

Science of Hair Color

VALERIE GEORGE

SIMPLY FORMULAS, INC.



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About Valerie



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PAUL MITCHELL



@cosmetic_chemist



society of
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CALIFORNIA



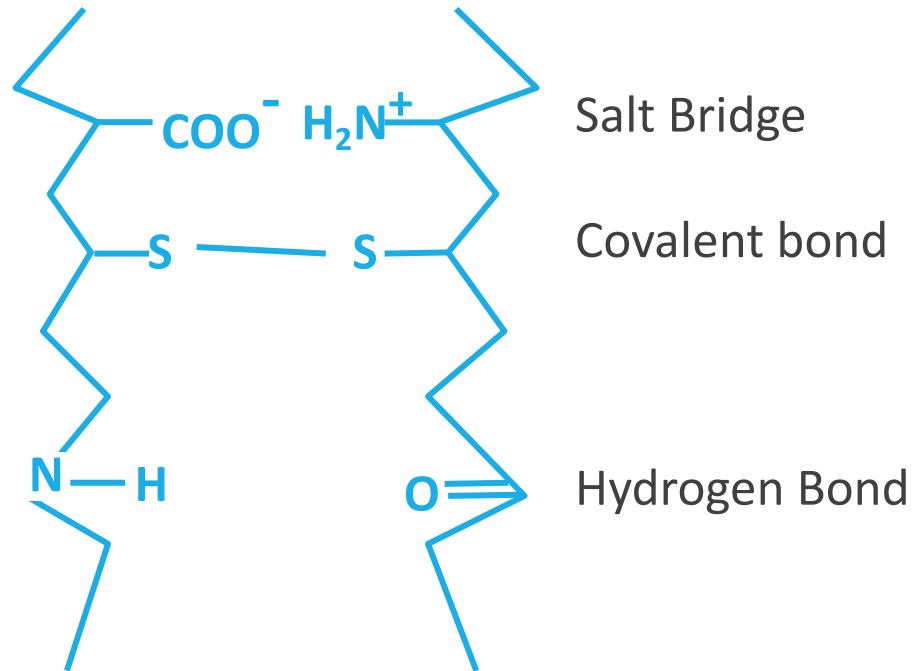
Today We'll Talk About...

- Hair Lightening
- Types of Hair Colorants
- Hair Colorant Products



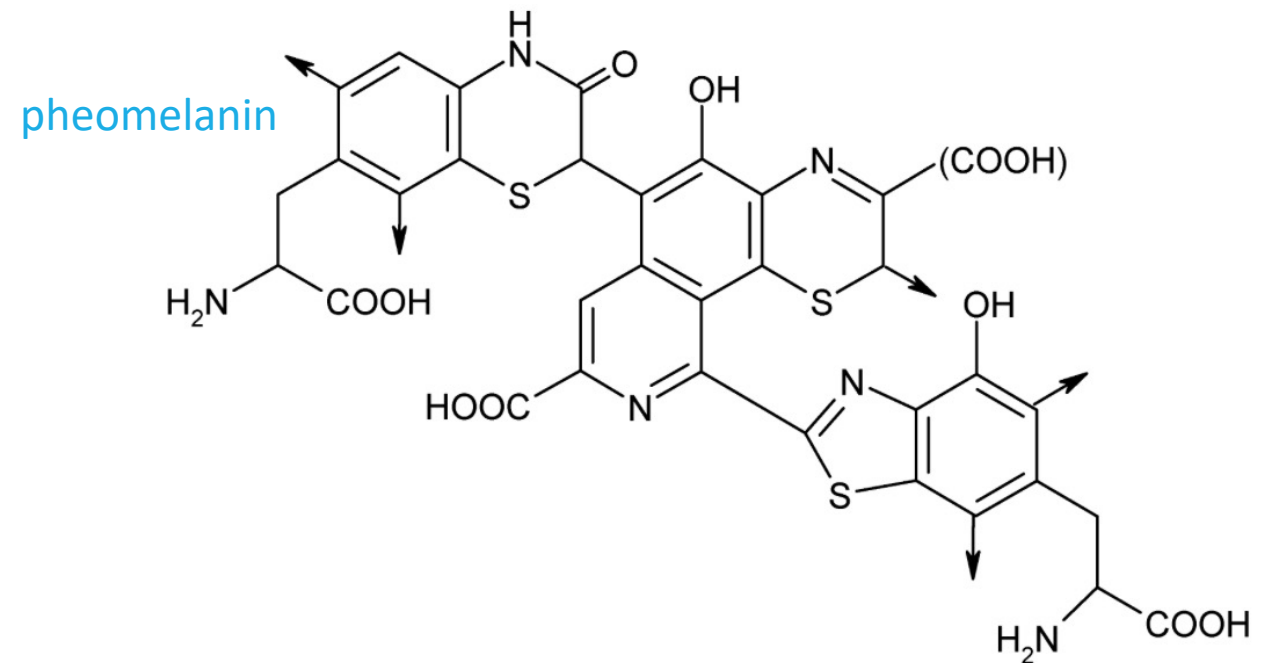
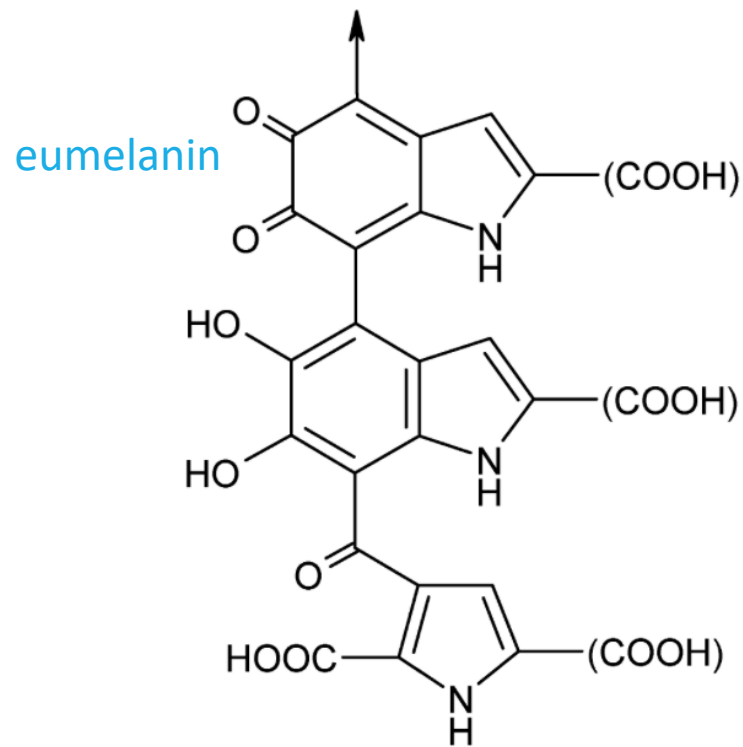
Hair Structure

