)	(2 oz. 175 gr.)
4.2 gm.	Sodium hydroxide (caustic soda)	145 gr.
1000 c.c.	Cold water to make	80 oz.

Dissolve the chemicals in the order given.

For use take 1 part A, 1 part B. For still warmer tones 1 part A and 2 parts B.

Develop for about 6 minutes at 65° F. (18° C.).

## KODAK FORMULA D-61a\*

'Elon'-hydroquinone negative developer for general dish or tank use with plates and films

### Stock Solution

Metric		Avoirdupois
3.1 gm.	'Elon'	110 gr.
180.0 gm.	Sodium sulphite (cryst.)	14 oz. 175 gr.
(90.0 gm.)	(or anhydrous)	(7 oz. 90 gr.)
2.1 gm.	Sodium bisulphite	75 gr.
5.9 gm.	Hydroquinone	210 gr.
31.1 gm.	Sodium carbonate (cryst.)	2 oz. 215 gr.
(11.5 gm.)	(or anhydrous)	(405 gr.)
1.7 gm.	Potassium bromide	60 gr.
(17 c.c.)	(or 10% solution)	(1 oz. 175 minims)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

For dish development, take one part of the above stock solution to one part of water: develop about 7 minutes at 65° F. (18° C.).

For tank development, take one part of the above stock solution to three parts of water: develop about 14 minutes at 65° F. (18° C.).

Add D-61aR replenisher to maintain the strength of the solution.

\*Available as a 'Kodak' Packed Developer Powder.

**KODAK FORMULA D-61aR\***

Replenisher for 'Kodak' D-61a developer to maintain volume and activity of tank developer

**Stock Solution A**

<i>Metric</i>		<i>Avoirdupois</i>
3.0 gm.	'Elon' . . . . .	100 gr.
180.0 gm.	Sodium sulphite (cryst.) . . . . .	14 oz. 175 gr.
(90.0 gm.)	(or anhydrous) . . . . .	(7 oz. 90 gr.)
1.9 gm.	Sodium bisulphite . . . . .	65 gr.
6.0 gm.	Hydroquinone . . . . .	210 gr.
1.6 gm.	Potassium bromide . . . . .	55 gr.
(16 c.c.)	(or 10% solution) . . . . .	(7 oz. 250 minims)
3000 c.c.	Water to make . . . . .	240 oz.

**Stock Solution B**

324.0 gm.	Sodium carbonate (cryst.) . . . . .	25 oz. 400 gr.
(120.0 gm.)	(or anhydrous) . . . . .	(9 oz. 260 gr.)
1000 c.c.	Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given.

For use, take 3 parts Solution A and 1 part Solution B, and add to the tank of developer as required to maintain the level of the solution. Do not mix the solutions until ready for use.

\* Available as a 'Kodak' Packed Developer Powder.

**KODAK FORMULA D-72**

'Elon'-hydroquinone developer for rapid dish development of plates and films

<i>Metric</i>		<i>Avoirdupois</i>
3.1 gm.	'Elon' . . . . .	110 gr.
90.0 gm.	Sodium sulphite (cryst.) . . . . .	7 oz. 90 gr.
(45.0 gm.)	(or anhydrous) . . . . .	(3 oz. 265 gr.)
12.0 gm.	Hydroquinone . . . . .	420 gr.
180.0 gm.	Sodium carbonate (cryst.) . . . . .	14 oz. 175 gr.
(67.5 gm.)	(or anhydrous) . . . . .	(5 oz. 175 gr.)
1.9 gm.	Potassium bromide . . . . .	65 gr.
(19 c.c.)	(or 10% solution) . . . . .	(1 oz. 250 minims)
1000 c.c.	Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given.

For general use, take 1 part of the above solution to 2 parts of water and develop about 4 minutes at 65° F. (18° C.).

For greater contrast, dilute 1 : 1 only.

## KODAK FORMULA D-76\*

'Elon'-hydroquinone-borax dish or tank developer for low-contrast, fine-grain negatives, for use when optimum emulsion speed is required

<i>Metric</i>		<i>Avoirdupois</i>
2.0 gm.	'Elon'	70 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
5.0 gm.	Hydroquinone	175 gr.
2.0 gm.	Borax	70 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution.

\* Available as a 'Kodak' Packed Developer Powder.

## KODAK FORMULA D-76R\*

Replenisher for 'Kodak' D-76 developer to maintain volume and activity of tank developer

<i>Metric</i>		<i>Avoirdupois</i>
3.0 gm.	'Elon'	105 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
7.5 gm.	Hydroquinone	265 gr.
20.0 gm.	Borax	1 oz. 260 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use the replenisher without dilution and add to the tank to maintain the level of the solution until 25 per cent. of the original developer has been replaced.

\* Available as a 'Kodak' Packed Developer Powder.

## KODAK FORMULA D-82

Maximum-energy developer, a high-contrast dish developer for extremely under-exposed negatives

<i>Metric</i>		<i>Avoirdupois</i>
48 c.c.	Methylated spirit	4 fluid oz.
14.0 gm.	'Elon'	1 oz. 50 gr.
105.0 gm.	Sodium sulphite (cryst.)	8 oz. 175 gr.
(52.5 gm.)	(or anhydrous)	(4 oz. 85 gr.)
14.0 gm.	Hydroquinone	1 oz. 50 gr.
8.8 gm.	Sodium hydroxide (caustic soda)	310 gr.
8.8 gm.	Potassium bromide	310 gr.
(88 c.c.)	(or 10% solution)	(7 oz.)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution. Develop about 5 minutes at 65° F. (18° C.).

The prepared developer does not keep more than a few days in a full bottle or more than 2 hours in an open dish.

**KODAK FORMULA D-156\***

**Warm-tone developer** for 'Kodura,' 'Bromesko' and other chlorobromide materials

<b>Stock Solution</b>	
<i>Metric</i>	<i>Avoirdupois</i>
1.7 gm. . . . 'Elon' . . . . .	60 gr.
44.0 gm. . . . Sodium sulphite (cryst.) . . . .	3 oz. 220 gr.
(22.0 gm.) . . . (or anhydrous) . . . . .	(1 oz. 330 gr.)
6.8 gm. . . . Hydroquinone . . . . .	240 gr.
44.0 gm. . . . Sodium carbonate (cryst.) . . . .	3 oz. 220 gr.
(16.0 gm.) . . . (or anhydrous) . . . . .	(1 oz. 110 gr.)
6.3 gm. . . . Potassium bromide . . . . .	220 gr.
(63 c.c.) . . . (or 10% solution) . . . . .	(5 oz.)
1000 c.c. . . . Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given. Use 1 part developer to 1 part water.

Approximate development time at 65° F. (18° C.) is 2 minutes.

\* Available as a 'Kodak' Packed Developer Powder.

**KODAK FORMULA D-158\***

**Normal developer for chloride paper** giving blue-black tone on 'Velox,' and high contrast on process materials

<b>Stock Solution</b>	
<i>Metric</i>	<i>Avoirdupois</i>
3.2 gm. . . . 'Elon' . . . . .	110 gr.
100.0 gm. . . . Sodium sulphite (cryst.) . . . .	8 oz.
(50.0 gm.) . . . (or anhydrous) . . . . .	(4 oz.)
13.3 gm. . . . Hydroquinone . . . . .	1 oz. 40 gr.
186.0 gm. . . . Sodium carbonate (cryst.) . . . .	14 oz. 375 gr.
(69.0 gm.) . . . (or anhydrous) . . . . .	(5 oz. 220 gr.)
0.9 gm. . . . Potassium bromide . . . . .	32 gr.
(9 c.c.) . . . (or 10% solution) . . . . .	(350 minims)
1000 c.c. . . . Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given. For use, dilute with an equal bulk of water.

