

VEIN BATCH 2027

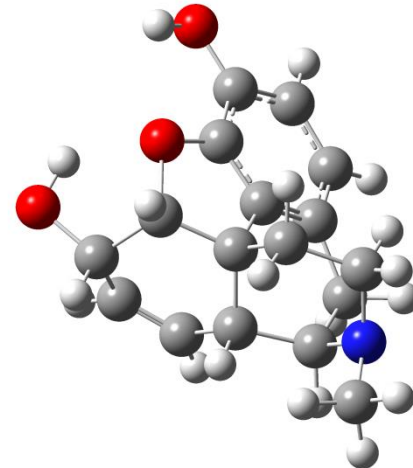
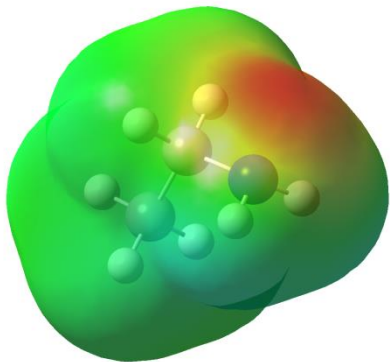


Sub: Organic المادة:

Lecture: 11 المحاضرة:

By: Johainah Taha إعداد:

Edited: تعديل:



Chapter 11: Amines

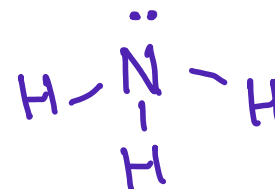
DONE BY : JOHAINAH TAHA

دعواتكم 

Record 21
34:30

Classification and Structure

Amines can be classified as follows:



* معلومات عن N

1. يتصل 3 covalent bonds

2. عندها lone pair

احفظوا الأسماء



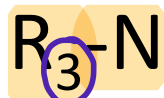
ammonia



1° amine



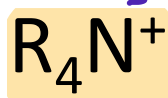
2° amine



3° amine



ammonium → 4 covalent bonds → Salt

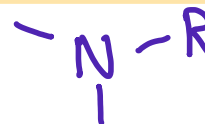


4° alkylammonium (salt)

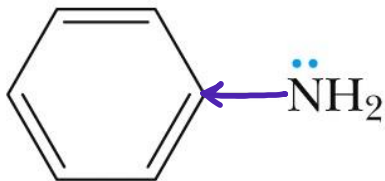
Structure & Classification

- Amines are further divided into ^①aliphatic, ^②aromatic, and ^③heterocyclic amines.

– **Aliphatic amine:** An amine in which nitrogen is bonded only to alkyl groups.

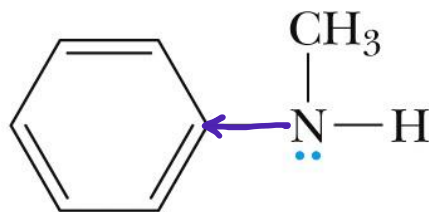


– **Aromatic amine:** An amine in which nitrogen is bonded to one or more aryl groups.

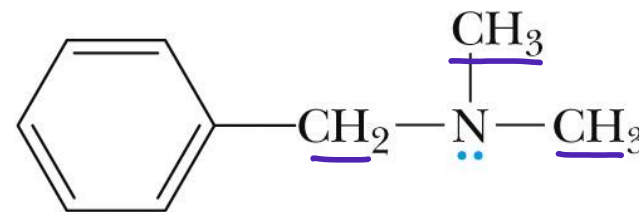


Aniline

(a 1° aromatic amine)

*N*-Methylaniline

(a 2° aromatic amine)



Benzyldimethylamine

(a 3° aliphatic amine)



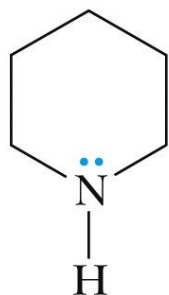
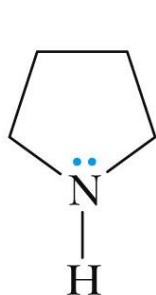
Structure & Classification

Chapter 1 أخذنا هاب ↻

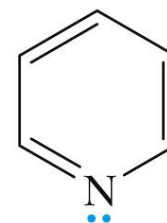
Heterocyclic amine: An amine in which nitrogen is one of the atoms of a ring.

استبدال C بـ أحادي

NOF



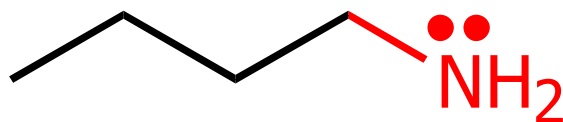
~~Pyrrolidine~~ ~~Piperidine~~
(heterocyclic aliphatic amines)



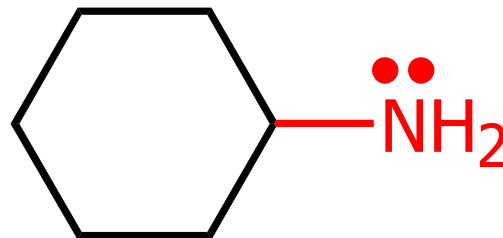
~~Pyrrole~~ ~~Pyridine~~
(heterocyclic aromatic amines)

1. Nomenclature

❖ **1° Amines** → 1R → Alkyl amine / cycloalkyl amine.

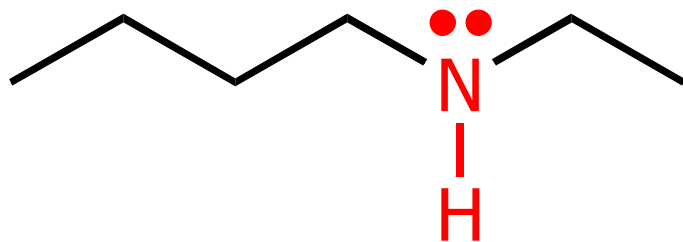


Butylamine

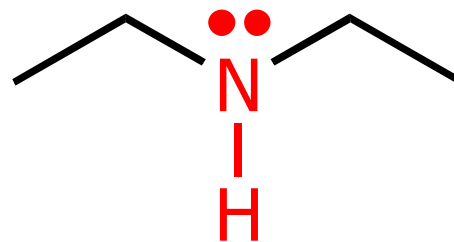


Cyclohexylamine

❖ **2° Amines** → 2R → Alkyl Alkyl amine.