Keratin is the overall protein structure of hair in the cortex.



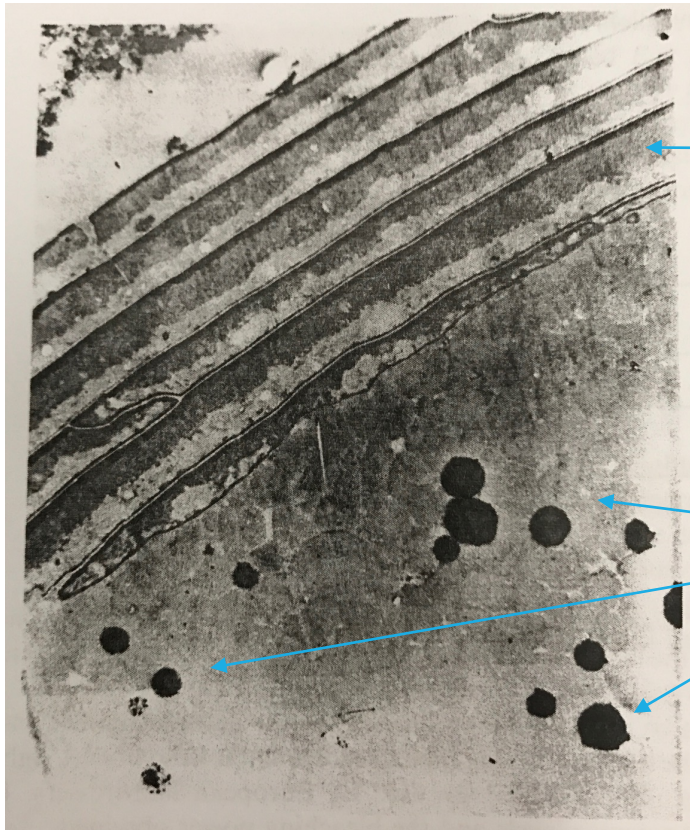
Cortex

Melanin in the cortex responsible for natural color of the hair...



Cortex

Cross-section of natural brown hair.



overlapping cuticle cells

melanin granules

Image Courtesy of Informa Healthcare



Cortex



more pheomelanin than eumelanin



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more eumelanin than pheomelanin



