



كلية العلوم التطبيقية
جامعة بنها



Model Answer of Final Exam of First Semester 2016/2017

Course: Chemistry of dyes

Second year student

Textile Printing Dept.

Code: 2110

Time: 120 min.

Full mark: (90)

First Question: (30 points)

I. Put (T) for true and (F) for false answers in the following statements.

II. Correct the false ones.

1. It is easier for an electron to jump into an excited state from a single bond. (F)
It is easier for an electron to jump into an excited state from **a double bond**.
2. Dyes are either soluble, or dispersible in a solvent. (T)
3. If a light source is deficient in any colour band, the light appears to be coloured in the complementary colour. (T)
4. The hue of a dye depends on the wavelength it reflects. (F)
The hue of a dye depends on the wavelength it **absorbs**.
5. The wavelengths that the dye absorbs depend on its structure. (T)
6. The chromophore and the auxochrome groups are connected by a conjugated system. (T)
7. Different dyes will have same fastnesses on different materials. (F)
Different dyes will have **different fastnesses** on different materials.
8. Nitrations are often conducted by using a mixture of Nitric acid and sulfuric acid. (T)
9. Diazo component is treated in low temperature, acid conditions with sodium nitrite to form a stable diazonium salt. (F)
Diazo component is treated in low temperature, acid conditions with sodium nitrite to form an **unstable diazonium** salt.
10. The second part of the dyes name is the color. (T)
11. The similarity between carminic acid and alizarin, the core of both molecules is the same, but the functional groups differ. (T)
12. Energy requirements for the azo dye making reaction are low, since most of the chemistry occurs at or below room temperature. (T)
13. The raw materials used to synthesize organic dyes are commonly referred to as dye intermediates. (T)

14. Azo dyes are characterized by the presence of the azo moiety ($-N=N-$) in their structure, conjugated with two identical aromatic systems. (F)

Azo dyes are characterized by the presence of the azo moiety ($-N=N-$) in their structure, conjugated with two ***distinct or identical*** aromatic systems.

15. Nitrating mixture is especially effective when activated ring systems are to be nitrated. (F)
Nitrating mixture is especially effective when ***deactivated ring systems*** are to be nitrated.

Second Question: (20 points)

Choose the right answer in the following questions:

1..... *Is two atoms share two electrons, each atom providing one electron of the pair.*

- a. Ionic bond
- b. ***Covalent bond***
- c. Hydrogen bond

2.*If a light source is deficient in green colour band, the light appears to be coloured in:*

- a. Violet
- b. Blue
- c. ***Purple***

3.*The color is appeared bright when the absorption band is:*

- a. Broad.
- b. ***Narrow and sharp.***
- c. Neither

4.*A dye will run if:*

- a. It has a weak affinity for the material it is attached to.
- b. It has a much stronger affinity for a non-aqueous solvent.
- c. ***Both***

5.*The absorption of light energy by an organic dye or inorganic pigment causes:*

- a. ***An electron to jump into a higher energy level, thus bringing the dye molecule into an excited state.***
- b. An electron to jump into a lower energy level, thus bringing the dye molecule into an excited state.
- c. An electron to jump into a lower energy level, thus bringing the dye molecule into a stable state.

6.*The causes of color fading are:*

- a. Infra red radiation from sunlight and washing.
- b. Ultra violet radiation from sunlight and mercerization.
- c. ***Ultra violet radiation from sunlight and washing.***

7.*The meta position in a dye has:*

- a. The longest wavelength.
- b. ***The shortest wavelength.***
- c. No wavelength.