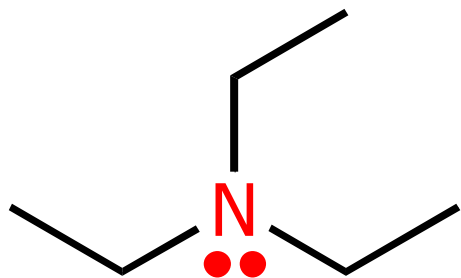


Butylethylamine

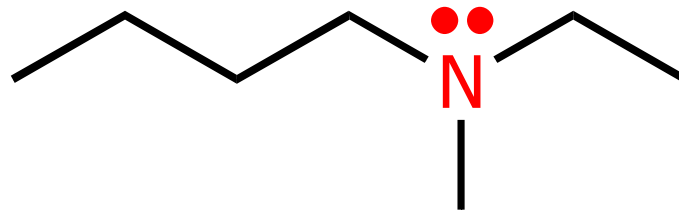


Diethylamine

❖ **3° Amines** → 3R → Alkyl Alkyl Alkyl amine.

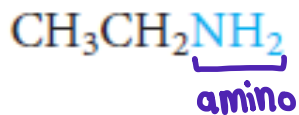


Triethylamine

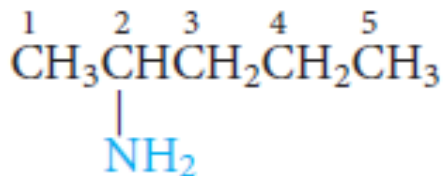


Butylethylmethylamine

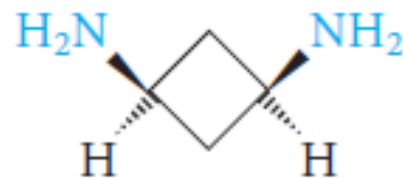
طريقة 2 في التسمية :-



aminoethane



2-aminopentane

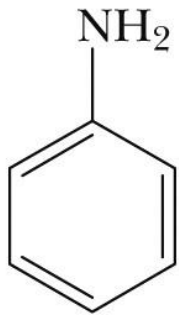


cis-1,3-diaminocyclobutane

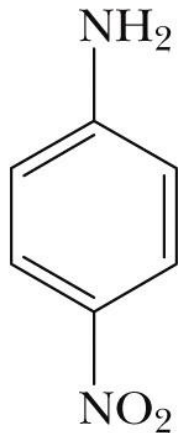
نفس الاتجاه

Nomenclature

- The IUPAC system retains the common name aniline.



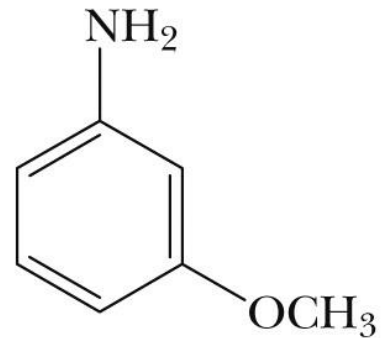
Aniline



4-Nitroaniline
(*p*-Nitroaniline)



4-Methyaniline
(*p*-Toluidine)



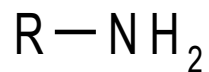
3-Methoxyaniline
(*m*-Anisidine)

احتفاظ

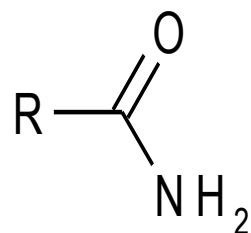
أخذناه بـ Chapter 4

Classification and Structure

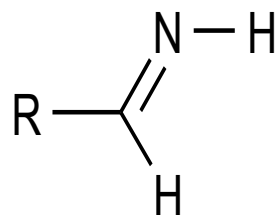
Other types of nitrogen compounds:



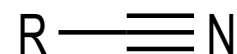
amine



amide



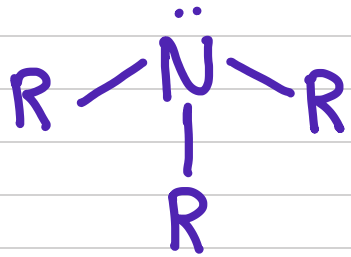
imine



nitrile

منقذ

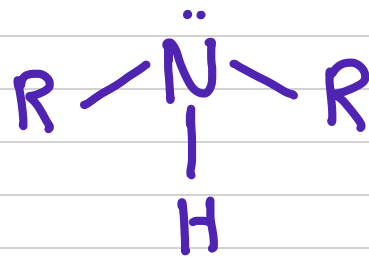
طب، تظاولا زحكي عن
:- Amines و IMF



Tertiary alcohol



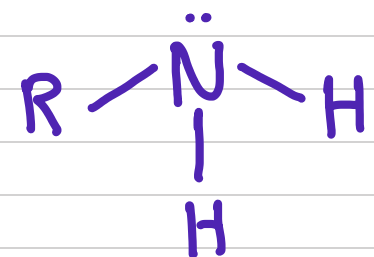
بتعمل H-Bonding مع مرتبات
أخرى عندها H.



Secondary alcohol



H-Bonding



Primary alcohol



H-Bonding

Record 22

1:12

Physical Properties of Amines

N atom is sp^3 hybridized.

- sp^3 .
- Polar, less than OH.
- Soluble in water.

N-H is polar but less so than O-H, so the H-bonds are weaker than an alcohol. (N is less EN than O)

* العلاقة طرئية بين EN وقوة ال Bond.

Similar to alcohols the H-bonding makes the smaller amines soluble in water.

