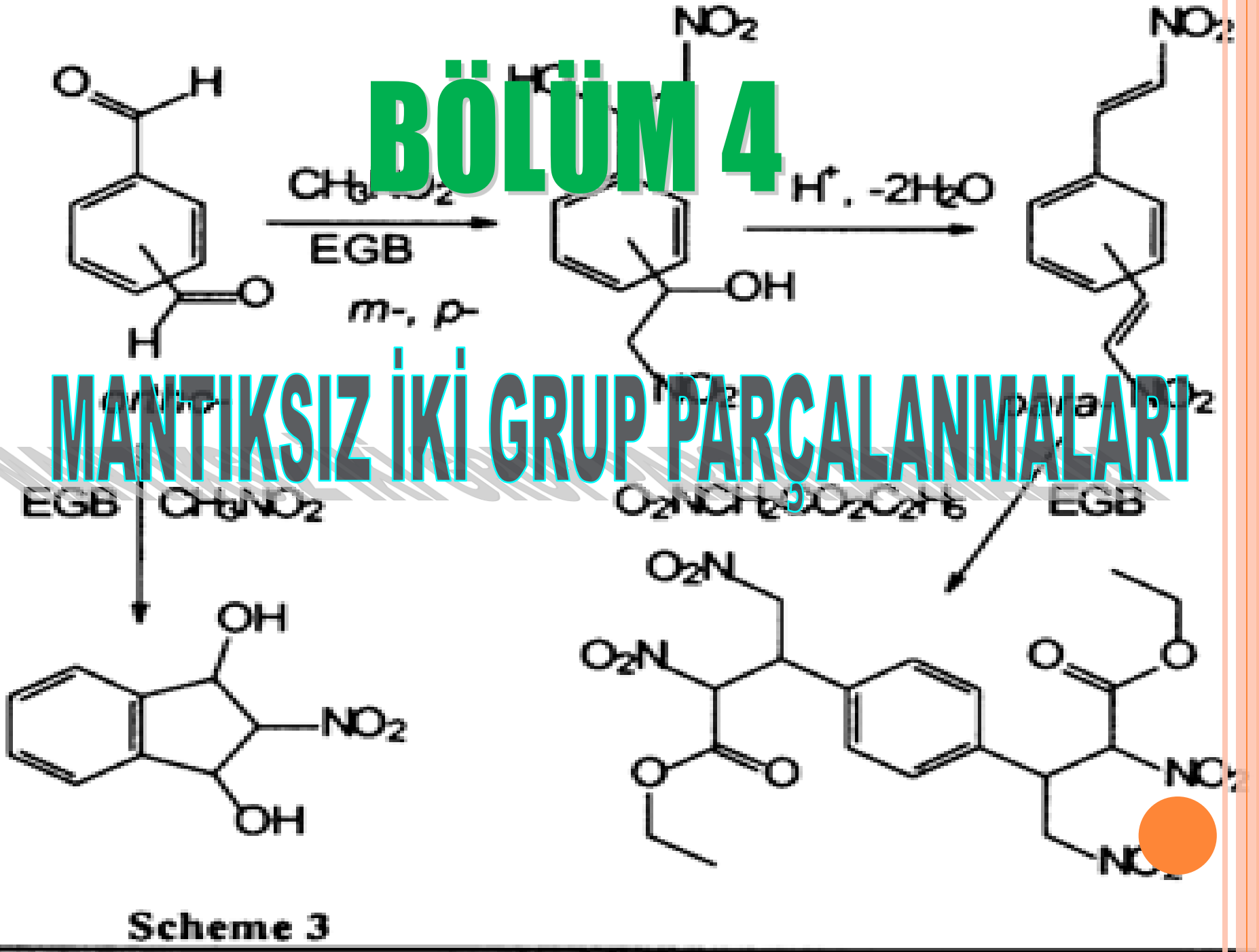
BÖLÜM 4

MANTIKSIZ İKİ GRUP PARÇALANMALARI

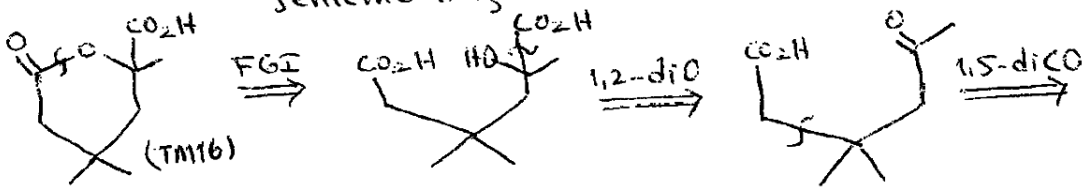


Scheme 3

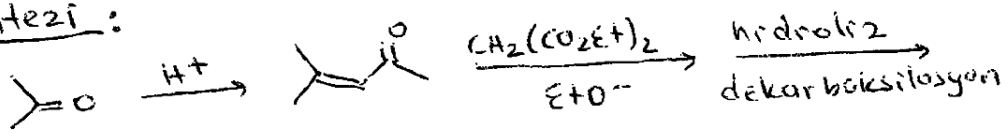
(d) Problemler

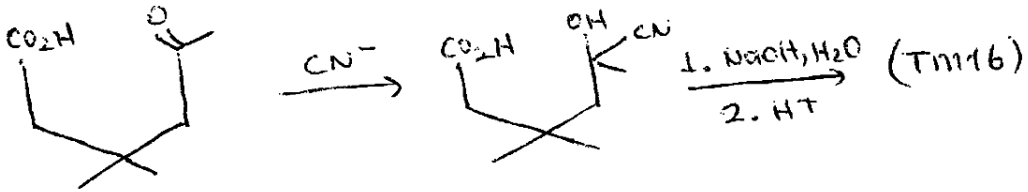
1. Aşağıdaki Lakton asidi (TM16) için bir sentez yöntemi

Analizi: laktonun açılmasıyla, 1,2-, 1,5- ve 1,6-dioksi fonksiyonlu bağlantıları ortaya çıkar.



Sentezi:





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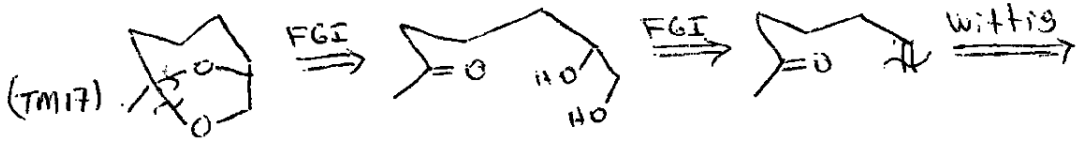
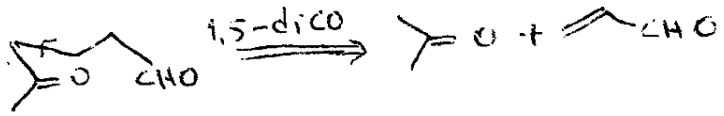
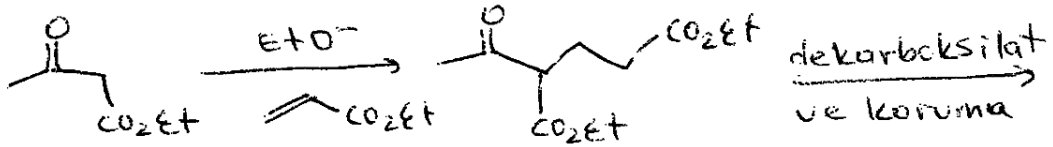
2. (TM17) bileziğinin analiz ve sentezini yapınız.

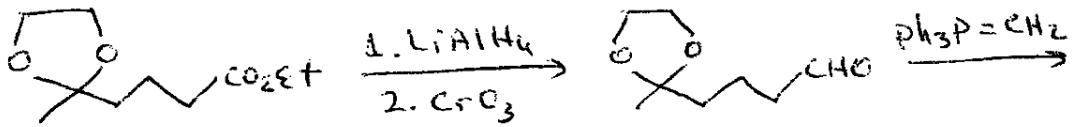
Analizi: öncelikle, asetal fonksiyonlu grubu uzaklaştırılır.





Sentezi: wittig reaksiyonunu aldehit üzerinde yapmalıyız, keton ile etkileşmemesi için keton grubunu korumalıyız. Bundan dolayı, aldehite bir ester grubu bağlamalıyız.





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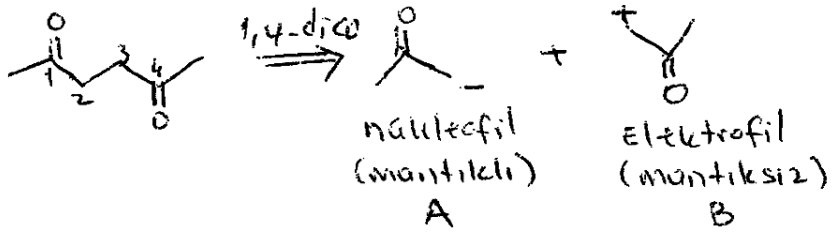
2. 1,4-DİOKSİJENLEME MODELİ

(a) 1,4-Dikarbonil Bileşikleri

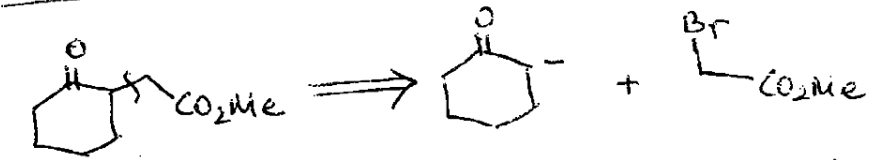
1,4-dikarbonil bileşiklerinin parçalanması sonucunda, mantıklı nükleofilik Synthon (bir enolat anyonu) oluşurken, mantıksız elektrofilik synthon da ortaya çıkar



B için, polaritesi giderilmiş bir keton türevine ihtiyaç duyulur, bunun için en ideali α-halokarbonil bileşiğidir.

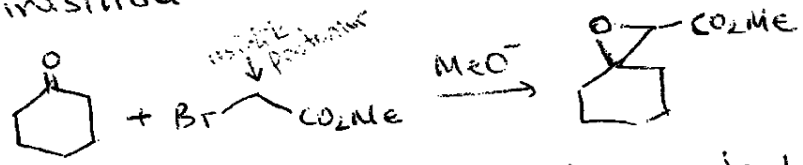
Örnek 1 : LTM18) bileşiğinin analiz ve sentezi için öneride bulununuz.

Analiz :

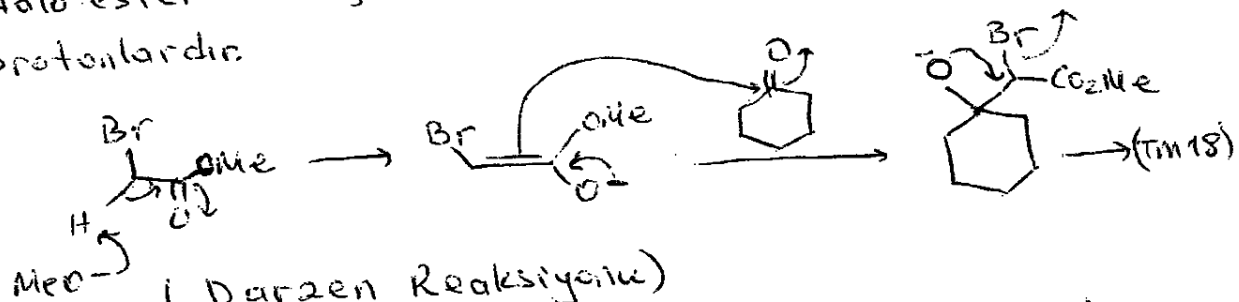


(TM18)

Sentezi : α-halo ester ile ketonun birleştirilmesi sırasında oldukça farklı reaksiyonlar olur:



Halo ester bileşiğinin metilen protonları en asidik protonlardır.

