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EXPT. NO. 3: Chemical Detectives: Forensic Analysis

AIMS & OBJECTIVES :-

→ Learn and apply basic chemistry concepts.
→ Understand the nature of science
→ Develop and practice science process skills.
→ Incorporate technology as a tool for collecting and analyzing data.
→ Demonstrate good lab practices.
→ Recognise how chemistry relates to your life in an authentic way.

SUPPLIES & REQUIREMENTS :-

→ General Supplies: Tweezers, Disposable Gloves, Scissors
→ Iodine Fuming Chamber Method: Iodine, TLC tank and lid, Blank Glass TLC plate, Scotch Tape, Glass tray for warming TLC tank with hot water.
→ Ninhydrin Method: Ninhydrin solution (ninhydrin (5g) in methanol (100mL)), distilled water, cardboard and blotter.
→ Silver Nitrate Method: Silver Nitrate (3g) in distilled water (100mL). Store in a brown bottle. Glass tray, Spray Bottle, and blotters. High Sensitivity UV lamp and UV protective goggles.

EXPERIMENTAL PROCEDURE :-

Iodine Method : The image formed by Iodine method is not permanent and should be photographed as soon as possible.

Prepare an iodine-fuming chamber by placing iodine crystals (½ teaspoon) on the bottom of a TLC development tank with cover. Tape the samples on a piece of blank TLC glass and place the glass with the samples facing the bottom of the tank. Place the tank in a shallow pan of hot water to speed up the iodine vaporization.

Ninhydrin Method : Spray the solution. Heat the sprayed sample with steam from a water bath. Record the duration of heating reqd. to bring out the print.

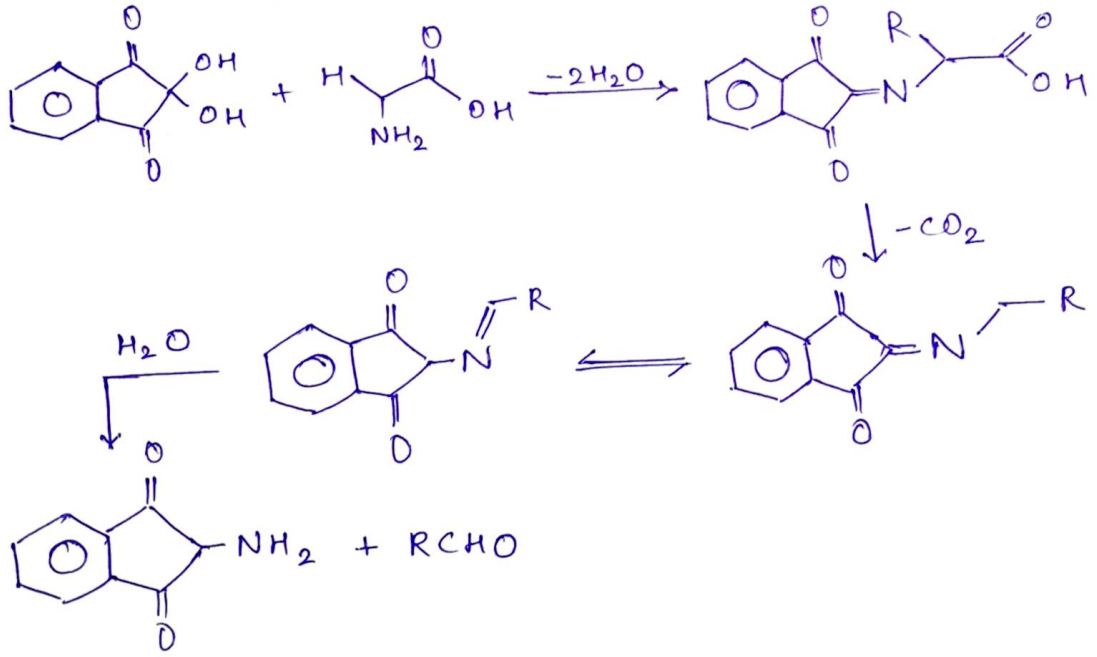
Silver Nitrate Method : Place the $AgNO_3$ sol^n in a glass tray in an illuminated room but not in direct sunlight. Immerse the specimen in the sol^n until the surfaces are completely moistened. Remove it, place it between blotters to remove the excess solution, ~~until the surfaces~~ and dry it with an electric hair dryer / heat gun. Expose the heated specimen to sunlight, a 1000 watt photofloood lamp, or a high-intensity UV lamp. As soon as the ridge details of the prints are clearly visible, remove the paper from the light and photograph it promptly. $AgNO_3$ treated prints become illegible in a few hours when exposed to light but will keep for a long time in total darkness. Larger objects may be treated by brushing with the solutions.

