

KÜTLE SPEKTRUMLARI

ORGANİK FONKSİYONEL GRUPLARIN FRAGMENTASYON PATERNLERİ

Ref. Enstrümantal Analiz

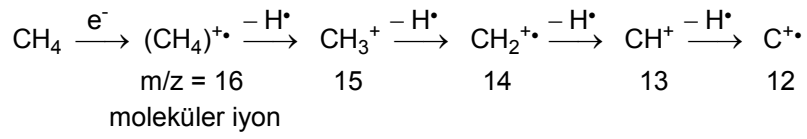
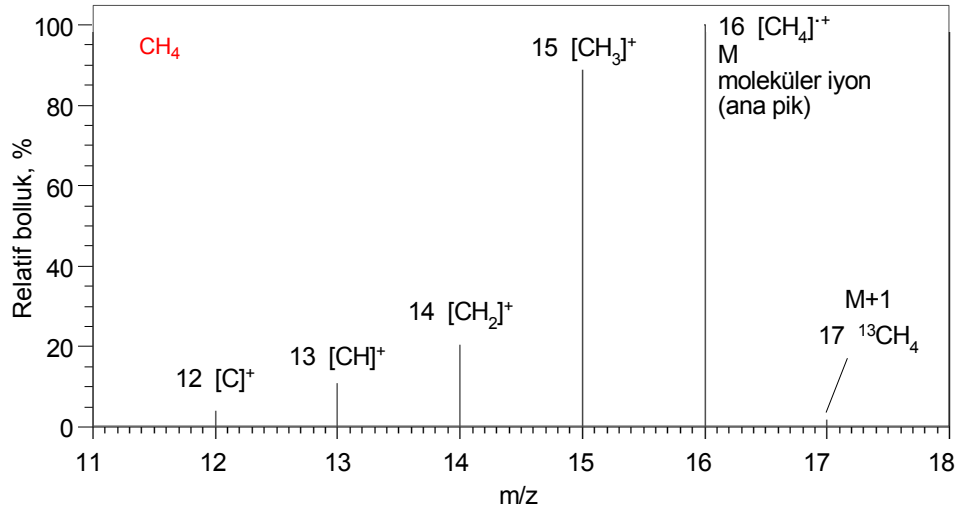
Organik moleküller, molekülde bulunan fonksiyonel gruplara bağlı olarak çeşitli parçalanma (fragman) şekilleri gösterirler; fragmanlar pozitif yüklü ise, kütle spektrometresiyle saptanabilir. Spektruma bulunan veya bulunmayan çeşitli kütle pikleri, bileşiğin yapısının aydınlatılmasında kullanılabilen önemli verilerdir. Bu çalışmada temel organik fonksiyonel grupların verebilecekleri fragmanları incelenerek yapısal formüllerle kütle spektrumlarının bağlantısı gösterilmiştir.

| | |
|--------------------------------|-----------------------------------|
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| 2. Dallanmış Alkanlar | 2. Siklik Alkenler |
| 3. Siklik Alkanlar | 3. Alkinler |
| C. AROMATİK BİLEŞİKLER | |
| D. KARBONİL BİLEŞİKLERİ | E. DİĞER ÖNEMLİ GRUPLAR |
| 1. Aldehitler | 1. Alkoller |
| 2. Ketonlar | 2. Tiyoller |
| 3. Esterler | 3. Eterler |
| 4. Karboksilik Asitler | 4. Sülfürler |
| 5. Amidler | 5. Aminler |
| 6. Anhidritler | 6. Nitriller |
| 7. Asit Halojenler | 7. Nitro Bileşikleri |
| | 8. Halojenli Bileşikler |

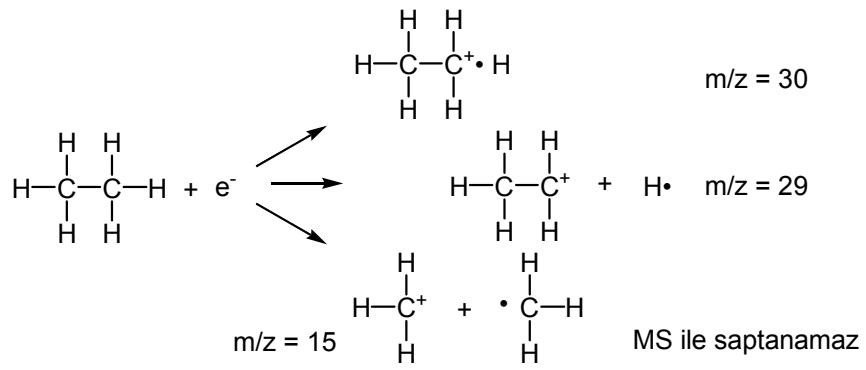
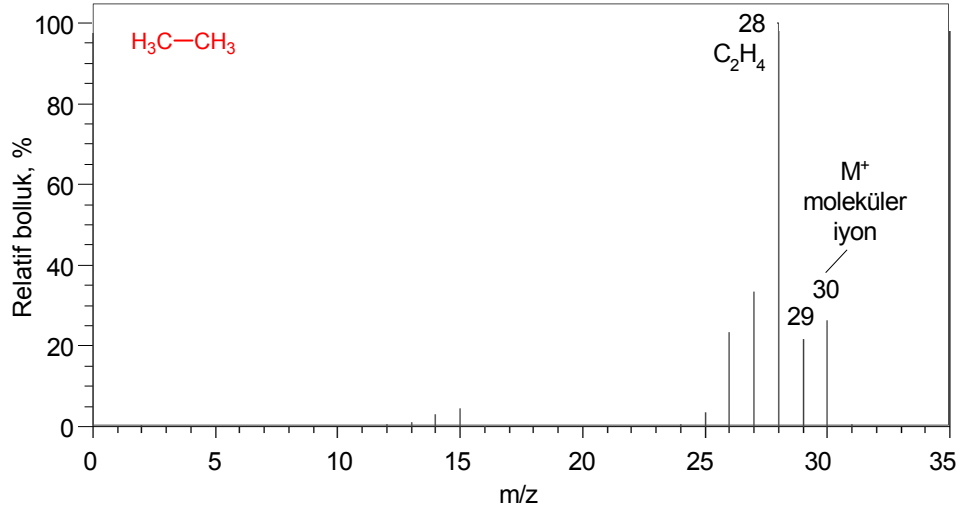
A. ALKANLAR

1. DÜZ ZİNCİRLİ ALKANLAR

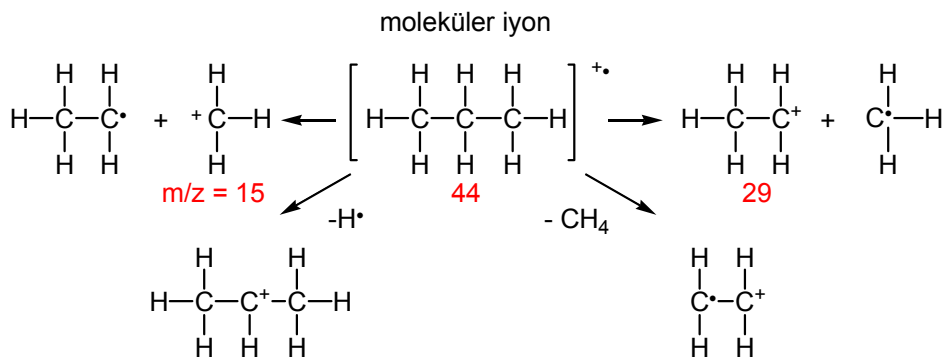
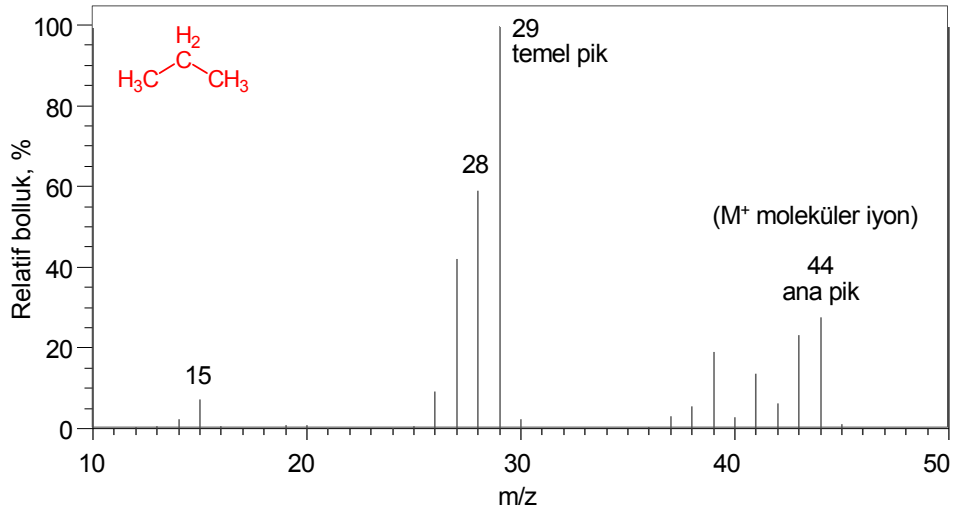
Metan, CH₄ (16.04)



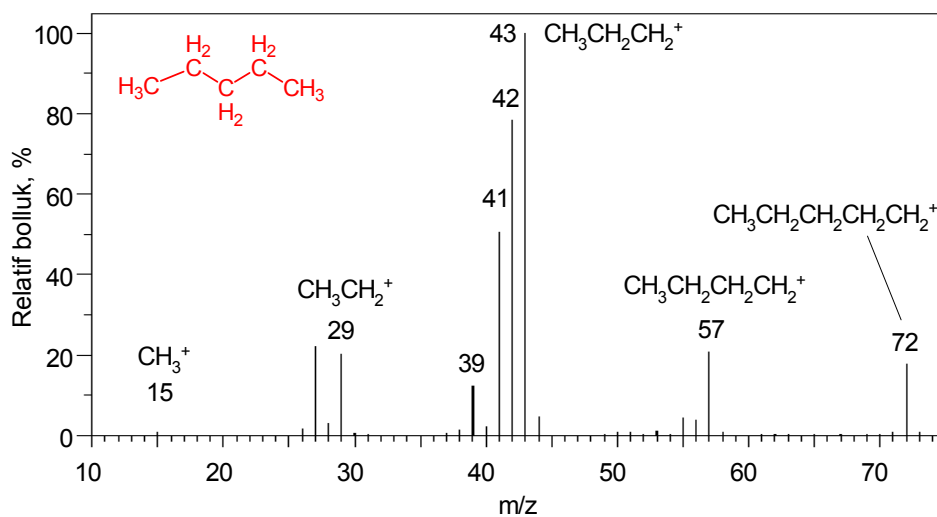
Etan, C₂H₆ (30.07)



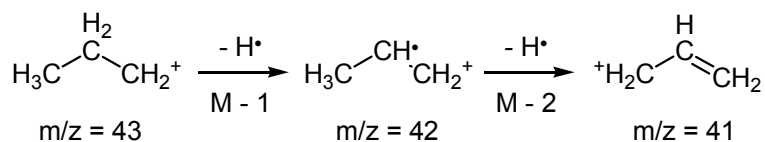
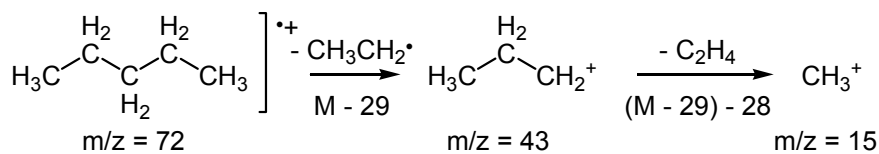
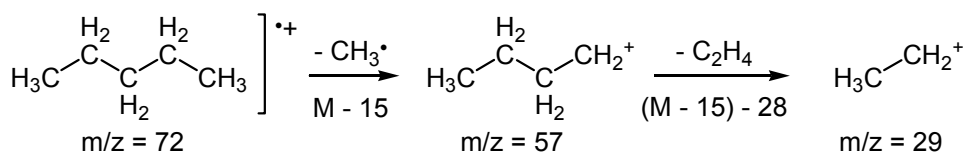
Propan, C₃H₈ (44.1)



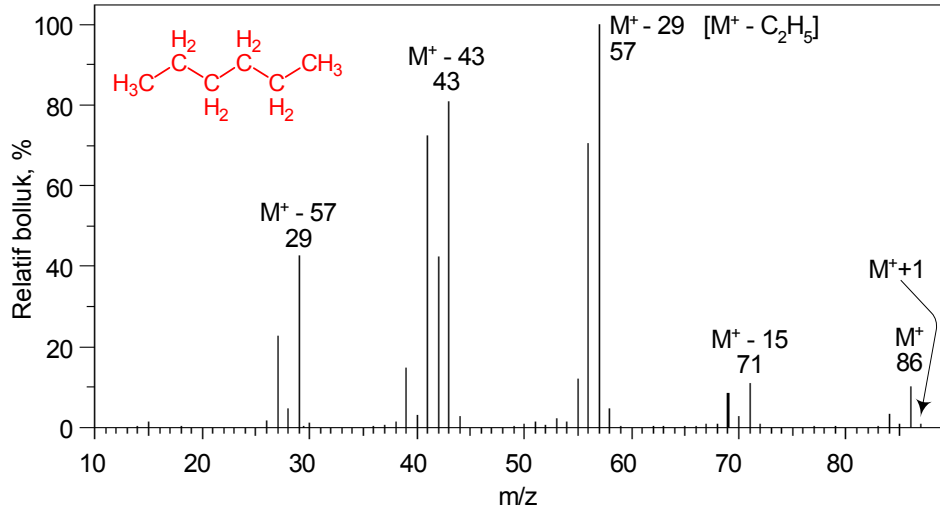
Pentan, C₅H₁₂ (72.15)



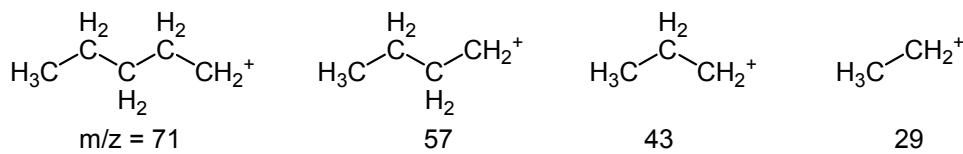
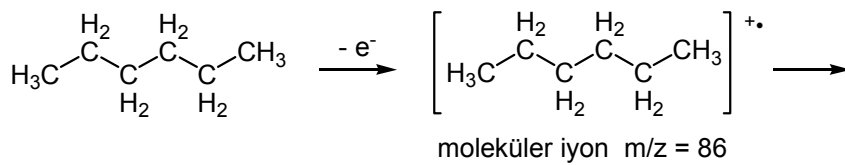
| | | | | | |
|------|------|------|-------|------|------|
| 26.0 | 1.6 | 40.0 | 2.2 | 53.0 | 1.1 |
| 27.0 | 22.2 | 41.0 | 50.5 | 55.0 | 4.4 |
| 28.0 | 3.1 | 42.0 | 78.3 | 56.0 | 3.7 |
| 29.0 | 20.3 | 43.0 | 100.0 | 57.0 | 20.6 |
| 38.0 | 1.3 | 44.0 | 4.6 | 72.0 | 17.8 |
| 39.0 | 12.2 | | | | |



n-Heksan, C₆H₁₄ (86.18)

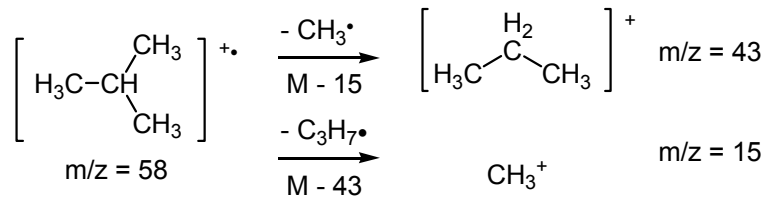
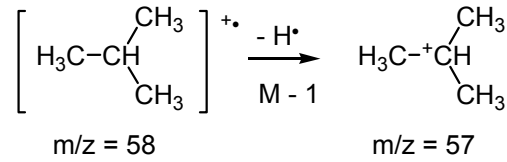
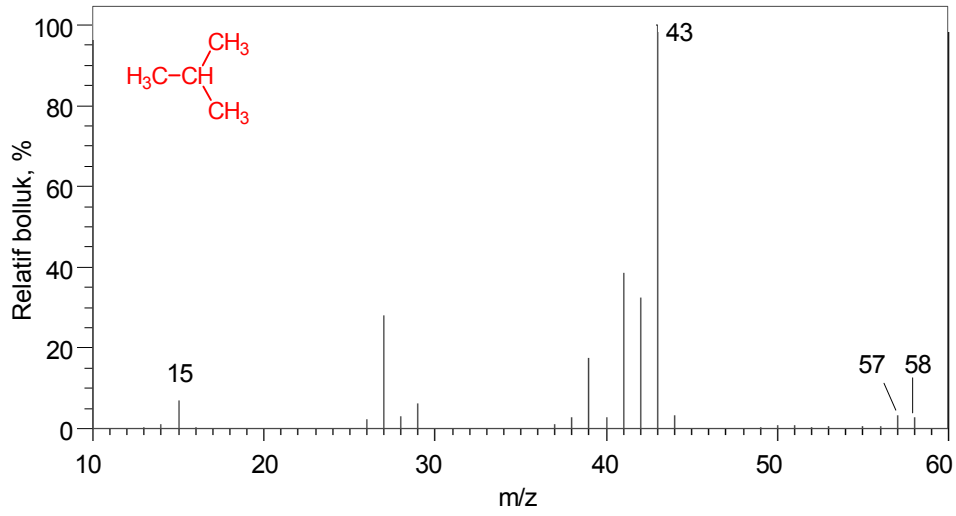


| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 1.3 | 41.0 | 72.5 | 56.0 | 70.5 |
| 26.0 | 1.7 | 42.0 | 42.4 | 57.0 | 100.0 |
| 27.0 | 22.7 | 43.0 | 80.9 | 58.0 | 4.7 |
| 28.0 | 4.7 | 44.0 | 2.8 | 69.0 | 8.5 |
| 29.0 | 42.5 | 51.0 | 1.2 | 70.0 | 2.6 |
| 30.0 | 1.0 | 53.0 | 2.2 | 71.0 | 11.0 |
| 38.0 | 1.2 | 54.0 | 1.2 | 84.0 | 3.2 |
| 39.0 | 14.8 | 55.0 | 12.1 | 86.0 | 10.0 |
| 40.0 | 3.1 | | | | |

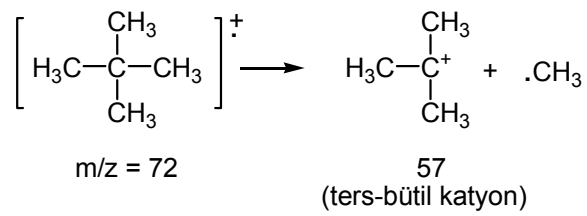
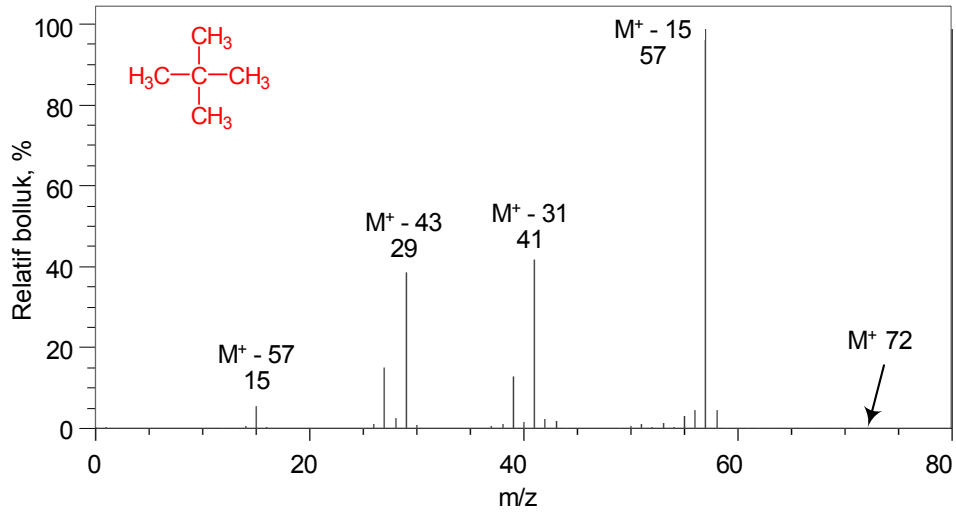


2. DALLANMIŞ ALKANLAR

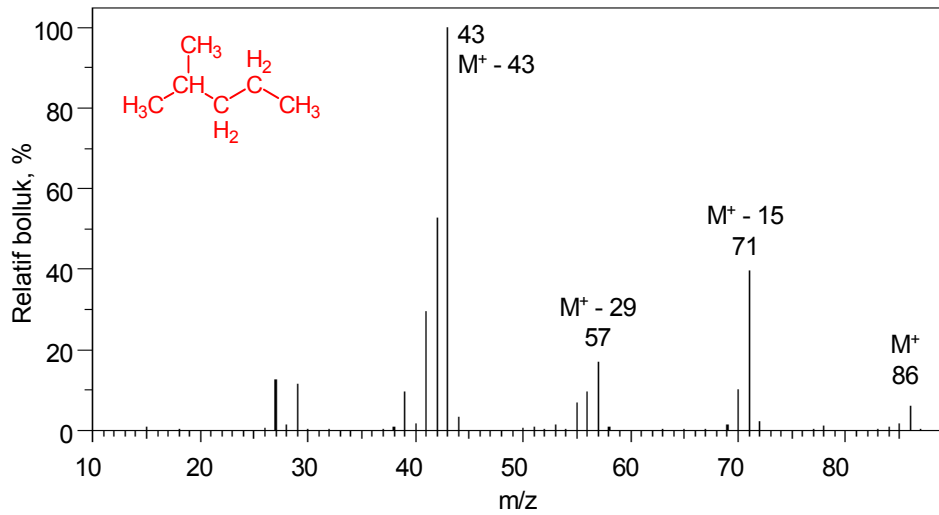
İzobütan, C₄H₁₀ (58.12)



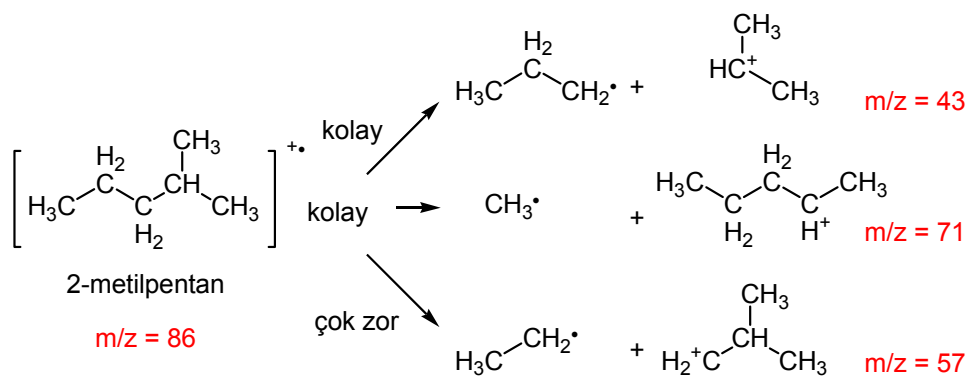
2,2-Dimetilpropan, C₅H₁₂ (72.15)



2-Metilpentan, C₆H₁₄ (86.18)

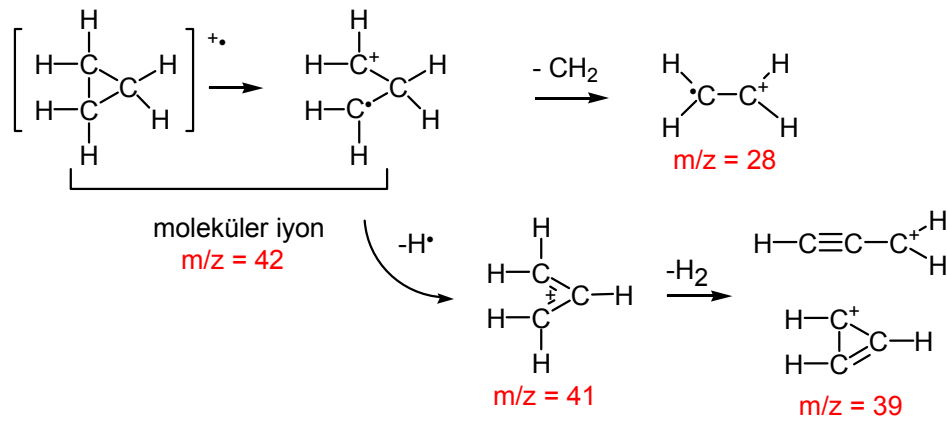
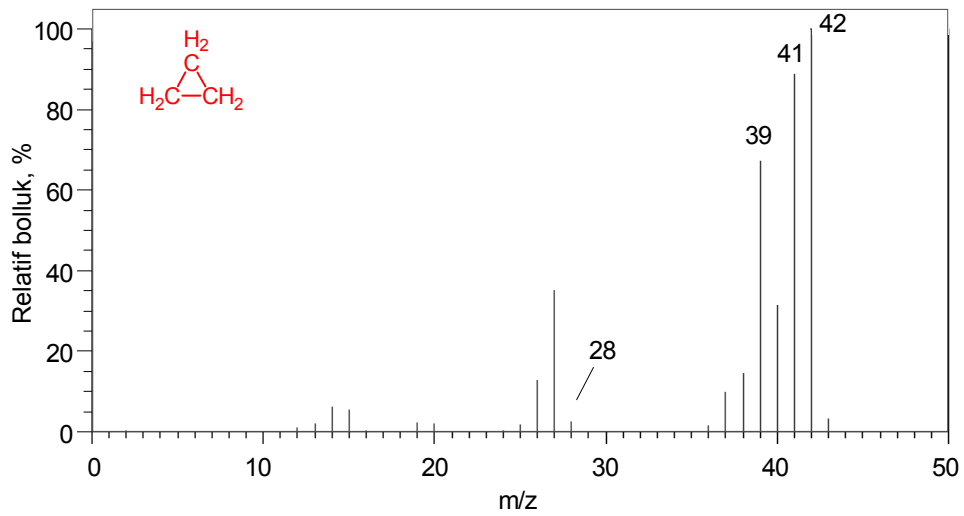


| | | | | | |
|------|------|------|-------|------|------|
| 27.0 | 12.6 | 43.0 | 100.0 | 70.0 | 10.2 |
| 28.0 | 1.3 | 44.0 | 3.2 | 71.0 | 39.5 |
| 29.0 | 11.3 | 53.0 | 1.2 | 72.0 | 2.2 |
| 39.0 | 9.6 | 55.0 | 6.7 | 78.0 | 1.0 |
| 40.0 | 1.5 | 56.0 | 9.4 | 85.0 | 1.5 |
| 41.0 | 29.5 | 57.0 | 17.0 | 86.0 | 6.1 |
| 42.0 | 52.6 | 69.0 | 1.3 | | |

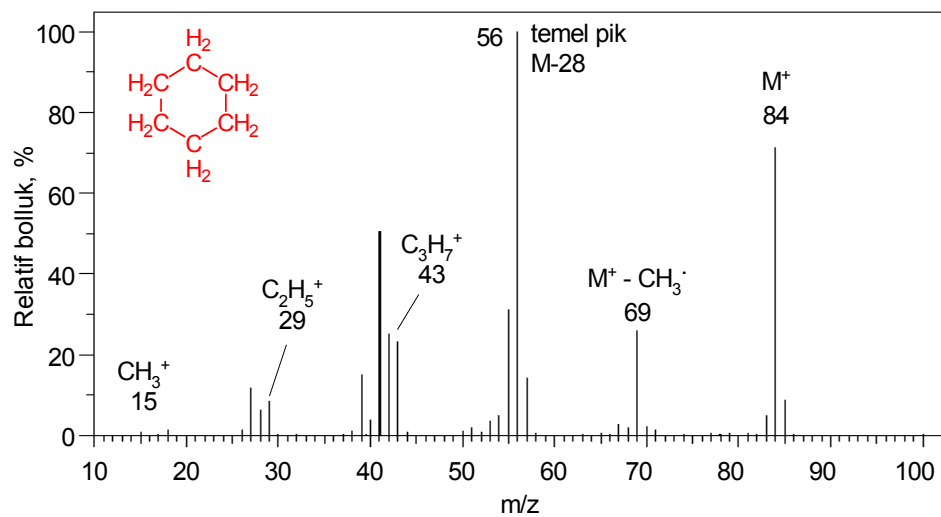


3. SIKLIK ALKANLAR

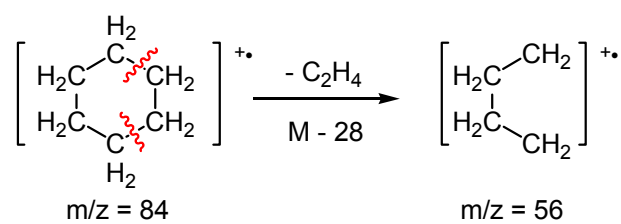
Siklopropan, C₃H₆ (42.08)

