Formulas for Process E-4 Solutions

Kodak discontinued its packaged chemicals for Process E-4 several years ago. The formulas for mixing the solutions from the individual chemicals are listed below. Be sure to add the components in the order given in the formula.

**Note:** Safe handling of any chemical is the responsibility of the user. If you don’t have experience in mixing chemical formulas, obtain the aid of an experienced chemist. Handle photographic chemicals and processing solutions with care. Observe the safe-handling information and precautionary labels provided with each product and follow the instructions carefully.

Before beginning any mixing operation, read and be sure you understand the precautionary information on the product labels and in the Material Safety Data Sheet (MSDS) from the manufacturer of each chemical you use. You can obtain MSDS for Kodak products from [www.Kodak.com/go/MSDS](http://www.Kodak.com/go/MSDS)

For chemicals produced by others, contact the manufacturer.

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### PREHARDENER AND REPLENISHER

- **Water at 35 to 38°C (95 to 100°F):** 850 mL
- **Succinaldehyde-bis-bisulfite (KODAK Hardening Agent HA2):** 10.00 grams
- **Sodium sulfate, anhydrous (desiccated):** 147.00 grams
- **Aminoacetic acid (KODAK Solubilizing Agent SA-2) (Glycine):** 1.00 grams
- **Sodium bromide:** 2.00 grams
- **Sodium acetate, anhydrous:** 15.00 grams
- **Formaldehyde, 37% solution (12% methanol):** 28.35 grams
- **Acetic acid, glacial:** 5.24 grams
- **Water to make:** 1.00 litre

The pH of the prehardener and replenisher is 4.80 ± 0.10 at 27°C (80.6°F). The specific gravity is 1.136 ± 0.003 at 27°C (80.6°F).

**Note:** Fresh replenisher is colorless, but the solution turns dark purple after standing. This does not have any adverse photographic effects.
NEUTRALIZER AND REPLENISHER

Water at 21 to 27°C (70 to 80°F) 800 mL
Hydroxylamine sulfate (KODAK Neutralizing Agent NA-1) 12.60 grams
Sodium Bromide, anhydrous 11.90 grams
Acetic acid, glacial 7.00 grams
COOL TO 29°C (85°F); THEN ADD, WITH STIRRING
Sodium Hydroxide, 50% solution 9.6 grams
COOL TO 49°C (120°F); THEN ADD
Sodium sulfate, anhydrous 23.5 grams
KODAK Anti-Fog No. 6 (3-Methyl Benzothiazolium p-toluenesulfonate) 0.021 grams
Water to make 1.00 litre

The pH of neutralizer and replenisher is 5.25 ± 0.15 at 27°C (80.6°F).
The specific gravity is 1.043 ± 0.005 at 27°C (80.6°F).

FIRST DEVELOPER

Water at 32 to 38°C (90 to 100°F) 800 mL
Sodium sulfite, Anhydrous (desiccated) 39.00 grams
KODAK ELON Developing Agent 5.00 grams
Hydroquinone 5.90 grams
Quadrafos (Essex) 2.00 grams
Sodium carbonate, monohydrated 28.1 grams
Sodium bromide, anhydrous 1.50 grams
Potassium iodide (0.1% solution in water) 9.00 mL
Sodium thiocyanate, 51% solution 2.59 grams
Water to make 1.00 litre

The pH of first developer is 9.90 ± 0.10 at 27°C (80.6°F).
The specific gravity is 1.065 ± 0.003 at 27°C (80.6°F).

FIRST DEVELOPER REPLENISHER

Water at 32 to 38°C (90 to 100°F) 800 mL
Sodium sulfite 45.60 grams
KODAK ELON Developing Agent 5.30 grams
Hydroquinone 7.00 grams
Quadrafos (Essex) 2.00 grams
Sodium carbonate, monohydrated 29.30 grams
Sodium bromide 0.50 grams
Sodium hydroxide, 50% solution 3.44 grams
Sodium thiocyanate, 51% solution 2.70 grams
Water to make 1.00 litre

The pH of first developer replenisher is 10.04 ± 0.05 at 27°C (80.6°F).
The specific gravity is 1.067 ± 0.003 at 27°C (80.6°F).