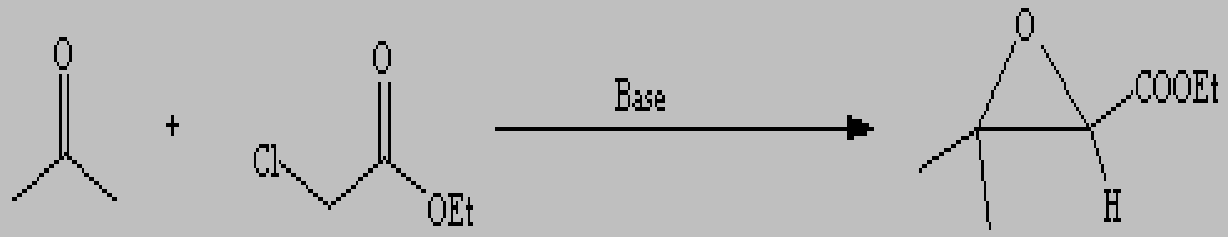


(Darzen Reaksiyonu)

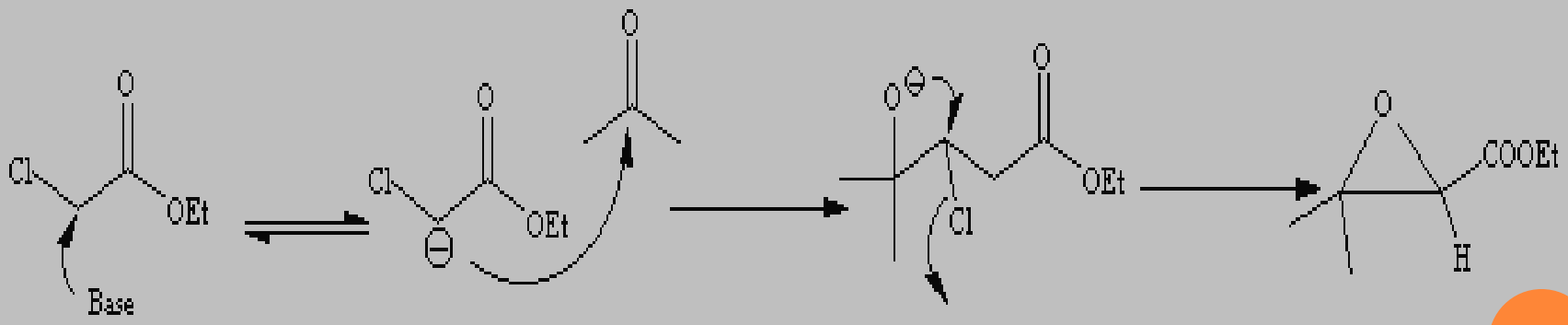
Burada, 1'lik kondenzasyonda ketonu nükleofil olarak kullanmak gerekir. Bunu yapmak için en iyi yol,

Darzen kondenzasyonu (reaksiyonu)

Formation of a,ß-epoxy esters by the condensation of aldehydes or ketones with esters of a-haloacids.:

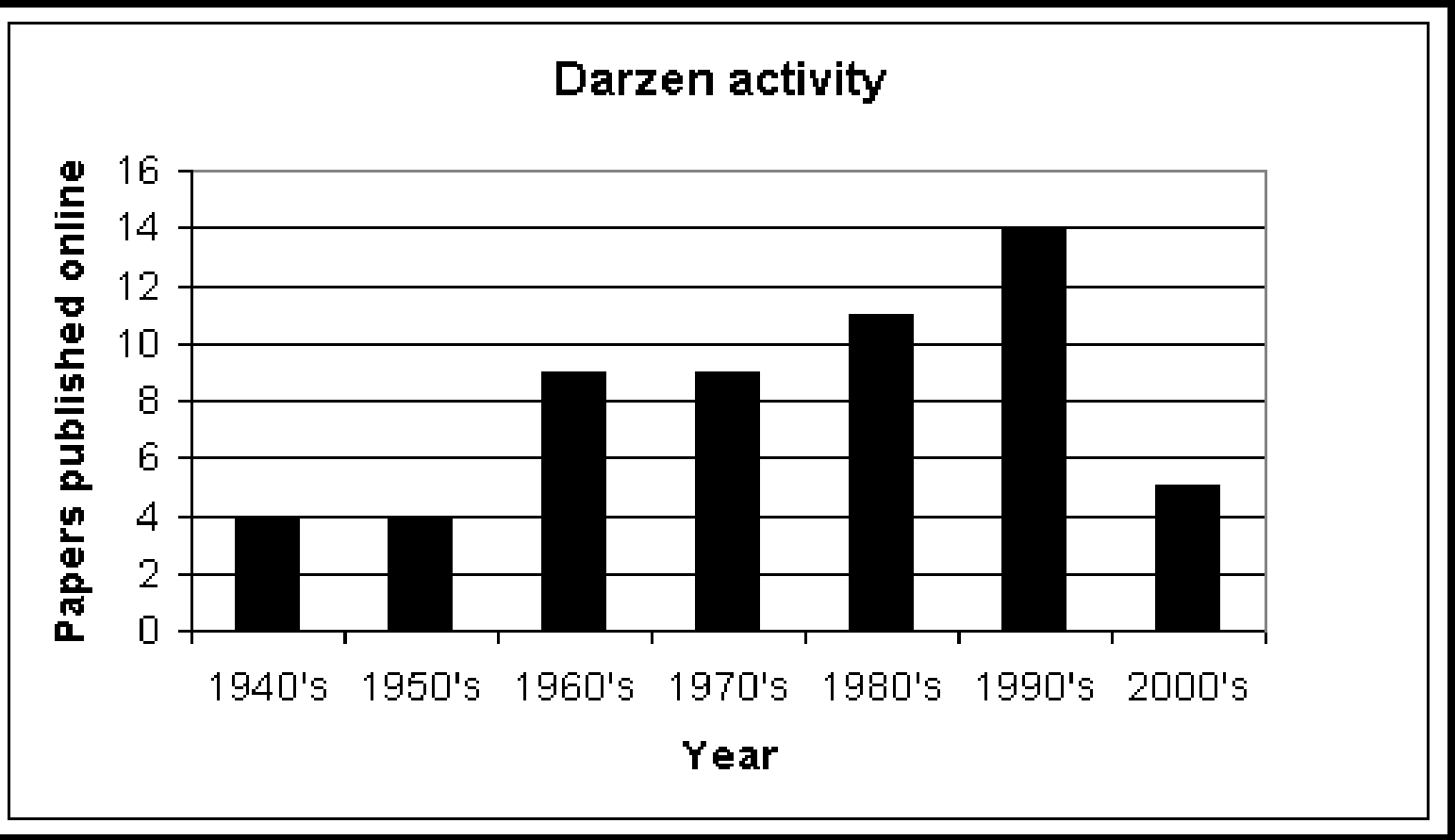


Mekanizma



Frequency of appearance:

This bar graph represents all of the online articles that were found to contain this specific name reaction in the title of the article. Tetrahedron letters, Tetrahedron, Synthetic letters, Synthesis, Journal of Organic Chemistry and Journal of the American Chemical Society are represented here. This table by no means represents the periodicity of the name reaction found in the literature.

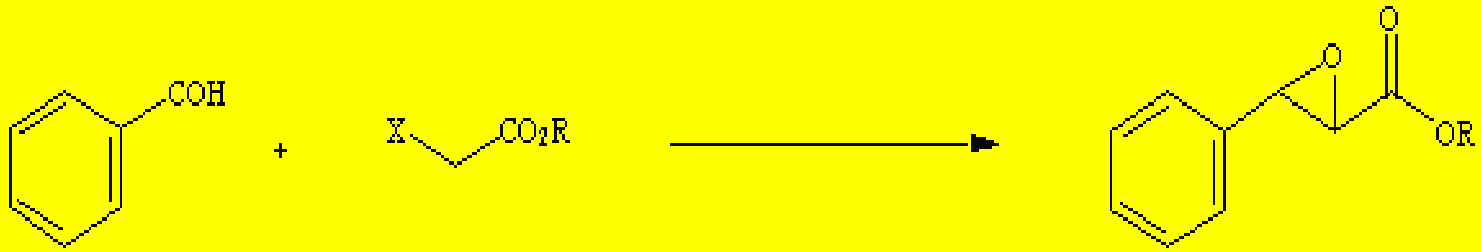


Recent academic references:

Camphor-Based Bromo Ketones for the Asymmetric Darzens Reaction
Palomo, C.; et al., *J. Org. Chem.;* **2000**; *65*(26); 9007-9012.

Inverted Diastereoselectivity in Asymmetric Aziridine Synthesis via Aza-Darzens Reaction of (2S)-N-Bromoacyl Camphorsultam
McLaren, A. B.; et al., *Org. Lett.;* **1999**; *1*(9); 1339-1341.

A Cyclic Transition State for the Darzen Reaction
Yliniemela, A.; et al., *J. Org. Chem.;* **1996**; *61*(19); 6723-6726.



Transition state study

Scope and Limitations:

Good yields with aromatic aldehydes and ketones. A+B

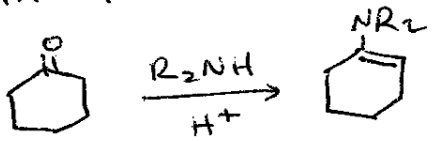
Aliphatic aldehydes need the aid of LDA or LiN(SiMe3)2 to 1st deprotonate the alpha halo ester to obtain high yields. A+B

alpha-halo ketones, nitriles, sulphones and N,N-amides are also used for Darzen's condensation. A+B

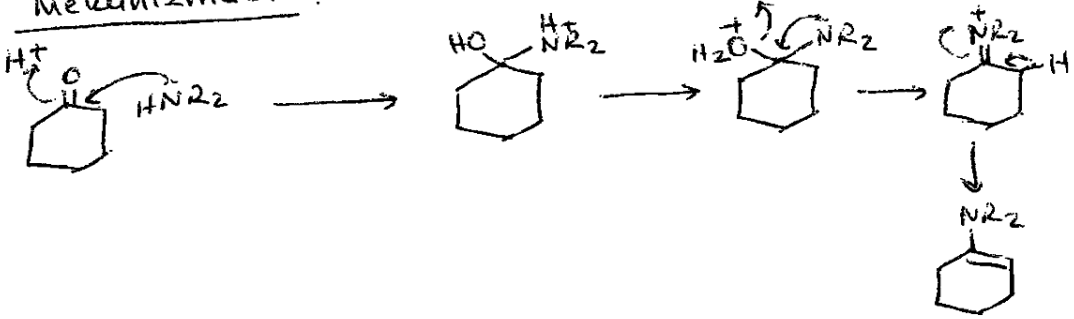
Na ethoxide is often employed as a base. A

Reaction can also be catalyzed by an acid. A

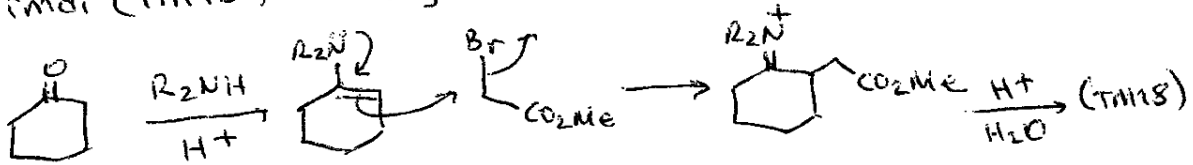
enamine çevirmektir.



Mekanizması :



Şimdi (TM18) bileşiğinin sentezi

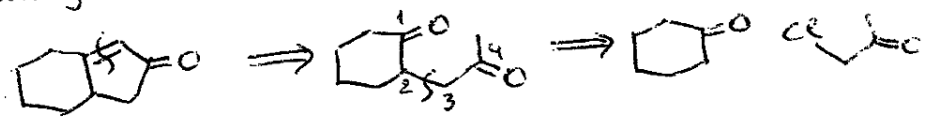


şeklinde tamamlanır.

Enamin, reaktif α-karbonil haleğenürüne karbonil grubunun kendisinden daha çok atak yapar.

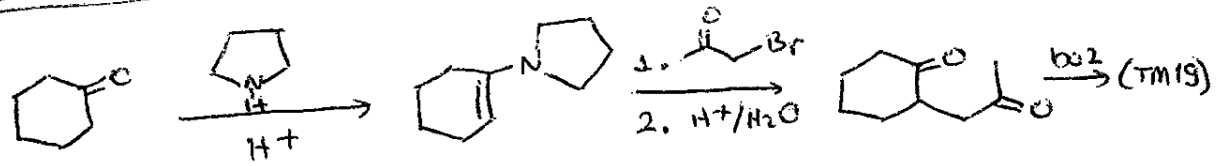
Örnek 2 : (TM19) bileşiğini nasıl sentezlersiniz?

Analizi : α,β-doymamış keton parçalanarak başlanır ve yeni yöntemde kullanacağımız 1,4-diketona sahip oluruz.



