GOVT. RESIDENCIAL WOMEN POLYTECHNIC COLLEGE, JODHPUR

DEPARTMENT OF COMMERCIAL ART

MODEL TEST PAPER WITH ANSWER KEY

Subject: Photography **Ankan Garg**
Subject Code: CA-204 **Lecturer, C.A.**

(Q-1) Write down the Structure of Photographic Film?
(Q-2) Explain Panchromatic and Orthochromatic Film?
(Q-3) Write down Equipments used in photographic dark room?
(Q-4) Explain Film Developing and Paper Printing?

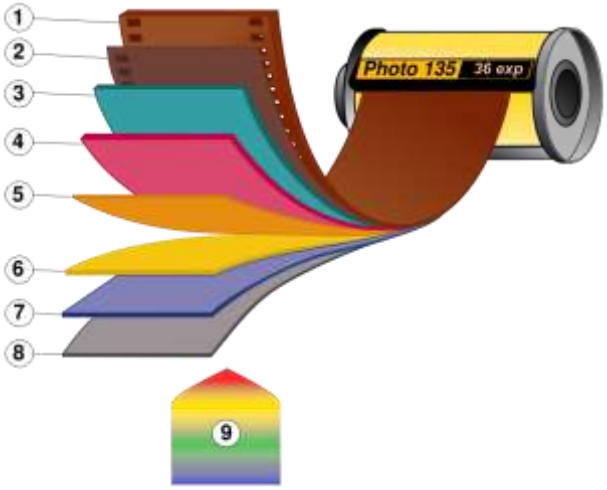
Answers: -

(Q-1) Write down the Structure of Photographic Film?
(A-1) Photographic film is a strip or sheet of transparent plastic film base coated on one side with a gelatine emulsion containing microscopically small light-sensitive silver halide crystals. The sizes and other characteristics of the crystals determine the sensitivity, contrast and resolution of the film.

The emulsion will gradually darken if left exposed to light, but the process is too slow and incomplete to be of any practical use. Instead, a very short exposure to the image formed by a camera lens is used to produce only a very slight chemical change, proportional to the amount of light absorbed by each crystal. This creates an invisible latent image in the emulsion, which can be chemically developed into a visible photograph.

In black-and-white photographic film there is usually one layer of silver salts. When the exposed grains are developed, the silver salts are converted to metallic silver, which blocks light and appears as the black part of the film negative. **Colour film** has at least three sensitive layers, incorporating different combinations of sensitizing dyes. Typically the blue-sensitive layer is on top, followed by a yellow filter layer to stop any remaining blue light from affecting the layers below. Next come a green-and-blue sensitive layer, and a red-and-blue sensitive layer, which record the green and red images respectively. During development, the exposed silver salts are converted to metallic silver, just as with black-and-white film. But in a colour film, the by-products of the development reaction simultaneously combine with chemicals known as colour couplers that are included either in the film itself or in the

developer solution to form coloured dyes. Because the by-products are created in direct proportion to the amount of exposure and development, the dye clouds formed are also in proportion to the exposure and development. Following development, the silver is converted back to silver salts in the bleach step. It is removed from the film during the process of fixing the image on the film with a solution of ammonium thiosulfate or sodium thiosulfate (hypo or fixer). Fixing leaves behind only the formed colour dyes, which combine to make up the coloured visible image. Later colour films, like Kodacolour II, have as many as 12 emulsion layers, with upwards of 20 different chemicals in each layer.



Layers of 35mm colour film:
1. Film base
2. Subbing layer
3. Red light sensitive layer
4. Green light sensitive layer
5. Yellow filter
6. Blue light sensitive layer
7. UV Filter
8. Protective layer
9. (Visible light exposing film).

(Q-2) Explain Panchromatic and Orthochromatic Film?