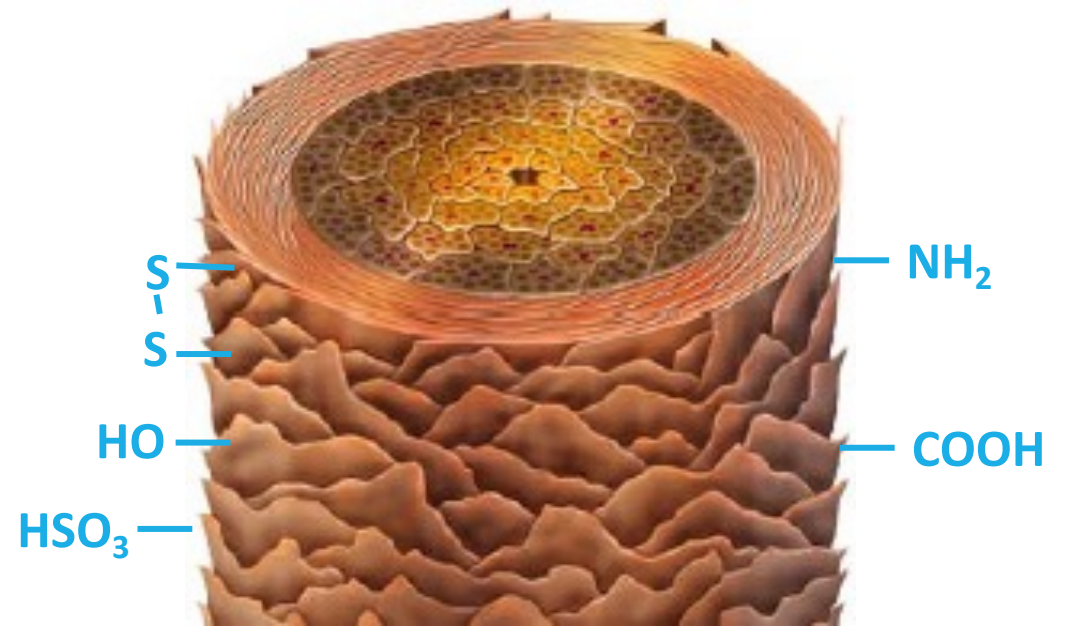
Cuticle

Lots of charges exist on the surface of hair...

- Water
- UV
- Oxidation
- Increase in pH



Change charge
on surface of hair



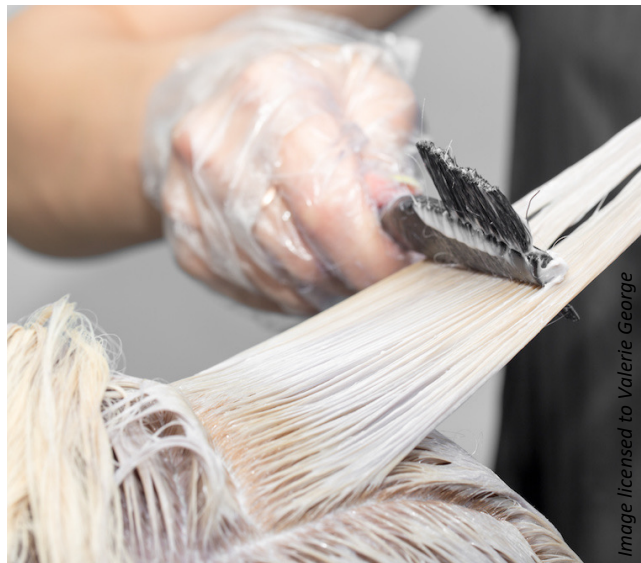
hair fiber image courtesy of Ashland



Hair Lightening

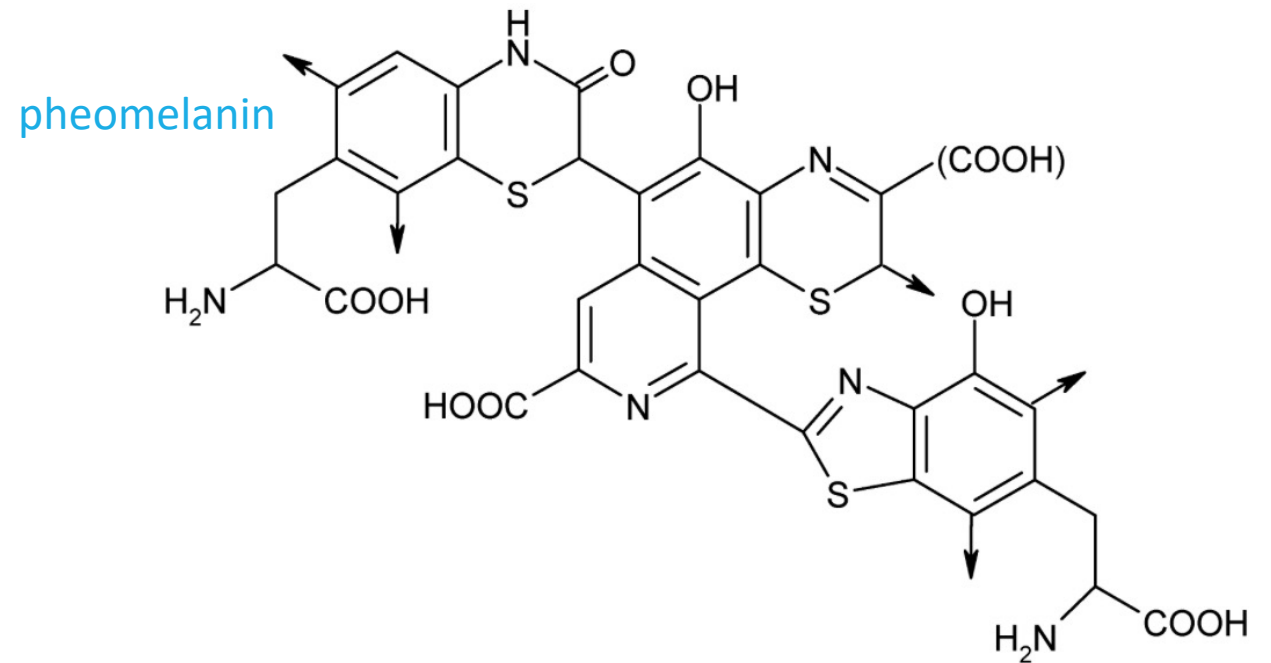
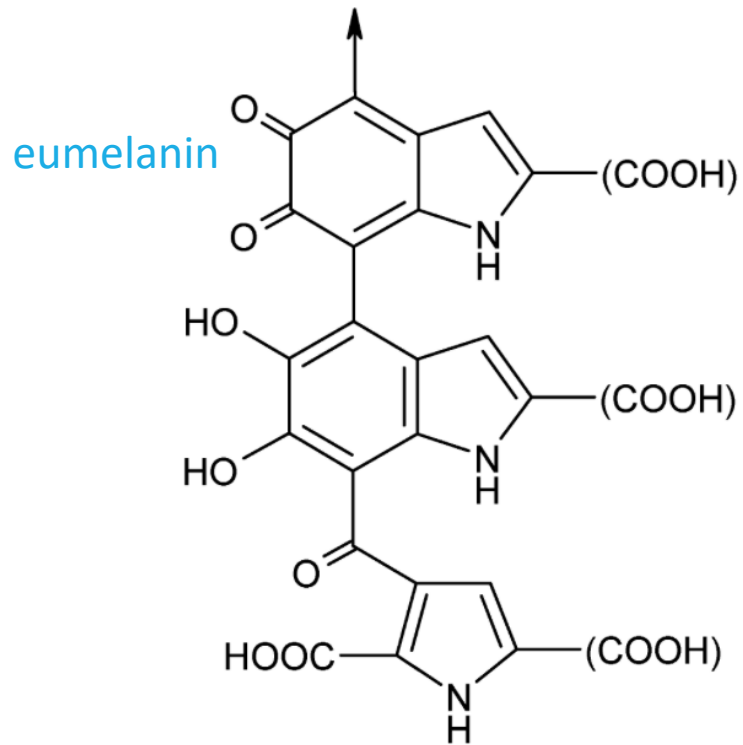
Why lighten the hair?