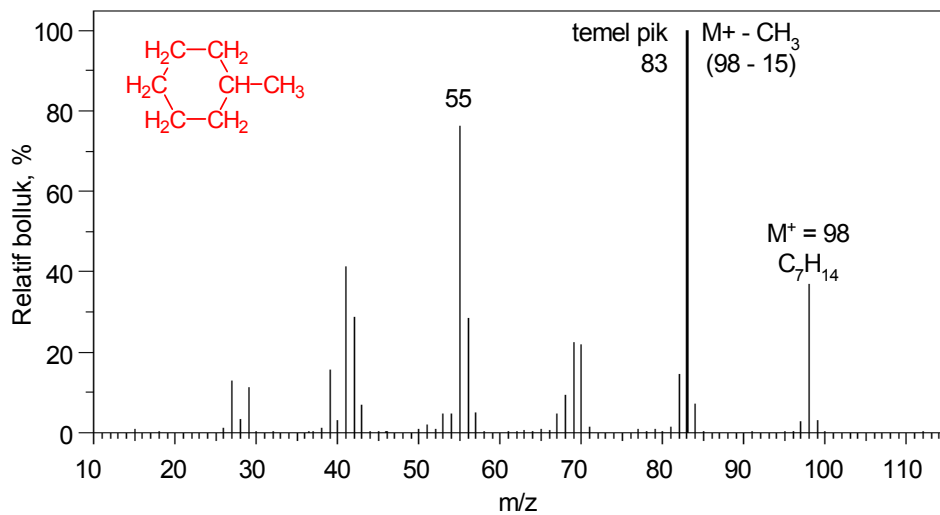


Sikloheksan, C₆H₁₂ (84.16)



| | | | | | |
|------|------|------|-------|------|------|
| 18.0 | 1.2 | 42.0 | 25.1 | 67.0 | 2.7 |
| 26.0 | 1.3 | 43.0 | 23.1 | 68.0 | 2.0 |
| 27.0 | 11.7 | 50.0 | 1.1 | 69.0 | 25.9 |
| 28.0 | 6.2 | 51.0 | 1.8 | 70.0 | 2.2 |
| 29.0 | 8.5 | 53.0 | 3.4 | 71.0 | 1.2 |
| 38.0 | 1.0 | 54.0 | 4.9 | 83.0 | 4.9 |
| 39.0 | 15.0 | 55.0 | 31.0 | 84.0 | 71.4 |
| 40.0 | 3.9 | 56.0 | 100.0 | 85.0 | 8.6 |
| 41.0 | 50.5 | 57.0 | 14.1 | | |



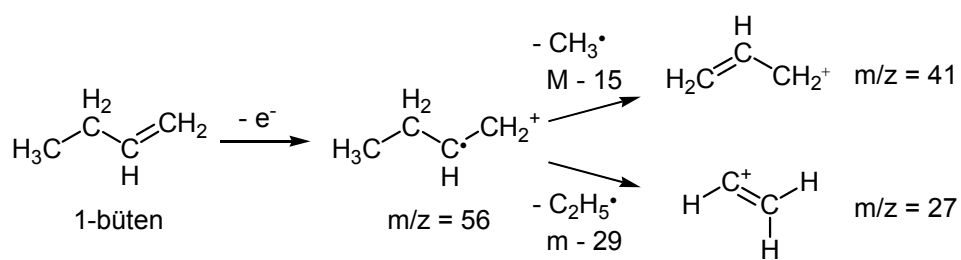
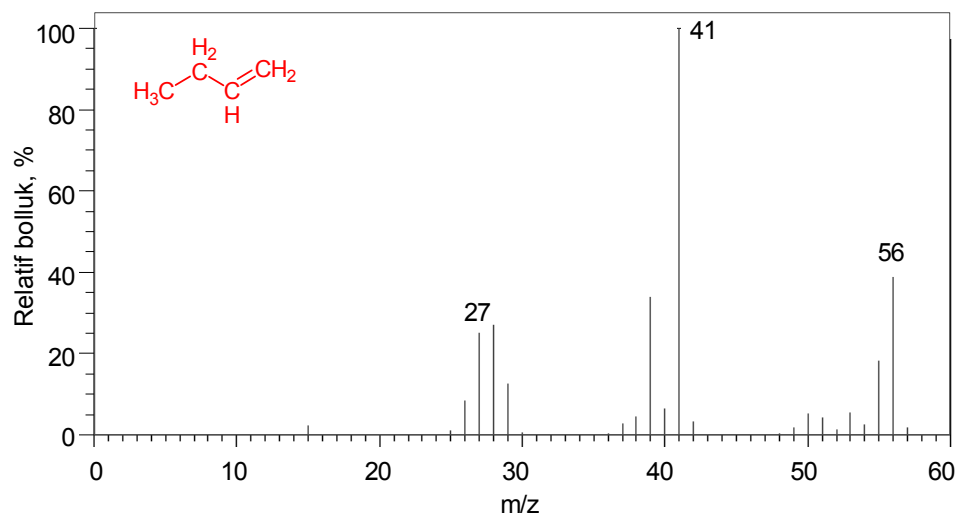
Metilsikloheksan, C₇H₁₄ (98.19)


| | | | | | |
|------|------|------|------|------|-------|
| 26.0 | 1.0 | 43.0 | 6.9 | 69.0 | 22.5 |
| 27.0 | 12.9 | 51.0 | 1.9 | 70.0 | 21.8 |
| 28.0 | 3.2 | 53.0 | 4.6 | 71.0 | 1.4 |
| 29.0 | 11.1 | 54.0 | 4.5 | 81.0 | 1.4 |
| 38.0 | 1.0 | 55.0 | 76.3 | 82.0 | 14.5 |
| 39.0 | 15.6 | 56.0 | 28.5 | 83.0 | 100.0 |
| 40.0 | 2.9 | 57.0 | 5.0 | 84.0 | 7.0 |
| 41.0 | 41.1 | 67.0 | 4.5 | 97.0 | 2.8 |
| 42.0 | 28.6 | 68.0 | 9.3 | 98.0 | 36.9 |
| | | | | 99.0 | 3.1 |

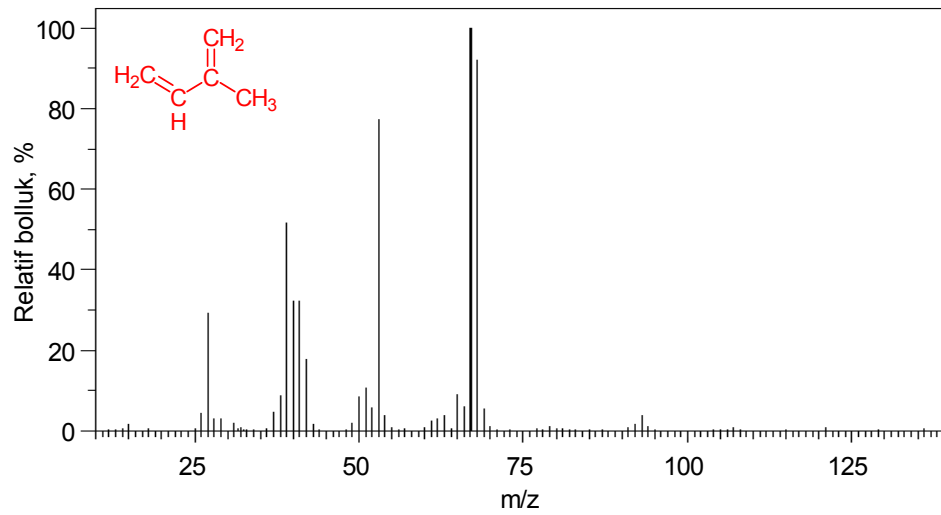
B. DOYMAMIŞ HİDROKARBONLAR

1. DÜZ ZİNCİRLİ ALKENLER

1-Büten, C₄H₈ (56.11)

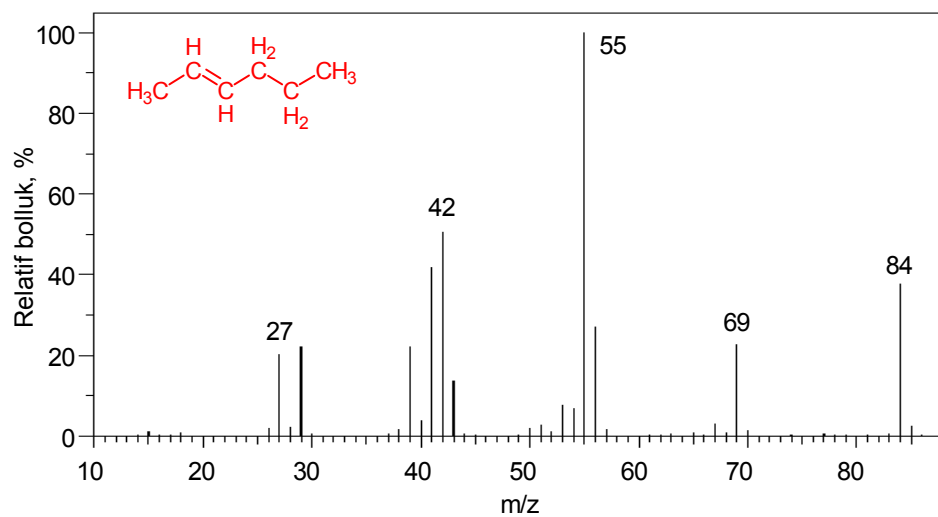


İzopren, C₅H₈ (68.12)

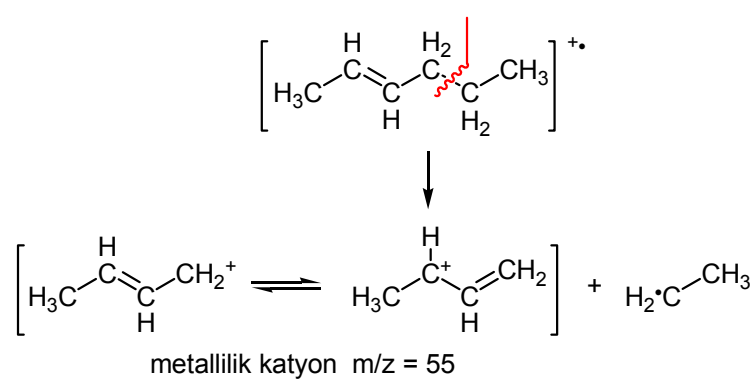


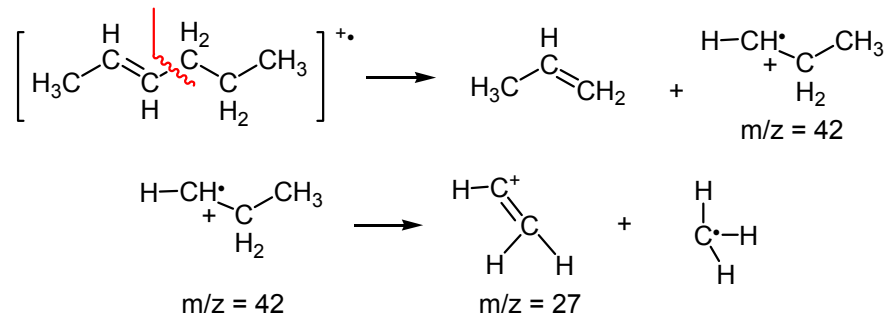
| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 1.6 | 42.0 | 17.8 | 65.0 | 9.1 |
| 26.0 | 4.3 | 43.0 | 1.5 | 66.0 | 6.1 |
| 27.0 | 29.1 | 49.0 | 2.0 | 67.0 | 100.0 |
| 28.0 | 2.9 | 50.0 | 8.3 | 68.0 | 92.1 |
| 29.0 | 2.9 | 51.0 | 10.6 | 69.0 | 5.4 |
| 31.0 | 1.9 | 52.0 | 5.7 | 70.0 | 1.0 |
| 37.0 | 4.7 | 53.0 | 77.2 | 79.0 | 1.1 |
| 38.0 | 8.8 | 54.0 | 3.7 | 92.0 | 1.7 |
| 39.0 | 51.5 | 61.0 | 2.3 | 93.0 | 3.8 |
| 40.0 | 32.3 | 62.0 | 3.1 | 94.0 | 1.0 |
| 41.0 | 32.2 | 63.0 | 3.9 | | |

2-Heksen, C₆H₁₂ (84.16)

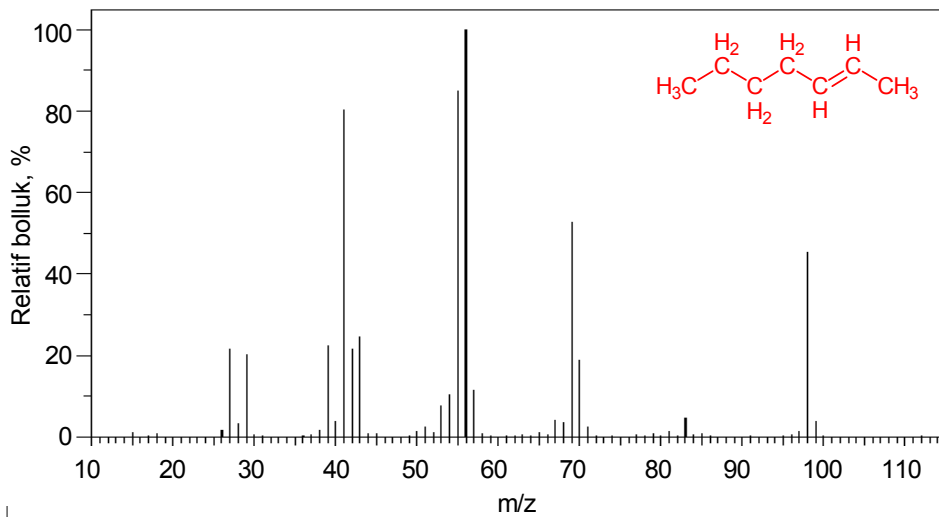


| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 1.1 | 41.0 | 41.9 | 55.0 | 100.0 |
| 26.0 | 1.9 | 42.0 | 50.4 | 56.0 | 27.0 |
| 27.0 | 20.1 | 43.0 | 13.6 | 57.0 | 1.6 |
| 28.0 | 2.1 | 50.0 | 1.8 | 67.0 | 2.9 |
| 29.0 | 22.1 | 51.0 | 2.7 | 69.0 | 22.6 |
| 38.0 | 1.7 | 52.0 | 1.1 | 70.0 | 1.2 |
| 39.0 | 22.2 | 53.0 | 7.5 | 84.0 | 37.8 |
| 40.0 | 3.9 | 54.0 | 6.9 | 85.0 | 2.5 |



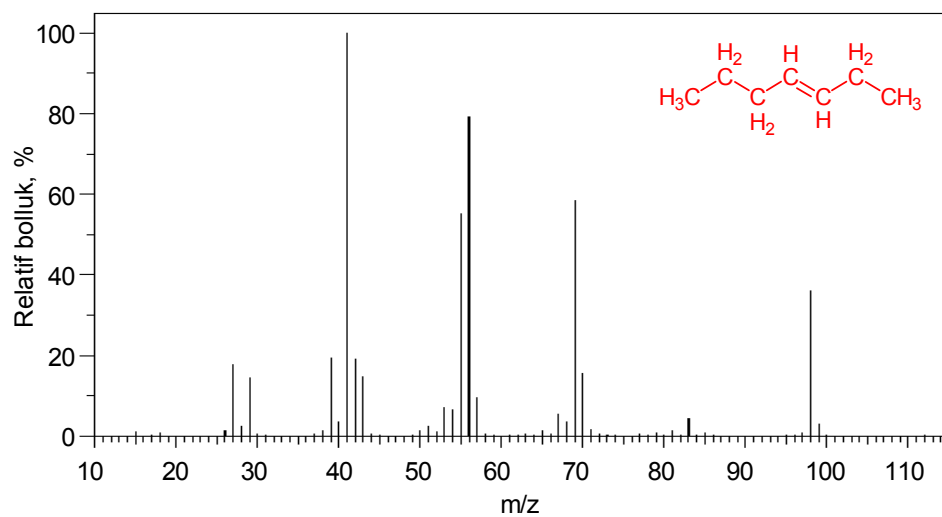


2-Hepten, C₇H₁₄ (98.19)



| | | | | | |
|------|------|------|-------|------|------|
| 15.0 | 1.0 | 43.0 | 24.6 | 67.0 | 4.0 |
| 26.0 | 1.5 | 50.0 | 1.3 | 68.0 | 3.6 |
| 27.0 | 21.5 | 51.0 | 2.4 | 69.0 | 52.8 |
| 28.0 | 3.2 | 52.0 | 1.1 | 70.0 | 18.9 |
| 29.0 | 20.2 | 53.0 | 7.6 | 71.0 | 2.5 |
| 38.0 | 1.5 | 54.0 | 10.4 | 81.0 | 1.4 |
| 39.0 | 22.4 | 55.0 | 84.8 | 83.0 | 4.7 |
| 40.0 | 3.9 | 56.0 | 100.0 | 97.0 | 1.3 |
| 41.0 | 80.2 | 57.0 | 11.5 | 98.0 | 45.4 |
| 42.0 | 21.5 | 65.0 | 1.1 | 99.0 | 3.7 |

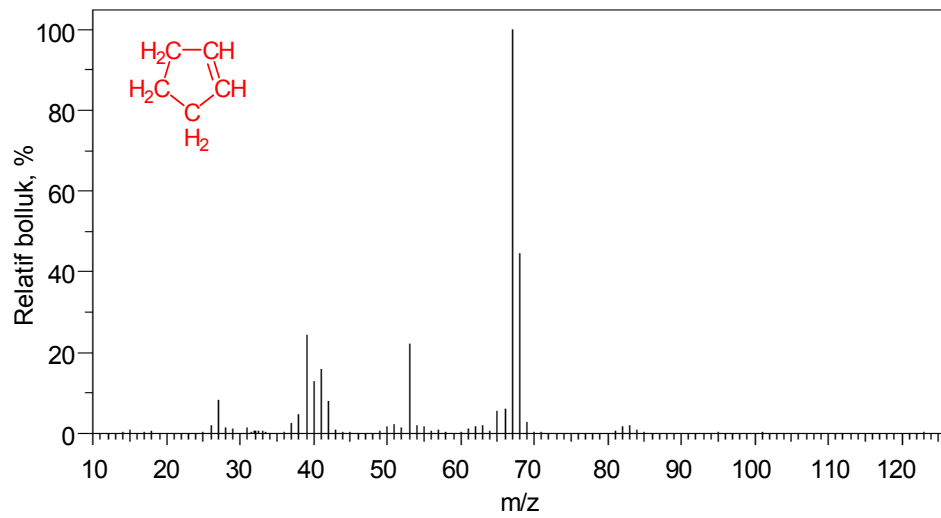
3-Hepten, C₇H₁₄ (98.19)



| | | | | | |
|------|-------|------|------|------|------|
| 15.0 | 1.0 | 43.0 | 14.7 | 67.0 | 5.3 |
| 26.0 | 1.4 | 50.0 | 1.2 | 68.0 | 3.4 |
| 27.0 | 17.6 | 51.0 | 2.4 | 69.0 | 58.4 |
| 28.0 | 2.3 | 52.0 | 1.0 | 70.0 | 15.6 |
| 29.0 | 14.5 | 53.0 | 7.0 | 71.0 | 1.7 |
| 38.0 | 1.4 | 54.0 | 6.4 | 81.0 | 1.4 |
| 39.0 | 19.3 | 55.0 | 55.2 | 83.0 | 4.3 |
| 40.0 | 3.6 | 56.0 | 79.2 | 98.0 | 36.1 |
| 41.0 | 100.0 | 57.0 | 9.5 | 99.0 | 2.9 |
| 42.0 | 19.0 | 65.0 | 1.2 | | |

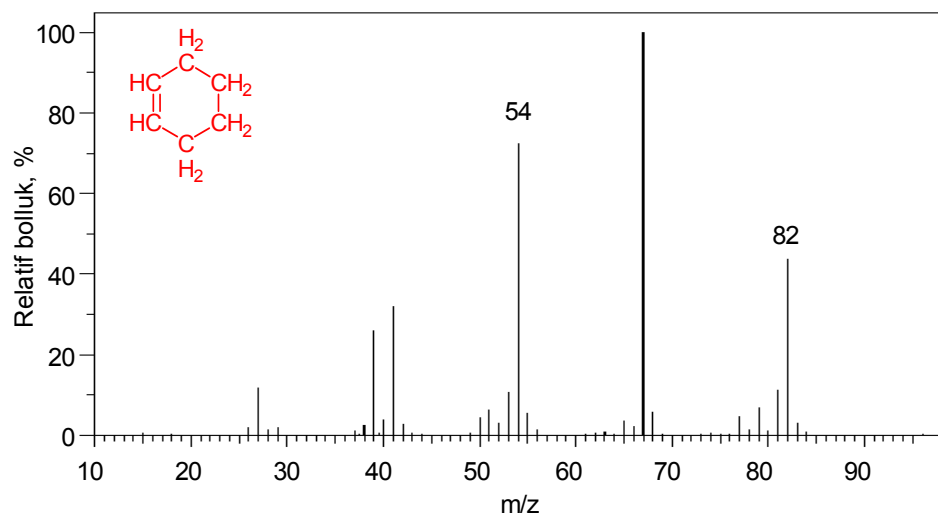
2. SIKLIK ALKENLER

Siklopenten, C₅H₈ (68.12)

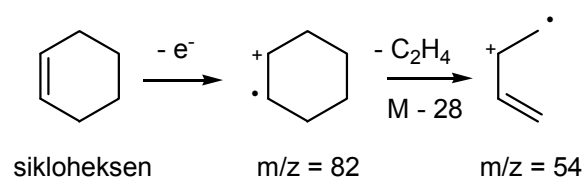


| | | | | | |
|------|------|------|------|------|-------|
| 26.0 | 1.9 | 41.0 | 15.7 | 62.0 | 1.5 |
| 27.0 | 8.1 | 42.0 | 8.0 | 63.0 | 2.0 |
| 28.0 | 1.3 | 50.0 | 1.6 | 65.0 | 5.5 |
| 29.0 | 1.1 | 51.0 | 2.2 | 66.0 | 6.1 |
| 31.0 | 1.4 | 52.0 | 1.2 | 67.0 | 100.0 |
| 37.0 | 2.3 | 53.0 | 22.2 | 68.0 | 44.4 |
| 38.0 | 4.6 | 54.0 | 1.8 | 69.0 | 2.6 |
| 39.0 | 24.3 | 55.0 | 1.6 | 82.0 | 1.7 |
| 40.0 | 12.9 | 61.0 | 1.1 | 83.0 | 1.8 |

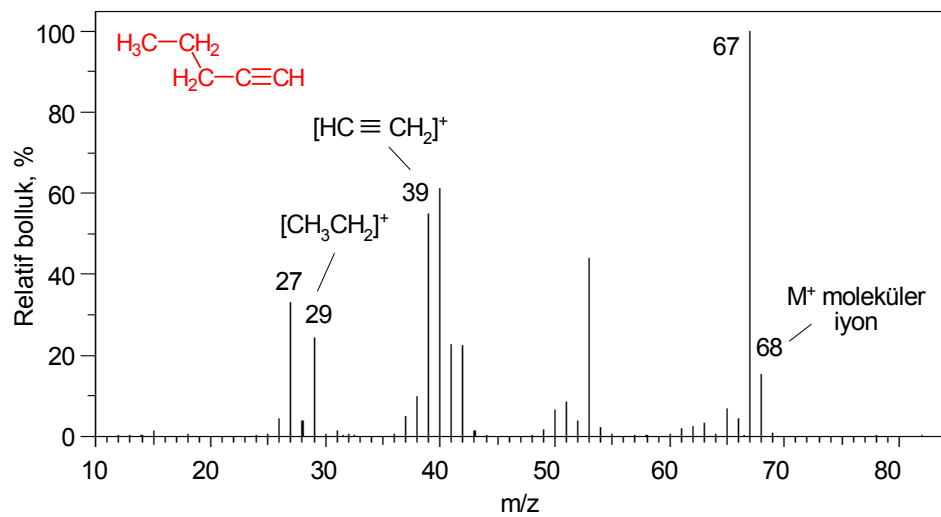
Sikloheksen, C₆H₁₀ (82.14)



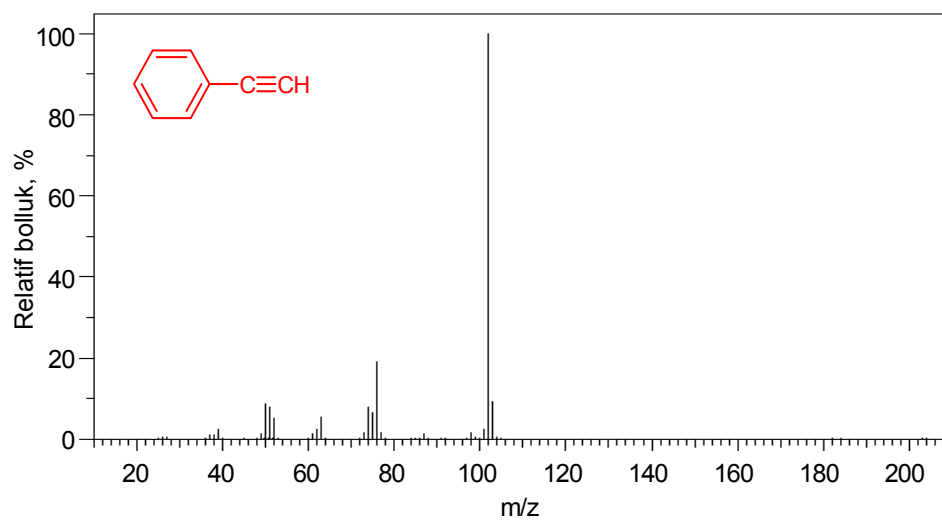
| | | | | | |
|------|------|------|-------|------|------|
| 26.0 | 1.9 | 50.0 | 4.3 | 68.0 | 5.7 |
| 27.0 | 11.8 | 51.0 | 6.2 | 77.0 | 4.6 |
| 28.0 | 1.3 | 52.0 | 3.1 | 78.0 | 1.3 |
| 29.0 | 1.8 | 53.0 | 10.5 | 79.0 | 6.7 |
| 37.0 | 1.0 | 54.0 | 72.3 | 80.0 | 1.0 |
| 38.0 | 2.3 | 55.0 | 5.4 | 81.0 | 11.2 |
| 39.0 | 25.8 | 56.0 | 1.3 | 82.0 | 43.7 |
| 40.0 | 3.7 | 65.0 | 3.4 | 83.0 | 3.1 |
| 41.0 | 31.9 | 66.0 | 2.2 | | |
| 42.0 | 2.7 | 67.0 | 100.0 | | |



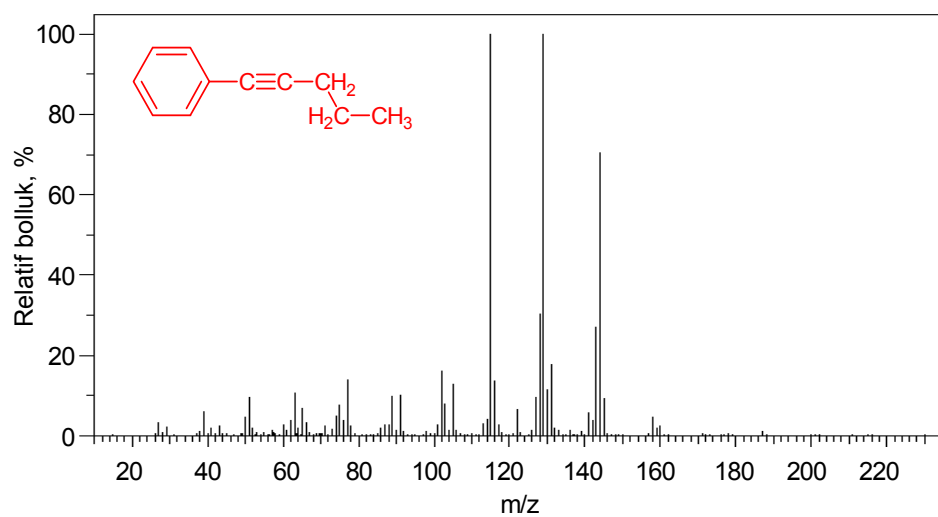
1-Pentin, C₅H₈ (68.12)



| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 1.2 | 40.0 | 61.2 | 54.0 | 2.1 |
| 26.0 | 4.3 | 41.0 | 22.7 | 61.0 | 1.8 |
| 27.0 | 32.9 | 42.0 | 22.3 | 62.0 | 2.5 |
| 28.0 | 3.9 | 43.0 | 1.4 | 63.0 | 3.2 |
| 29.0 | 24.4 | 49.0 | 1.5 | 65.0 | 6.7 |
| 31.0 | 1.3 | 50.0 | 6.5 | 66.0 | 4.2 |
| 37.0 | 5.0 | 51.0 | 8.5 | 67.0 | 100.0 |
| 38.0 | 9.8 | 52.0 | 3.7 | 68.0 | 15.3 |
| 39.0 | 54.9 | 53.0 | 44.0 | | |

Fenilasetilen, C₈H₆ (102.13)

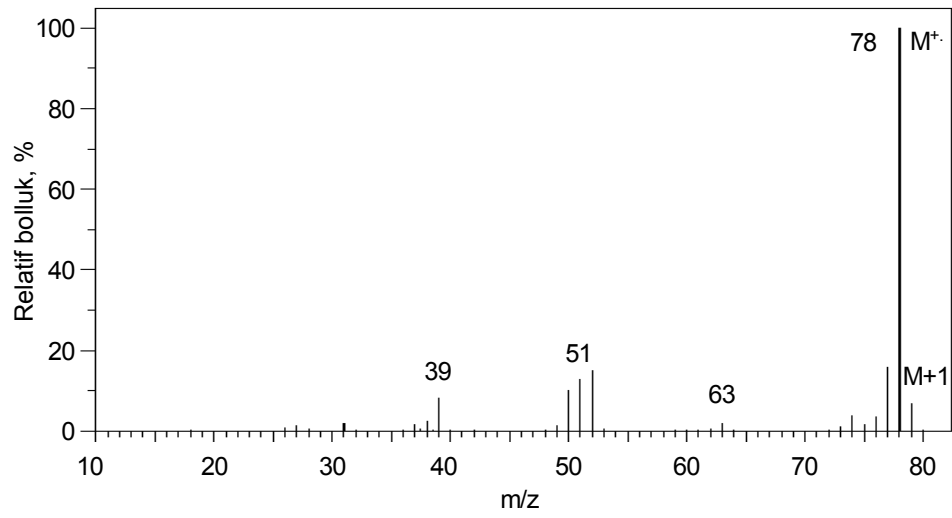
| | | | | | |
|------|-----|------|------|-------|-------|
| 37.0 | 1.1 | 61.0 | 1.4 | 77.0 | 1.5 |
| 38.0 | 1.1 | 62.0 | 2.5 | 87.0 | 1.3 |
| 39.0 | 2.5 | 63.0 | 5.5 | 98.0 | 1.6 |
| 49.0 | 1.2 | 73.0 | 1.5 | 101.0 | 2.3 |
| 50.0 | 8.6 | 74.0 | 7.8 | 102.0 | 100.0 |
| 51.0 | 7.8 | 75.0 | 6.4 | 103.0 | 9.3 |
| 52.0 | 5.1 | 76.0 | 19.0 | | |

