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1. Learning Outcomes

After studying this module, you will be able to

- Know what are erasures
- Learn the types of erasures
- Identify the erasure on document

2. Introduction to Erasure

Erasure is a method of alteration of any document. It may be a correction method made by erasing such as rubbing, scraping, or wiping out. Sometimes the term erasure refers to an effective revocation of a will or a portion of a will.

Erasure is classified as:

- Chemical erasure
- Physical erasure or Mechanical erasure

3. Chemical erasure

Chemical erasure is just a process of bleaching the colour of ink by converting coloured compound into colourless compounds. And the ink itself remains in the paper in invisible form.

The commonly used chemicals for erasure purpose:

- Sodium hypochlorite
- Potassium permanganate
- Oxalic acid
- Stannous chloride solution
- Sodium tungstate

Chemical erasure can also be done with suitable solvents. Ball-point pen inks can be partially or completely removed from paper by the application of polar solvents such as tetrahydrofurane or acetone etc.



This chemical erasure is result of re-washing the cheque once in alcohol and then in nail polish remover and the pilot rolling ball extra fine pen is used in the above cheque.

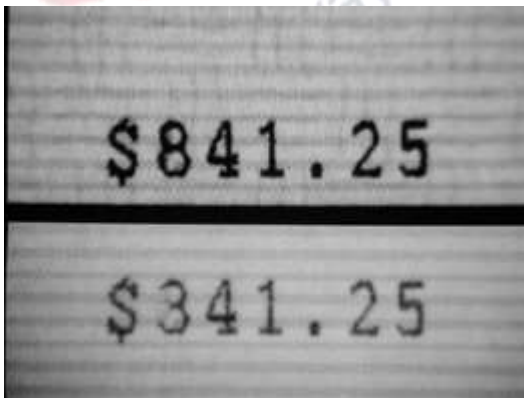


Fig: A chemical erasure

4. Physical erasure or Abrasion erasure

Physical erasure in a part of writing can be done by the abrasion of surface of paper with the help of rubber, sharp instrument such as razor blade, scalper, knife or Emory paper etc.

The characteristic feature of physical erasure is removal of surface fibres of paper make the erased are comparatively thinner and translucent. But if some weak pencil writing is erased with a soft rubber erasure there is no mark of abrasion the surface fibres may not be damaged to the appreciable degree and those rubber particles get embedded in the fibres of paper. If sizing is damaged, the paper surface become porous and any subsequent writing over the erased area with fluid ink pen usually shows feathered ink lines.

The application of sharp instrument causes disturbance on the surface finish of paper which can be detected by examining the document by oblique light i.e by a beam of light falling at low angle. The soft rubber erasure particles can be detected under microscope or by subjecting the erased area to iodine vapors.

5. Detection of erasure

Detection of chemical erasure:

Examination of invisible ink can be done by using UV rays. It plays an important role in detecting and decipherment of chemically erased writing. The action of the chemical erasure often changes the fluorescence of paper and most of the chemical erasure can be detected and photographed by UV rays.

Physical erasure

The application of sharp instrument causes disturbance on the surface finish of paper which can be detected by examining the document by oblique light i.e by a beam of light falling at low angle. The soft rubber erasure particles can be detected under microscope or by subjecting the erased area to iodine vapors.

6. Advancement in detection technique: VSC

When a portion of the document has been altered and some portion is not clearly visible, or some text added. The VSC (video spectral comparator) can be used to decipher the alteration. The image is examined by viewing on a monitor, and digital image processing through a computer.



Fig: Video spectral comparator (VSC)

About VSC apparatus:

The VSC has an imaging device that includes a colour charge coupled device (CCD) video camera, a black and white CCD video camera, excitation/ barrier filter, and various radiant energy sources (tungsten, halogen, and fluorescent lamps). The software of the VSC allows examiner to record the image of the document that being examined, to rotate, flip and render negative the picture and temporarily store and mixing different images, enabling distinct images to be overlaid or compared side by side.

VSC- Working

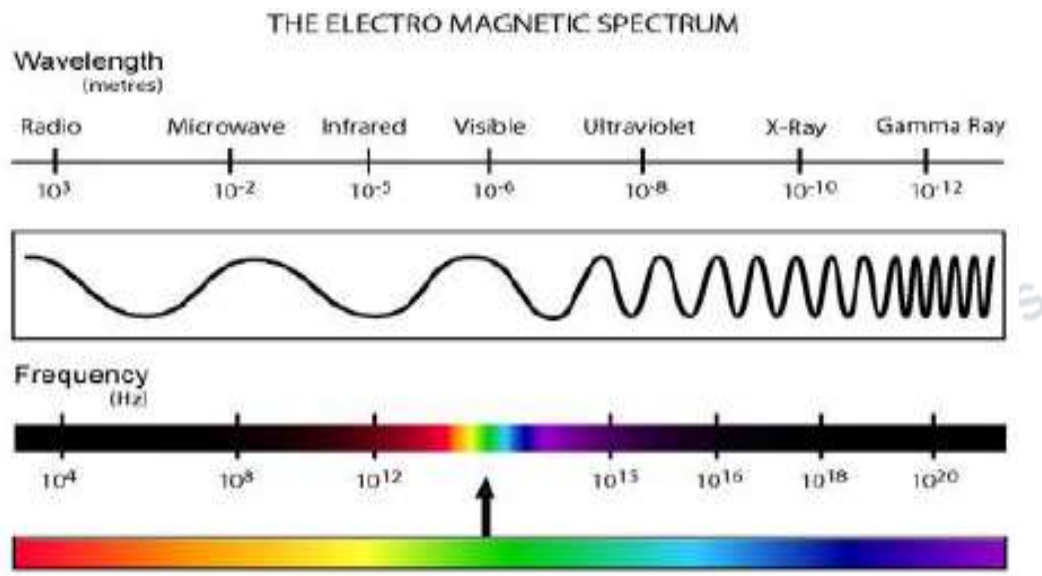


Fig: Light is a form of radiant energy that occupies the 400nm through 700nm range of the electromagnetic spectrum and travels in different wavelengths.

The VSC uses a combination of cameras, light and filters to allow an examiner to produce each of these effects under certain circumstances. There are some wavelength such as IR and UV which are not visible to the human eye. When these wavelengths are used the object which is that is used in visible region and appeared black, now in IR it appear clear like a piece of glass. For instance, the VSC's camera operating in the IR portion of the spectrum can be capture an image lying underneath an opaque blue ink, similar to the way an X-ray captures image of bones through skin.

There are some changes when light is directed toward an object usually 7 changes depends on the emitted wavelength;

- All or most of the light can be reflected off the object making it appear white (if white light is emitted) or lighter (if only specific wavelengths are emitted).
- All or most of the light can be absorbed by the object making it appear black or darker.

- Part of the light can be reflected, and part can be absorbed producing colors in the visible portion of the spectrum. The different intensities of radiant energy can be displayed using the VSC as shades of gray in the non visible portions of the spectrum.
- Light can be transmitted through the object.
- Light can strike the object, be absorbed, and then reemitted at a longer wavelength: an event called luminescence.

7. Summary

- Erasure is a type of alteration in document. It can be classified as chemical erasure and physical erasure.
- There are many chemicals which are able to invisible the ink such as oxalic acid, sodium hydrochlorite etc.
- Physical erasure is the physical abrasion of the paper by using any sharp instrument such as knife, blade etc.
- The erasure can be deciphered under oblique light or UV light and the more advanced technique used in detection is VSC.