Physical Properties of Amines

Since the H-bonds in amines are weaker than alcohols, their BP is intermediate between alkanes and alcohols, i.e.

بأية حاله

name	formula	BP (°C)	Solubility (mg/L)
Propane	CH ₃ CH ₂ CH ₃	-42	40
Ethanamine	CH ₃ CH ₂ NH ₂	17	Miscible
Ethanol	CH ₃ CH ₂ OH	78	Miscible

→ London

amine →

alcohol →

] → H-bonding

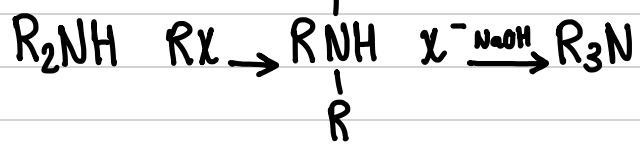
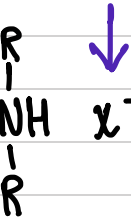
* BP أعلى للمركب الي الروابط فيه أقوى.

* المركبات الصغيرة الأكثر ذوباناً بالماء.

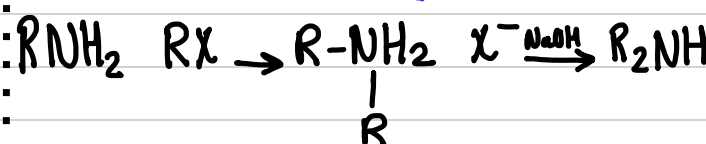
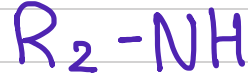
الآن بنا نتعلم كيف بنكون ال Amines :-

طريقة 1 من (R-X) Alkyl halid

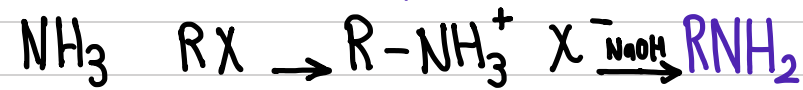
Tertiary amine ③



Secondary amine ②



Primary amine ①



* ال N هي good nucleophile تحتاج ال R و

تطرح ال X و LG.

* ولأنه ال N يتعمل 3 روابط فسهل عليها فقدان ال H

وبهيك يكون عملت ال base treatment مع ال

* القاعدة القوية تحتاج ال H⁺ وتوخذ البروتون

وال e⁻ حتروح ال N ثم يكون ال R-NH₂

* التفاعل صار بخطوتين :-

1. Nu substitution

2. Neutral Base

* نفس القصة ولكن حاحمل على 2R :-

(الاولى) مصدرها من RNH₂

(الثانية) مصدرها من Alkyl Halide

* كونت Salt ، حاخذ منه ال H⁺ باستخدام

Base .

بالخطوة الأخيرة بعمل ال treatment with base

القاعدة بتوخذ ال H⁺ وبتحول ال Salt الى مرتب

Neutral بترجع ال اكتر وناحه وياكون

عليه +1 .

* طريقة تكون tertiary هي الأصعب والسبب

معوية تكون تفاعل ال SN₂

* ولكن كخطوات هو نفس ابي قبل و

القاعدة بتوخذ ال H⁺ وبتحول ال Salt الى مرتب

بالخطوة الأخيرة بعمل ال treatment with base

القاعدة بتوخذ ال H⁺ وبتحول ال Salt الى مرتب

Neutral بترجع ال اكتر وناحه وياكون

عليه +1 .

Record 22
5:20

Preparation of Amines

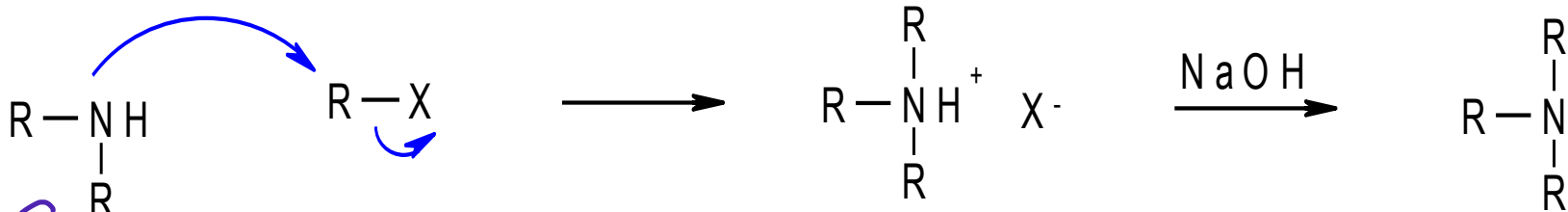
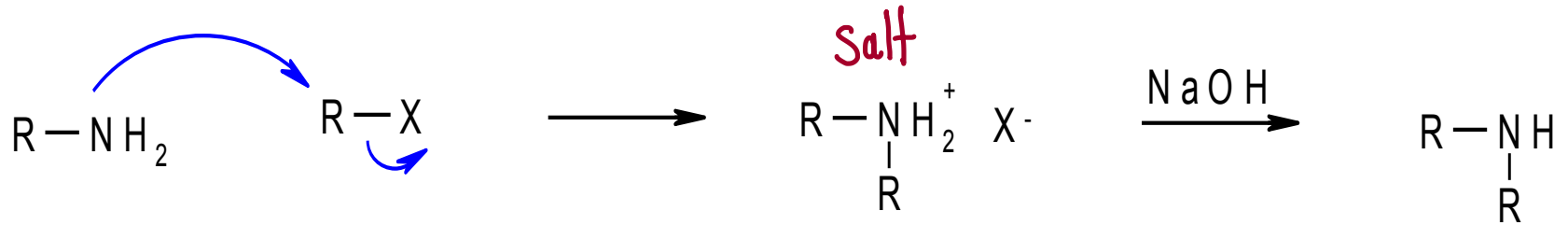
1. From *alkyl halides*: use ammonia which is nucleophilic, i.e.



2nd step with NaOH is required to remove the extra acidic proton on the intermediate quaternary ammonium salt.

