IR SPEKTRUMLAR, ORGANİK FONKSİYONEL GRUPLARIN TANIMLANMASI

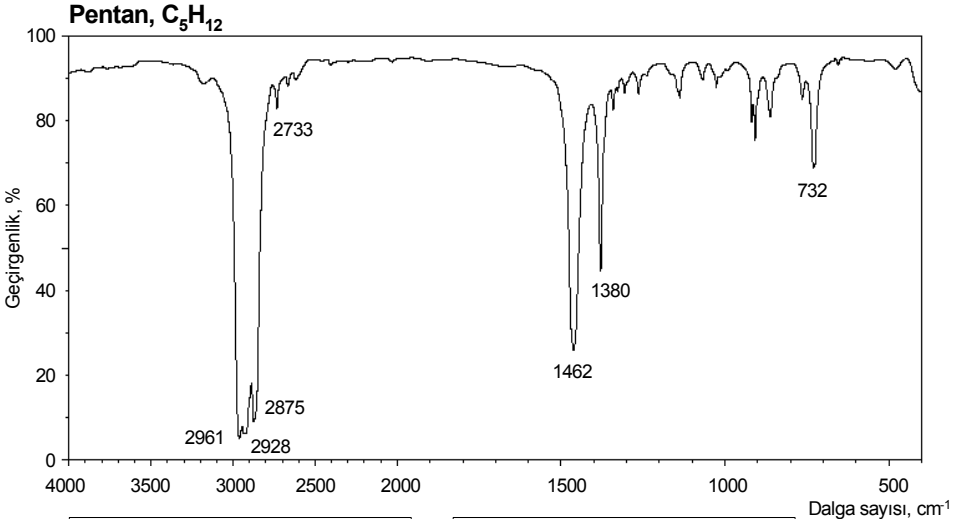
Ref. Enstrümantal Analiz

A. ALKANLAR

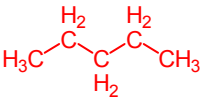
Metil grup (– CH_3)	
C – H gerilme, asimetrik	2970-2950 cm^{-1}
C – H gerilme, simetrik	2880-2860 cm^{-1}
C – H eğilme, asimetrik	1470-1430 cm^{-1}
C – H eğilme, simetrik	1380-1370 cm^{-1}
Gem-dimetil veya izo (dublet)	1385-1380, 1370-1365 cm^{-1}
Trimetil veya ters-bütil (multiplet)	1395-1385, 1365 cm^{-1}
Metilen grup (> CH_2)	
C – H gerilme, asimetrik	2935-2915 cm^{-1}
C – H gerilme, simetrik	2865-2845 cm^{-1}
C – H eğilme	1484-1445 cm^{-1}
C – H eğilme, $(– CH_2)_n–$, n > 3	750-720 cm^{-1}
Sikloheksan halka	1055-1000, 1005-925 cm^{-1}
Metin grup (> CH –)	
C – H gerilme	2900-2880 cm^{-1}
C – H eğilme	1350-1330 cm^{-1}
C – C vibrasyonlar	1300-1700 cm^{-1}
http://infrared.als.lbl.gov/BLManual/IR_Interpretation.pdf	

2

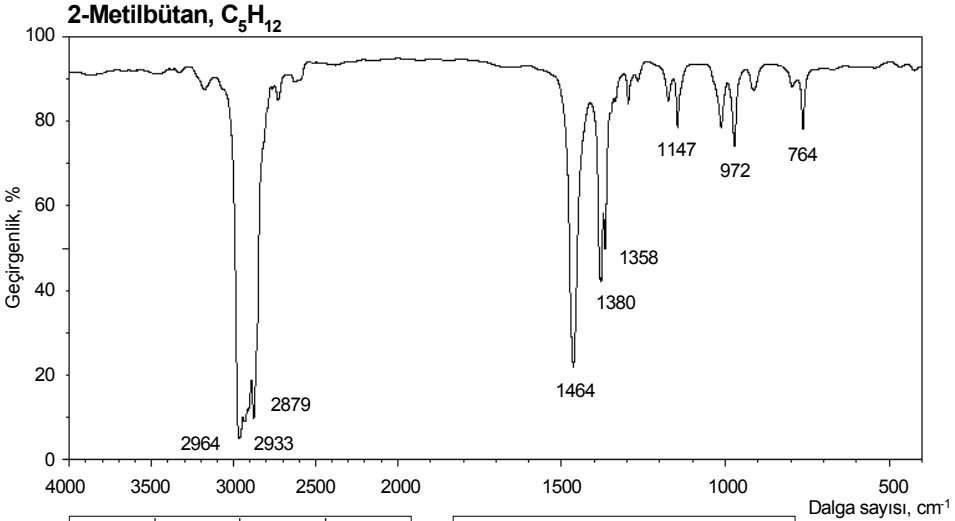
Pentan, C_5H_{12}



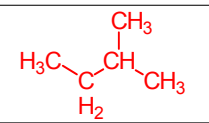
3182	86	2619	88	1138	81	732	65
3172	86	1462	24	1068	86		
2961	4	1380	45	1027	84		
2928	6	1342	79	919	77		
2875	8	1307	84	908	72		
2733	79	1264	84	862	79		
2666	84	1144	84	765	81		



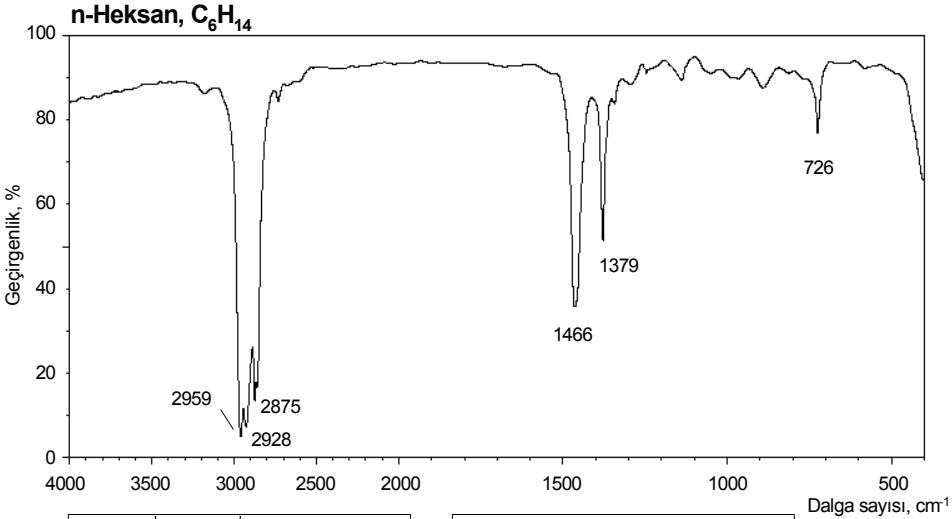
2-Metilbütan, C_5H_{12}



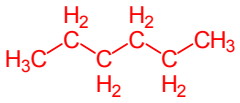
3176	84	1464	21	1013	77		
2964	4	1380	41	972	70		
2933	8	1368	47	915	84		
2878	9	1297	81	797	84		
2733	81	1268	86	764	74		
2627	86	1175	81				
2604	86	1147	77				



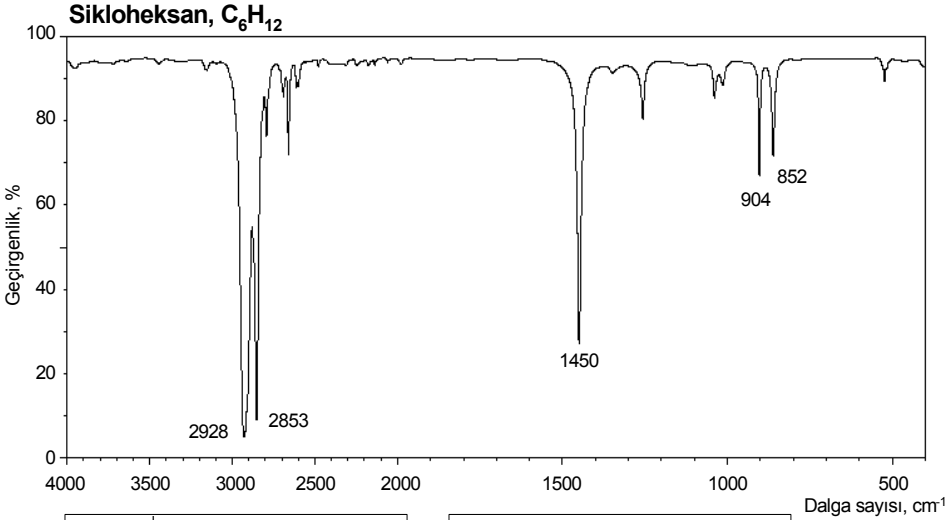
n-Heksan, C_6H_{14}



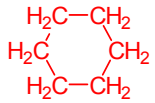
3187	84	1466	34	726	74
3176	84	1379	49		
2959	4	1300	84		
2928	7	1294	84		
2875	13	1138	86		
2862	15	891	84		
2734	81	884	84		



Sikloheksan, C_6H_{12}

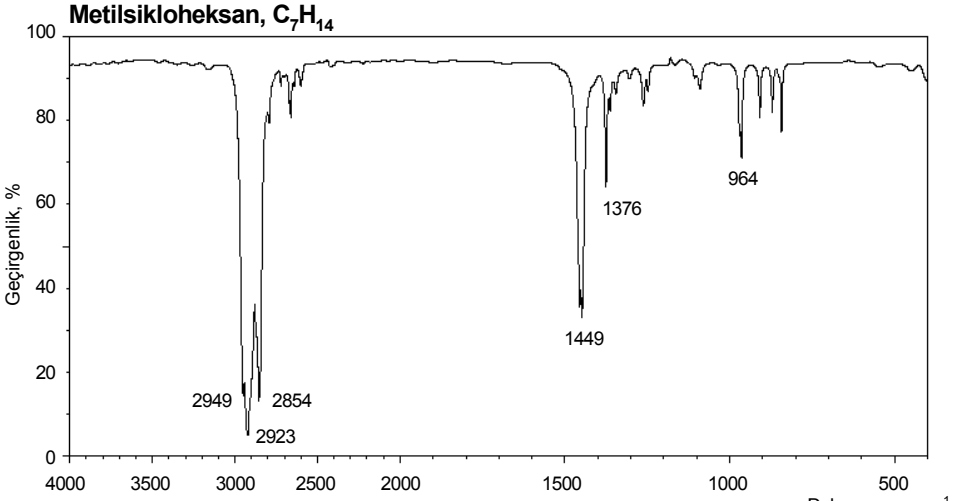


2928	4	1450	26
2853	8	1257	77
2794	72	1039	81
2690	81	1016	84
2661	70	904	64
2613	84	852	68
2599	84	524	86

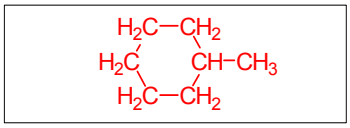


4

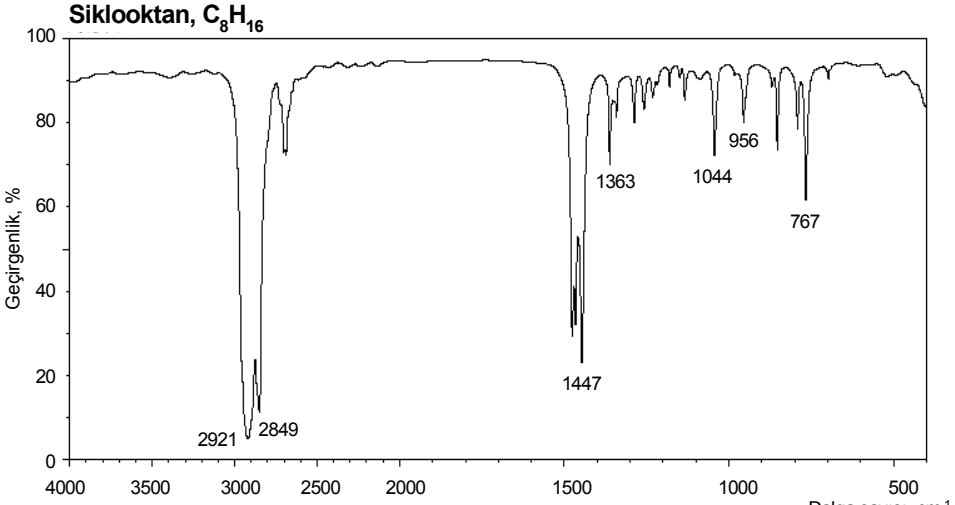
Metilsikloheksan, C_7H_{14}



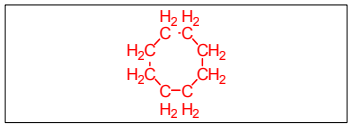
2949	13	2600	84	1263	79	843	74
2923	4	1456	34	1249	84		
2854	12	1449	32	1091	84		
2792	77	1376	62	970	72		
2720	84	1363	79	964	68		
2662	77	1348	84	909	77		
2641	84	1306	88	872	79		



Siklooktan, C_8H_{16}



2921	4	1447	21	1218	86	792	74
2849	10	1363	68	1181	84	767	58
2702	70	1349	81	1135	81		
2688	70	1342	79	1044	70		
2672	79	1288	77	956	77		
1477	26	1259	79	871	84		
1467	31	1232	84	853	70		

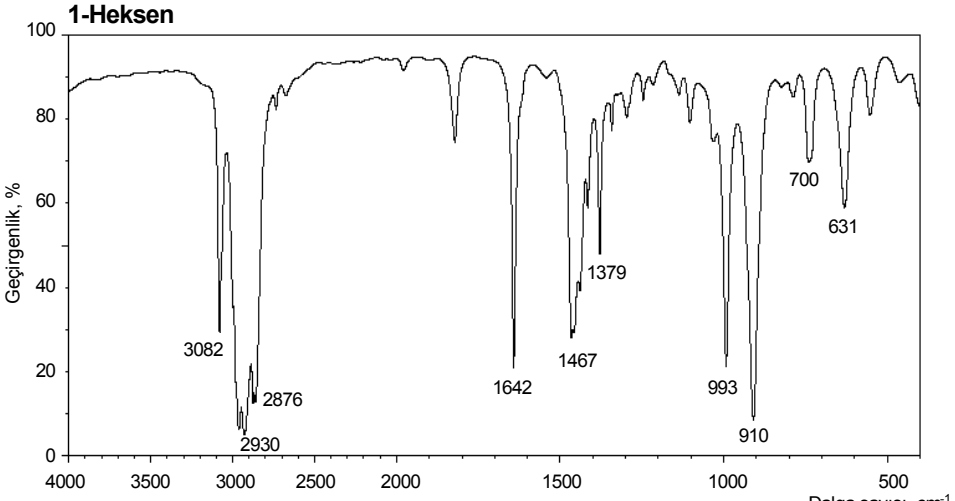


B. DOYMAMIŞ HİDROKARBONLAR

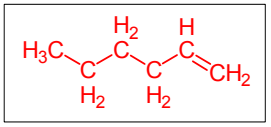
ALKENLER (OLEFİNİK)

C – H gerilme, terminal vinil	3095-3075, 3040-3010 cm^{-1}
C – H gerilme, viniliden	3095-3075 cm^{-1}
C – H gerilme, cis-, veya trans-	3040-3010 cm^{-1}
C = C gerilme, alkenil	1680-1620 cm^{-1}
C = C gerilme, aril sbübstitüe	1625 cm^{-1}
C = C gerilme, konjuge	1600 cm^{-1}
C – H düzlem içi eğilme, vinil	1420-1410 cm^{-1}
C – H düzlem içi eğilme, viniliden	1310-1290 cm^{-1}
C – H düzlem dışı eğilme, vinil	995-985, 915-890 cm^{-1}
C – H düzlem dışı eğilme, viniliden	895-885 cm^{-1}
C – H düzlem dışı eğilme, trans-	970-960 cm^{-1}
C – H düzlem dışı eğilme, cis- (geniş)	700 cm^{-1}
http://infrared.als.lbl.gov/BLManual/IR_Interpretation.pdf	

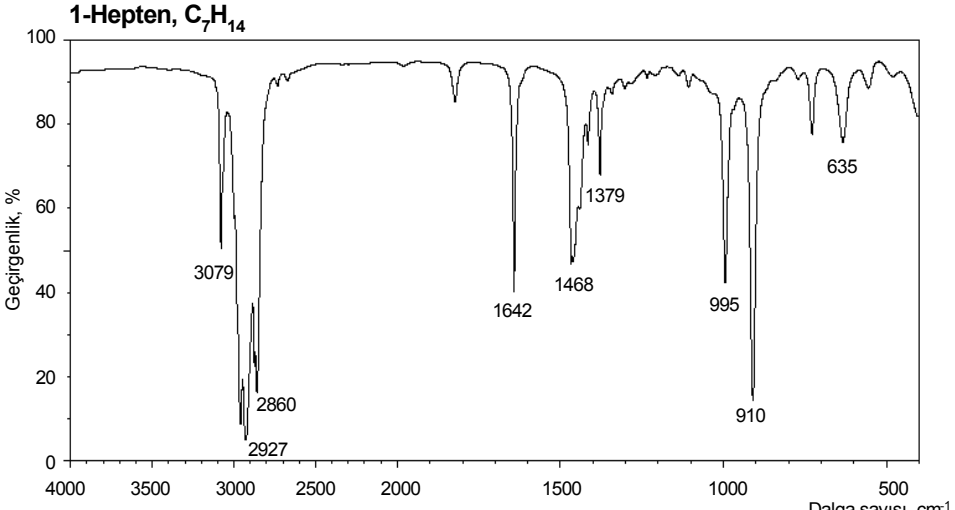
1-Heksen



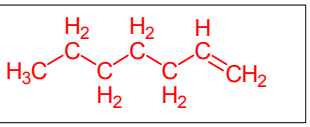
3080	27	2663	84	1416	67	1103	77	631	67
2962	5	1821	72	1379	46	1031	72	554	77
2929	4	1642	20	1343	74	993	20	462	66
2876	12	1642	66	1297	77	910	7		
2861	12	1467	26	1247	81	824	84		
2735	79	1459	28	1216	84	787	81		
2676	81	1439	37	1137	81	741	66		



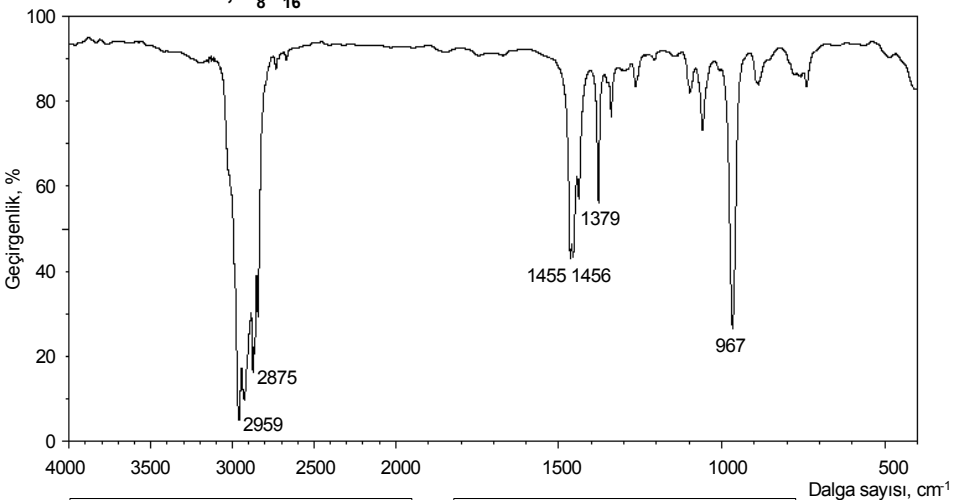
1-Hepten, C_7H_{14}



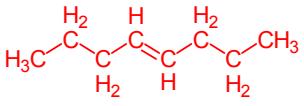
3079	49	1642	38	1108	86
2959	8	1468	44	995	41
2927	4	1460	46	910	15
2874	21	1416	72	729	74
2860	15	1379	66	635	72
2733	86	1342	84	556	84
1823	81	1303	84		



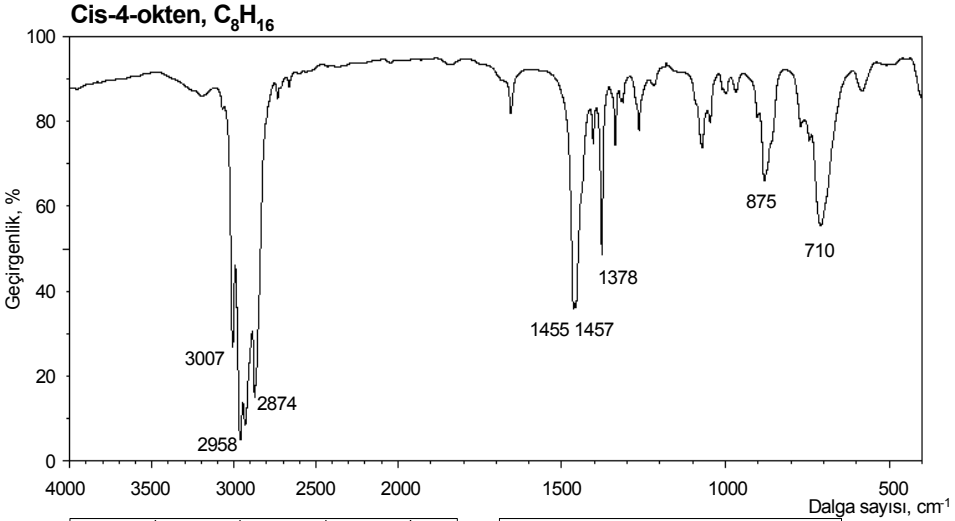
Trans-4-okten, C_8H_{16}



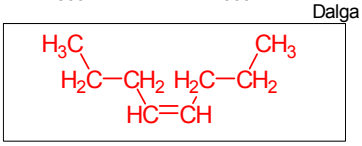
3193	86	2733	84	1266	81	768	81
2959	4	2670	86	1207	86	740	81
2941	14	1465	42	1098	79		
2926	9	1456	42	1060	70		
2875	15	1439	55	967	25		
2864	20	1379	59	892	81		
2844	28	1340	74	886	81		



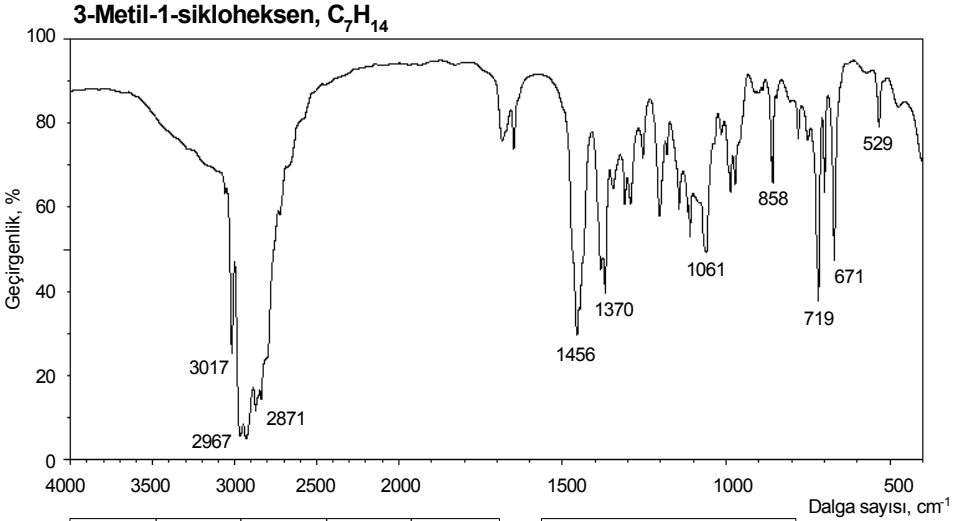
Cis-4-okten, C_8H_{16}



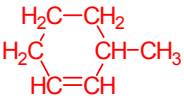
3190	84	2663	84	1320	81	1010	84	74
3007	26	1655	79	1313	81	1002	84	71
2959	4	1465	34	1264	74	997	84	56
2931	7	1457	36	1218	84	968	84	
2874	14	1404	72	1072	70	883	64	
2735	81	1378	46	1061	79	875	66	
2714	84	1337	72	1047	77	772	77	