- Consumer wants lighter look
- Need to prepare the hair for application of a dye preparation



Hair Lightening

First step – remove pigment.



Hair Lightening

- H_2O_2 is preferred ingredient
- Unclear mechanism on how it oxidizes melanin
- Consumers purchase developer solutions with H_2O_2
- Developer is a liquid or a cream
- Developer pH $\sim 2.0 - 3.5$
- Consumer developer is typically 20 Volume or lower

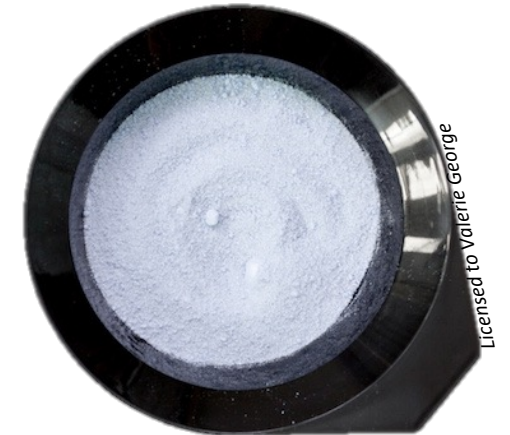
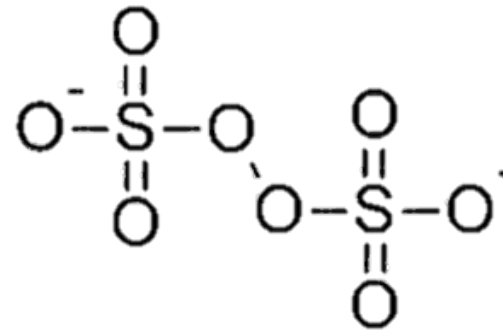
% H_2O_2	Volume Equivalent
1.5% H_2O_2	5 Volume
3.0% H_2O_2	10 Volume
6.0% H_2O_2	20 Volume
9.0% H_2O_2	30 Volume
12.0% H_2O_2	40 Volume

Volume is # of liters of O_2 in gaseous form released by the decomposition of one liter of H_2O_2 solution.



Hair Lightening

- Bleach is the preferred vehicle for hair lightening
- Main ingredients are ammonium and potassium persulfates
- Typically powder format
- Mixed developer + bleach has a final pH ~ 10-11
- 30 or 40 Volume H₂O₂ used
- Application Time < 50 minutes
- Lift up to 7 levels



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Hair Lightening

Hydrogen Peroxide & Bleach are not selective!

