



# B&W Photography: Processing Roll Film

## Introduction

Black-and-white photography is known as **continuous tone photography** because it records images on film in continuous shades of gray, black, and white. The photographer focuses the camera lens on the subject and snaps the picture. As the camera shutter opens, reflected light passes through the lens, and the image is recorded on the film. The lens opening (**aperture setting**) and **shutter speed** must be coordinated so that the proper amount of light reaches the film. If too much light reaches the film, the negative will be overexposed; if not enough light reaches the film, it will be underexposed. After all the frames on your roll of film have been exposed, the roll must be developed using black-and-white film developing chemicals. The photographic negatives will then be used to make photographic prints. The term **negative** is used because the image is recorded the reverse of your subject, in terms of light and dark areas. Negatives will be used in a later activity to make both contact prints and enlargements. With care and proper handling, your negatives can be used many times.

## Activity Description

In this activity you will expose and develop a roll of 35mm black-and-white film. The roll of film will be loaded into a developing tank in the darkroom or by using a changing bag. After loading the roll of film, you will process the film using photographic chemicals. It will be necessary to use a timer or clock with a

second hand to keep track of processing times. After completing the processing steps, the negatives will be cut into strips and stored in print files or negative sleeves.

## Materials and Supplies

To complete this activity, you will need the following materials:

- automatic camera with flash
- roll of black-and-white film,  
    such as Kodak Plus-X, ASA 125
- darkroom or changing bag
- film developing tank and reel
- scissors
- bottle cap opener
- thermometer
- timer (with second hand)
- graduate
- pre-mixed photo solutions
- developer D-76 (1:1)
- indicator stop bath
- fixer
- optional photo chemicals:
  - hypo clearing agent
  - wetting agent
- negative envelopes or preserver sheets

## Taking Your Pictures

Before you can develop your roll of film, you must record the image you are photographing on the film using a camera. Many camera types and sizes are available in local camera stores; they range in price from \$25 to over \$1000. For this activity, an automatic focus 35mm camera will produce satisfactory im-

ages and is simple to use. Most sell for under \$100 and have a built-in flash for low light situations.

Films come in a variety of film speeds; the **film speed** refers to the film's sensitivity to light, and is indicated with an ASA or ISO rating. High speed film is available that allows the photographer to shoot photographs in very low light situations, but the negatives are very grainy. For this activity, it is suggested that you use Kodak Plus-X (ASA 125), which is considered a medium speed film. Most of the films on the market are processed similarly using standard black-and-white photography chemicals, and developing charts are usually provided by the manufacturer.

When taking your pictures, remember to keep your camera steady and stay close to your subject. Lighting is important; outdoor photos in subdued sunlight will produce a sharp negative. Keep any light source behind the you as you are shooting; this will illuminate your subject as best as possible. Keep your subject interesting, experimenting with different light conditions and subject matter.



After you have completed shooting your roll of film, remember to rewind the film into the film cassette. Many cameras do this automatically; if yours does not, follow the instructions provided with the camera or ask your teacher. It is important that the film be

completely rewound before opening your camera, as any light will ruin your film by overexposing it.

## Loading Your Film

The next step is to load your film into a **film developing tank**. The film must be reeled onto a developing **spool** that allows the processing chemicals to come in contact with all the film at the same time. This process requires planning and practice, and it must be done in total darkness or in a **changing bag**. All the necessary tools must first be gathered together in the changing bag or on a countertop in the darkroom. This includes the developing tank, film reel, lid, bottle opener, and scissors, along with your exposed roll of film.

Because no stray light can reach the film, you must make sure you are working in a totally dark room or using a changing bag that has no holes or tears. The **film cassette** can now be opened using a bottle opener. Pry the flat side of the cassette off, allowing the removal of the film from the film cassette. Gently slide the roll of film out of the film cassette and hold the film in one hand while cutting off the film **lead**, making a straight edge to fit onto the developing reel. Pick up the film developing reel and start to reel the film in carefully. Scratching or putting fingerprints on the negative will cause problems that will affect the final outcome of your photos. Handle the film by the edges and lead it slowly on the developing reel. At the end of the roll, you must cut the film from the spool using the scissors. Finish reeling the remainder of the film and place the developing reel into the developing tank. Place the lid on the developing tank, making sure that the tank is sealed shut before unzipping the bag or turning on the lights. At this point, throw away all parts from the film cassette and put all tools away in their correct areas. You are now ready for the developing process.