Preparation of Amines

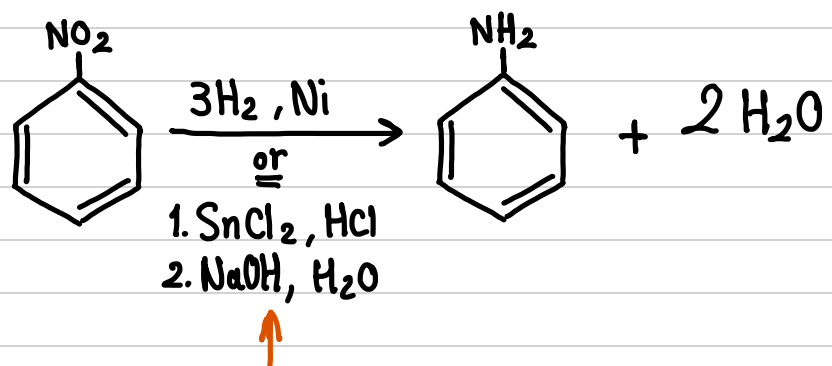
1° and 2° amines are reactive under these conditions, i.e.



هنا التفاعل $\text{S}_{\text{N}}2$ ولكن $\text{S}_{\text{N}}2$ أضعف
Why not 3°?

الطريقة الثانية لتكوين amines

هي ا Reduction و nitro compounds مثل :-



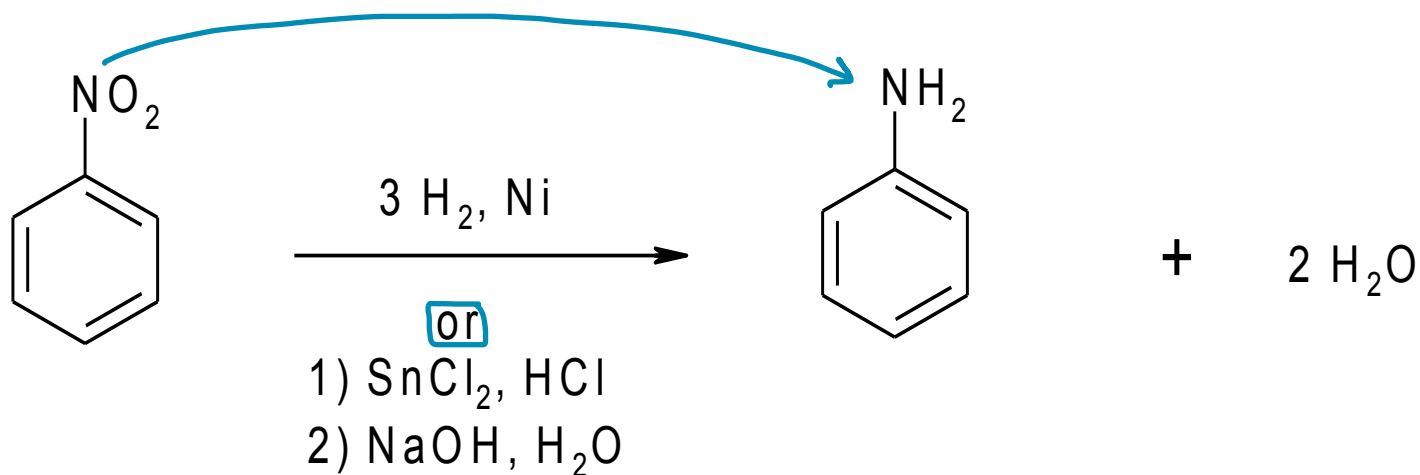
يمكن نستعمل واحد من هذين reagents
الأول بمرحلتين بخطوتين والثاني بخطوتين

Preparation of Amines

2. Reduction of nitro compounds:

(i) Aromatic nitro compounds, i.e.

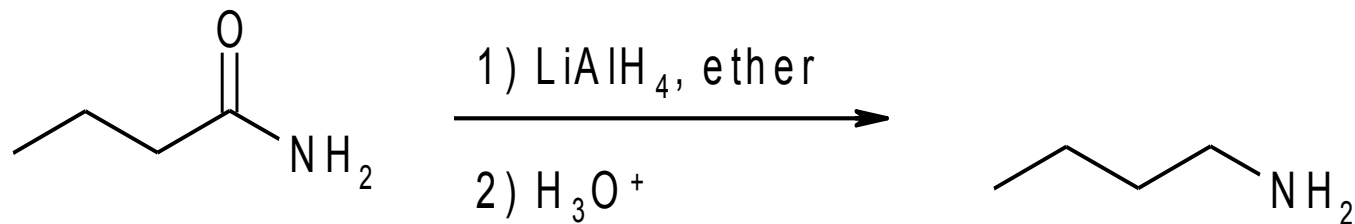
Reagents رکزواعلی



Preparation of Amines

2. Reduction of amides:

(ii) Amides, i.e.



بإعداد التفاعل بقدر أحرص على 3°, 2°, 1°
Amide

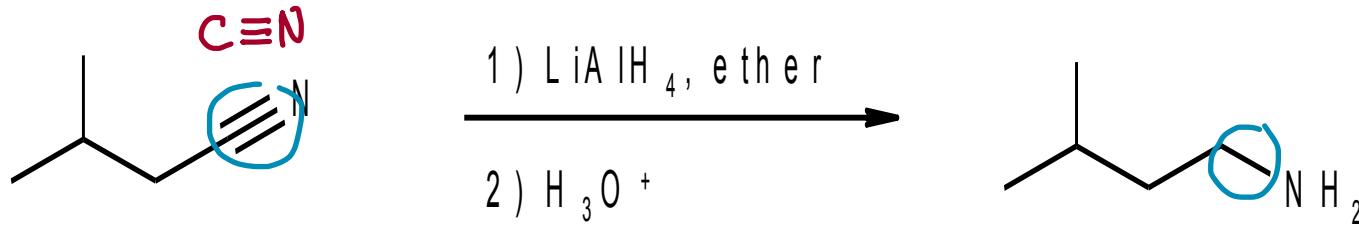
Works for 2° and 3° amides as well.