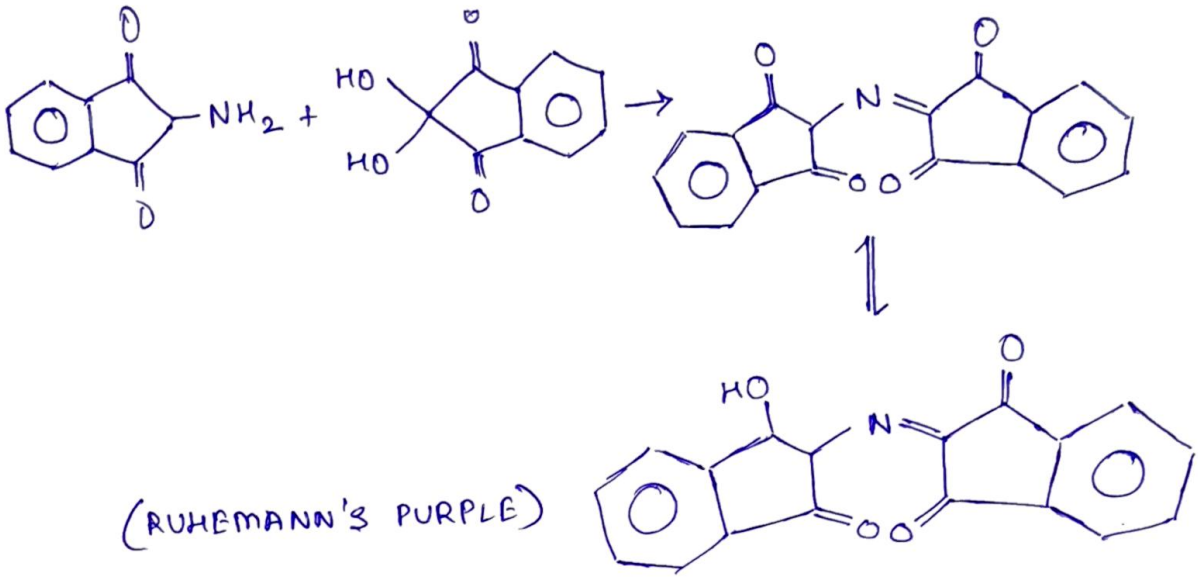
RESULTS AND OBSERVATIONS:—

No.	Name of Experiment	Observation
01	Iodine Method	Iodine was put in a beaker to form fumes, fingerprint was made on the index paper, after iodine chamber is ready after adding fingerprints we place the index card with fingerprints on the iodine chamber inverted and put the lid on the index paper for some minutes then we remove the card and the finger-prints are visible on the index card.
02	Ninhydrin Method	5% Ninhydrin solution in ethanol is taken, fingerprints were made on the index card and then the Ninhydrin was sprayed on the index card and then excess Ninhydrin was washed out and the index card was heated for some time on water bath and the color of fingerprints changes gradually after some time we can see a purple color fingerprint. this purple color is also known as Ruhemann's Purple.

No.	Name of experiment	Observations
03	Silver Nitrate Method	3% $AgNO_3$ solution is taken in a plastic box, fingerprints are made on the index paper, then we dip the index paper in the box containing $AgNO_3$ sol^n so that it gets completely covered with the solution then we dry it between two filter papers, after allowing it to dry, we take it out and put it inside the UV lamp so that the fingerprint becomes visible and after some minutes we take our index card out

⊛ Mechanism of conversion of Ninhydrin to Ruhemann's purple





(RUHEMANN'S PURPLE)

CONCLUSIONS :-

We studied the role of chemical detectives in forensic analysis and deduced that forensic science is highly important for society since it helps a lot in crime scene investigations and that forensic science heavily depends on the concepts of chemistry. We did a similar experiment imitating a crime scene where the culprit had left his/her fingerprints and we successfully recovered those fingerprints using not one but three different methods.