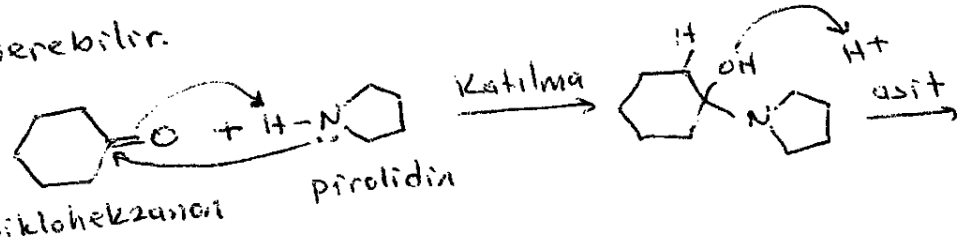
(TM19)

Sentezi :

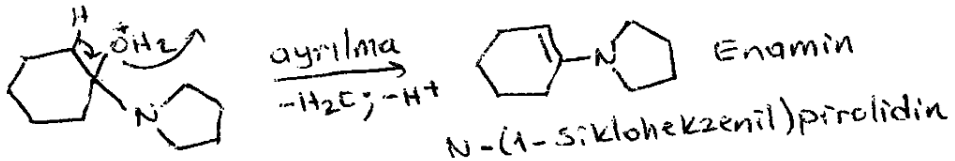


Enamin mekanizması

Sekonder aminler karbonil bileşikleriyle kondenzasyon verebilir.



Siklohekzanon pirolidin

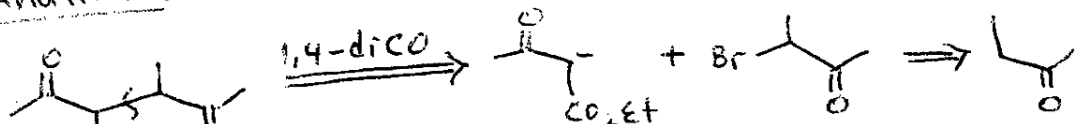


N-(1-siklohekzenil)pirolidin

- Enaminler her zaman gerekli değildir, bazen eno-lat anyonunun bizzat kendisi yeterince kararlıdır.

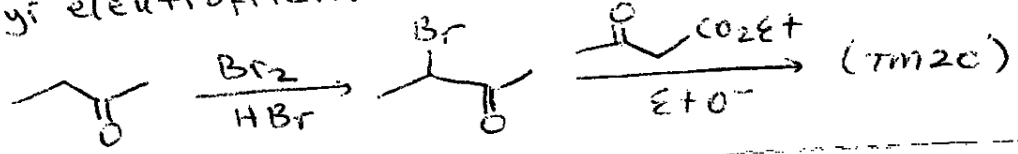
Örnek 1 : (TM20) bileşiğini nasıl yaparsınız?

Analizi :



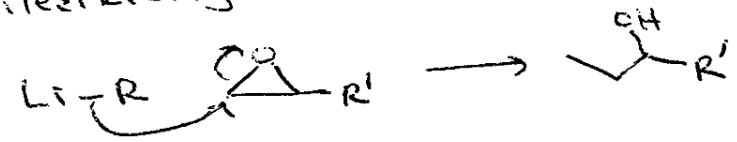
(TM20)

Sentezi: Bütanonun bromlanması (asit ortamında) istediğimiz izomeri verir. oluşan α-karbonil haleşenür iyi elektrofildir.



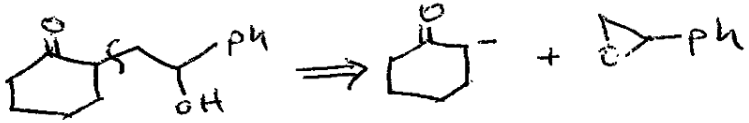
(b) γ-Hidroksi Karbonil Bileşikleri

α-halo karbonil bileşikleri, $\overset{+}{C}-\overset{O}{\overset{\|}{C}}$ synthonu için reaktif olarak kullanılmaktadır. Daha düşük yükseltgenme basamağında $\overset{+}{C}-\overset{OH}{C}$ synthonu için reaktif olarak epoksitler kullanılır (Grignard ve organolityum bileşikleriyle reaksiyonlarında olduğu gibi).

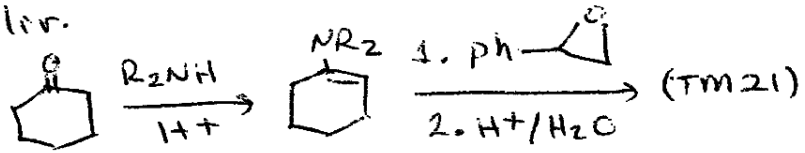


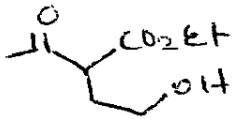
Örnek 1: (TM21) aşağıda gösterilen γ-hidroksi keton bileşiğini analiz ederek bir sentez öneriniz.

Analiz:

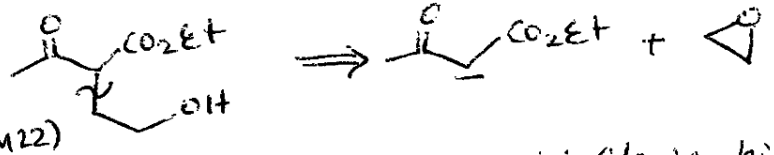


Sentezi: Enolat synthonu sağlamak için enamin kullanılabilir.



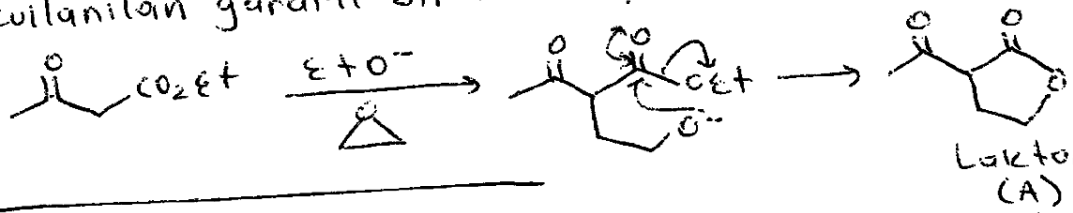
Örnek 2 :  (TM22) bileşiğini yapınız.

Analiz :



(TM22)

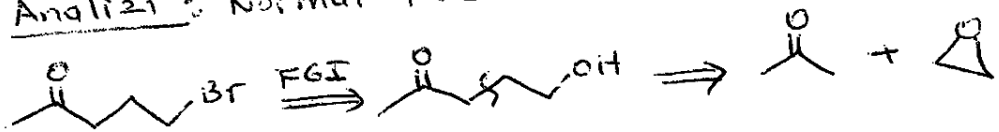
Sentezi : Aslında reaktiflerin birleştirilmesi (TM22)'yi vermez. Bunun yerine Lakton (A) oluşur. Bu lakton, planladığımız (TM22) bileşiğinin bütün reaksiyonlarında kullanılan yararlı bir reaktiftir.



Lakton (A)

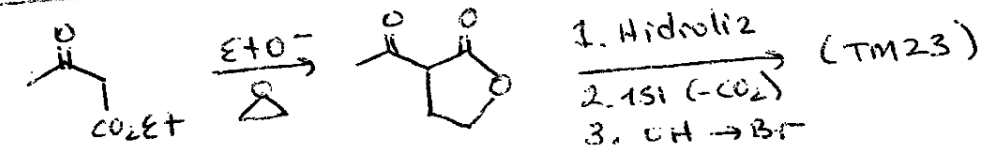
Örnek 3 : Aşağıda görülen γ-haloketon (TM23)'ü nasıl yaparsınız?

Analizi : Normal FGI alkol verir.



(TM23)

Sentezi : Aktifleştirici grup olarak CO_2Et kullanılır.

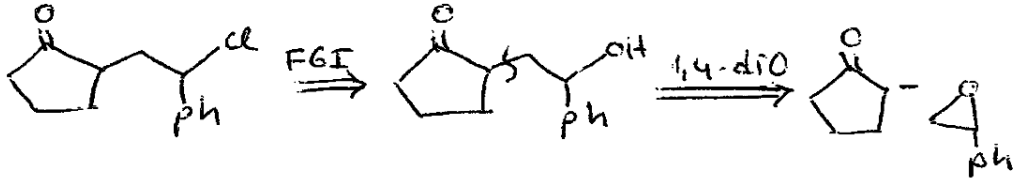


1. Hidroliz
2. Isı ($-CO_2$)
3. $OH \rightarrow Br$

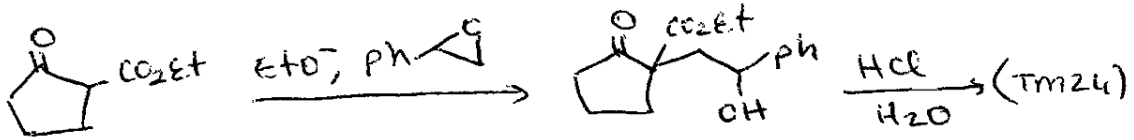
(TM23)

Örnek 4: Aşağıdaki γ-halo keton u (TM24) nasıl elde edersiniz?

Analiz:



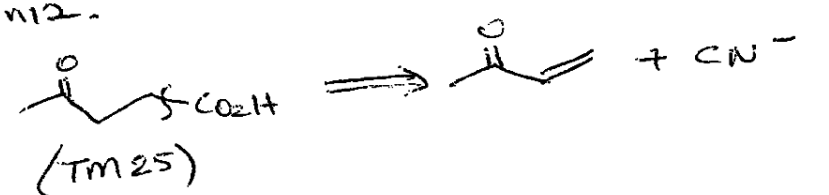
Sentezi: Başlangıç maddesinde aktifleştirici bir grup olmalıdır.



(c) Diğer Mantıksız Synthonlar

1,4-dioksijenlenmiş bileşikleri elde etmek için hem mantıklı hem de mantıksız Synthonlar kullanılmıştır.

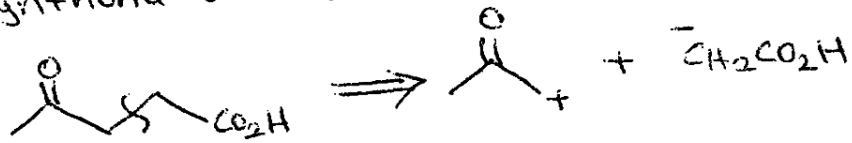
Örnek 1: Aşağıdaki gibi bir γ-keto asidi elde etmek için CN^- iyonunu ($^-CO_2H$ Synthonu olarak) nasıl kullanırsınız.



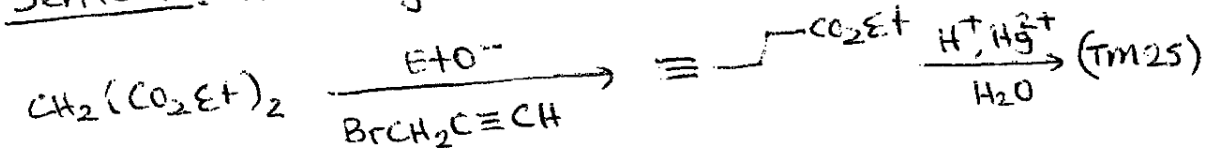
(TM25)

Örnek 2: Aynı asidi, propargil bromür ($BrCH_2C{\equiv}CH$) (mantıksız bölüm) kullanarak nasıl yaparsınız?