1-Fenil-1-Pentin, C₁₁H₁₂ (144.21)


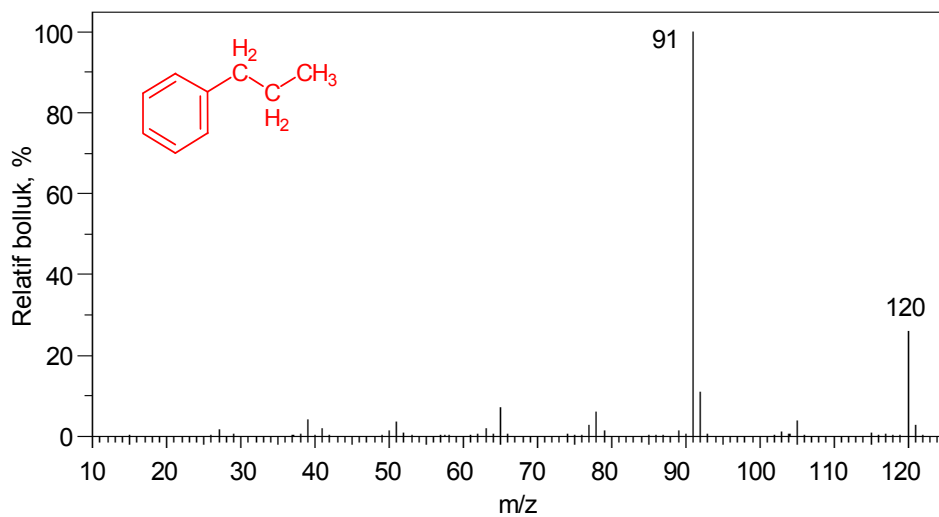
| | | | | | |
|------|------|-------|------|-------|-------|
| 27.0 | 3.3 | 77.0 | 13.8 | 126.0 | 1.3 |
| 29.0 | 2.1 | 78.0 | 2.5 | 127.0 | 9.4 |
| 38.0 | 1.0 | 86.0 | 1.8 | 128.0 | 30.3 |
| 39.0 | 6.1 | 87.0 | 2.7 | 129.0 | 100.0 |
| 41.0 | 2.0 | 88.0 | 2.6 | 130.0 | 11.3 |
| 43.0 | 2.4 | 89.0 | 9.7 | 131.0 | 17.7 |
| 50.0 | 4.6 | 90.0 | 1.2 | 132.0 | 1.9 |
| 51.0 | 9.5 | 91.0 | 10.1 | 133.0 | 1.4 |
| 52.0 | 1.9 | 92.0 | 1.0 | 136.0 | 1.4 |
| 57.0 | 1.4 | 98.0 | 1.0 | 139.0 | 1.0 |
| 60.0 | 2.7 | 101.0 | 2.8 | 141.0 | 5.8 |
| 61.0 | 1.2 | 102.0 | 16.1 | 142.0 | 3.9 |
| 62.0 | 3.7 | 103.0 | 8.0 | 143.0 | 27.1 |
| 63.0 | 10.6 | 104.0 | 1.4 | 144.0 | 70.4 |
| 64.0 | 2.0 | 105.0 | 12.7 | 145.0 | 9.2 |
| 65.0 | 6.7 | 106.0 | 1.2 | 158.0 | 4.6 |
| 66.0 | 3.2 | 113.0 | 3.1 | 159.0 | 1.9 |
| 71.0 | 2.5 | 114.0 | 4.0 | 160.0 | 2.5 |
| 73.0 | 1.5 | 115.0 | 99.9 | 187.0 | 1.1 |
| 74.0 | 4.9 | 116.0 | 13.7 | | |
| 75.0 | 7.7 | 117.0 | 2.7 | | |
| 76.0 | 3.9 | 122.0 | 6.4 | | |

C. AROMATİK BİLEŞİKLER

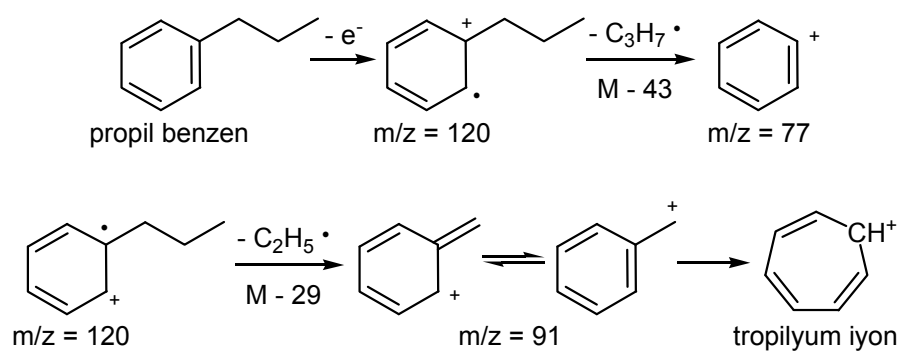
Benzen, C₆H₆ (78.11)

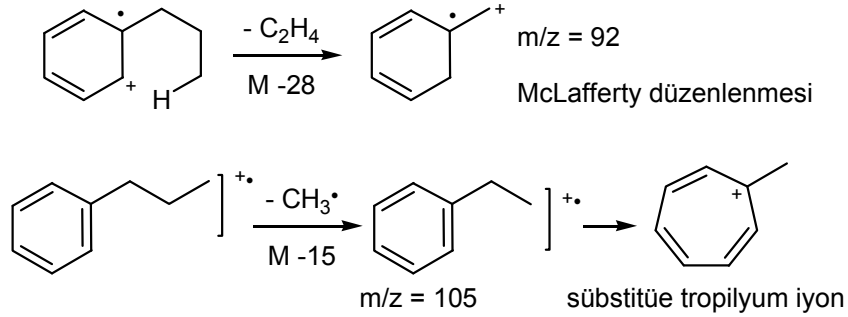


1-Propilbenzen, C₉H₁₂ (120.19)

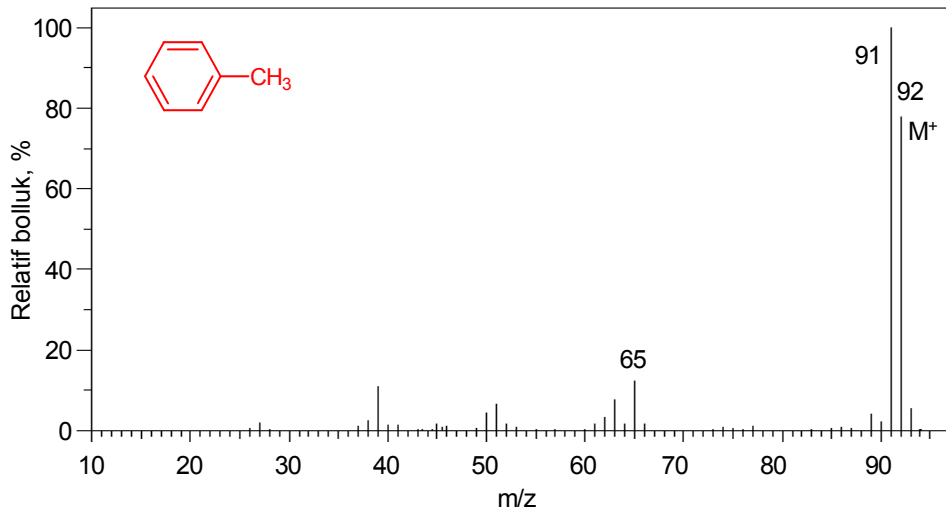


| | | | | | |
|------|-----|------|-------|-------|------|
| 27.0 | 1.6 | 65.0 | 7.2 | 92.0 | 10.8 |
| 39.0 | 4.1 | 77.0 | 2.7 | 103.0 | 1.1 |
| 41.0 | 1.9 | 78.0 | 5.9 | 105.0 | 3.8 |
| 50.0 | 1.3 | 79.0 | 1.3 | 120.0 | 25.9 |
| 51.0 | 3.5 | 89.0 | 1.4 | 121.0 | 2.6 |
| 63.0 | 2.0 | 91.0 | 100.0 | | |

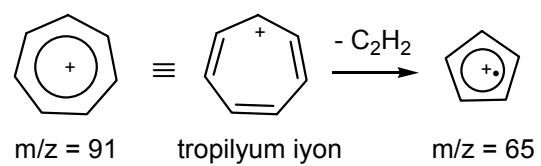
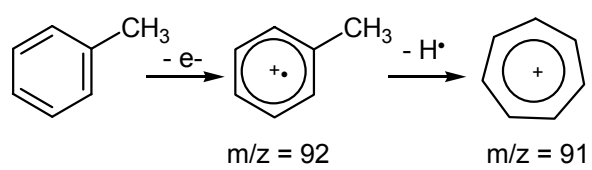




Toluen, C₇H₈ (92.14)



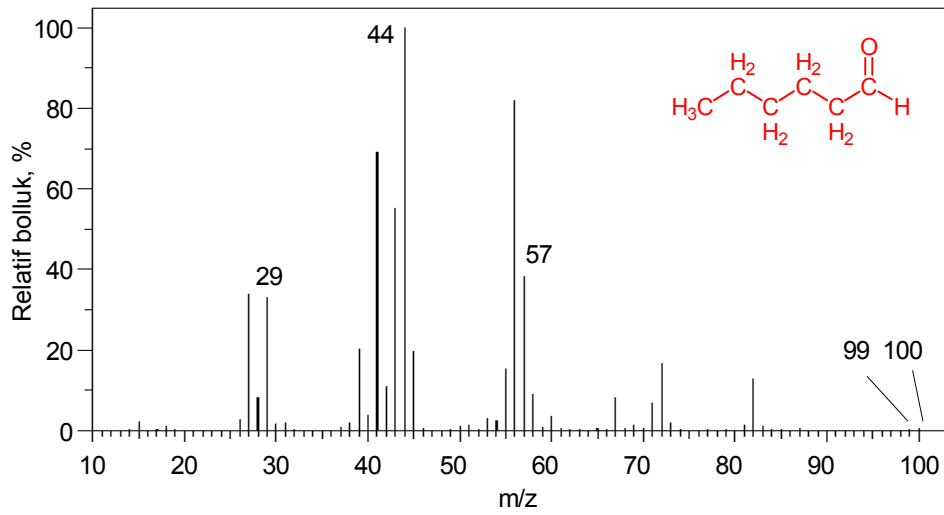
| | | | | | |
|------|------|------|------|------|-------|
| 27.0 | 1.8 | 50.0 | 4.2 | 66.0 | 1.5 |
| 37.0 | 1.1 | 51.0 | 6.5 | 77.0 | 1.0 |
| 38.0 | 2.5 | 52.0 | 1.6 | 89.0 | 4.0 |
| 39.0 | 10.8 | 61.0 | 1.5 | 90.0 | 2.2 |
| 40.0 | 1.2 | 62.0 | 3.3 | 91.0 | 100.0 |
| 41.0 | 1.2 | 63.0 | 7.5 | 92.0 | 77.7 |
| 45.0 | 1.5 | 64.0 | 1.6 | 93.0 | 5.5 |
| 46.0 | 1.0 | 65.0 | 12.2 | | |



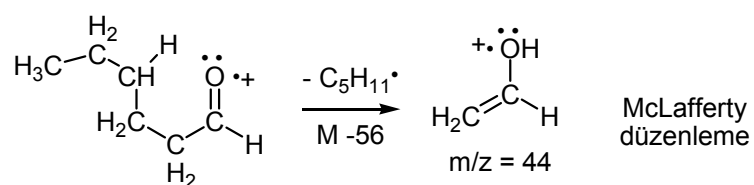
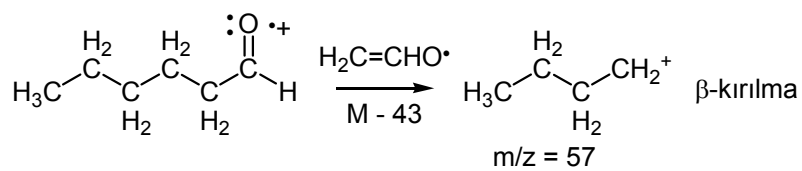
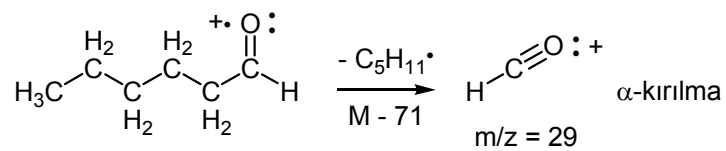
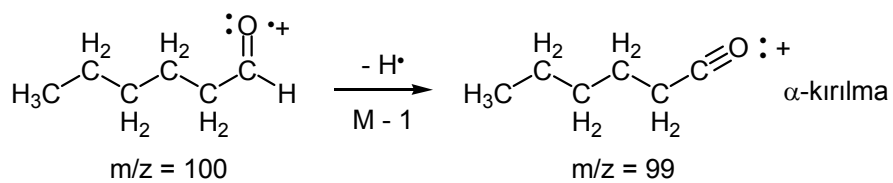
D. KARBONİL BİLEŞİKLERİ

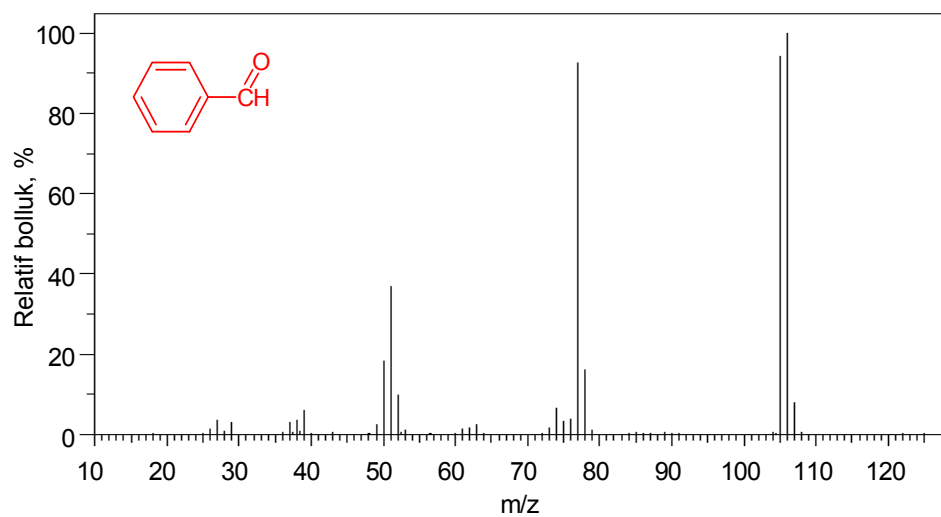
1. ALDEHİTLER

Heksanal, C₆H₁₂O (100.16)



| | | | | | |
|------|------|------|-------|------|------|
| 15.0 | 2.2 | 41.0 | 69.1 | 57.0 | 38.1 |
| 18.0 | 1.0 | 42.0 | 10.8 | 58.0 | 9.0 |
| 26.0 | 2.7 | 43.0 | 55.1 | 60.0 | 3.6 |
| 27.0 | 33.9 | 44.0 | 100.0 | 67.0 | 8.1 |
| 28.0 | 8.1 | 45.0 | 19.5 | 69.0 | 1.4 |
| 29.0 | 33.0 | 50.0 | 1.0 | 71.0 | 6.7 |
| 30.0 | 1.6 | 51.0 | 1.3 | 72.0 | 16.7 |
| 31.0 | 1.8 | 53.0 | 2.9 | 73.0 | 1.8 |
| 38.0 | 1.9 | 54.0 | 2.3 | 81.0 | 1.2 |
| 39.0 | 20.1 | 55.0 | 15.3 | 82.0 | 12.8 |
| 40.0 | 3.8 | 56.0 | 82.0 | 83.0 | 1.0 |

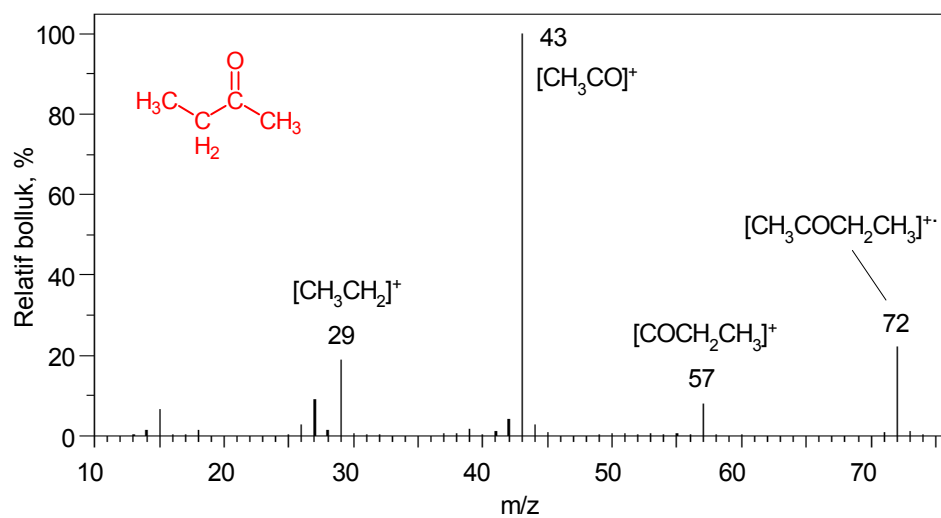


Benzaldehit, C₇H₆O (106.12)

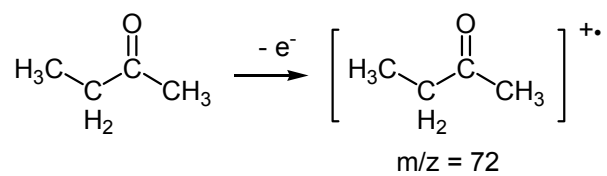
| | | | | | |
|------|------|------|------|-------|-------|
| 26.0 | 1.3 | 51.0 | 36.8 | 75.0 | 3.3 |
| 27.0 | 3.5 | 52.0 | 9.9 | 76.0 | 3.8 |
| 29.0 | 3.0 | 53.0 | 1.1 | 77.0 | 92.6 |
| 37.0 | 3.1 | 61.0 | 1.2 | 78.0 | 16.2 |
| 38.0 | 3.6 | 62.0 | 1.5 | 79.0 | 1.0 |
| 39.0 | 6.1 | 63.0 | 2.4 | 105.0 | 94.2 |
| 49.0 | 2.4 | 73.0 | 1.7 | 106.0 | 100.0 |
| 50.0 | 18.2 | 74.0 | 6.4 | 107.0 | 7.8 |

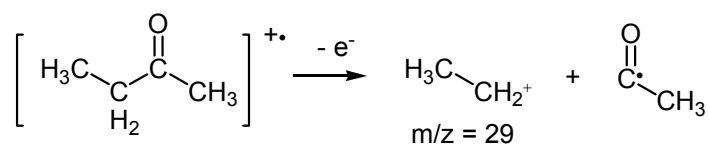
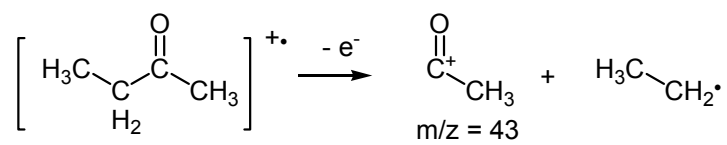
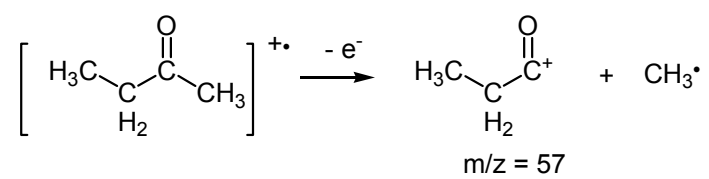
2. KETONLAR

2-Bütanon, C₄H₈O (72.11)

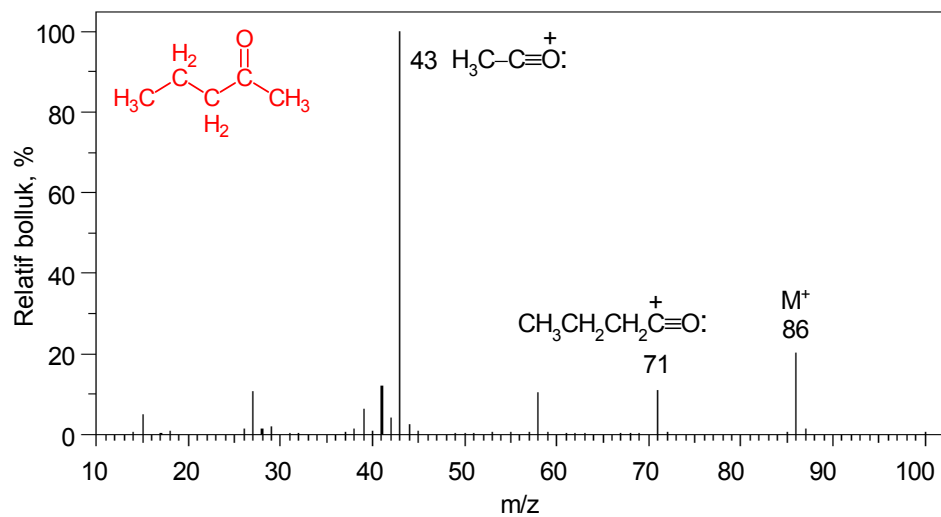


| | | | | | |
|------|-----|------|------|------|-------|
| 14.0 | 1.2 | 28.0 | 1.3 | 43.0 | 100.0 |
| 15.0 | 6.6 | 29.0 | 18.8 | 44.0 | 2.6 |
| 18.0 | 1.3 | 39.0 | 1.6 | 57.0 | 8.0 |
| 26.0 | 2.6 | 41.0 | 1.1 | 72.0 | 22.1 |
| 27.0 | 8.9 | 42.0 | 4.1 | 73.0 | 1.0 |

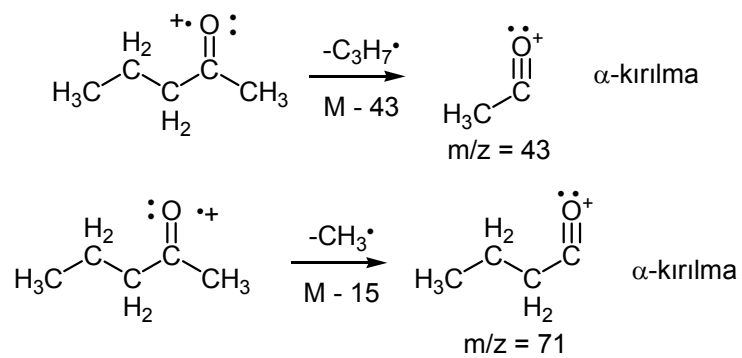


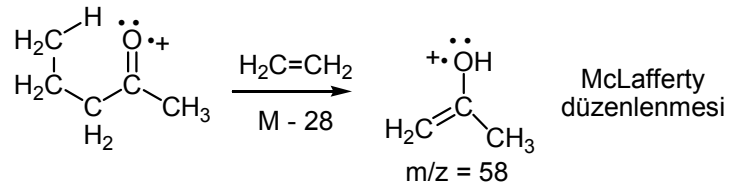
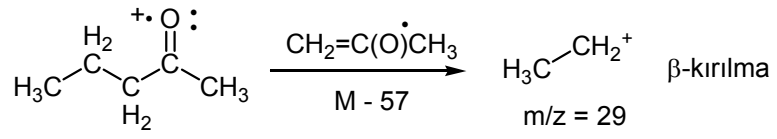


1-Pentanon, C₅H₁₀O (86.13)

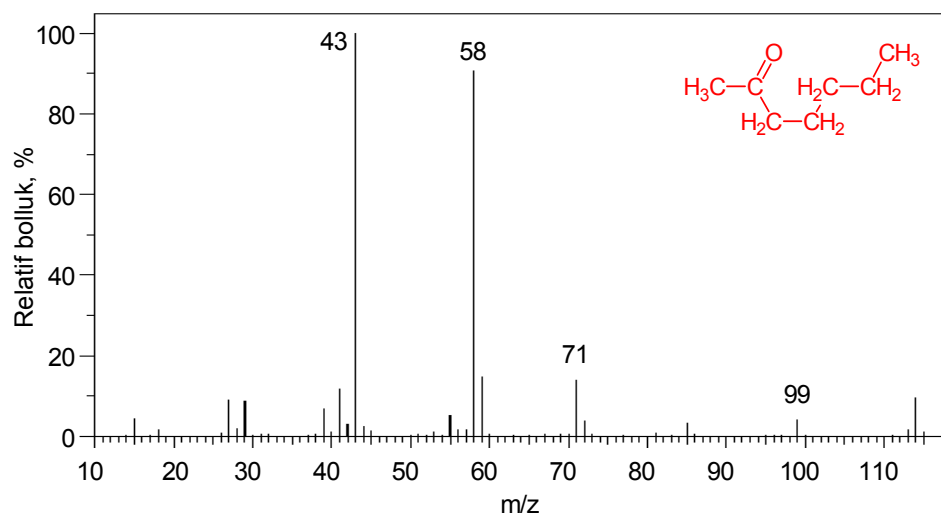


| | | | | | |
|------|------|------|-------|------|------|
| 15.0 | 4.8 | 38.0 | 1.2 | 44.0 | 2.3 |
| 26.0 | 1.3 | 39.0 | 6.3 | 58.0 | 10.3 |
| 27.0 | 10.5 | 41.0 | 11.9 | 71.0 | 11.0 |
| 28.0 | 1.3 | 42.0 | 4.0 | 86.0 | 20.2 |
| 29.0 | 1.9 | 43.0 | 100.0 | 87.0 | 1.2 |

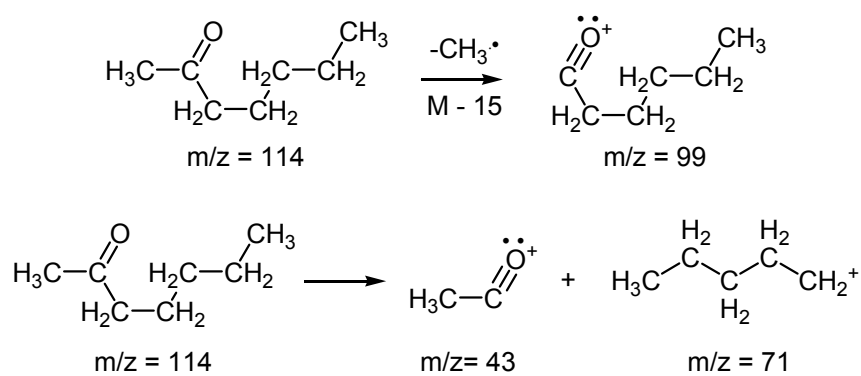


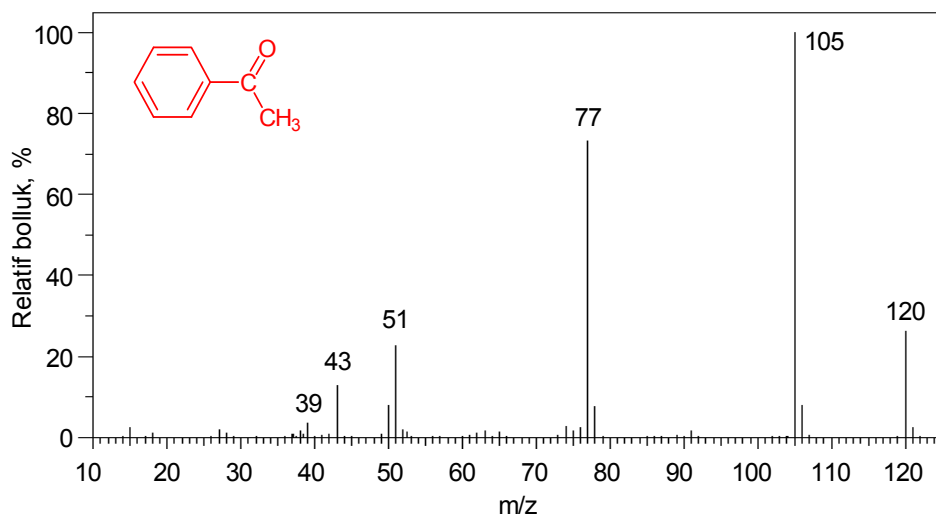


2-Heptanon, C₇H₁₄O (114.19)