- Reacts with all structural components of the hair
- Damages hair while decolorizing melanin
- Increased solubility because of free acid groups (cysteic acid)
- Increased porosity -> easy in, easy out
- Hair feels like it's easily going to break, difficult to comb
- Damage may not be uniform



Hair Colorants

Types of Colorants Used to Color Hair

- Pigments
- Acid Dyes
- Basic Dyes
- Nitro Dyes
- Oxidative Dyes



Pigments

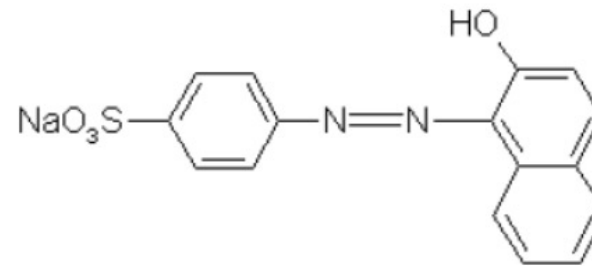
- Color additives that are insoluble in medium used
- Opaque
- Synthetic or Natural
- Lakes, Toners, True Pigments
- Iron Oxides



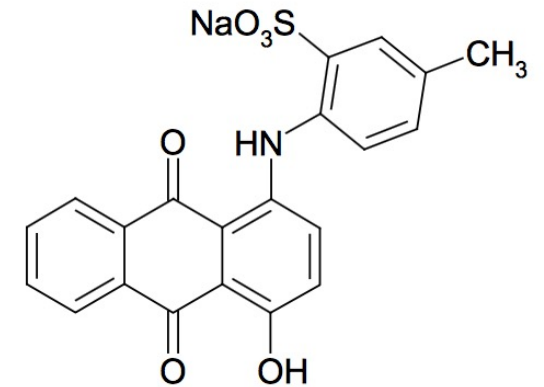
Acid Dyes

- Temporary to Semi-permanent
- No lightening effect
- Anionic character
- Water-soluble
- Bright colors
- Best at pH 2-4

Acid Orange 7



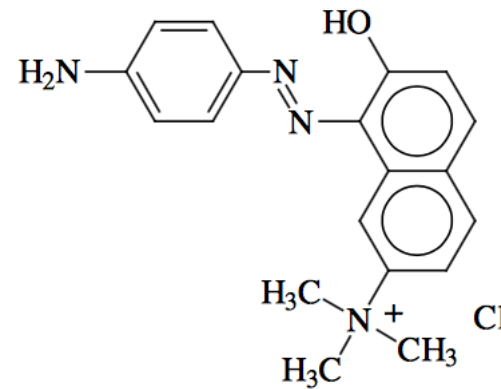
Acid Violet 43



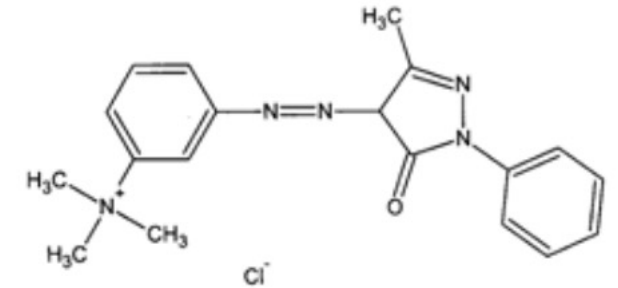
Basic Dyes

- Temporary to Semi-permanent
- No lightening effect
- Cationic character
- Water-soluble
- Stable pH 4 – 9
- Good for natural coloring

Basic Brown 16



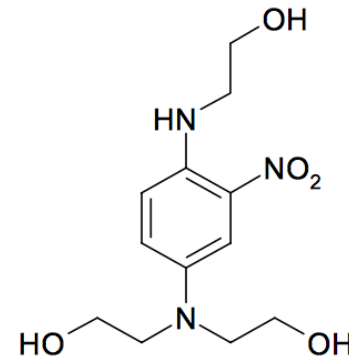
Basic Yellow 57



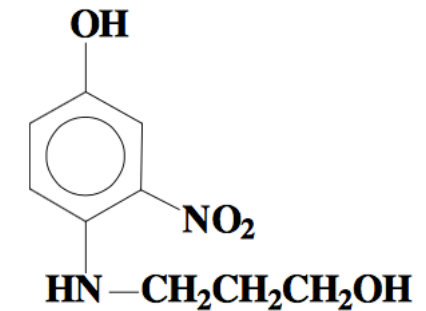
Nitro Dyes

- Semi-Permanent
- No Lightening Effect
- Non-ionic
- Poor water solubility
- Extremely affinitive for hair

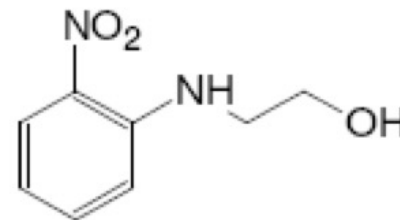
HC Blue 2



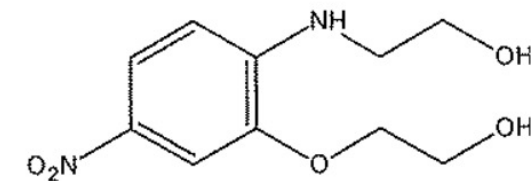
3-Nitro-4-hydroxypropylaminophenol



HC Yellow 2



HC Yellow 4



Oxidative Dyes

- Permanent
- No lightening effect*
- No intrinsic color
- Oxidizer required
- Two dyes required to make one color – base (primary), coupler (secondary)
- Long-lasting