Develop 'Velox' paper for 30-40 seconds at 65° F. (18° C.); 'Kodamine' films for 3-4 mins. at 65° F. (18° C.); and 'Kodamine' papers for 2-3 mins. at 65° F. (18° C.).

\* Alternatively use 'Velox' Developer Powder, 'Velox' Developer, or 'Kodamine' Developer Powder.

## KODAK FORMULA D-163\*

Special developer for papers giving normal to high contrast; suitable also as a dish developer for negative materials. Recommended for tropical use for papers

### Stock Solution

Metric		Avoirdupois
2.3 gm.	'Elon'	80 gr.
150.0 gm.	Sodium sulphite (cryst.)	12 oz.
(75.0 gm.)	(or anhydrous)	(6 oz.)
17.0 gm.	Hydroquinone	1 oz. 160 gr.
175.0 gm.	Sodium carbonate (cryst.)	14 oz.
(65.0 gm.)	(or anhydrous)	(5 oz. 80 gr.)
2.8 gm.	Potassium bromide	100 gr.
(28 c.c.)	(or 10% solution)	(2 oz. 130 minims)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

### FOR NEGATIVE MATERIALS :

Dilute 1 part of stock solution with 3 parts of water.

Develop for 5-10 minutes at 65° F. (18° C.).

### FOR BROMIDE PAPERS :

For normal use dilute 1 part of stock solution with 3 parts of water.

For longer working life dilute 1 part of stock solution with 1 part of water.

Develop for 2 minutes at 65° F. (18° C.).

### FOR 'BROMESKO' PAPERS :

Dilute 1 part of the above stock solution with 3 parts of water. White Glossy 'Bromesko'—develop for 1½ minutes at 65° F. (18° C.). Other surfaces—develop for 1½ to 2 minutes at 65° F. (18° C.).

### FOR 'VELOX' AND GASLIGHT PAPERS :

Dilute 1 part of stock solution with 1 part of water.

Develop for 60-120 seconds at 65° F. (18° C.).

TIME-TEMPERATURE CHART FOR 'KODAK' PAPERS

65° F.	70° F.	75° F.	80° F.	85° F.
18° C.	21° C.	24° C.	27° C.	30° C.
60 sec.	45 sec.	30 sec.	25 sec.	20 sec.
90 sec.	65 sec.	45 sec.	35 sec.	25 sec.
120 sec.	90 sec.	60 sec.	45 sec.	35 sec.

\* Available as a 'Kodak' Packed Developer Powder and in solution form.

**KODAK FORMULA D-165**

'Elon' low-contrast developer for P.300 plates, photogravure transparencies, lantern plates and bromide papers

Stock Solution		
Metric		Avoirdupois
6.0 gm.	'Elon'	210 gr.
50.0 gm.	Sodium sulphite (cryst.)	4 oz.
(25.0 gm.)	(or anhydrous)	(2 oz.)
100.0 gm.	Sodium carbonate (cryst.)	8 oz.
(37.0 gm.)	(or anhydrous)	(3 oz.)
1.0 gm.	Potassium bromide	35 gr.
(10 c.c.)	(or 10% solution)	(380 min.)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Dilute 1 part of the above stock solution with 3 parts of water.

Develop P.300 for 4-6 minutes. B.40 for 3 minutes, and bromide paper for 2 minutes at 65° F. (18° C.).

**KODAK FORMULA D-166\***

Extra warm tone developer for 'Bromesko' and 'Kodura' papers

Stock Solution		
Metric		Avoirdupois
1.15 gm.	'Elon'	40 gr.
50.0 gm.	Sodium sulphite (cryst.)	4 oz.
(25.0 gm.)	(or anhydrous)	(2 oz.)
8.5 gm.	Hydroquinone	300 gr.
68.0 gm.	Sodium carbonate (cryst.)	5 oz. 220 gr.
(25.0 gm.)	(or anhydrous)	2 oz.
12.5 gm.	Potassium bromide	1 oz.
(175 c.c.)	(or 10% solution)	(10 oz.)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use 1 part of developer to 3 parts of water.

Develop for 2 minutes at 65° F. (18° C.): with this time of development, the correct exposure will give a first appearance of the image after about 50 secs. development. The warmth of image tone may be varied by increasing or decreasing the dilution of the developer (with the development time unchanged) with a corresponding decrease or increase in exposure.

Note. This developer as sold in liquid form is double the strength of the stock solution made up according to Formula D-166. Therefore 1 part of this 'Kodak' liquid preparation should be diluted with 7 parts of water to make up the working developer.

\* Available as a 'Kodak' Packed Developer Powder and in solution form.

## KODAK FORMULA D-167

**Pyro-'Elon' staining developer** for rapid dish development of press and commercial negatives, giving high contrast and speed

Solution A	
Metric	Avoirdupois
5.0 gm. . . . 'Elon'. . . . .	175 gr.
10.0 gm. . . . Potassium metabisulphite . . . . .	350 gr.
15.0 gm. . . . Pyro . . . . .	1 oz. 110 gr.
1000 c.c. . . . Water to make . . . . .	80 oz.

Solution B	
200.0 gm. . . . Sodium carbonate (cryst.) . . . . .	16 oz.
(75.0 gm.) . . . (or anhydrous) . . . . .	(6 oz.)
1000 c.c. . . . Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given.

Take 1 part of solution A and 1 part of Solution B. Oxidation is very rapid and therefore solutions A and B should not be mixed until immediately before use.

Develop for 2-3 minutes at 65° F. (18° C.).

## KODAK FORMULA D-170\*

**'Dolmi' developer** for bromide papers

Stock Solution	
Metric	Avoirdupois
50.0 gm. . . . Sodium sulphite (cryst.) . . . . .	4 oz.
(25.0 gm.) . . . (or anhydrous) . . . . .	(2 oz.)
1.0 gm. . . . Potassium bromide . . . . .	35 gr.
200 c.c. . . . Water to make . . . . .	16 oz.

For use, dilute the above 16 oz. (200 c.c.) of stock solution with water to make 80 oz. (1000 c.c.) and dissolve in this 160 gr. (4.5 gm.) of 'Dolmi.' The diluted solution does not keep well and should be made up as required. Time of development for bromide prints : 2 mins. at 65° F. (18° C.).

\* Available as a 'Kodak' Packed Developer Powder.

**KODAK FORMULA D-173**

**'Elon'-free developer for 'Velox' paper** eliminating risk of discomfort to persons prone to Metol-dermatitis

<i>Metric</i>		<i>Avoirdupois</i>
45.0 gm.	Sodium sulphite (cryst.)	3 oz. 260 gr.
(22.5 gm.)	(or anhydrous)	(1 oz. 350 gr.)
175.0 gm.	Sodium carbonate (cryst.)	14 oz.
(65.0 gm.)	(or anhydrous)	(5 oz. 85 gr.)
0.375 gm.	Paraminophenol hydrochloride	13 gr.
7.5 gm.	Hydroquinone	265 gr.
0.15 gm.	Potassium bromide	5 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given. For use dilute with an equal volume of water and develop for 35-45 seconds at 65° F. (18° C.).