Analizi: Asetilenler, keton vermek üzere hidratize edilebilmektedir böylece propargil bromür, $MeCOCH_2^+$ synthonu verir:



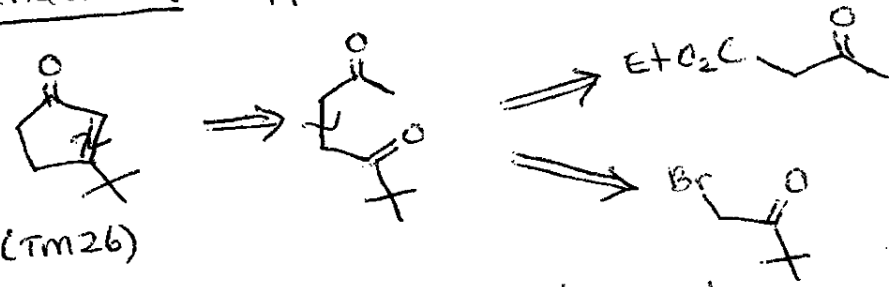
Sentezi: Aktivasyon gerekecektir:



(d) Problemler ve çözümleri

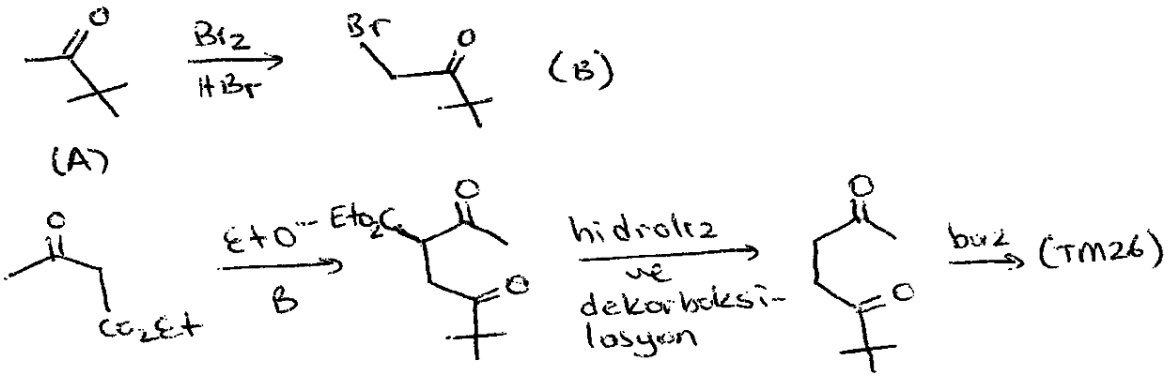
1. Doğada bulunan ve prostaglandin sentezinde önemli bir bileşik olan siklopentenonlardan aşağıdaki bileşiği nasıl yaparsınız? (TM26)

Analizi: α,β-doymamış karbonilden başlamalıyız:



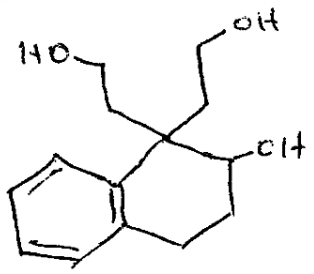
(TM26)

Sentezi: (A) ketonu pinokolon olduğu için, pinokolon çevrilmesiyle elde edilebilir:

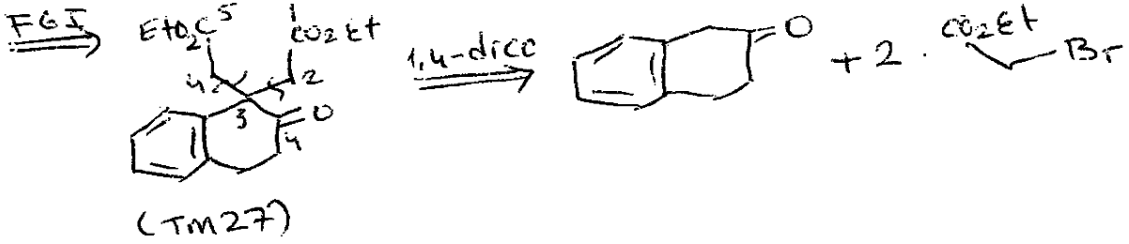


2. Aşağıdaki triol (TM27) 1,4-veya 1,5-dioksijenlenmiş bileşik olarak alınabilir. Aslında bunlardan birisi uygundur. Sentezi için bir öneride bulunuyuz.

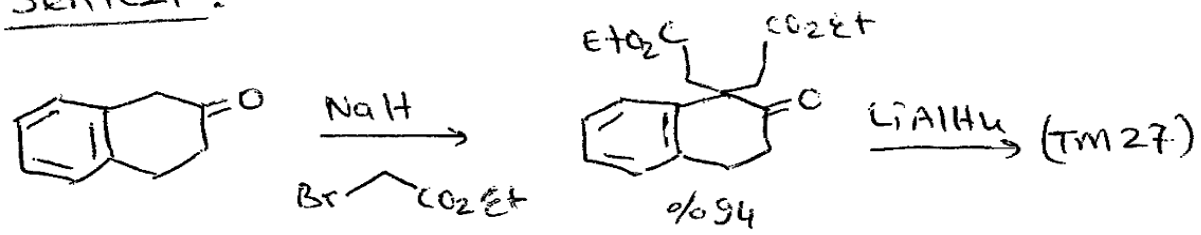
Analizi:



Bu üç OH- grubuna karşı gelen trikarbonil bileşiğini düşünmeliyiz. CH_2OH için; CHO veya CO_2Et yazmalıyız (FGI yapılır). 1,5- parçalanmasıyla, oluşan öncüler içindeki çift bağlar oda sıcaklığında kararsız olacağı için, 1,5-dikarbonil parçalanması kullanılmıyor.



Sentezi:



Çıkış maddesi olan keton, sübstitüe naftalinin indirgenmesi ile (J. Amer. Chem. Soc., 1950, 72, 3704) yapılabilir.

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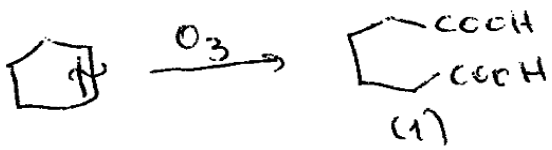
3. 1,6-DİKARBONİL BİLEŞİKLERİ

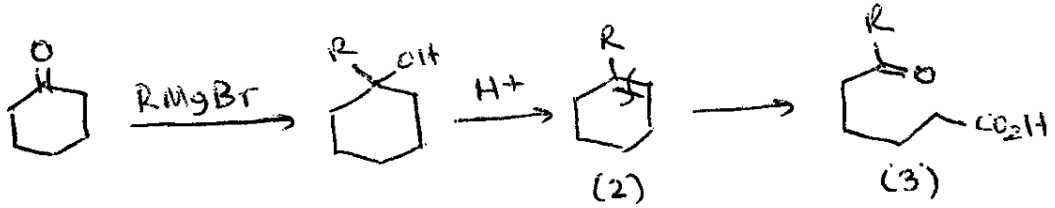
İki karbonil grubu olan bileşiklerin sentezinde bir takım problemler olacaktır. Burada, yeniden birleştirme (reconnection) 1,6-difonksiyonlu bileşiklerin sentezinde uygulanan genel bir strajedidir.

Adipik asit (1) siklohekzenden kolayca elde edilebilir:

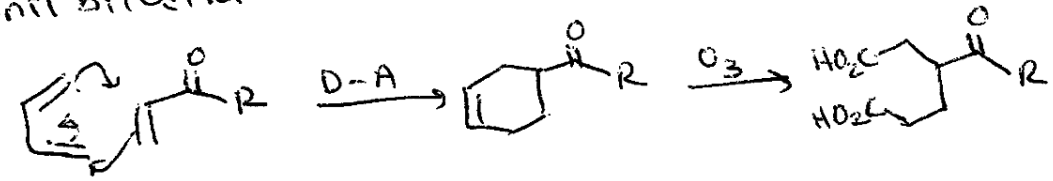


(1)

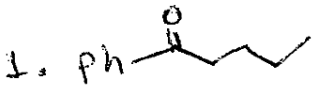
1-yerinde sübstitüent olan siklohekzenler (2), siklohekzanondan ve Grignard reaktiflerinden yapılabilir. Parçalanması keto asitleri (3) verir.



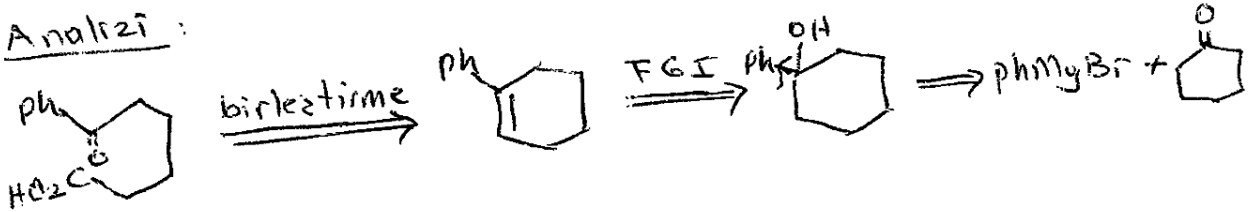
Siklohekzenleri hazırlamak için en önemli yol, Diels-Alder reaksiyonu ve elde edilen ürünün parçalanması ile oluşan 1,4- ve 1,5-dikarbonil bileşiklerinin 1,6-dikarbonil bileşiklerinin sentezinde kullanılmasıdır.



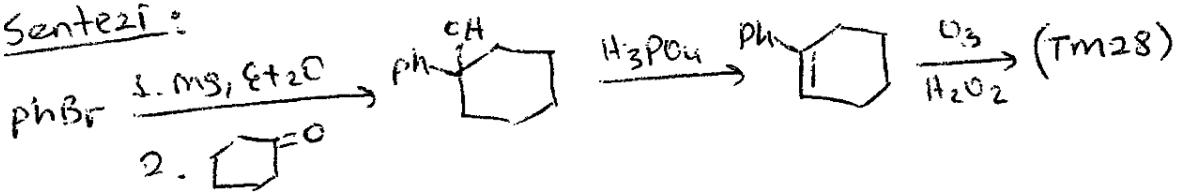
Örnekler

1.  (TM28) sentezini analiz ediniz.

Analizi:

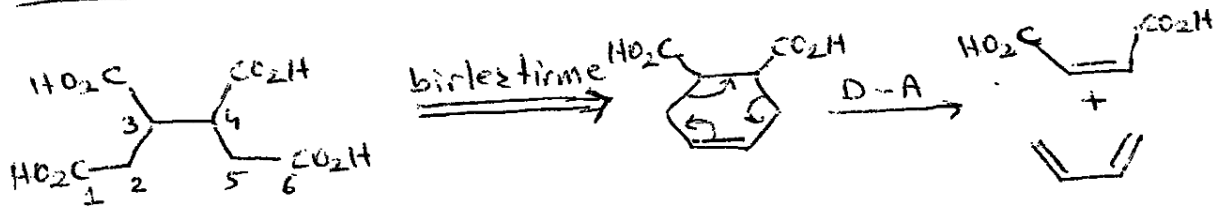


Sentezi:

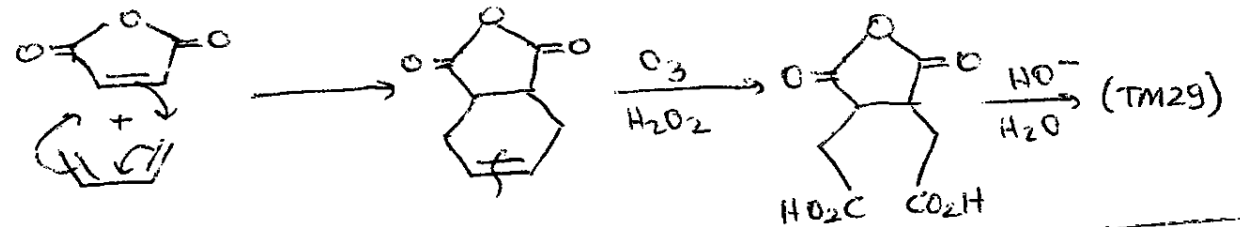


2. (TM29) bileşiğini analiz ederek sentezini yapınız.