Preparation of Amines

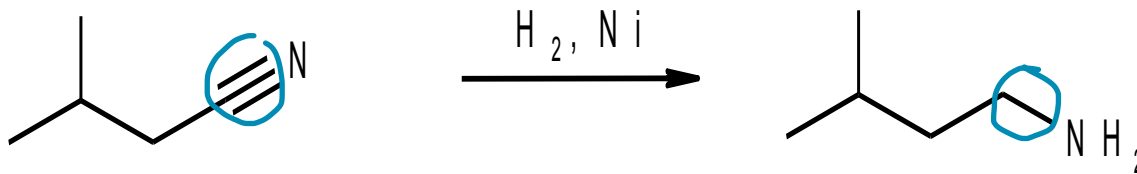
* رتروا بدراستيم هموضوع

2. Reduction of nitriles:

iii. Nitriles, i.e.



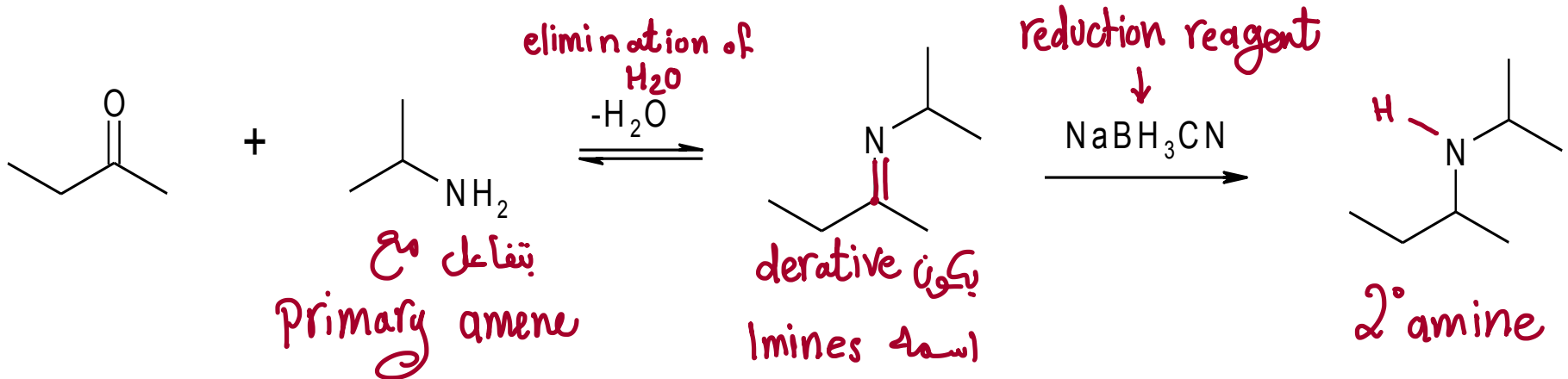
or reagent واحد من هون



Preparation of Amines

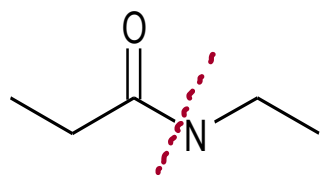
2. Reduction of carbonyl groups:

iv. Aldehydes and ketones, via the imine i.e.

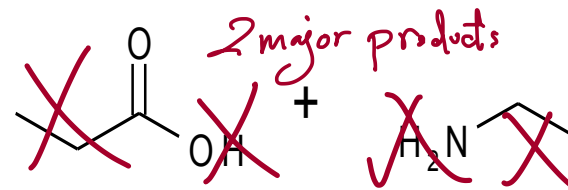
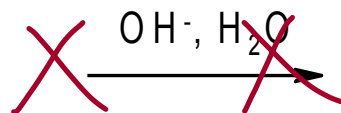
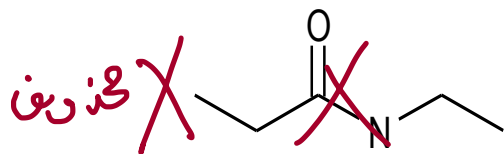
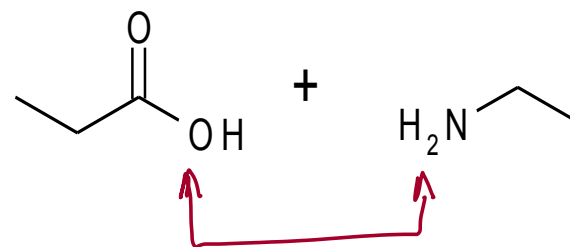
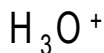


Preparation of Amines

3. *Hydrolysis of amides*: requires an acid or base catalyst, i.e.