**KODAK FORMULA D-177\***

**Pyro-soda dish developer** for general use with plates and films

**Solution A**

(stock solution for storage)

<i>Metric</i>		<i>Avoirdupois</i>
1.4 gm.	Potassium metabisulphite	50 gr.
12.5 gm.	Pyro	1 oz.
1.7 gm.	Potassium bromide	60 gr.
150 c.c.	Water to make	12 oz.

**Solution B**

150 c.c.	Solution A	12 oz.
1000 c.c.	Water to make	80 oz.

**Solution C**

100.0 gm.	Sodium sulphite (cryst.)	8 oz.
(50.0 gm.)	(or anhydrous)	(4 oz.)
100.0 gm.	Sodium carbonate (cryst.)	8 oz.
(37.5 gm.)	(or anhydrous)	(3 oz.)
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given. For negatives of average contrast, use equal parts of Solutions B and C. For portraits and softer negatives, use equal parts of Solutions B and C and 2 parts of water. Develop for 5-8 minutes at 65° F. (18° C.).

\* Available as a 'Kodak' Packed Developer Powder.

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## KODAK FORMULA D-178

Extreme-contrast developer for 'Kodak' Maximum Resolution Plates

Stock Solution	
<i>Metric</i>	<i>Avoirdupois</i>
180.0 gm. . . . Sodium sulphite (cryst.) . . .	14 oz. 175 gr.
(90.0 gm.) . . . (or anhydrous) . . . . .	(7 oz. 90 gr.)
45.0 gm. . . . Hydroquinone . . . . .	3 oz. 265 gr.
18.0 gm. . . . Caustic soda . . . . .	1 oz. 190 gr.
30.0 gm. . . . Potassium bromide . . . . .	2 oz. 175 gr.
1000 c.c. . . . Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given.

Use 2 parts stock solution and 1 part water.

Develop 'Kodak' Maximum Resolution plates for 3 to 6 minutes at 65° F.

**'Kodalk' Developer Formulae**

'Kodalk' is an alkaline accelerator intermediate in activity between sodium carbonate and borax, and permits of greater control of the energy of the developer. There is no risk of blistering as it does not evolve carbon dioxide on acidifying. There is also less tendency to precipitate aluminium sulphite from fixing baths containing alum.

**KODAK FORMULA DK-15\***

Tropical developer for negatives for dish or tank 75° to 90° F.

Metric		Avoirdupois
5.7 gm.	'Elon'	200 gr.
180.0 gm.	Sodium sulphite (cryst.)	14 oz. 175 gr.
(90.0 gm.)	(or anhydrous)	(7 oz. 88 gr.)
22.5 gm.	'Kodalk'	1 oz. 335 gr.
1.9 gm.	Potassium bromide	67 gr.
105.0 gm.	Sodium sulphate (cryst.)	8 oz. 175 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

**TANK DEVELOPMENT TIME IN MINUTES**

	Group 1	Group 2	Group 3	Group 4
75° F. (24° C.)	9	6	3	2
80° F. (27° C.)	7½	5	2½	1¾
85° F. (30° C.)	5	3½	1¾	1¼
90° F. (32° C.)	3¾	2½	1¼	1

Group 1. *Slow-developing*: 'Super-XX' miniature film; 'Super-XX' sheet film; 'Ortho-X' sheet film.

Group 2. *Normal developing*: 'Plus-X' 35 mm. film; 'Panatomic'-X miniature film; Roll films; Commercial Ortho sheet film; 'Panatomic'-X sheet film; P.1200 plates.

Group 3. *Rapid-developing*: P.1500 plates; P.300 plates; O.800 plates.

Group 4. *Very rapid-developing*: Lantern plates; O.250 plates; B.40 plates.

These times are for development with moderate agitation; they may have to be increased or decreased according to the degree of agitation employed. For dish development reduce these times by about 20 per cent.

\* Available as a 'Kodak' Packed Developer Powder.

**KODAK FORMULA DK-20\***

Extra fine grain developer for films or plates, in dish or tank

Metric		Avoirdupois
5.0 gm.	'Elon'	175 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
2.0 gm.	'Kodalk'	70 gr.
1.0 gm.	Potassium thiocyanate (sulphocyanide)	35 gr.
0.5 gm.	Potassium bromide	18 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Use without dilution. Average development time about 15 minutes at 65° F. (18° C.). The useful life of this developer can be increased greatly by the use of DK.20R replenisher.

\* Available as a 'Kodak' Packed Developer Powder.

## KODAK FORMULA DK-20\*

Replenisher for 'Kodak' developer DK-20 to maintain volume and activity of tank developer

Metric		Avoirdupois
7.5 gm.	'Elon'	265 gr.
200.0 gm.	Sodium sulphite (cryst.)	16 oz.
(100.0 gm.)	(or anhydrous)	(8 oz.)
20.0 gm.	'Kodak'	1 oz. 260 gr.
5.0 gm.	Potassium thiocyanate (sulphocyanide)	175 gr.
1.0 gm.	Potassium bromide	35 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

Add to the tank as necessary to maintain the volume constant, until 25 per cent. of the original developer has been replaced.

**Deep Tank Use.** A given high-light density will be maintained throughout the developer life for a constant development time at a constant temperature, provided the volume of replenisher added is about 5 gallons per 1000 rolls of film (80,000 square inches) processed.

\* Available as a 'Kodak' Packed Developer Powder.

## KODAK FORMULA DK-50\*

'Elon'-hydroquinone-'Kodak' developer for normal-contrast negatives by dish or tank development

Metric		Avoirdupois
2.5 gm.	'Elon'	88 gr.
60.0 gm.	Sodium sulphite (cryst.)	4 oz. 350 gr.
(30.0 gm.)	(or anhydrous)	(2 oz. 175 gr.)
2.5 gm.	Hydroquinone	88 gr.
10.0 gm.	'Kodak'	350 gr.
0.5 gm.	Potassium bromide	18 gr.
1000 c.c.	Water to make	80 oz.

Dissolve the chemicals in the order given.

By increasing or decreasing the quantity of 'Kodak' in the formula it is possible (a) to increase or decrease the contrast obtained in a given time of development; (b) to decrease or increase the time of development without affecting the contrast.

Average development time about 10 minutes at 65° F. (18° C.) or as recommended for specific materials.

\* Available as a 'Kodak' Packed Developer Powder.

# STOP AND HARDENING BATHS

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## KODAK FORMULA SB-1

Acid stop bath for papers, plates and films

<i>Metric</i>			<i>Avoirdupois</i>	
1000	c.c.	Water	80	oz.
17	c.c.	Acetic acid (glacial)	1 oz.	120 minims

Rinse prints for 5 seconds.

## KODAK FORMULA SB-1A

Acid stop bath for Reflex plates.

<i>Metric</i>			<i>Avoirdupois</i>	
1000	c.c.	Water	80	oz.
50	c.c.	Acetic acid (glacial)	4	oz.