**Note:** Reuseable film cassettes are available for bulk loading; check with your teacher before throwing out any parts.

**Reminder:** When using a changing bag, keep your hands in the bag until the film is safely reeled into the developing tank and the lid is fastened securely to prevent any light from reaching the film.

## Processing Black-and-White Film

Now that your film is in a light-tight tank, you can process your film with the room lights on. You will first need to find a work area that is near a sink. Next secure the necessary supplies. You will need your film developing tank (loaded with your film), timer (with second hand), thermometer, developing chart, developer, stop bath, fixer, and running water. Hypo clearing agent and wetting agent will help reduce the total processing time and should be used if available.

The standard temperature for black-and-white film processing is 68 degrees Fahrenheit (F) or 20 degrees Celsius (C). You can maintain this temperature using a temperature-controlled developing sink. However, if this is not available and the temperature of your developer varies, you may adjust your developing time using the developing chart provided. While all the photographic chemi-

**Developing times in a small tank (in minutes)**

	Temperature in degrees Fahrenheit				
	65	68	70	72	75
Plus-X (ASA 125)					
D-76 (stock sol.)	6 1/2	5 1/2	5	4 1/2	3 3/4
D-76 (diluted 1:1)	8	7	6 1/2	6	5
Microdol-X (stock sol.)	8	7	6 1/2	6	5
Tri-X (ASA 400)					
D-76 (stock sol.)	5	5	7 1/2	6 1/2	5 1/2
D-76 (diluted 1:1)	11	10	9 1/2	9	8
Microdol-X (stock sol.)	11	10	9 1/2	9	8

Agitate every 30 seconds throughout development

Figure 1 - Developing Chart

icals must be at a temperature between 65 and 75 degrees F (18.5 to 24 degrees C) to insure proper final results, only the developer temperature is critical. As long as the other solutions are within the 65 to 75 degrees F range, the times will not change. If you are using film or chemicals not listed in this activity, adjust your times according to the directions provided by the manufacturer. Only three chemicals are necessary for processing black-and-white films. The first chemical is the **developer**, which is used to bring out the images. Second is the **stop bath**, which is used to stop the action of the developer. The third chemical is the **fixer**, which hardens the **emulsion** and removes the unused silver bromide particles from the film. Two other chemicals which are very useful are **hypo clearing agent** to remove the fixer and shorten wash time, and a **wetting agent** to prevent water spots.

Processing Plus-X film with D-76(1:1) at 68 degrees F (20 degrees C)		
	Minutes:	
1. Developer	7	Agitate 5 seconds initially; then for 5 seconds every half minute. Discard diluted developer.
2. Indicator Stop Bath	1/2	Agitate gently for 1/2 minute. The solution should be lemon-yellow. Discard if it is darker.
3. Fixer Rapid Fixer	5-10 2-4	Agitate 5 seconds initially; then for 5 seconds every half minute. Solution should be clear; discard if it is discolored.
4. Wash Or Rinse Hypo clearing agent Wash	30	Remove lid from the developing tank and place tank with film under running water.
5. Drying Or Wetting agent (Photo-flo 200) Drying	1/2 1-2 5	Remove lid and place tank with film under running water. Agitate moderately entire time. Wash under running water.
	As needed	Hang film with a film clip or spring-type clothespin at each end and wipe gently with a viscous sponge to remove excess water.
	1/2 As needed	Bathe in solution and drain. Hang film - do not wipe. Let dry in a dust-free place.

Figure 2 - Sample Processing Chart

The steps in Figure 2 are for processing Kodak Plus X (ASA 125) in a small developing tank at 68 degrees F (20 degrees C), using Kodak D-76 developer (diluted 1:1 just before using); indicator stop bath; and fixer. Hypo clearing agent and Photo-flo 200 wetting agent are used in this activity, as they help reduce the time needed to process your film.

## Contamination of Solutions

Photographic quality and the life of the processing solutions depend upon the cleanliness of the equipment in which solutions are mixed, stored, and used. Always clean processing reels and tanks thoroughly after each use. Avoid the contamination of any chemical solution by any other. The best procedure is to use the same tanks for the same solutions each time, and to make sure that each tank or other container is thoroughly washed before it is refilled.

