



SNS COLLEGE OF ALLIED HEALTH SCIENCES- COIMBATORE 35



DEPARTMENT : RADIOGRAPHY AND IMAGNG TECHNOLOGY

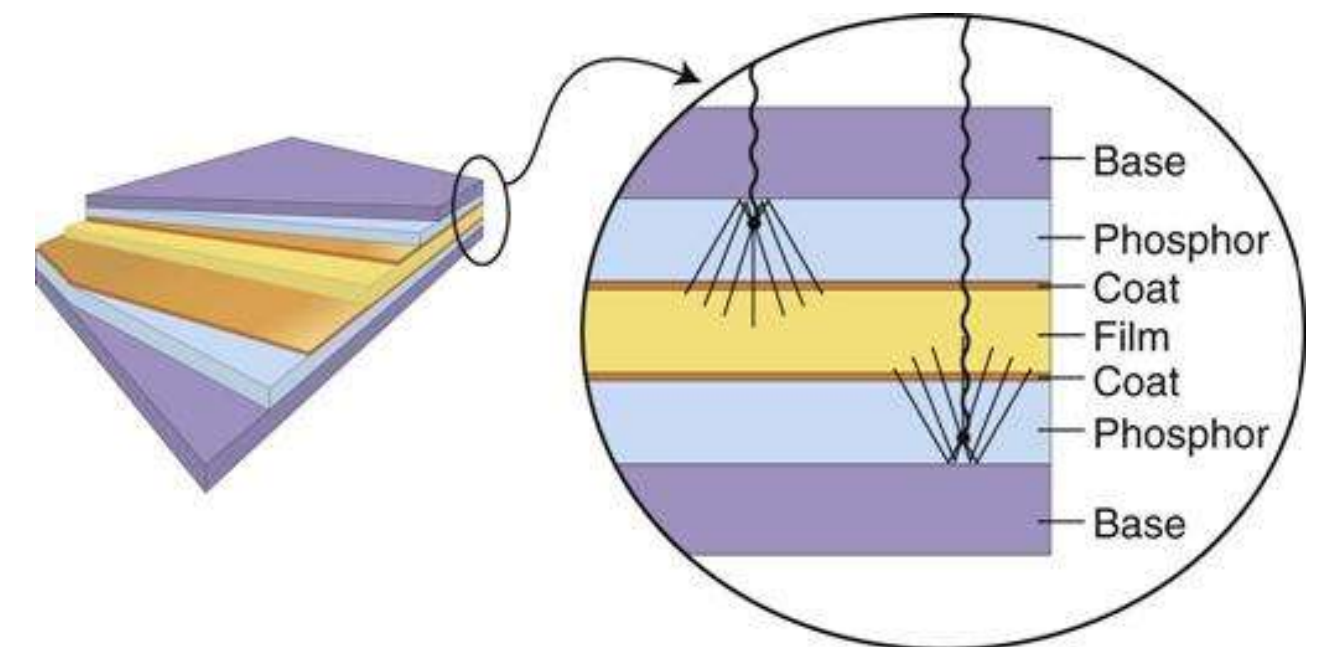