## KODAK FORMULA SB-3

Hardening bath for films and plates

<i>Metric</i>			<i>Avoirdupois</i>	
1000	c.c.	Water	80	oz.
30.0	gm.	Potassium chrome alum	2 oz.	175 gr.

Agitate the negative for a few seconds immediately after immersion.

Maximum hardening takes 3-5 minutes in a fresh bath.

## KODAK FORMULA SB-4

Tropical hardening bath for films and plates, for use *after* development, at temperatures from 75° F. to 95° F.

<i>Metric</i>			<i>Avoirdupois</i>	
1000	c.c.	Water	80	oz.
30.0	gm.	Potassium chrome alum	2 oz.	175 gr.
140.0	gm.	Sodium sulphate (cryst.)	11 oz.	90 gr.
(60.0	gm.)	(or anhydrous)	(4 oz.	350 gr.)

Agitate negatives for 30 to 45 seconds when they are first immersed, to avoid unevenness, and leave them for 3 minutes. After the equivalent of twenty 10×8 in. films per gallon have been treated, the bath should be replaced, otherwise scum markings will result.

The freshly-made bath is a violet-blue colour and keeps indefinitely while unused. A partially used bath deteriorates on standing for a few days, the colour changing to a yellow-green.

## KODAK FORMULA SH-1

**Alkaline formalin hardener** for films and plates, for use after development. Recommended for the treatment of negatives when the emulsion would otherwise be softened considerably by chemical treatments as in the removal of several types of stains, intensification or reduction.

<i>Metric</i>		<i>Avoirdupois</i>
16.89 min 10	c.c. . . . Formalin (40% formaldehyde solution) . . . . .	360 minims
1.35 gr	13.5 gm. . . . Sodium carbonate (cryst.) . . . . .	1 oz. 35 gr.
	(5.0 gm.) . . . (or anhydrous) . . . . .	(175 gr.)
3.52 oz	1000 c.c. . . . Water to make . . . . .	80 oz.

After hardening for 3 minutes in the above bath, negatives should be rinsed and immediately immersed for 5 minutes in a fresh acid fixing bath and washed thoroughly before they are given any further chemical treatment.

# FIXING BATHS

## KODAK FORMULA F-5

Tropical acid hardening fixing bath for films and plates

<i>Metric</i>		<i>Avoirdupois</i>
240.0 gm.	Sodium thiosulphate (hypo)	19 oz. 90 gr.
(150.0 gm.)	(or anhydrous)	(12 oz. 100 gr.)
30.0 gm.	Sodium sulphite (cryst.)	2 oz. 175 gr.
(15.0 gm.)	(or anhydrous)	(1 oz. 90 gr.)
17.0 c.c.	Acetic acid (glacial)	1 oz. 120 minims
7.5 gm.	Boric acid	260 gr.
15.0 gm.	Potassium alum	1 oz. 90 gr.
1000 c.c.	Water to make	80 oz.

Dissolve chemicals in the order given.

Films and plates will be fixed properly in 10 minutes if a freshly prepared fixing bath has been used. Prolonged immersion at high temperatures is harmful.

## KODAK FORMULA F-16

Chrome alum hardening fixing bath recommended for hot weather processing

### Solution A

<i>Metric</i>		<i>Avoirdupois</i>
320.0 gm.	Sodium thiosulphate (hypo)	26 oz.
40.0 gm.	Sodium sulphite (cryst.)	3 oz. 90 gr.
(20.0 gm.)	(or anhydrous)	(1 oz. 260 gr.)
1000 c.c.	Water to make	80 oz.

### Solution B

500 c.c.	Water	40 oz.
60.0 gm.	Potassium chrome alum	4 oz. 350 gr.
8 c.c.	Sulphuric acid (concentrated)	300 minims
1000 c.c.	Water to make	80 oz.

Pour 1 part Solution B into 3 parts Solution A, whilst stirring A rapidly, and use same day.

This formula, when freshly mixed, is especially recommended for use during hot weather, but it rapidly loses its hardening properties, with or without use. Scum which may form on the surface of the negative when an old bath is used is removable by swabbing with cotton-wool before the negative is dried.

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## KODAK FORMULA F-52\*

**Non-hardening acid fixing bath** for use when hardening is not desired, or must be avoided, e.g., with 'Transferotype' and Bromoil papers

<i>Metric</i>		<i>Avoirdupois</i>
250.0 gm.	Sodium thiosulphate (hypo)	20 oz.
25.0 gm.	Potassium metabisulphite	2 oz.
1000 c.c.	Water to make	80 oz.

\*As an alternative to preparing your own fixing bath, 'Kodak' Rapid Acid Fixer is available in powder form.

## KODAK FORMULA F-53\*

**Acid-hardener stock solution** required in Kodak formulae F-54 and F-54a

<i>Metric</i>		<i>Avoirdupois</i>
100.0 gm.	Sodium sulphite (cryst.)	8 oz.
(50.0 gm.)	(or anhydrous)	(4 oz.)
75 c.c.	Acetic acid (glacial)	6 oz.
100.0 gm.	Potassium alum	8 oz.
1000 c.c.	Water to make	80 oz.

Dissolve the sulphite in 250 c.c. (20 oz.) of warm water about 125° F. (52° C.) and allow to cool. Then add the acetic acid slowly and with constant stirring. Dissolve the potassium alum in about 500 c.c. (40 oz.) of hot water and allow to cool below 70° F. (20° C.) before adding to the sulphite and acetic acid mixture. Finally make up to 1000 c.c. (80 oz.) with cold water.

**Note** that 'Kodak' Liquid Hardener, as sold, is  $2\frac{1}{2}$  times stronger than formula F.53. Therefore if 40 oz. of K.L.H. is specified in a formula it would be necessary to take 100 oz. of formula F.53.

\* As an alternative to preparing your own hardening solution, 'Kodak' Hardening Powder or 'Kodak' Liquid Hardener are available.

**KODAK FORMULA F-54\***

Acid hardening fixing bath for paper

<i>Metric</i>		<i>Avoirdupois</i>
500 c.c.	Warm water	40 oz.
250.0 gm.	Sodium thiosulphate (hypo)	20 oz.
To this, when cold, add:		
50 c.c.	'Kodak' Liquid Hardener	4 oz.
(125 c.c.)	(or Acid Hardener Stock Solution Formula F.53)	(10 oz.)
1000 c.c.	Water to make	80 oz.

\* As an alternative to preparing your own fixing baths, 'Kodak' Acid Fixing Salt with Hardener is available in powder form.

**KODAK FORMULA F-54a\***

Acid hardening fixing bath for films and plates

<i>Metric</i>		<i>Avoirdupois</i>
500 c.c.	Warm water	40 oz.
400.0 gm.	Sodium thiosulphate (hypo)	32 oz.
To this, when cold, add:		
75 c.c.	'Kodak' Liquid Hardener	6 oz.
(185 c.c.)	(or Acid Hardener Stock Solution—Formula F.53)	(15 oz.)
1000 c.c.	Water to make	80 oz.

\* As an alternative to preparing your own fixing baths, 'Kodak' Acid Fixing Salt with Hardener is available in powder form.