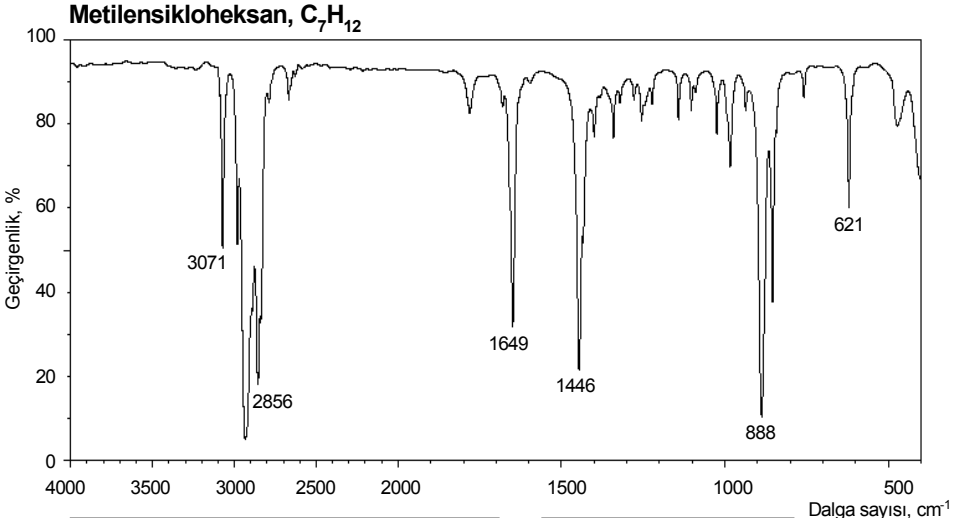
3-Metil-1-sikloheksen, C_7H_{14}



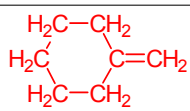
3069	60	1648	70	1292	68	1078	68	781	72
3017	24	1458	28	1254	68	1061	47	752	72
2967	5	1447	34	1203	55	1016	74	719	36
2930	4	1383	43	1181	70	987	60	700	60
2871	10	1370	37	1145	57	973	62	671	46
2836	13	1346	62	1117	57	858	64	534	77
1684	72	1310	68	1111	60	846	81	529	81



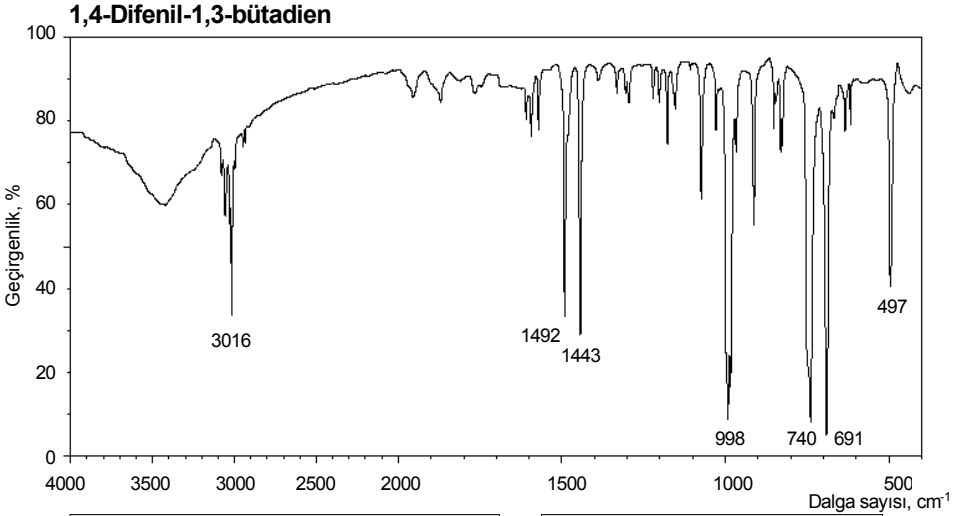
Metilensikloheksan, C_7H_{12}



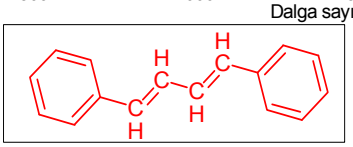
3089	84	2788	81	1434	60	1223	81	888	9
3071	49	2669	81	1400	74	1143	79	854	36
3052	84	1781	79	1341	74	1103	79	759	64
2981	49	1680	81	1322	81	1090	84	621	68
2933	4	1649	30	1279	81	1025	74	472	77
2856	17	1598	86	1256	77	984	68		
2839	31	1446	20	1247	81	937	79		



1,4-Difenil-1,3-bütadien

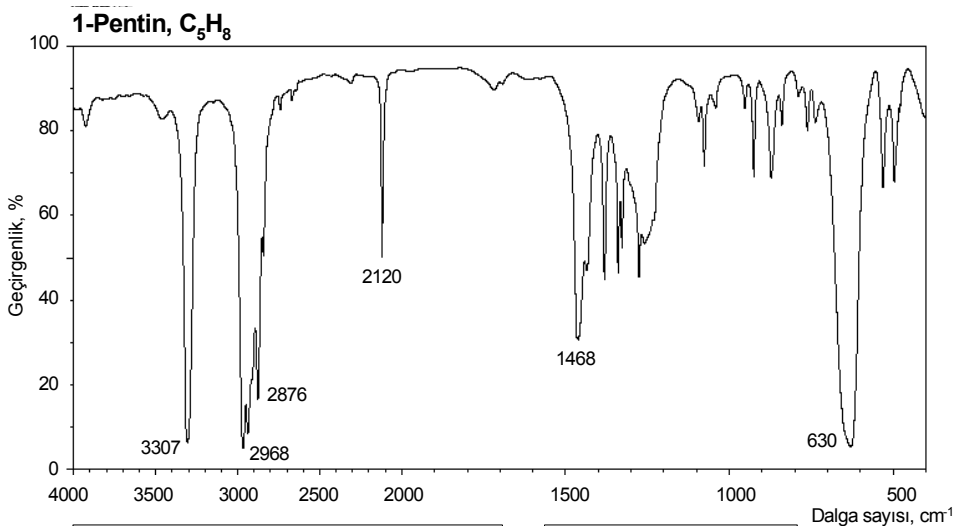


3437	58	2998	66	1482	74	993	8	747	18
3424	57	2947	70	1443	27	985	15	740	7
3076	84	2935	72	1178	72	967	70	691	4
3057	65	1609	77	1154	79	913	69	669	77
3041	66	1594	72	1074	58	852	74	635	74
3030	53	1571	74	1029	74	832	70	616	77
3016	32	1492	32	998	22	826	72	497	38

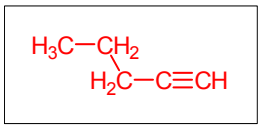


ALKİNLER (ASETİLENİK)

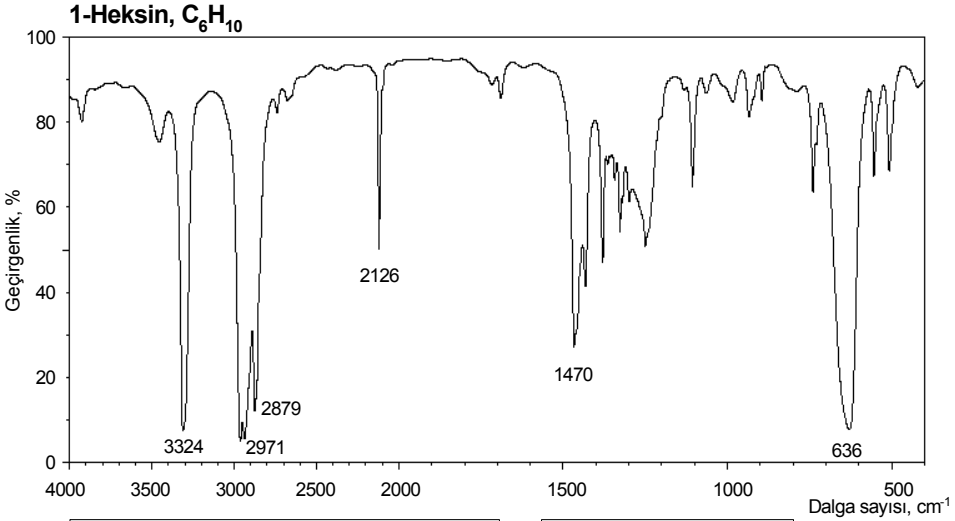
C – H gerilme	3320-3310 cm^{-1}
C ≡ C gerilme, disübstitüe alkin	2260-2190 cm^{-1}
C ≡ C gerilme, monosübstitüe alkin	2140-2100 cm^{-1}
C – C gerilme	1350-1000 cm^{-1}
C – H eğilme	680-610 cm^{-1}
C – H eğilme, tipik	630



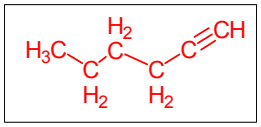
3928	79	2741	81	1381	43	1041	81	739	79
3457	79	2670	84	1340	44	954	81	630	5
3307	6	2120	47	1328	50	926	65	532	64
2968	4	1718	88	1276	43	872	66	497	66
2938	7	1466	29	1259	52	840	79	481	81
2876	16	1460	29	1095	79	791	84		
2843	49	1435	44	1077	68	762	77		



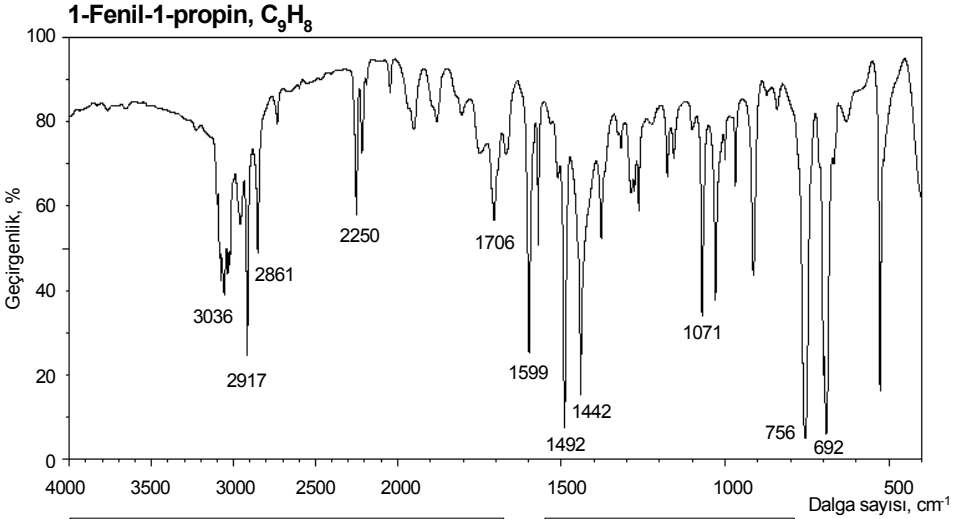
1-Heksin, C_6H_{10}



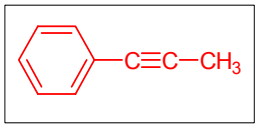
3926	77	2679	81	1432	39	1260	49	740	60
3455	72	2120	49	1380	46	1107	62	730	72
3311	7	2097	84	1366	88	1063	84	630	7
2962	4	1717	86	1344	84	983	81	665	64
2937	5	1690	81	1328	52	934	79	509	86
2876	11	1467	26	1320	58	895	81		
2738	79	1461	29	1300	58	793	84		



1-Fenil-1-propin, C_9H_8

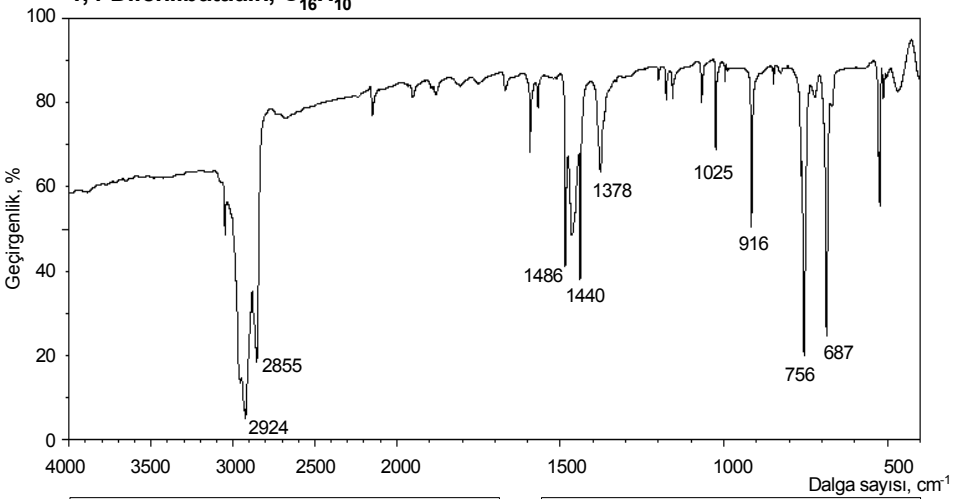


3100	68	2861	47	1611	64	1264	57	914	42
3076	41	2250	55	1492	7	1177	64	756	4
3056	37	2217	70	1464	41	1157	68	701	19
3036	42	1706	56	1442	14	1071	32	692	5
3022	44	1670	70	1379	50	1030	36	668	68
2956	53	1599	24	1287	80	1001	68	526	15
2917	23	1571	49	1278	80	969	62	517	68

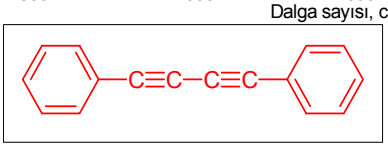


12

1,4-Difenilbütadin, $C_{16}H_{10}$



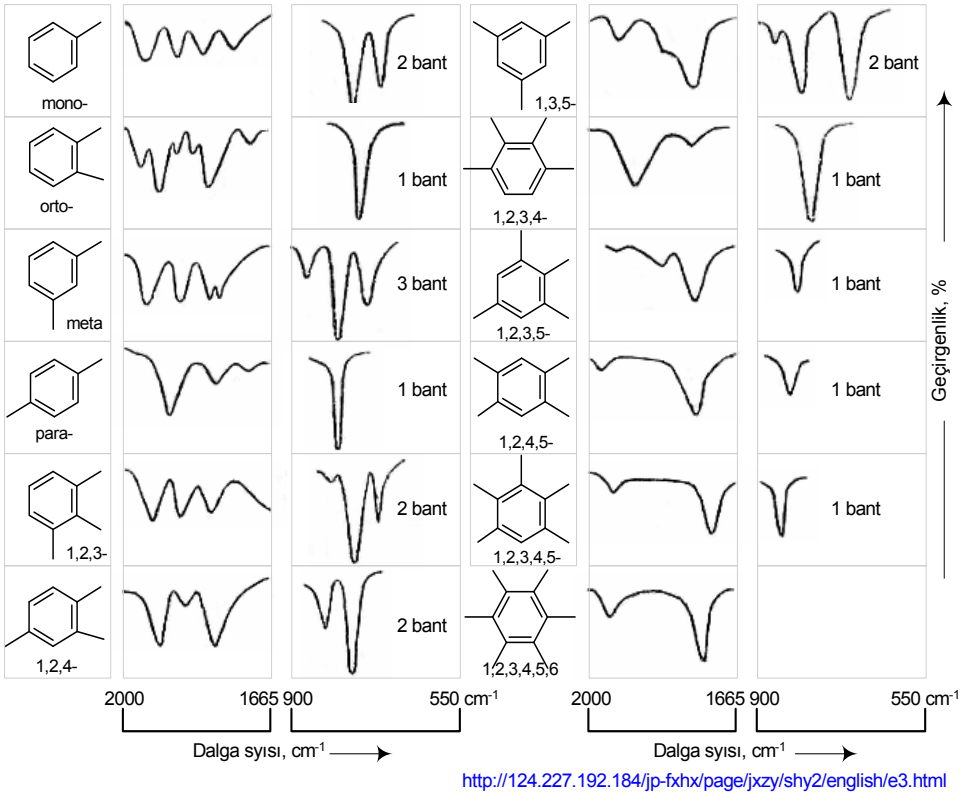
3049	46	1960	78	1664	81	1368	72	765	60
2956	13	1890	79	1593	66	1177	77	756	19
2924	4	1881	78	1569	77	1157	78	722	79
2870	26	1811	81	1485	39	1068	77	687	23
2855	17	1806	81	1465	46	1025	66	524	53
2148	74	1751	81	1440	36	998	81	514	77
2131	79	1669	78	1378	60	916	49	468	79



C. AROMATİK BİLEŞİKLER

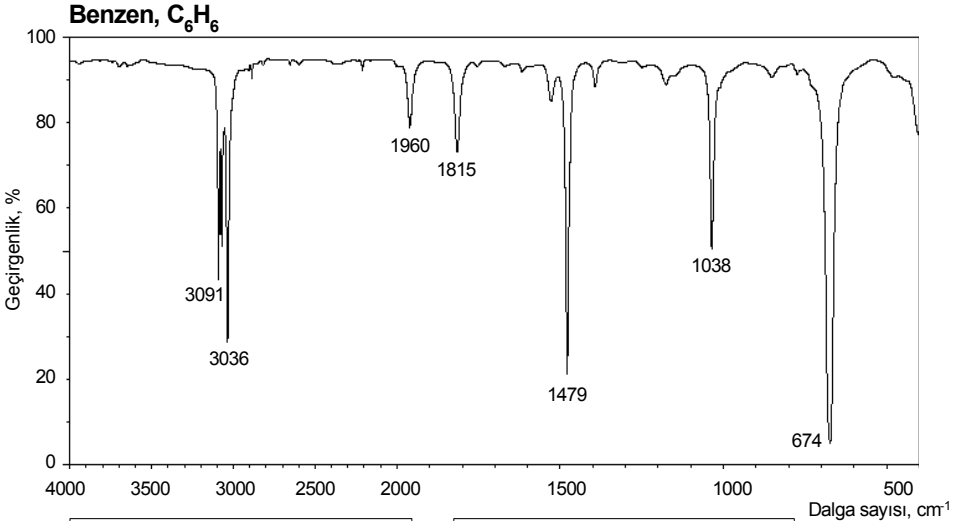
C – H gerilme	3100-3000 cm^{-1}
Kombinasyon bantlar	2000-1660 cm^{-1}
C = C – C gerilme (halkada)	1615-1580 cm^{-1}
C = C – C gerilme (halkada)	1510-1450 cm^{-1}
C – H aromatik düzlem dışı eğilmeler	900-670 cm^{-1}
mono-sübstitüsyon (fenil)	770-730 ve 710-690
1,2-di sübstitüsyon (ortho)	770-735
1,3--di sübstitüsyon (meta)	810-750 ve 730-680
1,4--di sübstitüsyon (para)	860-800

2000-1665 cm^{-1}, ve 900-670 cm^{-1} bölgeleri

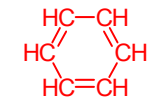


http://124.227.192.184/jp-fxhx/page/jxzy/shy2/english/e3.html

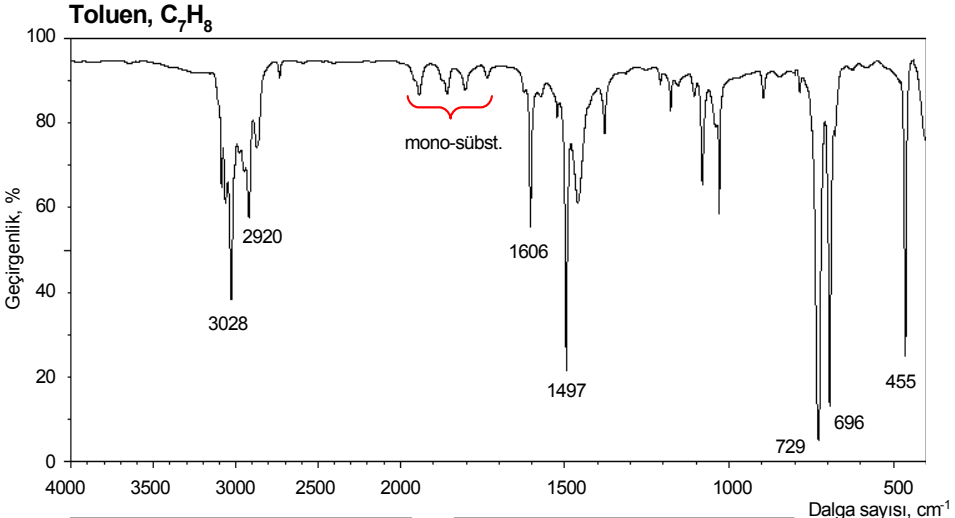
Benzen, C_6H_6



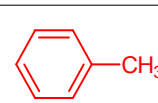
3091	42	1393	84		
3072	49	1176	86		
3036	27	1038	49		
1961	77	674	4		
1815	70				
1526	81				
1479	20				



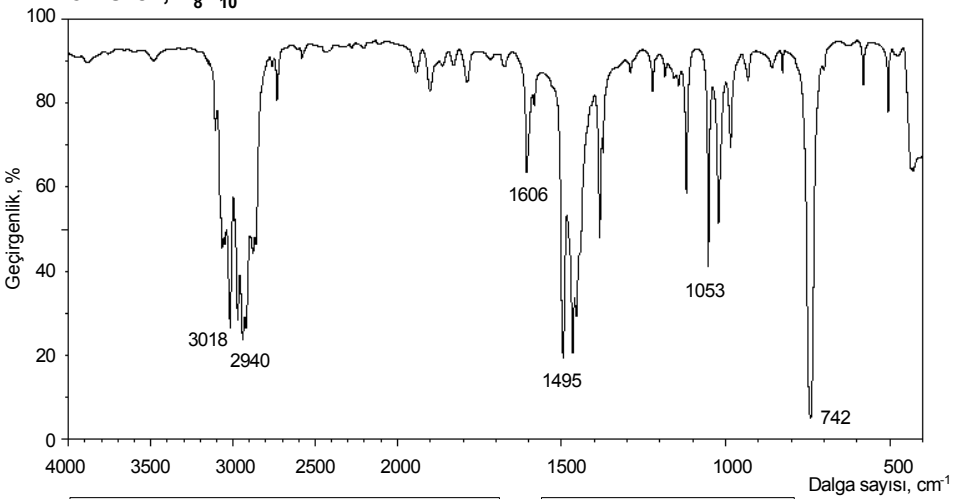
Toluen, C_7H_8



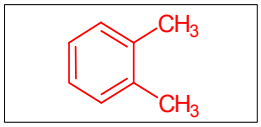
3087	62	1868	84	1210	86	895	81
3062	58	1803	84	1179	79	786	84
3028	37	1605	55	1156	86	729	4
2948	66	1524	79	1107	84	696	12
2920	55	1496	20	1082	82	678	74
2873	70	1461	58	1042	77	455	29
1942	84	1379	74	1030	67		