STOP BATH AND REPLENISHER

Water at 21 to 27°C (70 to 80°F) 900 mL
Acetic acid, glacial 28.5 grams (30 mL)
Sodium hydroxide, granular 1.75 grams
Water to make 1.00 litre

The pH of stop bath is 3.5 ± 0.20 at 27°C (80.6°F).
The specific gravity is 1.000 ± 0.003 at 27°C (80.6°F).

COLOR DEVELOPER

Water at 21 to 27°C (70 to 80°F) 750 mL
Quadrafos (Essex) 5.0 grams
Benzyl alcohol, photograde, inhibited 3.25 grams
Sodium sulfite, anhydrous 7.60 grams
Potassium iodide 0.1% solution in water 28 mL
Sodium bromide, anhydrous 0.80 grams
Sodium hydroxide, 50% solution 4.1 grams
Ethylenediamine, 99% 3.0 grams
Tertiary butylamine borane, powder (KODAK Reversal Agent RA-1) 0.070 grams (TBAB)
Trisodium phosphate, dodecahydrated, crystals 36.0 grams
Citrazinic acid 1.35 grams
KODAK Color Developing Agent CD-3 10.5 grams
Water to make 1.00 litre

The pH of color developer is 11.25 ± 0.10 at 27°C (80.6°F).
The specific gravity is 1.035 ± 0.003 at 27°C (80.6°F).
COLOR DEVELOPER REPLENISHER

Water at 21 to 27°C (70 to 80°F) 800 mL
Quadrafos (Essex) 5.0 grams
Benzyl alcohol, photograde, inhibited 3.82 grams
Sodium sulfite, anhydrous 8.0 grams
Sodium hydroxide, 50% solution 6.8 grams
Ethylenediamine, 99% 3.06 grams
Tertiary butylamine borane, powder (KODAK Reversal Agent RA-1) 0.070 grams
Trisodium phosphate, dodecahydrated, crystals 37.60 grams
Citrazinic acid 1.60 grams
KODAK Color Developing Agent CD-3 11.5 grams
Water to make 1.00 litre

The pH of color developer replenisher is 11.68 ± 0.10 at 27°C (80.6°F).
The specific gravity is 1.037 ± 0.003 at 27°C (80.6°F).

BLEACH

Water at 32 to 38°C (90 to 100°F) 800 mL
Sodium thiocyanate, 51% solution 14.7 grams (11.0 mL)
Potassium ferricyanide, anhydrous 90.0 grams
Sodium bromide, anhydrous 22.5 grams
Disodium phosphate, anhydrous 19.5 grams
Monosodium phosphate, monohydrated 7.5 grams
Water to make 1.00 litre

The pH of bleach is 6.80 ± 0.15 at 27°C (80.6°F).
The specific gravity is 1.083 ± 0.003 at 27°C (80.6°F).

BLEACH REPLENISHER

Water at 32 to 38°C (90 to 100°F) 800 mL
Sodium thiocyanate, 51% solution 19.6 grams (14.9 mL)
Potassium ferricyanide, anhydrous 120.0 grams
Sodium bromide, anhydrous 30.0 grams
Disodium phosphate, anhydrous 26.0 grams
Monosodium phosphate, monohydrated 10.0 grams
Water to make 1.00 litre

The pH of bleach replenisher is 6.80 ± 0.10 at 27°C (80.6°F).
To make a working tank solution, dilute three parts replenisher with one part water.
The specific gravity is 1.112 ± 0.003 at 27°C (80.6°F).

FIXER AND REPLENISHER

Use KODAK Fixer, Process E-6

STABILIZER AND REPLENISHER

Water at 32 to 38°C (90 to 100°F) 800 mL
Formalin, 37.5% solution 6 mL
Renex 30 0.14 mL
Water to make 1.00 litre

The pH of stabilizer and replenisher is 7.25 ± 0.75 at 27°C (80.6°F).
The specific gravity is 1.000 ± 0.003 at 27°C (80.6°F).