## Hypo Eliminator and Test Solutions

### KODAK FORMULA HE-I

#### Hypo eliminator

Metric		Avoirdupois
500 c.c.	Water	40 oz.
125 c.c.	Hydrogen peroxide (3% solution*)	10 oz.
100 c.c.	Ammonia (3% solution)†	8 oz.
1000 c.c.	Water to make	80 oz.

\* i.e., 10 vol. solution, as purchased.

† To make 3% ammonia, dilute 9 parts of .880 ammonia to make 100 parts of solution.

Hypo eliminators are not usually required in processing negative materials. In the case of prints, however, traces of hypo are tenaciously held by the paper fibres and may lead to fading of the image on long keeping under adverse conditions. HE-I used as directed converts the hypo to inert sulphate and also facilitates its removal.

#### DIRECTIONS FOR USE

Wash the prints for about 30 minutes at 65° to 70° F.\* in running water which flows rapidly enough to replace the water in the vessel (dish or tank) completely once every five minutes. Then immerse each print for about six minutes at 70° F. in the hypo eliminator solution ('Kodak' HE-I) and finally wash for about 10 minutes before drying.

#### LIFE OF HE-I SOLUTION

About fifty 8×10 in prints or their equivalent per gallon (4 litres). If used on plates, films or lantern slides the eliminator should be diluted with 10 parts of water, otherwise the emulsion may be rendered unduly tender.

#### TEST FOR HYPO

Process with the batch of prints an unexposed white sheet of photographic paper (same weight and size as majority of prints in batch). After the final wash, cut off a strip of this sheet and immerse it in a 1 per cent. silver nitrate solution for about three minutes; then rinse in water and compare, while wet, in subdued daylight or artificial light, with the wet, untreated portion. If the hypo has been completely removed no colour difference should be observed. A yellow-brown tint indicates the presence of hypo.\*\*

**Caution:** Silver nitrate solution stains the skin black; avoid direct contact with the solution.

#### OCCASIONAL EFFECTS WHEN USING HE-I ELIMINATOR

- (1) Tendency for prints to stick on the belt of belt driers, avoided by bathing the prints for 3 minutes in 1% formaldehyde prior to drying.
- (2) Slight change of image colour, avoided by adding 15 gr. of potassium bromide to each quart (1 gm. per litre) of HE-I.
- (3) Slight yellowing of whites, avoided by bathing the prints in 1% sodium sulphite for 2 minutes prior to final wash.

\* For lower temperatures, increase the washing time. Double the washing time should be used when double-weight prints are treated.

\*\* The same effect can be caused if hydrogen sulphide or wood extracts are present in the water supply.

**KODAK FORMULA HT-I a****Hypo test solution** for checking thoroughness of washing

<i>Metric</i>		<i>Avoirdupois</i>
1.2 gm. . . .	Potassium permanganate . . .	40 gr.
2.4 gm. . . .	Sodium hydroxide . . . .	85 gr.
1000 c.c. . . .	Water (distilled) to make . . .	80 oz.

To make the test with film, take 8 oz. (250 c.c.) of pure water in a clear glass and add 15 minims (1 c.c.) of the permanganate-caustic soda solution.

**Films or Plates :** Take six films or plates size  $3\frac{1}{4} \times 4\frac{1}{4}$  in. (or equivalent area) from the wash water and drain them into the glass of test solution. If hypo is present, the violet colour will turn orange in about 30 seconds and with a larger concentration the orange colour will change to yellow. In either case the film should be returned to the wash water until further tests produce no change in the violet colour.

**Note :** Since oxidisable organic matter, if present in the water, will react with the permanganate in a similar manner to hypo, a comparison test should be made with a similar sample of water. The permanganate solution is diluted as instructed but with distilled water and about 120 minims (10 c.c.) of the mains water added.

**Papers :** Although the above test can also be used for testing papers (using six  $4 \times 5$  in. prints or equivalent area) when complete freedom from hypo is required (e.g., for chlorobromide prints likely to be submitted to tropical conditions), the test is not a completely reliable indication and the hypo eliminator HE-I should be used in conjunction with the test for residual hypo given under this heading.

# INTENSIFIERS AND REDUCERS

## KODAK FORMULA R-1

**Persulphate reducer** for reducing density and contrast of negative materials

<i>Metric</i>		<i>Avoirdupois</i>
1000 c.c.	Water . . . . .	80 oz.
60.0 gm.	Ammonium persulphate . . . . .	4 oz. 350 gr.
3 c.c.	Sulphuric acid (concentrated)	115 minims

For use take 1 part stock solution and 2 parts water.

When reduction is complete, immerse the negative in an acid fixing bath for a few minutes, then wash.

## KODAK FORMULA R-2

**Permanganate reducer** for reducing density of negative materials without loss of contrast

<b>Stock Solution A</b>		
<i>Metric</i>		<i>Avoirdupois</i>
52.5 gm.	Potassium permanganate . . . . .	4 oz. 90 gr.
1000 c.c.	Water to make . . . . .	80 oz.

<b>Stock Solution B</b>		
1000 c.c.	Cold water . . . . .	80 oz.
32 c.c.	Sulphuric acid (concentrated)	2 oz. 240 minims

Add the sulphuric acid very gradually to the water with constant stirring.

For use, take :

Stock Solution A	... ..	1 part
Stock Solution B	... ..	2 parts
Water	... ..	64 parts

When the negative has been sufficiently reduced, immerse it in a 2% solution of sodium bisulphite to remove the stain. Fix in a fresh acid fixing bath for a few minutes, after which wash thoroughly.

It is very important to wash the negative thoroughly before giving this treatment—otherwise an iridescent irremovable scum may appear on the negative after drying.

The stock solutions keep well but the mixture should be used immediately.

**KODAK FORMULA R-4a**

**Farmer's reducer.** A cutting reducer for correcting over-exposure and clearing shadow areas of negatives and high lights of prints

**Stock Solution A**

<i>Metric</i>		<i>Avoirdupois</i>
75.0 gm. . . .	Potassium ferricyanide . . .	6 oz.
1000 c.c. . . .	Water to make . . . . .	80 oz.

**Stock Solution B**

240.0 gm. . . .	Sodium thiosulphate (hypo) .	19 oz.
1000 c.c. . . .	Water to make . . . . .	80 oz.

For use, take 1 part Solution A, 4 parts Solution B, then add water 27 parts. Pour the mixed solution at once over the negative to be reduced. Watch closely. The action is best seen when the solution is poured over the negative in a white dish. When the negative has been reduced sufficiently, wash thoroughly before drying.

Solutions A and B should not be combined until they are to be used. They will not keep long when mixed.

**KODAK FORMULA R-4b**

**Two-bath Farmer's reducer** giving almost proportional reduction for lowering density and contrast of negatives

**Solution A**

<i>Metric</i>		<i>Avoirdupois</i>
7.5 gm. . . .	Potassium ferricyanide . . .	260 gr.
1000 c.c. . . .	Water to make . . . . .	80 oz.

**Solution B**

200.0 gm. . . .	Sodium thiosulphate (hypo) .	16 oz.
1000 c.c. . . .	Water to make . . . . .	80 oz.

Treat the negatives in Solution A with uniform agitation for 1 to 4 minutes at 65°-75° F. (18°-24° C.), depending on the degree of reduction desired. Then immerse them in Solution B for 5 minutes and wash thoroughly. The process may be repeated if more reduction is desired. For the reduction of general fog, 1 part of Solution A should be diluted with 1 part of water.