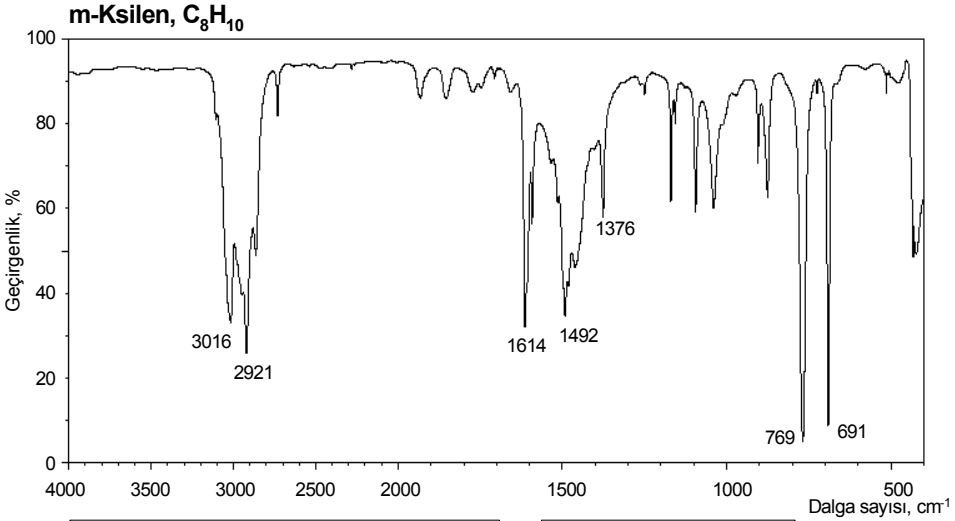
o-Ksilen, C_8H_{10}



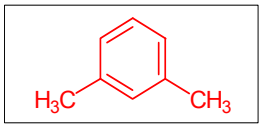
3108	70	2878	42	1683	77	1223	79	985	66
3066	43	2860	44	1495	18	1186	84	932	81
3050	44	2732	77	1467	20	1157	81	742	4
3018	25	1942	84	1456	27	1145	81	682	81
2971	26	1901	79	1384	46	1120	57	506	74
2940	22	1787	81	1374	66	1053	38	436	62
2921	25	1606	60	1291	84	1022	49	431	62



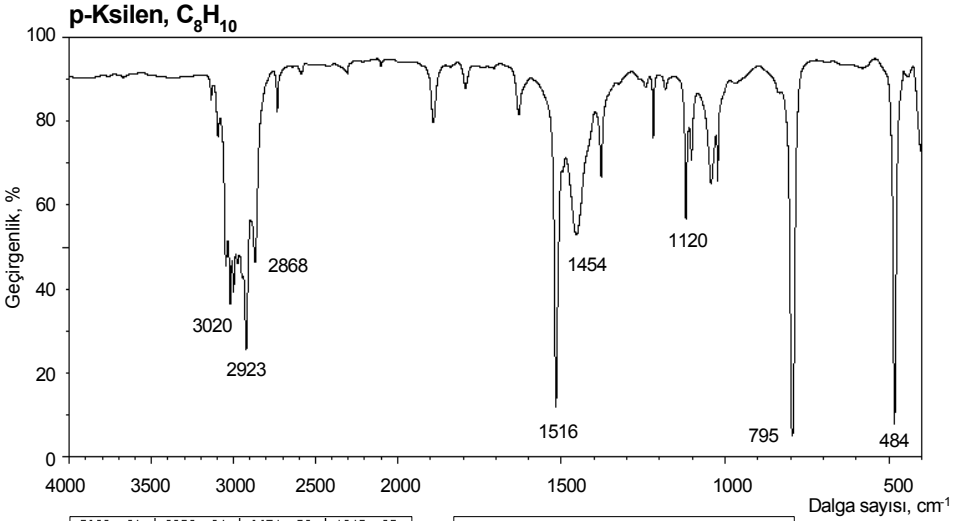
m-Ksilen, C_8H_{10}



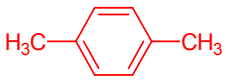
3106	79	1864	84	1492	33	1170	68	726	64
3016	32	1772	84	1482	39	1157	77	691	8
2948	37	1764	84	1462	44	1095	57	515	64
2921	24	1658	84	1376	55	1040	57	483	86
2864	47	1614	31	1263	86	905	68	478	86
2732	79	1592	59	1256	86	876	60	454	46
1932	84	1616	58	1260	84	769	4		



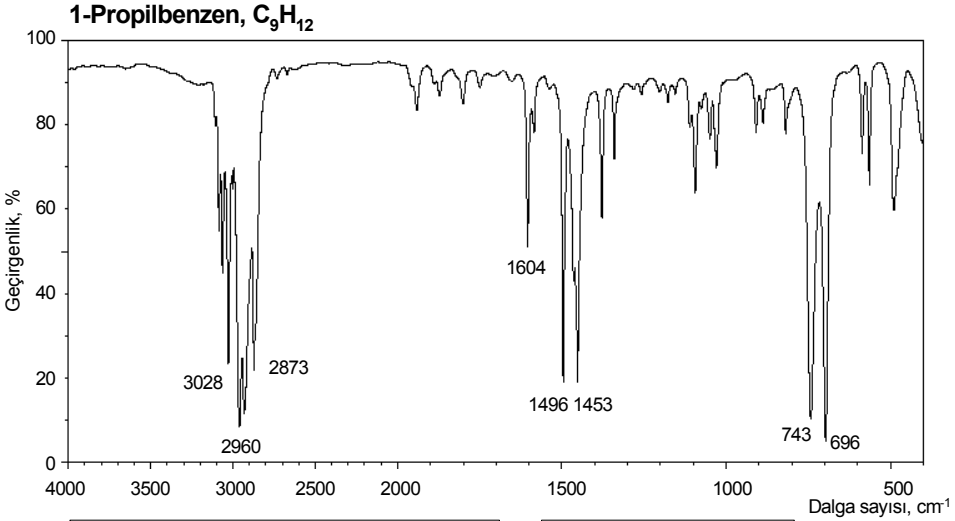
p-Ksilen, C_8H_{10}



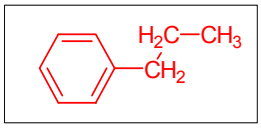
3136	81	2923	24	1464	50	1043	62
3095	74	2868	44	1378	64	1023	64
3047	43	2733	78	1243	84	795	4
3020	36	1890	77	1220	72	484	7
3000	37	1793	84	1183	84		
2976	44	1630	78	1120	55		
2946	41	1516	11	1103	68		



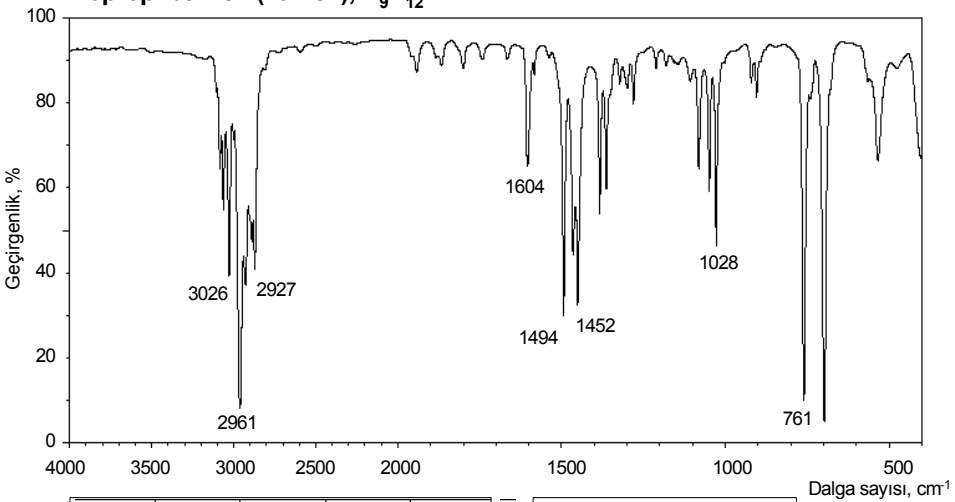
1-Propilbenzen, C_9H_{12}



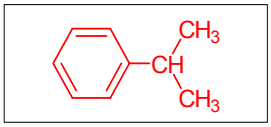
3108	77	2873	20	1465	41	1111	77	819	74
3085	52	1941	78	1453	18	1095	62	743	9
3064	43	1801	81	1379	55	1076	81	698	4
3028	22	1604	48	1341	70	1050	74	687	70
3002	62	1584	74	1258	84	1031	66	565	62
2960	6	1538	84	1205	84	909	74	490	57
2931	10	1496	18	1178	81	888	77	481	66



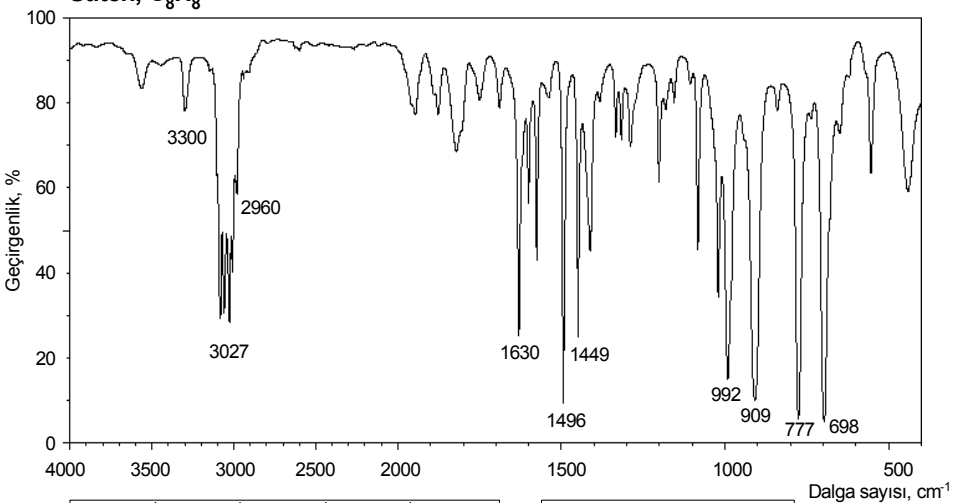
İzopropilbenzen (kümen), C_9H_{12}



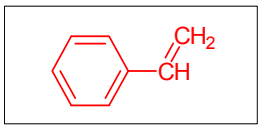
3084	62	2871	38	1466	42	1281	77	1028	44
3064	53	1942	84	1458	53	1213	84	922	81
3026	37	1868	86	1452	31	1150	86	905	79
3002	68	1800	84	1384	62	1144	86	761	9
2961	7	1604	62	1364	57	1108	81	699	4
2927	35	1583	84	1323	81	1082	62	535	54
2890	46	1494	28	1300	81	1050	57	478	84



Stiten, C_8H_8



3299	74	1946	74	1495	9	1202	58	841	74
3082	28	1876	74	1449	23	1182	74	777	5
3060	29	1821	66	1412	45	1156	77	736	72
3027	27	1688	77	1383	77	1083	49	698	4
3009	38	1630	24	1334	70	1021	33	650	70
2980	57	1601	55	1317	68	992	14	555	60
1956	77	1576	41	1290	66	909	9	442	57



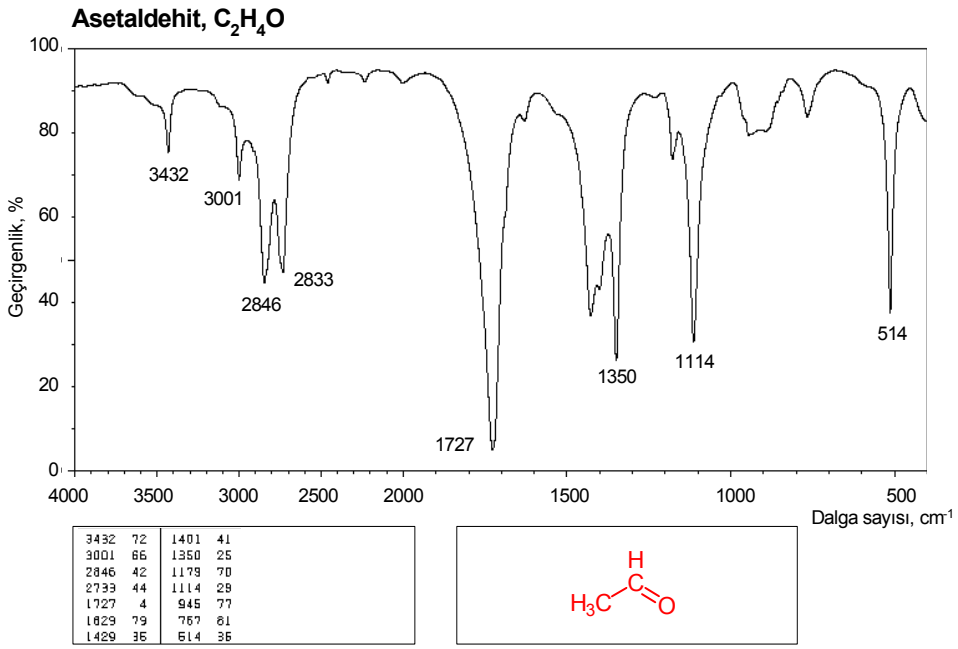
D. KARBONİL BİLEŞİKLERİ

C = O gerilme titreşimleri

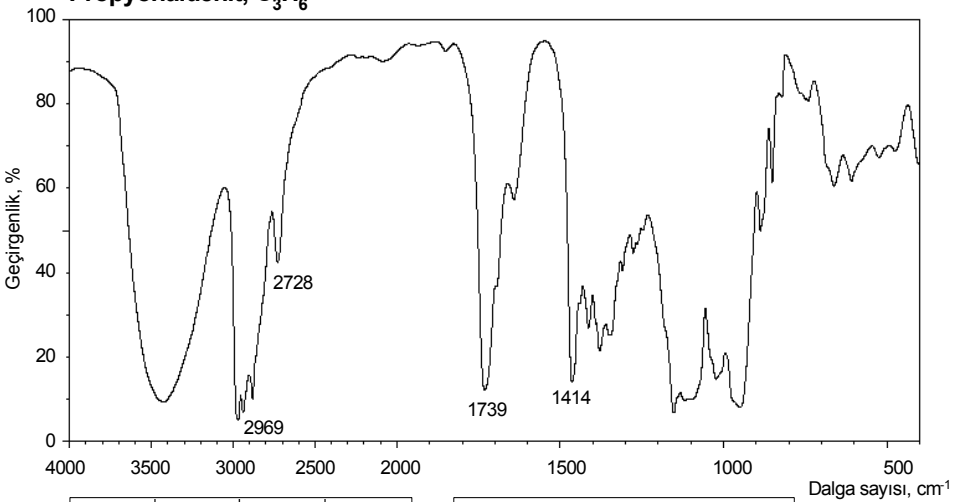
Aldehit (RCOH)	1740-1725 cm^{-1}
Keton (RCOR)	1725-1705 cm^{-1}
Ester (RCOOR')	1750-1725 cm^{-1}
Karboksilik asit (RCOOH)	1725-1700 cm^{-1}
Karboksilat (karboksilik asit tuzu)	1610-1550 cm^{-1}
Karboksilat, konjuge çift bağ	1420-1300 cm^{-1}
Amid ($RCONH_2$)	1680-1630 cm^{-1}
Anhidrit, açık zincirli	1850-1800 ve 1790-1740 cm^{-1}
Anhidrit, beşli halka	1870-1820 ve 1800-1775
Asit (acil) halojenür (RCOX)	1815-1770 cm^{-1}
Asit (acil) halojenür (RCOX), konjuge	1780-1760 cm^{-1}
Alkil karbonat	1760-1740 cm^{-1}
Aril karbonat	1820-1775

1. ALDEHİTLER

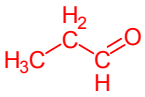
C = O gerilme	1740-1725 cm^{-1}
–CHO aldehit grubu C – H gerilme	2850 ve 2750 cm^{-1}



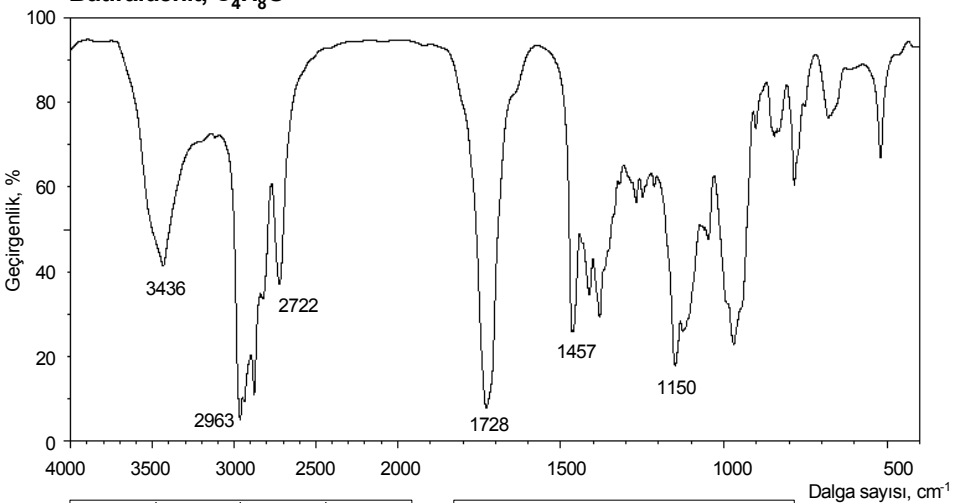
Propyonaldehit, C_3H_6



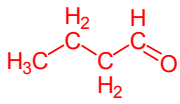
3436	9	1642	56	1277	43	862	68
3424	9	1465	13	1264	44	747	79
2969	4	1414	26	1153	6	742	77
2939	6	1380	21	1105	9	684	68
2881	9	1353	24	1024	14	609	60
2726	41	1348	24	949	7	525	66
1730	12	1310	39	888	49	475	66



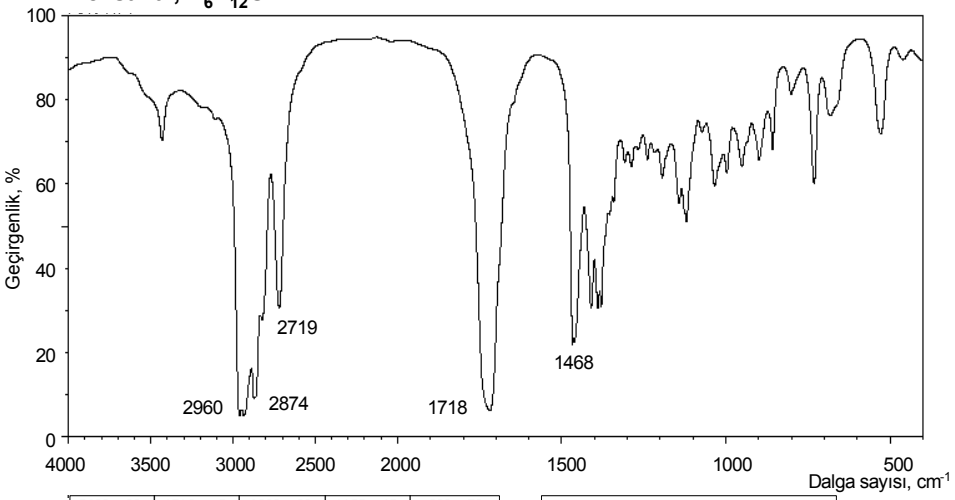
Bütiraldehit, C_4H_8O



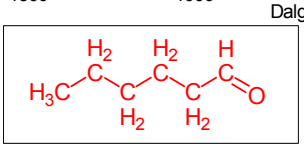
3436	39	1467	24	1160	17	839	70
2963	4	1462	25	1126	25	832	70
2936	8	1413	35	1060	47	785	58
2877	10	1381	27	1048	46	681	74
2824	32	1269	53	970	21	669	74
2722	35	1249	55	902	70	520	64
1728	7	1214	58	845	70		



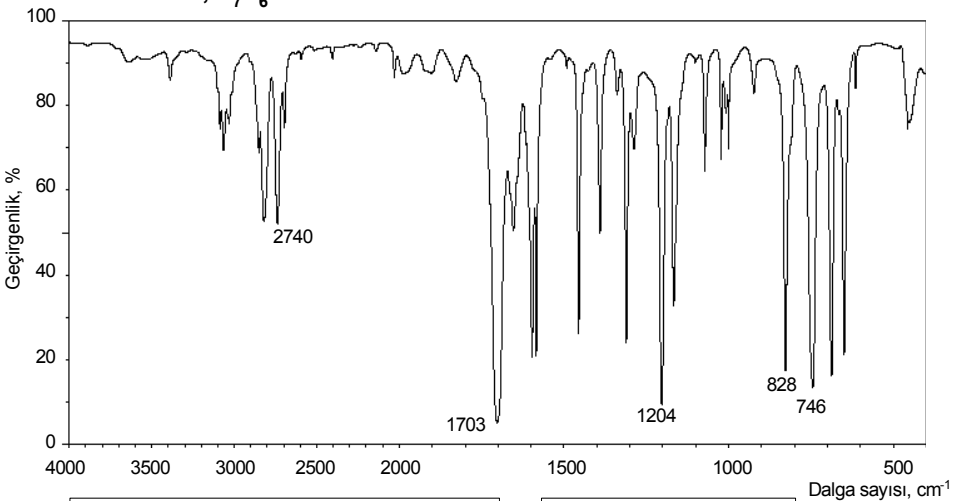
Heksanal, $C_6H_{12}O$



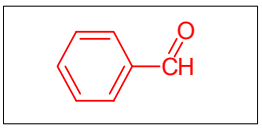
3432	66	1718	5	1308	62	1120	48	802	79
2960	4	1468	21	1300	64	1073	70	794	79
2942	5	1460	21	1286	82	1034	57	732	56
2932	4	1411	29	1240	62	997	60	683	72
2874	8	1391	29	1195	58	952	62	530	70
2864	8	1380	29	1163	84	899	62	461	66
2719	29	1342	53	1144	63	868	66		



Benzaldehit, C_7H_6O

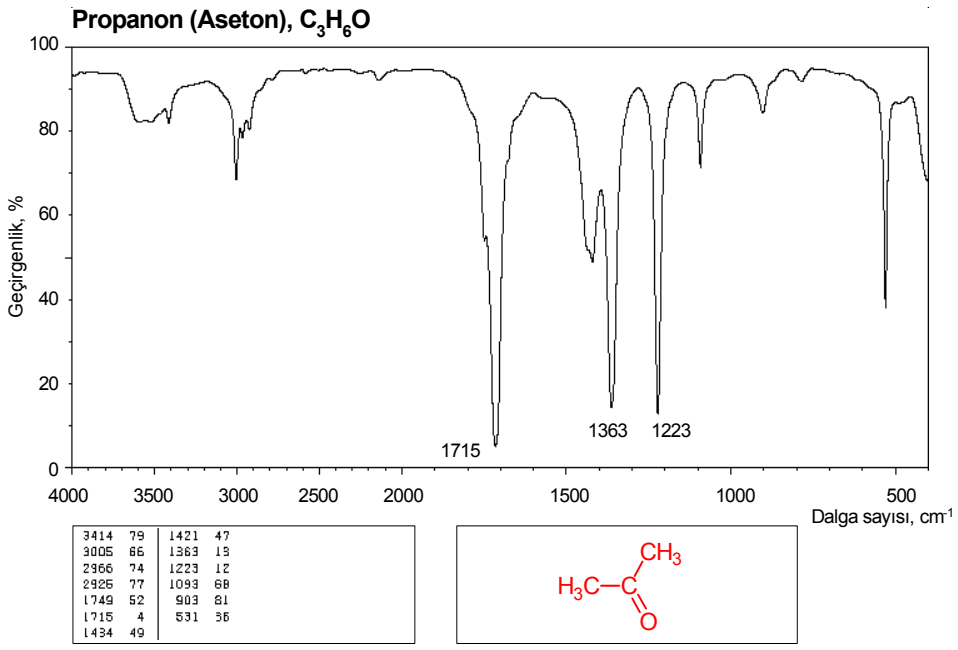


3086	72	1981	84	1597	20	1204	8	828	16
3065	66	1916	84	1584	20	1168	31	746	13
3031	72	1909	84	1456	25	1073	62	688	15
2850	66	1901	84	1391	47	1023	64	667	74
2820	50	1828	81	1339	79	1008	74	650	20
2736	50	1703	4	1311	23	1001	66	615	61
2696	72	1664	48	1288	68	924	79	457	72