## Safety

If using a darkroom to load film, be sure the floor and work area are free of all tools and debris before turning off the lights. Be careful when using scissors in the darkroom or the changing bag.

Store chemicals in plastic jugs which will not break if dropped. Always wear eye protection, gloves, and a rubber apron when handling photographic chemicals. When mixing stop bath, always pour the stop bath concentrate (acid) into the water. Although the photographic chemicals are not very dangerous when used properly, be aware that incorrect or random mixtures of chemicals can be extremely dangerous. When in doubt, always check with your instructor.

## Ecology

Disposal of chemicals, solutions, and other materials can be hazardous to the environment. Check with your instructor as to the proper disposal of photographic chemicals.

## Vocabulary

continuous tone photography	
shutter	ASA rating
aperture	developing spool
overexposed	film cassette
underexposed	film lead
film speed	developer
negative	stop bath
image	fixer
darkroom	emulsion
changing bag	hypo clearing agent
thermometer	wetting agent
developing tank	contamination
agitate	

## On Your Own

1. There are many careers related to photography. Contact a counselor or occupational specialist at your school, or visit the local library, and obtain information about career opportunities in this field. See how many specialized areas you can identify.
2. Contact the high school, community college, university, vocational schools, and adult education centers to see what courses are offered in photography. Obtain brochures from these sources if available.



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## **TEACHER GUIDE**

### **BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM**

**Objectives:** Upon completion of this assignment, students will be able to:

- Capture images on 35mm roll film.
- Load film into a developing tank.
- Prepare and measure developing chemicals.
- Properly develop film.
- Cut and store negatives in protective sleeves.

#### **Helpful Hints:**

1. Plan ahead of time for this assignment. You will need to do the following:
  - Have plenty of supplies available, including film, cameras, developing chemicals, and darkroom supplies.
  - Collect examples to use as visual aids.
  - Let students practice loading film onto developing reels using old, exposed film.
2. Have students keep a photography notebook. Let them decorate the front of the notebook with cutouts of cameras and their choice of pictures. Encourage them to be creative, selecting pictures that reflect their own personalities or interests.
3. Acquire old copies of photography magazines from the school library. These can be used to stimulate interest.

**LANGUAGE ARTS APPLICATION**  
**BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM**

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Student Name

In all types of jobs you will find that you need the ability to communicate your ideas effectively. Writing skills are necessary in all occupations. Here are a few examples of how writing skills are related to this activity.

In this activity package, you will be exposed to some new vocabulary related to photography. An important skill you will use throughout your life is using a dictionary to find out what a specific word or technical term means or is related to. In the space below, use a dictionary, a photography book, or your graphics textbook to discover the meaning of each of the terms. Remember that words may have several different meanings; you are to select that meaning that relates to photography.

1. Aperture: \_\_\_\_\_

\_\_\_\_\_

2. Contrast: \_\_\_\_\_

\_\_\_\_\_

3. Darkroom: \_\_\_\_\_

\_\_\_\_\_

4. F-stop: \_\_\_\_\_

\_\_\_\_\_

5. Film speed: \_\_\_\_\_

\_\_\_\_\_

6. Focal point: \_\_\_\_\_

\_\_\_\_\_

7. Lens: \_\_\_\_\_

\_\_\_\_\_

8. Negative: \_\_\_\_\_

\_\_\_\_\_

**LANGUAGE ARTS APPLICATION**  
**BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM (Cont'd.)**

9. Print: \_\_\_\_\_

\_\_\_\_\_

10. Safelight: \_\_\_\_\_

\_\_\_\_\_

11. Shutter: \_\_\_\_\_

\_\_\_\_\_

12. Shutter speed: \_\_\_\_\_

\_\_\_\_\_

13. Single-lens reflex camera: \_\_\_\_\_

\_\_\_\_\_

14. Telephoto lens: \_\_\_\_\_

\_\_\_\_\_

15. Viewfinder: \_\_\_\_\_

\_\_\_\_\_

**MATH APPLICATION**  
**BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM**

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Student Name

In all types of jobs and occupations, you need the ability to apply mathematics effectively. Here are a few examples of how math skills are used in relation to this activity.

Cameras are used by many people for many different purposes. Some people may even choose a career in which they will use the camera. These people are known as professional photographers.