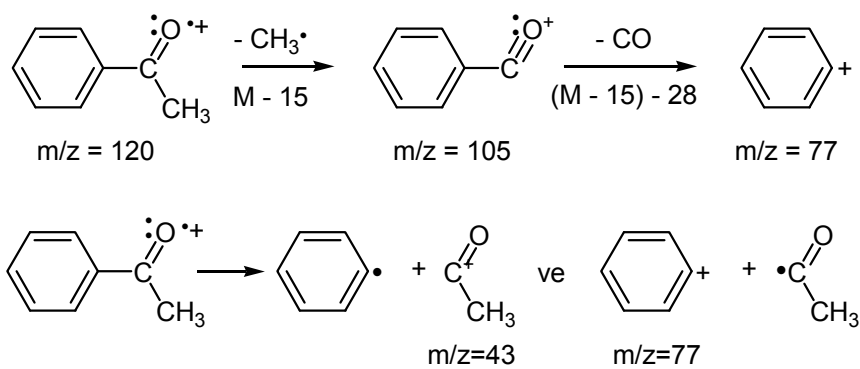


| | | | | | |
|------|------|------|-------|-------|------|
| 15.0 | 4.2 | 43.0 | 100.0 | 71.0 | 14.0 |
| 18.0 | 1.5 | 44.0 | 2.4 | 72.0 | 3.9 |
| 27.0 | 8.9 | 45.0 | 1.4 | 85.0 | 3.3 |
| 28.0 | 2.0 | 53.0 | 1.0 | 99.0 | 4.1 |
| 29.0 | 8.7 | 55.0 | 5.1 | 113.0 | 1.7 |
| 39.0 | 6.7 | 56.0 | 1.5 | 114.0 | 9.5 |
| 40.0 | 1.0 | 57.0 | 1.6 | 115.0 | 1.0 |
| 41.0 | 11.6 | 58.0 | 90.6 | | |
| 42.0 | 3.0 | 59.0 | 14.8 | | |



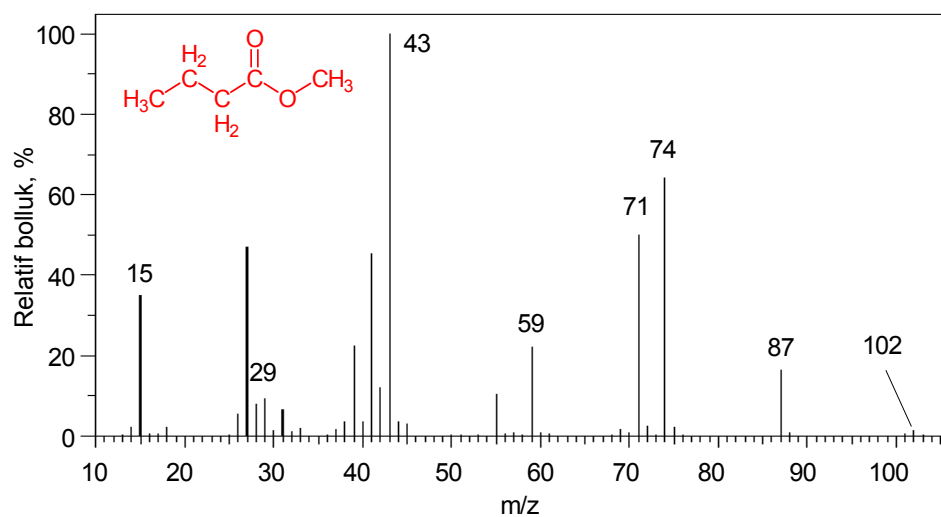
Asetofenon, C₈H₈O (120.15)

| | | | | | |
|------|------|------|------|-------|-------|
| 15.0 | 2.4 | 51.0 | 22.6 | 76.0 | 2.4 |
| 18.0 | 1.1 | 52.0 | 2.0 | 77.0 | 73.1 |
| 27.0 | 1.9 | 52.5 | 1.3 | 78.0 | 7.7 |
| 28.0 | 1.0 | 62.0 | 1.0 | 91.0 | 1.5 |
| 38.0 | 1.7 | 63.0 | 1.7 | 105.0 | 100.0 |
| 39.0 | 3.5 | 65.0 | 1.4 | 106.0 | 7.9 |
| 43.0 | 12.9 | 74.0 | 2.6 | 120.0 | 26.2 |
| 50.0 | 7.9 | 75.0 | 1.6 | 121.0 | 2.5 |

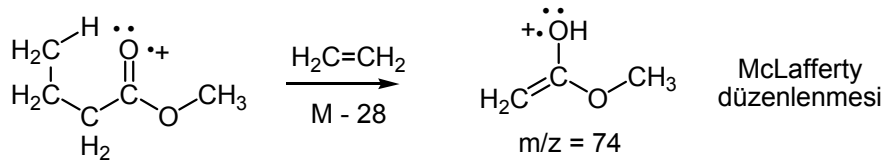
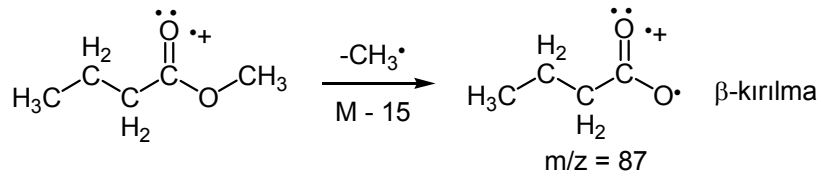
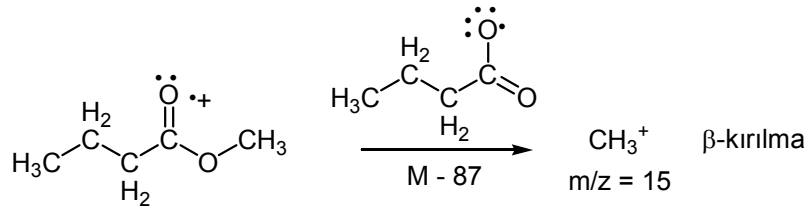
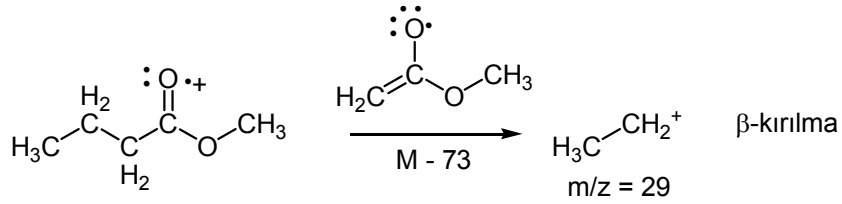
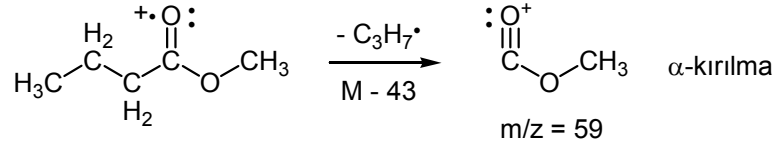
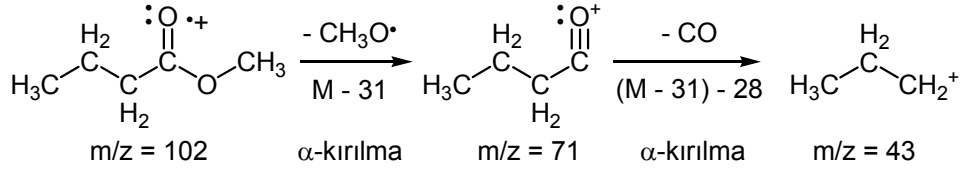


ESTERLER

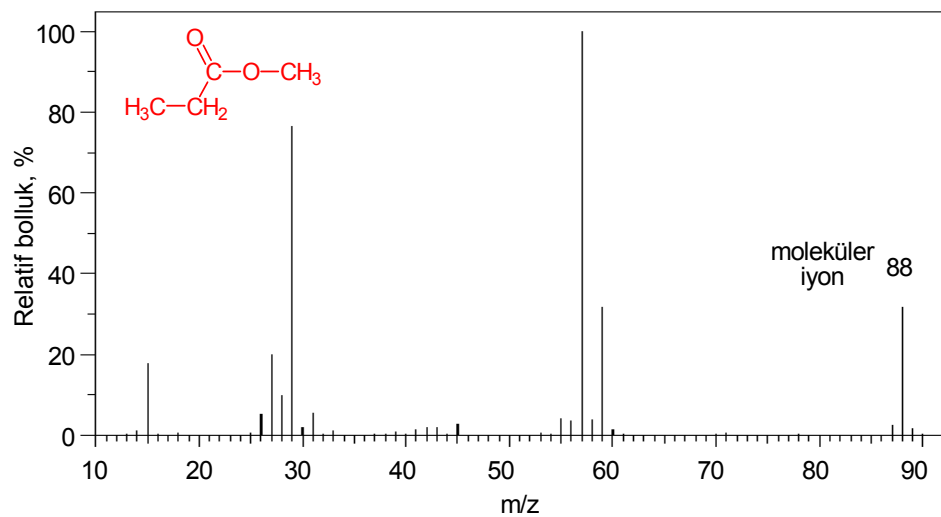
| | | |
|-----------------------------|---|---------|
| Metil Ester | $\text{CH}_3\text{O}\cdot$ radikal | M - 31 |
| Etil Ester | $\text{CH}_3\text{CH}_2\text{O}\cdot$ radikal | M - 45 |
| Propil (ve izopropil) Ester | $\text{CH}_3\text{CH}_2\text{CH}_2\text{O}\cdot$ radikal | M - 59 |
| Fenil Ester | $\text{C}_6\text{H}_5\text{O}\cdot$ (PhO \cdot) radikal | M - 93 |
| Benzil Ester | $\text{C}_6\text{H}_5\text{CH}_2\text{O}\cdot$ (BzO \cdot) radikal | M - 105 |

Metil bütirat, $\text{C}_5\text{H}_{10}\text{O}_2$ (102.13)

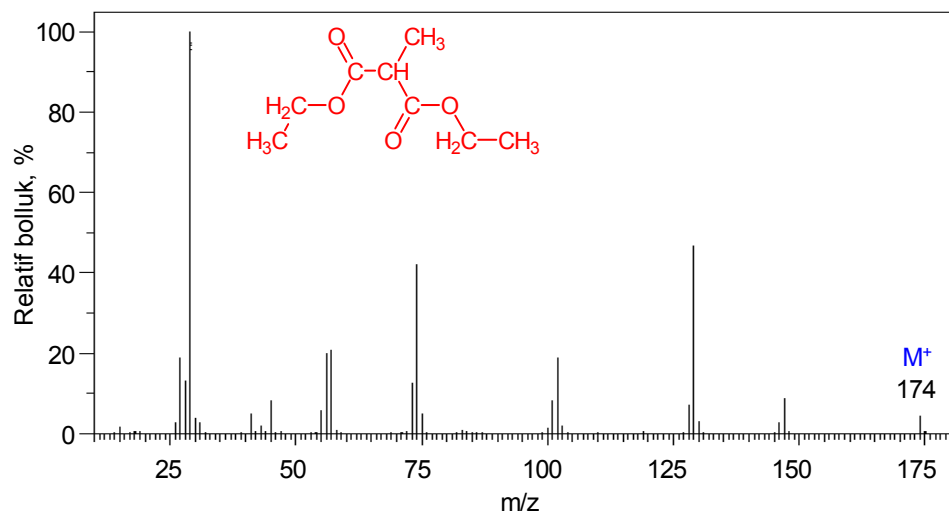
| | | | | | |
|------|------|------|-------|-------|------|
| 14.0 | 2.1 | 37.0 | 1.6 | 59.0 | 22.2 |
| 15.0 | 35.0 | 38.0 | 3.5 | 69.0 | 1.5 |
| 18.0 | 2.1 | 39.0 | 22.5 | 71.0 | 49.9 |
| 26.0 | 5.4 | 40.0 | 3.5 | 72.0 | 2.3 |
| 27.0 | 47.0 | 41.0 | 45.3 | 74.0 | 64.2 |
| 28.0 | 7.9 | 42.0 | 12.1 | 75.0 | 2.2 |
| 29.0 | 9.2 | 43.0 | 100.0 | 87.0 | 16.4 |
| 30.0 | 1.2 | 44.0 | 3.6 | 102.0 | 1.4 |
| 31.0 | 6.5 | 45.0 | 3.1 | | |
| 32.0 | 1.1 | 55.0 | 10.4 | | |
| 33.0 | 1.9 | | | | |



Metil propiyonat, C₄H₈O₂ (88.11)

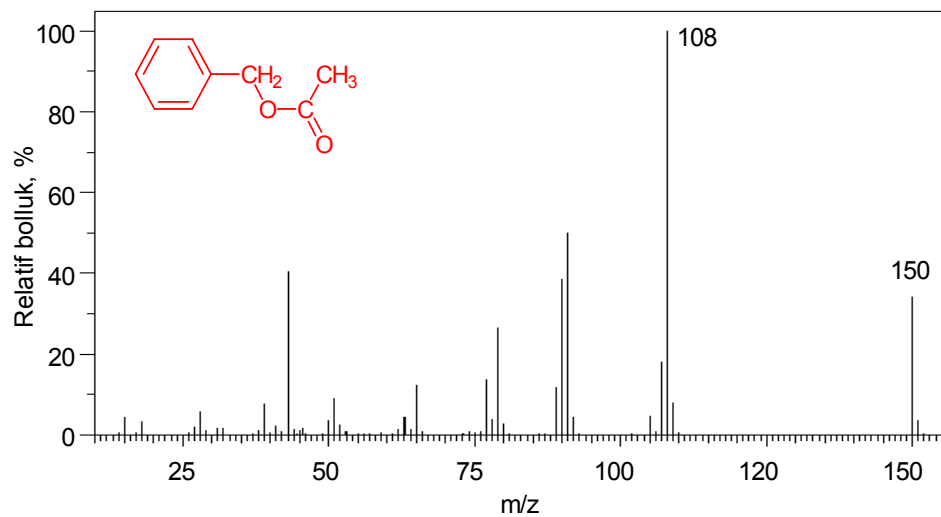


| | | | | | |
|------|------|------|-----|------|-------|
| 14.0 | 1.1 | 33.0 | 1.0 | 57.0 | 100.0 |
| 15.0 | 17.7 | 41.0 | 1.4 | 58.0 | 3.8 |
| 26.0 | 5.2 | 42.0 | 1.8 | 59.0 | 31.6 |
| 27.0 | 19.8 | 43.0 | 1.8 | 60.0 | 1.2 |
| 28.0 | 9.8 | 45.0 | 2.8 | 87.0 | 2.5 |
| 29.0 | 76.6 | 55.0 | 4.1 | 88.0 | 31.7 |
| 30.0 | 1.9 | 56.0 | 3.4 | 89.0 | 1.6 |
| 31.0 | 5.3 | | | | |

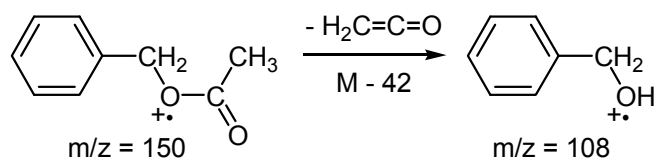
Diethyl 2-metilmalonat, C₈H₁₄O₄ (174.19)

| | | | | | |
|------|-------|-------|------|-------|------|
| 15.0 | 1.6 | 45.0 | 8.2 | 102.0 | 18.9 |
| 26.0 | 2.7 | 55.0 | 5.8 | 103.0 | 2.0 |
| 27.0 | 18.7 | 56.0 | 20.0 | 128.0 | 7.2 |
| 28.0 | 13.2 | 57.0 | 20.6 | 129.0 | 46.7 |
| 29.0 | 100.0 | 73.0 | 12.6 | 130.0 | 3.1 |
| 30.0 | 3.9 | 74.0 | 42.0 | 146.0 | 2.6 |
| 31.0 | 2.8 | 75.0 | 4.8 | 147.0 | 8.6 |
| 41.0 | 5.0 | 100.0 | 1.3 | 174.0 | 4.3 |
| 43.0 | 2.0 | 101.0 | 8.2 | | |

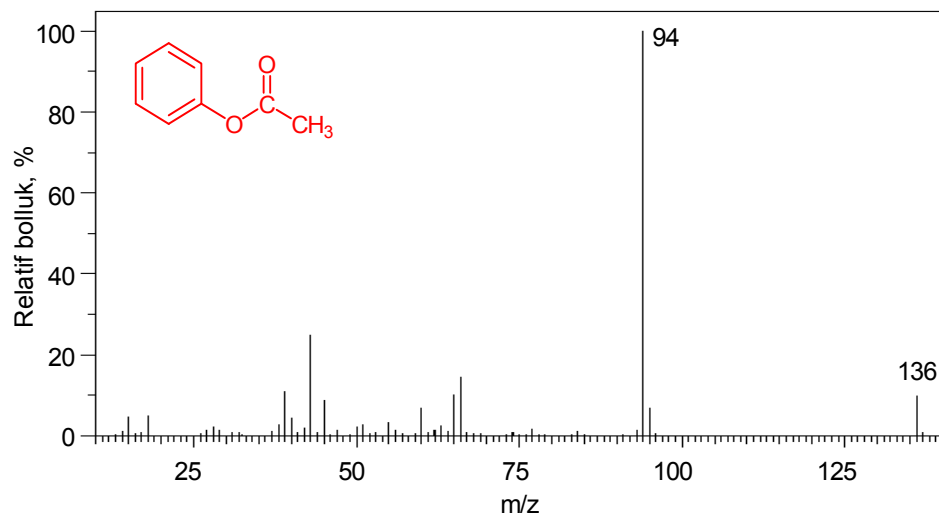
Benzil asetat, C₉H₁₀O₂ (150.17)



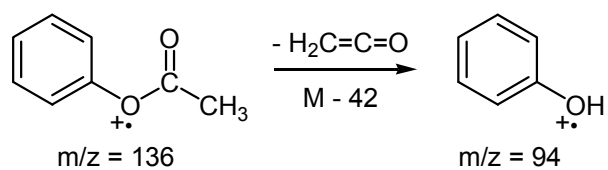
| | | | | | |
|------|------|------|------|-------|-------|
| 15.0 | 4.2 | 45.0 | 1.0 | 80.0 | 2.7 |
| 18.0 | 3.2 | 45.5 | 1.5 | 89.0 | 11.7 |
| 27.0 | 1.9 | 50.0 | 3.5 | 90.0 | 38.4 |
| 28.0 | 5.6 | 51.0 | 9.1 | 91.0 | 50.0 |
| 29.0 | 1.0 | 52.0 | 2.3 | 92.0 | 4.3 |
| 31.0 | 1.7 | 62.0 | 1.3 | 105.0 | 4.5 |
| 32.0 | 1.7 | 63.0 | 4.4 | 107.0 | 18.1 |
| 38.0 | 1.1 | 64.0 | 1.4 | 108.0 | 100.0 |
| 39.0 | 7.7 | 65.0 | 12.3 | 109.0 | 7.8 |
| 41.0 | 2.2 | 77.0 | 13.6 | 150.0 | 34.1 |
| 43.0 | 40.3 | 78.0 | 3.9 | 151.0 | 3.5 |
| 44.0 | 1.2 | 79.0 | 26.6 | | |



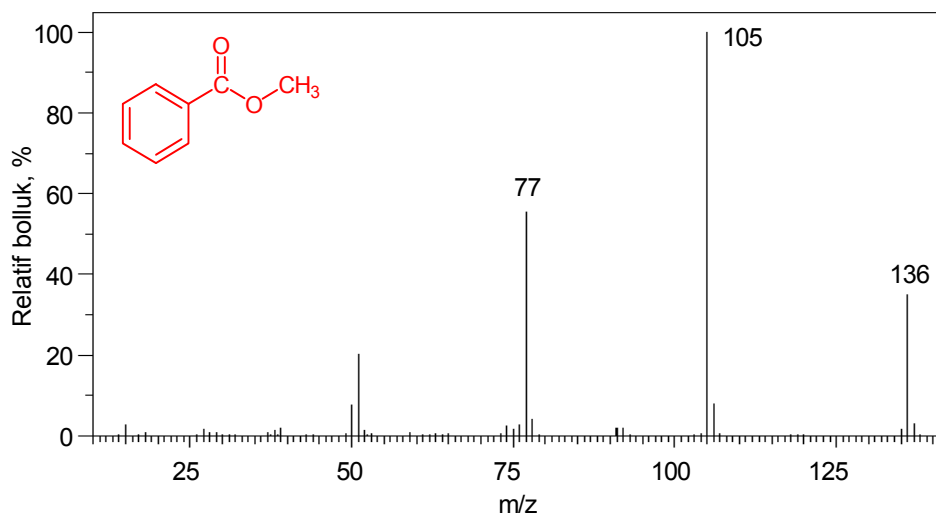
Fenil asetat, C₈H₈O₂ (136.15)



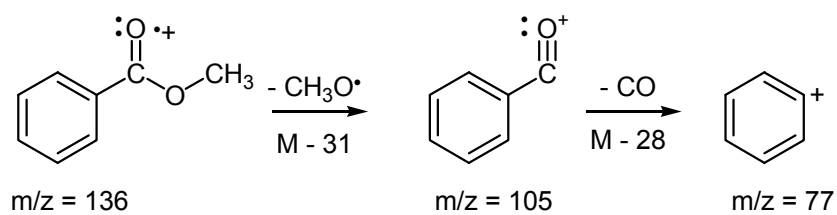
| | | | | | |
|------|------|------|------|-------|-------|
| 14.0 | 1.0 | 42.0 | 1.8 | 63.0 | 2.5 |
| 15.0 | 4.6 | 43.0 | 24.7 | 64.0 | 1.0 |
| 18.0 | 4.8 | 45.0 | 8.7 | 65.0 | 10.0 |
| 27.0 | 1.4 | 47.0 | 1.4 | 66.0 | 14.5 |
| 28.0 | 2.2 | 50.0 | 2.1 | 77.0 | 1.6 |
| 29.0 | 1.3 | 51.0 | 2.8 | 84.0 | 1.0 |
| 37.0 | 1.1 | 55.0 | 3.2 | 93.0 | 1.3 |
| 38.0 | 2.7 | 56.0 | 1.3 | 94.0 | 100.0 |
| 39.0 | 11.0 | 60.0 | 6.8 | 95.0 | 6.9 |
| 40.0 | 4.3 | 62.0 | 1.2 | 136.0 | 9.8 |

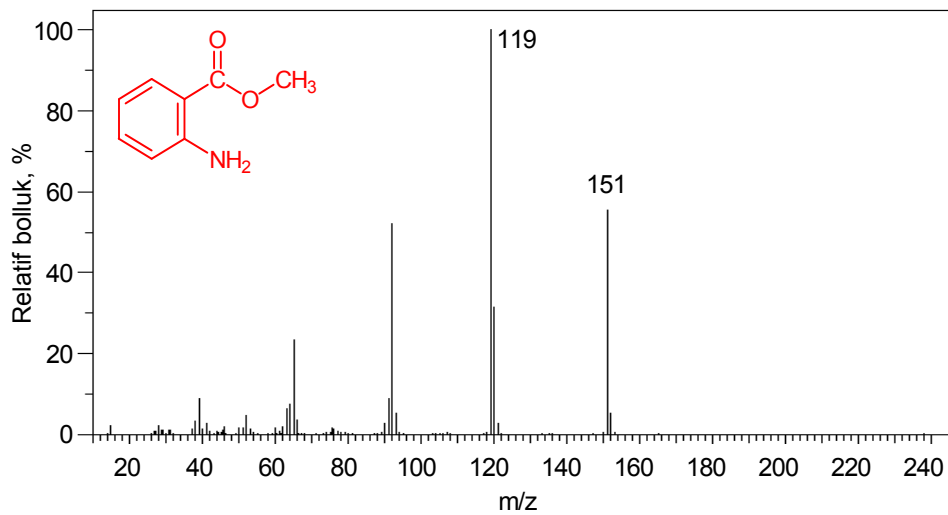


Metil benzoat, C₈H₈O₂ (136.15)

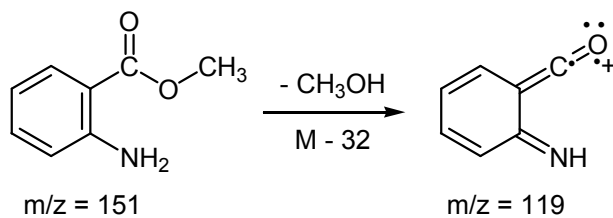


| | | | | | |
|------|------|------|------|-------|-------|
| 15.0 | 2.7 | 74.0 | 2.3 | 105.0 | 100.0 |
| 27.0 | 1.5 | 75.0 | 1.7 | 106.0 | 7.8 |
| 38.0 | 1.2 | 76.0 | 2.8 | 135.0 | 1.6 |
| 39.0 | 1.8 | 77.0 | 55.5 | 136.0 | 34.8 |
| 50.0 | 7.7 | 78.0 | 4.1 | 137.0 | 3.0 |
| 51.0 | 20.1 | 91.0 | 2.0 | | |
| 52.0 | 1.2 | 92.0 | 1.8 | | |



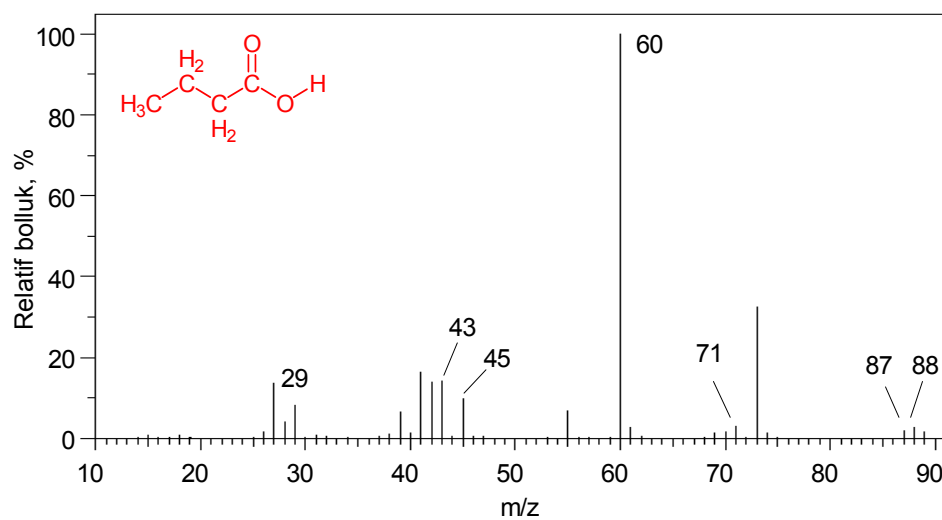
Metil-2-aminobenzoat, C₈H₉NO₂ (151.16)


| | | | | | |
|------|-----|------|------|-------|-------|
| 15.0 | 2.2 | 50.0 | 1.5 | 76.0 | 1.4 |
| 28.0 | 2.3 | 51.0 | 1.5 | 90.0 | 2.7 |
| 29.0 | 1.1 | 52.0 | 4.7 | 91.0 | 8.8 |
| 31.0 | 1.0 | 53.0 | 1.4 | 92.0 | 52.0 |
| 37.0 | 1.3 | 60.0 | 1.6 | 93.0 | 5.1 |
| 38.0 | 3.3 | 62.0 | 2.0 | 119.0 | 100.0 |
| 39.0 | 9.0 | 63.0 | 6.3 | 120.0 | 31.6 |
| 40.0 | 1.2 | 64.0 | 7.5 | 121.0 | 2.6 |
| 41.0 | 2.6 | 65.0 | 23.3 | 151.0 | 55.4 |
| 45.5 | 1.0 | 66.0 | 3.6 | 152.0 | 5.2 |
| 46.0 | 1.9 | 75.5 | 1.7 | | |

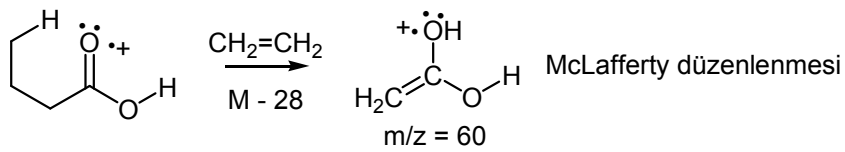
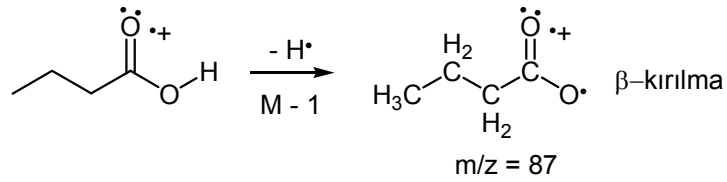
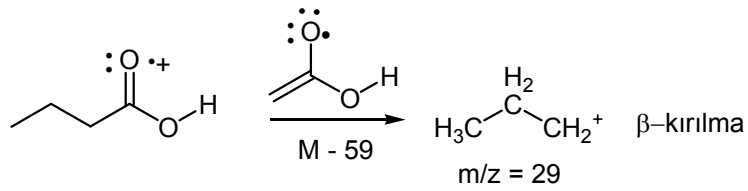
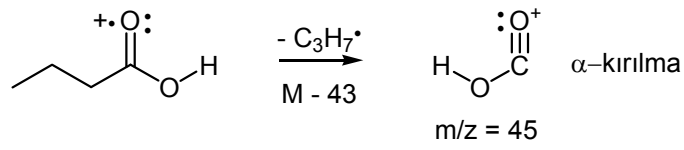
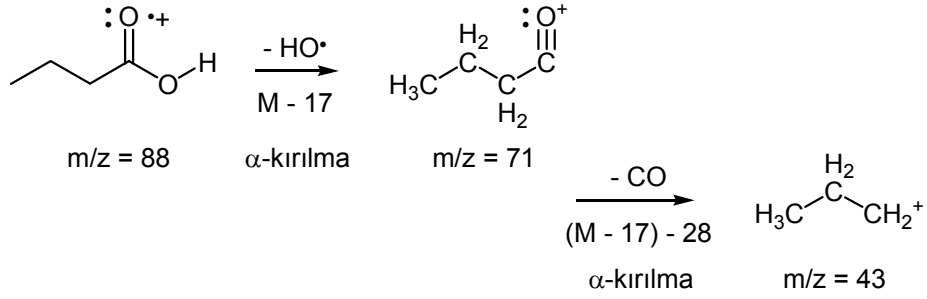