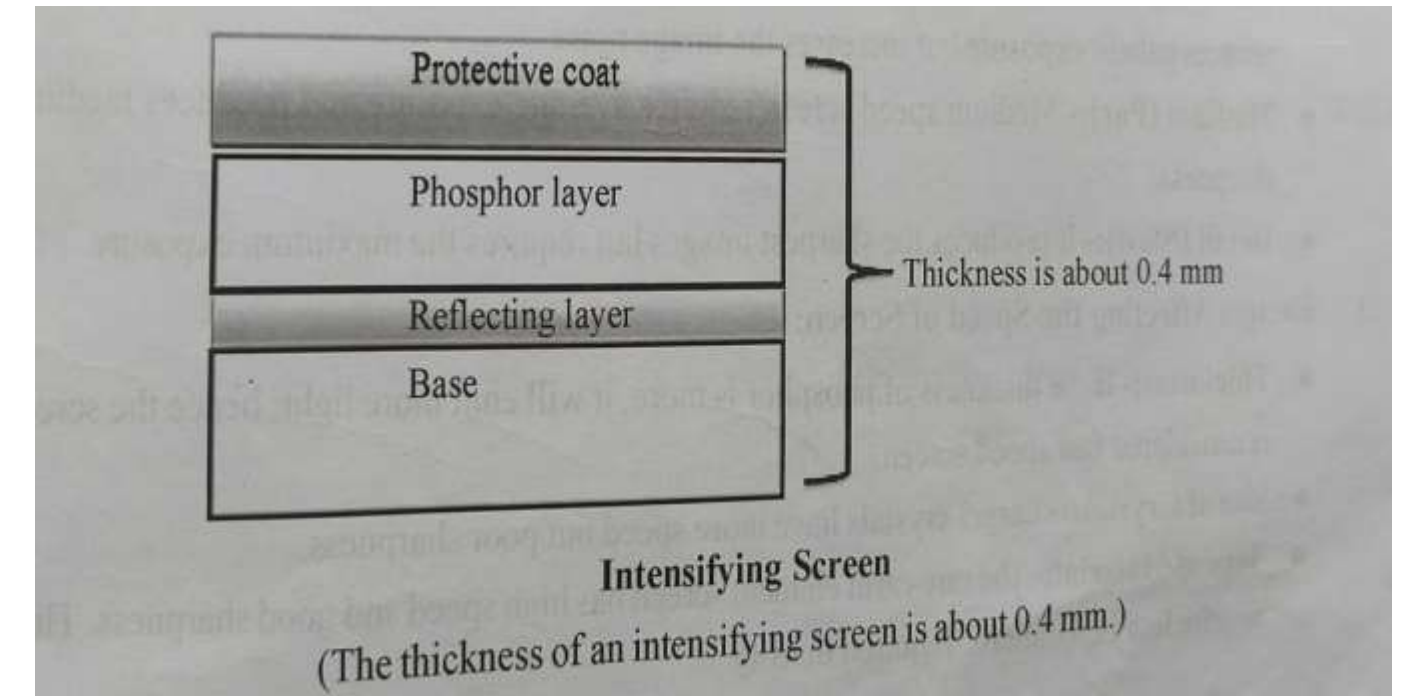
**SUBJECT : GENERAL PHYSICS, RADIATION PHYSICS AND PHYSICS OF
DIAGNOSTIC RADIOLOGY**

