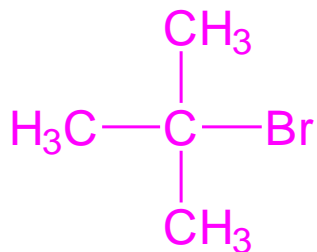


HALOGENI DERIVATI UGLJOVODONIKA

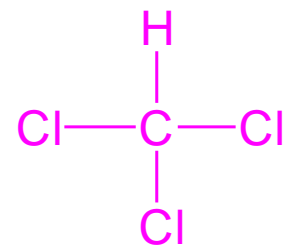
Nomenklatura:



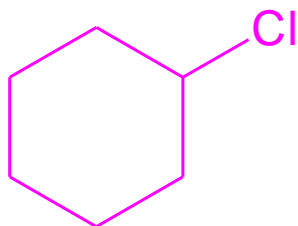
terc-butilbromid ili
2-brom-2-metilpropan



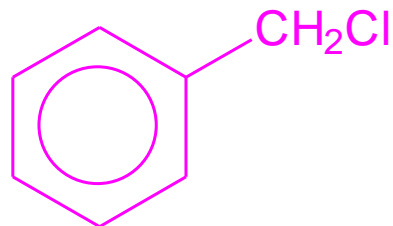
alilbromid ili
3-brompropen



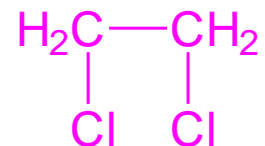
trihlormetan ili
hloroform



cikloheksilhlorid



benzilhlorid
hlorfenilmetan

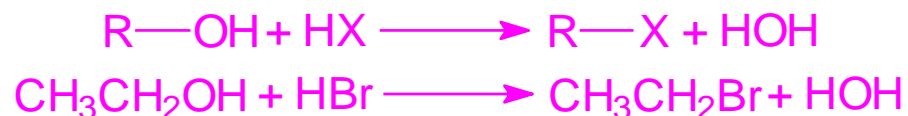


etilendihlorid i
etilehlorid ili
1,2-dihloretan

ALKILHALOGENIDI

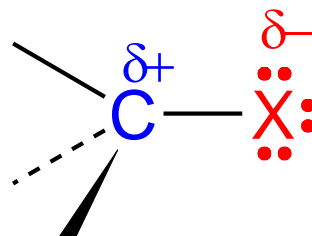
Dobijanje:

1. Halogenovanjem ugljovodonika
2. Adicijom halogena i halogenovodonika na alkene i alkinе
3. Reakcijom supstitucije iz alkohola

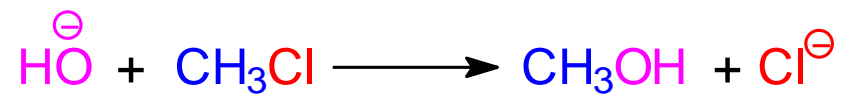


REAKCIJE ALKILHALOGENIDA

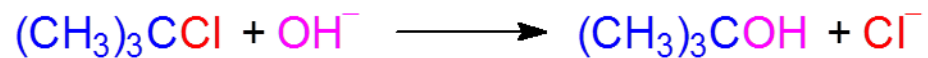
Polarni karakter C-X veze u molekulu alkilhalogenida:



S_N2 reakcija



S_N1 reakcija

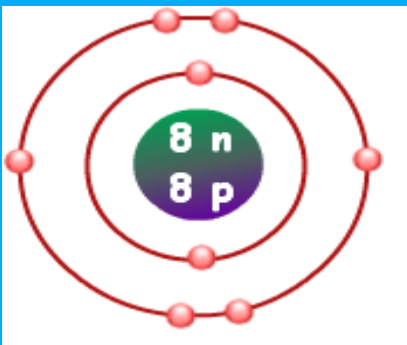


Metil- i 1° R–X uopšte ne reaguju po S_N1 mehanizmu!

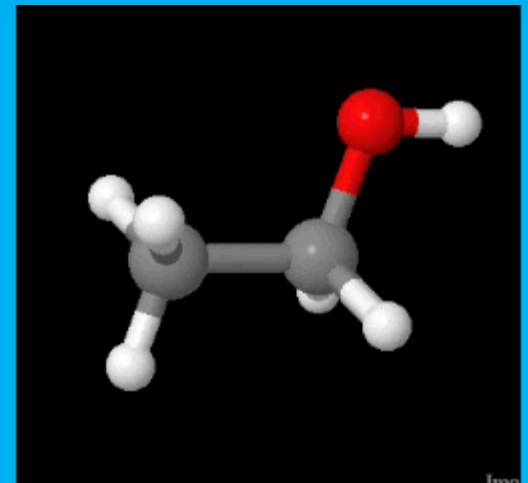
ORGANSKA JEDINJENJA KISEONIKA

OKSI DERIVATI

- Alkoholi su hidroksi (oksi) derivati ugljovodonika koji sadrže OH grupa kao funkcionalnu grupu.



Atom kiseonika



Etanol

NOMENKLATURA ALKOHOLA



metil-alkohol ili metanol



etil-alkohol ili etanol



n-propil-alkohol ili 1-propanol



izopropil-alkohol ili 2-propanol



n-butil-alkohol ili 1-butanol



sec-butil-alkohol ili 2-butanol



n-amil-alkohol ili 1-pentanol



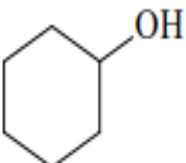
n-heksil-alkohol ili 1-heksanol

Podela alkohola:

1. Prema ugljovodoničnom nizu, za koji je vezana -OH grupa, alkoholi se dele na:

a) zasiceni $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ 1-propanol

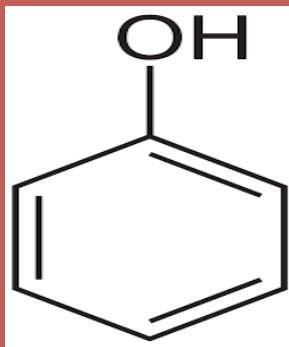
b) nezasiceni $\text{H}_2\text{C}=\text{CH}-\underset{\text{OH}}{\text{CH}_2}$ 2-propen-1-ol
(alil-alkohol)

c) ciklicni  cikloheksanol

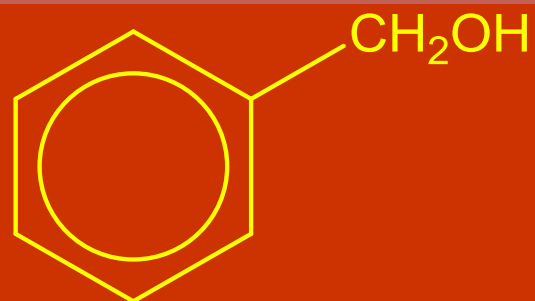
ALKANOLI

ALKENOLI I ALKINOLI

d)



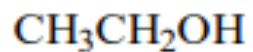
fenol



benzil-alkohol (alkohol)

Prema broju -OH grupa, alkoholi se dele na:

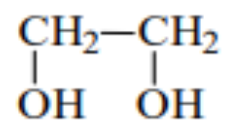
a) monohidroksilni



etanol

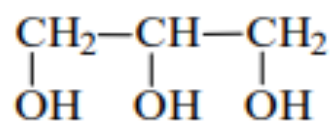
b) polihidroksilni

1) dvohidroksilni



1,2-etandiol
(etilen-glikol)

2) trohidroksilni



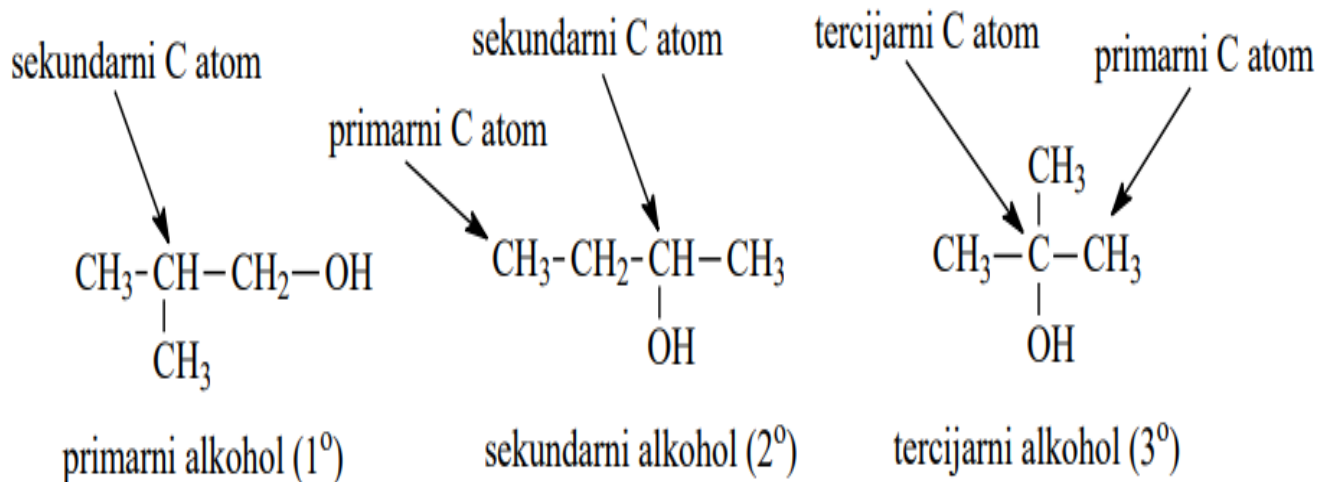
1,2,3-propantriol
(glicerol, glicerin)

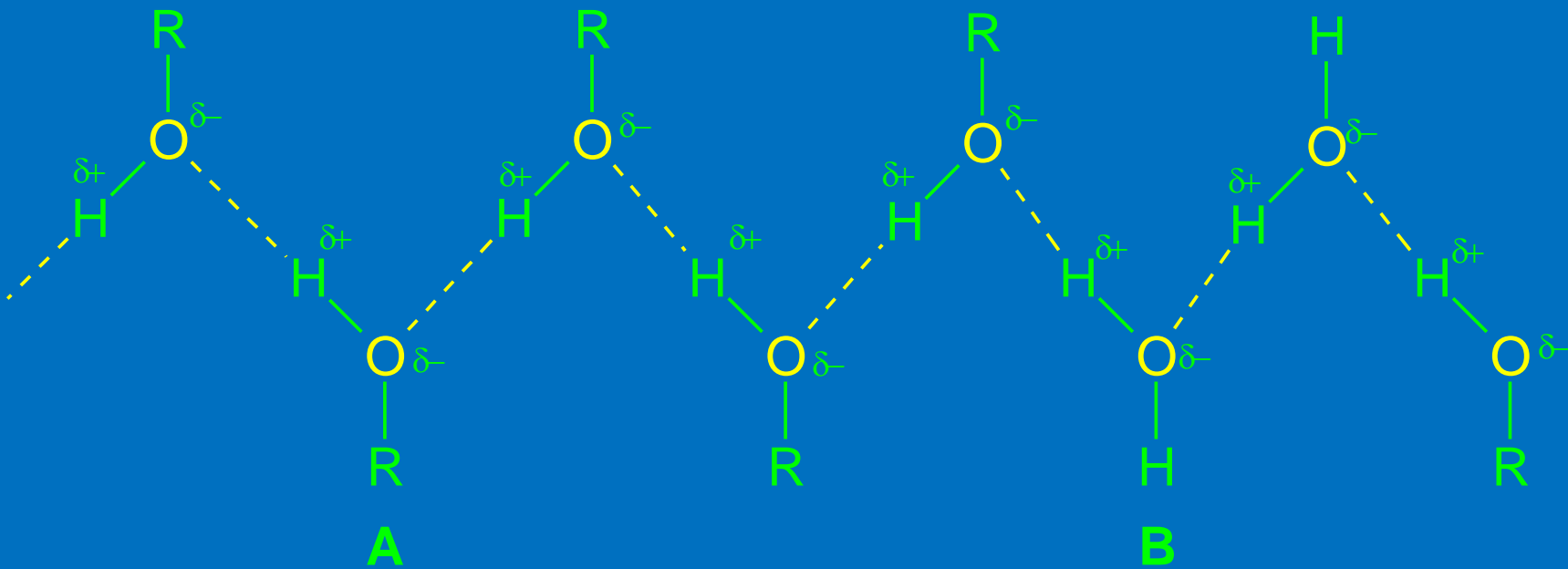
Prema položaju C-atoma za koji je vezana -OH grupa, alkoholi mogu biti:

a) primarni $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ 1-butanol

b) sekundarni $\text{CH}_3\text{CH}_2\underset{\text{OH}}{\text{CH}}\text{CH}_3$ 2-butanol

c) tercijarni $\text{CH}_3\text{CH}_2\underset{\text{OH}}{\overset{\text{CH}_3}{\text{C}}}\text{CH}_3$ 2-metil-2-propanol