## KODAK FORMULA R-5

**Proportional reducer** for lowering contrast of negatives

### Stock Solution A

<i>Metric</i>		<i>Avoirdupois</i>
16 c.c. . . .	Sulphuric acid (10% solution)	1 oz. 120 minims
0.3 gm. . . .	Potassium permanganate . . .	11 gr.
1000 c.c. . . .	Water to make . . . . .	80 oz.

### Stock Solution B

30.0 gm. . . .	Ammonium persulphate . . .	2 oz. 175 gr.
1000 c.c. . . .	Water to make . . . . .	80 oz.

For use, take 1 part of A to 3 parts of B. When sufficient reduction is secured, the negative should be cleared in a 1% solution of sodium bisulphite. Wash the negative thoroughly before drying.

To obtain consistent results it is recommended that distilled water (or water free from iron) be used in making up these stock solutions.

## KODAK FORMULA R-8

**Modified Belitzsky reducer.** A single-solution cutting reducer for tank use

<i>Metric</i>		<i>Avoirdupois</i>
25.0 gm. . . .	Ferric chloride . . . . .	2 oz.
75.0 gm. . . .	Potassium citrate . . . . .	6 oz.
60.0 gm. . . .	Sodium sulphite (cryst.) . . .	4 oz. 350 gr.
(30.0 gm.) . . .	(or anhydrous) . . . . .	(2 oz. 175 gr.)
20.0 gm. . . .	Citric acid . . . . .	1 oz. 260 gr.
200.0 gm. . . .	Sodium thiosulphate (hypo) .	16 oz.
1000 c.c. . . .	Water to make . . . . .	80 oz.

Dissolve the chemicals in the order given.

Use full strength for maximum rate of reduction. Treat negatives 1 to 10 minutes at 65°-70° F. (18°-20° C.). Then wash thoroughly. If a slower action is desired, dilute 1 part of solution with 1 part of water.

Suitable for professional and motion picture use. Specially suitable for the treatment of dense negatives, by lowering the contrast and clearing the shadows.

**KODAK FORMULA R-23**

**Iodine Reducer.** A potassium iodide-iodine solution for local reduction and cleaning up of prints

**Stock Reducing Solution**

<i>Metric</i>		<i>Avoirdupois</i>
30.0 gm.	Potassium iodide . . . . .	1 oz. 220 gr.
10.0 gm.	Iodine (resublimed) . . . . .	220 gr.
200 c.c.	Water to make . . . . .	10 oz.

**Stop and Clearing Bath**

200.0 gm.	Sodium thiosulphate (hypo) . . . . .	16 oz.
1000 c.c.	Water to make . . . . .	80 oz.

To clean fogged prints: Dilute reducing solution with 10 volumes of water, apply with cotton wool to soaked print after blotting off surplus water. To clear iodine stain, immerse print in stop bath. Repeat, if necessary, after washing print.

To remove dark spots on clear ground: Apply the undiluted stock reducing solution on a fine camel-hair brush to the soaked and blotted print. Clear as above.

Wash prints thoroughly before drying.

**KODAK FORMULA IN-1**

**Mercury intensifier:** An intensifier for line and process negatives giving increased maximum density with little intensification of intermediate tones.

Bleach the negative in the following solution until it is white, then wash thoroughly:

<i>Metric</i>		<i>Avoirdupois</i>
22.5 gm.	Potassium bromide . . . . .	1 oz. 350 gr.
22.5 gm.	Mercuric chloride . . . . .	1 oz. 350 gr.
1000 c.c.	Water to make . . . . .	80 oz.

The negative can be blackened with 10% sulphite solution, a developing solution, such as Formula D-72, diluted 1 to 2, or 10% ammonia; these give progressively greater density in the order given. Where permanence of the resulting image is essential ammonia should not be used for blackening. Alternatively, to increase contrast greatly, treat with the following solution after bleaching:

<i>Metric</i>		<i>Avoirdupois</i>
15.0 gm.	Sodium or potassium cyanide . . . . .	1 oz. 90 gr.
22.5 gm.	Silver nitrate (cryst.) . . . . .	1 oz. 350 gr.
1000 c.c.	Water to make . . . . .	80 oz.

Dissolve the cyanide and silver nitrate separately, and add the latter to the former, until a permanent precipitate is just produced; allow the mixture to stand a short time and then filter.

**Warning:** Cyanide is a deadly poison and should be handled with extreme care. It reacts with acid to form poisonous hydrogen cyanide gas. When discarding a solution containing cyanide, always run water to flush it out of the sink quickly. Cyanide solutions should never be used in poorly ventilated rooms.

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## KODAK FORMULA IN-4

**Chromium intensifier** for approximately proportional intensification of thin negatives whether arising from slight under-exposure or under-development.

<b>Stock Solution</b>		
<i>Metric</i>		<i>Avoirdupois</i>
90.0 gm. . . .	Potassium bichromate . . . .	7 oz. 90 gr.
64 c.c. . . .	Hydrochloric acid	
	(concentrated)	5 fluid oz.
1000 c.c. . . .	Water to make . . . .	80 oz.

For use take 1 part of stock solution to 10 parts of water.

Bleach thoroughly, wash until the yellow stain is removed (immersing the bleached and rinsed negative in a 5% solution of sodium carbonate for a few moments quickens this stage) and then re-develop with a non-staining developer, e.g., D-72, in artificial light or diffused daylight. Wash thoroughly and dry. If greater density is required, the operation may be repeated. The degree of intensification can be controlled by varying the time of re-development.

**N.B.** Fine-grain developers of the borax type containing a high concentration of sulphite are not suitable for re-development since the sulphite tends to dissolve the silver chloride before the developing agents have time to act on it.

**KODAK FORMULA IN-5**

**Silver intensifier** for proportional intensification of positive and negative transparencies without affecting image colour and stability

**Stock Solution No. 1**

(Store in a brown bottle)

<i>Metric</i>		<i>Avoirdupois</i>
60.0 gm.	Silver nitrate (cryst.)	4 oz. 350 gr.
1000 c.c.	Distilled water to make	80 oz.

**Stock Solution No. 2**

120.0 gm.	Sodium sulphite (cryst.)	9 oz. 260 gr.
(60.0 gm.)	(or anhydrous)	(4 oz. 350 gr.)
1000 c.c.	Water to make	80 oz.

**Stock Solution No. 3**

105.0 gm.	Sodium thiosulphate (hypo)	8 oz. 175 gr.
1000 c.c.	Water to make	80 oz.

**Stock Solution No. 4**

30.0 gm.	Sodium sulphite (cryst.)	2 oz. 175 gr.
(15.0 gm.)	(or anhydrous)	(1 oz. 90 gr.)
24.0 gm.	'Elon'	1 oz. 405 gr.
3000 c.c.	Water to make	240 oz.

Prepare the intensifier solution for use as follows: Slowly add 1 part of Solution No. 2 to 1 part of Solution No. 1, stirring to obtain thorough mixing. The white precipitate which appears is then dissolved by the addition of 1 part of Solution No. 3. Allow the resulting solution to stand a few minutes until clear. Then add, while stirring, 3 parts of Solution No. 4. The intensifier is then ready for use and the film should be treated immediately. The degree of intensification obtained depends upon the time of treatment, which should not exceed 25 minutes. After intensification, immerse the film for 2 minutes, with agitation, in a plain 30% hypo solution. Then wash thoroughly.