4. KARBOKSİLİK ASİTLER

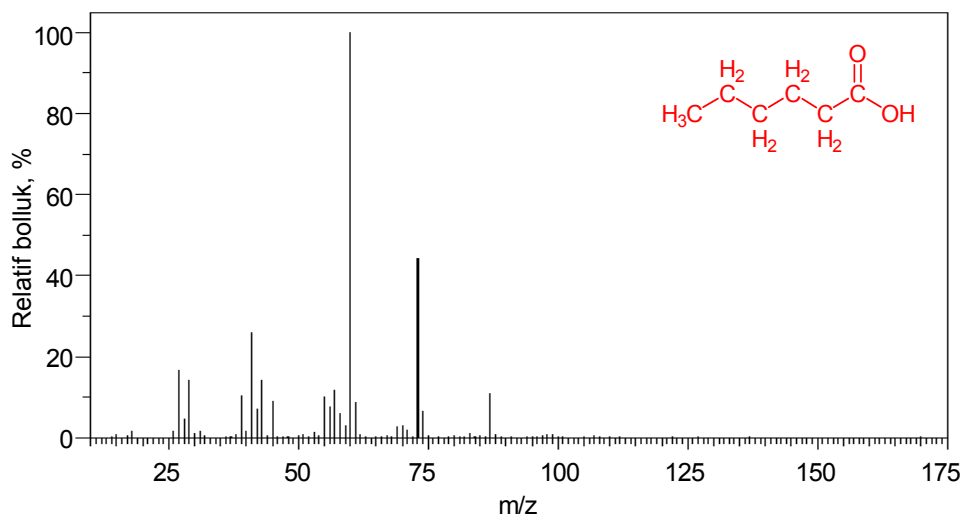
Bütirik Asit, C₄H₈O₂ (88.11)



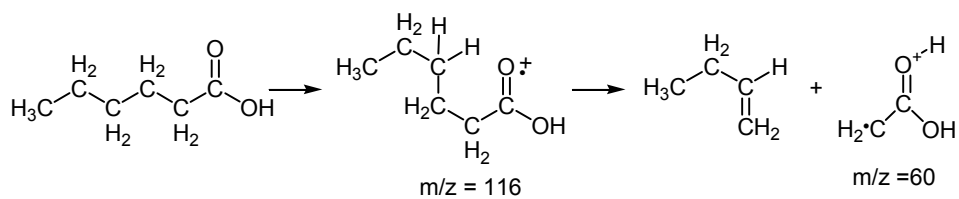
| | | | | | |
|------|------|------|-------|------|------|
| 26.0 | 1.5 | 42.0 | 14.0 | 71.0 | 2.9 |
| 27.0 | 13.6 | 43.0 | 14.1 | 73.0 | 32.5 |
| 28.0 | 4.1 | 45.0 | 9.9 | 74.0 | 1.2 |
| 29.0 | 8.1 | 55.0 | 6.7 | 87.0 | 1.9 |
| 38.0 | 1.1 | 60.0 | 100.0 | 88.0 | 2.6 |
| 39.0 | 6.6 | 61.0 | 2.7 | 89.0 | 1.7 |
| 40.0 | 1.2 | 69.0 | 1.3 | | |
| 41.0 | 16.3 | 70.0 | 1.5 | | |



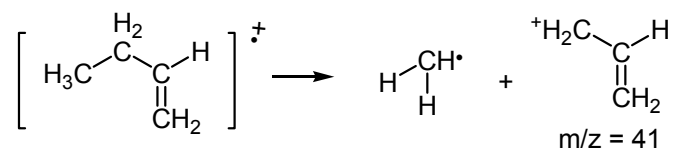
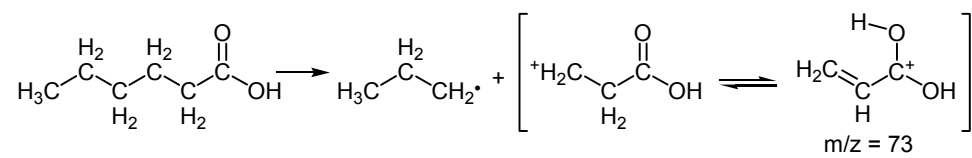
Heksanoik asit, $C_6H_{12}O_2$ (116.16)



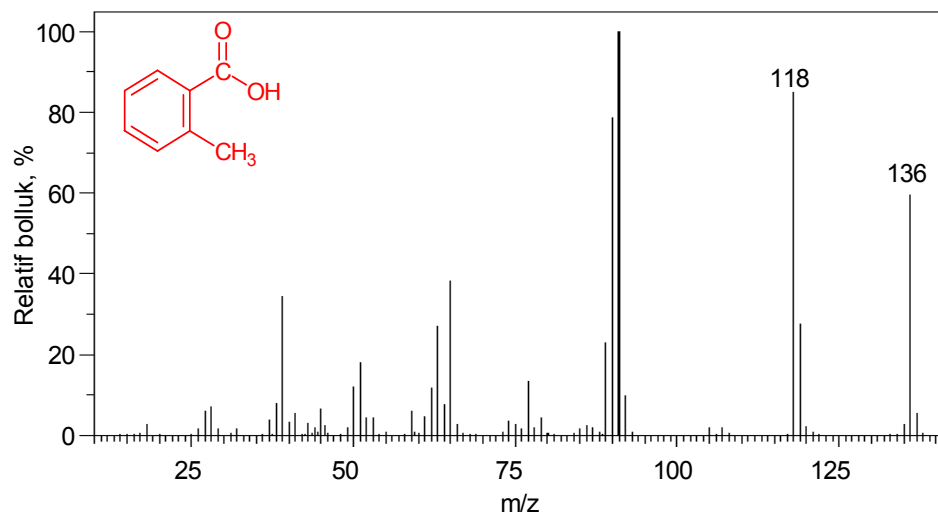
| | | | | | |
|------|------|------|-------|------|------|
| 18.0 | 1.7 | 42.0 | 7.0 | 61.0 | 8.7 |
| 26.0 | 1.5 | 43.0 | 14.1 | 69.0 | 2.7 |
| 27.0 | 16.7 | 45.0 | 8.9 | 70.0 | 3.1 |
| 28.0 | 4.5 | 53.0 | 1.3 | 71.0 | 2.0 |
| 29.0 | 14.1 | 55.0 | 10.0 | 73.0 | 44.3 |
| 30.0 | 1.0 | 56.0 | 7.5 | 74.0 | 6.6 |
| 31.0 | 1.7 | 57.0 | 11.7 | 83.0 | 1.0 |
| 39.0 | 10.4 | 58.0 | 6.1 | 87.0 | 11.0 |
| 40.0 | 1.7 | 59.0 | 3.0 | | |
| 41.0 | 26.0 | 60.0 | 100.0 | | |



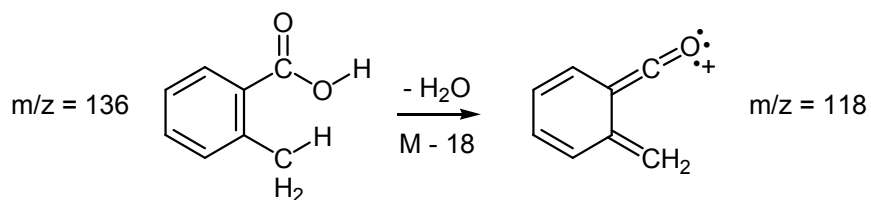
48



2-Metilbenzoik asit (o-Toluik asit), C₈H₈O₂ (136.15)

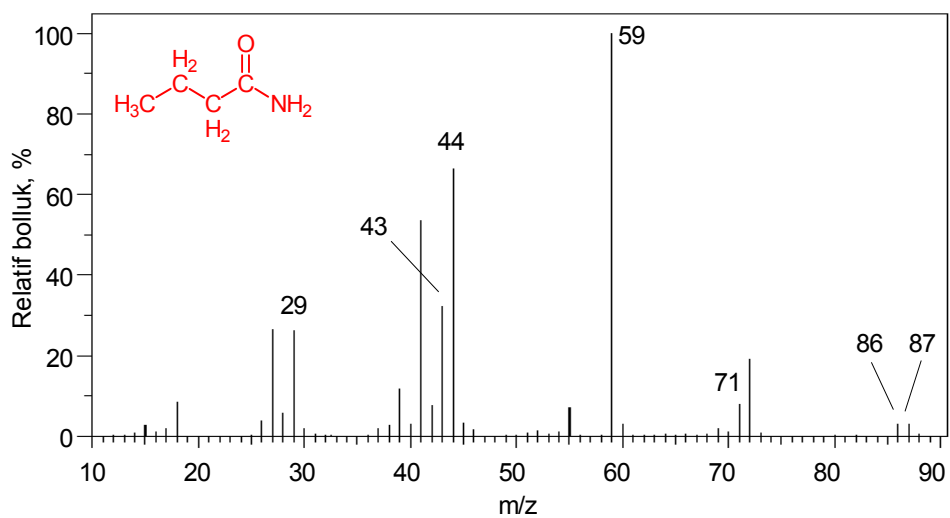


| | | | | | |
|------|------|------|------|-------|-------|
| 18.0 | 2.6 | 50.0 | 12.0 | 79.0 | 4.3 |
| 26.0 | 1.5 | 51.0 | 18.1 | 85.0 | 1.5 |
| 27.0 | 6.0 | 52.0 | 4.2 | 86.0 | 2.5 |
| 28.0 | 7.1 | 53.0 | 4.2 | 87.0 | 1.8 |
| 29.0 | 1.6 | 59.0 | 6.0 | 89.0 | 23.0 |
| 32.0 | 1.7 | 61.0 | 4.7 | 90.0 | 78.7 |
| 37.0 | 3.8 | 62.0 | 11.6 | 91.0 | 100.0 |
| 38.0 | 7.8 | 63.0 | 27.0 | 92.0 | 9.9 |
| 39.0 | 34.3 | 64.0 | 7.5 | 105.0 | 1.8 |
| 40.0 | 3.2 | 65.0 | 38.1 | 107.0 | 1.8 |
| 41.0 | 5.3 | 66.0 | 2.6 | 118.0 | 85.0 |
| 43.0 | 3.1 | 74.0 | 3.6 | 119.0 | 27.5 |
| 44.0 | 1.8 | 75.0 | 2.6 | 120.0 | 2.2 |
| 45.0 | 6.6 | 76.0 | 1.5 | 135.0 | 2.7 |
| 45.5 | 2.5 | 77.0 | 13.3 | 136.0 | 59.5 |
| 49.0 | 1.8 | 78.0 | 2.0 | 137.0 | 5.5 |

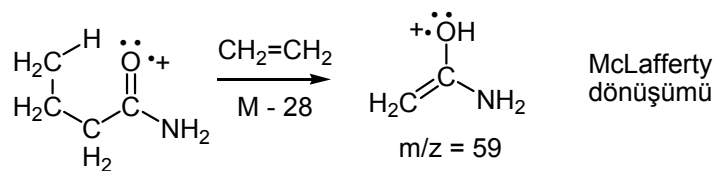
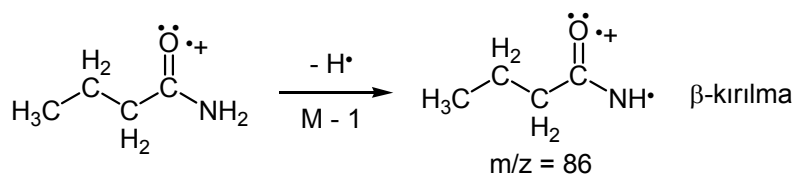
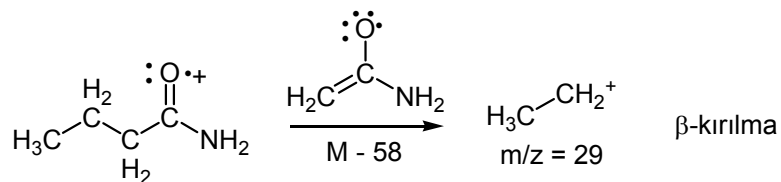
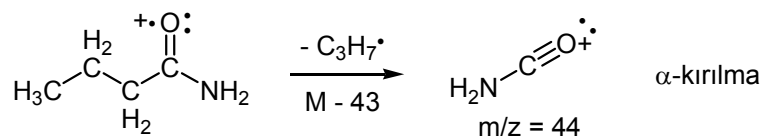
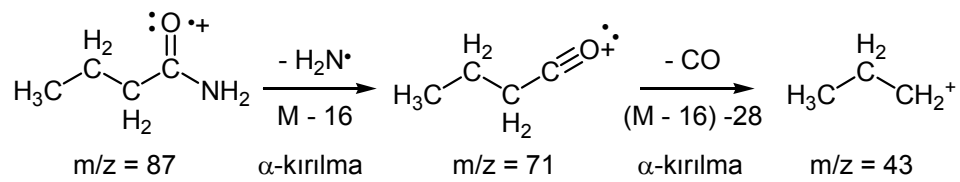


5. AMİDLER

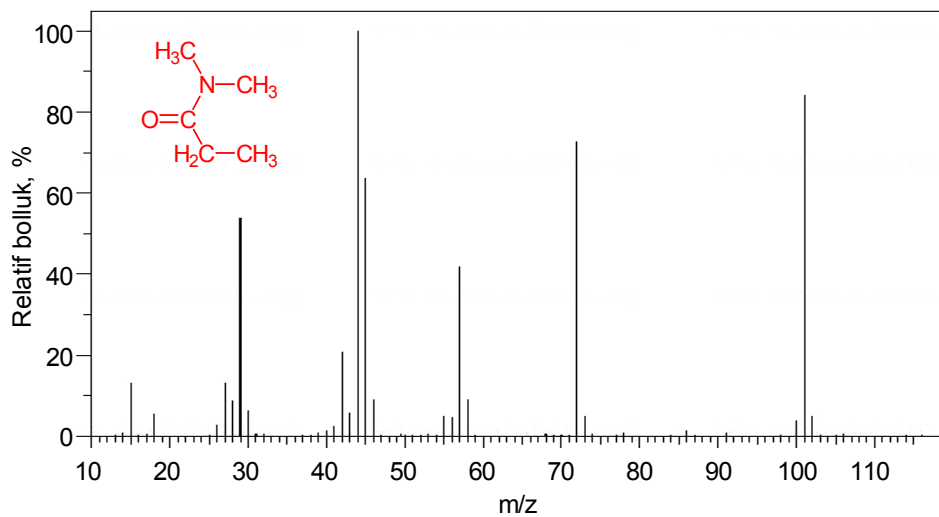
Bütiramid, C₄H₉ON (87.12)



| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 2.6 | 38.0 | 2.8 | 54.0 | 1.0 |
| 16.0 | 1.1 | 39.0 | 11.6 | 55.0 | 7.0 |
| 17.0 | 1.8 | 40.0 | 3.1 | 59.0 | 100.0 |
| 18.0 | 8.5 | 41.0 | 53.4 | 60.0 | 3.0 |
| 26.0 | 3.7 | 42.0 | 7.5 | 69.0 | 1.8 |
| 27.0 | 26.6 | 43.0 | 32.2 | 70.0 | 1.0 |
| 28.0 | 5.8 | 44.0 | 66.3 | 71.0 | 8.0 |
| 29.0 | 26.1 | 45.0 | 3.2 | 72.0 | 19.2 |
| 30.0 | 1.8 | 46.0 | 1.7 | 86.0 | 3.0 |
| 37.0 | 2.0 | 52.0 | 1.4 | 87.0 | 2.9 |



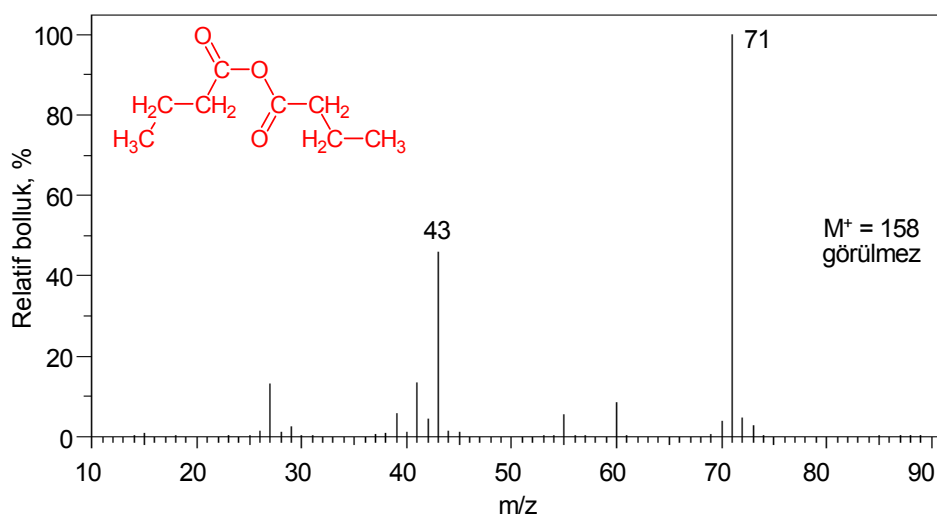
N,N-Dimetilpropanamid, C₅H₁₁ON (101.15)



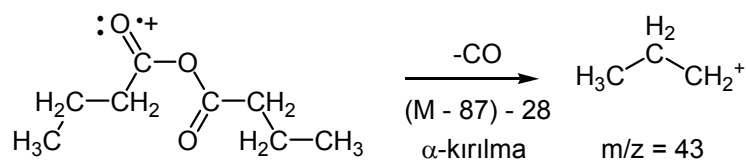
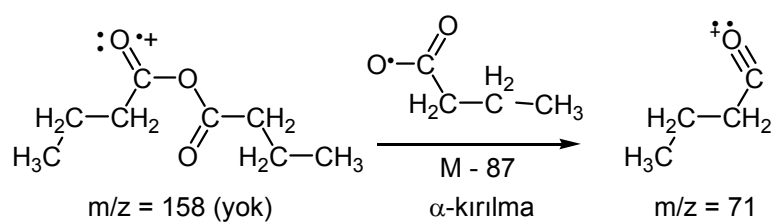
| | | | | | |
|------|------|------|-------|-------|------|
| 15.0 | 13.0 | 41.0 | 2.3 | 57.0 | 41.9 |
| 18.0 | 5.3 | 42.0 | 20.6 | 58.0 | 9.1 |
| 26.0 | 2.8 | 43.0 | 5.6 | 72.0 | 72.6 |
| 27.0 | 13.1 | 44.0 | 100.0 | 73.0 | 5.0 |
| 28.0 | 8.7 | 45.0 | 63.5 | 86.0 | 1.4 |
| 29.0 | 53.7 | 46.0 | 8.9 | 100.0 | 3.7 |
| 30.0 | 6.3 | 55.0 | 5.0 | 101.0 | 84.2 |
| 40.0 | 1.2 | 56.0 | 4.7 | 102.0 | 5.0 |

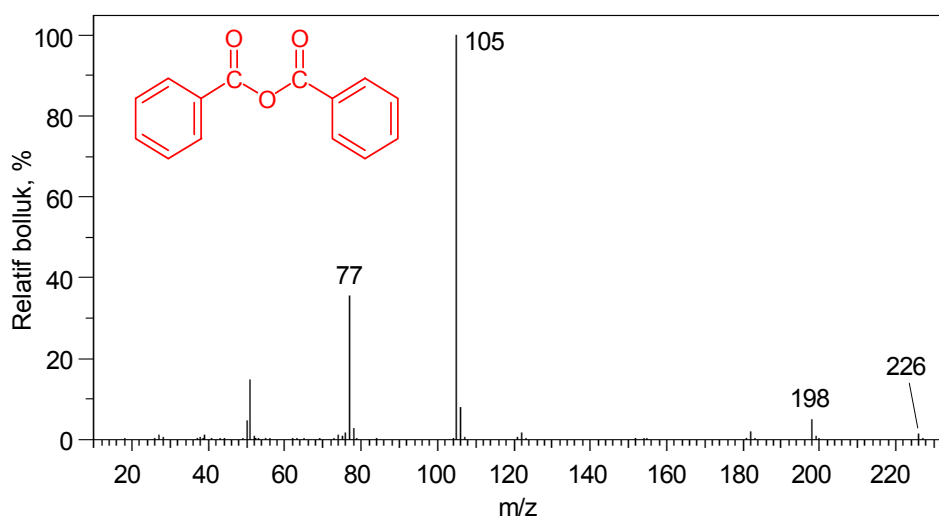
6. ANHİDRİTLER

Bütirik anhidrit, C₈H₁₄O₃ (158.19)

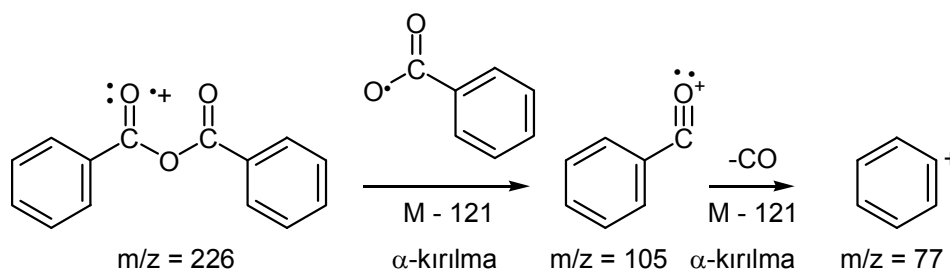


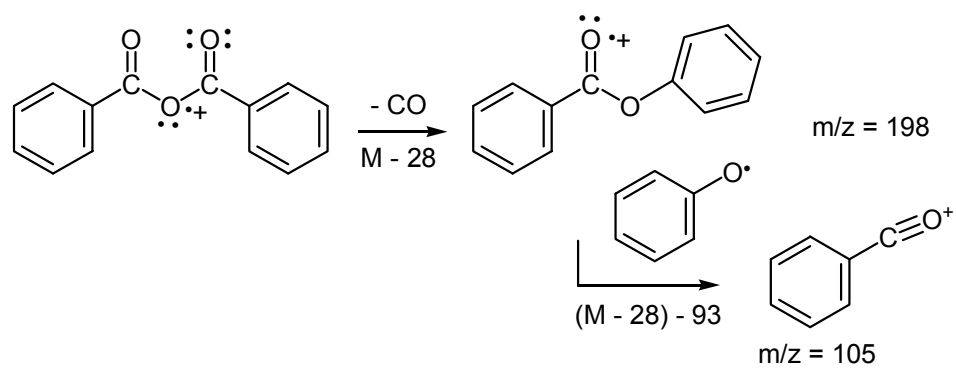
| | | | | | |
|------|------|------|------|------|-------|
| 26.0 | 1.3 | 41.0 | 13.4 | 60.0 | 8.3 |
| 27.0 | 13.1 | 42.0 | 4.4 | 70.0 | 3.9 |
| 28.0 | 1.1 | 43.0 | 45.8 | 71.0 | 100.0 |
| 29.0 | 2.3 | 44.0 | 1.4 | 72.0 | 4.7 |
| 39.0 | 5.6 | 45.0 | 1.1 | 73.0 | 2.7 |
| 40.0 | 1.1 | 55.0 | 5.3 | | |



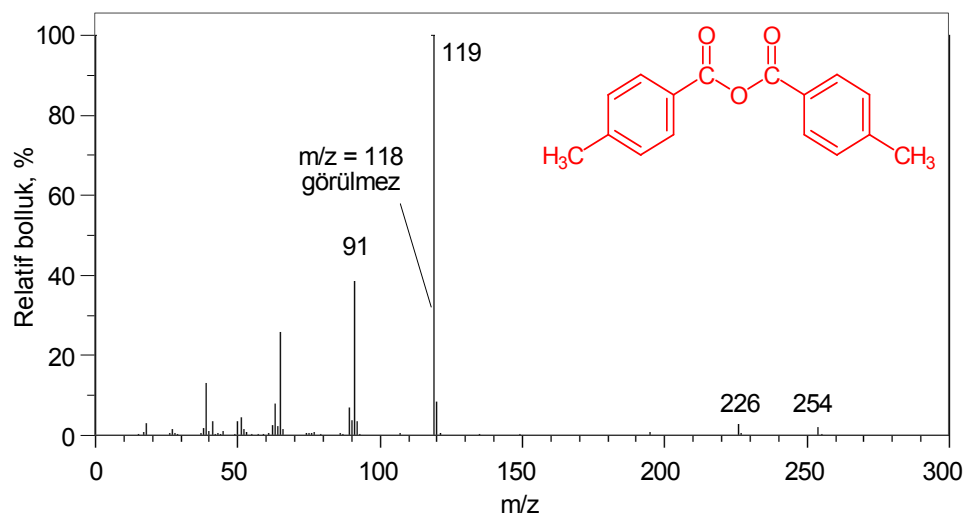
Benzoik anhidrit, C₁₄H₁₀O₃ (226.23)


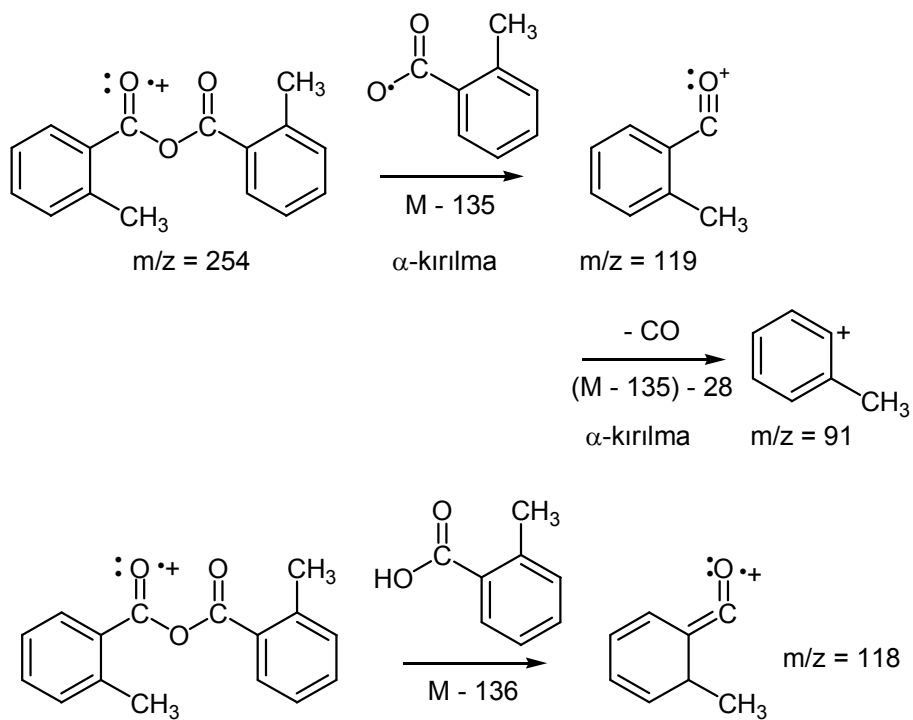
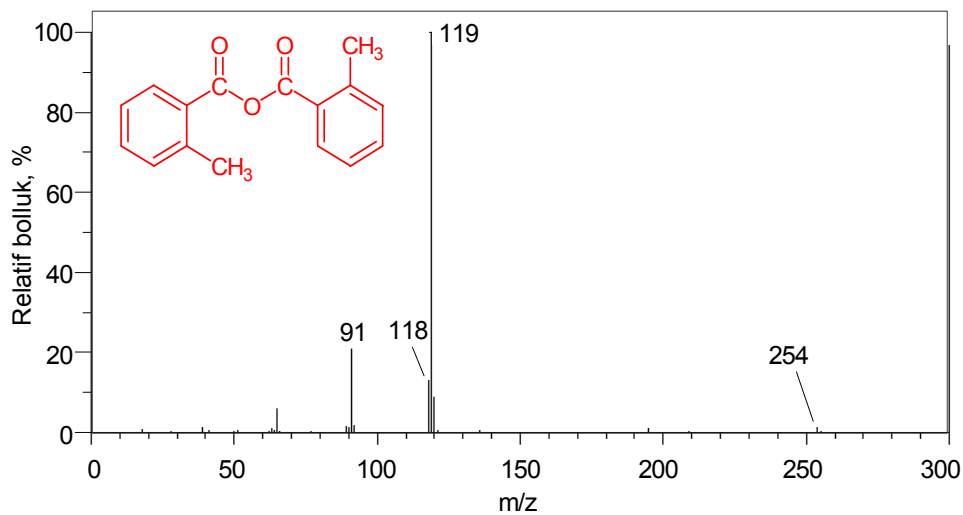
| | | | | | |
|------|------|-------|-------|-------|-----|
| 27.0 | 1.1 | 76.0 | 1.7 | 122.0 | 1.6 |
| 39.0 | 1.0 | 77.0 | 35.4 | 182.0 | 1.8 |
| 50.0 | 4.5 | 78.0 | 2.7 | 198.0 | 4.9 |
| 51.0 | 14.8 | 105.0 | 100.0 | 226.0 | 1.2 |
| 74.0 | 1.1 | 106.0 | 7.8 | | |





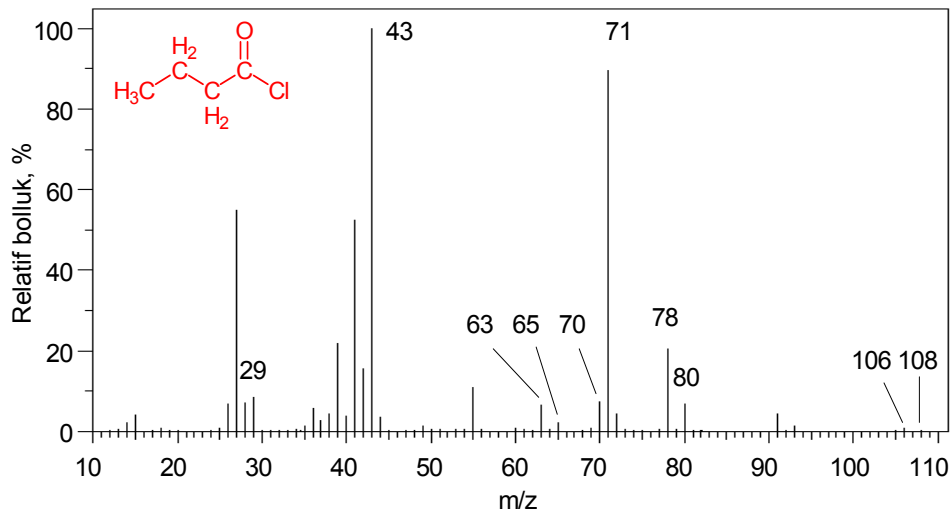
p-Toluik anhidrit, $\text{C}_{16}\text{H}_{14}\text{O}_3$ (254.28)