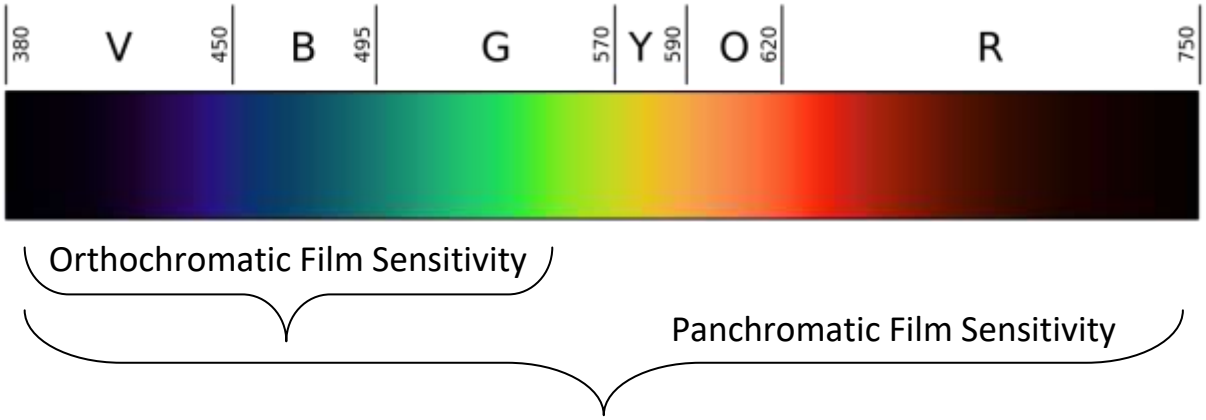
(A-2) Panchromatic Film produces a realistic reproduction of a scene as it appears to the human eye. Almost all modern photographic film is panchromatic, but some types are orthochromatic and are not sensitive to certain wavelengths of light. As naturally prepared, silver halide emulsions are much more sensitive to blue and UV light than to green and red wavelengths. The German chemist Hermann W. Vogel found out how to extend the sensitivity into the green, and later the orange, by adding sensitising dyes to the emulsion. By the addition of erythrosine the emulsion could be made orthochromatic while some cyanine derivatives confer sensitivity to the whole visible spectrum making it panchromatic. However, his technique was not extended to achieve a fully panchromatic film until the early 1900s, shortly after his death. Panchromatic stock for still photographic plates became available commercially in 1906. The switch from orthochromatic film, however, was only gradual. Panchromatic plates cost two to three times as much, and had to be developed in darkness, unlike orthochromatic—which, being insensitive to red, could be developed under a red light in the darkroom. And the

process that increased the film's sensitivity to yellow and red also made it oversensitive to blue and violet, requiring a yellow-red lens filter to correct it, which in turn reduced the total amount of light and increased the necessary exposure time.

Orthochromatic Film refers to a photographic emulsion that is sensitive to only blue and green light, and thus can be processed with a red safelight. The increased blue sensitivity causes blue objects to appear lighter, and red ones darker. A cyan lens filter (which removes red light) can be used with standard panchromatic film to produce a similar effect.

Orthochromatic films were first produced by Hermann Wilhelm Vogel in 1873 by adding small amounts of certain aniline-based dyes to photographic emulsions, which until that time had been sensitive to blue light only. This work was extended by others including Josef Maria Eder

Orthochromatic film proved troublesome for motion pictures, rendering pink skies as perpetually overcast, blond hair as washed-out, blue eyes nearly white, and red lips nearly black. To some degree this could be corrected by makeup, lens filters, and lighting, but never completely satisfactorily. But even those solutions were unusable for additive colour motion picture systems like Kinema colour and Prizma colour, which photographed on black-and-white stock behind alternating colour filters. In those cases, negative film stock after it arrived from the manufacturer had to be passed through a colour-sensitizing solution, a time-consuming process that increased the film's cost from 3 cents per foot to 7 cents. Eastman Kodak, the supplier of motion picture film, introduced a panchromatic film stock in September 1913, available on special order for photographing colour motion pictures in additive systems. Cameramen began using it for black-and-white films too in 1918, primarily for outdoor scenes. The company introduced Kodak Panchromatic Cine Film as a regular stock in 1922. The first black-and-white feature film photographed entirely on panchromatic stock was *The Headless Horseman* (1922). But panchromatic stock was more expensive, and not until the prices were equalized by competition in 1926 did it become used more widely than orthochromatic stock. Kodak discontinued manufacturing general-purpose orthochromatic motion picture film in 1930.



(Q-3) Write down Equipments used in photographic dark room?

(A-3) A darkroom is a workshop used by photographers working with photographic film to make prints and carry out other associated tasks. It is a room that can be made completely dark to allow the processing of the light sensitive photographic materials, including film and photographic paper. Various equipments is used in the darkroom, including an enlarger, baths containing chemicals, and running water.

1. Enlarger: An enlarger is a specialized transparency projector used to produce photographic prints from film or glass negatives, or from transparencies.