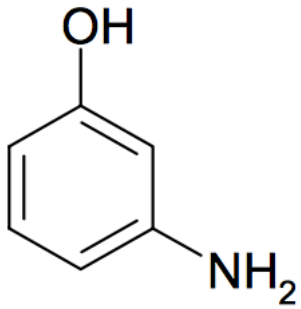


Oxidative Dyes

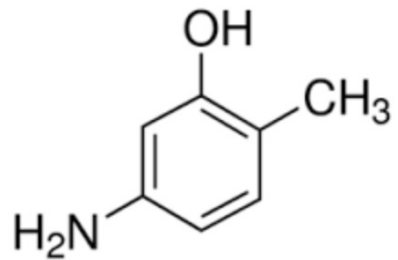


Oxidative Dyes

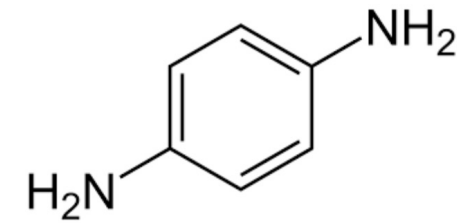
m-Aminophenol



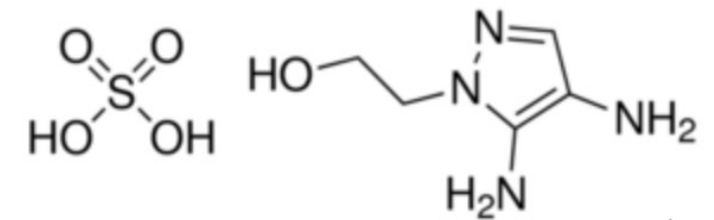
4-Amino-2-Hydroxytoluene



p-Phenylenediamine (PPD)

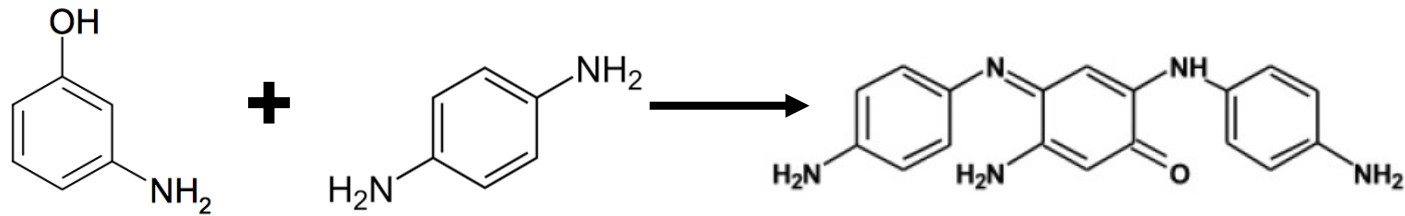


1-Hydroxyethyl-4,5-Diamino
Pyrazole Sulfate (WP5)



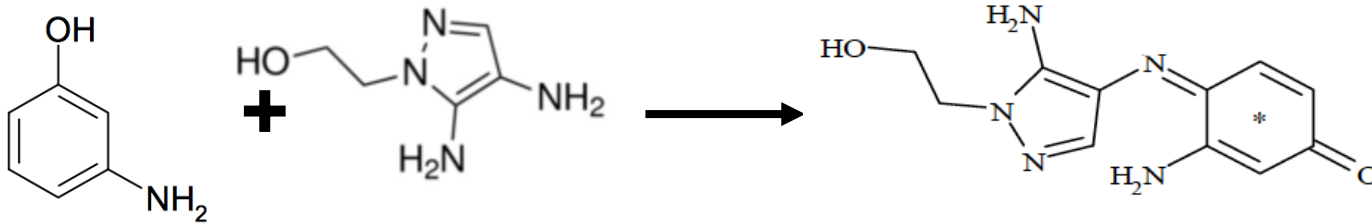
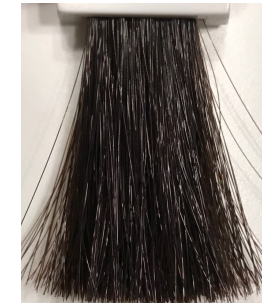
Oxidative Dyes