acidic condition

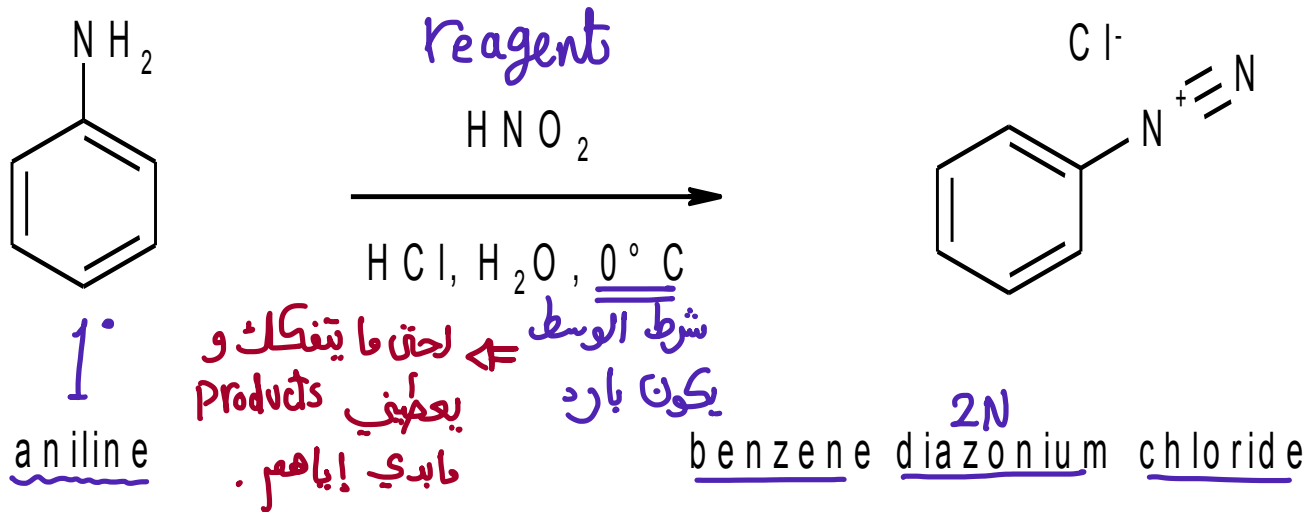


Record 22

20:17

Diazonium Compounds → ^{عملية تكوين} diazonium Salt

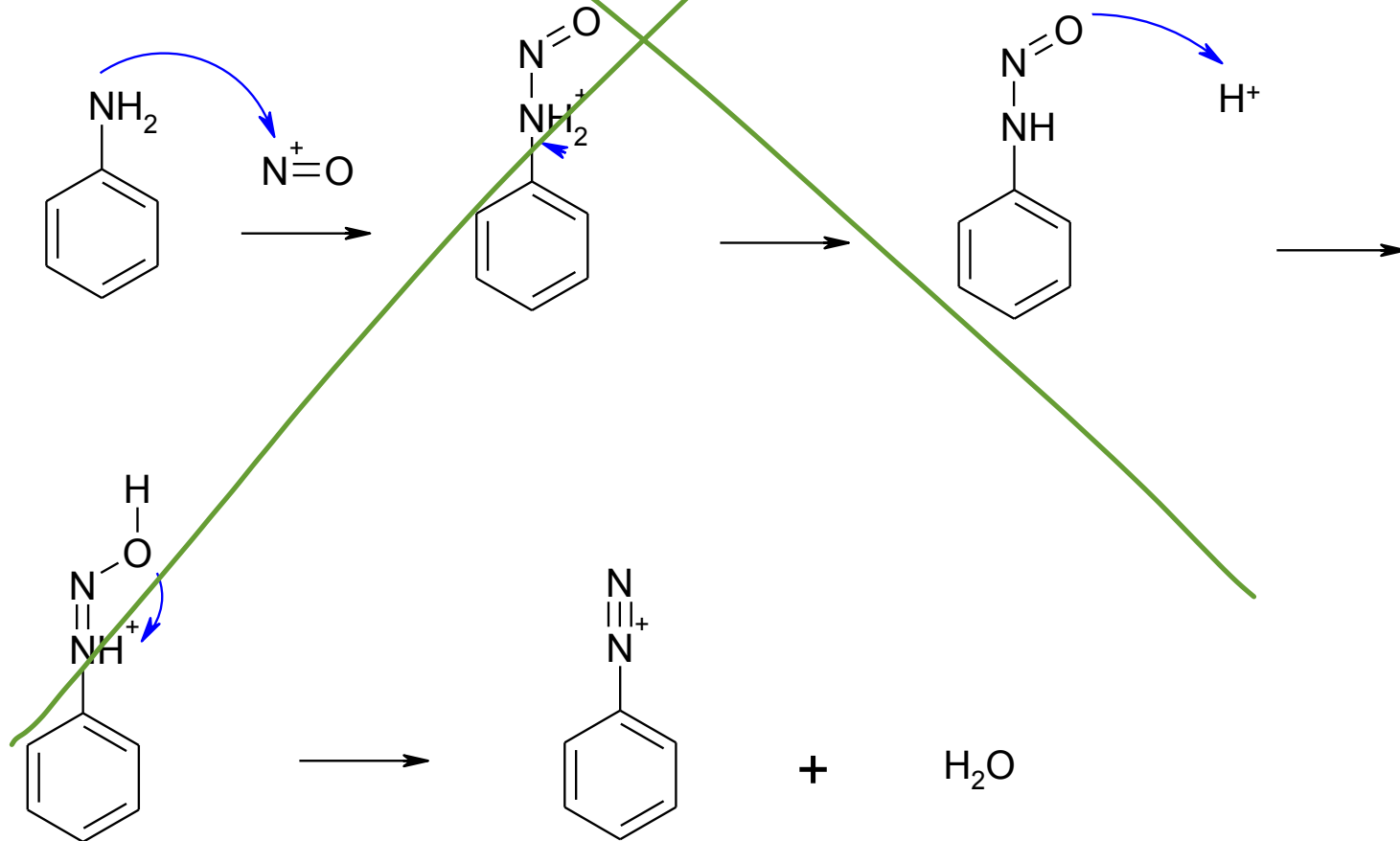
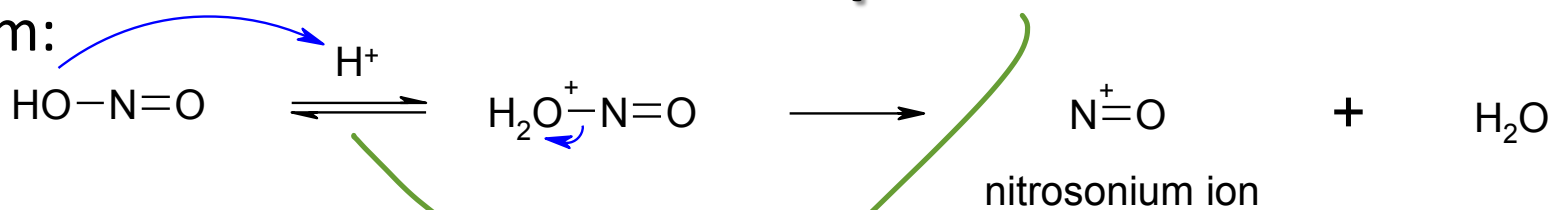
Diazonium compounds are very important in aromatic synthesis. The reaction allows for a direct nucleophilic substitution of the diazonium (N_2^+) group!