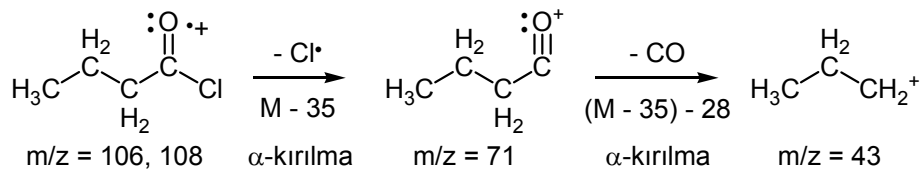
o-Toluik anhidrit, C₁₆H₁₄O₃ (254.280)

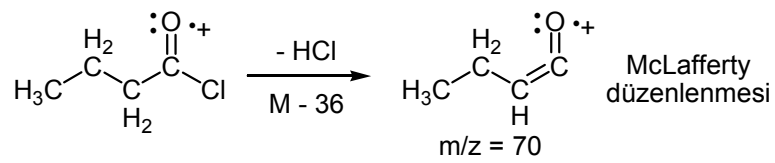
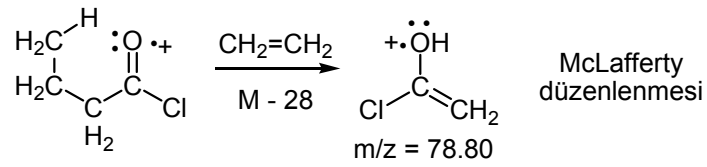
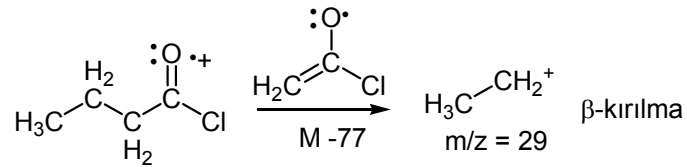
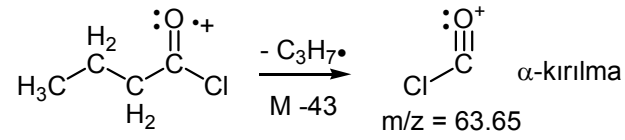
7. ASİT HALOJENLER

Bütiril Klorür, C₄H₇OCl (106.55)



| | | | | | |
|------|------|------|-------|------|------|
| 14.0 | 2.1 | 38.0 | 4.3 | 63.0 | 6.4 |
| 15.0 | 4.1 | 39.0 | 21.8 | 65.0 | 2.1 |
| 26.0 | 6.9 | 40.0 | 3.8 | 70.0 | 7.4 |
| 27.0 | 55.0 | 41.0 | 52.4 | 71.0 | 89.7 |
| 28.0 | 7.2 | 42.0 | 15.5 | 72.0 | 4.3 |
| 29.0 | 8.5 | 43.0 | 100.0 | 78.0 | 20.4 |
| 35.0 | 1.2 | 44.0 | 3.4 | 80.0 | 6.7 |
| 36.0 | 5.6 | 49.0 | 1.3 | 91.0 | 4.3 |
| 37.0 | 2.8 | 55.0 | 10.9 | 93.0 | 1.2 |

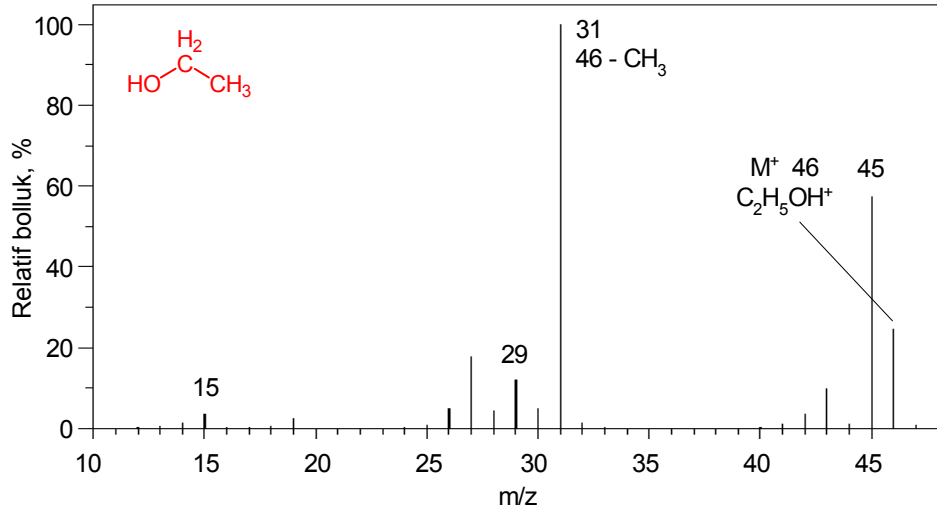




E. DİĞER ÖNEMLİ FONKSİYONEL GRUPLAR

1. ALKOLLER

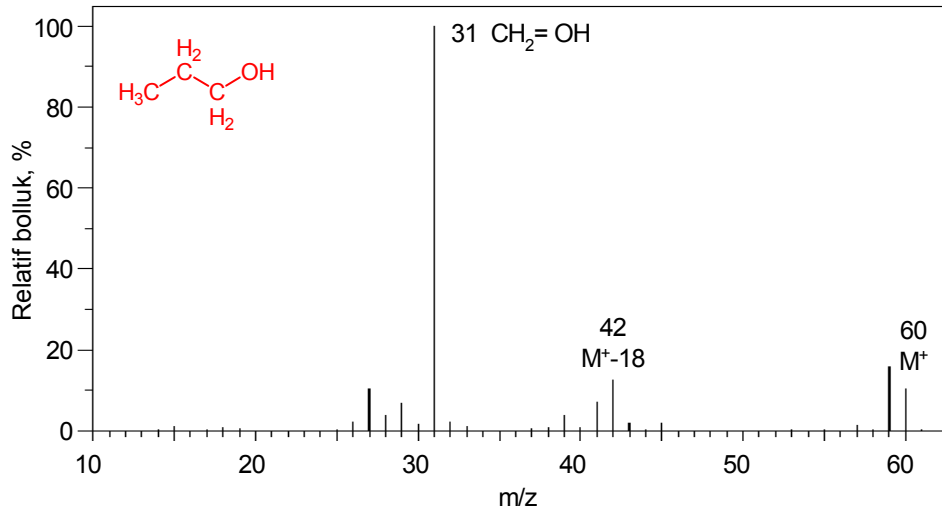
Etanol, C₂H₆O (46.07)



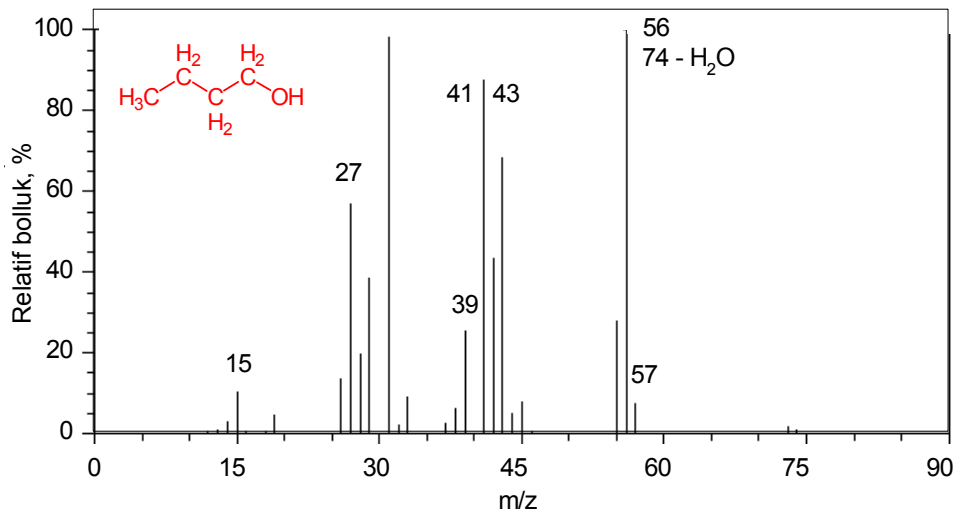
| | | | | | |
|------|------|------|-------|------|------|
| 14.0 | 1.4 | 29.0 | 12.0 | 43.0 | 9.9 |
| 15.0 | 3.4 | 30.0 | 5.0 | 44.0 | 1.0 |
| 19.0 | 2.3 | 31.0 | 100.0 | 45.0 | 57.3 |
| 26.0 | 4.9 | 32.0 | 1.4 | 46.0 | 24.6 |
| 27.0 | 17.7 | 41.0 | 1.0 | | |
| 28.0 | 4.2 | 42.0 | 3.4 | | |

60

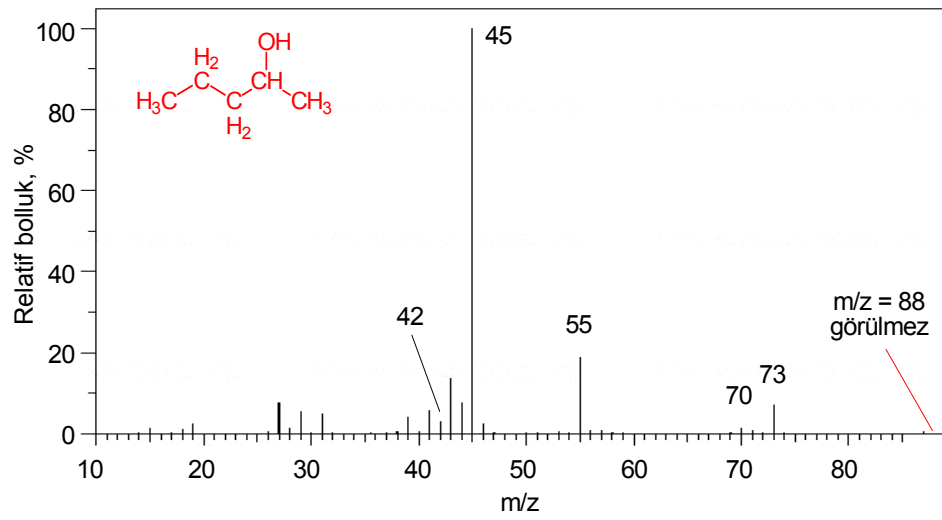
1-Propanol, C₃H₈O (60.1)



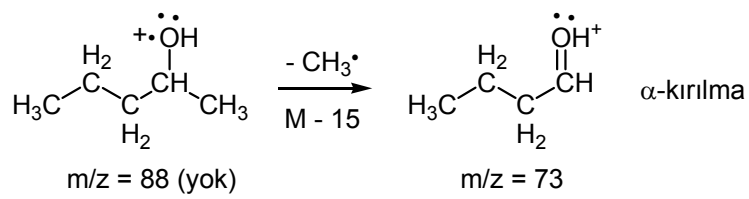
1-Bütanol, C₄H₁₀O (74.12)

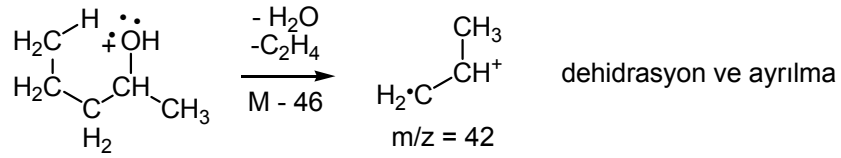
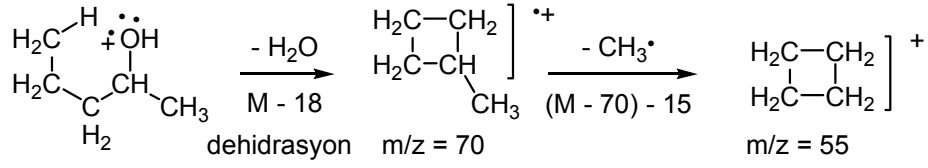
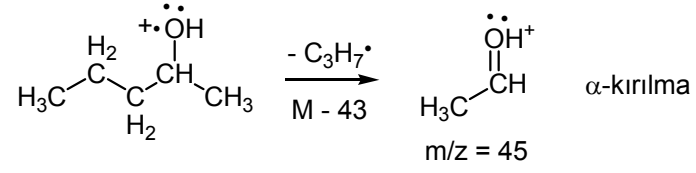


2-Pentanol, C₅H₁₂O (88.15)

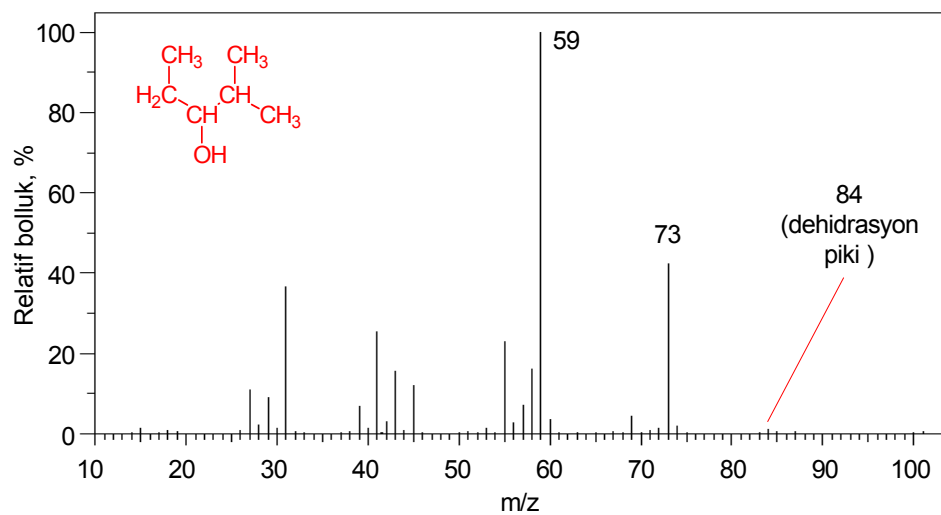


| | | | | | |
|------|-----|------|------|------|-------|
| 15.0 | 1.4 | 31.0 | 5.0 | 45.0 | 100.0 |
| 18.0 | 1.1 | 39.0 | 4.1 | 46.0 | 2.3 |
| 19.0 | 2.4 | 41.0 | 5.8 | 55.0 | 18.7 |
| 27.0 | 7.6 | 42.0 | 3.0 | 70.0 | 1.4 |
| 28.0 | 1.4 | 43.0 | 13.7 | 73.0 | 7.1 |
| 29.0 | 5.3 | 44.0 | 7.5 | | |

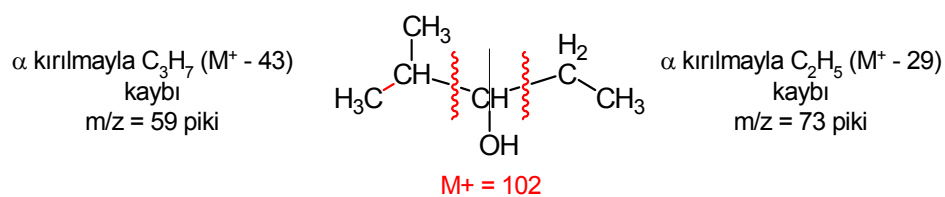




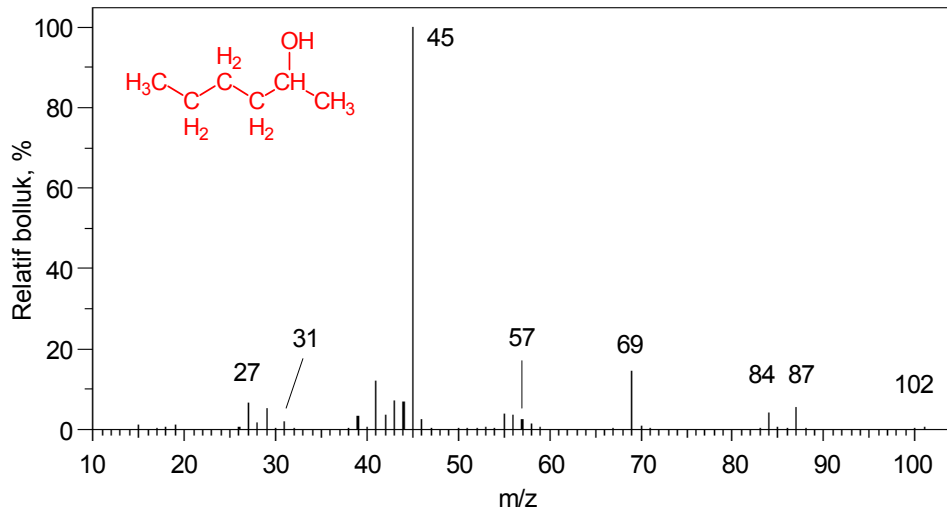
2-Metil-3-pentanol, C₆H₁₄O (102.17)



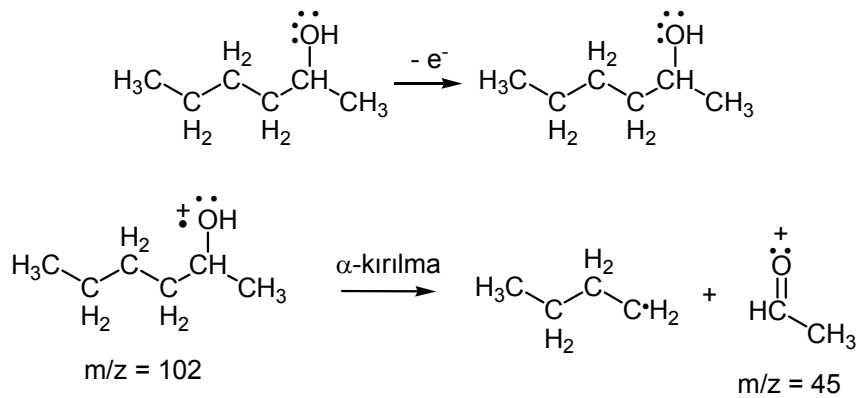
| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 1.4 | 41.0 | 25.4 | 58.0 | 16.2 |
| 27.0 | 10.9 | 42.0 | 3.1 | 59.0 | 100.0 |
| 28.0 | 2.1 | 43.0 | 15.4 | 60.0 | 3.5 |
| 29.0 | 9.0 | 45.0 | 11.9 | 69.0 | 4.3 |
| 30.0 | 1.2 | 53.0 | 1.2 | 72.0 | 1.4 |
| 31.0 | 36.7 | 55.0 | 22.8 | 73.0 | 42.3 |
| 39.0 | 6.8 | 56.0 | 2.7 | 74.0 | 1.9 |
| 40.0 | 1.2 | 57.0 | 7.1 | 84.0 | 1.1 |

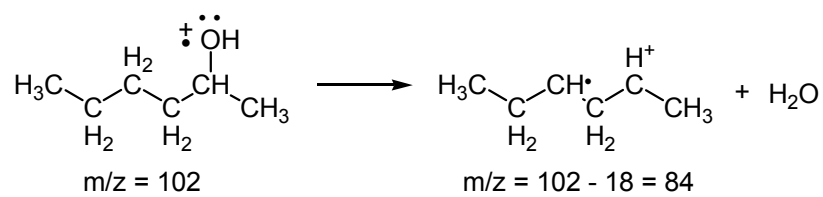
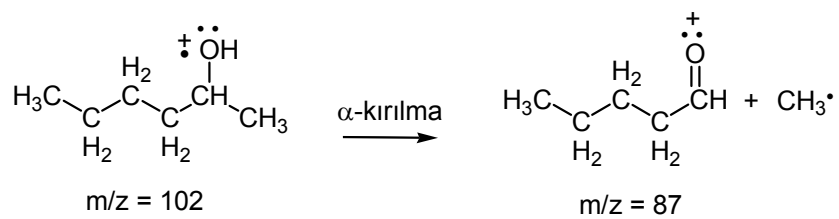


2-Heksanol, C₆H₁₄O (102.17)

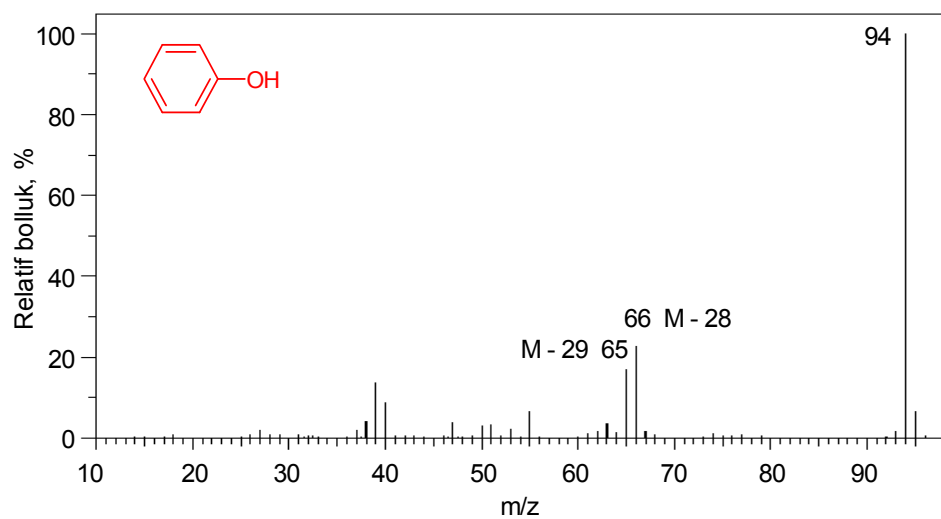


| | | | | | |
|------|-----|------|-------|------|------|
| 15.0 | 1.1 | 41.0 | 12.0 | 56.0 | 3.6 |
| 19.0 | 1.1 | 42.0 | 3.4 | 57.0 | 2.4 |
| 27.0 | 6.4 | 43.0 | 7.0 | 58.0 | 1.3 |
| 28.0 | 1.5 | 44.0 | 6.9 | 69.0 | 14.5 |
| 29.0 | 5.1 | 45.0 | 100.0 | 84.0 | 4.1 |
| 31.0 | 2.0 | 46.0 | 2.3 | 87.0 | 5.3 |
| 39.0 | 3.2 | 55.0 | 3.9 | | |





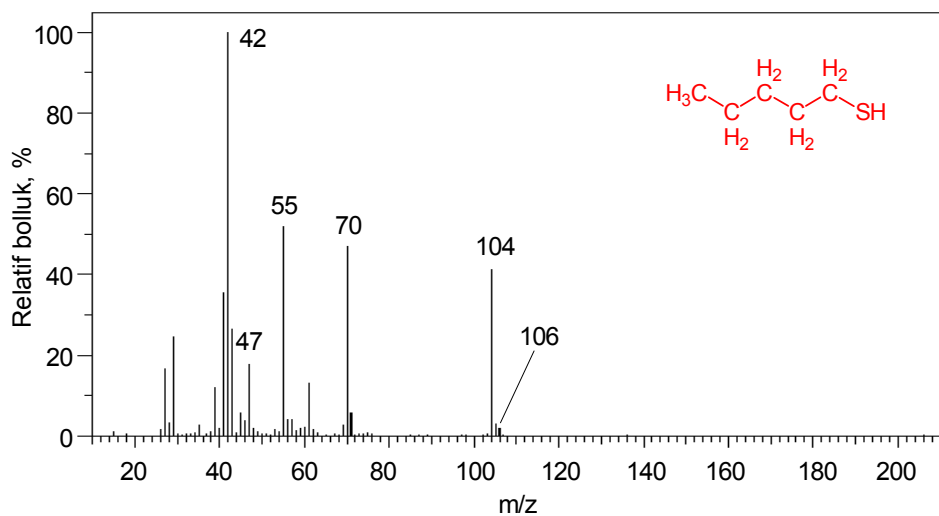
Fenol, C₆H₆O (94.11)



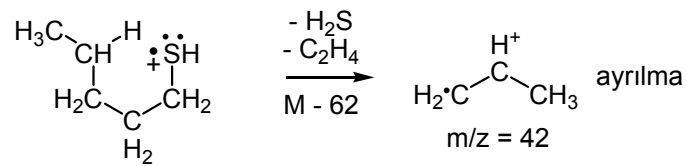
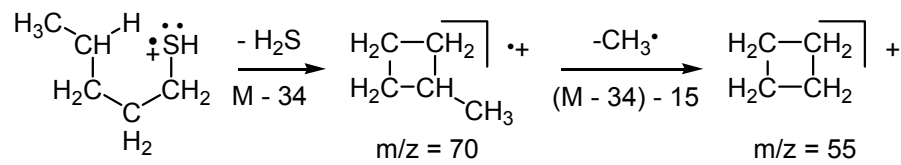
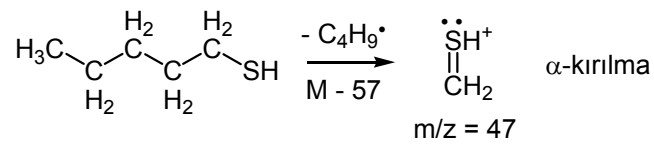
| | | | | | |
|------|------|------|-----|------|-------|
| 27.0 | 1.9 | 51.0 | 3.2 | 65.0 | 16.8 |
| 37.0 | 2.0 | 53.0 | 2.1 | 66.0 | 22.6 |
| 38.0 | 4.0 | 55.0 | 6.6 | 67.0 | 1.5 |
| 39.0 | 13.6 | 61.0 | 1.1 | 74.0 | 1.1 |
| 40.0 | 8.8 | 62.0 | 1.7 | 93.0 | 1.5 |
| 47.0 | 3.9 | 63.0 | 3.5 | 94.0 | 100.0 |
| 50.0 | 3.1 | 64.0 | 1.4 | 95.0 | 6.6 |

2. TIOLLER

Pentantiol, C₅H₁₂S (104.21)

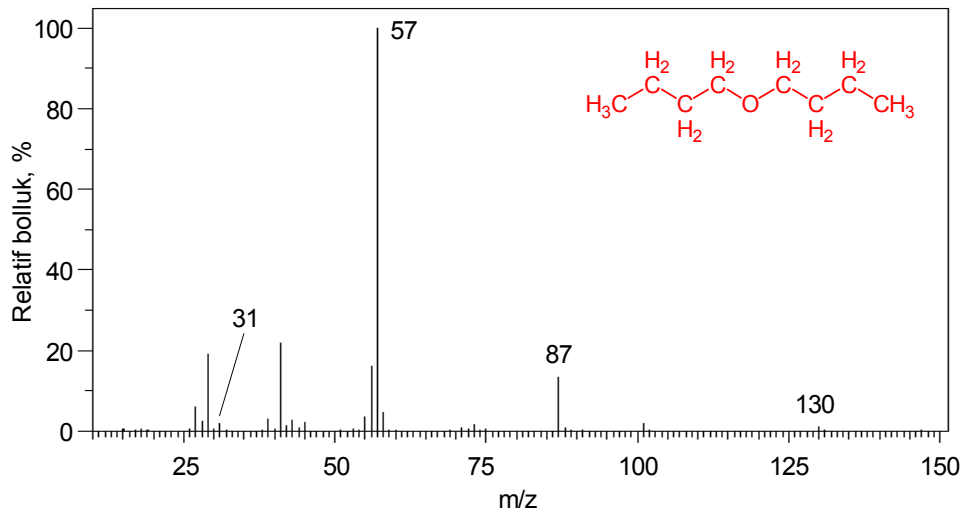


| | | | | | |
|------|-------|------|------|-------|------|
| 15.0 | 1.0 | 43.0 | 26.6 | 58.0 | 1.4 |
| 26.0 | 1.6 | 45.0 | 5.8 | 59.0 | 2.0 |
| 27.0 | 16.6 | 46.0 | 3.8 | 60.0 | 2.1 |
| 28.0 | 3.3 | 47.0 | 17.6 | 61.0 | 13.1 |
| 29.0 | 24.6 | 48.0 | 1.8 | 62.0 | 1.7 |
| 35.0 | 2.6 | 49.0 | 1.0 | 69.0 | 2.7 |
| 38.0 | 1.0 | 53.0 | 1.7 | 70.0 | 47.0 |
| 39.0 | 11.9 | 54.0 | 1.1 | 71.0 | 5.6 |
| 40.0 | 2.0 | 55.0 | 52.0 | 104.0 | 41.2 |
| 41.0 | 35.5 | 56.0 | 4.0 | 105.0 | 2.9 |
| 42.0 | 100.0 | 57.0 | 4.1 | 106.0 | 2.0 |

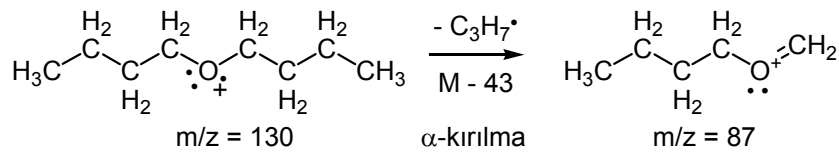


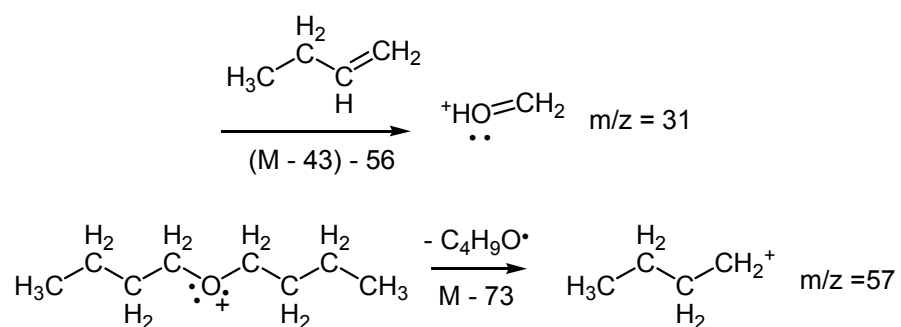
3. ETERLER

Di-n-bütül eter, C₈H₁₈O (130.23)