There are many career choices in the field of photography. These include portrait photography, commercial photography, industrial photography, photojournalism, law enforcement photography, and many more. No matter which area they have chosen, photographers find that they are required to use math skills frequently.

Example:

A photographer takes 375 pictures of a sailing event. If there are 36 pictures on each roll of film, how many rolls of film does the photographer need?

Divide 375 by 36             $375 \div 36 = 10 \text{ R } 15$

Since the photographer needs more than 10 rolls to photograph the event, 11 rolls will be needed.

**Solve the following problems:**

1. The photographer keeps photographic negatives in small files. If 40 sets of negatives fit into each file, how many files are needed for 150 sets of negatives?

Answer: \_\_\_\_\_

2. A special processing machine can develop 60 rolls of film in one hour. How long does it take the machine to develop 675 rolls of film?

Answer: \_\_\_\_\_



**MATH APPLICATION**  
**BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM (Cont'd.)**

3. On some rolls of film, there are only 20 exposures. How many rolls of 20 does the photographer need for 118 pictures?

Answer: \_\_\_\_\_

4. The photographer needs 26 rolls of film for a photography session. If the film is packed 12 rolls to a box, how many boxes are needed?

Answer: \_\_\_\_\_

5. There are 14 people at the photography session. Twenty-one sandwiches are delivered for lunch. If the sandwiches are divided equally, how much does each person eat?

Answer: \_\_\_\_\_

6. The photographer takes class portraits. She takes a set of three pictures for each student. If there are 20 pictures on a roll of film, how many complete sets of pictures are on the roll?

Answer: \_\_\_\_\_

7. There are 32 children in the class. Each child receives a small frame for the class picture. If the frames are packed 10 to a box, how many boxes must be opened?

Answer: \_\_\_\_\_

8. A developing tray can hold 30 negatives. If 96 negatives need to be developed at the same time, how many developing trays are used?

Answer: \_\_\_\_\_

**QUIZ**  
**BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM**

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Student Name

- \_\_\_\_\_ 1. The camera mechanism that controls the amount of time the light strikes the film is the:  
A. shutter C. aperture  
B. lens D. focus
- \_\_\_\_\_ 2. The adjustable opening in the camera lens that determines the amount of light that strikes the film is the:  
A. shutter C. aperture  
B. negative D. focus
- \_\_\_\_\_ 3. Film speed:  
A. refers to the film's sensitivity to light.  
B. is determined by the type of camera being used.  
C. is indicated with an ASA or ISO rating.  
D. both A & C.
- \_\_\_\_\_ 4. The light-sensitive coating on photographic film or paper is the:  
A. negative C. acetate  
B. emulsion D. aperture
- \_\_\_\_\_ 5. The film chemical that brings out the image is the:  
A. developer C. fixer  
B. stop bath D. Photo-flo
- \_\_\_\_\_ 6. The chemical that stops the development process and removes the excess developer from the film is the:  
A. developer C. fixer  
B. stop bath D. Photo-flo
- \_\_\_\_\_ 7. The chemical that removes unexposed silver halide particles and hardens the emulsion is the:  
A. developer C. fixer  
B. stop bath D. Photo-flo
- \_\_\_\_\_ 8. The cover of the developing tank may be removed without exposing the film after the following step:  
A. developing C. fixing  
B. stop bath D. washing

## QUIZ

### BLACK & WHITE PHOTOGRAPHY: PROCESSING ROLL FILM (Cont'd.)

True or False:

- \_\_\_\_\_ 9. At the aperture setting of  $f/22$ , the lens opening is smaller than at  $f/5.6$ .
- \_\_\_\_\_ 10. The shutter speed  $1/250$  is faster than  $1/125$ .
- \_\_\_\_\_ 11. Film must be loaded into the developing tank in total darkness or in a changing bag.
- \_\_\_\_\_ 12. Hypo clearing agent and a wetting agent will reduce the total processing time.
- \_\_\_\_\_ 13. The standard temperature for processing black-and-white film is 82 degrees Fahrenheit.
- \_\_\_\_\_ 14. All photographic chemicals used in film processing should be carefully washed down the drain.
- \_\_\_\_\_ 15. When handling photographic chemicals, always wear eye protection, gloves, and a rubber apron.