2. Enlarger Timer: In order to get prints which are correctly exposed, we need to control the amount of light that reaches our paper. The timer, along with the aperture on our enlarger lens, controls the exposure so that our prints are neither too light nor too dark. Timers can either be stand-alone, requiring us to turn off the enlarger manually, or they can connect to the enlarger for automatic shut-off.

3. Easel: The easel is used to hold the photographic printing paper while we are exposing it. The paper holders on the easel are used to correctly position the unexposed paper and hold it flat during the exposure. There are quick easels in a single set format like 8x10 or 5x7, and there are bladed easels that allow us to choose our own format.

4. Safelight: Safelight filters come in a few different varieties. The most commonly used are OC (amber) and Red (A1). Always check the manufacturer's instruction sheet to determine the appropriate type of safelight for a particular paper.

Red (1A) safelight filters are typically used for orthochromatic materials like litho film, certain liquid emulsions and some B&W photo papers. Never mix OC and red safelights in the darkroom -- even if a paper can be used with either safelight, the combination will usually cause fogging.

The safelight should be positioned to provide the best illumination of the work area, but should be kept at least four feet from the photographic paper.

5. Printing Tongs: These are used for moving the photographic paper through the processing solutions. We should have a set of four: one for developer, one for stop bath, one for fixer, and one for the final rinse. Label each one to avoid contaminating the chemicals.

6. Processing Trays: The trays hold the processing solutions. The first tray is for the developer, the second for the stop bath, the third is for the fixer and the fourth is for the wash. Label the trays and always use the same tray for each solution. It is a good idea to get trays at least one size larger than the paper we are using.

7. Thermometer: It is used to measure the temperature when mixing and using chemicals. Photographic thermometers are stainless steel or glass, and will not be damaged by the photographic chemicals.

8. Graduates: These are used to mix and measure the processing solutions. It is best to have a variety of sizes with at least one with markings at 1oz. or 10ml intervals. Some people have one graduate for each chemical type.

9. Bottles: These hold the mixed processing solutions. Bottles can be glass or plastic, and should be opaque brown or black. Make sure the lids are airtight. Label the bottles and always use the same bottle for each solution.

10. Funnel: This is how we get solutions back into the bottles. We should not try it without one.

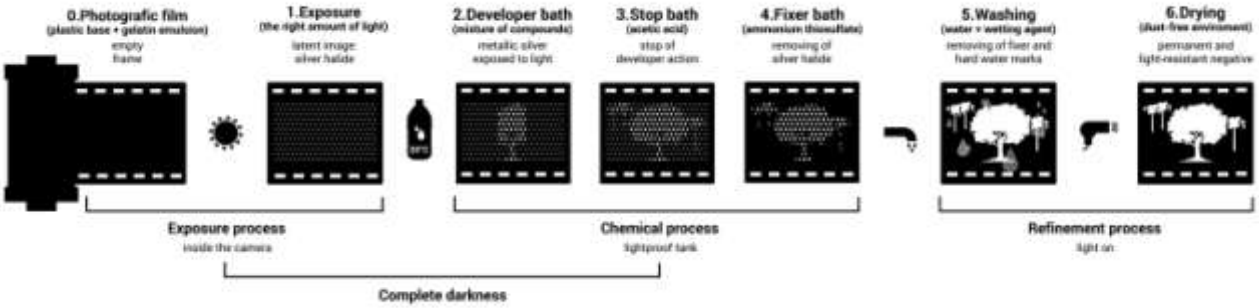
11. Print Squeegee: Remove excess water from our prints after they are washed so that they'll dry faster and more evenly.

12. Processing Chemicals: The three basic chemicals are (1) Developer (2) Stop Bath and (3) Fixer. We mix these with the appropriate amount of water and store them in our bottles.

13. Photographic Paper: Photographic paper is sensitive to light and should be handled only in a darkroom with the correct safelight. Black and white paper is exposed under an enlarger and processed in chemicals to create a final image.

(Q-4) Explain Film Developing and Paper Printing?

(A-4)



FILM DEVELOPING STEPS

1. The film may be soaked in water to swell the gelatine layer, facilitating the action of the subsequent chemical treatments.