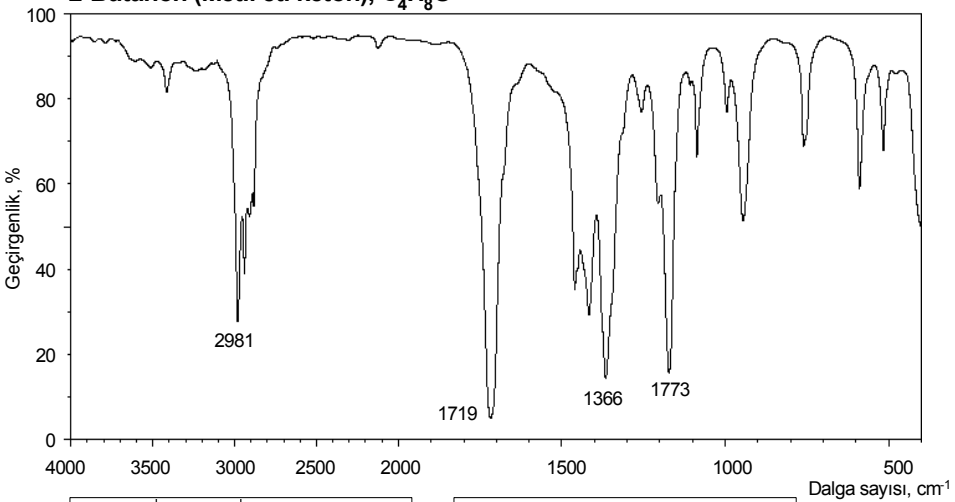


2. KETONLAR

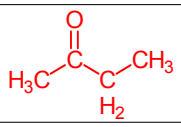
C = O gerilme	1725-1705 cm^{-1}
C – C eğilme	1300-1100 cm^{-1}



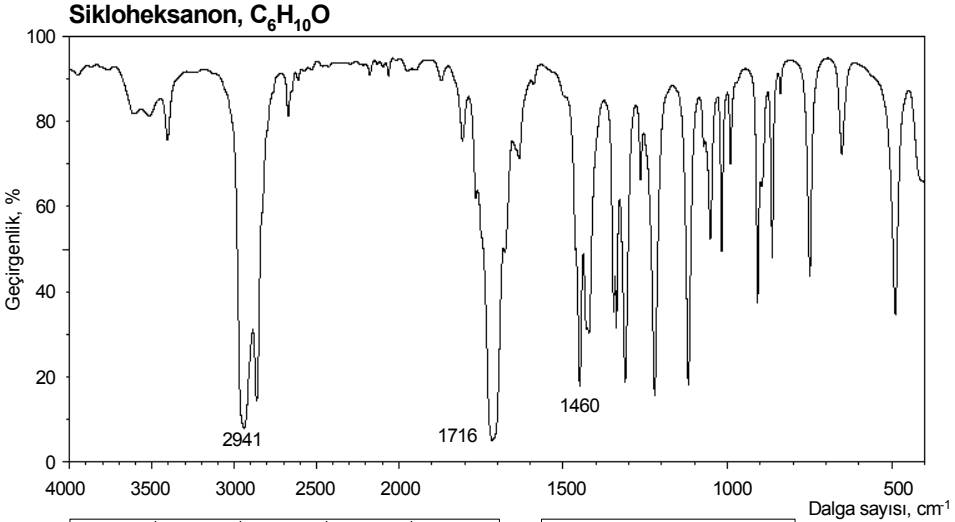
2-Bütanon (Metil etl keton), C_4H_8O



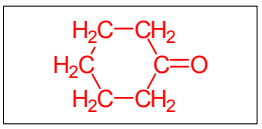
3611	84	1718	4	1173	14		
3416	79	1461	34	1087	64		
2981	26	1454	38	996	74		
2964	44	1417	27	946	49		
2940	37	1368	13	761	66		
2909	50	1257	74	590	57		
2883	62	1206	69	517	66		



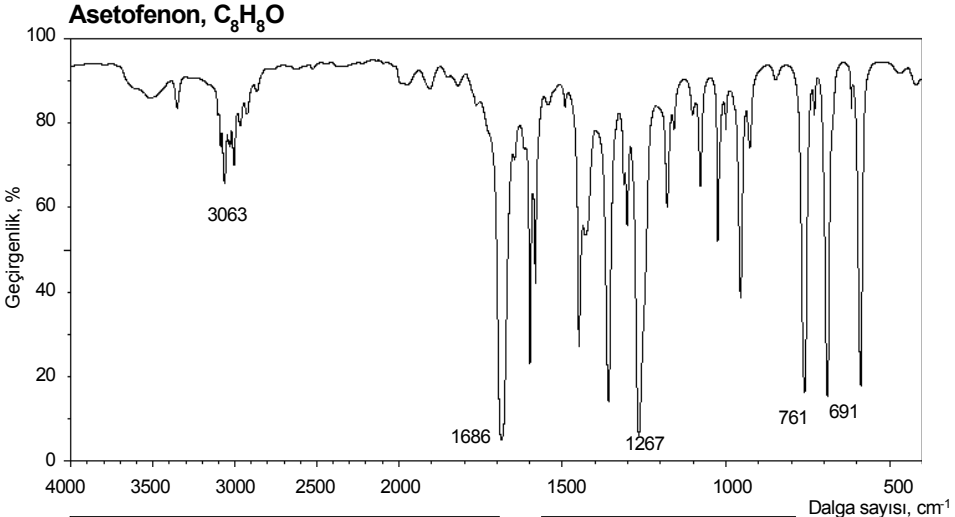
Sikloheksanon, $C_6H_{10}O$



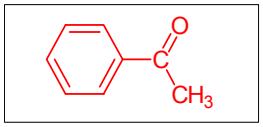
3610	79	2611	86	1460	17	1222	15	896	52
3515	79	1870	86	1429	30	1119	17	864	46
3407	72	1808	72	1422	28	1073	72	839	64
2941	7	1786	60	1347	34	1052	60	760	42
2864	13	1716	4	1338	30	1018	47	652	70
2670	79	1677	47	1311	17	991	68	490	33
2654	84	1634	68	1265	64	909	38		



Asetofenon, C_8H_8O

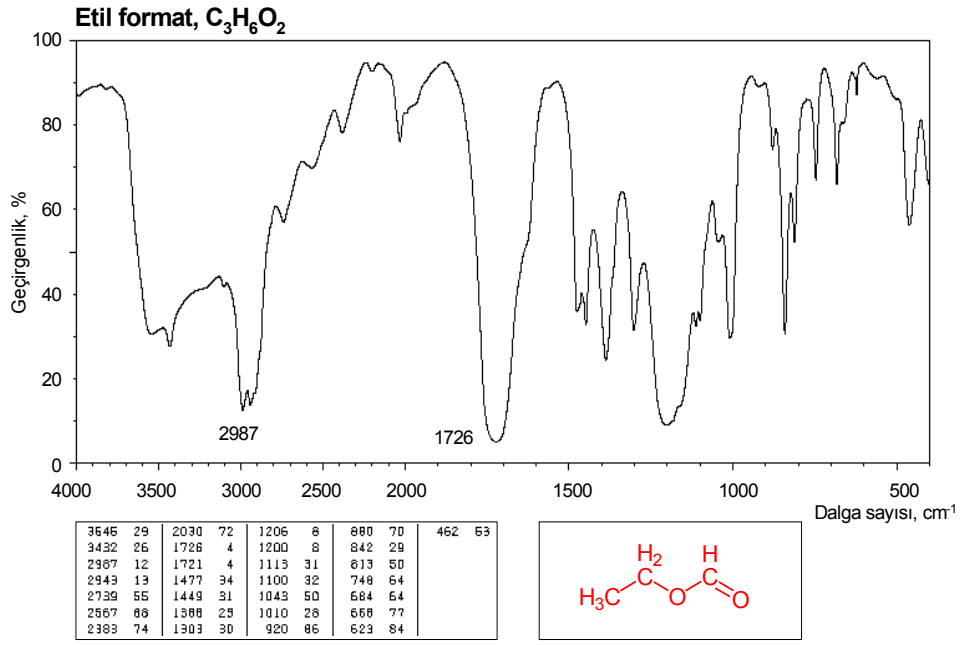


3604	84	2967	77	1645	81	1267	5	966	37
3352	81	2925	79	1492	81	1181	58	928	72
3087	72	2867	84	1450	26	1160	74	761	15
3063	64	1686	4	1430	62	1103	79	731	79
3040	72	1646	68	1360	13	1079	62	691	14
3029	72	1599	21	1315	82	1025	50	616	61
3006	68	1583	41	1303	53	1001	74	588	17



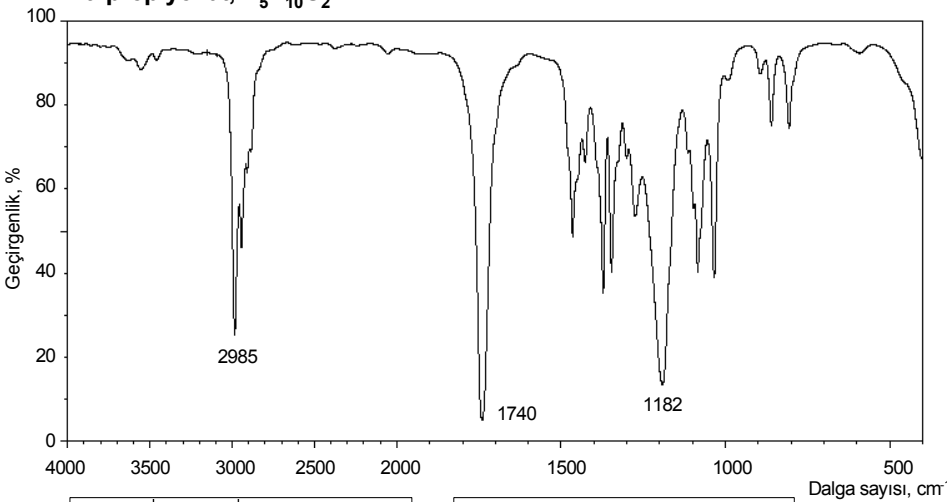
3. ESTERLER

C = O gerilme	1750-1725 cm^{-1}
C – C eğilme	1300-1100 cm^{-1}

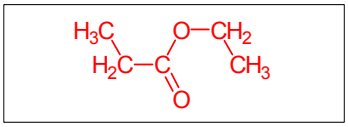


3646	29	2030	72	1206	8	880	70	462	63
3432	26	1728	4	1200	8	842	29		
2987	12	1721	4	1113	31	813	50		
2943	13	1477	34	1100	32	748	64		
2739	55	1449	31	1043	50	684	64		
2567	66	1388	25	1010	28	668	77		
2383	74	1303	30	920	86	623	84		

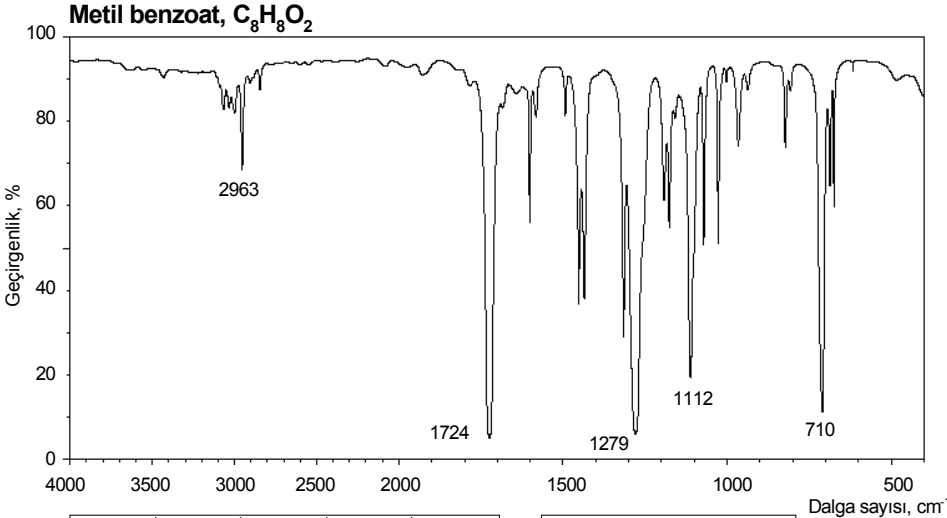
Etilpropiyonat, $C_5H_{10}O_2$



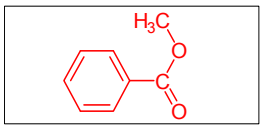
3654	84	1427	64	1036	37		
2985	23	1372	34	991	81		
2945	44	1347	38	895	84		
2910	60	1301	64	860	72		
1740	4	1275	52	807	72		
1465	47	1192	12				
1451	60	1084	38				



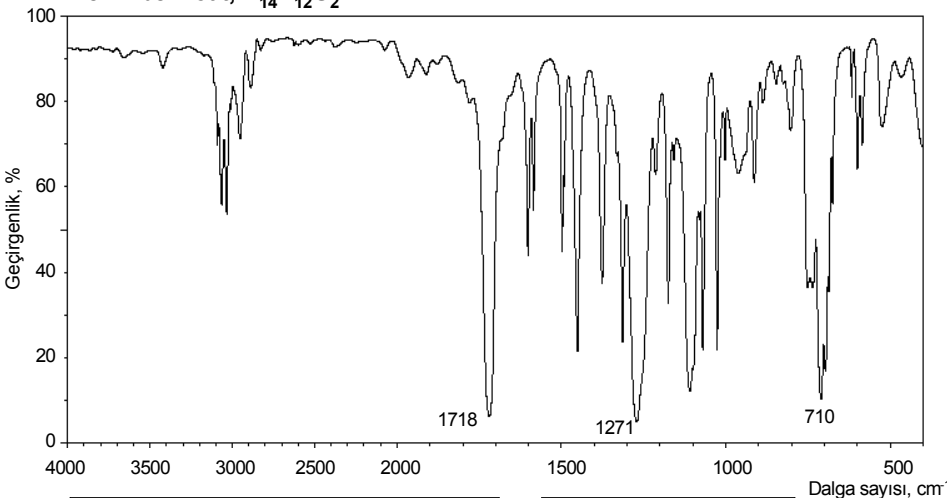
Metil benzoat, $C_8H_8O_2$



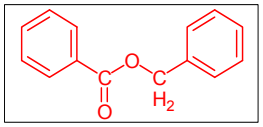
3065	79	1724	4	1316	27	1028	49	688	52		
3034	79	1644	84	1279	5	1003	86	676	58		
2999	79	1602	53	1193	58	966	72	483	66		
2953	66	1582	79	1177	62	937	84				
2907	86	1493	79	1160	77	823	70				
2845	84	1453	55	1112	18	808	84				
1784	84	1436	36	1072	49	710	10				



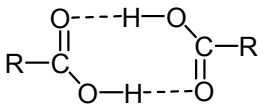
Benzilbenzoat, $C_{14}H_{12}O_2$

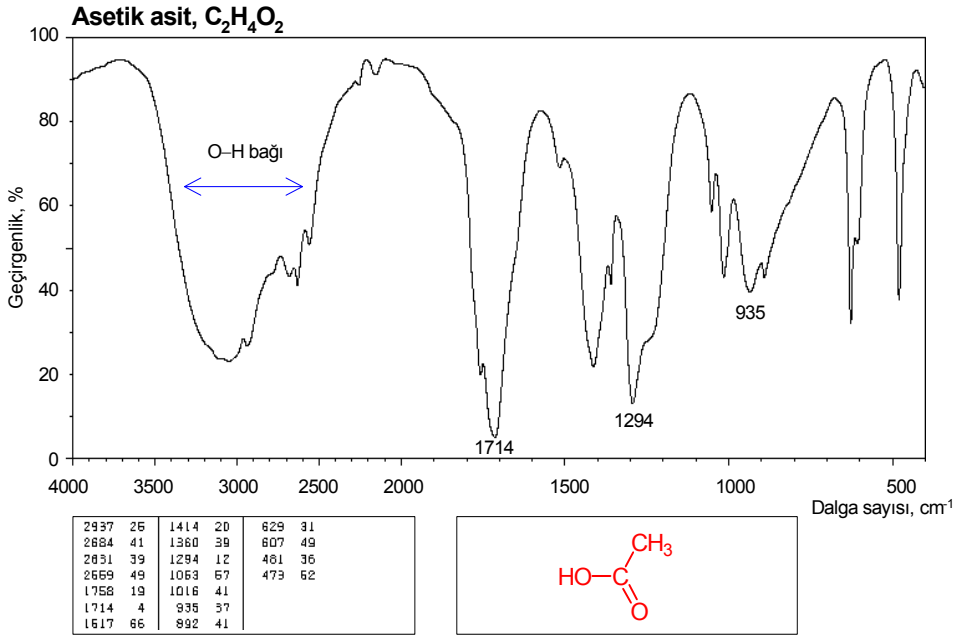


3091	66	1498	43	1176	31	1003	64	710	9
3065	53	1492	58	1159	64	963	60	698	16
3034	52	1451	20	1110	11	914	58	686	34
2953	68	1377	36	1099	16	804	70	676	63
1718	5	1315	22	1082	50	753	35	600	62
1602	42	1271	4	1070	20	747	36	586	56
1585	62	1214	60	1027	21	736	36	525	72

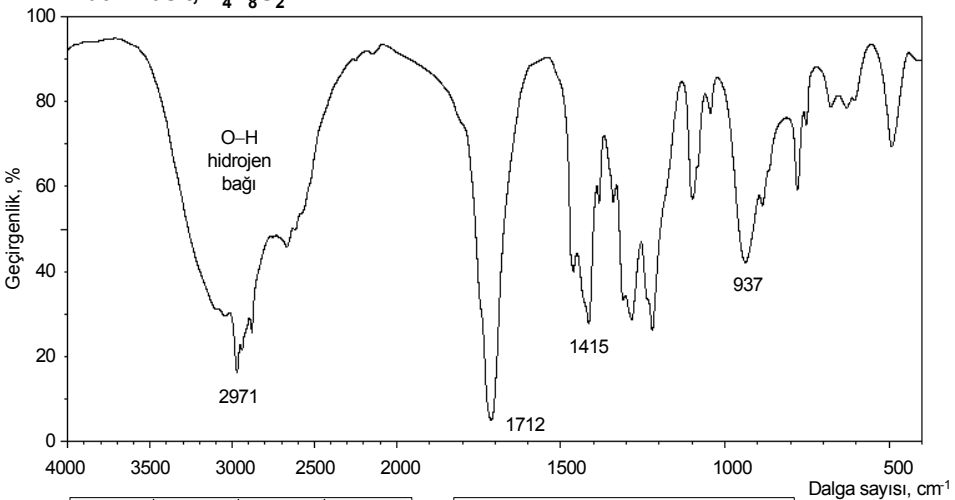


4. KARBOKSİLİK ASİTLER

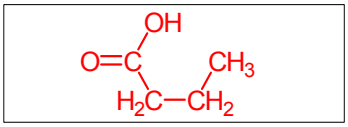
O – H gerilme, kuvvetli H-bağlı, çok geniş 	3300-2500 cm^{-1}
C = O gerilme	1725-1700 cm^{-1}
C – O gerilme	1320-1210 cm^{-1}
O-H eğilme	1440-1395, 950-910 cm^{-1}



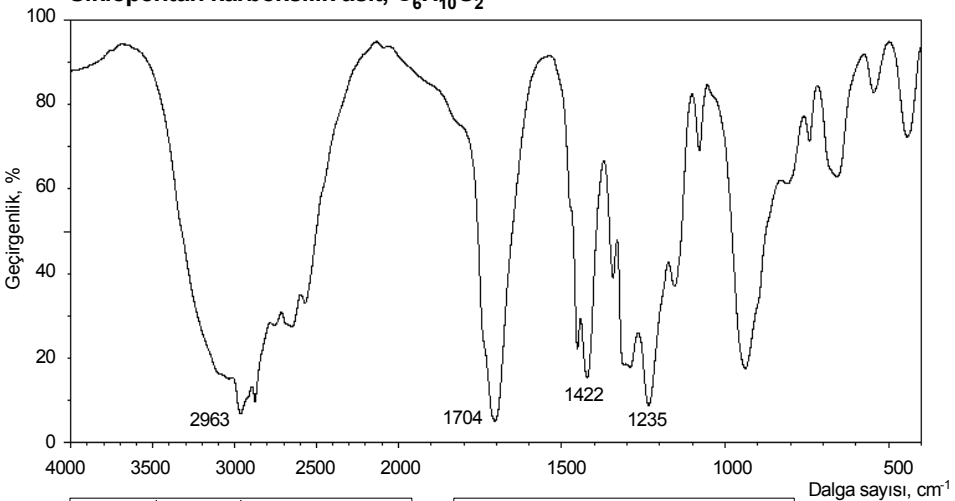
Bütirik asit, $C_4H_8O_2$



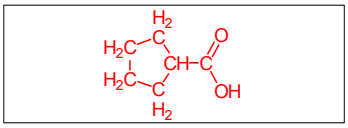
2971	15	1461	38	1098	66	678	77
2940	20	1415	26	1050	77	629	77
2880	24	1384	58	1044	74	492	66
2681	44	1341	66	937	41		
2668	44	1285	27	886	53		
1712	4	1235	32	780	57		
1467	39	1222	26	762	72		



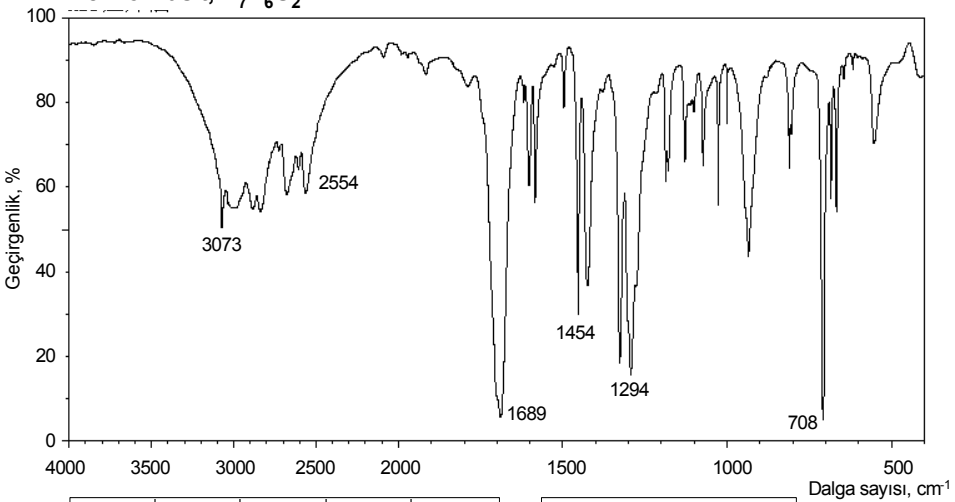
Siklopentan karboksilik asit, $C_6H_{10}O_2$



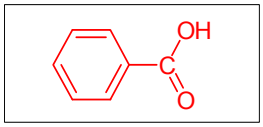
2963	6	1422	14	1079	66		
2874	9	1344	37	939	16		
2673	26	1307	17	742	88		
2651	26	1297	17	666	60		
2567	31	1291	17	658	60		
1705	4	1235	8	545	79		
1463	21	1166	36	443	70		