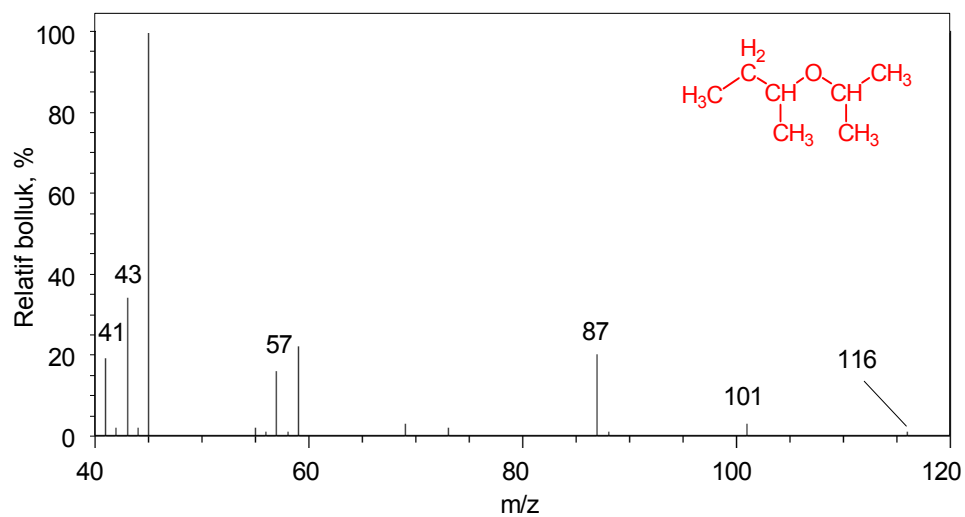


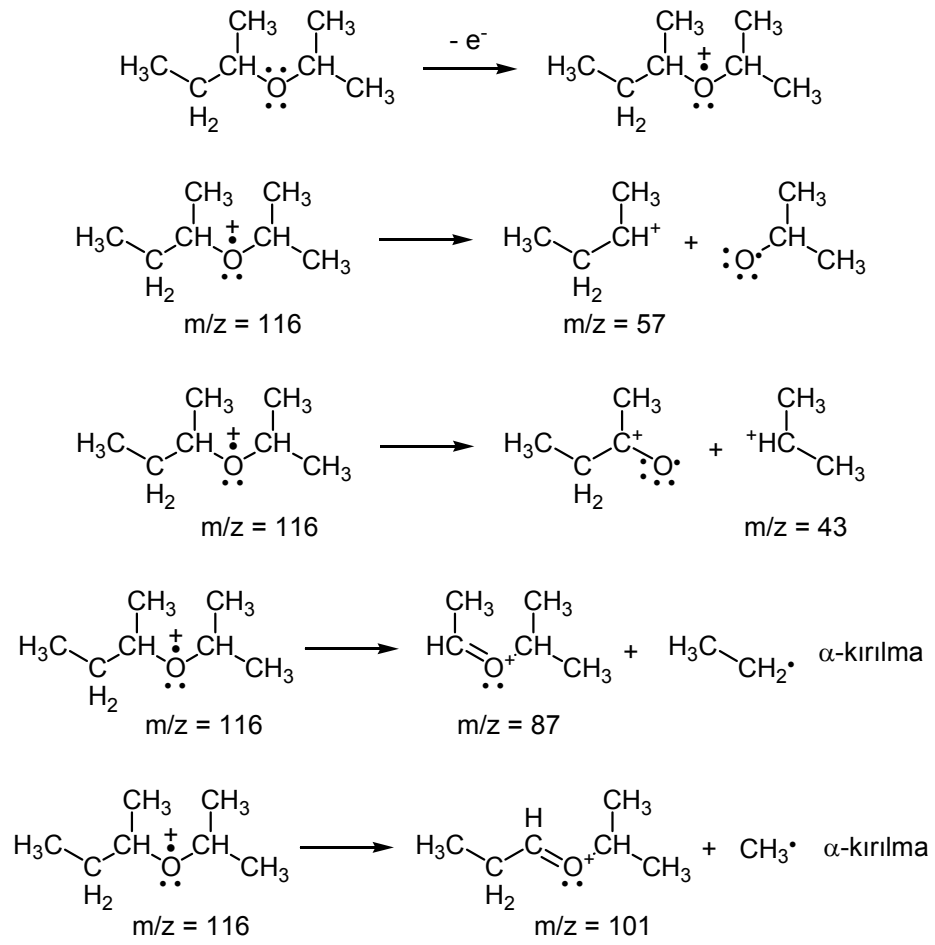
| | | | | | |
|------|------|------|-------|-------|------|
| 27.0 | 6.0 | 42.0 | 1.4 | 58.0 | 4.5 |
| 28.0 | 2.5 | 43.0 | 2.8 | 73.0 | 1.7 |
| 29.0 | 19.0 | 45.0 | 2.1 | 87.0 | 13.3 |
| 31.0 | 1.8 | 55.0 | 3.5 | 101.0 | 2.0 |
| 39.0 | 3.1 | 56.0 | 16.0 | 130.0 | 1.1 |
| 41.0 | 21.9 | 57.0 | 100.0 | | |



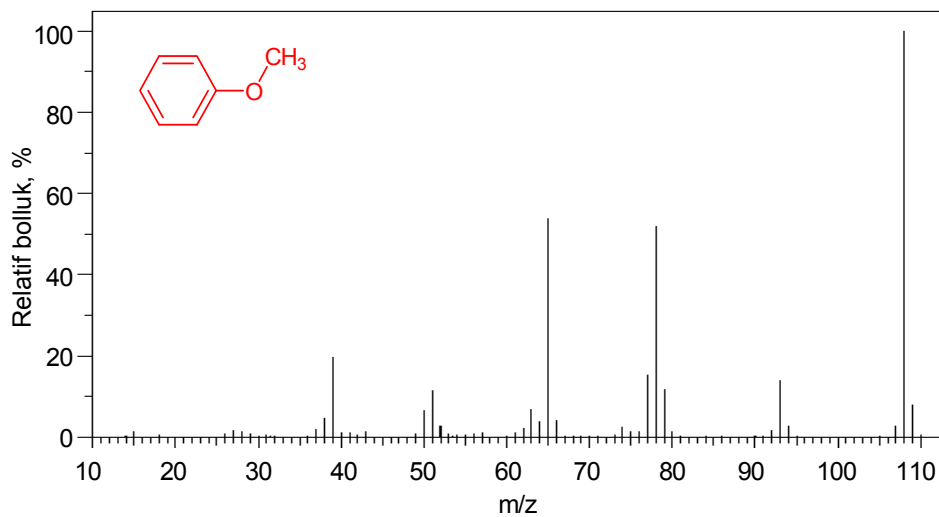


sek-Bütil izopropil eter, C₇H₁₆O (116.2013)

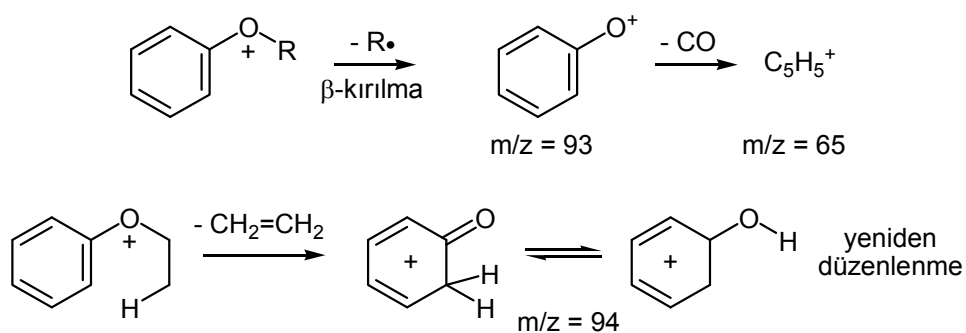




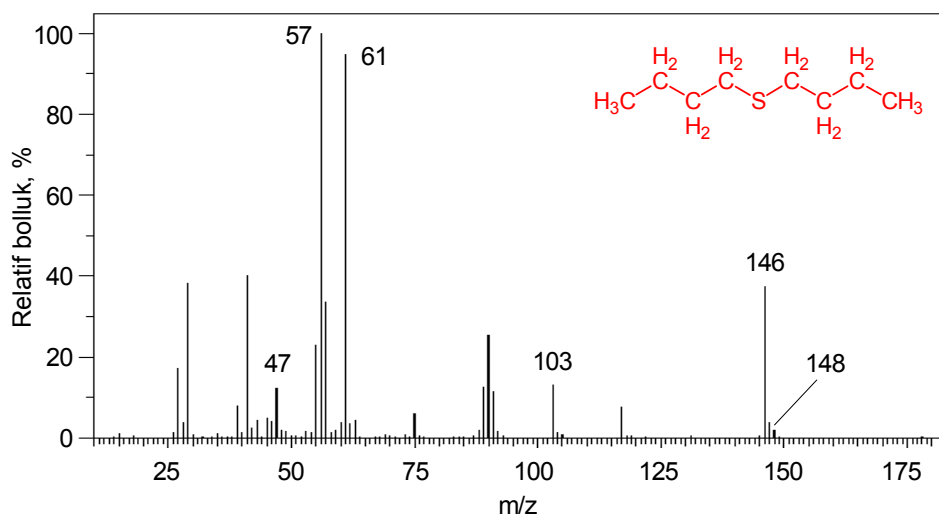
Metil fenil eter, C₇H₈O (108.14)



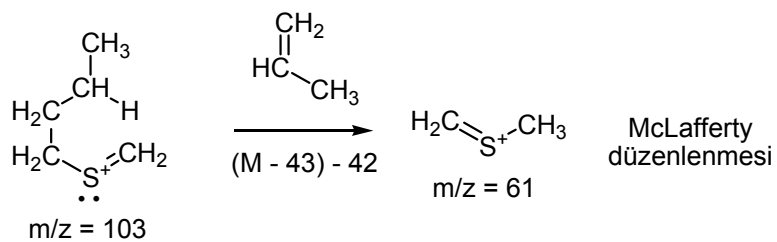
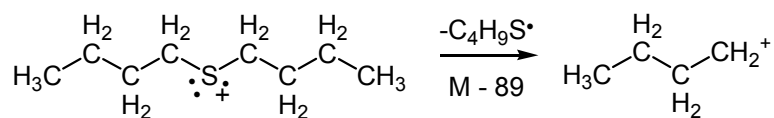
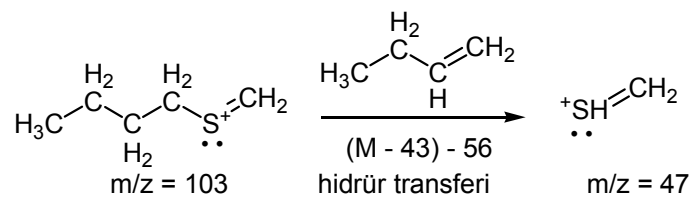
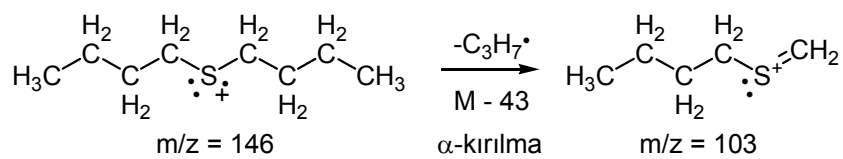
| | | | | | |
|------|------|------|------|-------|-------|
| 15.0 | 1.2 | 52.0 | 2.8 | 77.0 | 15.2 |
| 27.0 | 1.6 | 57.0 | 1.0 | 78.0 | 52.0 |
| 28.0 | 1.4 | 61.0 | 1.0 | 79.0 | 11.8 |
| 37.0 | 1.9 | 62.0 | 2.2 | 80.0 | 1.4 |
| 38.0 | 4.7 | 63.0 | 6.7 | 92.0 | 1.5 |
| 39.0 | 19.7 | 64.0 | 3.9 | 93.0 | 13.9 |
| 40.0 | 1.0 | 65.0 | 53.9 | 94.0 | 2.8 |
| 41.0 | 1.1 | 66.0 | 4.0 | 107.0 | 2.7 |
| 43.0 | 1.3 | 74.0 | 2.4 | 108.0 | 100.0 |
| 50.0 | 6.5 | 75.0 | 1.2 | 109.0 | 7.9 |
| 51.0 | 11.4 | 76.0 | 1.2 | | |



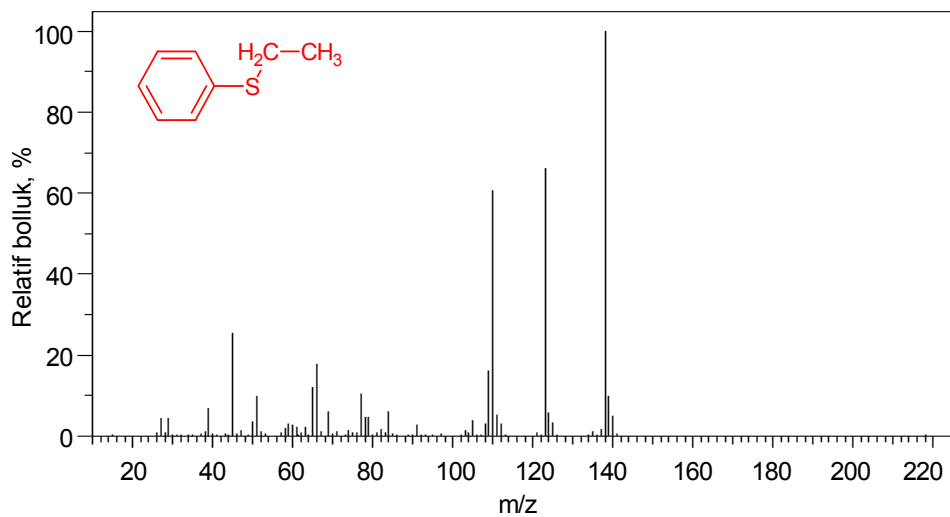
4. SÜLFÜRLER

Dibütil sülfür $C_8H^{18}S$ (146.29)

| | | | | | |
|------|------|------|-------|-------|------|
| 15.0 | 1.1 | 47.0 | 12.3 | 63.0 | 4.3 |
| 26.0 | 1.3 | 48.0 | 1.9 | 75.0 | 6.1 |
| 27.0 | 17.1 | 49.0 | 1.6 | 88.0 | 2.0 |
| 28.0 | 3.8 | 53.0 | 1.6 | 89.0 | 12.5 |
| 29.0 | 38.1 | 54.0 | 1.3 | 90.0 | 25.5 |
| 35.0 | 1.1 | 55.0 | 23.0 | 91.0 | 11.3 |
| 39.0 | 8.0 | 56.0 | 100.0 | 92.0 | 1.6 |
| 40.0 | 1.4 | 57.0 | 33.7 | 103.0 | 13.1 |
| 41.0 | 40.0 | 58.0 | 1.4 | 104.0 | 1.3 |
| 42.0 | 2.5 | 59.0 | 2.0 | 117.0 | 7.5 |
| 43.0 | 4.3 | 60.0 | 3.8 | 146.0 | 37.5 |
| 45.0 | 5.0 | 61.0 | 94.8 | 147.0 | 3.9 |
| 46.0 | 4.0 | 62.0 | 3.5 | 148.0 | 1.9 |

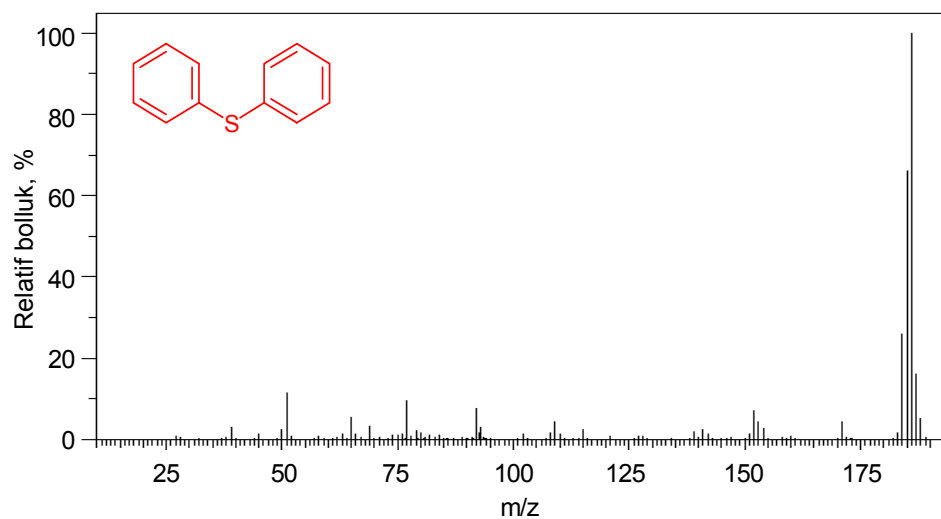


Etil fenil sülfür, C₈H₁₀S (138.23)



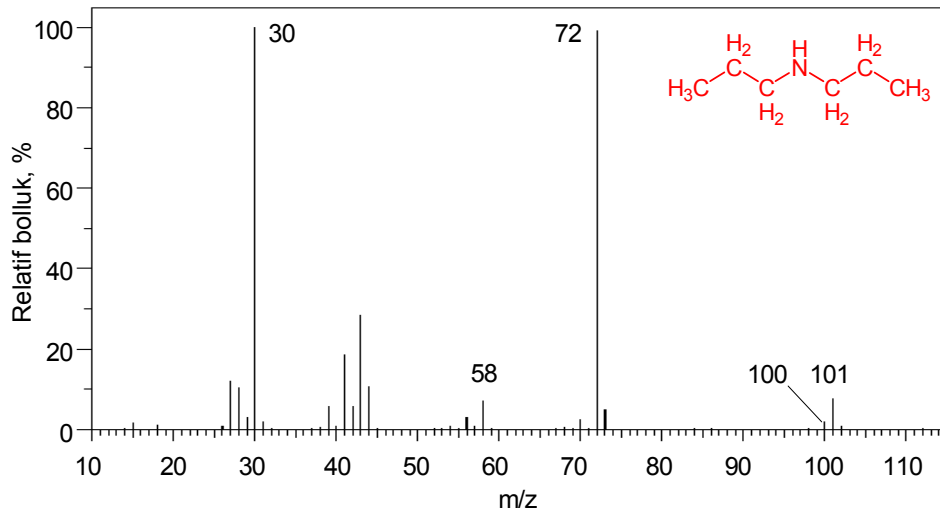
| | | | | | |
|------|------|-------|------|-------|-------|
| 27.0 | 4.4 | 65.0 | 12.1 | 108.0 | 3.1 |
| 29.0 | 4.4 | 66.0 | 17.7 | 109.0 | 16.0 |
| 38.0 | 1.0 | 67.0 | 1.0 | 110.0 | 60.5 |
| 39.0 | 6.9 | 69.0 | 6.0 | 111.0 | 5.2 |
| 45.0 | 25.5 | 71.0 | 1.0 | 112.0 | 2.9 |
| 47.0 | 1.2 | 74.0 | 1.3 | 123.0 | 66.0 |
| 50.0 | 3.5 | 77.0 | 10.3 | 124.0 | 5.7 |
| 51.0 | 9.7 | 78.0 | 4.7 | 125.0 | 3.2 |
| 52.0 | 1.1 | 79.0 | 4.7 | 135.0 | 1.1 |
| 58.0 | 2.0 | 82.0 | 1.7 | 137.0 | 1.7 |
| 59.0 | 3.1 | 84.0 | 6.1 | 138.0 | 100.0 |
| 60.0 | 2.7 | 91.0 | 2.8 | 139.0 | 9.8 |
| 61.0 | 2.2 | 103.0 | 1.2 | 140.0 | 4.9 |
| 63.0 | 2.1 | 105.0 | 3.7 | | |

Difenil sülfür, C₁₂H₁₀S (186.27)

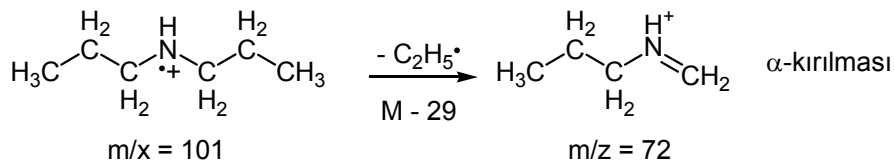


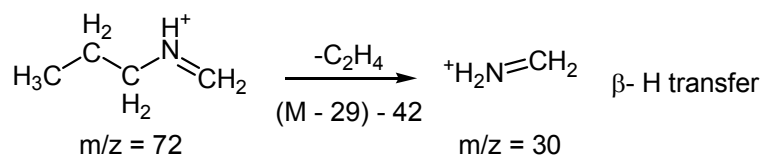
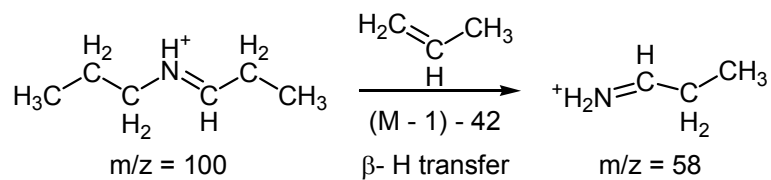
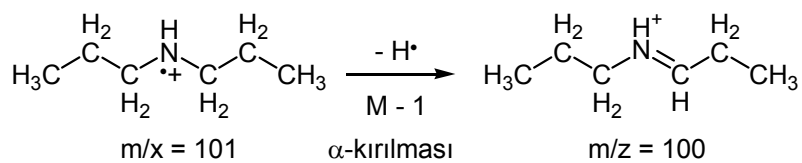
| | | | | | |
|------|------|-------|-----|-------|-------|
| 39.0 | 3.0 | 80.0 | 1.6 | 142.0 | 1.4 |
| 45.0 | 1.2 | 82.0 | 1.0 | 151.0 | 1.2 |
| 50.0 | 2.5 | 84.0 | 1.0 | 152.0 | 7.2 |
| 51.0 | 11.4 | 92.0 | 7.6 | 153.0 | 4.2 |
| 63.0 | 1.4 | 92.5 | 1.5 | 154.0 | 2.7 |
| 65.0 | 5.4 | 93.0 | 3.1 | 171.0 | 4.3 |
| 66.0 | 1.3 | 102.0 | 1.4 | 183.0 | 1.6 |
| 69.0 | 3.3 | 108.0 | 1.6 | 184.0 | 25.8 |
| 74.0 | 1.0 | 109.0 | 4.2 | 185.0 | 66.0 |
| 75.0 | 1.0 | 110.0 | 1.3 | 186.0 | 100.0 |
| 76.0 | 1.2 | 115.0 | 2.3 | 187.0 | 16.2 |
| 77.0 | 9.6 | 139.0 | 1.9 | 188.0 | 5.2 |
| 79.0 | 2.1 | 141.0 | 2.5 | | |

5. AMİNLER

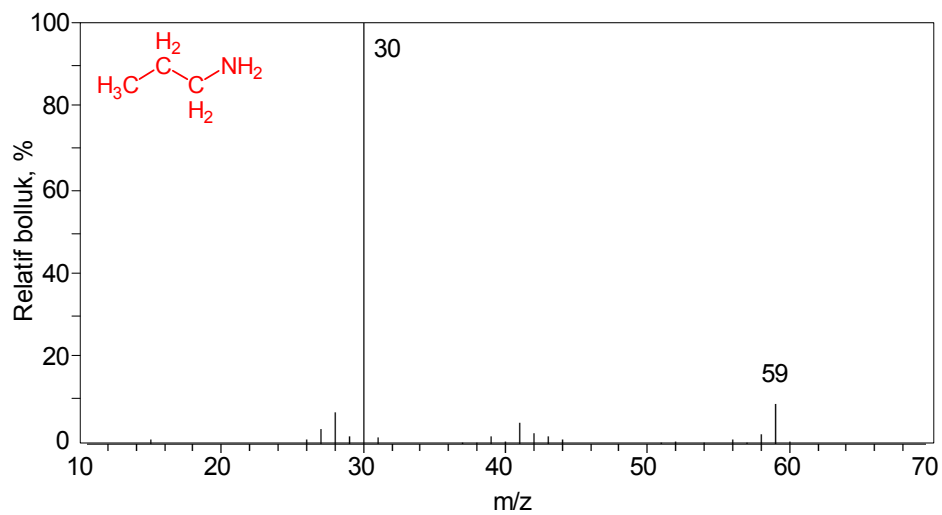
Dipropilamin, C₆H₁₅N (101.19)

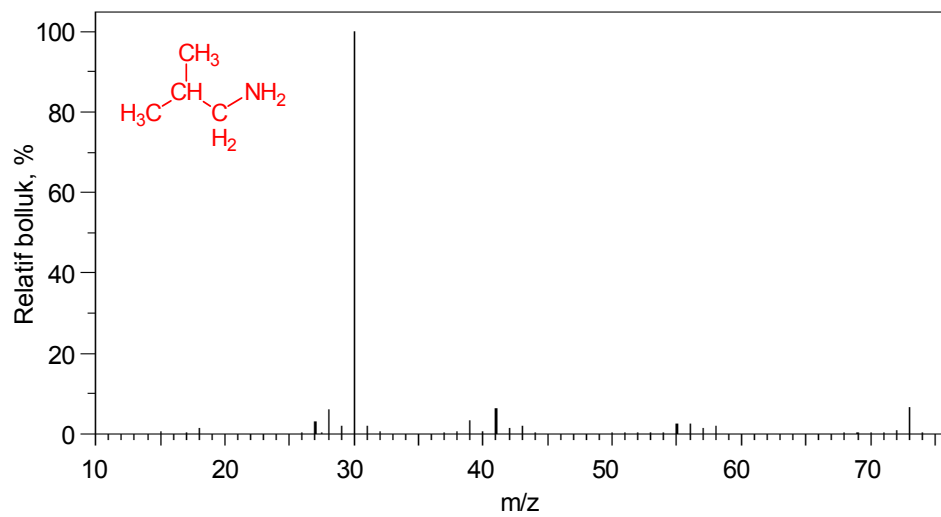
| | | | | | |
|------|-------|------|------|-------|------|
| 15.0 | 1.6 | 39.0 | 5.8 | 70.0 | 2.3 |
| 18.0 | 1.1 | 41.0 | 18.5 | 72.0 | 99.2 |
| 27.0 | 11.9 | 42.0 | 5.6 | 73.0 | 4.9 |
| 28.0 | 10.3 | 43.0 | 28.4 | 100.0 | 1.9 |
| 29.0 | 3.1 | 44.0 | 10.5 | 101.0 | 7.7 |
| 30.0 | 100.0 | 56.0 | 3.1 | | |
| 31.0 | 1.8 | 58.0 | 7.1 | | |





1-Propilamin, C₃H₉N

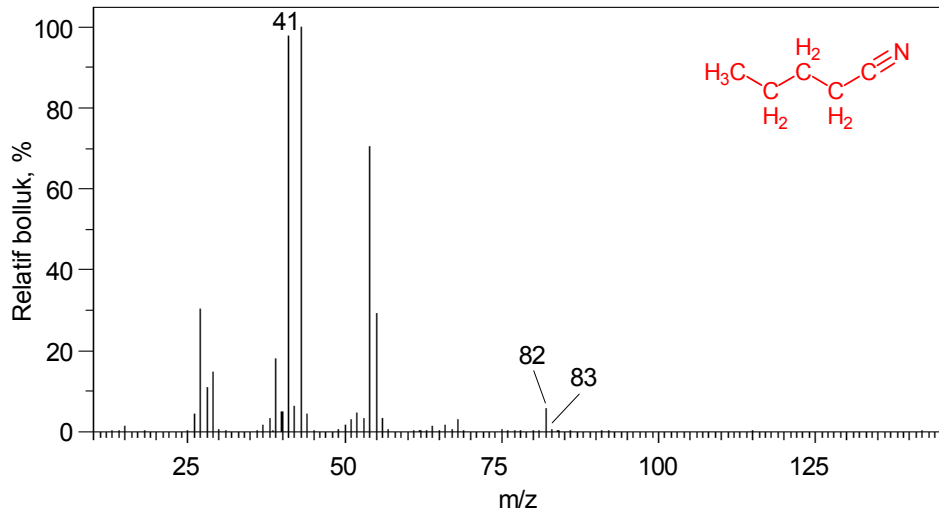


İzobütilamin, C₄H₁₁N (73.14)

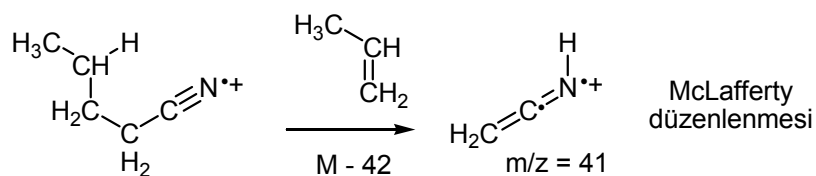
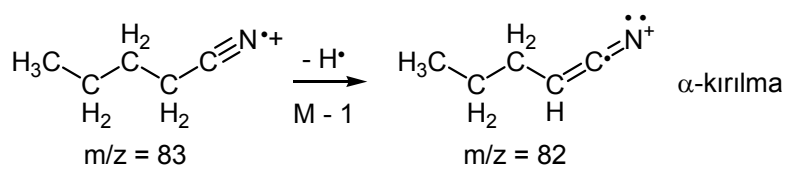
| | | | | | |
|------|-------|------|-----|------|-----|
| 18.0 | 1.2 | 31.0 | 2.0 | 55.0 | 2.4 |
| 27.0 | 3.0 | 39.0 | 3.2 | 56.0 | 2.3 |
| 28.0 | 5.9 | 41.0 | 6.2 | 57.0 | 1.2 |
| 29.0 | 1.9 | 42.0 | 1.4 | 58.0 | 1.9 |
| 30.0 | 100.0 | 43.0 | 2.0 | 73.0 | 6.4 |