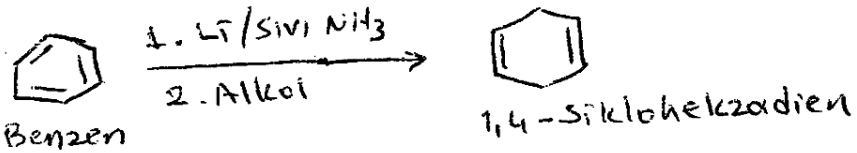
Analiz: Öncelikle, 1,6-dikarbonil bağlantısını seçiniz:

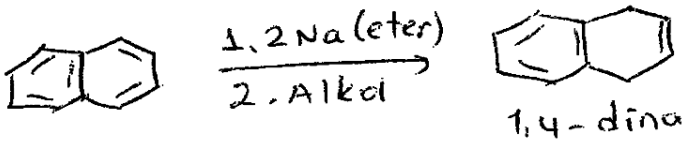


Sentezi: Maleik anhidrit en iyi reaktiftir



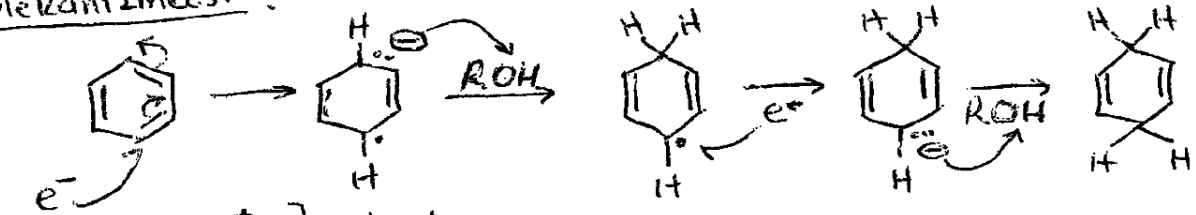
- Siklohekzenleri elde etmek için diğer bir yöntem; benzen halkasının kısmi indirgenmesini içeren "Birch indirgemesidir"





Reaksiyon, radikal bir mekanizma üzerinden yürür:

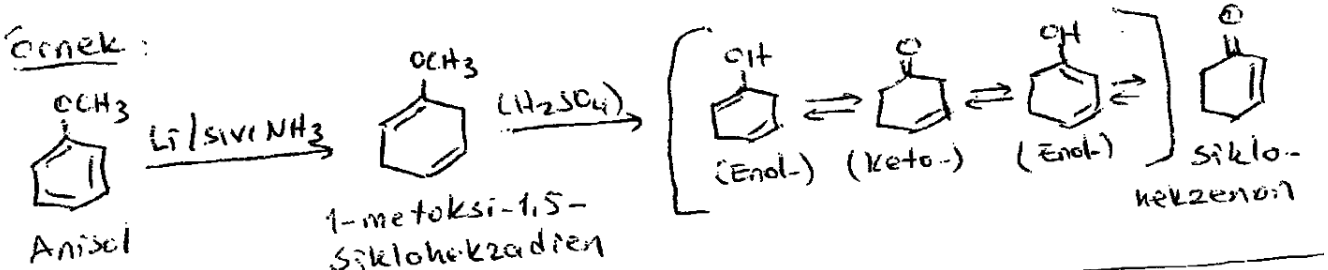
Mekanizması :



$[(Na(NH_3)_x)^+ e^-]$ solvatize.

Benzen halkasında, alkil, metoksi gibi elektron salıcı gruplar varsa reaksiyon yavaş olur ve hekzadienin çift bağları "2,5" durumunda oluşur. -COOH gibi elektron çekici gruplar durumunda ise, reaksiyon hızlı olur ve çift bağlar "2,4-" yerinde meydana gelir.

Örnek :

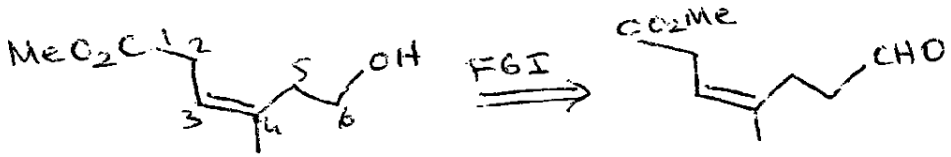


Anisol

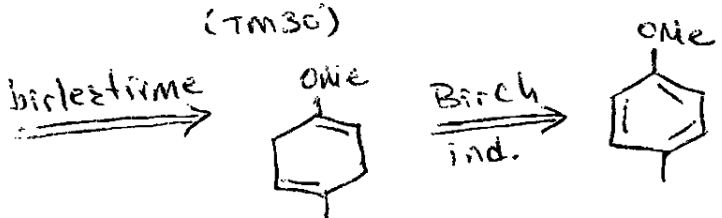
1-metoksi-1,5-Siklohekzadien

Siklo-hekzenon

Örnek 1 : (TM30) bileşiğini analiz ediniz.

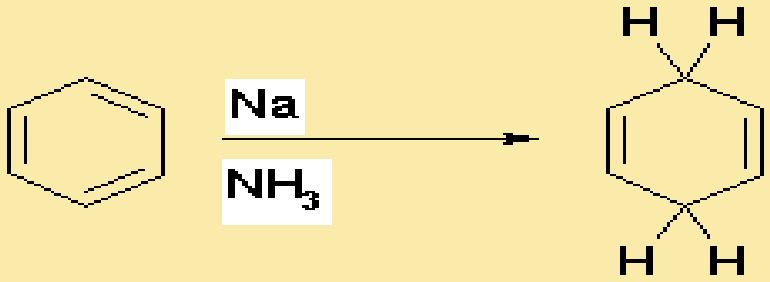


(TM30)



Hatırlatma: *Birch indirgenmesi*

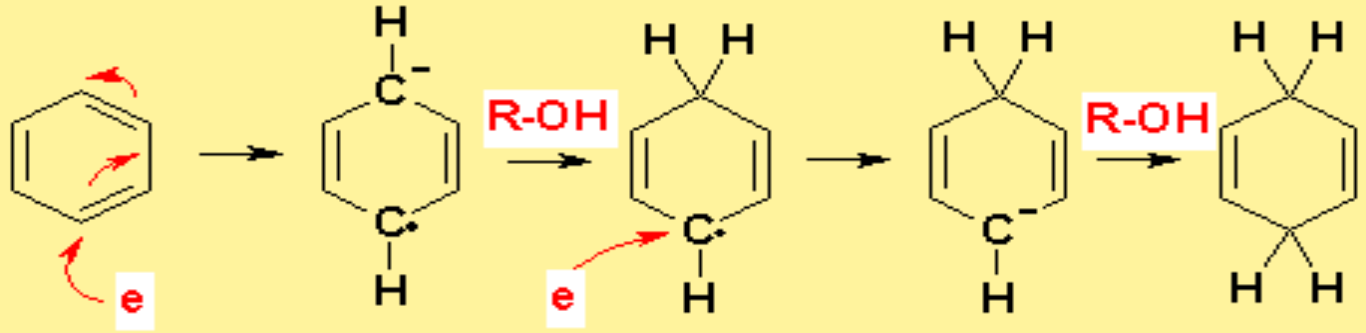
The Birch reduction is the organic reduction of aromatic rings with sodium in liquid ammonia to form 1,4-cyclohexadienes. The reaction was reported by the Australian chemist Arthur John Birch (1915–1995) in 1944.[1] [2] This reaction provides an alternative to catalytic hydrogenation, which usually reduces the aromatic ring all the way to a cyclohexane (after the initial reduction to a cyclohexadiene, catalytic reduction of the remaining (nonaromatic) double bonds is easier than the first reduction).



Lithium and potassium can substitute for sodium, and alcohol such as ethanol and tert-butanol can be used instead of ammonia.

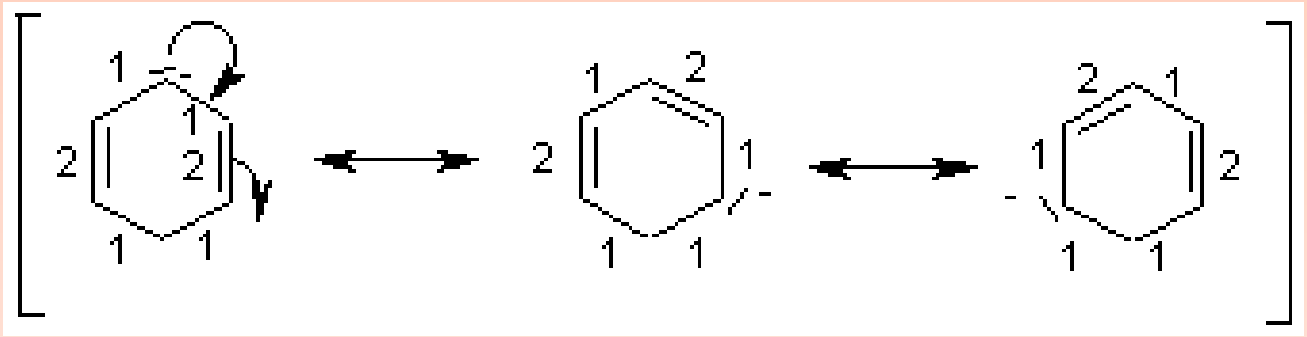
Reaction mechanism

A solution of sodium in liquid ammonia consists of the electride salt $[Na(NH_3)_x]^+ e^-$, associated with the intense blue color of these solutions. The solvated electrons add to the aromatic ring to give a radical anion followed by the dianion. These carbanions deprotonate the ammonia to form the cyclohexadiene.

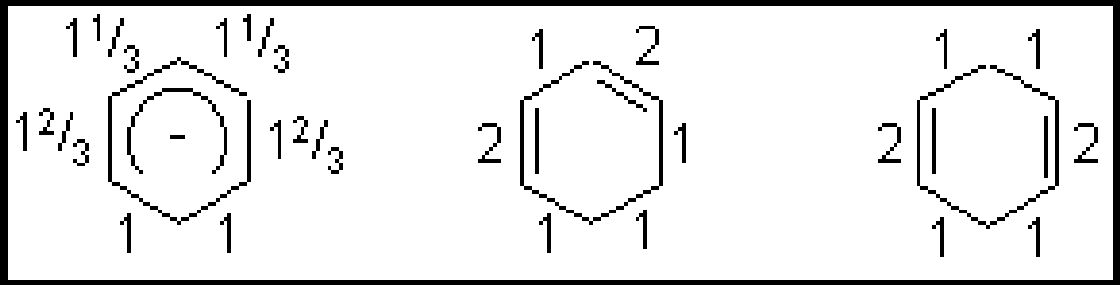


The question of why the 1,3-diene is not formed, even though it would be more stable through conjugation, can be rationalized with a simple mnemonic. When viewed in valence bond terms, electron-electron repulsions in the radical anion will preferentially have the nonbonding electrons separated as much as possible, in a 1,4-relationship.

This question can also be answered by considering the mesomeric structures of the dienyl carbanion

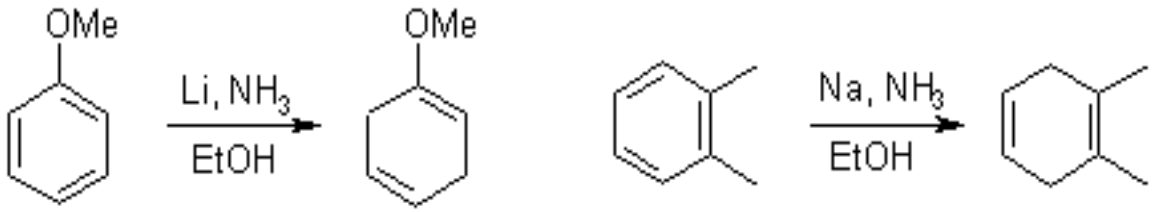


The numbers, which stand for the number of bonds, can be averaged and compared with the 1,3- and the 1,4-diene. The structure on the left is the average of all mesomers depicted above followed by 1,3 and 1,4-diene:

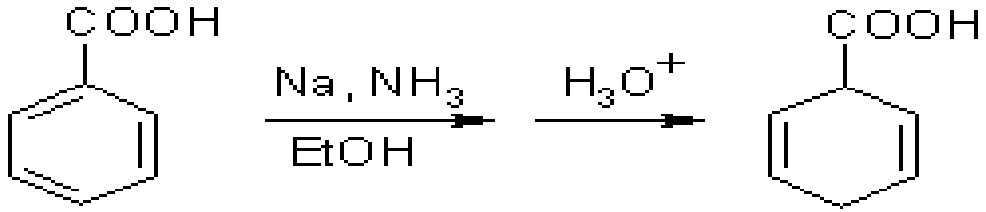


The difference between the dienyl carbanion and 1,3-diene in absolute numbers is 2, and between the dienyl carbanion and 1,4-diene is 4/3. The comparison with the least change in electron distribution will be preferred

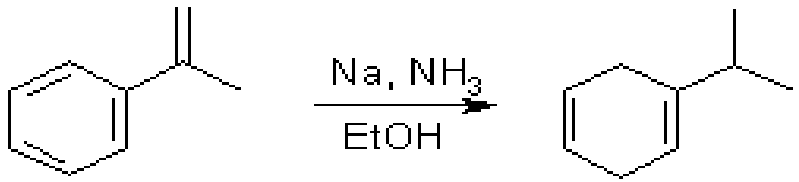
Reactions of arenes with +I- and +M-substituents lead to the products with the most highly substituted double bonds



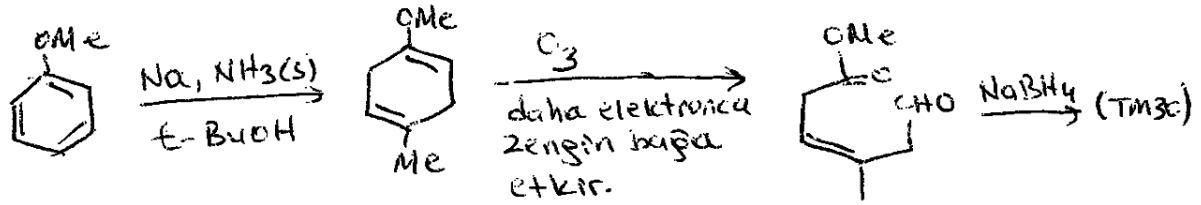
The effect of electron-withdrawing substituents on the Birch Reduction varies. For example, the reaction of benzoic acid leads to 2,5-cyclohexadienecarboxylic acid, which can be rationalized on the basis of the carboxylic acid stabilizing an adjacent anion:



Alkene double bonds are only reduced if they are conjugated with the arene, and occasionally isolated terminal alkenes will be reduced.