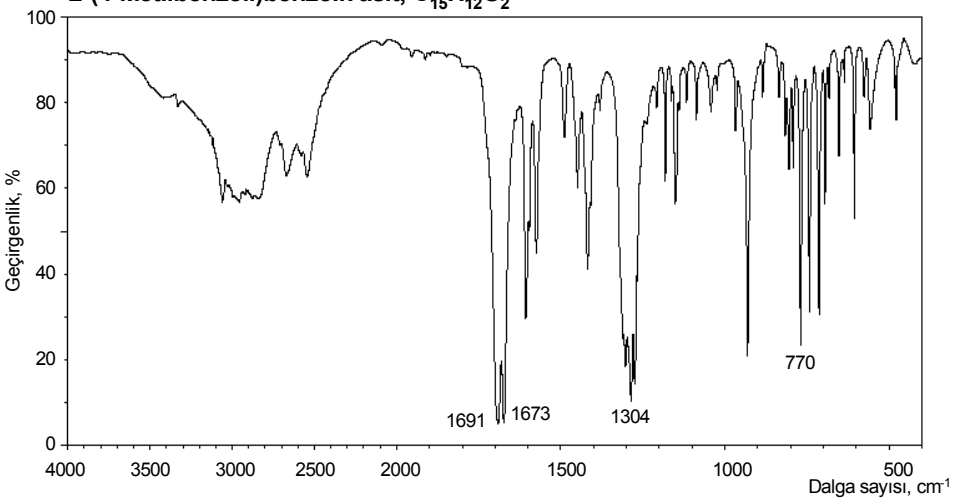
Benzoik asit, $C_7H_6O_2$



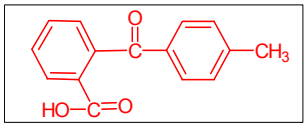
3073	49	2678	57	1426	35	1112	77	936	42
3012	53	2607	62	1327	17	1107	77	812	62
2998	53	2564	57	1294	14	1102	74	805	70
2986	53	1688	5	1187	68	1074	62	708	4
2886	52	1603	58	1180	60	1028	53	685	55
2856	52	1585	59	1129	64	1001	72	667	52
2726	66	1454	28	1118	77	943	60	664	68



2-(4-Metilbenzoil)benzoik asit, $C_{15}H_{12}O_2$

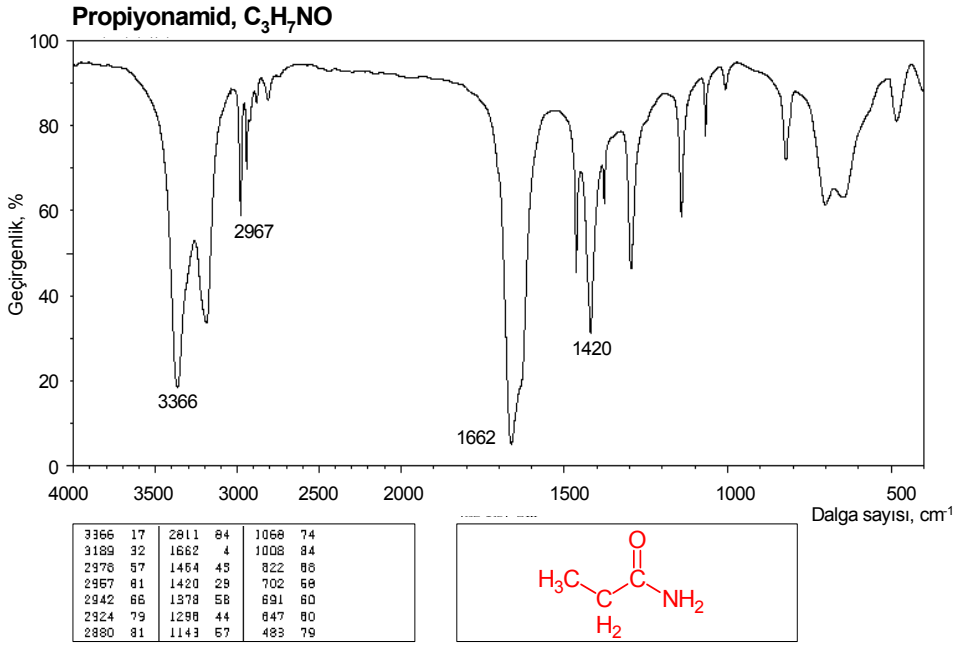


3061	55	2644	60	1449	58	1182	58	770	22
2982	55	1691	4	1419	39	1152	53	743	30
2968	55	1673	5	1410	53	968	70	714	29
2956	55	1607	28	1304	17	931	20	696	53
2859	55	1598	47	1286	10	817	70	653	64
2844	55	1574	45	1275	13	805	62	607	50
2671	60	1489	70	1267	36	793	62	568	70

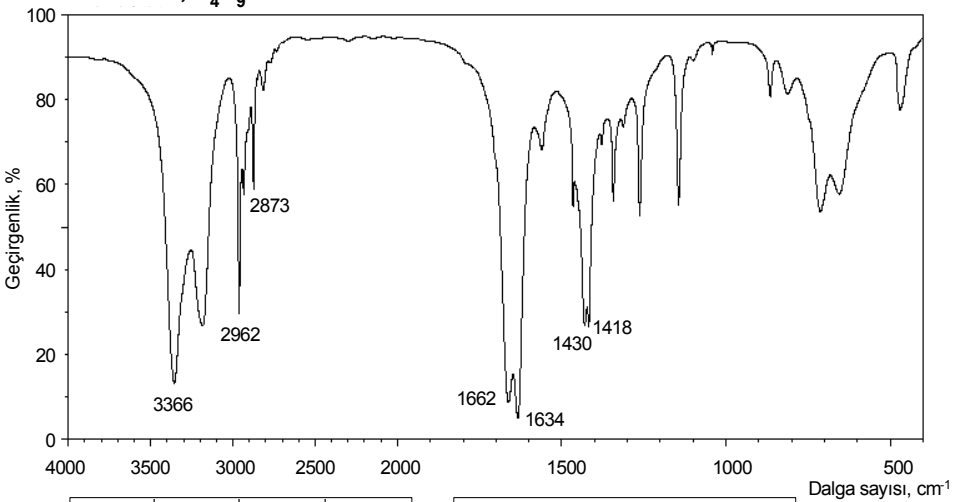


5. AMİDLER

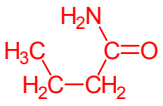
C = O gerilme	1680-1630 cm^{-1}
N – H gerilme, primer amid	3350 ve 3180 cm^{-1}, 2 bant
N – H gerilme, sekonder amid	~3300 cm^{-1}, 1 bant
N –H eğilme (primer ve sek. amidler)	1640-1550 cm^{-1}



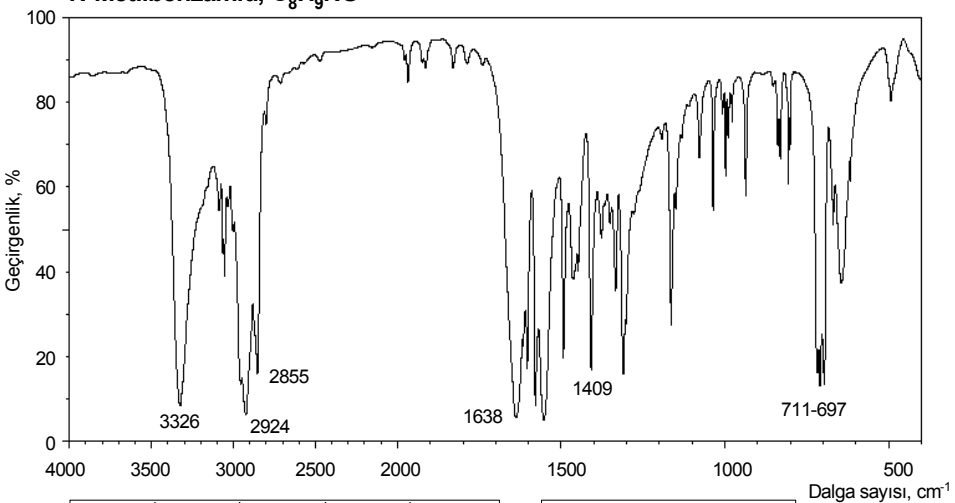
Bütiramid, C_4H_9O



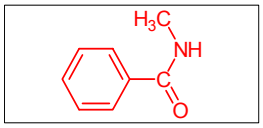
3366	12	1634	4	1313	70	666	55
3184	25	1561	66	1263	50	470	74
2962	28	1468	52	1145	55		
2934	55	1430	25	866	77		
2873	57	1418	25	813	79		
2816	79	1379	66	805	79		
1662	8	1344	59	713	52		



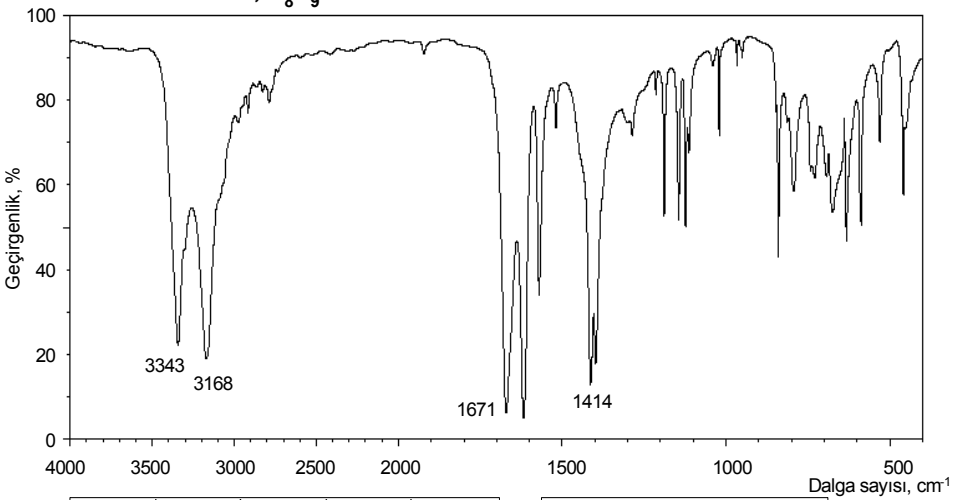
N-Metilbenzamid, C_8H_9NO



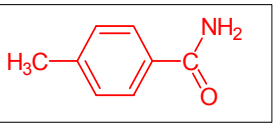
3326	7	2924	5	1494	18	1311	15	807	58
3088	52	2855	15	1464	36	1303	26	718	15
3065	42	1638	5	1449	38	1165	25	711	12
3054	37	1616	21	1409	16	1151	52	697	12
3035	53	1604	16	1378	46	1036	52	671	49
3004	47	1579	7	1352	49	999	60	645	36
2955	12	1564	4	1334	34	937	55	618	58



4-Metilbenzamid, C_8H_9NO

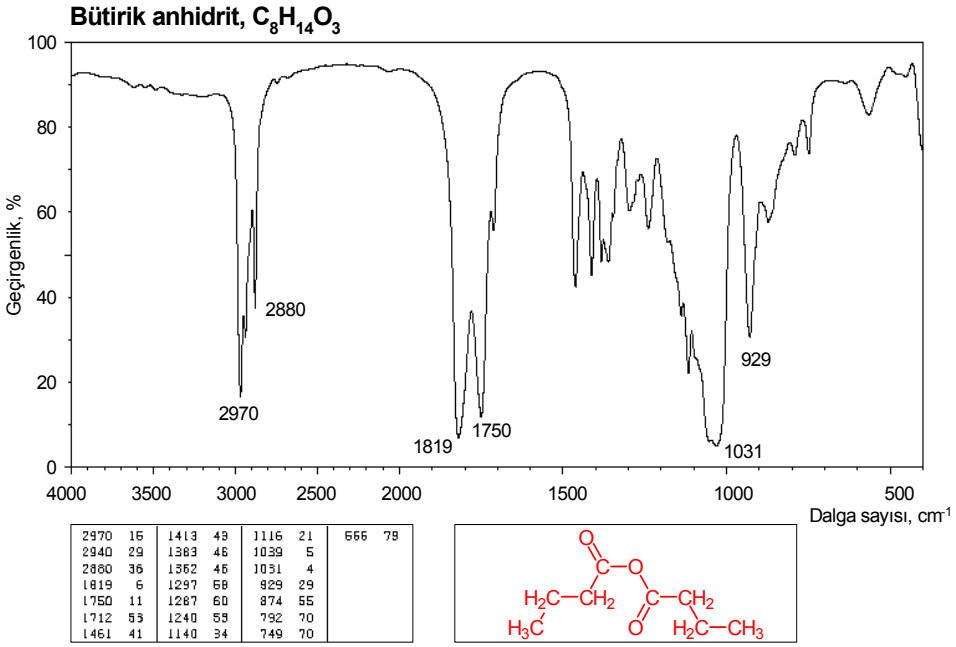


3343	21	1618	4	1287	68	1041	84	694	58
3168	18	1571	32	1215	79	1021	68	676	52
2976	72	1519	70	1169	50	848	74	635	44
2918	74	1414	12	1153	77	841	41	588	49
2826	79	1398	17	1145	50	794	57	531	68
2787	77	1302	72	1124	47	743	60	460	55
1671	6	1296	72	1114	64	729	58	455	70



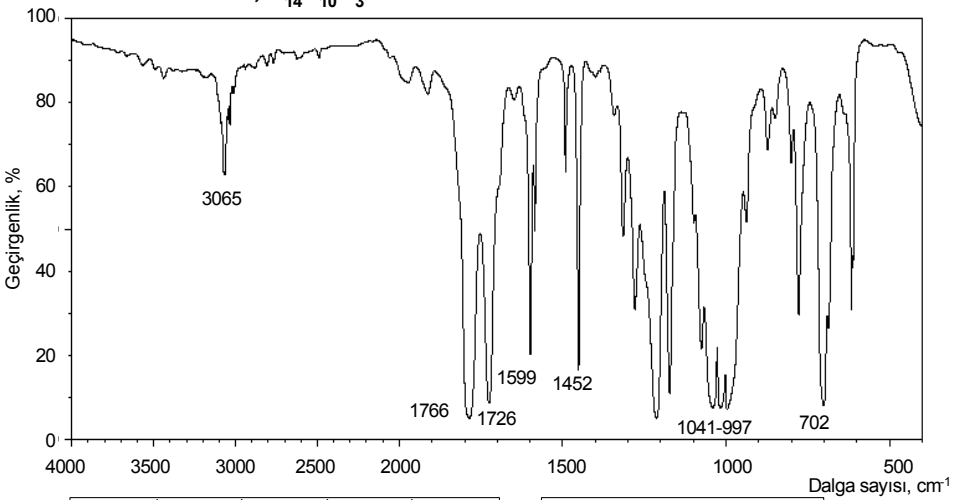
6. ANHİDRİTLER

C = O gerilme, açık zincirli (2 bant)	1850-1800 ve 1790-1740 cm^{-1}
C = O gerilme, beşli halka (2 bant)	1870-1820 ve 1800-1775
C – O gerilme	1300-900 cm^{-1}

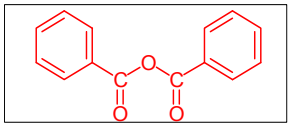


2970	15	1413	43	1116	21	666	79		
2940	29	1383	46	1039	5				
2880	36	1362	46	1031	4				
1819	6	1297	58	929	29				
1750	11	1287	60	874	55				
1712	53	1240	53	792	70				
1461	41	1140	34	749	70				

Benzoik anhidrit, $C_{14}H_{10}O_3$

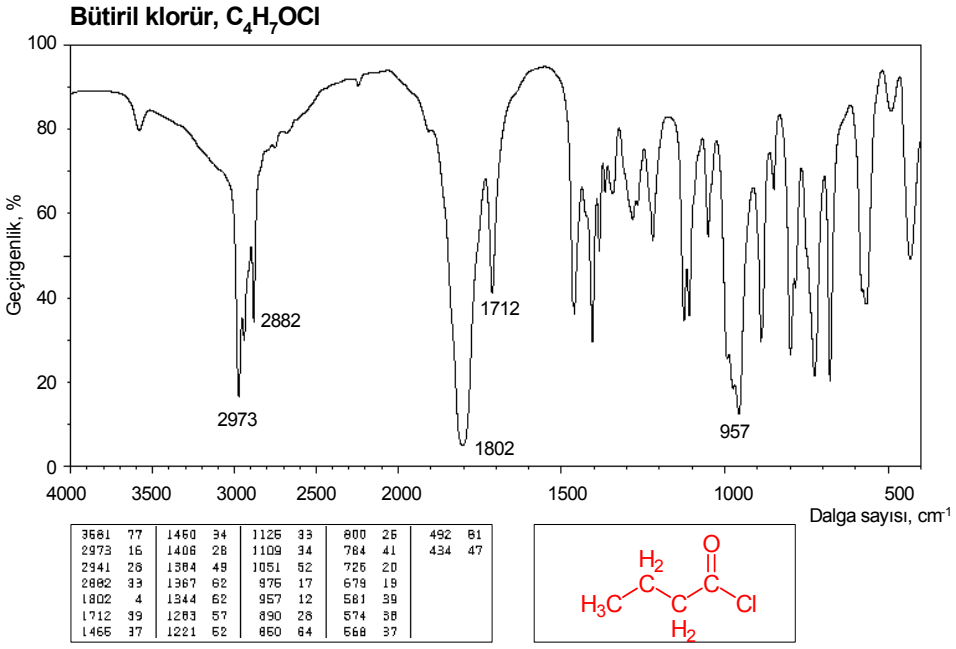


3440	81	1973	81	1492	60	1173	10	874	66
3089	72	1912	79	1452	15	1099	49	850	74
3065	60	1788	4	1408	84	1076	20	802	54
3048	72	1726	8	1344	74	1041	7	779	28
3034	72	1649	77	1315	46	1016	7	702	7
3010	79	1599	19	1280	29	997	5	686	25
1979	81	1586	47	1213	4	938	49	617	29

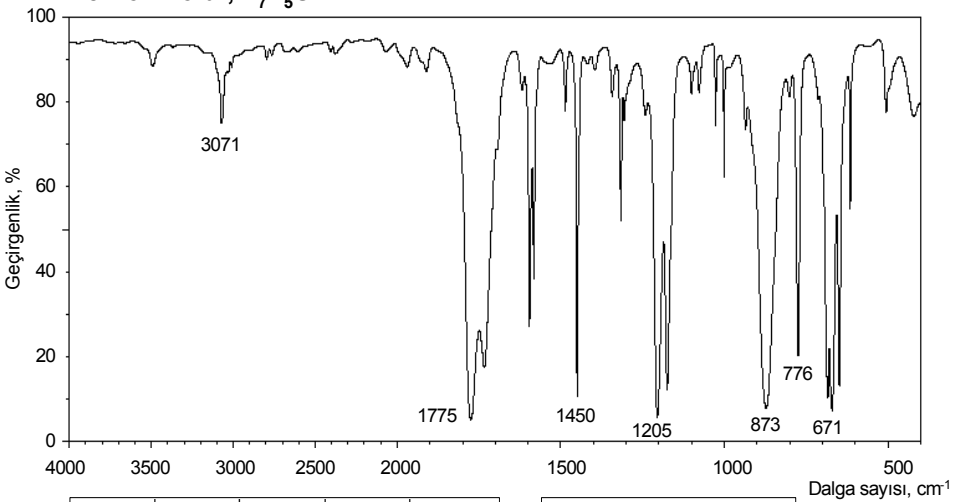


7. ASİT HALOJENLER

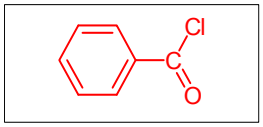
C = O gerilme, konjuge değilse	1810-1775 cm^{-1}
C = O gerilme, konjuge	1780-1760 cm^{-1}
C – F gerilme	1400-1000 cm^{-1}
C – Cl gerilme	800-600 cm^{-1}
C – Br gerilme	600-500 cm^{-1}
C – I gerilme	500 cm^{-1}



Benzoil klorür, C_7H_5OCl

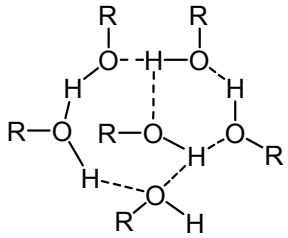


3493	84	1618	78	1317	60	1027	72	776	19
3071	72	1596	26	1307	72	1002	60	685	10
3009	84	1583	36	1242	74	992	84	671	6
1969	84	1486	74	1205	5	986	84	649	12
1910	84	1450	10	1175	11	936	70	616	52
1775	4	1395	84	1100	79	873	7	507	74
1733	16	1343	79	1078	79	802	79	500	79

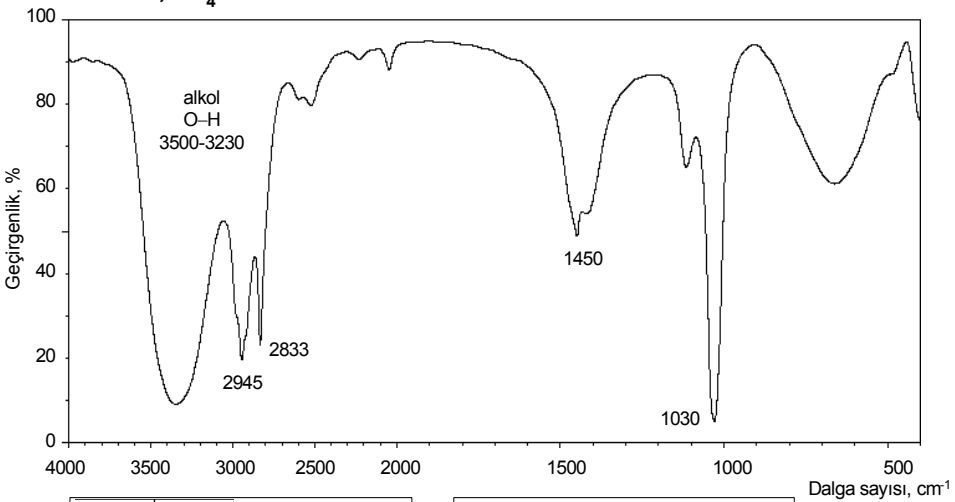


E. DİĞER ÖNEMLİ FONKSİYONEL GRUPLAR

1. ALKOLLER

O – H gerilme, hidoksil grup H-bağlı, geniş	3570-3200 cm^{-1}
Normal “polimerik”,	3400-3200 cm^{-1}
Dimerik	3550-3450 cm^{-1}
O – H gerilme, serbest hidroksil grup, dar	3650-3600 cm^{-1}
Primer alkol	3645-3630 cm^{-1}
Sekonder alkol	3635-3620 cm^{-1}
Tersiyer alkol	3620-3540 cm^{-1}
Fenol	3640-3530 cm^{-1}
O – H düzlem-içi eğilme, tersiyer alkol veya fenol	1410-1310 cm^{-1}
O – H düzlem-içi eğilme, primer veya sekonder	1350-1260 cm^{-1}
C – O gerilme	1260-1000 cm^{-1}
Primer alkol	~1050 cm^{-1}
Sekonder alkol	~1100 cm^{-1}
Tersiyer alkol	~1150 cm^{-1}
Fenol	~1200 cm^{-1}
O – H düzlem-dışı eğilme,	720-790 cm^{-1}
O – H gerilme, hidrojen-bağlı, geniş bant 	3400-3200 cm^{-1}