8. *Diazotisation involves a primary aromatic amine, called:*

- a. The azo component
- b. The coupling component
- c. ***The diazo component.***

9. Nitro groups serve as:

- Chromophores
- Auxochromes
- Both**

10. Chlorine reacts with boiling methylbenzene, in the absence of a catalyst but in the presence of UV light

- Substitution happens in the methyl group rather than the ring**
- Substitution happens in the ring rather than the methyl group
- Substitution happens in both the ring rather and the methyl group

Third Question: (40 points)

1. Outline the advantages and disadvantages of natural dyes. (10 points)

Advantages of natural dyes

- Natural dyes can exhibit better biodegradability.
- They have a higher compatibility with the environment.
- They also can show more friendly to the environment, a lower toxicity and allergic reaction than synthetic dyes.
- Their color is very brilliant.
- They have wonderful rich colors.
- Those are fast and permanent unlike chemical ones and are fast to washing and light.

Disadvantages of natural dyes:

- The dyestuffs were difficult to store.
- Much time was spent in extracting color from these raw materials
- Much time was spent in imparting it in cloth.
- Its impossible to consider using natural dyes as a viable alternative to dyeing today's textile production.

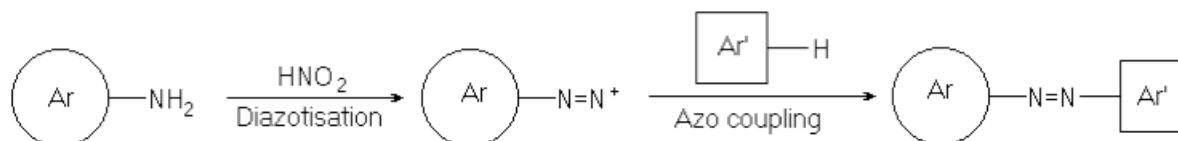
2. Synthesis of azo dyes including two stages namely diazotization and coupling

...Explain

(10 points)

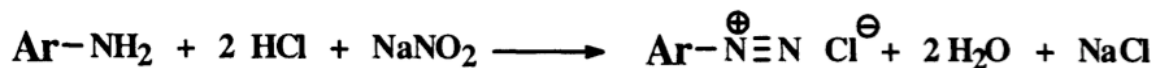
Synthesis of azo dyes

An overview of azo dye synthesis is shown in figure below:



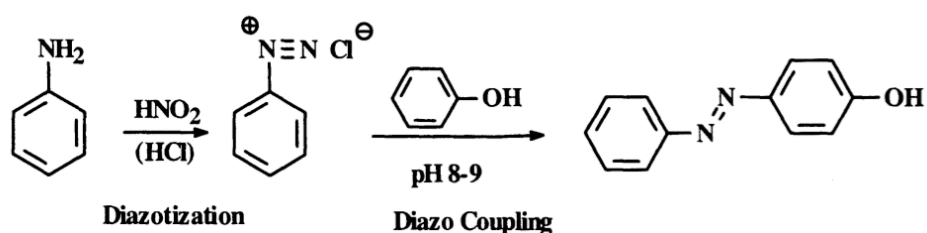
Stage 1- Diazotization

This involves a primary aromatic amine, called the diazo component. It is treated in low temperature, acid conditions with sodium nitrite to form an unstable diazonium salt



Stage 2- Azo coupling

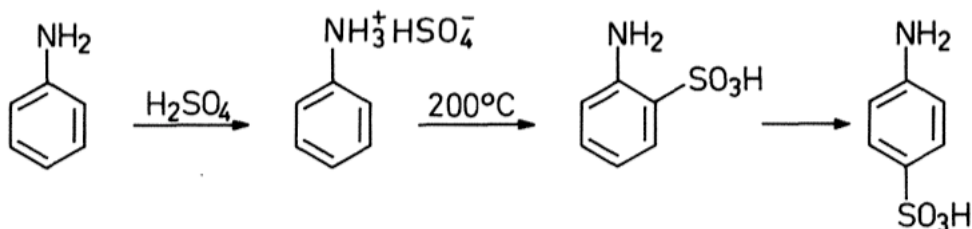
The diazonium salt is reacted with a coupling component (for example a phenol, naphthol or an aromatic amine). This forms the stable azo dye. For example two-step synthesis of an azo dye from aniline and phenol is shown in figure.