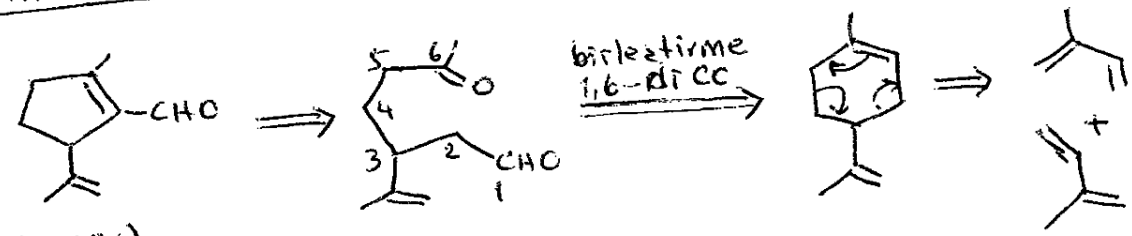


Sentezi:



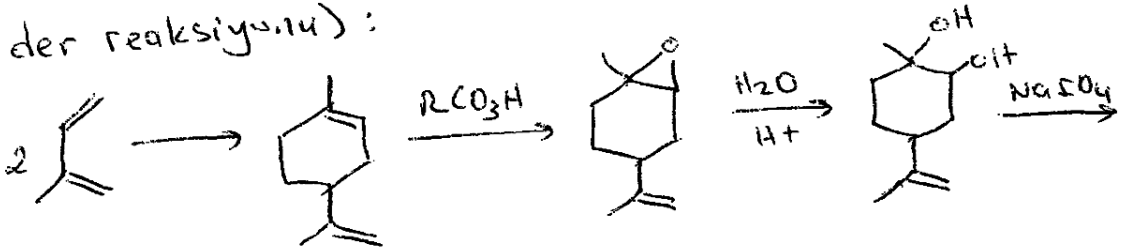
Örnek 2: (TM31) bileşiğini nasıl yaparsınız?

Analizi: önce, α,β-doymamış aldehit kullanılmalı:

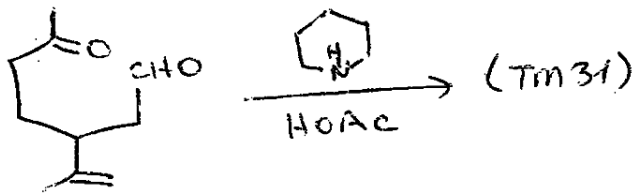


(TM31)

Sentezi: İzoprenin, doğal olarak bulunan bir terpen olan (A) bileşiğini vermek üzere dimerleşir (Diels-Alder reaksiyonu):



A



(J. Amer. Chem. Soc., 1960, 82, 636; J. org-Chem., 1964, 29, 3740; Tetrahedron letters, 1965, 4097)

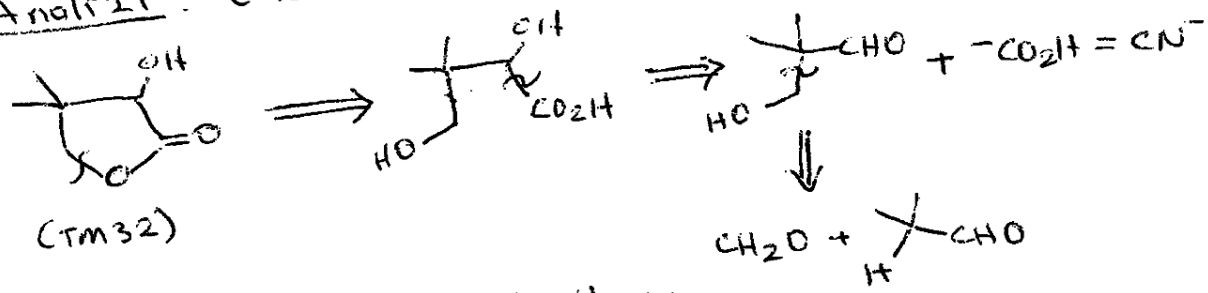
4. LAKTONLARIN SENTEZİ

Şimdiye kadar edindiğimiz basit ikr-grup parçalanmaları bilgi ve becerisiyle, çoğu küçük moleküller için analiz ve sentez yöntemleri önerebiliriz. Burada, bir seri problem üzerinde laktonların sentezini planlamaya çalışacağız.

Örnekler

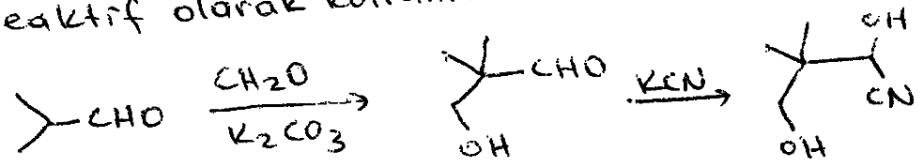
1. (TM32) bileşiğinin (Khorana'nın koenzim A sentezinde kullanılan bir ara ürün) sentez tasarımını yapınız (J. Amer. Chem. Soc., 1961, 83, 663).

Analizi: Önce lakton halkası açılır:



not: CN^- anyonu, $^-CO_2H$ synthonu için reaktif olarak kullanılmaktadır.

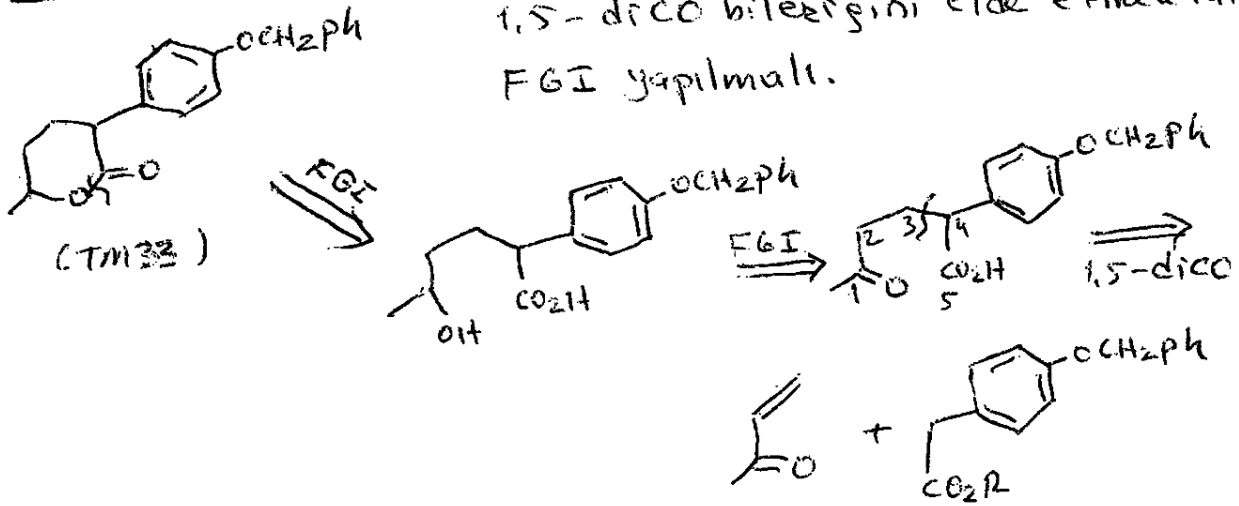
Sentezi:



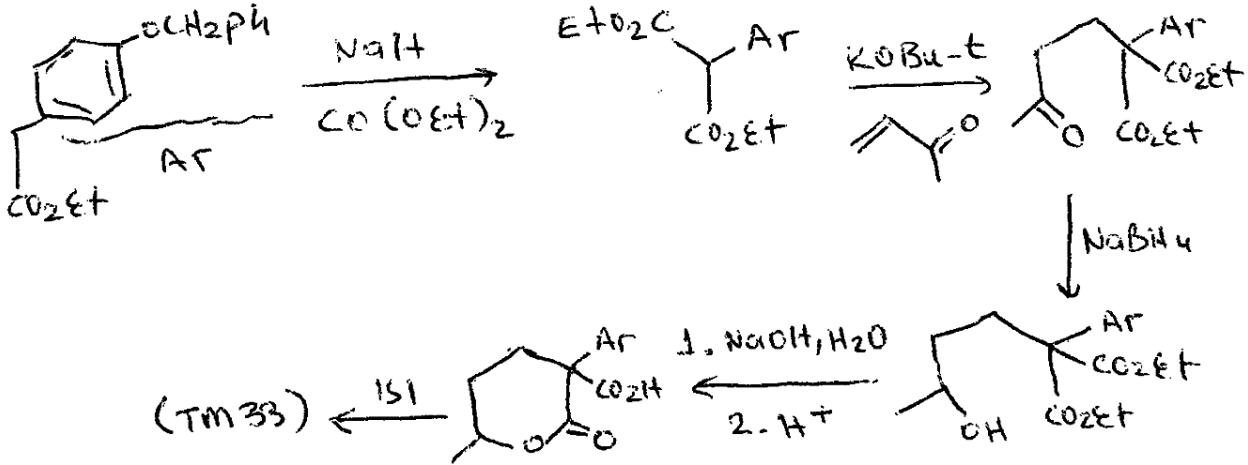
not: Cannizzaro reaksiyonu önlemek için daha ılımlı bir baz kullanılıyor

Örnek 2: Cedren sentezinde bir ara ürün olan (TM33) bileşiğinin sentez tasarımını yapınız.

Analizi: Bileşikte, 1,5-dio iskeleti var, bundan dolayı 1,5-dico bileşiğini elde etmek için FGI yapılmalı.

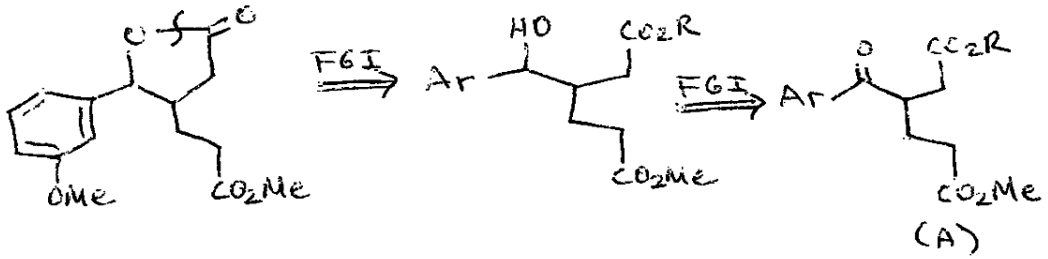


Sentezi: Michael reaksiyonu için aktifleştirilmiş bir grup gereklidir.