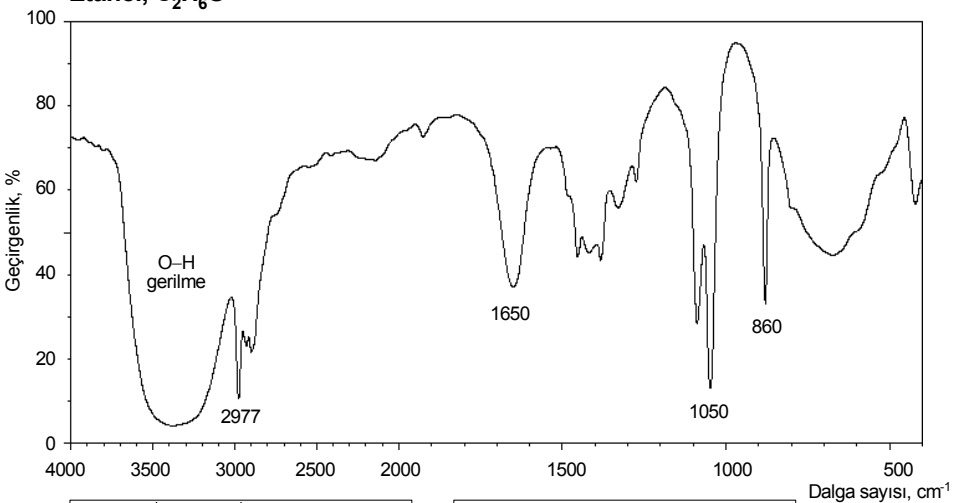
Metanol, CH_4O



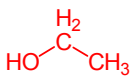
3347	8	1116	62
3336	8	1030	4
2945	18	662	58
2833	22		
2522	77		
2046	84		
1460	47		

$H_3C{-}OH$

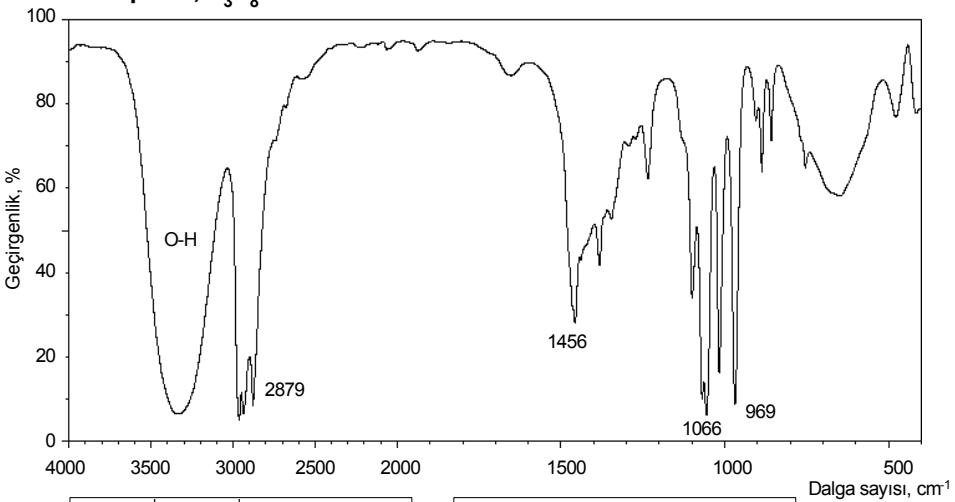
Etanol, C_2H_6O



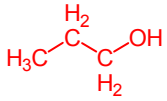
2977	4	1384	32
2930	13	1329	44
2899	12	1275	52
1925	62	1089	18
1650	26	1048	6
1454	33	880	22
1418	33		



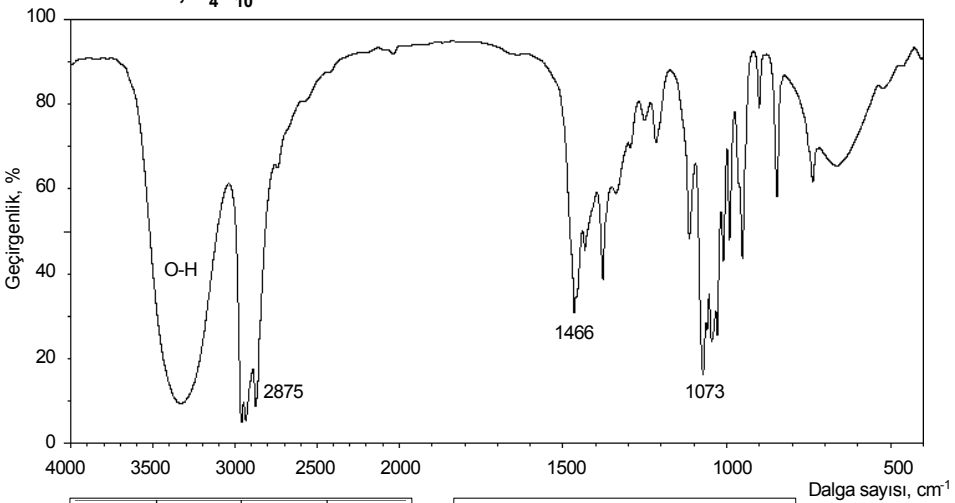
1-Propanol, C_3H_8O



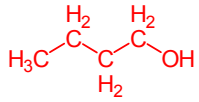
3333	6	1383	39	1017	15
2963	4	1348	50	969	8
2936	6	1293	68	905	72
2878	0	1236	60	888	62
1656	84	1100	32	858	68
1651	84	1069	9	755	82
1466	26	1056	6	479	74



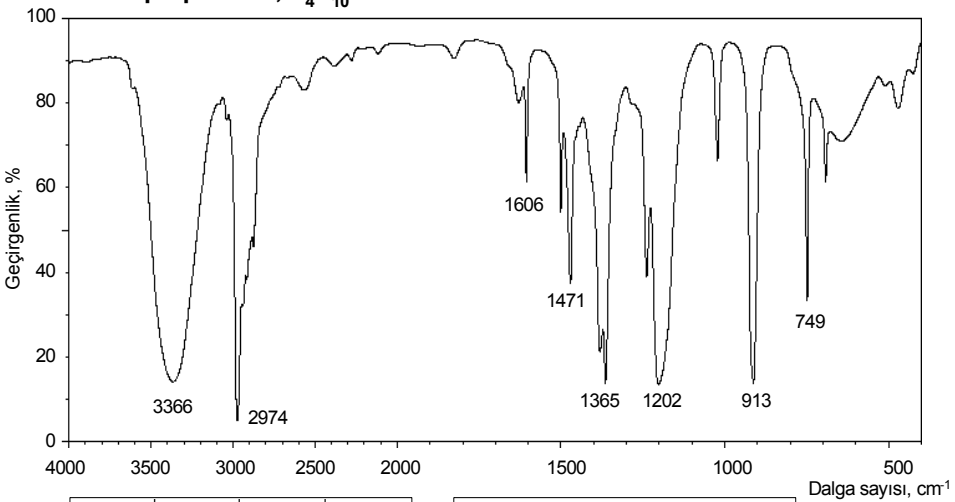
1-Bütanol, $C_4H_{10}O$



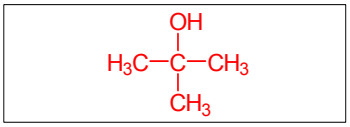
3333	9	1434	48	1073	16	901	77
3323	9	1379	37	1060	26	847	57
2960	4	1338	57	1047	23	738	58
2934	5	1296	68	1029	24	670	62
2875	8	1252	74	1011	42	665	62
1466	30	1217	68	992	46		
1461	33	1116	46	953	42		



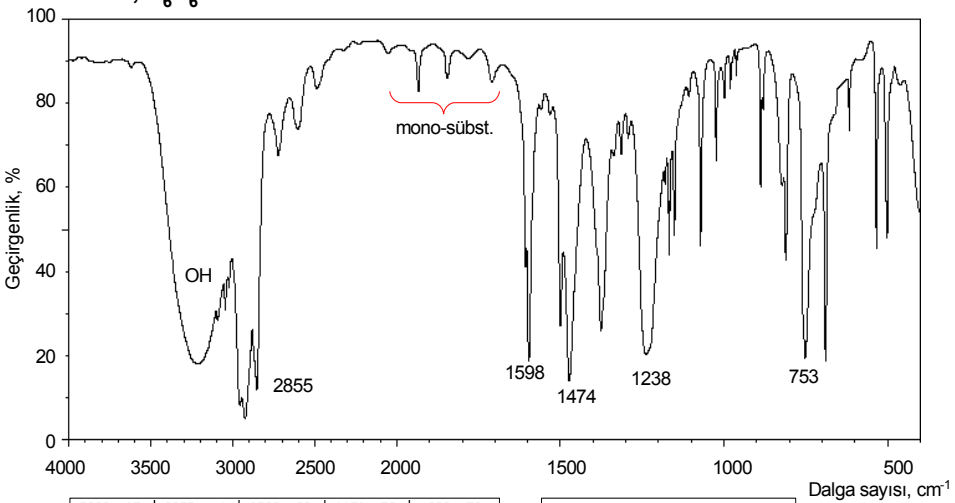
2-Metilpropan-2-ol, $C_4H_{10}O$



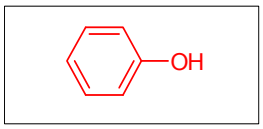
3366	13	1630	77	1202	12	611	81
3038	72	1606	58	1022	64	471	77
2974	4	1501	52	915	15		
2940	31	1471	36	749	32		
2875	44	1381	20	693	58		
2564	79	1365	15	646	66		
2385	86	1239	37	643	68		



Fenol, C_6H_6O

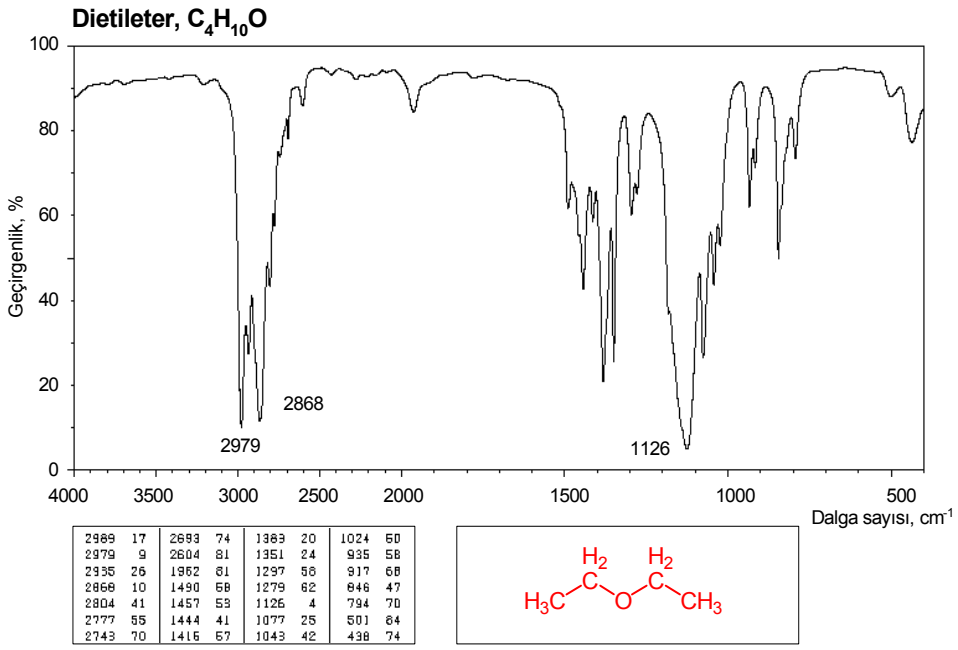


3226	17	2926	4	1600	26	1181	58	823	58
3215	17	2855	11	1474	13	1168	42	812	41
3205	17	2723	64	1376	24	1153	45	753	18
3094	26	2602	70	1337	66	1072	44	690	18
3047	29	1606	39	1315	66	1024	64	617	70
3023	35	1598	17	1294	68	888	57	535	43
2956	7	1532	74	1238	19	881	77	503	46

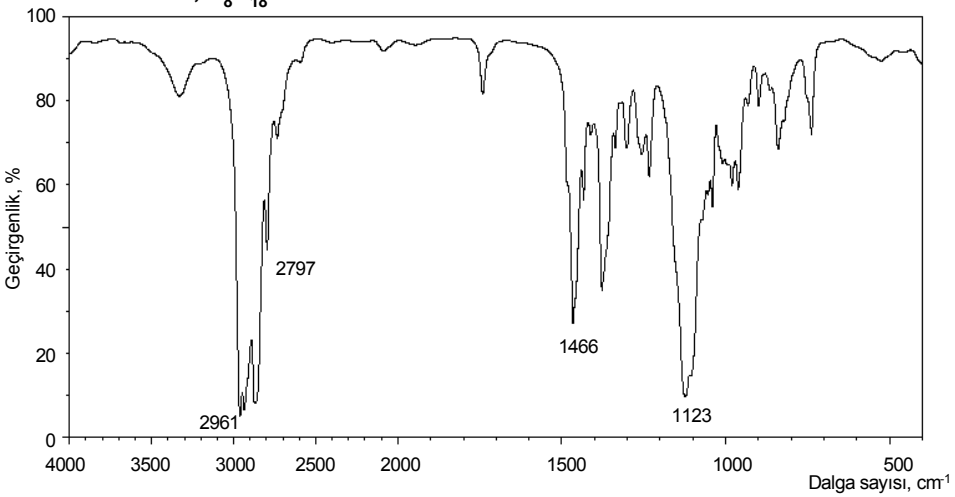


2. ETERLER

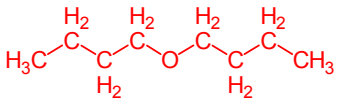
C – H gerilme, metoksi (CH_3 – O –)	2820-2810 cm^{-1}
C – O gerilme, alkil sübstitüe eter (C – O – C)	1150-1050 cm^{-1}
C – O gerilme, siklik eter ((C – O – C)	1140-1070 cm^{-1}
Aril – O gerilme, aromatik eter	1270-1230 cm^{-1}
C – O – O – gerilme, peroksit (C – O – O – C)	890-820 cm^{-1}



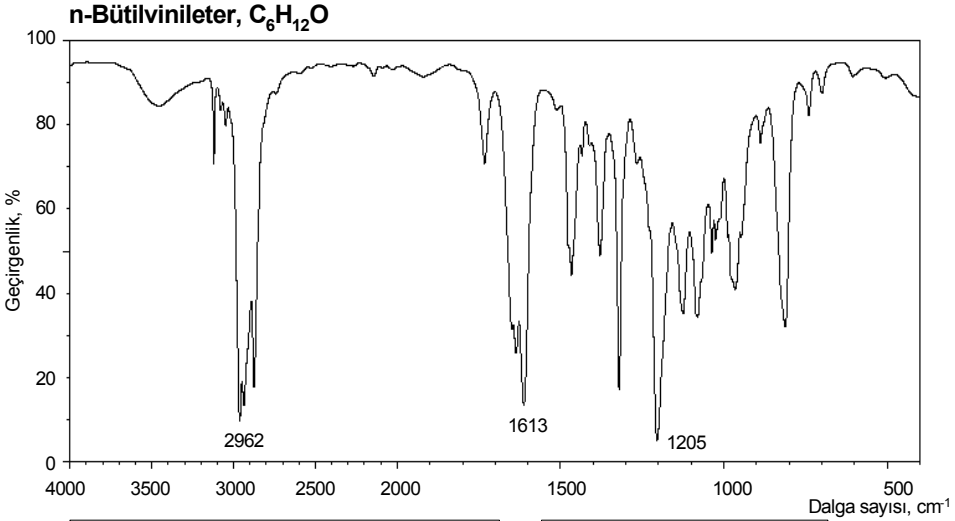
Dibütil eter, $C_8H_{18}O$



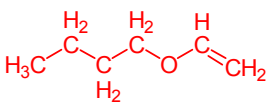
3328	79	1466	26	1257	64	932	77
2961	4	1434	53	1234	60	900	77
2935	6	1412	66	1123	9	840	66
2868	7	1378	33	1109	13	824	72
2797	42	1359	46	1040	52	739	70
2734	66	1337	66	981	57		
1741	79	1303	66	962	67		



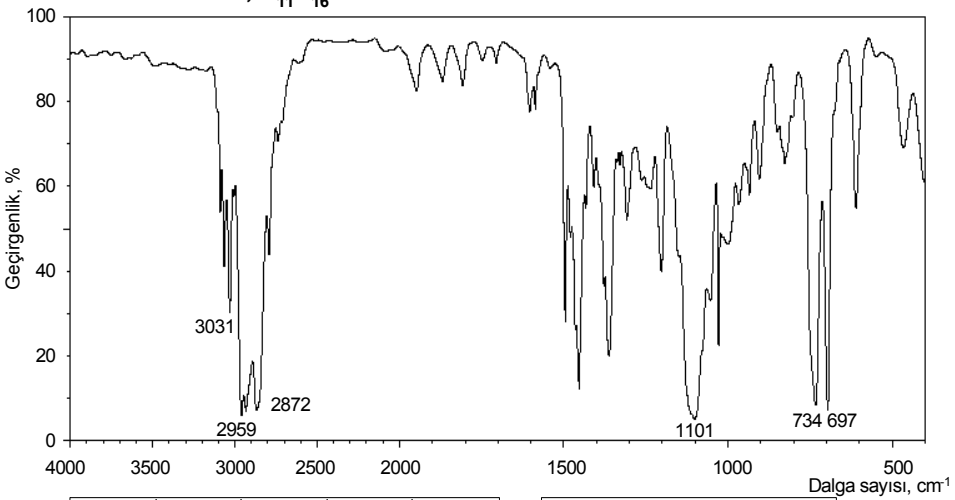
n-Bütilvinileter, $C_6H_{12}O$



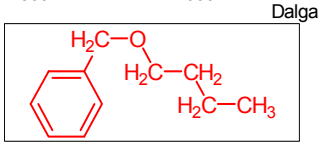
3466	81	1732	68	1436	70	1037	47	740	79
3120	68	1649	30	1380	47	1026	50	700	84
3080	81	1636	25	1321	16	979	42		
3048	77	1613	12	1268	68	986	39		
2962	9	1511	81	1205	4	947	52		
2937	12	1477	49	1125	34	889	72		
2876	17	1467	42	1082	33	813	31		



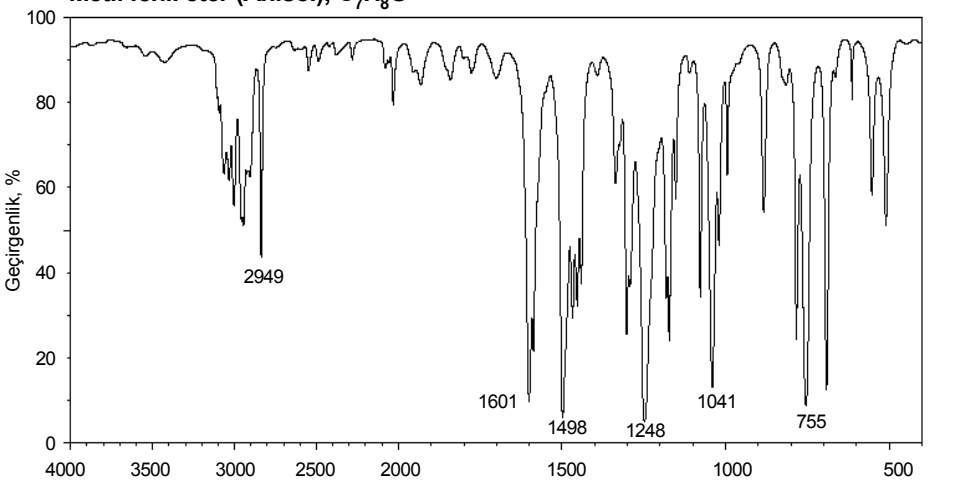
Benzil bütil eter, $C_{11}H_{16}O$



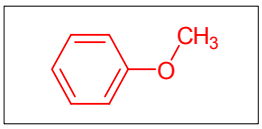
3089	52	2872	7	1409	57	1203	38	1000	44
3065	39	2793	42	1378	35	1110	5	967	53
3055	52	1498	26	1363	19	1101	4	935	55
3031	28	1480	46	1306	60	1063	31	905	58
3006	55	1465	25	1248	57	1029	21	734	7
2959	5	1454	11	1241	57	1015	46	697	6
2933	6	1433	52	1236	57	1007	44	612	52



Metil fenil eter (Anisol), C_7H_8O

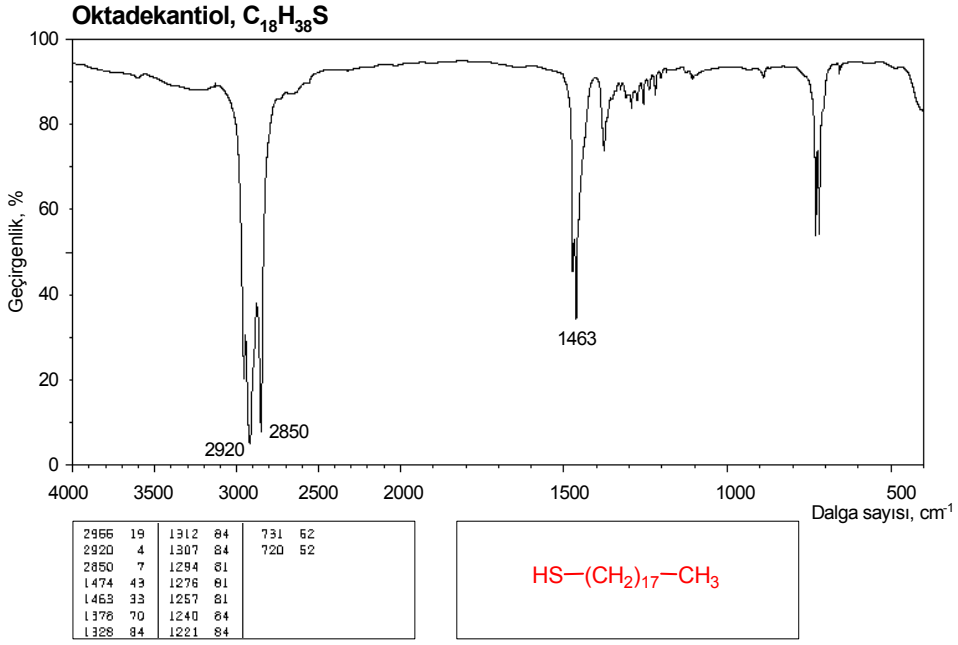


3094	74	2906	60	1468	27	1182	32	884	52
3063	60	2836	42	1454	31	1173	23	784	23
3033	58	2031	77	1442	36	1153	55	755	8
3003	63	1702	81	1337	68	1078	39	692	12
2957	50	1601	9	1303	24	1041	12	614	77
2945	49	1588	20	1293	35	1021	44	555	57
2926	60	1498	5	1248	4	995	60	511	49