* The N_2 is a VERY good leaving group and reacts by direct nucleophilic substitution!

Diazonium Compounds

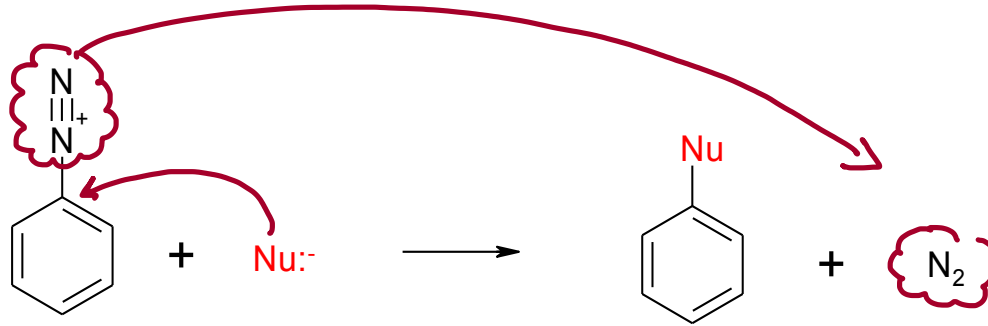
Mechanism:



Diazonium Compounds

تكون أهمية diazonium بأني بقدر أفعاله مع Nu مختلفة ، ابي حتحتاج وتطرح N_2 LG أو
يكون على هيئة gas .

Note: only 1° amines react this way, you need two H atoms on the N.

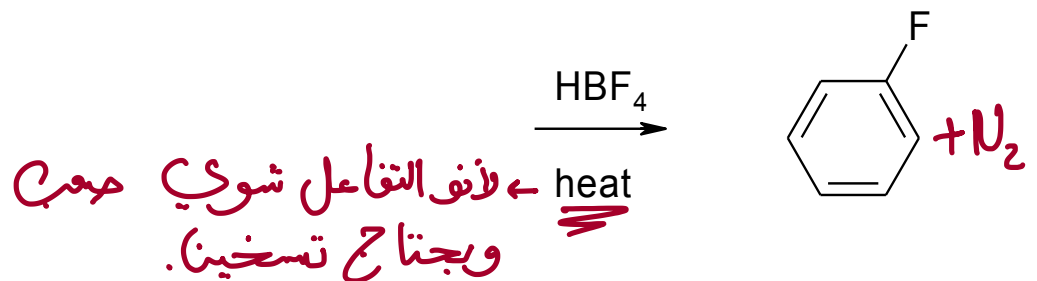
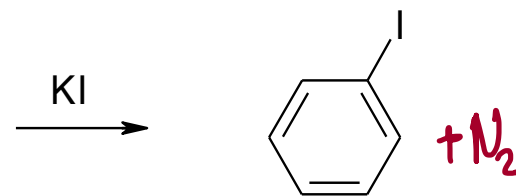
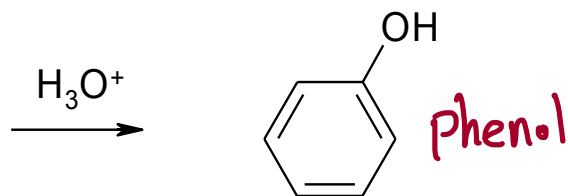
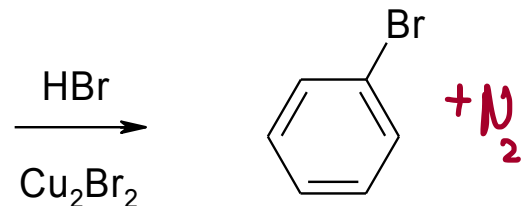
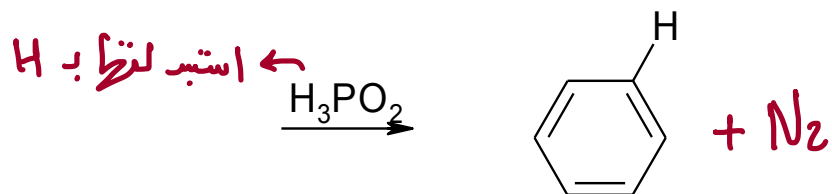
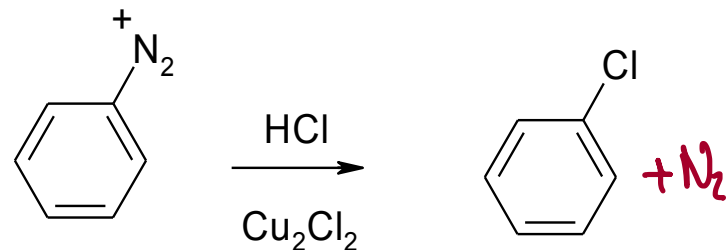
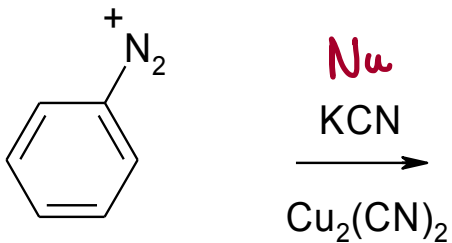


Note: Nu replace N₂, i.e. this is an SN type of reaction

* لازم یفل لتحت 5c° .