Base + Coupler



m-Aminophenol

PPD



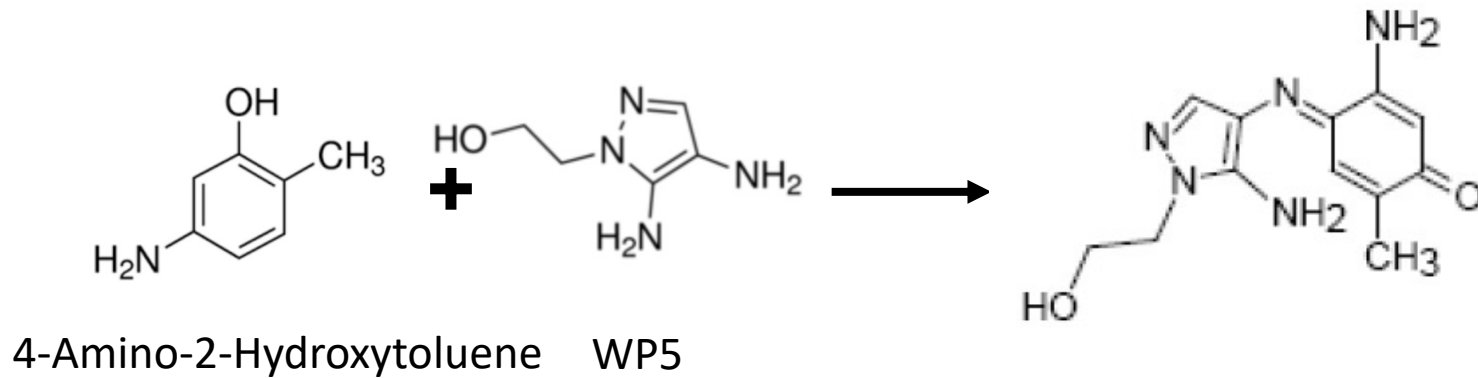
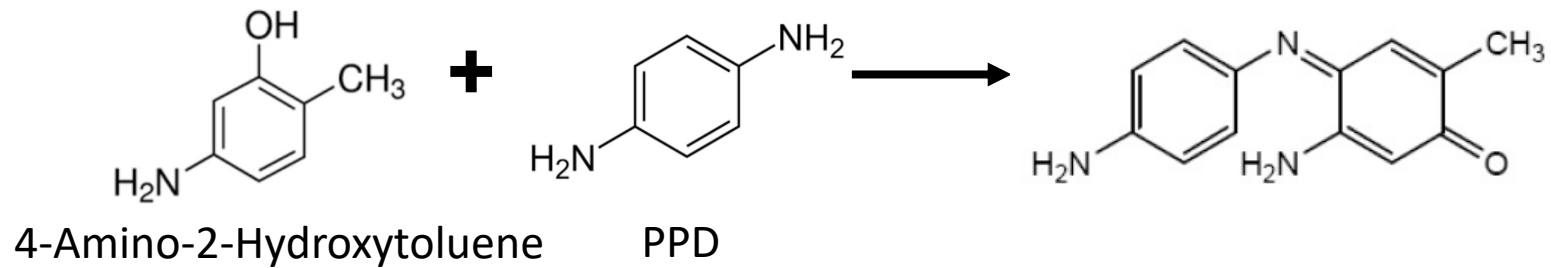
m-Aminophenol

WP5



Oxidative Dyes

Base + Coupler



Oxidative Colorants

	Jarocol DPE	Jarocol AHEA	Jarocol AN	Jarocol ACC	Jarocol 2M5AP	Jarocol 2M5HEAP	Jarocol 2A3HP	Jarocol MAP	Jarocol RL	Jarocol 2MR	Jarocol 4CLR
Jarocol TDS											
Jarocol PPD											
Jarocol BTX											
Jarocol BHP											
Jarocol TAP											
Jarocol AHP											
Jarocol PAP											
Jarocol 4A3MP											
Jarocol PMAP											



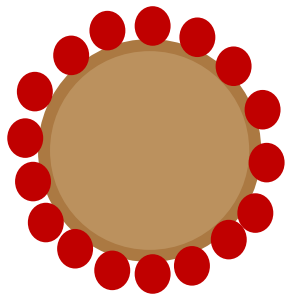
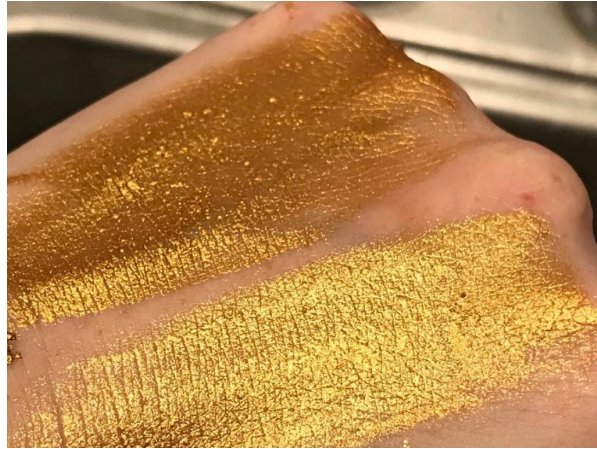
Other Required Oxidative Color Ingredients

- Alkalizer Ammonia, MEA, Aminopropanol
- H2O2 5, 10, 20 Volume
- Antioxidant ... Protects the dyes from oxidizing in the formula
- Chelator..... Remove metals from solution
- Hair..... Need hair to put all these ingredients on!