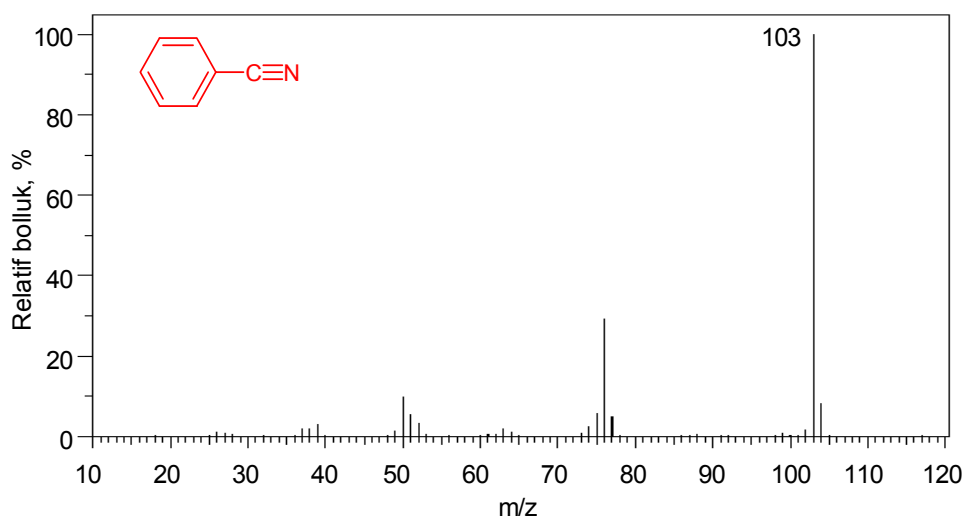
6. NİTRİLLER

Pentannitril, C₅H₉N (83.13)



| | | | | | |
|------|------|------|-------|------|------|
| 15.0 | 1.3 | 40.0 | 4.8 | 53.0 | 3.2 |
| 26.0 | 4.4 | 41.0 | 97.7 | 54.0 | 70.4 |
| 27.0 | 30.2 | 42.0 | 6.2 | 55.0 | 29.3 |
| 28.0 | 10.8 | 43.0 | 100.0 | 56.0 | 3.2 |
| 29.0 | 14.7 | 44.0 | 4.2 | 64.0 | 1.4 |
| 37.0 | 1.7 | 50.0 | 1.7 | 66.0 | 1.7 |
| 38.0 | 3.2 | 51.0 | 3.1 | 68.0 | 3.1 |
| 39.0 | 18.0 | 52.0 | 4.6 | 82.0 | 5.6 |

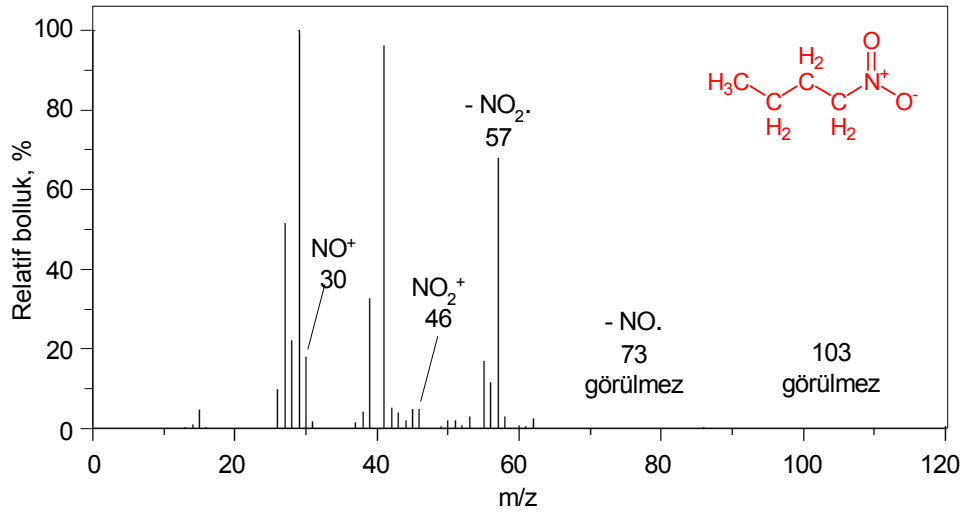


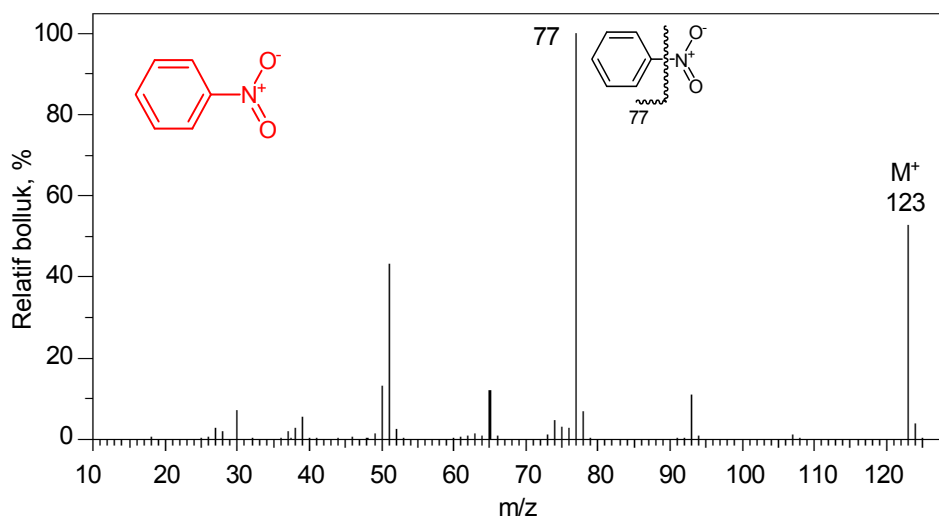
Benzonitril, C₇H₅N (103.12)

| | | | | | |
|------|-----|------|-----|-------|-------|
| 26.0 | 1.0 | 51.0 | 5.4 | 76.0 | 29.3 |
| 37.0 | 1.8 | 52.0 | 3.3 | 77.0 | 4.9 |
| 38.0 | 1.8 | 63.0 | 1.8 | 102.0 | 1.5 |
| 39.0 | 3.0 | 64.0 | 1.0 | 103.0 | 100.0 |
| 49.0 | 1.2 | 74.0 | 2.5 | 104.0 | 8.2 |
| 50.0 | 9.9 | 75.0 | 5.7 | | |

7. NİTRO BİLEŞİKLERİ

1-Nitrobütan, C₄H₉NO₂ (103.12)

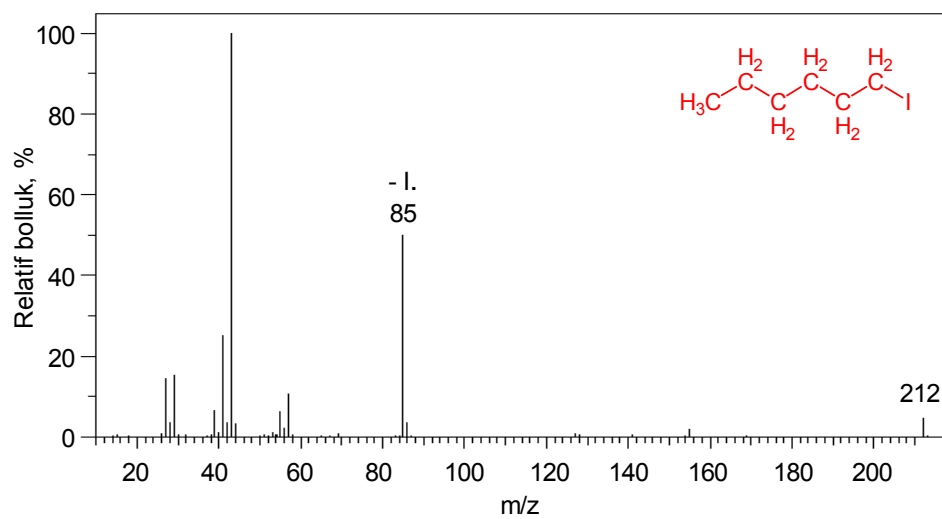


Nitrobenzen, $C_6H_5NO_2$ (123.11)

| | | | | | |
|------|------|------|------|-------|-------|
| 27.0 | 2.7 | 51.0 | 43.2 | 77.0 | 100.0 |
| 28.0 | 2.0 | 52.0 | 2.3 | 78.0 | 6.7 |
| 30.0 | 7.2 | 63.0 | 1.4 | 93.0 | 10.9 |
| 37.0 | 1.9 | 65.0 | 11.9 | 107.0 | 1.1 |
| 38.0 | 2.6 | 73.0 | 1.0 | 123.0 | 52.7 |
| 39.0 | 5.3 | 74.0 | 4.7 | 124.0 | 3.9 |
| 49.0 | 1.2 | 75.0 | 3.0 | | |
| 50.0 | 13.2 | 76.0 | 2.7 | | |

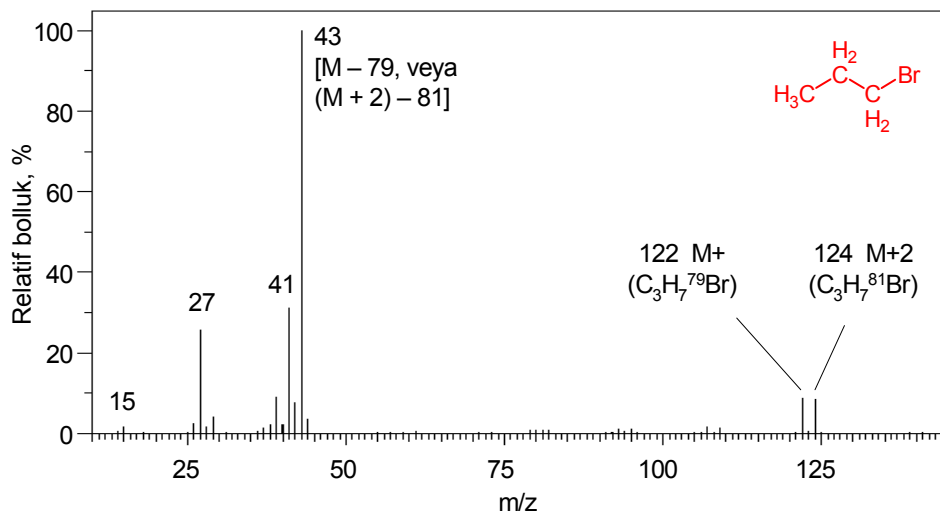
8. HALOJENLİ BİLEŞİKLER

1-İyodoheksan, C₆H₁₃I (212.07)

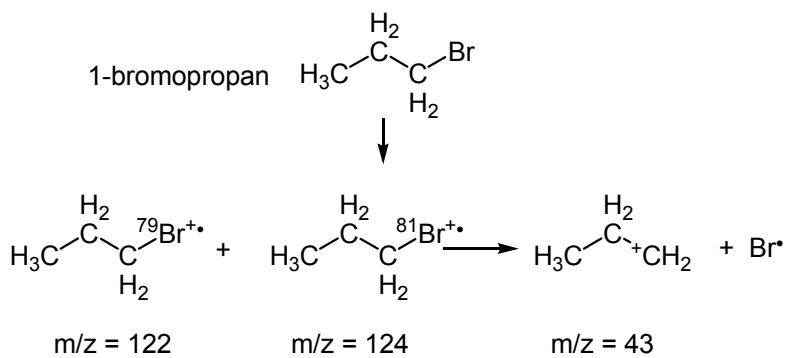


| | | | | | |
|------|------|------|-------|-------|------|
| 27.0 | 14.4 | 42.0 | 3.4 | 57.0 | 10.7 |
| 28.0 | 3.4 | 43.0 | 100.0 | 85.0 | 49.9 |
| 29.0 | 15.2 | 44.0 | 3.2 | 86.0 | 3.4 |
| 39.0 | 6.6 | 53.0 | 1.0 | 155.0 | 1.8 |
| 40.0 | 1.1 | 55.0 | 6.3 | 212.0 | 4.5 |
| 41.0 | 25.1 | 56.0 | 2.1 | | |

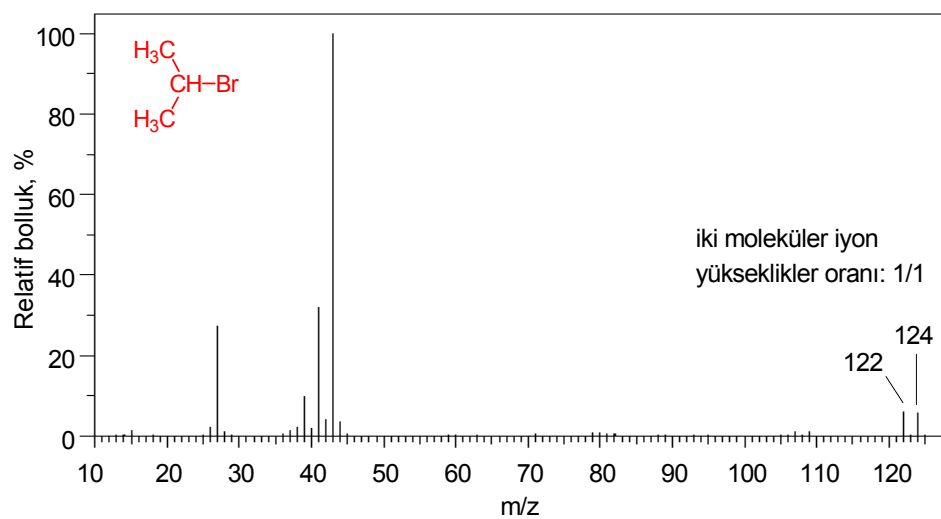
1-Bromopropan, C₃H₇Br (122.99)



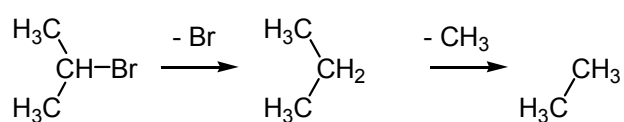
| | | | | | |
|------|------|------|-------|-------|-----|
| 15.0 | 1.6 | 39.0 | 9.0 | 95.0 | 1.0 |
| 26.0 | 2.4 | 40.0 | 2.1 | 107.0 | 1.5 |
| 27.0 | 25.6 | 41.0 | 31.0 | 109.0 | 1.2 |
| 28.0 | 1.6 | 42.0 | 7.7 | 122.0 | 8.6 |
| 29.0 | 4.0 | 43.0 | 100.0 | 124.0 | 8.3 |
| 37.0 | 1.2 | 44.0 | 3.5 | | |
| 38.0 | 2.2 | 93.0 | 1.1 | | |



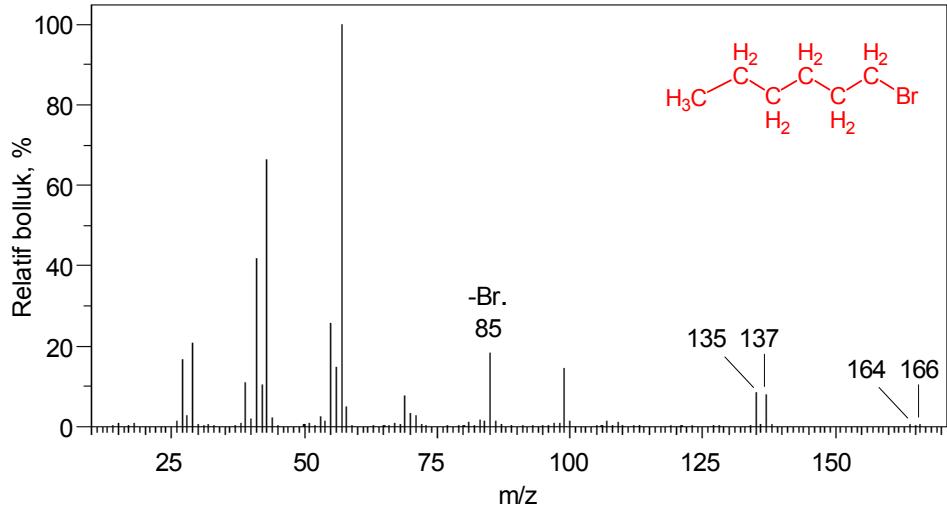
2-Bromopropan, C₃H₇Br (122.99)



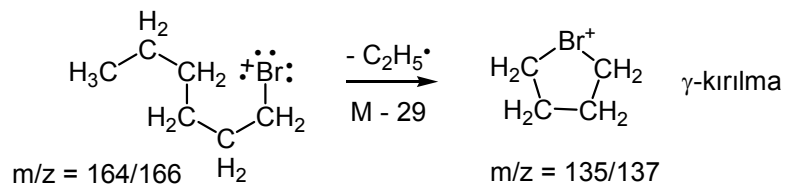
| | | | | | |
|------|------|------|-------|-------|-----|
| 15.0 | 1.4 | 39.0 | 9.9 | 44.0 | 3.6 |
| 26.0 | 2.2 | 40.0 | 1.9 | 107.0 | 1.1 |
| 27.0 | 27.4 | 41.0 | 31.9 | 109.0 | 1.0 |
| 28.0 | 1.1 | 42.0 | 4.0 | 122.0 | 5.9 |
| 37.0 | 1.2 | 43.0 | 100.0 | 124.0 | 5.7 |
| 38.0 | 2.1 | 44.0 | 3.6 | | |

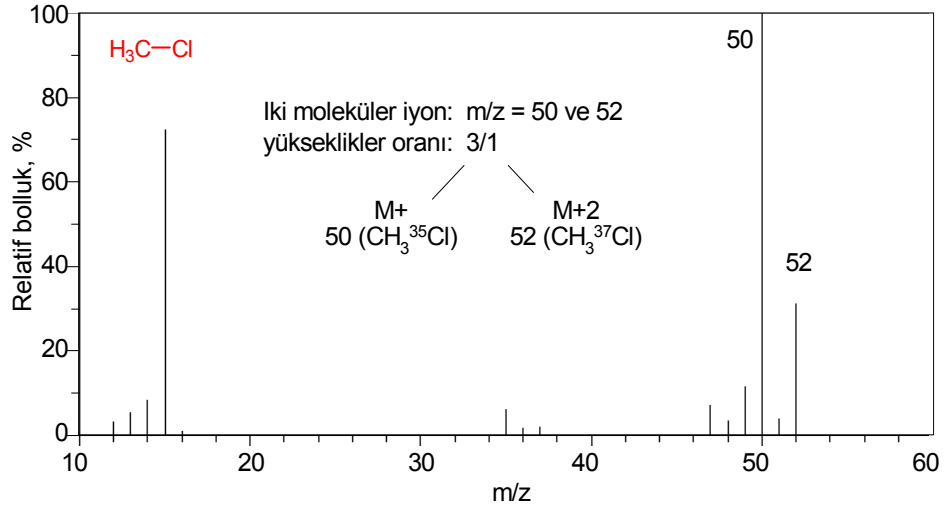


1-Bromoheksan, C₆H₁₃Br (165.07)



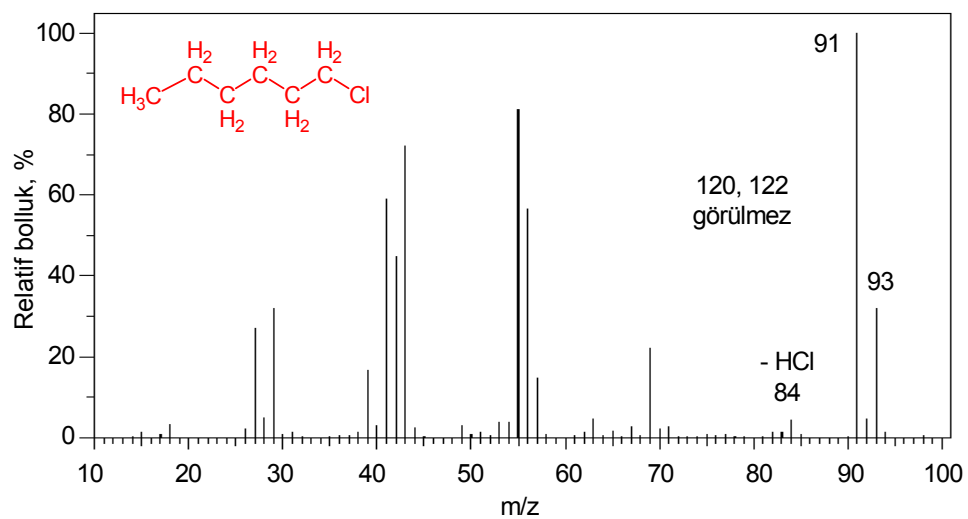
| | | | | | |
|------|------|------|-------|-------|------|
| 26.0 | 1.2 | 53.0 | 2.4 | 83.0 | 1.5 |
| 27.0 | 16.5 | 54.0 | 1.3 | 84.0 | 1.2 |
| 28.0 | 2.7 | 55.0 | 25.7 | 85.0 | 18.2 |
| 29.0 | 20.7 | 56.0 | 14.6 | 86.0 | 1.3 |
| 39.0 | 10.8 | 57.0 | 100.0 | 99.0 | 14.5 |
| 40.0 | 1.9 | 58.0 | 4.9 | 100.0 | 1.2 |
| 41.0 | 41.8 | 69.0 | 7.5 | 107.0 | 1.2 |
| 42.0 | 10.3 | 70.0 | 3.2 | 109.0 | 1.0 |
| 43.0 | 66.4 | 71.0 | 2.8 | 135.0 | 8.3 |
| 44.0 | 2.2 | 81.0 | 1.0 | 137.0 | 8.0 |



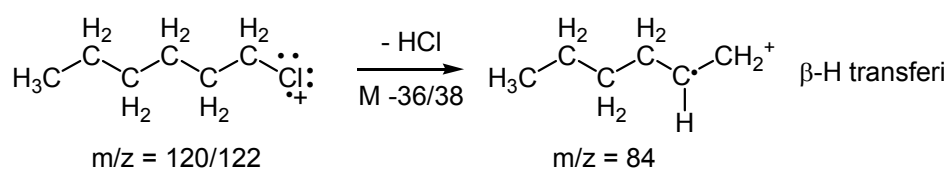
Klorometan, CH₃Cl ()

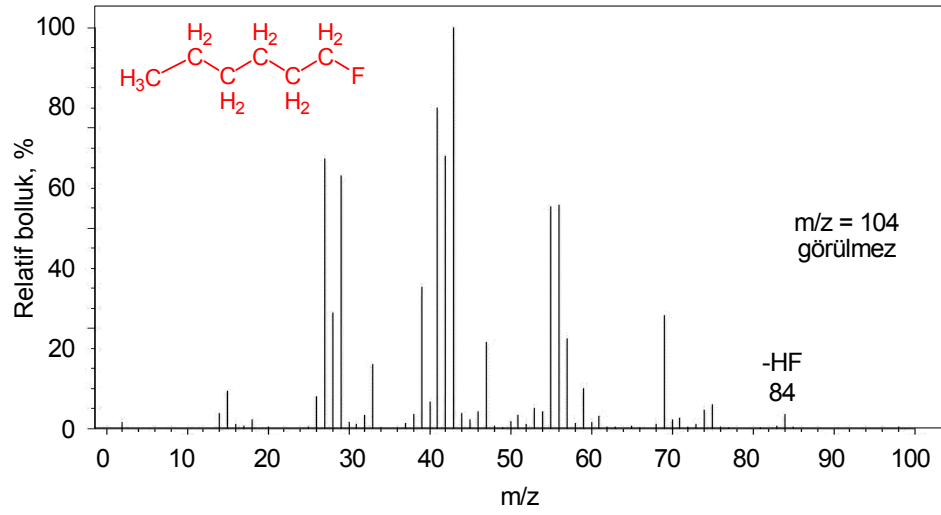
(³⁵Cl ve ³⁷Cl doğal olarak %67 ve%33 (veya 3/1) oranında bulunurlar.)

1-Kloroheksan, C₆H₁₃Cl (120.62)



| | | | | | |
|------|------|------|------|------|-------|
| 15.0 | 1.3 | 43.0 | 72.0 | 67.0 | 2.7 |
| 18.0 | 3.2 | 44.0 | 2.5 | 69.0 | 22.1 |
| 26.0 | 2.2 | 49.0 | 3.0 | 70.0 | 2.1 |
| 27.0 | 27.0 | 51.0 | 1.4 | 71.0 | 2.8 |
| 28.0 | 5.0 | 53.0 | 3.7 | 82.0 | 1.2 |
| 29.0 | 32.0 | 54.0 | 3.9 | 83.0 | 1.3 |
| 31.0 | 1.4 | 55.0 | 81.1 | 84.0 | 4.2 |
| 38.0 | 1.2 | 56.0 | 56.5 | 91.0 | 100.0 |
| 39.0 | 16.7 | 57.0 | 14.7 | 92.0 | 4.5 |
| 40.0 | 2.9 | 62.0 | 1.2 | 93.0 | 32.0 |
| 41.0 | 59.0 | 63.0 | 4.7 | 94.0 | 1.4 |
| 42.0 | 44.7 | 65.0 | 1.5 | | |



1-Fluoroheksan, C₆H₁₃F (104.17)

Bazı Fragmantasyon Paternleri

| | | |
|---------------|------------------------------|--|
| Alkanlar | iyi M+ | |
| | 14-amu fragmanlar | |
| Alkenler | bölgesel M+ | |
| | m/e = 27 | CH ₂ =CH+ |
| | m/e = 41 | CH ₂ =CHCH ₂ + |
| | M-15, M-29, M-43, v.s.. | alkil kaybı |
| Sikloalkanlar | kuvvetli M+ | |
| | M-28 | CH ₂ =CH ₂ kaybı |
| | M-15, M-29, M-43, v.s... | alkil kaybı |
| | | |
| Aromatikler | kuvvetli M+ | |
| | m/e = 105 | C ₈ H ₉ + |
| | m/e = 91 | C ₇ H ₇ + |
| | m/e = 77 | C ₆ H ₅ + |
| | m/e = 65 (zayıf) | C ₅ H ₅ + |
| Halojenürler | M+ ve M+2 | Cl ve Br |
| | m/e = 49 veya 51 | CH ₂ =Cl+ |
| | m/e = 93 veya 95 | CH ₂ =Br+ |
| | M-36, M-38 | HCl kaybı |
| | M-79, M-81 | Br-kayı |
| | M-127 | I-kayı |
| Alkoller | M+ zayıf veya yok | |
| | M-15, M-29, M-43, v.s.. | alkil kaybı |
| | m/e = 31 | CH ₂ =OH+ |
| | m/e = 45, 59, 73, ... | RCH=OH+ |
| | m/e = 59, 73, 87, ... | R ₂ C=OH+ |
| | M-18 | H ₂ O kaybı |
| | M-46 | H ₂ O ve CH ₂ =CH ₂ kaybı |
| Fenoller | kuvvetli M+ | |
| | kuvvetli M-1 | H-kayı |
| | M-28 | CO kaybı |
| Eterler | M+ alkollerden daha kuvvetli | |
| | M-15, M-29, M-43, v.s.. | alkil kaybı |
| | M-31, M-45, M-59, v.s.. | OR kaybı |
| | m/e = 45, 59, 73, ... | CH ₂ =OR+ |
| Aminler | M+ zayıf veya yok | Nitrojen kuralı |
| | m/e = 30 | temel pik |
| | M-15, M-29, M-43, v.s.. | alkil kaybı |
| Aldehitler | zayıf M+ | |

| | | |
|---------------------|---------------------------|---|
| | m/e = 29 | HCO+ |
| | M-29 | HCO kaybı |
| | M-43 | I CH ₂ =CHO kaybı |
| | m/e = 44, 58, 72, 86, ... | McLafferty düzenlenmesi |
| | kuvvetli M+ | aromatik aldehit |
| | M-1 | aromatik aldehit H· kaybı |
| Ketonlar | M+ kuvvetli | |
| | M-15, M-29, M-43, v.s.. | alkil kaybı |
| | m/e = 43 | CH ₃ CO+ |
| | m/e = 55 | +CH ₂ CH=C=O |
| | m/e = 42, 83 | siklohexanonunda |
| | m/e = 105, 120 | aril ketonlarda |
| Karboksilik asitler | M+ zayıf, gözlenebilir | |
| | M-17 | OH kaybı |
| | M-45 | CO ₂ H kaybı |
| | m/e = 45 | CO ₂ H+ |
| | m/e = 60 | ·CH ₂ C(OH) ₂ + |
| | M+ büyük | aromatik asitler |
| | M-18 | orto-etkisi |
| Esterler | M+ zayıf, gözlenebilir | metil esterler |
| | M-31 | metil esterler OCH ₃ kaybı |
| | m/e = 59 | metil esterler CO ₂ CH ₃ + |
| | m/e = 74 | metil esterler CH ₂ C(OH)OCH ₃ + |
| | M+ zayıf | yüksek esterler |
| | M-45, M-59, M-73, v.s.. | OR kaybı |
| | m/e = 73, 87, 101 | CO ₂ R+ |
| | m/e = 88, 102, 116 | ·CH ₂ C(OH)OR+ |
| | m/e = 61, 75, 89 | RC(OH) ₂ + (uzun alkil ester) |
| | m/e = 108 | CH ₂ =C=O kaybı (benzil, asetat) |
| | m/e = 105 | C ₆ H ₅ CO+ (benzoat) |
| | M-32, M-46, M-60 | ROH kaybı (orto-etkisi) |

Yararlanılan Kaynaklar

[http://www.chemistry.ccsu.edu/glagovich/teaching/316/ms%20\(old\)/ms.html](http://www.chemistry.ccsu.edu/glagovich/teaching/316/ms%20(old)/ms.html)

http://www.chemicalbook.com/ProductIndex_EN.aspx