The mixed intensifier solution is stable for approximately 30 minutes at 65° F. (18° C.).

All dishes used *must* be scrupulously clean and the operations should preferably take place in artificial light.

## KODAK FORMULA IN-6

**Quinone-thiosulphate intensifier**, giving maximum effective intensification of very under-exposed negatives, particularly those made on high-speed materials.

### Solution A

	Metric		Avoirdupois
13.4 fl oz	750 c.c.	. . . Distilled water (about 70° F.)	60 oz.
5.28 fl oz	30 c.c.	. . . Sulphuric acid (concentrated)*	2 oz. 96 min.
= 25.12 fl oz	22.5 gm.	. . . Potassium bichromate . . .	1 oz. 350 gr.
11.25 fl oz	1000 c.c.	. . . Distilled water to make . . .	80 oz.
+ 17.6 fl oz			

### Solution B

13.4 fl oz	750 c.c.	. . . Distilled water (about 70° F.)	60 oz.
1.2 fl oz	3.8 gm.	. . . Sodium bisulphite . . . . .	133 gr.
7.8 fl oz	15.0 gm.	. . . Hydroquinone . . . . .	1 oz. 88 gr.
3.8 fl oz	20 c.c.	. . . 'Kodak' Wetting Agent (10% solution) . . . . .	1 oz. 270 min.
+ 17.6 fl oz	1000 c.c.	. . . Distilled water to make . . .	80 oz.

### Solution C

13.4 fl oz	750 c.c.	. . . Distilled water (about 70° F.)	60 oz.
11.25 fl oz	22.5 gm.	. . . Sodium thiosulphate (cryst.)	1 oz. 350 gr.
+ 17.6 fl oz	1000 c.c.	. . . Distilled water to make . . .	80 oz.

For use: To 1 part of solution A add 2 parts of solution B with stirring, then 2 parts of solution C; continue stirring and finally add 1 part of solution A. The order of mixing is important and should be followed.

Negatives should be washed for 5 to 10 minutes, and hardened in the alkaline formaldehyde hardener, SH.1, for 5 minutes at 68° F. (20° C.), and then washed for 5 minutes. Treat, with frequent agitation, for up to 10 minutes at 68° F. (20° C.) in the above working solution, then wash 10 to 20 minutes and dry as usual. When working in a dish, treat only one negative at a time. The intensifier should be freshly mixed before use, and should be used only once.

The intensified image is destroyed by acid hypo so that under no circumstances should the intensified negatives be placed either in fixing baths or wash water contaminated with fixing bath.

\* Add the sulphuric acid very gradually to the water with constant stirring.

**KODAK FORMULA IN-21**

**Uranium intensifier:** a simple intensifier giving, next to Formula IN-6, maximum intensification of negatives

**Solution A**

<i>Metric</i>		<i>Avoirdupois</i>
20.0 gm.	. . . Uranium (uranyl) nitrate . . .	2 oz.
10 c.c.	. . . Glacial acetic acid . . .	1 fluid oz.
500 c.c.	. . . Water to make . . .	50 oz.

**Solution B**

20.0 gm.	. . . Potassium ferricyanide . . .	2 oz.
500 c.c.	. . . Water to make . . .	50 oz.

Use 1 part A, 1 part B and 6 parts of water. The film or plate should be washed very thoroughly after fixing, to remove all traces of hypo. Maximum intensification will be obtained with 2-3 minutes' immersion in the above working solution: further treatment only increases fog. The intensified image should have a reddish-brown colour. Wash only briefly before drying, since the usual alkaline wash water will destroy the intensification.

## KODAK FORMULA T-9

**Uranium toner** for brown to red tones in slides or films

<i>Metric</i>		<i>Avoirdupois</i>
2.5 gm.	Uranium (uranyl) nitrate . . .	90 gr.
2.5 gm.	Potassium oxalate . . .	90 gr.
1.0 gm.	Potassium ferricyanide . . .	35 gr.
6.0 gm.	Ammonium alum . . .	210 gr.
5.0 c.c.	Hydrochloric acid (10% solution)	190 minims
1000 c.c.	Water to make . . .	80 oz.

Dissolve the chemicals in the order given. The solution should be perfectly clear and pale yellow in colour. It is light-sensitive, however, and should be stored in the dark. The maximum effect is produced in about 10 minutes, the tone passing from brown to red during this time.

After toning, wash for about 10 minutes, though the washing should not be prolonged, especially if the water is slightly alkaline, since the toned image is soluble in alkali.

## KODAK FORMULA T-11

**Iron toner** for blue tones in slides or films

<i>Metric</i>		<i>Avoirdupois</i>
0.5 gm.	Ammonium persulphate . . .	17 gr.
1.4 gm.	Iron ammonium sulphate (Ferric alum)	50 gr.
3.0 gm.	Oxalic acid . . .	105 gr.
1.0 gm.	Potassium ferricyanide . . .	35 gr.
5.0 gm.	Ammonium alum . . .	175 gr.
1 c.c.	Hydrochloric acid (10% solution)	40 minims
1000 c.c.	Water to make . . .	80 oz.

The method of compounding this bath is very important. Each of the solid chemicals should be dissolved separately in a small volume of water, the solutions then mixed strictly in the order given, and the whole diluted to the required volume. If these instructions are followed, the bath will be pale yellow in colour and perfectly clear.

Immerse the slides or films from 2 to 10 minutes at 70° F. (21° C.) until the desired tone is obtained. Wash for 10 to 15 minutes until the high-lights are clear. Since the toned image is soluble in alkali, washing should not be carried out for too long a period, especially if the water is slightly alkaline. A very slight permanent yellow colouration of the clear gelatin will usually occur, but should be too slight to be detectable on projection. If the high-lights are stained blue, then either the slide (film) was fogged during development, or the toning bath was stale, or not mixed correctly.

By mixing the uranium (T-9) and iron (T-11) toning solutions in different proportions, tones ranging from reddish-brown to chocolate are produced.

**KODAK FORMULA T-51**

**Hypo-alum toning bath** for direct sepia toning of bromide and 'Bromesko' prints

To prepare the hypo-alum toning bath, dissolve 1 lb. (200 gm.) of hypo in 80 oz. (1000 c.c.) of hot water, then add 3½ oz. (44 gm.) of ordinary potassium alum; stir well and boil for two or three minutes; cool down to about 150° F. (65° C.) and add the following silver ripener:—

Dissolve 20 gr. (0.5 gm.) of silver nitrate in 1 oz. (15 c.c.) of water and add, drop by drop (.880) ammonia with vigorous stirring until the precipitate first formed is just re-dissolved, and stir the solution so formed into the hypo-alum mixture. In a further oz. (15 c.c.) of water dissolve 30 gr. (1 gm.) of potassium iodide; add this also to the hypo-alum mixture and stir well.

This bath can be used repeatedly. It may be kept up to its original bulk by the occasional addition of fresh solution, being discarded when it ceases to tone satisfactorily.

Prints for toning by this method should be fixed as usual, briefly rinsed in water, soaked for 10 minutes in a saturated solution of potassium alum, rinsed and then toned at a temperature not exceeding 140° F. (60° C.). After toning, sponge the prints with lukewarm water to remove sediment and wash as usual.