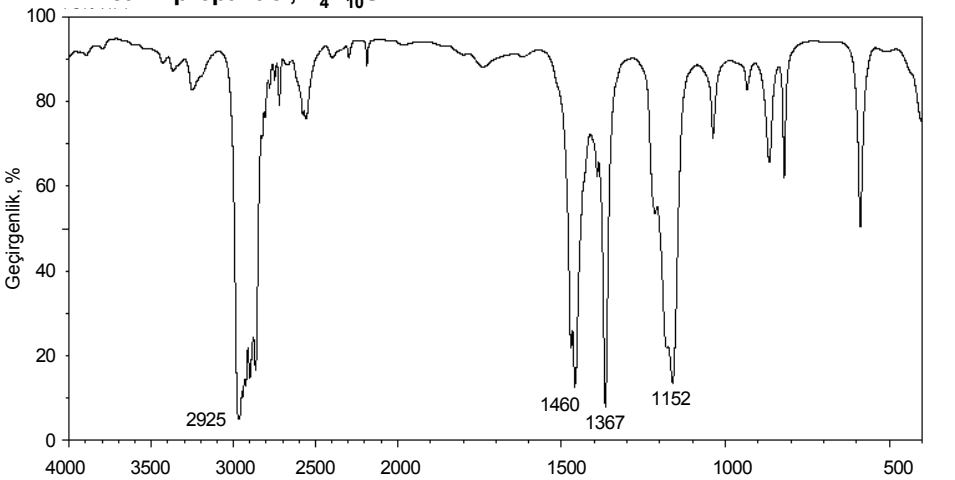


3. SÜLFÜRLÜ BİLEŞİLER

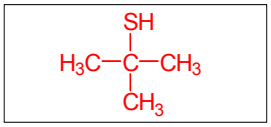
S – H gerilme, merkaptan	~2250 cm^{-1}
S = O gerilme, sülfoksit	~1050 cm^{-1}
S = O gerilme, dialkil sülfon	1335-1300 cm^{-1}
S = O gerilme, aril sülfon	1170-1135 cm^{-1}
S = O gerilme, sülfonat	1365-1340, 1200-1100 cm^{-1}
S – O gerilme, sülfonat	1000-750 cm^{-1}



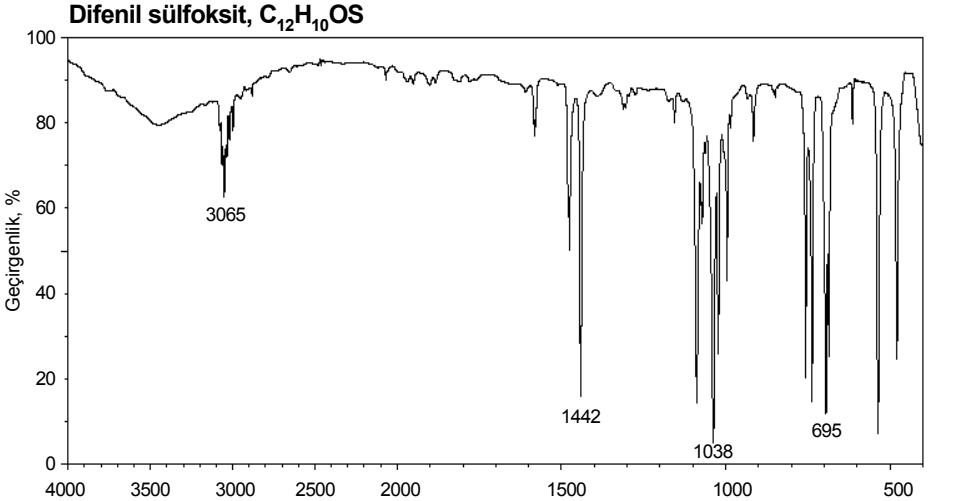
2-Metil-2-propantiol, $C_4H_{10}S$



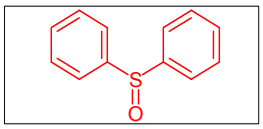
3427	86	2866	16	2186	84	1216	52	821	60
3368	84	2808	72	1742	84	1179	20	589	49
3248	79	2778	78	1737	84	1162	12		
2966	4	2748	81	1471	20	1038	68		
2942	9	2719	77	1460	12	934	79		
2926	12	2577	74	1392	80	929	81		
2900	13	2557	72	1367	7	867	64		



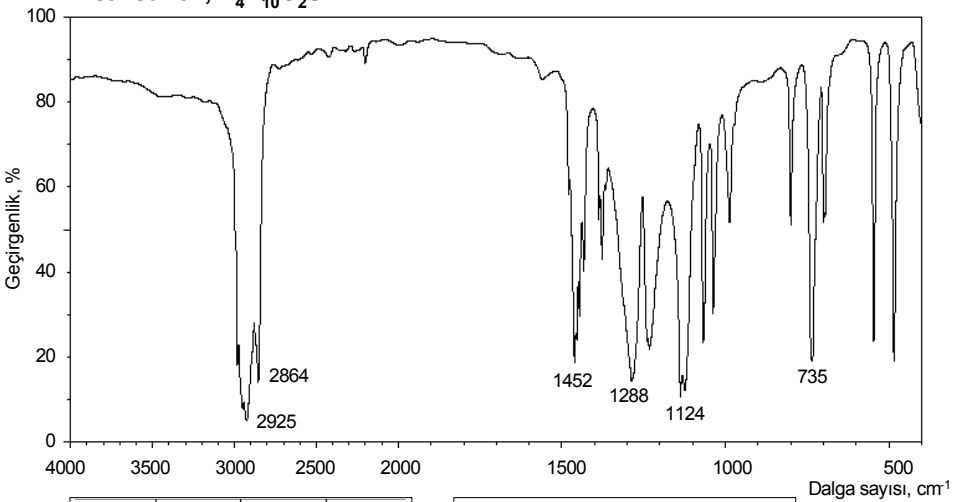
Difenil sülfoksit, $C_{12}H_{10}OS$



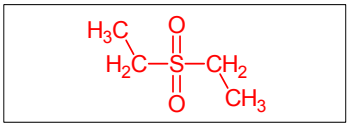
3079	74	1609	84	1276	84	1038	4	738	14
3065	68	1583	74	1173	81	1032	49	700	41
3052	80	1578	77	1165	81	1024	25	695	11
3036	70	1478	49	1166	77	998	42	687	24
3019	72	1442	15	1088	13	985	77	615	77
2998	74	1312	78	1072	53	916	72	537	7
2882	84	1306	81	1062	70	767	20	480	23



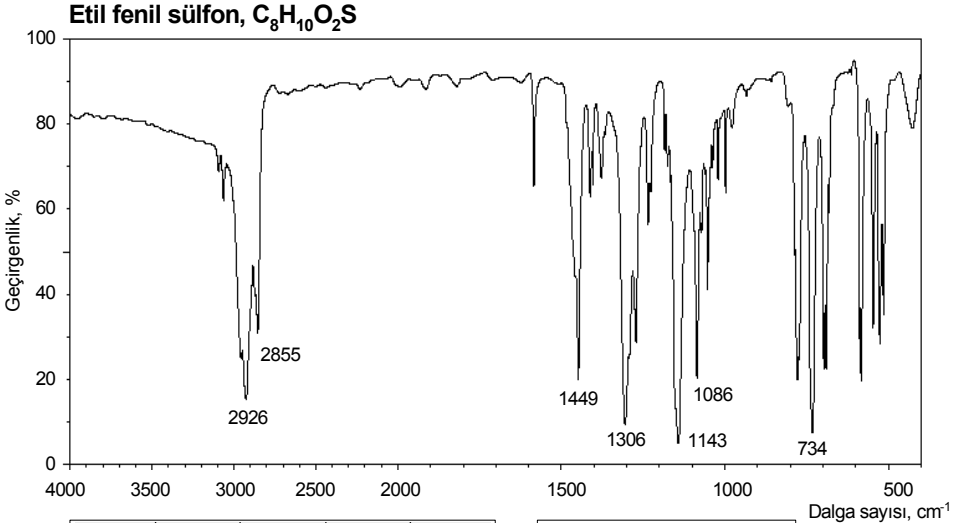
Dietil sülfon, $C_4H_{10}O_2S$



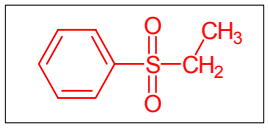
2981	17	1462	18	1240	22	987	49
2949	7	1455	23	1233	21	800	49
2925	4	1448	28	1136	10	735	18
2864	13	1433	38	1132	15	701	49
2202	86	1387	50	1124	11	547	23
1560	81	1378	41	1066	22	485	18
1479	65	1288	13	1038	29		



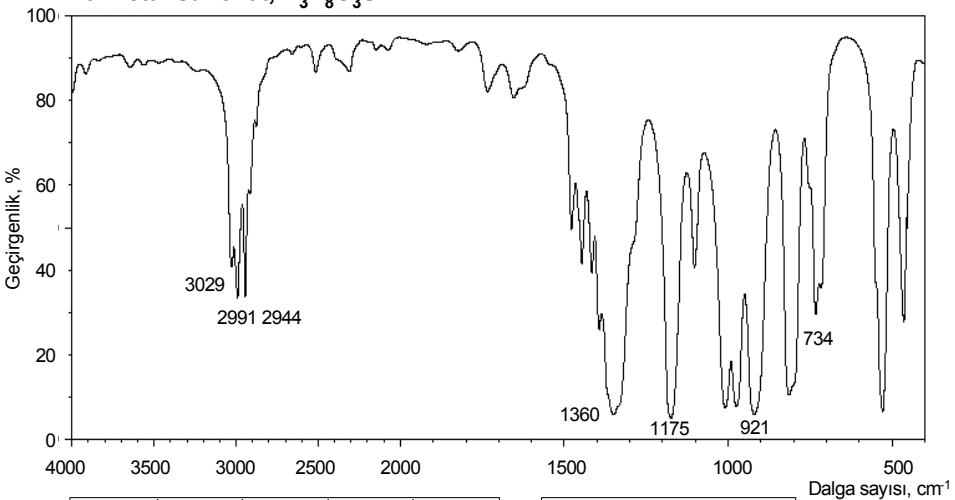
Etil fenil sülfon, $C_8H_{10}O_2S$



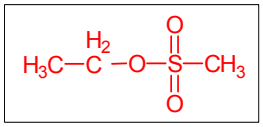
3095	66	1448	18	1236	53	1021	64	691	21
3063	58	1412	60	1228	62	999	62	682	57
2957	23	1404	64	1167	84	787	47	590	26
2925	14	1378	64	1143	4	779	18	584	18
2855	29	1306	8	1086	19	773	23	548	31
1584	62	1292	25	1072	52	734	7	527	26
1468	42	1273	27	1063	39	698	21	515	34



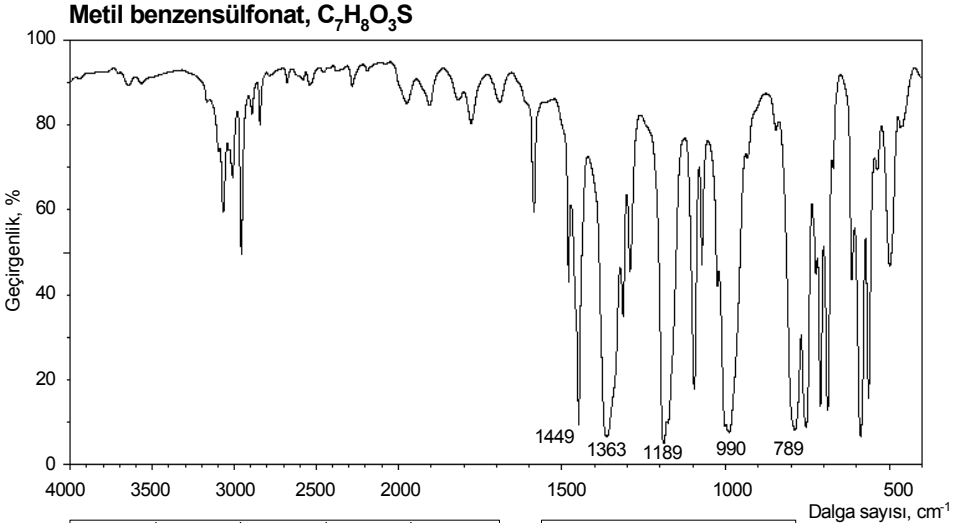
Etl metansülfonat, $C_3H_8O_3S$



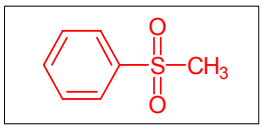
3916	84	2877	70	1447	39	976	7	467	47		
3644	84	2515	84	1416	37	921	5				
3563	84	2309	84	1394	25	815	10				
3029	38	1734	79	1360	6	734	28				
2991	32	1654	77	1175	4	717	34				
2944	32	1646	79	1105	38	529	6				
2917	66	1479	47	1009	7	466	28				



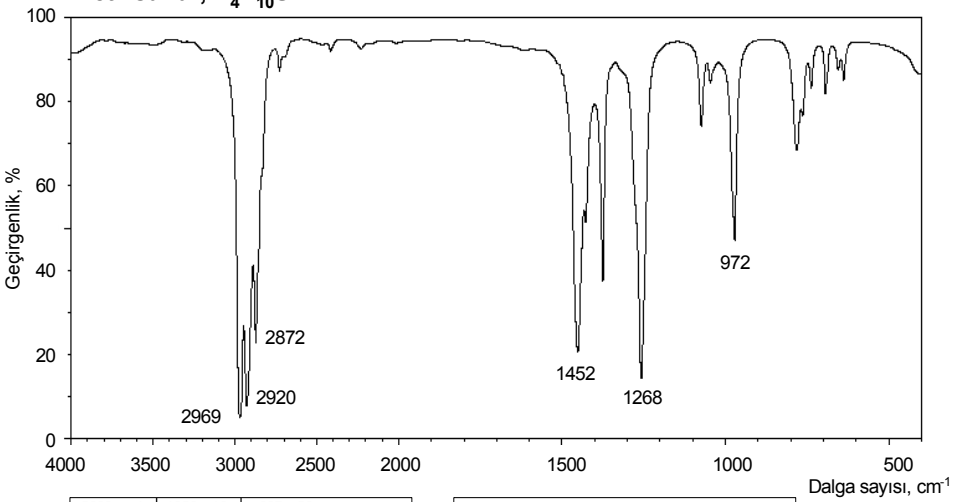
Metil benzensülfonat, $C_7H_8O_3S$



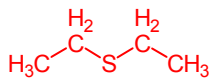
3096	72	1688	81	1189	4	847	77	616	42
3067	57	1586	57	1177	9	789	7	588	6
3009	86	1480	41	1096	17	755	8	564	15
2957	47	1449	8	1073	44	726	49	537	66
2892	79	1363	6	1026	41	711	13	499	44
2843	77	1314	34	1003	8	689	12	467	77
1777	77	1292	43	990	7	672	68	462	77



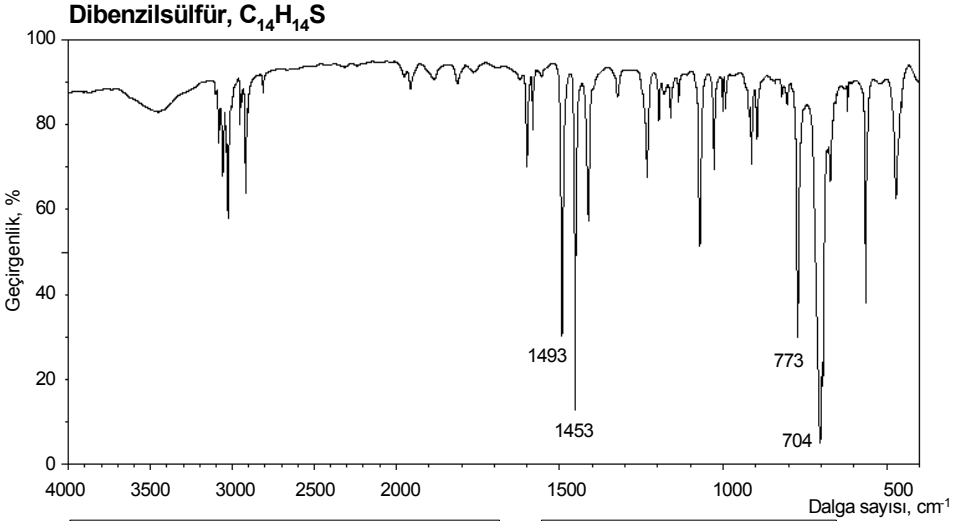
Dietil sülfür, $C_4H_{10}S$



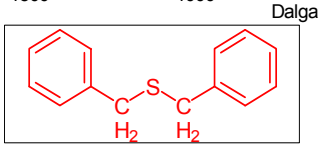
2969	4	1258	18	695	79
2929	7	1074	72	656	84
2872	21	1047	81	639	81
2727	84	972	44		
1452	20	783	66		
1428	49	754	74		
1376	36	738	78		



Dibenzilsülfür, $C_{14}H_{14}S$



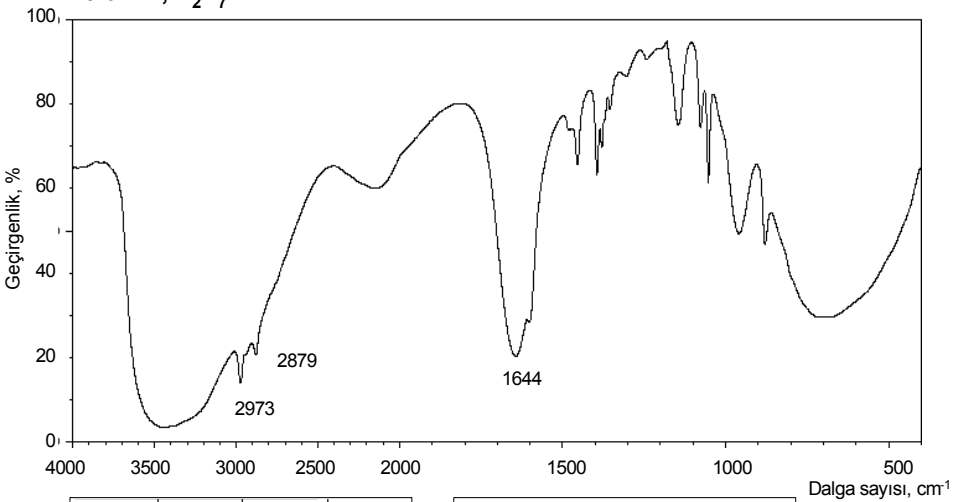
3083	72	1966	84	1197	79	921	78	696	17
3059	66	1600	68	1161	79	914	68	673	64
3059	70	1583	77	1137	81	897	74	621	79
3026	65	1493	29	1073	49	822	84	576	84
2953	77	1453	12	1028	66	805	81	565	37
2920	82	1412	55	1002	79	773	28	473	60
2906	79	1233	68	993	81	704	4	457	81



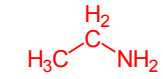
4. AMİNLER

N –H gerilme, alifatik primer amin, 2 bant	3400-3380, 3345-3325 cm^{-1}
> N – H gerilme, alifatik sekonder amin	3360-3310 cm^{-1}
N –H gerilme, aromatik primer amin, 2 bant	3510-3460, 3415-3380
> N – H gerilme, aromatik sekonder amin	~3450 cm^{-1}
> N – H gerilme, heterosiklik amin	3490-3430 cm^{-1}
= N –H gerilme, imino bileşikleri	3350-3320 cm^{-1}
N –H eğilme, primer amin	1650-1590 cm^{-1}
> N – H eğilme, sekonder amin	1650-1550 cm^{-1}
C – N gerilme: Primer amin Sekonder amin Tersiyer amin Aromatik primer amin Aromatik sekonder amin Aromatik tersiyer amin	1370-1000 cm^{-1} 1090-1020 cm^{-1} 1190-1130 cm^{-1} 1210-1150 cm^{-1} 1340-1250 cm^{-1} 1350-1280 cm^{-1} 1360-1310 cm^{-1}

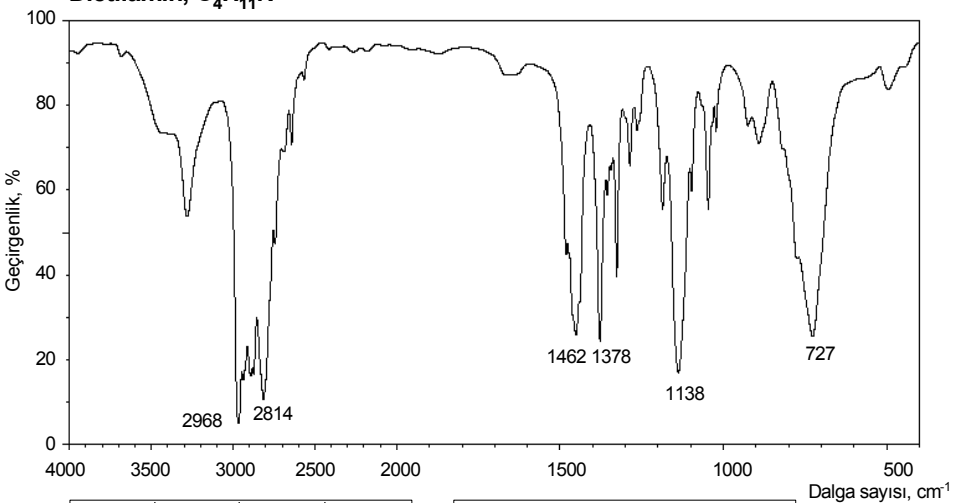
Etilamin, C_2H_7N



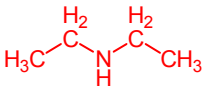
2973	4	1366	66	873	33		
2879	8	1306	77				
1644	8	1147	62				
1471	60	1078	60				
1454	50	1053	46				
1395	47	959	39				
1380	66	880	30				



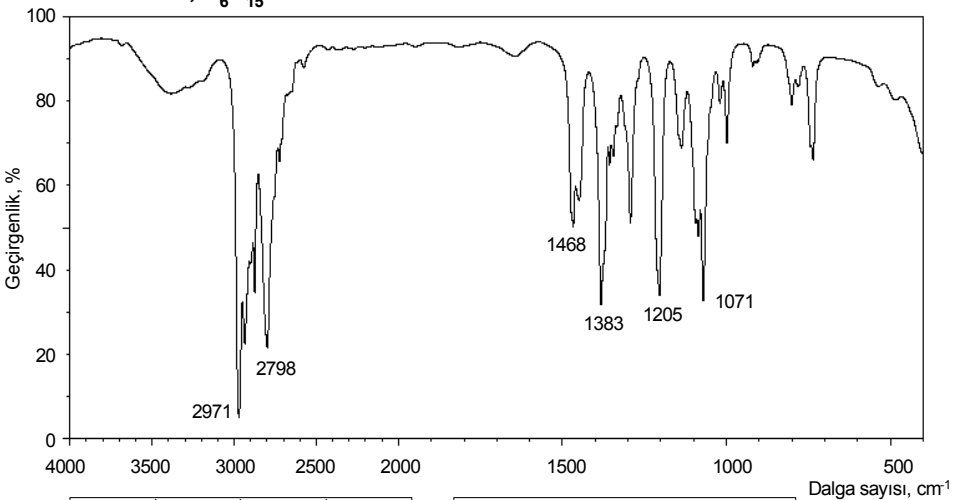
Dietilamin, $C_4H_{11}N$



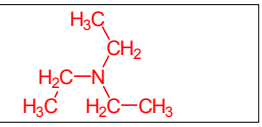
3281	52	2643	68	1287	62	926	72
2968	4	2566	84	1265	72	891	68
2936	14	1462	45	1187	53	727	24
2892	15	1462	24	1138	16	496	81
2873	15	1378	23	1097	57		
2814	10	1358	57	1046	53		
2744	44	1327	38	1023	70		