PAPER : PAPER II (UNIT 5 – PHYSICS OF DIAGNOSTIC RADIOLOGY : X-ray TUBE)

TOPIC : 9. INTENSIFYING SCREENS

INTENSIFYING SCREENS

- Intensifying screens are thin sheets of fluorescent materials which are used in the X-ray cassette to intensify the effect of the X-ray photon.
- The Intensifying screen converts the X-ray photon energy into visible light.
- It reduces the radiation exposure mAs; thus, the patient dose is reduced significantly and film contrast is improved.
- Most commonly in conventional radiography, the double emulsion film is used.
- The cassettes have a pair of screens that sandwich the film so that the emulsion on each side is exposed to the light.



COMPONENTS OF AN INTENSIFYING SCREEN

THE BASE

- It is made of polyester or cellulose acetate. The base must be strong, chemically inert, flexible, moisture resistant, and free of impurities. It must not be discolored with age.

REFLECTING LAYER

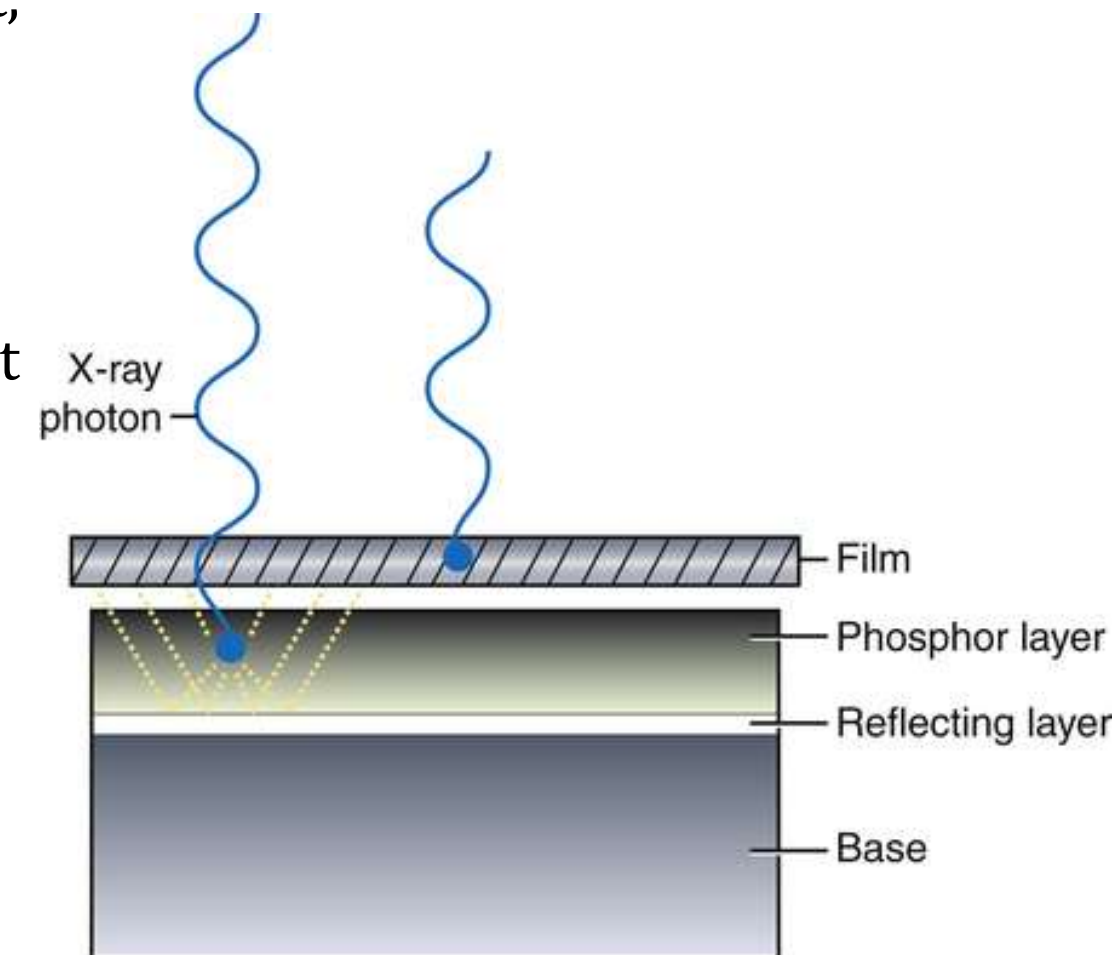
- The reflecting layer is made of titanium dioxide. The reflective layer redirects the light to the film; without this layer, only half of the light would interact with the film.

PHOSPHOR LAYER

- A uniform fluorescent material is coated over the reflecting layer.