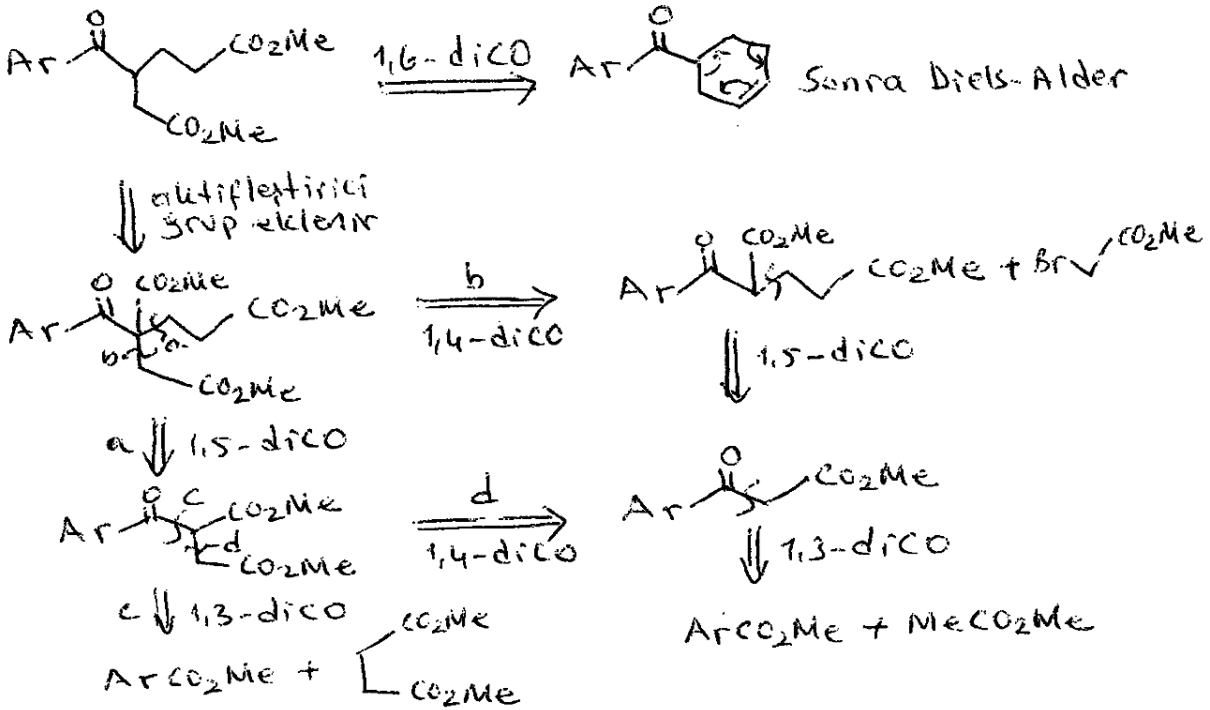


Örnek 3 : (TM34) bileşiğinin (Woodward'ın tetrasiklin sentezinde bir ara ürün) sentez tasarımını yapınız.

Analiz :

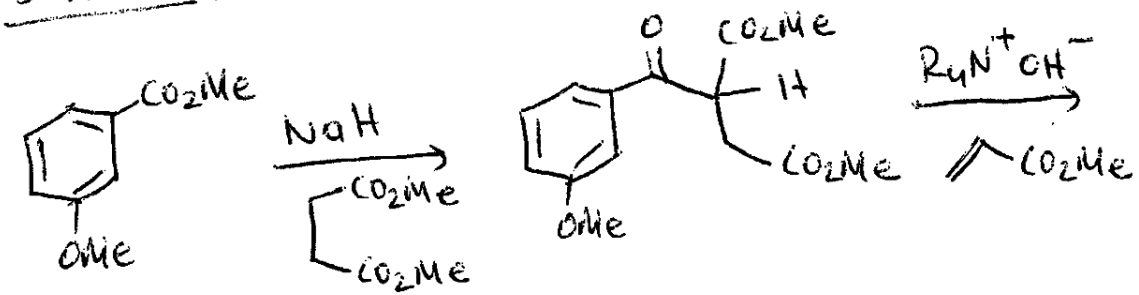


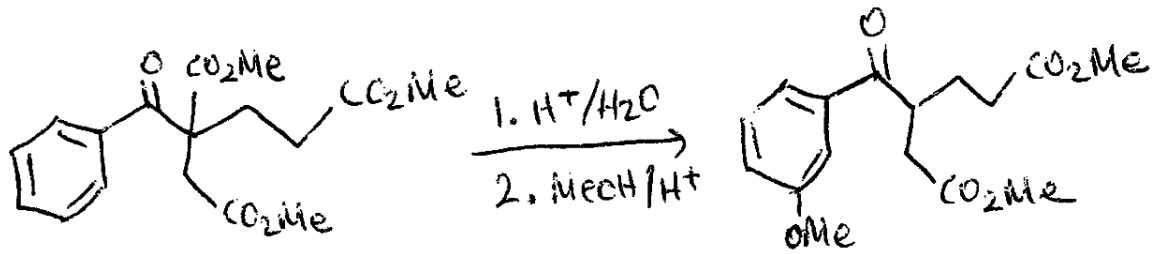
(A) bileşiği anahtar pozisyonundadır, çünkü, 1,4-, 1,5-, ve 1,6-dikarbonil bağlantılarını içerir. Bundan dolayı, farklı parçalanmalar olacaktır :

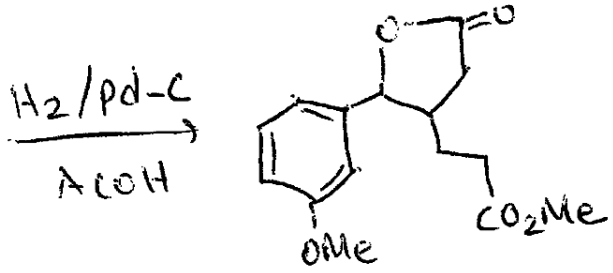


Woodward, bütün bu farklı yolların 1,6-dico bağlantısı dışında, hepsini incelemiş ve hepsinin başarılı olduğunu gözlemiştir. Ancak, sonunda a ve c'ye karşı gelen yolları seçmiştir.

Sentezi:



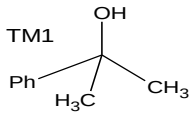




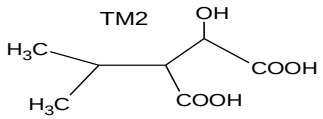
(TM 33)

(J. Amer. Chem. Soc., 1968, 90, 439; Pure and Applied Chem., 1963, 6, 651).

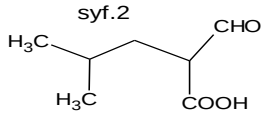
Ek-1. Bölüm 4'de geçen bileşiklerin adlandırılması



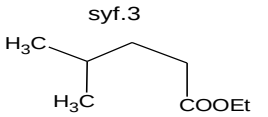
2-phenylpropan-2-ol



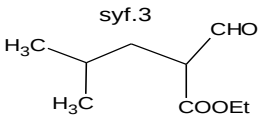
2-hydroxy-3-isopropylsuccinic acid



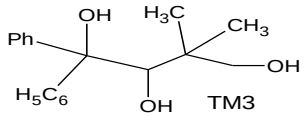
2-formyl-4-methylpentanoic acid



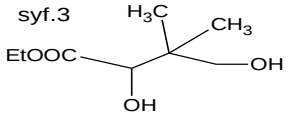
ethyl 4-methylpentanoate



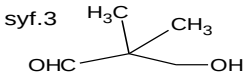
ethyl 2-formyl-4-methylpentanoate



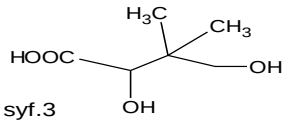
3,3-dimethyl-1,1-diphenylbutane-1,2,4-triol



ethyl 2,4-dihydroxy-3,3-dimethy lbutanoate

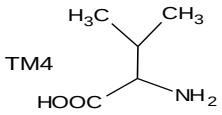


3-hydroxy-2,2-dimethylpropanal

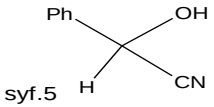


2,4-dihydroxy-3,3-dimethylbutanoic acid

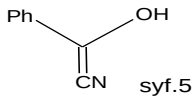
syf.3



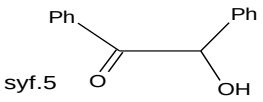
2-amino-3-methylbutanoic acid



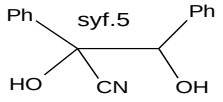
hydroxy(phenyl)acetonitrile



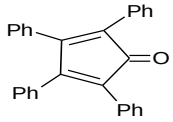
hydroxy(phenyl)acetonitrile



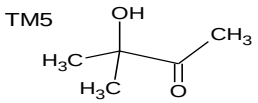
2-hydroxy-1,2-diphenylethanone (Benzoin)



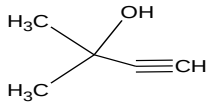
2,3-dihydroxy-2,3-diphenyl propanenitrile



2,3,4,5-tetraphenylcyclopenta-2,4-dien-1-one

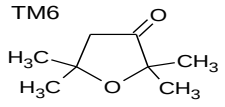


3-hydroxy-3-methylbutan-2-one

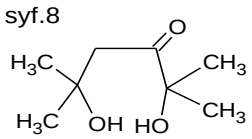


2-methylbut-3-yn-2-ol

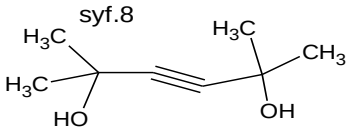
syf.7



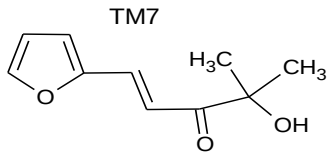
2,2,5,5-tetramethyldihydrofuran-3(2*H*)-one



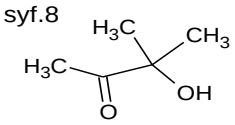
2,5-dihydroxy-2,5-dimethyl hexan-3-one



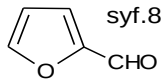
2,5-dimethylhex-3-yne-2,5-diol



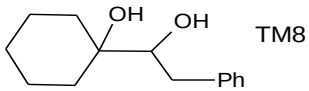
(1*E*)-1-(2-furyl)-4-hydroxy-4-methylpent-1-en-3-one



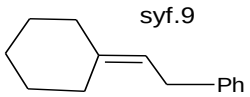
3-hydroxy-3-methyl butan-2-one



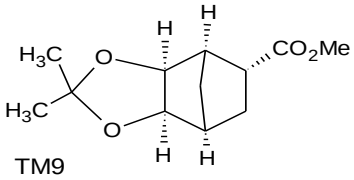
2-furaldehyde



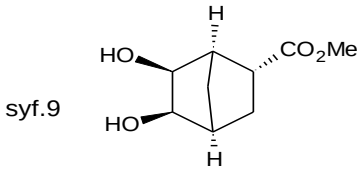
1-(1-hydroxy-2-phenylethyl)cyclohexanol



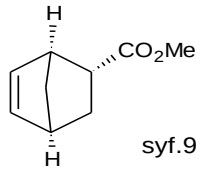
(2-cyclohexylideneethyl) benzene



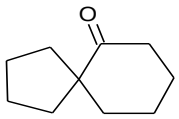
methyl (1*S*,2*R*,6*S*,7*R*,8*R*)-4,4-dimethyl-3,5-dioxatricyclo[5.2.1.0^{2,6}]decane-8-carboxylate



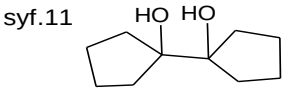
methyl (1*R*,2*R*,4*S*,5*R*,6*S*)-5,6-dihydroxy bicyclo[2.2.1]heptane-2-carboxylate



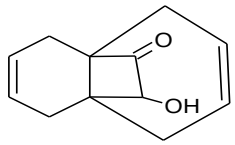
methyl (1*S*,2*R*,4*S*)-bicyclo[2.2.1] hept-5-ene-2-carboxylate



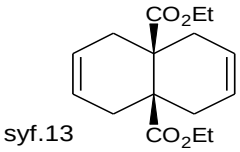
spiro[4.5]decan-6-one



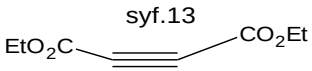
1,1'-bi(cyclopentyl)-1,1'-diol



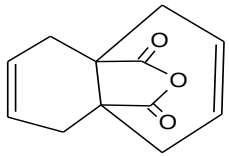
12-hydroxytricyclo[4.4.2.0^{1,6}]dodeca-3,8-dien-11-one