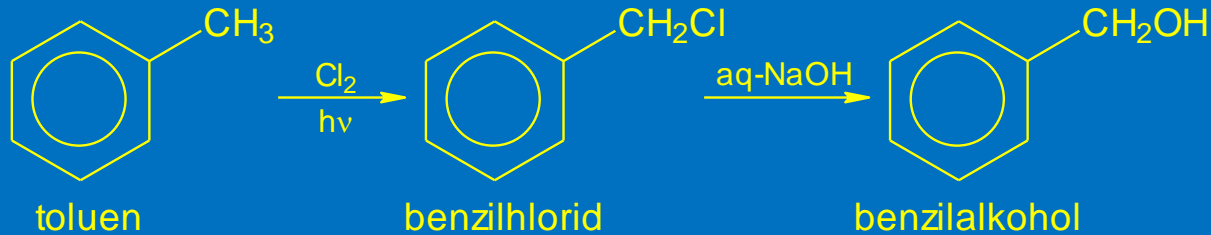
Vodonično vezivanje (A) kod alkohola i (B) između alkohola i vode

DOBIJANJE ALKOHOLA

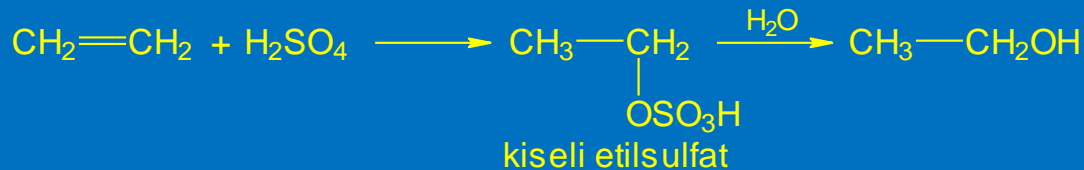
1. Dobijanje alkohola hidrolizom halogenalkana



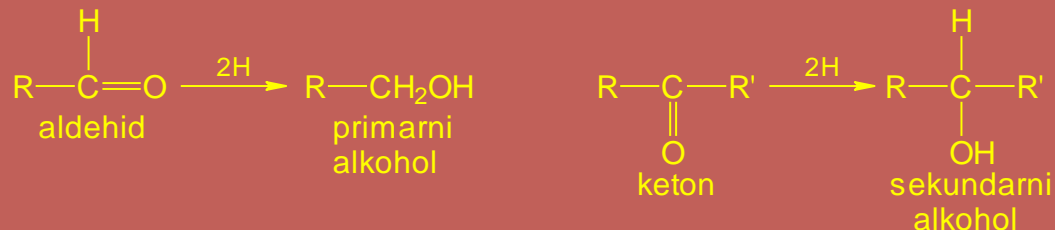
Dobijanje alkohola iz alkilhalogenida:



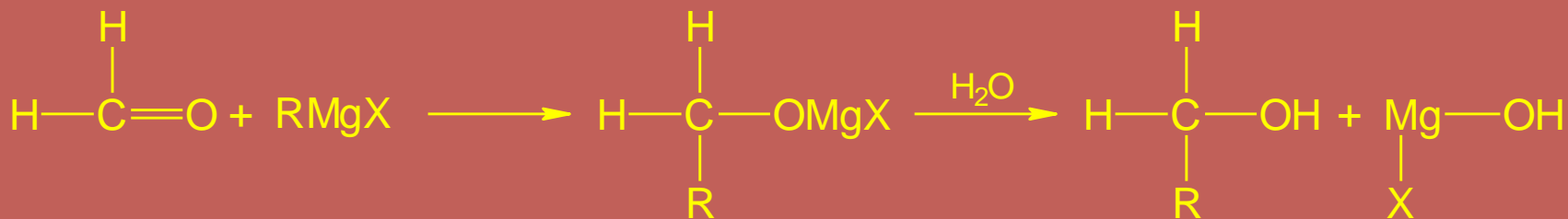
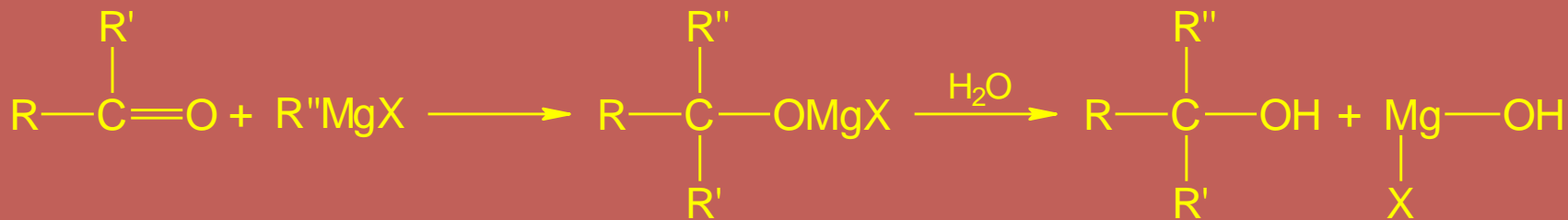
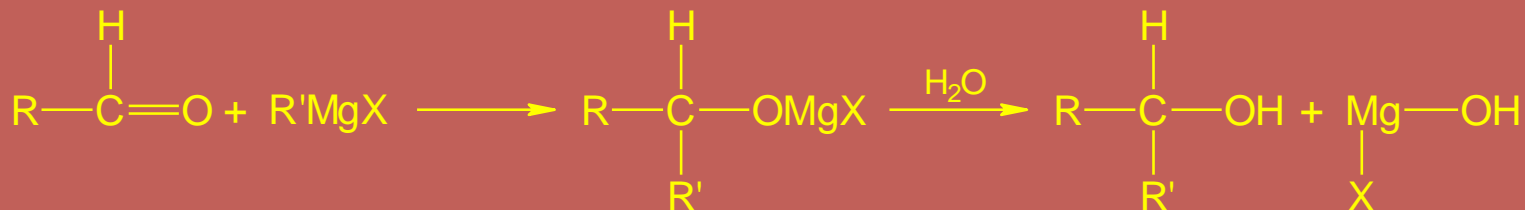
2. Dobijanje alkohola hidratacijom alkena:



3. Dobijanje alkohola hidrogenovanjem karbonilnih jedinjenja:

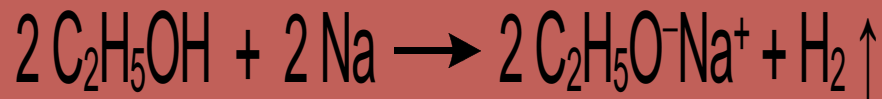
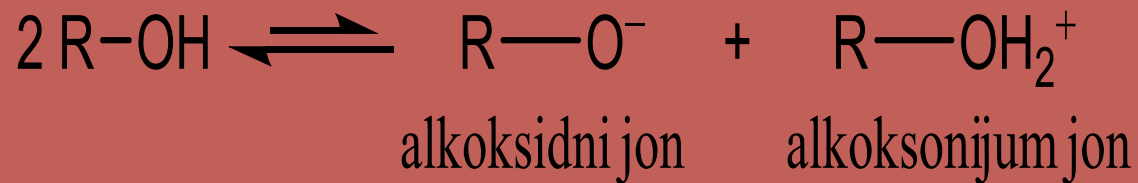


4. Dobijanje alkohola reakcijom Grinjar-ovih jedinjenja sa karbonilnim jedinjenjima:

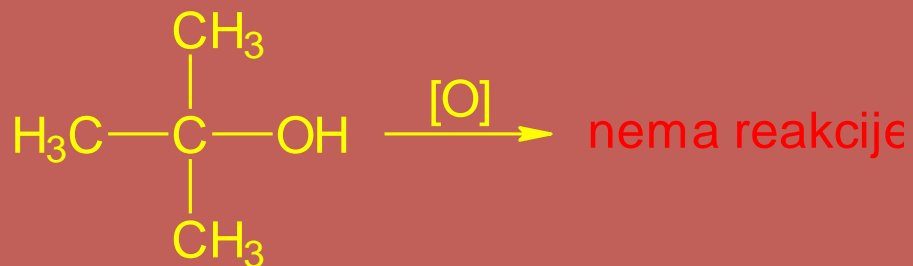
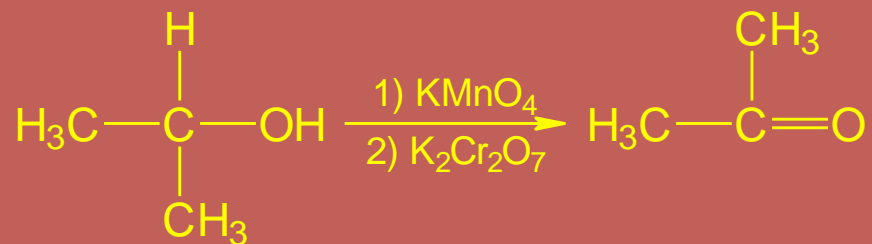
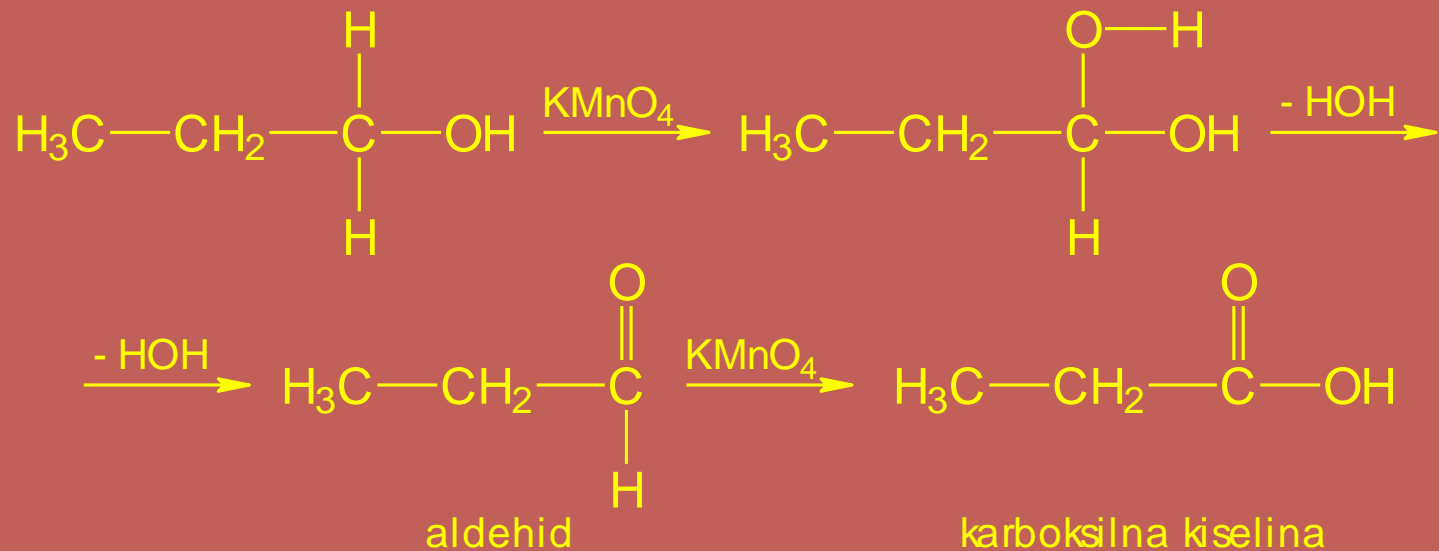


HEMIJSKE OSOBINE ALKOHOLA

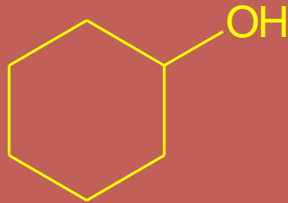
1. Kiselost i baznost alkohola:



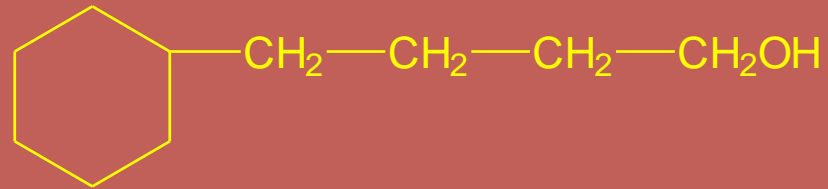
2. Reakcija oksidacije alkohola:



ALICIKLIČNI ALKOĦOLI (CIKLOALKANOLI I CIKLOALKENOLI)