2. The developer converts the latent image to macroscopic particles of metallic silver.
3. A stop bath, typically a dilute solution of acetic acid or citric acid, halts the action of the developer. A rinse with clean water may be substituted.
4. The fixer makes the image permanent and light-resistant by dissolving remaining silver halide. A common fixer is *hypo*, specifically ammonium thiosulfate.
5. Washing in clean water removes any remaining fixer. Residual fixer can corrode the silver image, leading to discolouration, staining and fading.

The washing time can be reduced and the fixer more completely removed if a hypo clearing agent is used after the fixer.

6. Film may be rinsed in a dilute solution of a non-ionic wetting agent to assist uniform drying, which eliminates drying marks caused by hard water. (In very hard water areas, a pre-rinse in distilled water may be required - otherwise the final rinse wetting agent can cause residual ionic calcium on the film to drop out of solution, causing spotting on the negative.)
7. Film is then dried in a dust-free environment, cut and placed into protective sleeves.

Once the film is processed, it is then referred to as a *negative*.

The negative may now be printed; the negative is placed in an enlarger and projected onto a sheet of photographic paper. Many different techniques can be used during the enlargement process. Two examples of enlargement techniques are dodging and burning.

In modern automatic processing machines, the stop bath is replaced by mechanical squeegee or pinching rollers. These treatments remove much of the carried-over alkaline developer, and the acid, when used, neutralizes the alkalinity to reduce the contamination of the fixing bath with the developer.

PHOTOGRAPHIC PAPER PRINTING STEPS

List of accessories we need to print

1. Photographic enlarger
2. Photographic Paper
3. Multigrade contrast filters
4. Chemical solutions for development, stopping and fixing. To stop may actually be enough water.
5. 3 bowls to soak the paper in various stages of development
6. Clamps for handling the paper. We should not dip our fingers in acid!

7. Thermometer to measure the temperature of the acid
8. Scoops graduated to mix chemicals
9. Red lamp for darkroom
10. A large bowl with water for wash the papers at the end of the process
11. A dark room.

1. Place the negative in the enlarger head: Remember that the image will be projected upside down, so the negative is put reversed.

2. Focus the projected image: Place a sheet of paper of the same size of the final printing sheet on the surface of the enlarger. Turn on the enlarger and adjust the height so that the projected image covering the whole area of the sheet.
Using the knob near the head of the enlarger, try to focus the image.
We may use the Focus Scope to focus on the film grain. We only need to put the instrument on the projection plane at the center and examine the image.

3. **Set the aperture and insert the multigrade filter**: Close the aperture to f / 8 to increase the detail. Insert in the filter holder of the enlarger head a Multigrade filters n2. This filter produces a good range of print tones with an average negative.

4. **Exposing a test print:** Turn off the light, turn on the red safety lamp.
We have to sacrifice a sheet of photo paper for testing exposure. Extract one sheet (always in the dark or red light) and cut a strip of sufficient size to cover an area of the image that has the relevant details to find the correct exposure.
4.1 Place the paper strip with the sensitive part upwards on the projection plane.
4.2 Turn on the projector light for 2 seconds using the timer connected exposing the entire strip.
4.3 Cover with a matte card one-fifth of the paper and expose the rest for another 2 seconds.
4.4 Cover 2/5 and expose for 4 seconds.
4.5 Cover 3/5 expose for 8 seconds.
4.6 Cover 4/5 expose for 12 seconds.

5. **Developing the test print:** Always with the red light on:
5.1 Dip the test strip into the development bath. Start the timer for 60 seconds. Shake the basin gently to ensure that the solution covers the entire image.
5.2 After 60 seconds, remove rapidly the strip from the development and dip it into the stopping bath for about 30 seconds while stirring.
5.3 Last step, dip the strip into the fix bath for another 30 seconds.

5.4 At the end we put the paper in another tray with a good flow of water to wash for 1 to 2 minutes.

6. **Now we examine the test** we just did. We turn on the lights now.
The paper will present 5 strips with different exposures.
The lightest was exposed for 2 seconds, the second by 4.
The third for 8 seconds (2 +2 +4), the fourth for 16s (2 +2 +4 +8), the last for 28s (2 +2 +4 +8 +12).

Make a note of the time and the aperture used.
One of these strips should give you a correct exposure.
If they are all too light, open the aperture by two stops or increase time.
If they are all too dark, close the aperture by one stop and repeat the test.

7. Making the final print: When we find the correct exposure time, we put a new sheet of photographic paper under the enlarger and expose.

Refrences:

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