Temporary Hair Color

- Pigments
- Pearls
- Basic Dyes
- Acid Dyes

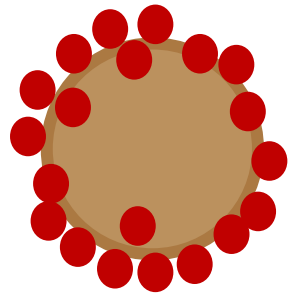


adsorption



Semi-Permanent Hair Color

- Basic Dyes
- Acid Dyes
- Nitro Dyes

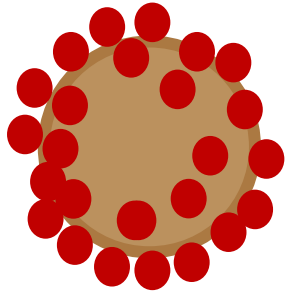


Adsorption + Absorption



Demi-Permanent Color

- Oxidative Dyes
- Nitro Dyes
- Basic Dyes
- Alkalizer
- Anti-oxidants
- Chelators
- H_2O_2

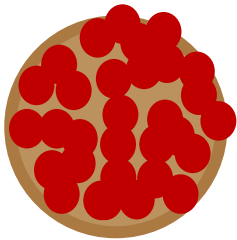


Adsorption + Absorption



Permanent Color

- Oxidative Dyes
- Alkalizer
- Anti-oxidants
- Chelators
- H_2O_2



Absorption

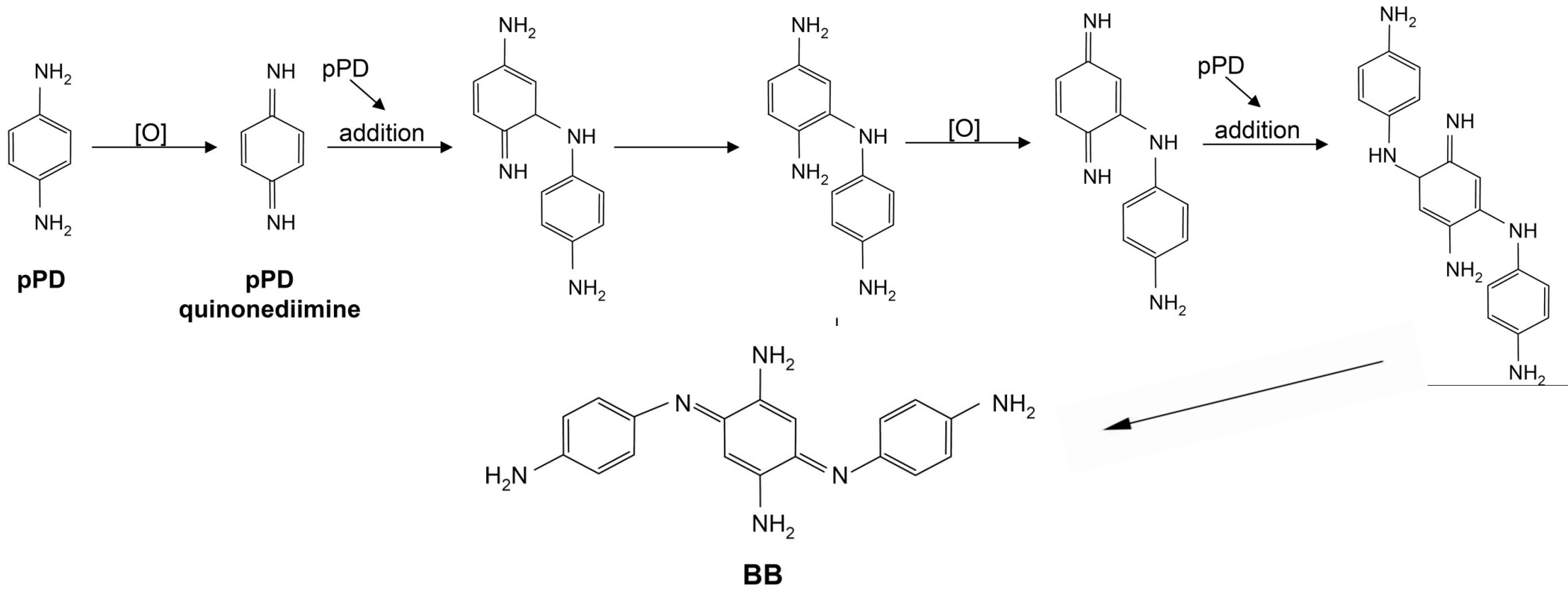


Soapbox Time



PPD

Bandrowski's Base



PPD & Black Henna



Natural Hair Color

- Alkalizer
- Dyes
- Antioxidants
- Chelators
- H₂O₂



sound natural?



Natural Hair Color



How to Become Blonde Naturally

1. Boil 2 tablespoons of chamomile in 4 cups of water for about 5 minutes.
2. Cool and filter.
3. To ensure that the color is intense, use more chamomile and less water - 300 ml, and simmer for 15 minutes.
4. Moisten your hair along the entire length to achieve a rich color.

See more lahealthyliving.com



Contact

Valerie George

valerie@simplyformulas.com

 [@cosmetic_chemist](https://www.instagram.com/cosmetic_chemist)