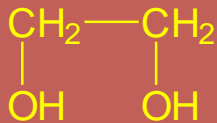


cikloheksanol

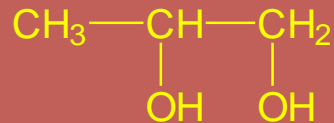


4-cikloheksil-1-butanol

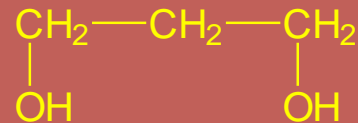
DIOLI



glikol
etilenglikol
1,2-etandiol



propilenglikol
1,2-propandiol

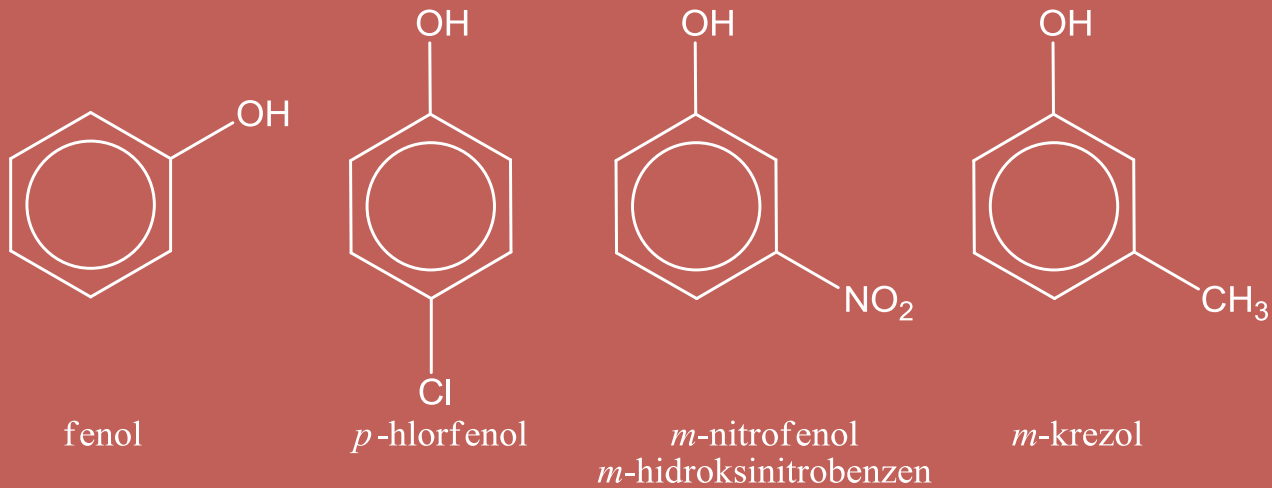


trimetilenglikol
1,3-propandiol

ARENOLI (FENOLI)

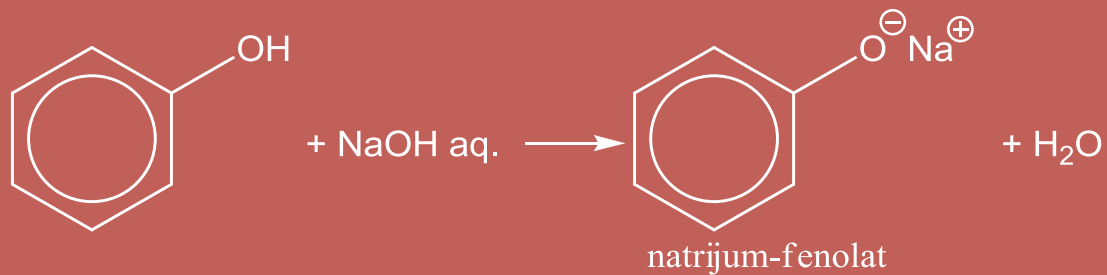
Sve OH grupe su vezane direktno za aromatično jezgro.

Nomenklatura



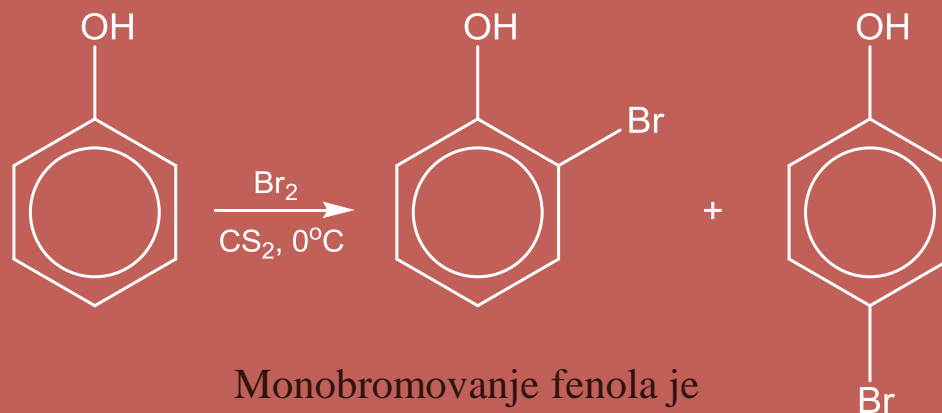
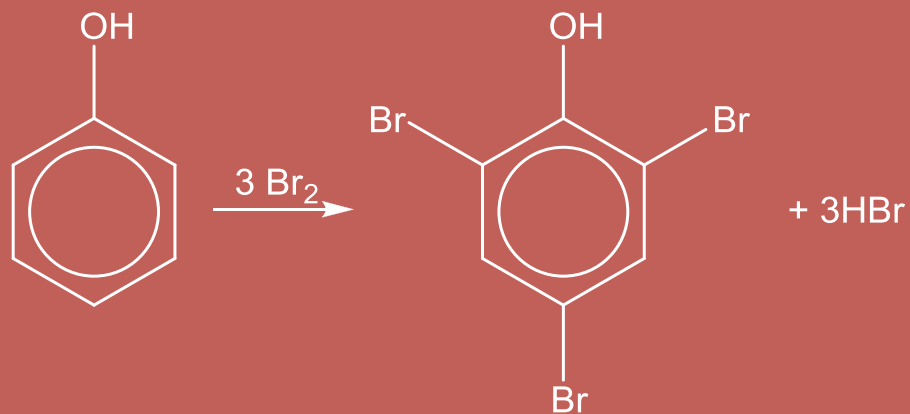
Kiselost i baznost fenola:

Fenoli su kiseliji od alkohola



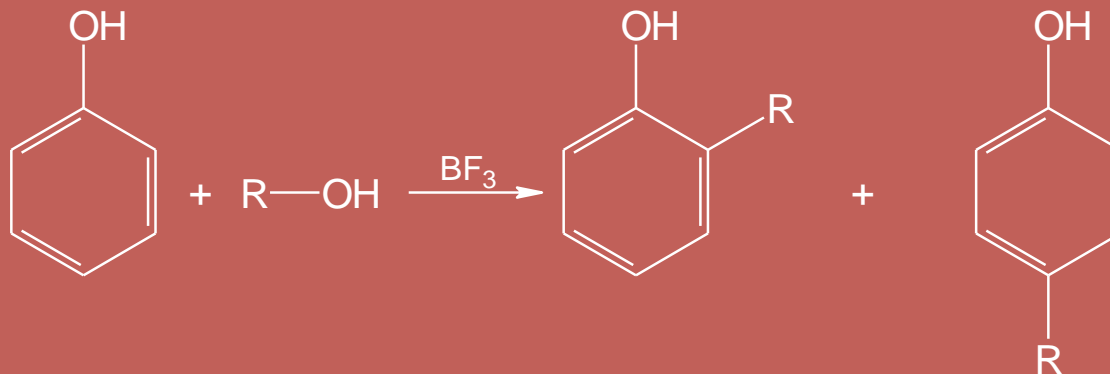
Reakcija elektrofilne aromatične supstitucije kod fenola:

Do bromovanja dolazi u vodi kao rastvaraču, na 20° C – brom se uvodi u sva tri raspoloživa položaja.

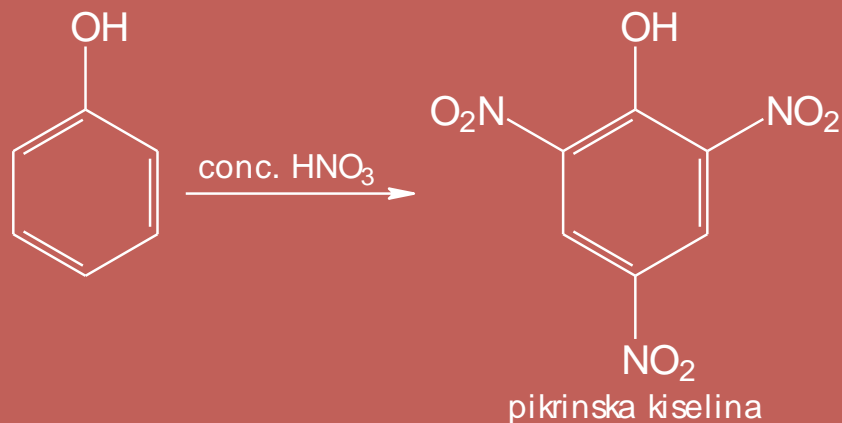
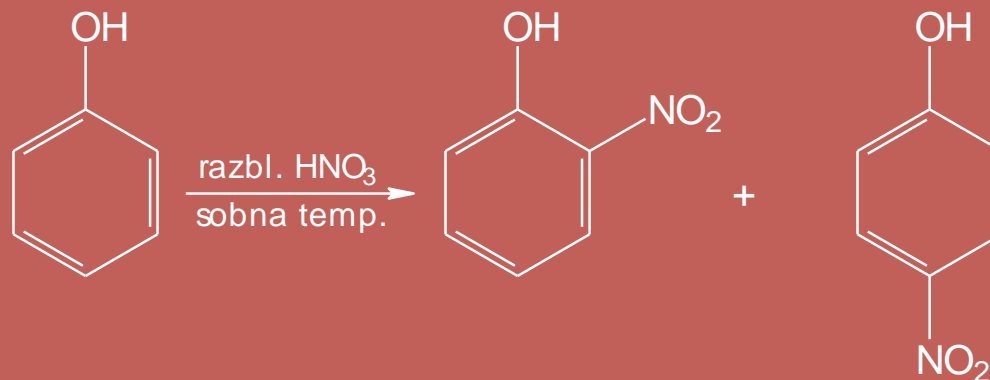


Monobromovanje fenola je moguće ukoliko se reakcija izvodi u ugljen-disulfidu, na 0° C.

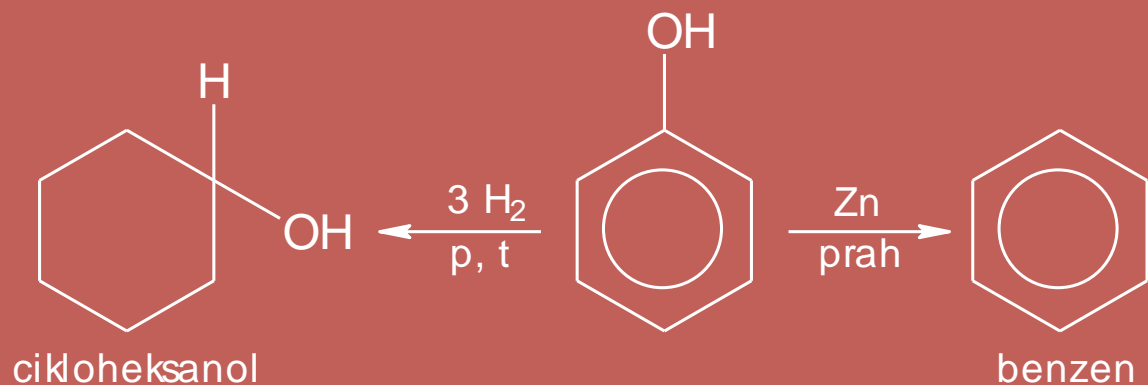
Alkilovanje fenola alkoholima i alkenima u prisustvu Luisovih kiselina:



Nitrovanje fenola:

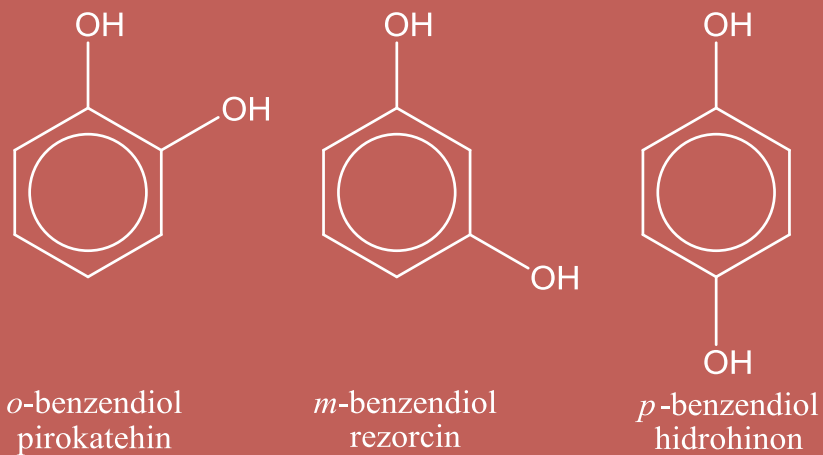


Reakcija hidrogenovanja fenola:



ARENOLI I ARENTRIOLI

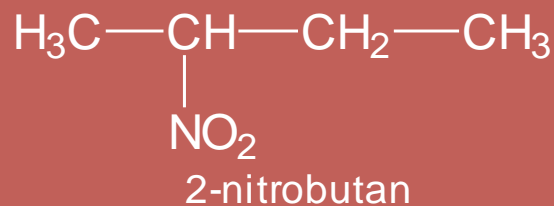
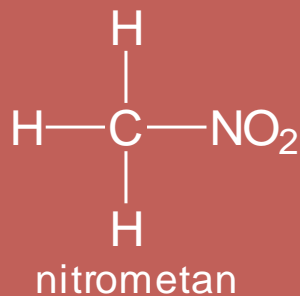
Dihidroksibenzeni:



ORGANSKA JEDINJENJA AZOTA

Nitro jedinjenja

Nomenklatura:

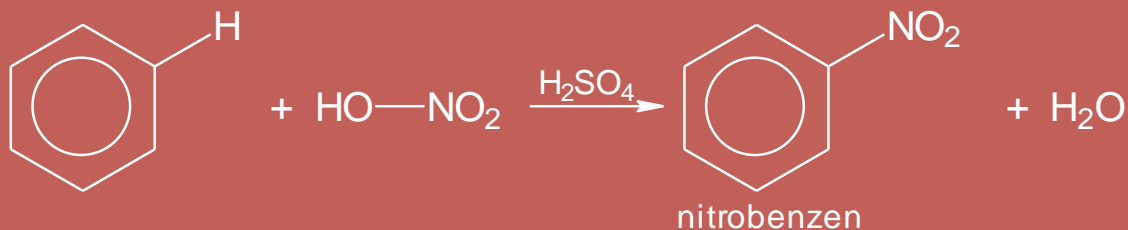


Hemijske osobine nitroalkana

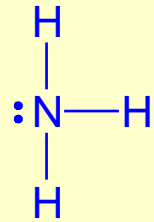
Reakcija redukcije nitroalkana:



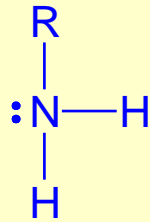
Dobijanje nitroarena nitrovanjem arena



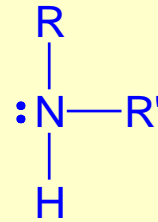
AMINI



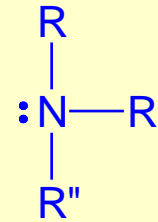
amonijak



primarni amin

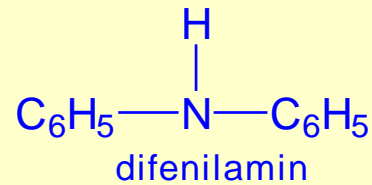
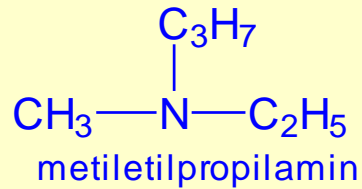
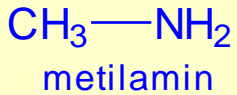


sekundarni amin

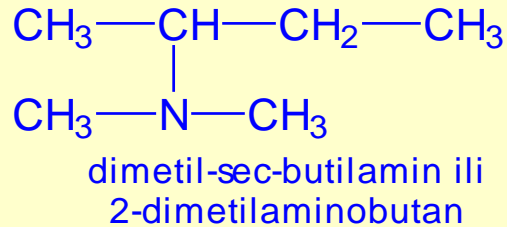
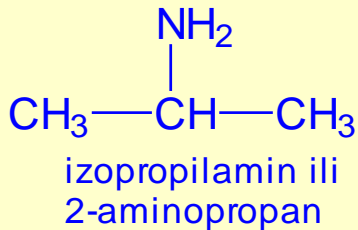


tercijarni amin

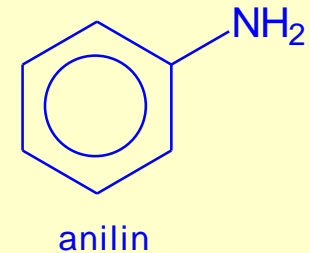
NOMENKLATURA AMINA



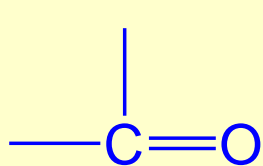
Nazivi primarnih amina:



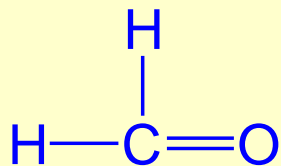
Nazivi aromatičnih amina:



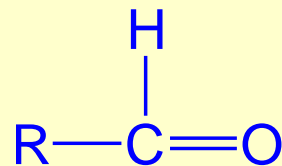
KARBONILNA JEDINJENJA



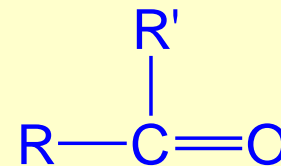
krabonilna grupa



formaldehid



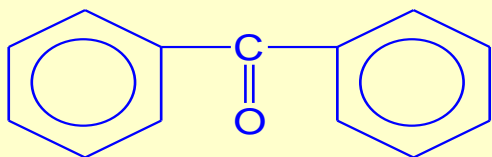
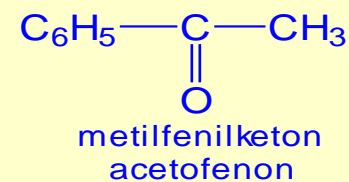
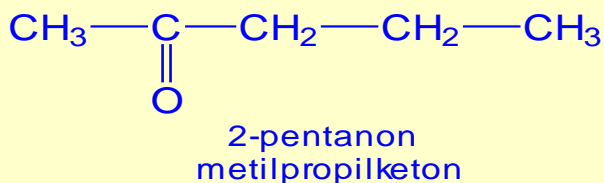
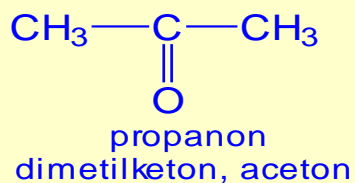
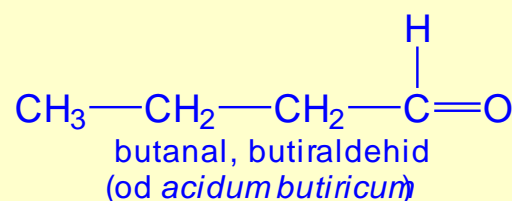
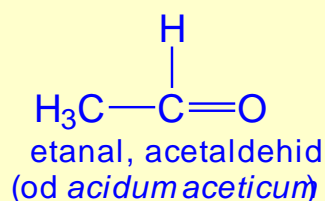
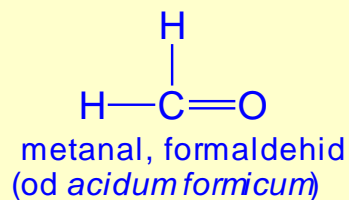
aldehid



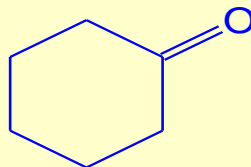
keton

ALDEHIDI I KETONI

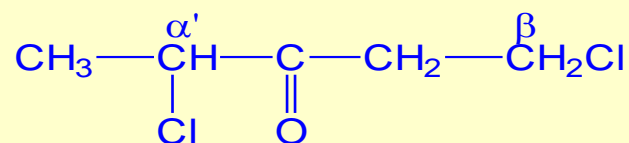
Nomenklatura aldehida i ketona



difenilketon



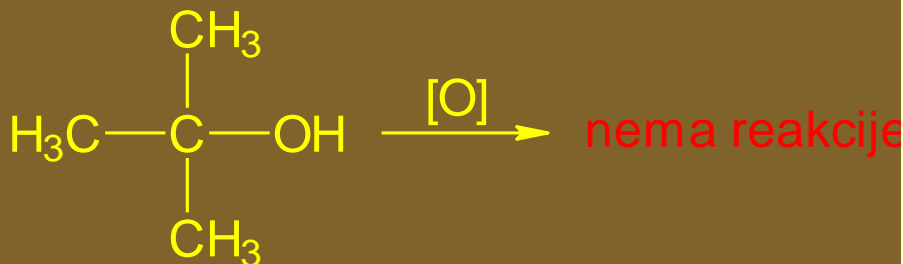
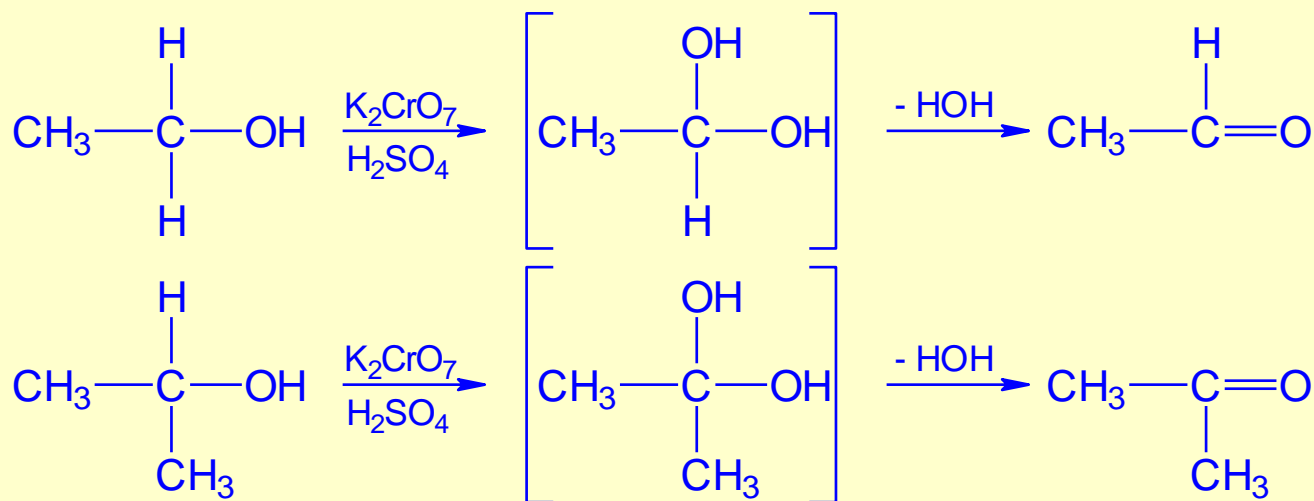
cikloheksanon



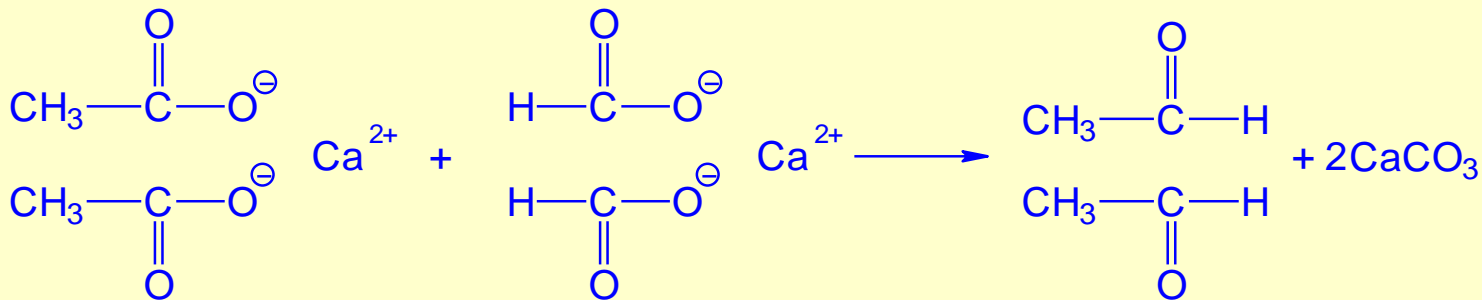
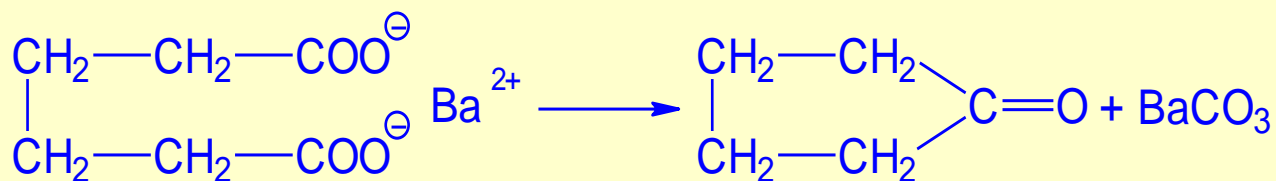
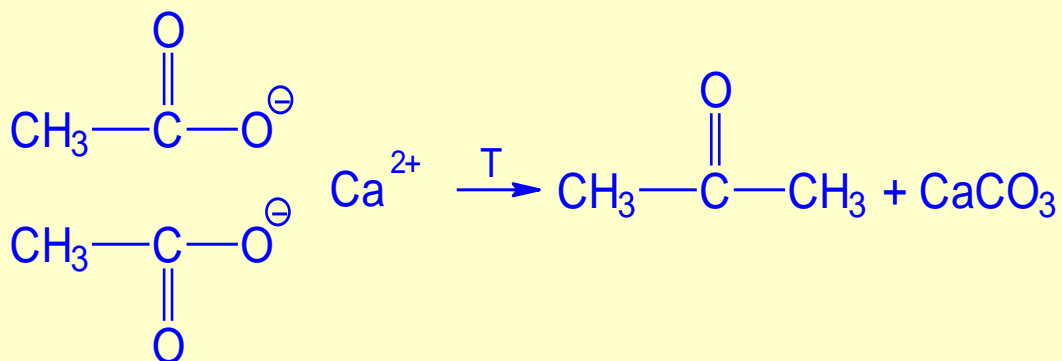
α' , β -dihlordietilketon

Načini dobijanja aldehida i ketona

Dobijanje aldehida i ketona oksidacijom alkohola:

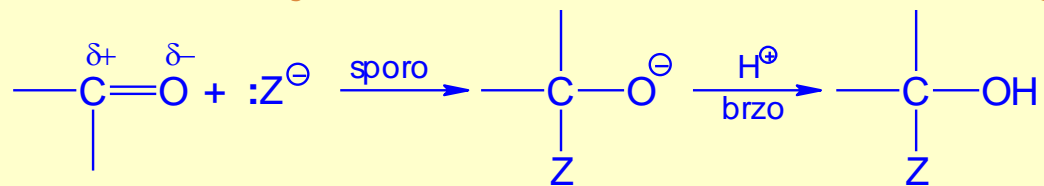


Dobijanje aldehida i ketona pirolizom soli karbonskih kiselina:

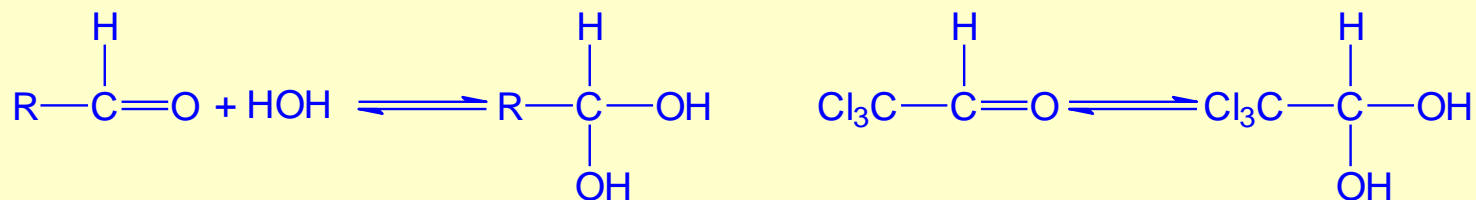


Hemijske reakcije aldehida i ketona

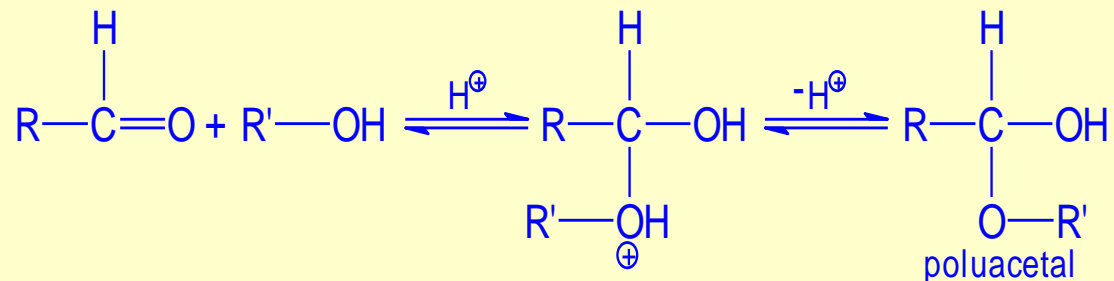
A. Reakcija nukleofilne adicije na dvostruku vezu karbonilne grupe:



1. Adicija vode:

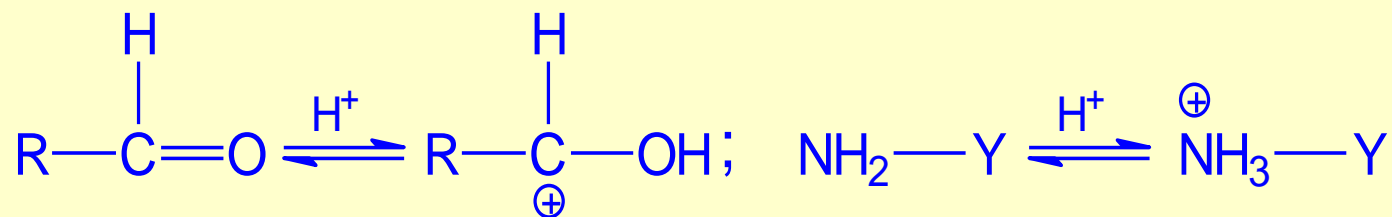
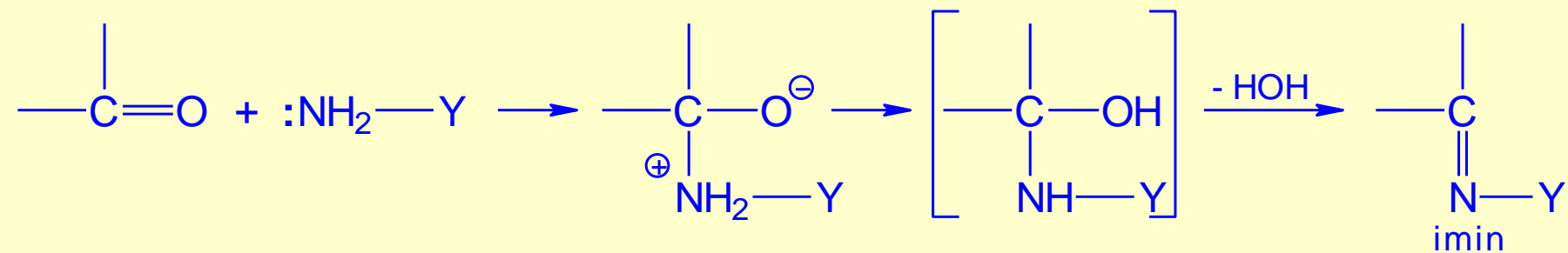


2. Adicija alkohola:

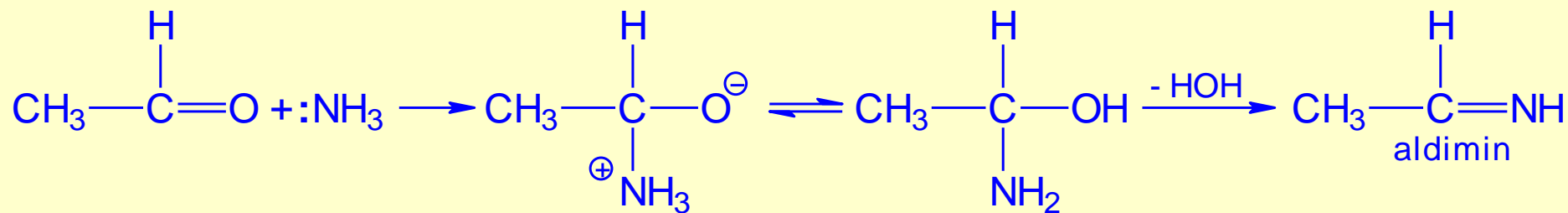


B. Reakcije supstitucije atoma kiseonika karbonilne grupe

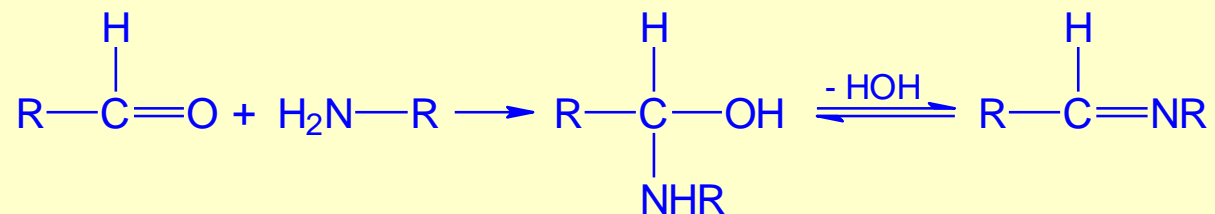
1. Reakcije sa jedinjenjima koja sadrže NH₂ grupu:



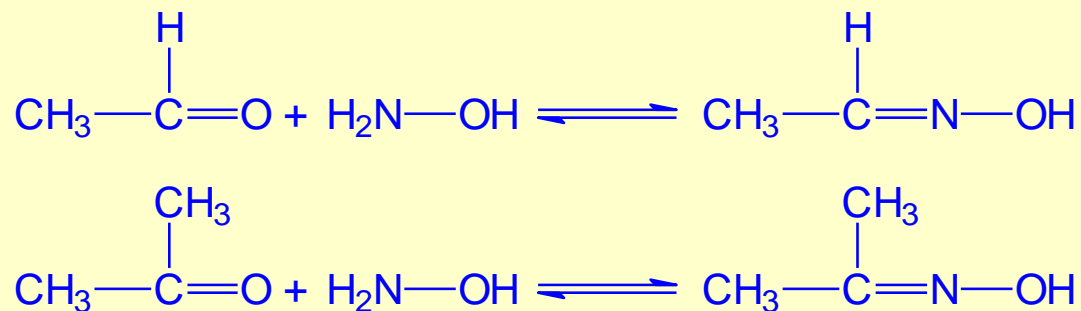
a) Reakcija sa amonijakom:



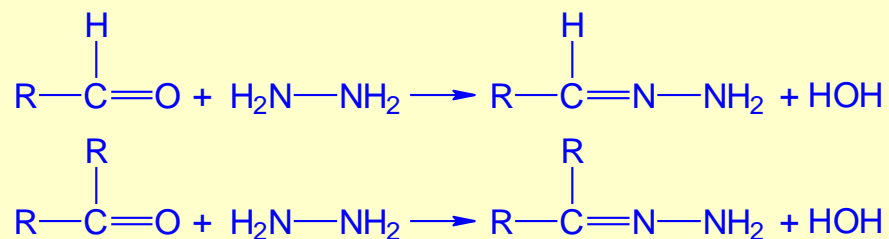
b) Reakcija sa primarnim aminima:



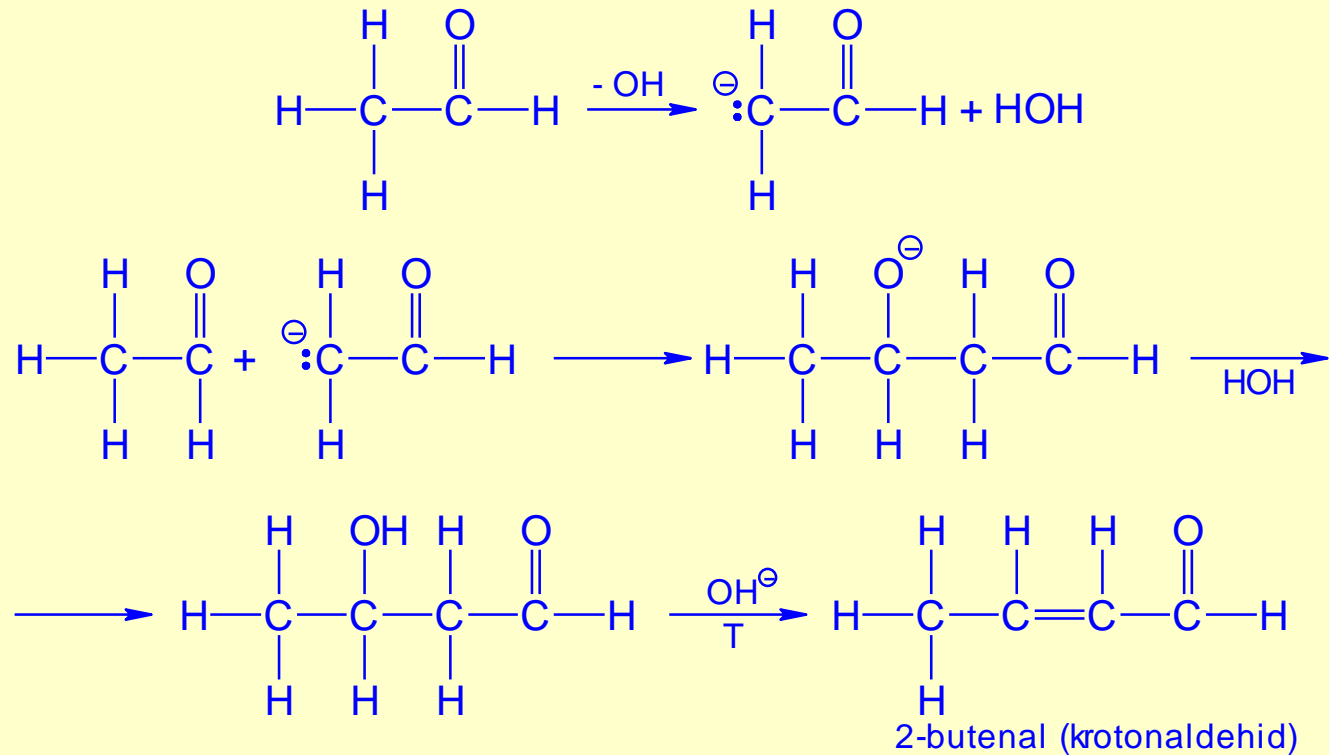
c) Reakcija sa hidroksilaminom:



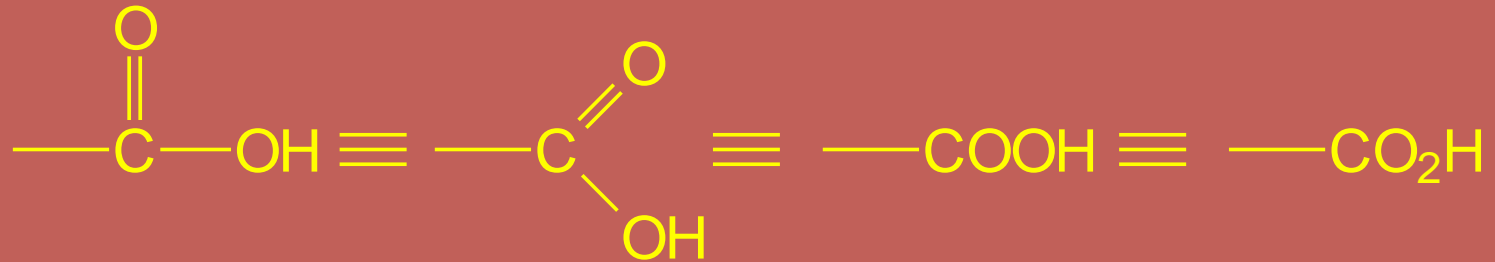
d) Reakcija sa hidrazinom:



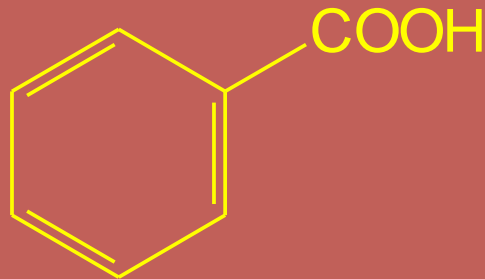
Kondenzacija između dva molekula aldehida (aldolna ili krotonska kondenzacija):



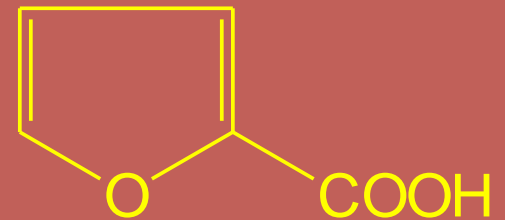
KARBOKSILNE KISELINE



Alifatična karboksilna
kislina

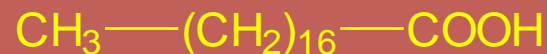
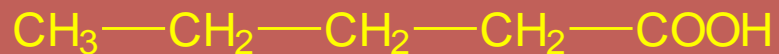


Aromatična karboksilna
kislina

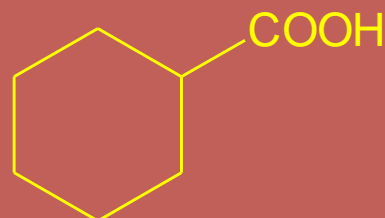
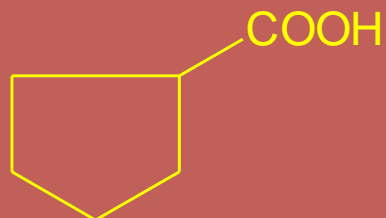


Heterociklična karboksilna
kislina

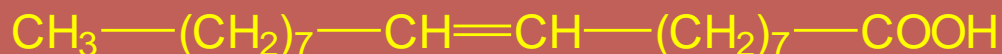
Alifatične kiseline sa normalnim nizom (masne kiseline):



Naftenske kiseline:



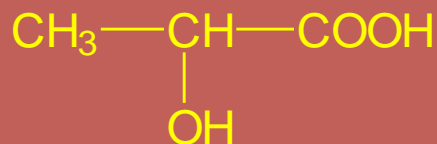
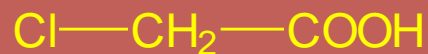
Nezasićene karboksilne kiseline:



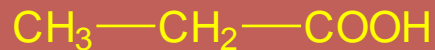
Mono-, di- i polikarboksilne kiseline:



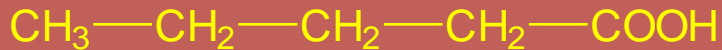
Supstituisane karboksilne kiseline:



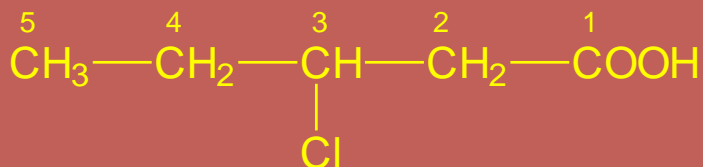
NOMENKLATURA ZASIĆENIH KARBOKSILNIH KISELINA



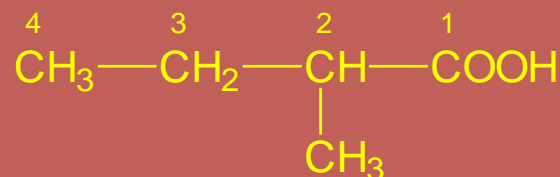
Propanska kiselina



Pentanska kiselina



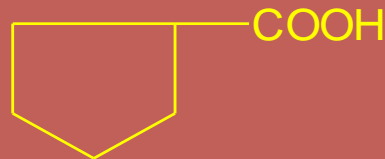
3-Hlorpentanska kiselina



2-Metilbutanska kiselina



1,3-Propandikarbonska kiselina
(1,5-Pentan-dikiselina)



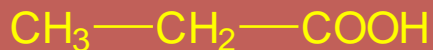
Ciklopentankarbonska kiselina



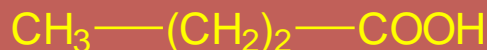
Mravlja kiselina



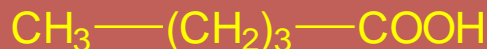
Sirćetna kiselina



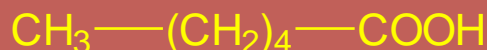
Propionska kiselina



Buterna kiselina

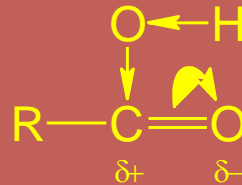


Valerijanska kiselina

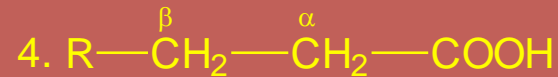
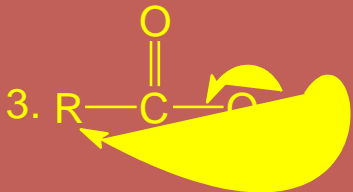
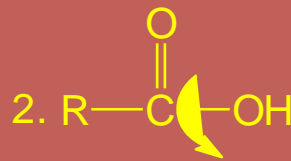
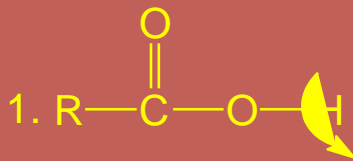


Kaprnska kiselina

HEMIJSKE OSOBINE ALIFATIČNIH ZASIĆENIH MONOKARBONSKIH KISELINA



Reakcije:



Rezimirajući sve reakcije karbonskih kiselina one se mogu podeliti na:

1. Reakcije kod kojih se raskida O-H veza;
2. Reakcije na karbonilnom C-atomu;
3. Reakcija dekarboksilacije i
4. Reakcije u ugljovodničnom ostatku.

1. Kiselist karbonskih kiselina:



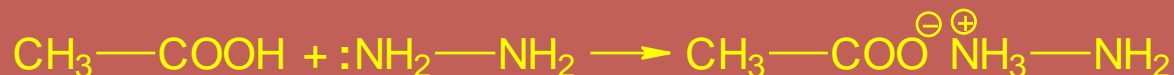
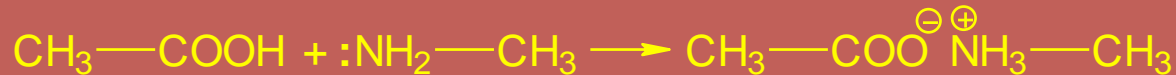
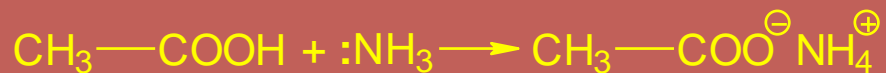
a) Reakcija sa metalima:



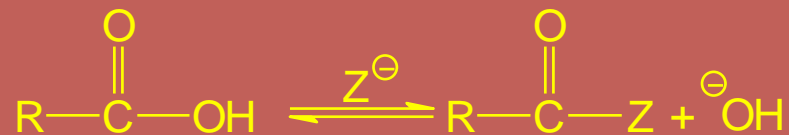
b) Reakcija sa hidroksidima metala:



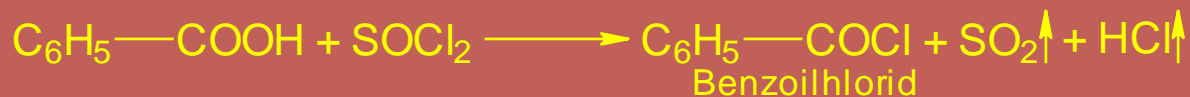
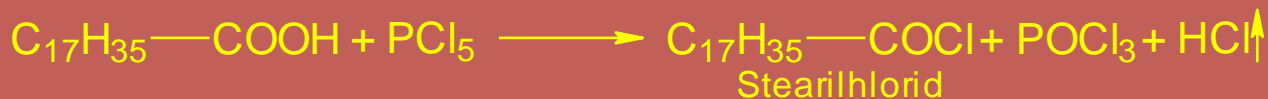
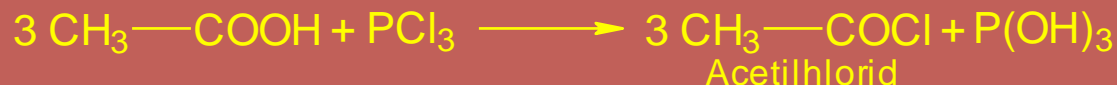
d) Reakcija sa amonijakom i njegovim derivatima:



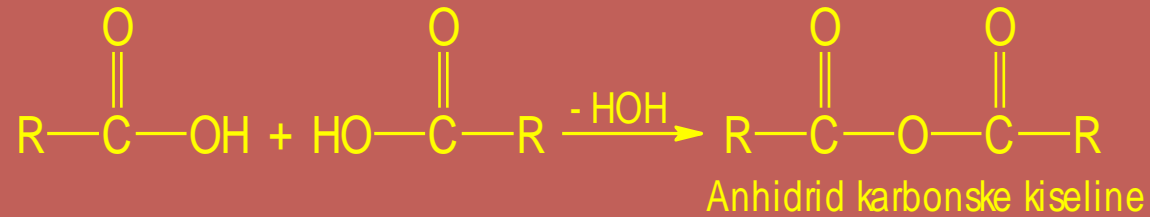
2. Konverzija karbonskih kiselina u derivate kiselina.



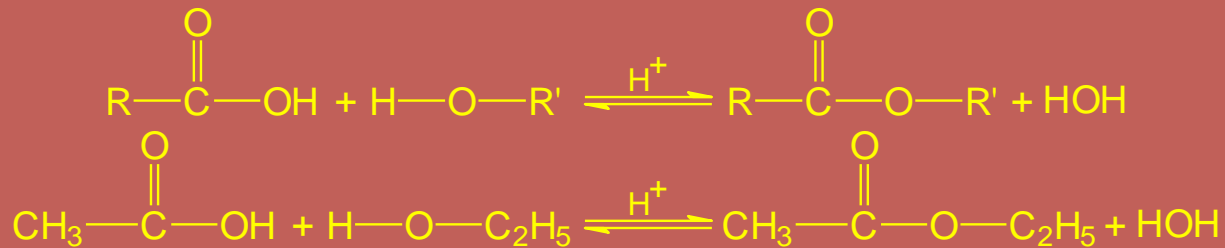
a) Konverzija u hloride kiselina:



b) Konverzija u anhidride kiselina:



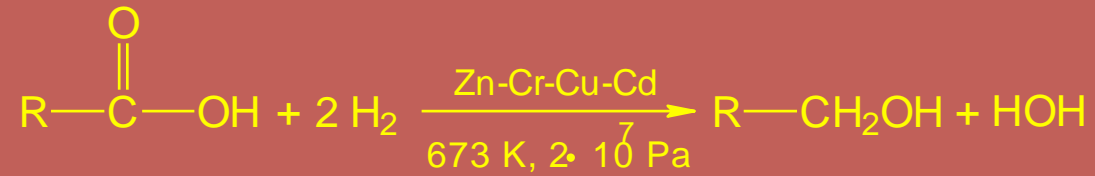
c) Konverzija u estere kiselina. Reakcija esterifikacije.