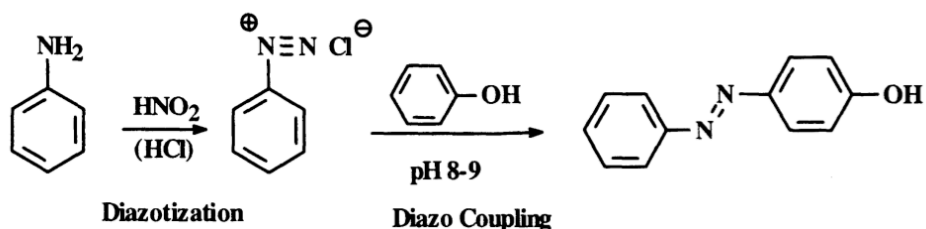
3. Write the Equations of the following: (only 4)

(20 points)

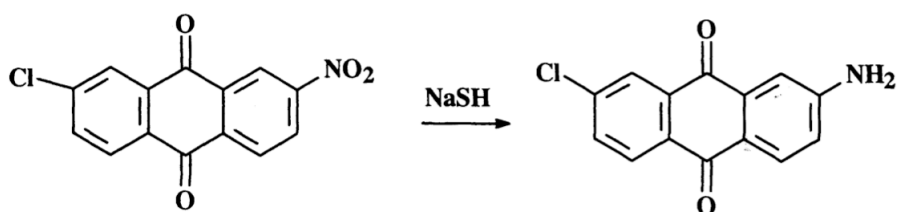
1. The sulfonation of aniline.



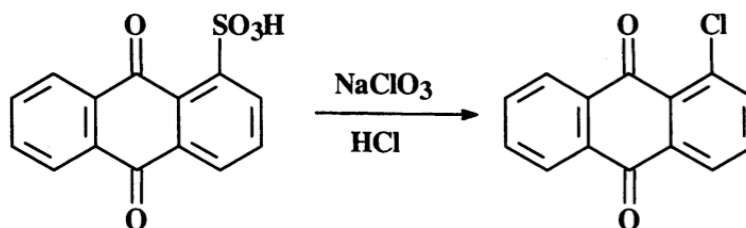
2. Two-step synthesis of an azo dye from aniline and phenol.



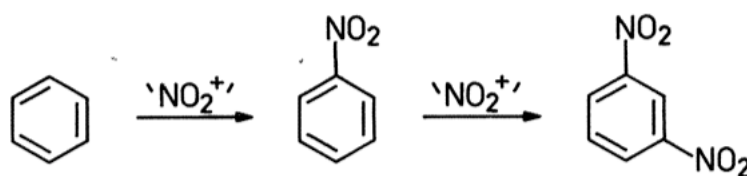
3. The reduction of nitro groups in anthraquinone compounds.



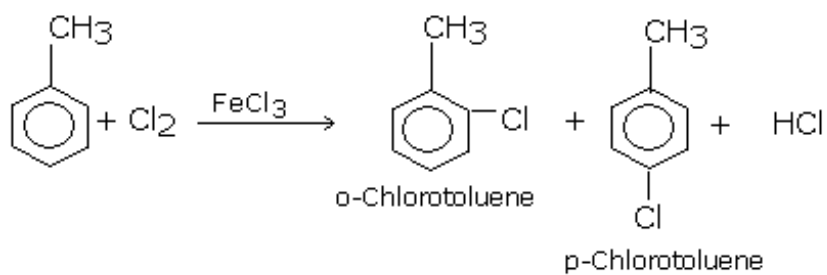
4. Substitution of (-SO₃H) group with chlorine in Anthraquinone-2-sulfonic acid



5. Nitration of benzene.



6. Chlorination of toluene.



Good Luck
Dr. Eman Abdelaziz