Diazonium Compounds

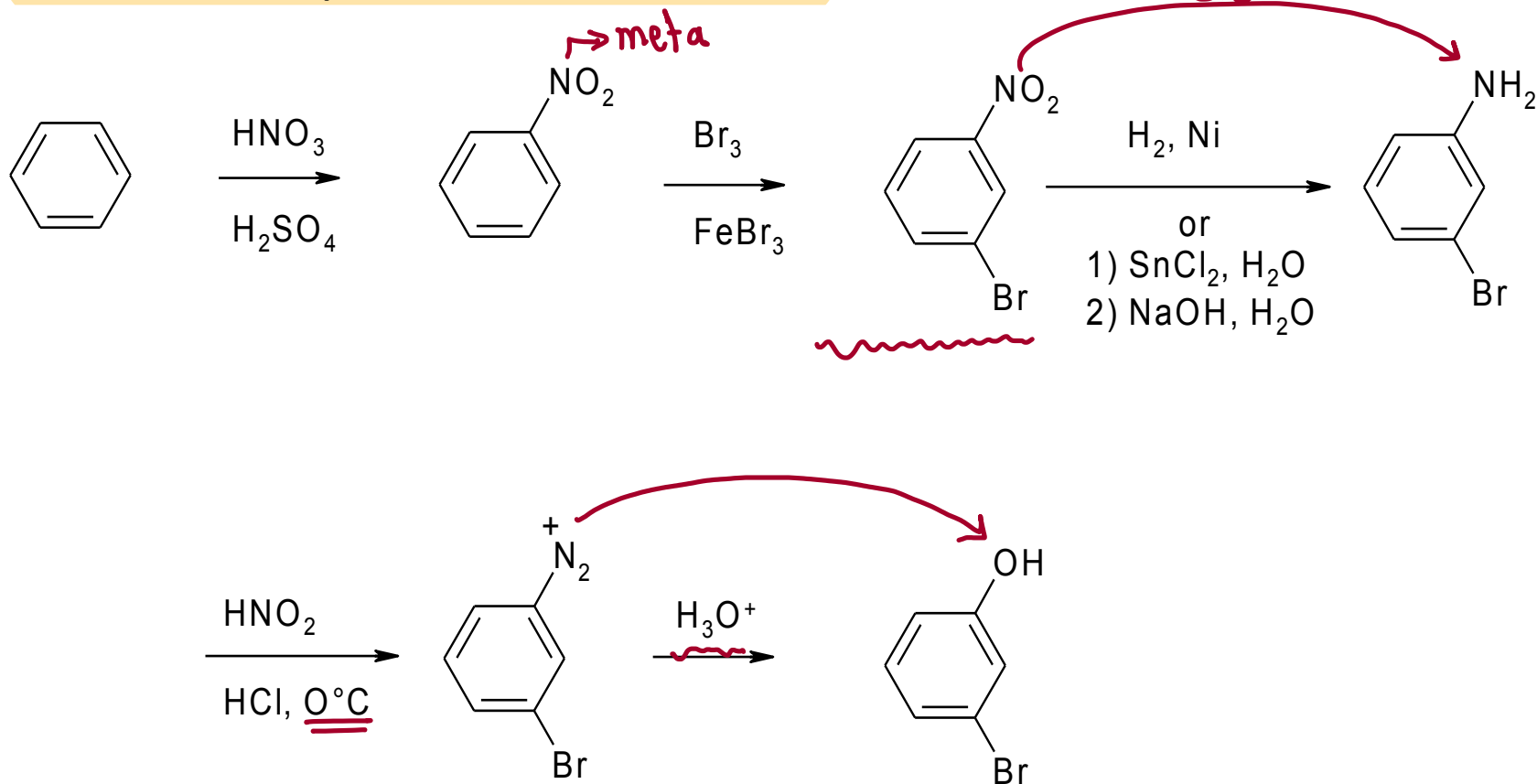
Eg.



Diazonium Compounds

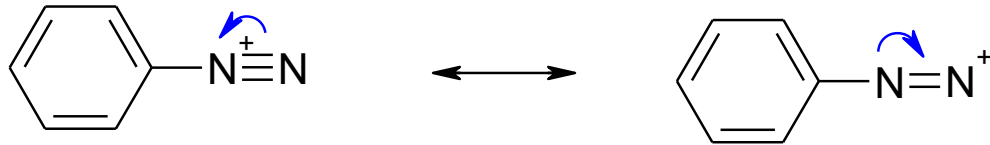
شرحناہ 4 Chapter + ہاڈ التثابتر

This allows more flexibility in making poly substituted aromatic, i.e. m-bromophenol from benzene

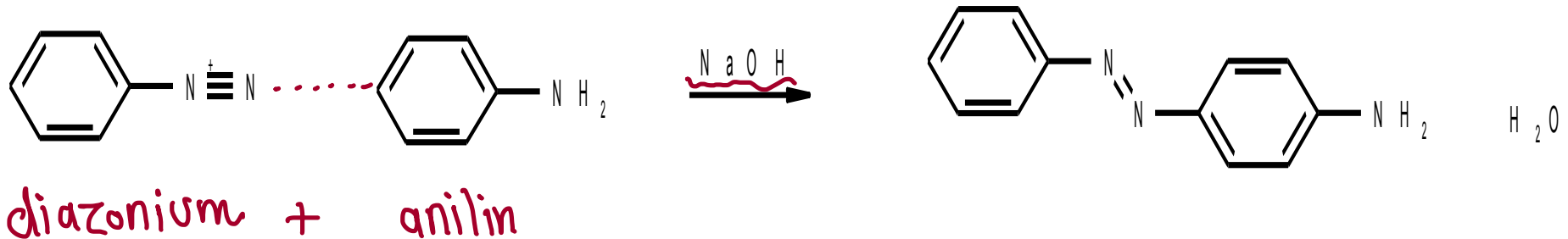


Diazo Coupling

Diazonium ions are electrophiles, i.e.



They will react with strongly activated aromatics (i.e. phenols or anilines), i.e.





Diazo Coupling

Normally get para, but ortho can occur if the para site is blocked by a substituent.

The diazo (-N=N-) group provides for a π system to “bridge” the two aromatic rings.

The large extended π system can absorb light in the visible region, especially if there are charged groups on the ends.

Key use: as dyes as they can be highly colored, and acid/base indicators if they are pH sensitive.