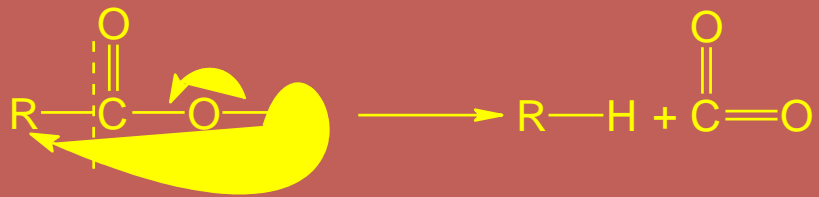
d) Konverzija u amide kiselina



3. Redukcija karbonskih kiselina:



4. Reakcija dekarboksilacije karbonskih kiselina:

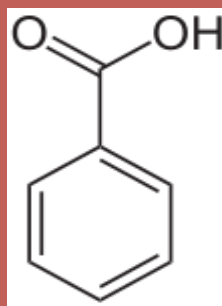


DIKARBOKSILNE KISELINE

Formula	Trivijalni naziv	IUPAC
HOOC-COOH	Oksalna	etandikiselina
HOOC-CH ₂ -COOH	Malonska	1,3-propandikiselina
HOOC-(CH ₂) ₂ -COOH	Ćilibarna Sukcinska	1,4-butandikiselina
HOOC-(CH ₂) ₃ -COOH	Glutarna	1,5-pentandikiselina
HOOC-(CH ₂) ₄ -COOH	Adipinska	1,6-heksadikiselina
HOOC-(CH ₂) ₅ -COOH	Pimelinska	1,7-heptandikiselina

AROMATIČNE KARBONSKE KISELINE

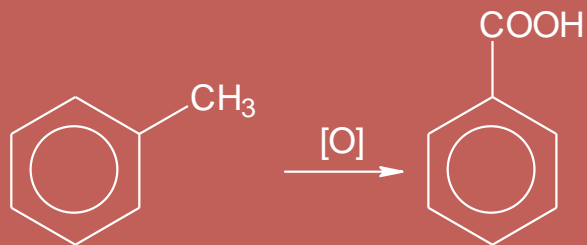
Aromatične monokarbonske kiseline



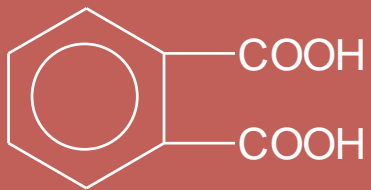
— COOH

Benzoeva kiselina sintetički se dobija:

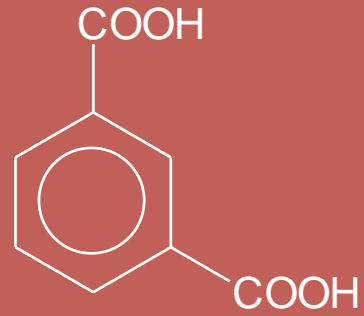
1. iz toluena



Aromatične dikarbonske kiseline



Ftalna kiselina

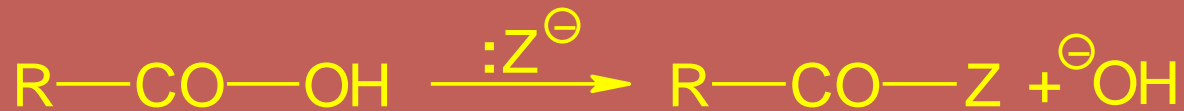


Izoftalna kiselina



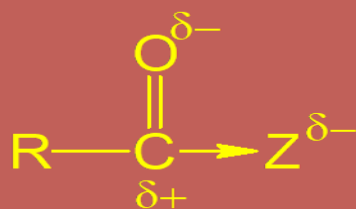
Tereftalna kiselina

DERIVATI KARBONSKIH KISELINA



U zavisnosti od prirode atoma ili atomske grupe Z, derivati kiselina dele se na:

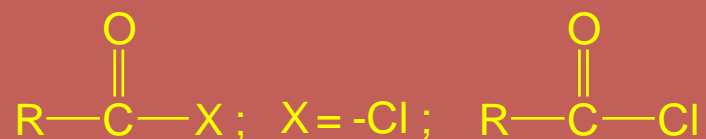
1. Halogenide kiselina $\text{Z} = -\text{F}, -\text{Cl}, -\text{Br}, -\text{J}$
2. Anhidride kiselina $\text{Z} = -\text{O}-\text{CO}-\text{R}$
3. Estre kiselina $\text{Z} = -\text{OR}$
4. Amide kiselina $\text{Z} = -\text{NH}_2$
5. Hidrazide kiselina $\text{Z} = -\text{NH}-\text{NH}_2$
6. Azide kiselina $\text{Z} = -\text{N}_3$



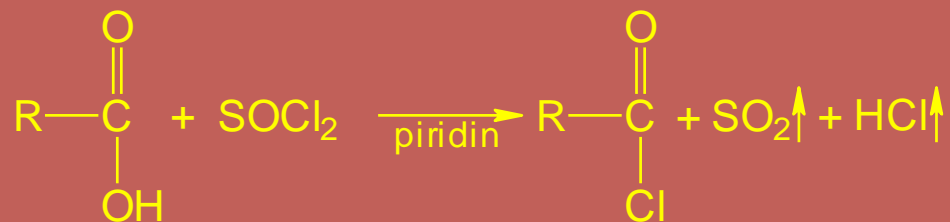
KONVERZIJA



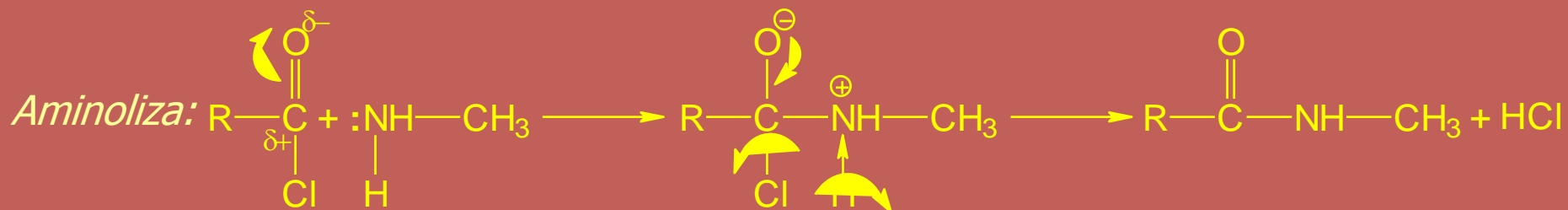
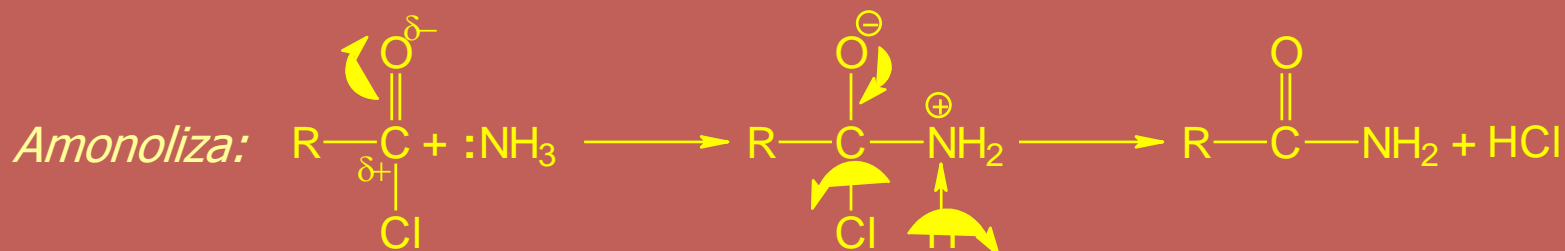
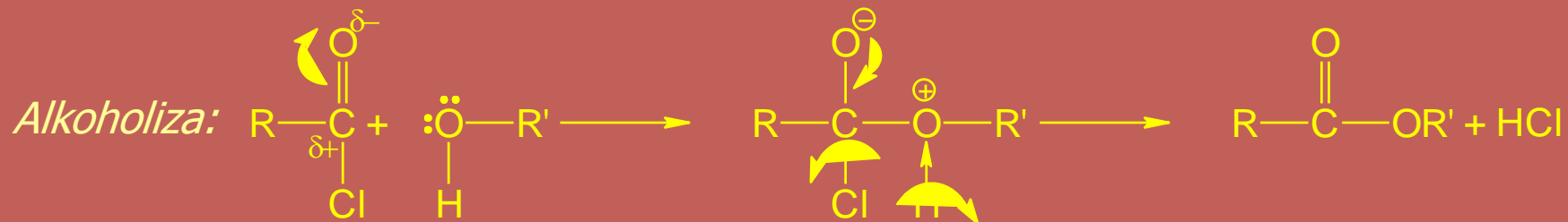
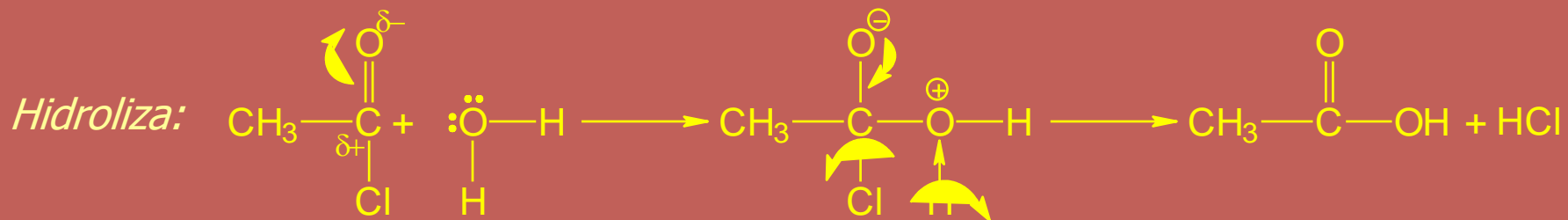
HALOGENIDI KISELINA



Hloridi kiselina dobijaju se delovanjem hlorida mineralnih kiselina na karbonske kiseline



1. Konverzija hlorida kiselina u druge derivate kiselina:



ANHIDRIDI KISELINA

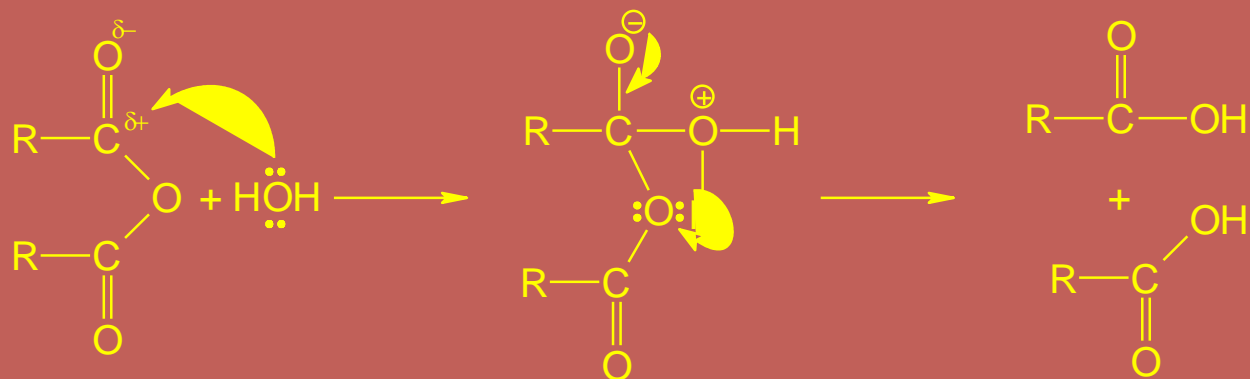


Dobijanje anhidrida kiselina:

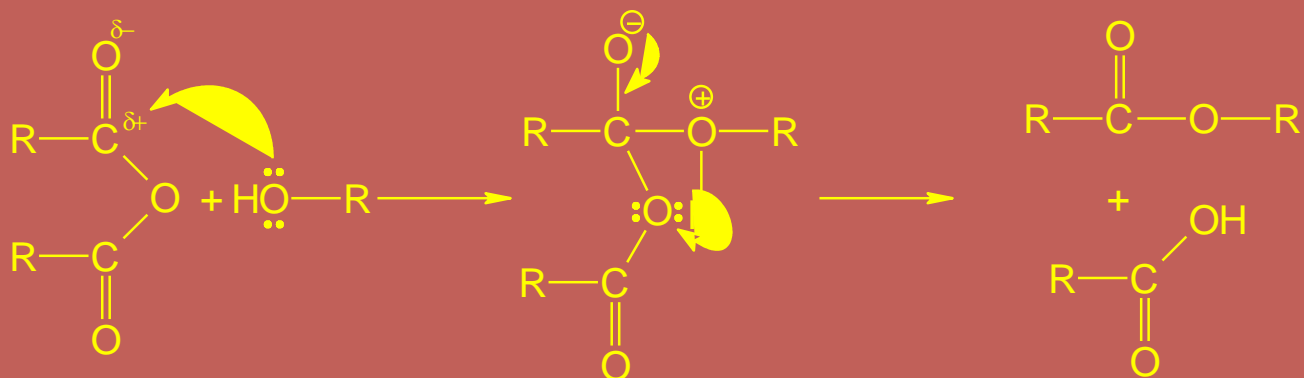


1. Konverzija anhidrida kiselina u derivate kiselina:

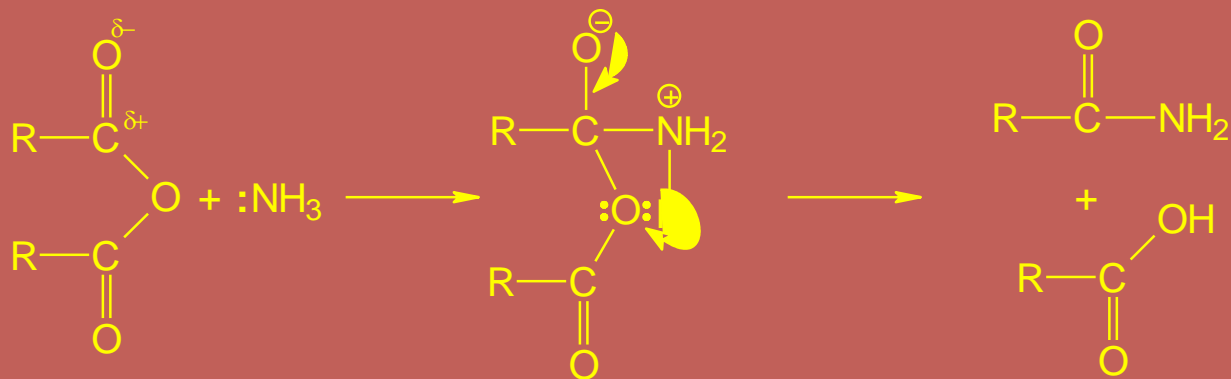
Hidroliza:



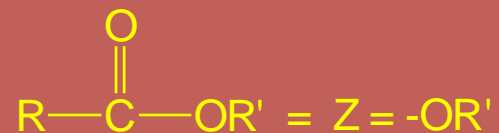
Alkoholiza:



Amonoliza:



ESTRI KARBONSKIH KISELINA



Dobijanje estara karbonskih kiselina

1. Reakcija esterifikacije:

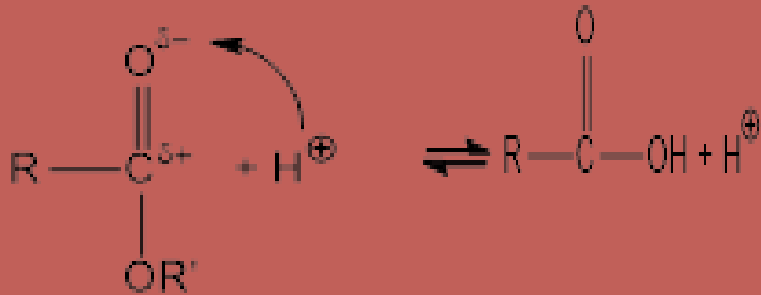


2. Dobijanje estara iz derivata kiselina:

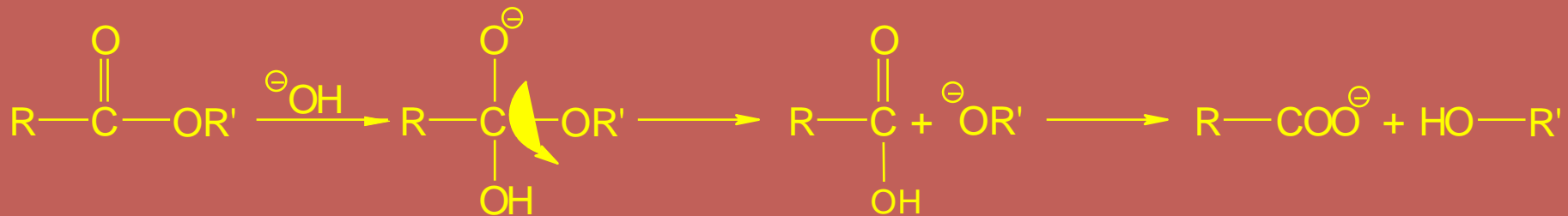


Hemijske osobine estara

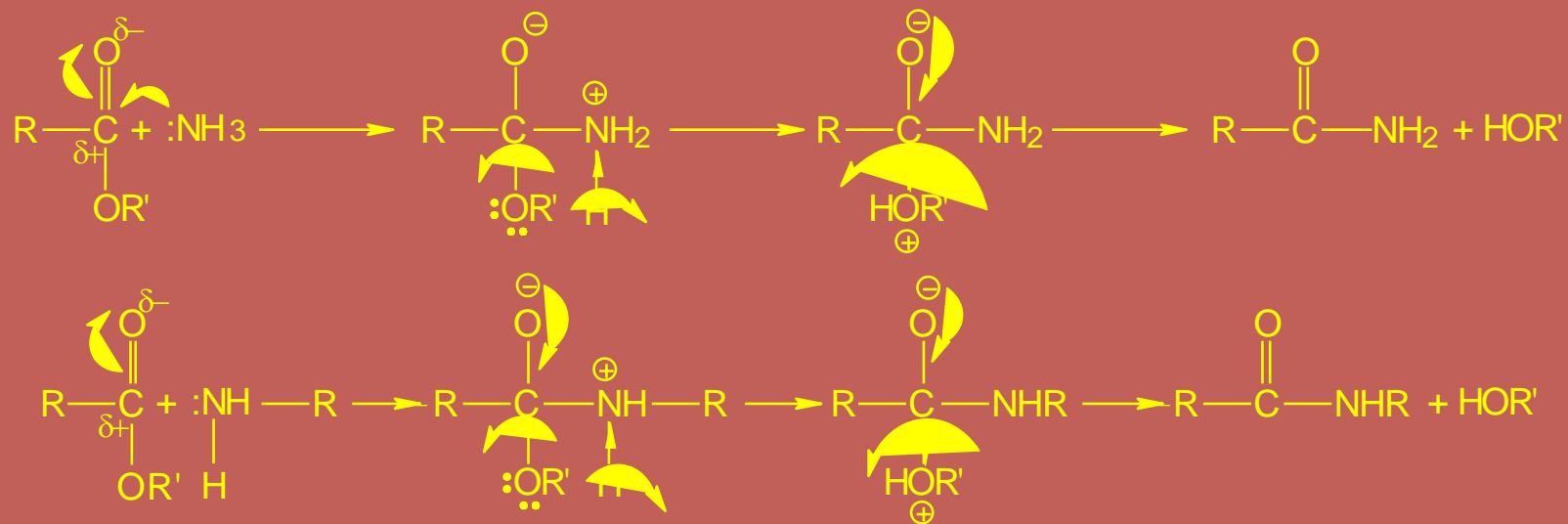
1. Reakcija hidrolize:



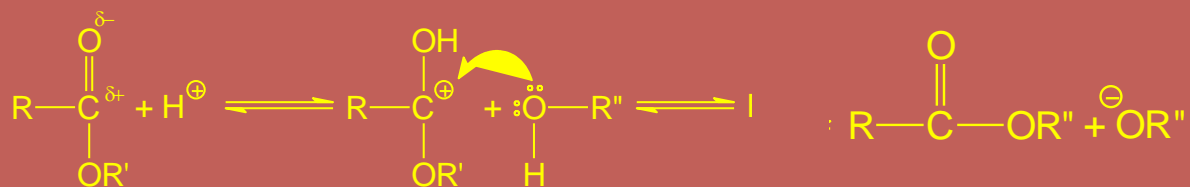
Saponifikacija – hidroliza u baznoj reakcionoj sredini



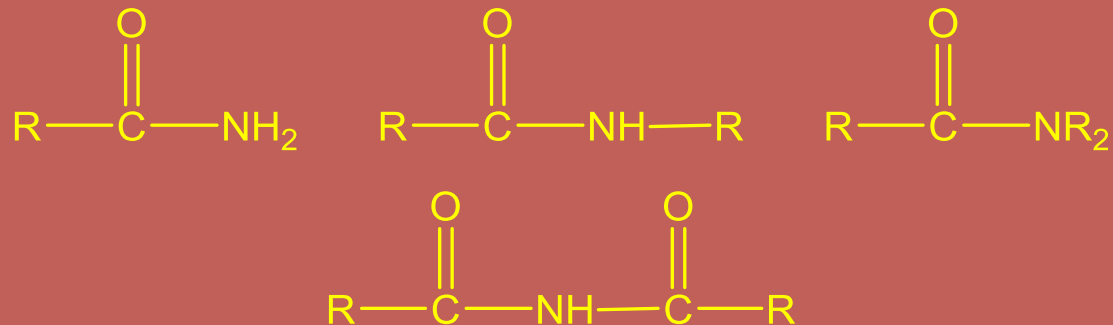
2. Reakcija amonolize i aminolize:



3. Reakcija alkoholize estara, reakcija transesterifikacije:



AMIDI I IMIDI KARBONSKIH KISELINA

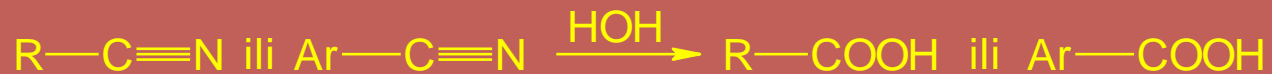


Dobijanje amida

1. Aminolizom derivata karbonskih kiselina:



NITRILI (CIJANIDI) KARBONSKIH KISELINA



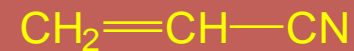
Acidum aceticum



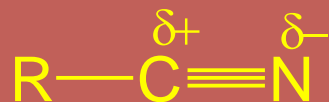
Acetonitril



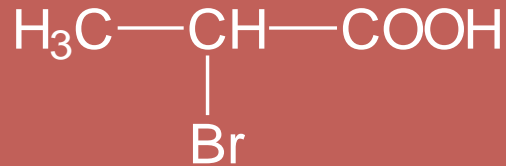
Acidum acrilicum



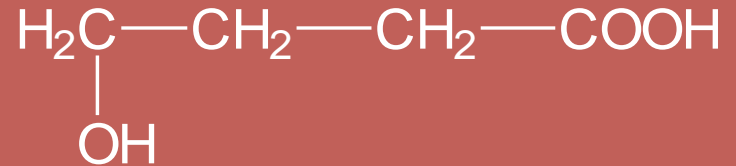
Akronitril



SUPSTITUISANE KISELINE



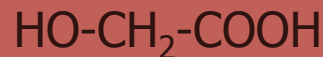
α -Brompropionska kiselina
2-Brompropanska kiselina



γ -Hidroksibuterna kiselina
 γ -Oksibuterna kiselina
4-Hidroksibutanska kiselina

HIDROKSI KISELINE ILI OKSI KISELINE

Glikolna



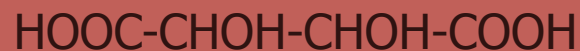
(+)-Mlečna



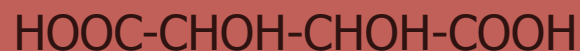
(-)-Jabučna



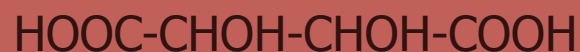
(+)-Vinska



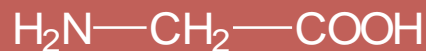
(-)-Vinska



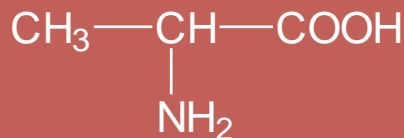
Groždana



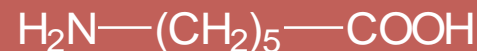
AMINO KISELINE



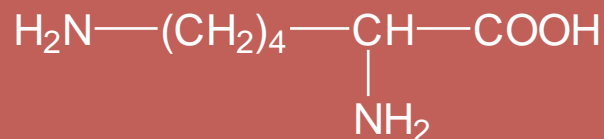
Aminosirćetna kiselina,
Glicin ili glikokol
2-aminoetanska kiselina



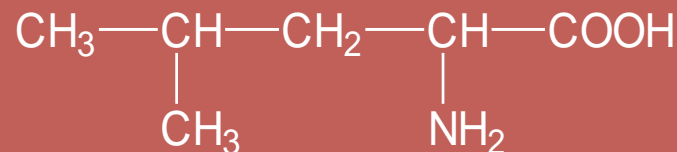
α -Aminopropionska kiselina,
Alanin,
2-aminopropanska kiselina



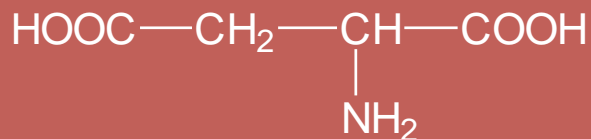
ϵ -Aminokapronska kiselina,
6-aminoheksanska kiselina



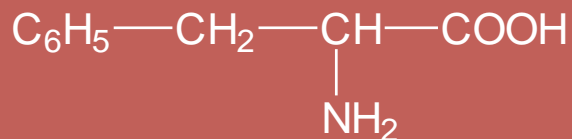
α,ϵ -Diaminokapronska kiselina,
Lizin,
2,6-diaminoheksanska kiselina



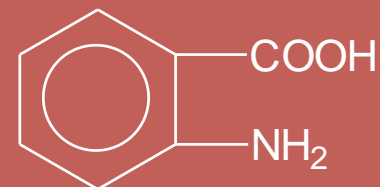
α -Amino- γ -metilvalerijanska kiselina,
Leucin,
2-amino-4-metilpentanska kiselina



Aminoćilibarna kiselina,
Asparaginska kiselina,
2-aminobutandi-kiselina



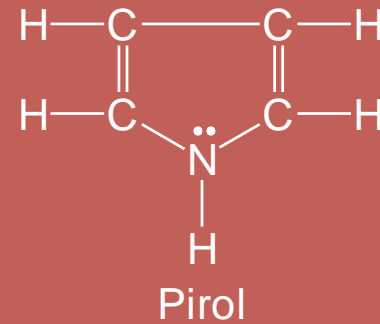
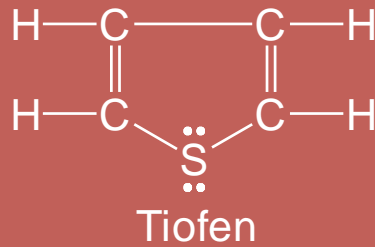
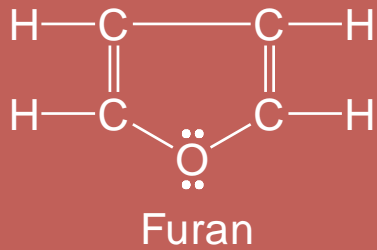
α -Amino- β -fenilpropionska kiselina,
 β -fenilalanin,
2-amino-3-fenilpropanska kiselina



o-Aminobenzoeva kiselina,
Antranilna kiselina,
2-aminobenzoeva kiselina

HETEROCIKLIČNA JEDINJENJA

1. Petočlani heterociklični sistemi:



2. Šestočlani heterociklični sistemi