**KODAK FORMULA T-52\***

**Sulphide toner.** A two-solution sepia toner for bromide paper and lantern slides

**A. Bleaching Solution**

<i>Metric</i>		<i>Avoirdupois</i>
50.0 gm.	Potassium ferricyanide	4 oz.
50.0 gm.	Potassium bromide	4 oz.
1000 c.c.	Water to make	80 oz.

**B. Stock Sulphide Solution**

200.0 gm.	Sodium sulphide (pure)	16 oz.
1000 c.c.	Water to make	80 oz.

**C. Toning Solution**

50 c.c.	Stock Solution B	4 oz.
1000 c.c.	Water to make	80 oz.

Bleach in Solution A, wash until yellow stain is removed, and tone in Solution C. Complete with brief washing in running water. Throw away Solution C after use.

\* A toner of this type is available as 'Kodak' Sepia Toner

## KODAK FORMULA T-55\*

Selenium toner for 'Bromesko' and warm-tone lantern slides

### Stock Solution

<i>Metric</i>		<i>Avoirdupois</i>
300.0 gm. . . .	Sodium sulphite (cryst.) . . . .	24 oz.
(150.0 gm.) . . . .	(or anhydrous) . . . .	(12 oz.)
6.0 gm. . . .	Selenium powder . . . .	210 gr.
190.0 gm. . . .	Ammonium chloride . . . .	15 oz.
1000 c.c. . . .	Water to make . . . .	80 oz.

Dissolve the sulphite in about 700 c.c. of hot water, then add the selenium powder and boil until it is completely dissolved. Allow the solution to cool; then add the ammonium chloride and stir until it is dissolved. Finally make up to the required bulk with cold water.

For use dilute 1 part of stock solution with 5 parts of water.

Prints should be fixed and well washed before toning in the above solution for 10 to 15 minutes at 65° F. (18° C.). Finally wash well before drying.

\*Available as 'Kodak' Selenium Toner.

## KODAK FORMULA T-56

Sulphide-selenium toner for bromide, 'Bromesko' and 'Kodura' prints

### A. Bleaching Solution

<i>Metric</i>		<i>Avoirdupois</i>
50.0 gm. . . .	Potassium ferricyanide . . . .	4 oz.
50.0 gm. . . .	Potassium bromide . . . .	4 oz.
1000 c.c. . . .	Water to make . . . .	80 oz.

### B. Stock Sulphide-Selenium Solution

250.0 gm. . . .	Sodium sulphide (pure) . . . .	20 oz.
5.7 gm. . . .	Selenium powder . . . .	200 gr.
1000 c.c. . . .	Water to make . . . .	80 oz.

### C. Toning Solution

50 c.c. . . .	Stock Solution B . . . .	4 oz.
1000 c.c. . . .	Water to make . . . .	80 oz.

Bleach in Solution A, wash until the yellow stain is removed and tone in Solution C. Complete with brief wash in running water. Throw away Solution C after use.

# DISH CLEANERS AND STAIN REMOVERS

## KODAK FORMULA TC-1

**One-solution dish cleaner** for removing silver and developer stains on dishes

<i>Metric</i>		<i>Avoirdupois</i>
1000 c.c.	Water	80 oz.
90.0 gm.	Potassium bichromate	7 oz.
96 c.c.	Sulphuric acid (concentrated)	8 oz.

Dissolve the bichromate in the water, cool and add the sulphuric acid slowly, whilst stirring the solution.

Pour a small volume of the dish cleaner solution into the vessel to be cleaned. Rinse the solution around so that it has access to all parts of the vessel. Then pour off and wash the dish thoroughly with six or eight changes of water.

## KODAK FORMULA TC-3

**Two-solution dish cleaner and hand stain remover**

### Solution A

<i>Metric</i>		<i>Avoirdupois</i>
1000 c.c.	Water	80 oz.
2.0 gm.	Potassium permanganate	70 gr.
4 c.c.	*Sulphuric acid (concentrated)	77 minims

Store the solution in a stoppered glass bottle away from the light.

\* Add the sulphuric acid slowly while stirring constantly. Never add the solution to the acid as the solution may boil and spatter acid on the hands or face, causing serious burns.

### Solution B

<i>Metric</i>		<i>Avoirdupois</i>
1000 c.c.	Water	80 oz.
30 gm.	Sodium bisulphite	2 oz. 175 gr.
30 gm.	Sodium sulphite (anhydrous)	2 oz. 175 gr.

**Cleaning dishes.** To remove stains due to silver, silver sulphide and many dyes, pour a small quantity of solution A into the vessel and allow to remain for a few minutes; rinse well and replace with a similar volume of solution B. Agitate so as to clear the brown stain completely, then wash thoroughly.

**Cleaning the hands.** To clean stains from the nails and skin, remove rings from the fingers and immerse for 1 to 3 minutes in Solution A contained in a glass or other suitable vessel, gently rubbing the stained areas. Rinse briefly in running water, then immerse for a few minutes in Solution B; then wash thoroughly, preferably in warm water.

## KODAK FORMULA S-6

**Two-solution negative cleaner** for removing developer oxidation stains from negatives.

### Stock Solution A

<i>Metric</i>		<i>Avoirdupois</i>
5.3 gm.	Potassium permanganate . . . . .	185 gr.
1000 c.c.	Water to make . . . . .	80 oz.

### Stock Solution B

75.0 gm.	Sodium chloride . . . . .	6 oz.
16 c.c.	Sulphuric acid (concentrated)	1 oz. 135 minims
1000 c.c.	Water to make . . . . .	80 oz.

Use equal parts of A and B.

In mixing Stock Solution B, care should be taken to see that the sodium chloride solution is cool before adding the sulphuric acid slowly and with constant stirring.

The negative should first be hardened by immersion in a 5% formalin solution for 2 or 3 minutes, followed by 5 minutes' washing. The image is then bleached, an operation which should be complete in 3 to 4 minutes at 65° F. (18° C.). The brown stain of manganese dioxide is then removed by immersing the negative in 1% sodium bisulphite solution. Then rinse well and develop in strong light with any non-staining developer, e.g., D-72 diluted 1 part to 2 parts water. (Do not use a developer containing high sulphite and low alkali content, because the sulphite tends to dissolve the silver image before the developer can act on it.)

## ***Procedure for Cleaning Equipment***

### **FOR CLEANING DEVELOPER HANGERS AND CLIPS**

Dilute 5 fluid oz. (60 c.c.) of glacial acetic acid with water to make 80 oz. (1000 c.c.) of solution. Soak in this solution for one hour, and scrub in clean water.

### **FOR CLEANING VERTICAL TANKS**

Deep tanks should be scrubbed thoroughly with clean warm water, preferably by means of a double-sided brush. It is advisable to sterilize the developer tanks occasionally, especially during warm weather, in order to prevent bacterial growth.

Stone tanks can be sterilized by scrubbing the sides and bottom with a paste of bleaching powder (chloride of lime) made by mixing the dry solid with water. The tanks can also be cleansed with one of the many proprietary hypochlorite cleaners, such as 'Chloras' or 'Voltas'.

Tanks which have been sterilized by either of these methods should be thoroughly washed before use.

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