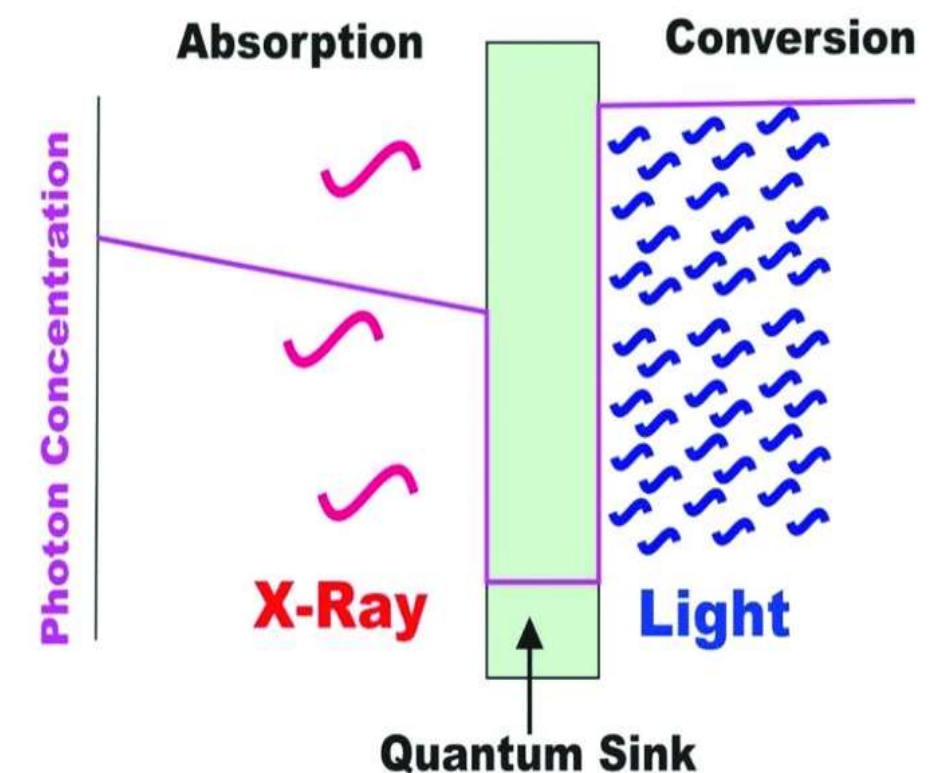
PROTECTIVE COAT/LAYER

- The protective coating is placed on the outer surface of the screen and protects the phosphors. It is waterproof, transparent to light, and resistant to static electricity. It protects the phosphor from scratches during the cleaning and processing.



CHARACTERISTICS OF INTENSIFYING SCREENS

- The phosphor of the screen must have a high level of X-ray absorption.
- The phosphor of the screen must have a high conversion efficiency of absorbed X-rays to light.
- The color of the light emitted by the intensifying screen must be matched with the light sensitivity of the film.
- The afterglow of phosphor should be minimal.
- The Phosphor layer should not be affected by heat humidity or other environmental conditions.
- The Intensifying Screen must be flexible and tough.





INTENSIFYING FACTOR



INTENSIFYING FACTOR

- It is the ratio of mAs which is necessary for producing the required density on film.
- Intensifying factor = $\frac{\text{Exposure required when the screen is not used}}{\text{Exposure is required when the screen is used}}$



FACTOR AFFECTS THE INTENSIFYING FACTOR



FACTOR AFFECTS THE INTENSIFYING FACTOR

- The amount of radiation absorbed by the screen,
- The light conversion efficiency of the screen.
- The quantity of light photon which reaches on film.

THE SPEED OF THE SCREEN

- It is a relative number that describes the efficiency of the screen, which converts the X-ray photon into useable light.
- The speed of the screen ranges from 100 (slow) to 1200 (fast). Calcium tungstate screen speed is 100, and rare earth material speed is 1200.



FACTOR AFFECTS THE INTENSIFYING FACTOR



TYPES OF SPEED

- **Fast (Rapid)**
 1. Requires the least exposure, but the images are less sharp.
 2. Faster speed reduces patient exposure but increases the image noise.
- **Medium (Par)** : Medium speed screen requires average exposure and produces medium sharpness.
- **Detail (Slow)** : It produces the sharpest images but requires the maximum exposure.

FACTORS AFFECTING THE SPEED OF SCREEN

- **Thickness** : If the thickness of phosphor is more, it will emit more light; hence the screen is considered fast speed screen.
- **Size of Crystals** : Larger crystals have more speed but poor sharpness.
- **Type of Material**:- The rare earth element screen has high speed and good sharpness. They require less exposure for required density.



CLEANING AND MAINTENANCE



CLEANING AND MAINTENANCE

- Screens must be kept clean.
- Dirt particles and stains should be cleaned regularly.
- The Screens are cleaned with an antistatic solution with a soft cloth.
- The screen should be dried before closing the cassette.



INTERROGATIONS



1. What are the components of X-ray cassettes ?
2. Structure of X-ray cassettes
3. What is the size of X-ray cassette in Chest X-ray ?



REFERENCES

1. Physics for Radiography - Hay and Hughs
2. Ball and mores essential physics radiographers, IV edition, Blackwell publishing.
3. Basic Medical Radiation physics – Stanton.
4. Christensen's Physics of Diagnostic Radiology – Christensen.
5. The physics of Radiology and Imaging – K Thayalan.



THANK YOU