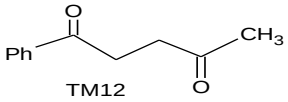
diethyl *cis*-1,4,5,8-tetrahydron aphthalene-4a,8a-dicarboxylate



diethyl but-2-ynedioate

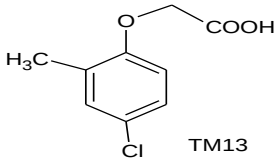


12-oxatricyclo[4.4.3.0^{1,6}]trideca-3,8-diene-11,13-dione



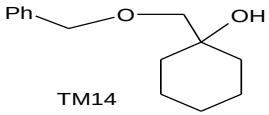
TM12

1-phenylpentane-1,4-dione



TM13

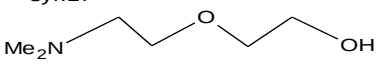
(4-chloro-2-methylphenoxy)acetic acid



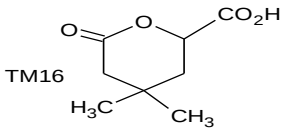
TM14

1-[(benzyloxy)methyl]cyclohexanol

syf.17

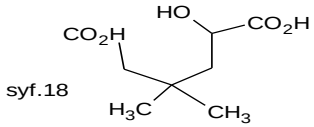


2-[2-(dimethylamino)ethoxy]ethanol



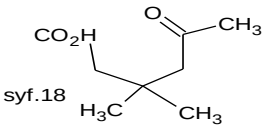
TM16

4,4-dimethyl-6-oxotetrahydro-2*H*-pyran-2-carboxylic acid



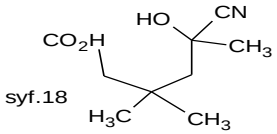
syf.18

2-hydroxy-4,4-dimethyl hexanedioic acid



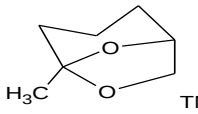
syf.18

3,3-dimethyl-5-oxohexanoic acid



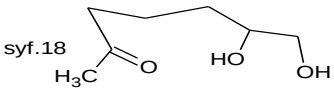
syf.18

5-cyano-5-hydroxy-3,3-dimethylhexanoic acid

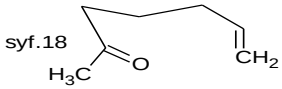


TM17

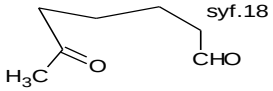
5-methyl-6,8-dioxabicyclo[3.2.1]octane



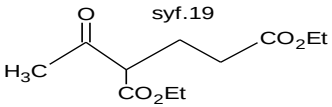
6,7-dihydroxyheptan-2-one



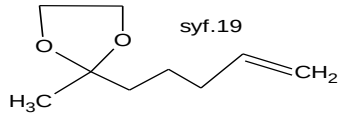
hept-6-en-2-one



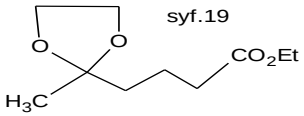
6-oxoheptanal



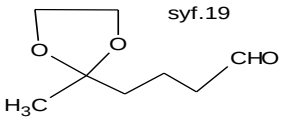
diethyl 2-acetylpentanedioate



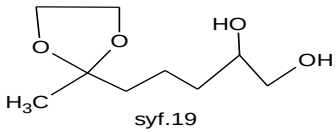
2-methyl-2-pent-4-en-1-yl-1,3-dioxolane



ethyl 4-(2-methyl-1,3-dioxolan-2-yl)butanoate



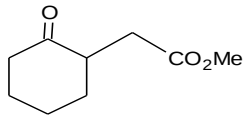
4-(2-methyl-1,3-dioxolan-2-yl)butanal



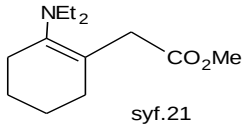
syf.19

5-(2-methyl-1,3-dioxolan-2-yl) pentane-1,2-diol

TM18



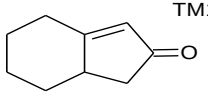
methyl (2-oxocyclohexyl)acetate



syf.21

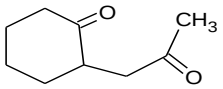
methyl [2-(diethylamino)cyclohex-1-en-1-yl]acetate

TM19



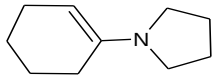
1,4,5,6,7,7a-hexahydro-2*H*-inden-2-one

syf.21

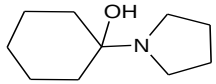


2-(2-oxopropyl)cyclohexanone

syf.22



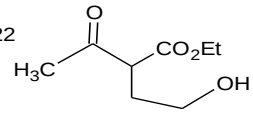
1-cyclohex-1-en-1-ylpyrrolidine



syf.22

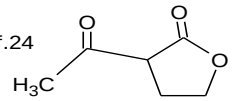
1-pyrrolidin-1-ylcyclohexanol

TM22

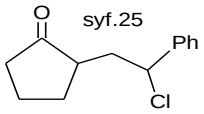


ethyl 2-(2-hydroxyethyl)-3-oxobutanoate

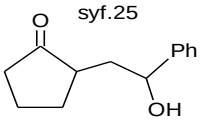
syf.24



3-acetyldihydrofuran-2(3*H*)-one

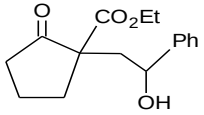


2-(2-chloro-2-phenylethyl) cyclopentanone

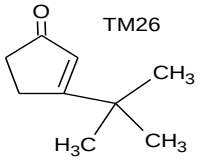


2-(2-hydroxy-2-phenylethyl) cyclopentanone

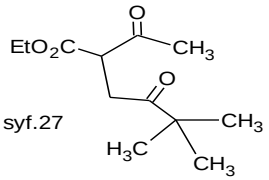
syf.25



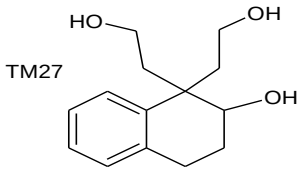
ethyl 1-(2-hydroxy-2-phenylethyl) -2-oxocyclopentanecarboxylate



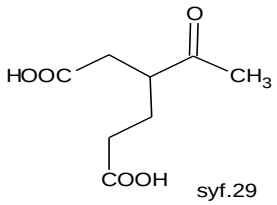
3-*tert*-butylcyclopent-2-en-1-one



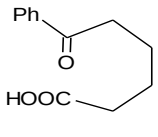
ethyl 2-acetyl-5,5-dimethyl -4-oxohexanoate



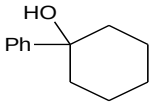
1,1-bis(2-hydroxyethyl)-1,2,3,4 -tetrahydronaphthalen-2-ol



3-acetylhexanedioic acid

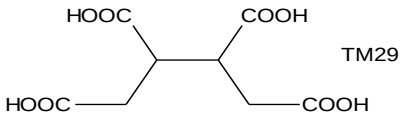


6-oxo-6-phenylhexanoic acid



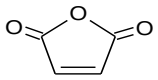
syf.29

1-phenylcyclohexanol

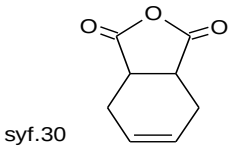


butane-1,2,3,4-tetracarboxylic acid

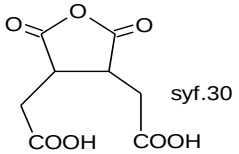
syf.30



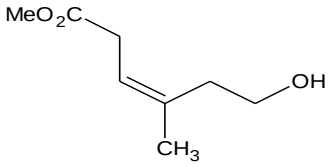
furan-2,5-dione



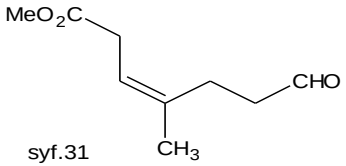
3a,4,7,7a-tetrahydro-2-benzofuran-1,3-dione



2,2'-(2,5-dioxotetrahydrofuran-3,4-diyl)diacetic acid

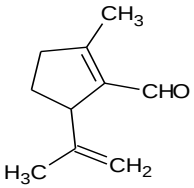


methyl (3*Z*)-6-hydroxy-4-methylhex-3-enoate

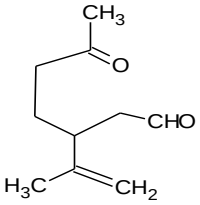


syf.31

methyl (3*Z*)-4-methyl-7-oxohept-3-enoate

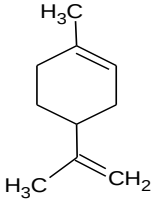


5-isopropenyl-2-methylcyclopent-1-ene-1-carbaldehyde

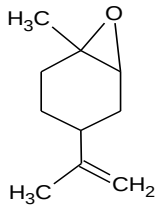


syf.32

3-isopropenyl-6-oxoheptanal

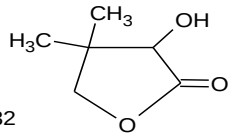


4-isopropenyl-1-methylcyclohexene



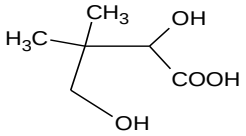
4-isopropenyl-1-methyl-7-oxabicyclo[4.1.0]heptane

TM32

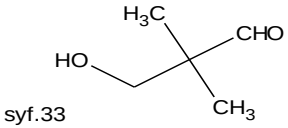


3-hydroxy-4,4-dimethyldihydrofuran-2(3*H*)-one

syf.33



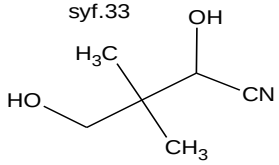
2,4-dihydroxy-3,3-dimethylbutanoic acid



syf.33

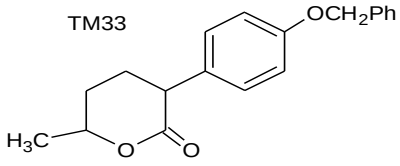
3-hydroxy-2,2-dimethylpropanal

syf.33

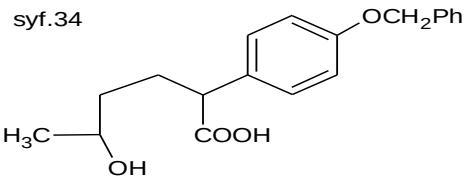


2,4-dihydroxy-3,3-dimethylbutanenitrile

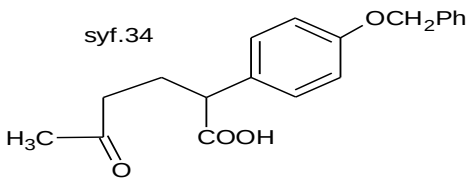
TM33



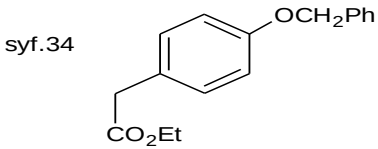
3-[4-(benzyloxy)phenyl]-6-methyl tetrahydro-2*H*-pyran-2-one



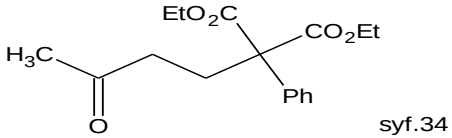
2-[4-(benzyloxy)phenyl]-5-hydroxyhexanoic acid



2-[4-(benzyloxy)phenyl]-5-oxohexanoic acid

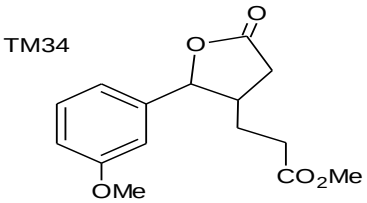


ethyl [4-(benzyloxy)phenyl]acetate

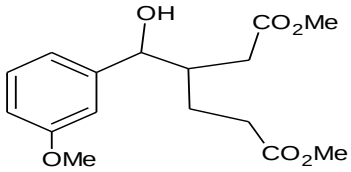


syf.34

diethyl (3-oxobutyl)(phenyl)malonate

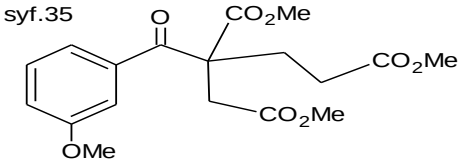


methyl 3-[2-(3-methoxyphenyl)-5-oxotetrahydrofuran-3-yl]propanoate

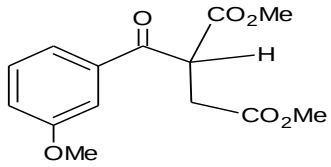


syf.35

dimethyl 3-[hydroxy(3-methoxyphenyl)methyl]hexanedioate

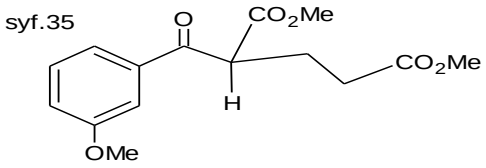


trimethyl 2-(3-methoxybenzoyl) butane-1,2,4-tricarboxylate

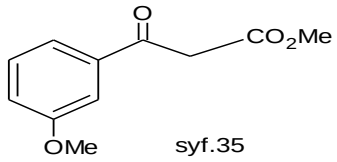


syf.35

dimethyl 2-(3-methoxybenzoyl)succinate



dimethyl 2-(3-methoxybenzoyl)pentanedioate



syf.35

methyl 3-(3-methoxyphenyl)-3-oxopropanoate