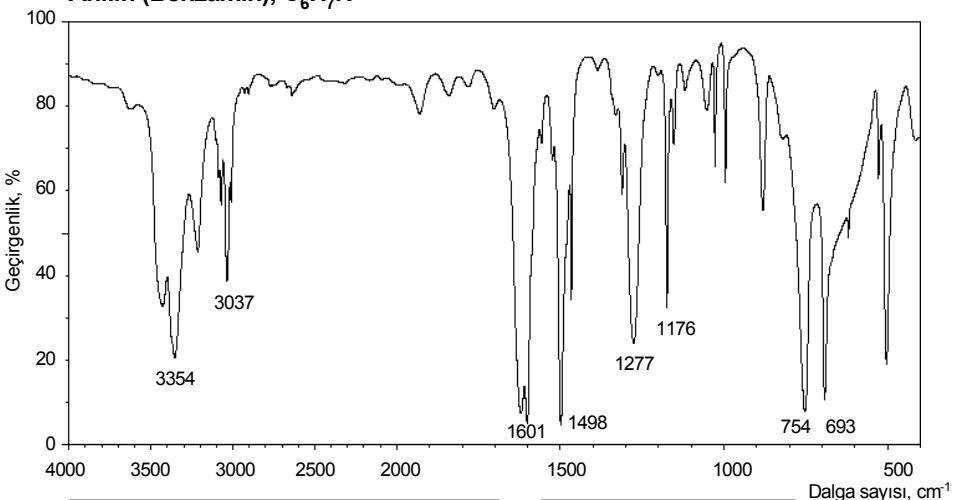
Trietilamin, $C_6H_{15}N$



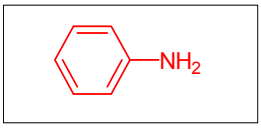
2971	4	1460	56	1096	49	914	86
2936	21	1383	31	1086	46	908	86
2875	33	1357	62	1071	31	903	86
2798	21	1345	64	1020	77	801	77
2723	64	1293	49	1010	81	782	79
2576	84	1205	33	999	88	744	66
1468	49	1138	68	920	84	737	64



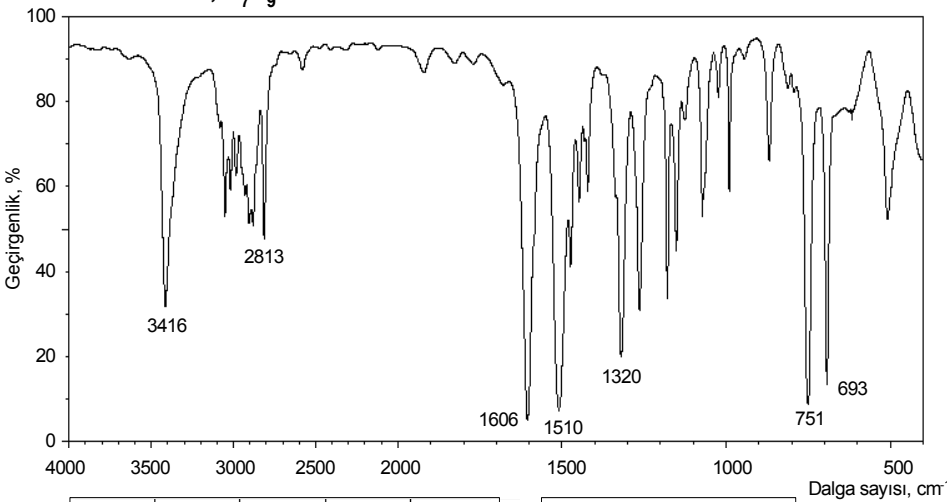
Anilin (Benzamin), C_6H_7N



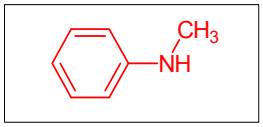
3623	77	3010	57	1705	77	1332	74	996	60
3429	32	2930	81	1621	7	1312	57	881	53
3354	20	2904	78	1601	5	1277	29	754	8
3214	44	2640	78	1567	70	1176	32	693	10
3088	62	2627	81	1525	66	1154	66	620	47
3072	55	1929	77	1498	4	1053	77	529	60
3037	38	1839	78	1467	34	1028	64	504	18



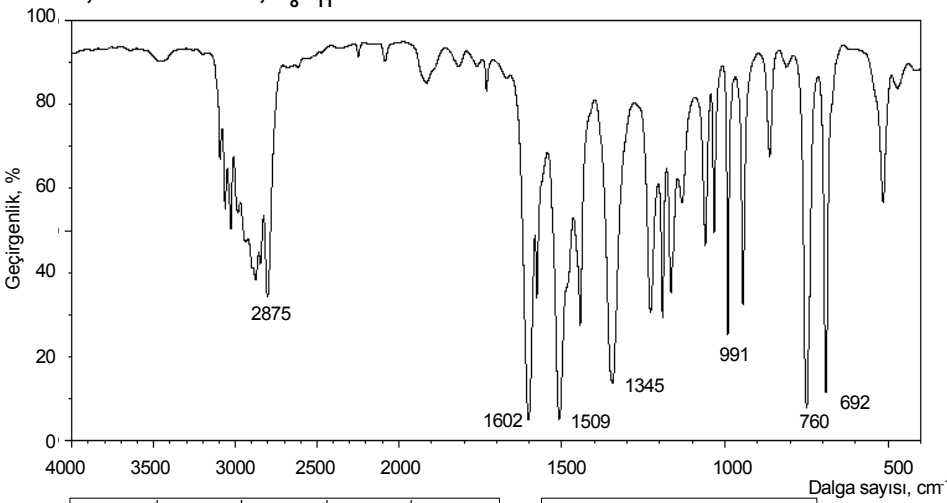
N-Metilanilin, C_7H_9N



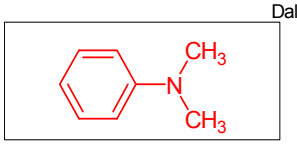
3416	31	2880	49	1610	7	1163	43	796	79
3083	72	2813	46	1474	39	1126	72	751	8
3052	52	2580	84	1446	55	1073	50	693	13
3018	57	1920	84	1422	57	1024	79	623	74
2983	60	1825	86	1320	19	991	57	617	72
2930	55	1769	86	1264	30	869	64	509	50
2906	49	1605	4	1180	32	813	79		



N,N-Dimetilanilin, $C_8H_{11}N$

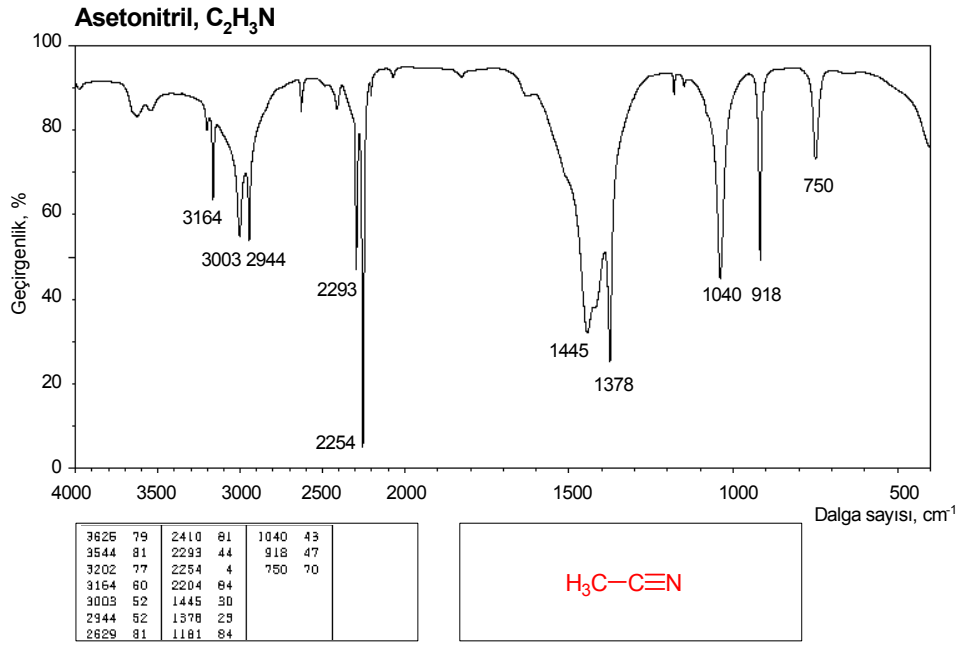


3094	64	2804	39	1609	4	1061	44	760	7
3063	53	1915	81	1444	26	1033	47	692	10
3027	49	1818	86	1345	13	991	29	516	55
2984	52	1760	86	1229	29	981	74	473	81
2893	39	1731	79	1192	27	945	31		
2875	36	1602	4	1167	34	864	64		
2846	41	1577	32	1131	56	813	86		



5. NİTRİLLER

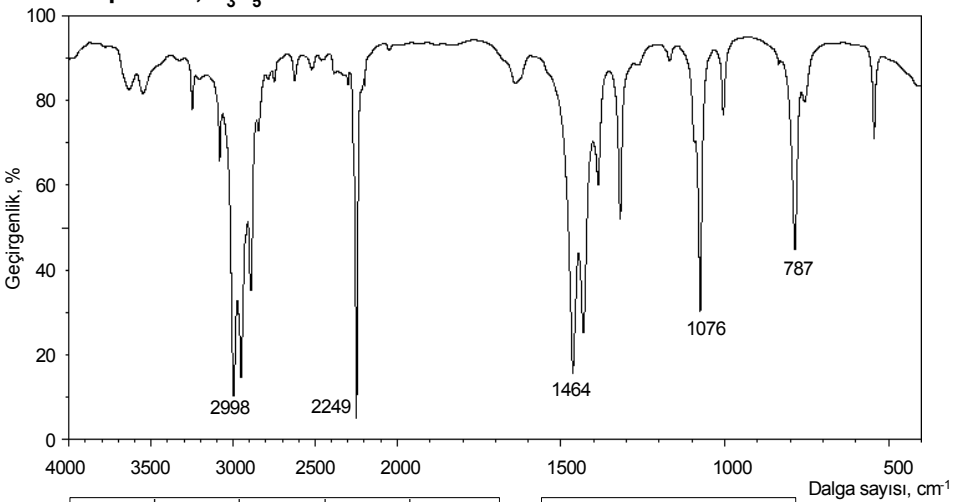
C ≡ N gerilme, alifatik fluorürler	~2250 cm^{-1}



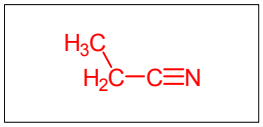
3625	79	2410	81	1040	43
3544	81	2293	44	918	47
3202	77	2254	4	750	70
3164	60	2204	84		
3003	52	1445	30		
2944	52	1378	25		
2629	81	1181	84		

$H_3C-C\equiv N$

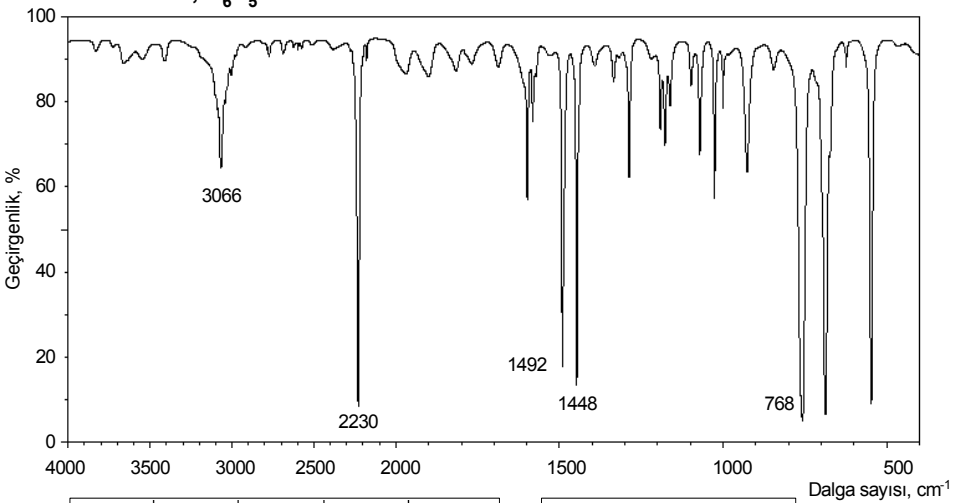
Propionitril, C_3H_5N



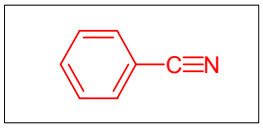
3632	79	2844	70	2299	81	1320	60	645	68
3548	79	2787	81	2248	4	1170	86		
3249	74	2749	81	2196	81	1075	29		
3082	64	2624	81	1639	81	1005	74		
2997	10	2521	84	1464	14	836	84		
2952	13	2461	86	1452	23	786	49		
2891	34	2450	86	1387	58	767	77		



Benzonitril, C_6H_5N

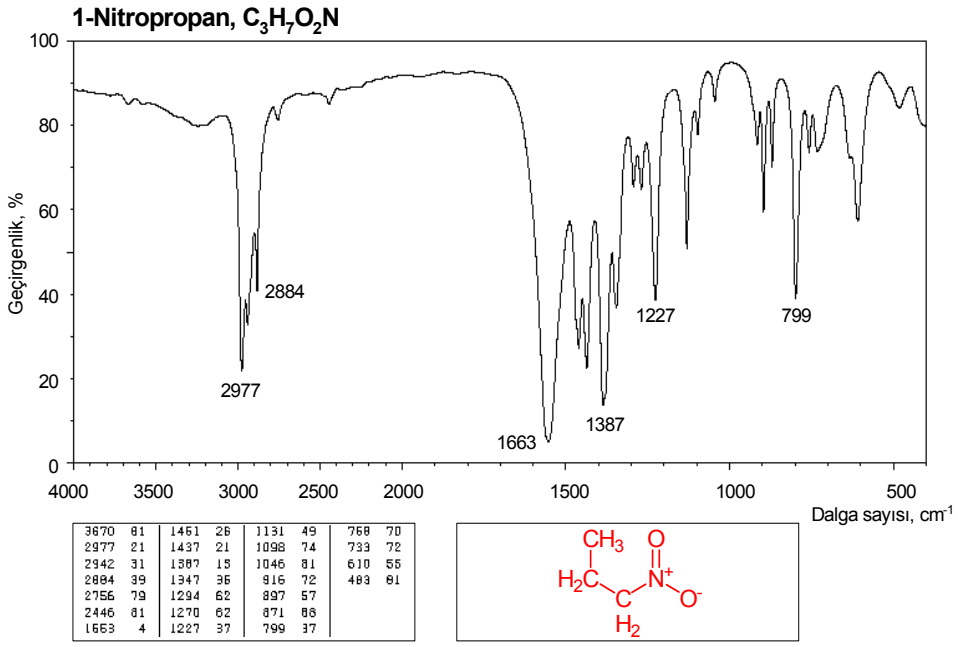


3546	86	2178	86	1582	72	1288	60	1001	74
3412	86	1969	84	1572	81	1193	70	927	60
3068	74	1899	81	1492	17	1178	66	846	64
3066	62	1816	84	1448	12	1163	77	768	4
3004	84	1768	86	1441	72	1098	81	688	6
2256	84	1688	84	1392	84	1072	64	625	64
2230	8	1599	66	1336	81	1027	66	548	8

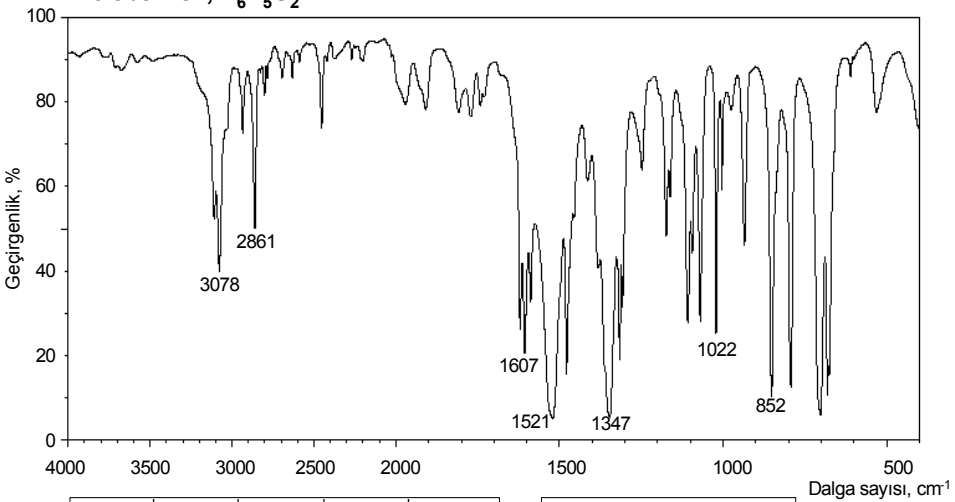


6. NİTRO BİLEŞİKLERİ

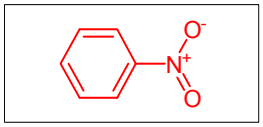
N – O gerilme, alifatik nitro bileşikleri	1600-1530, 1390-1300 $cm^{-1.}$
N – O gerilme, aromatik nitro bileşikleri	1550-1490, 1355-1315 cm^{-1}
N – O gerilme, Organi nitrarlar	1640-1620, 1285-1270 cm^{-1}



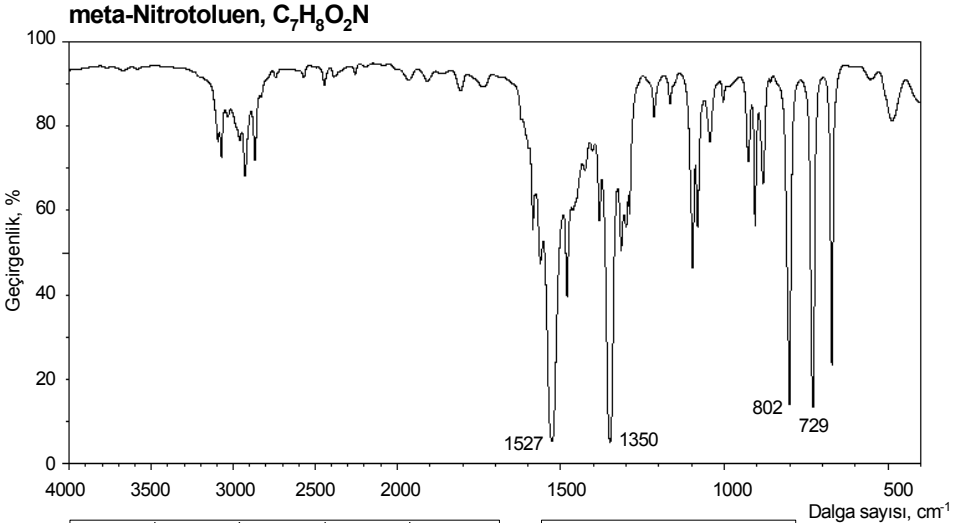
Nitrobenzen, $C_6H_5O_2N$



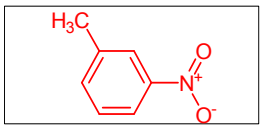
3108	60	1772	74	1416	68	1176	46	976	74
3078	38	1620	25	1382	39	1163	55	935	44
2935	70	1607	20	1363	17	1108	26	852	10
2861	49	1589	31	1347	5	1095	42	794	12
2453	72	1521	4	1317	18	1070	26	703	5
1908	74	1479	14	1306	30	1022	24	682	10
1808	74	1456	60	1248	62	1004	57	676	14



meta-Nitrotoluen, $C_7H_8O_2N$

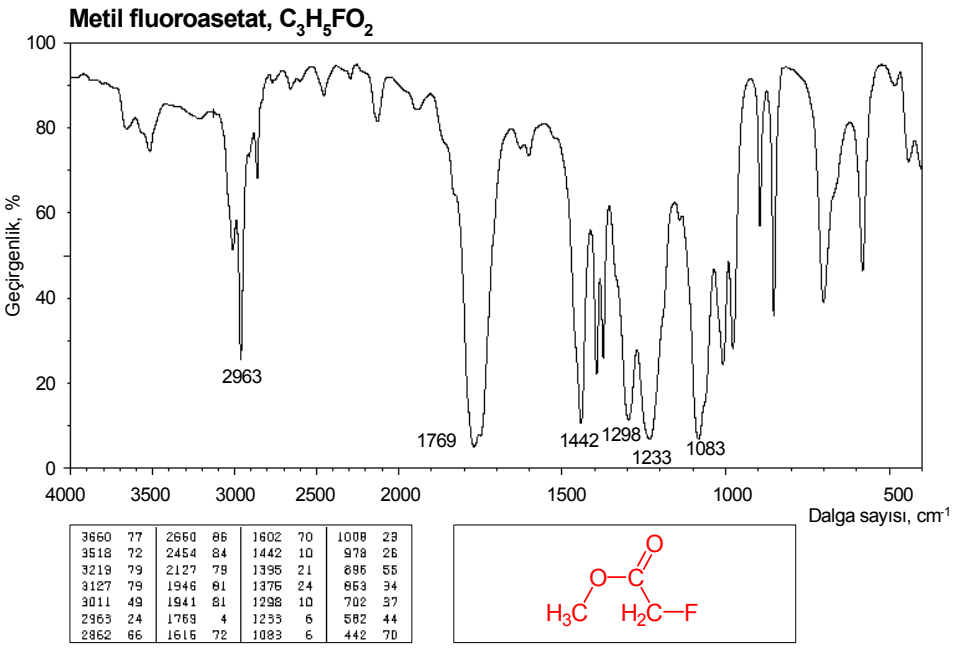


3094	74	1740	86	1403	72	1157	81	927	58
3072	70	1735	86	1382	55	1097	44	906	53
3032	79	1588	53	1350	4	1082	59	862	64
2960	74	1562	46	1316	49	1044	74	802	13
2927	66	1527	4	1301	53	1004	81	729	12
2867	70	1482	38	1290	57	993	86	672	22
1806	84	1427	66	1216	79	988	86	488	79

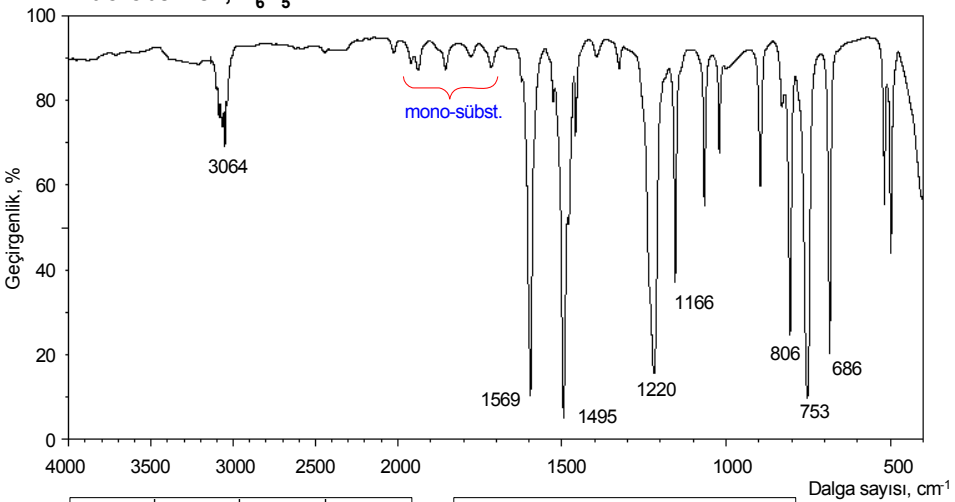


7. HALOJENLİ BİLEŞİKLER

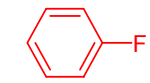
C – F gerilme, alifatik fluorürler	1400-1000 cm^{-1}
C – F gerilme, aril fluorürler	1250-1100 cm^{-1}.
C – Cl, gerilme, alifatik klorürler	785-540 cm^{-1}
C – Cl, gerilme, aril klorürler	1100-1035 cm^{-1}
CH_2 – Cl eğilme	1300-1230 cm^{-1}
C – Br gerilme, alifatik bromürler	650-510 cm^{-1}
C – Br gerilme, aril bromürler	1075-1030
CH_2 – Br eğilme	1250-1190 cm^{-1}
C – I gerilme	600-485 cm^{-1}
CH_2 – I eğilme	1200-1150 cm^{-1}



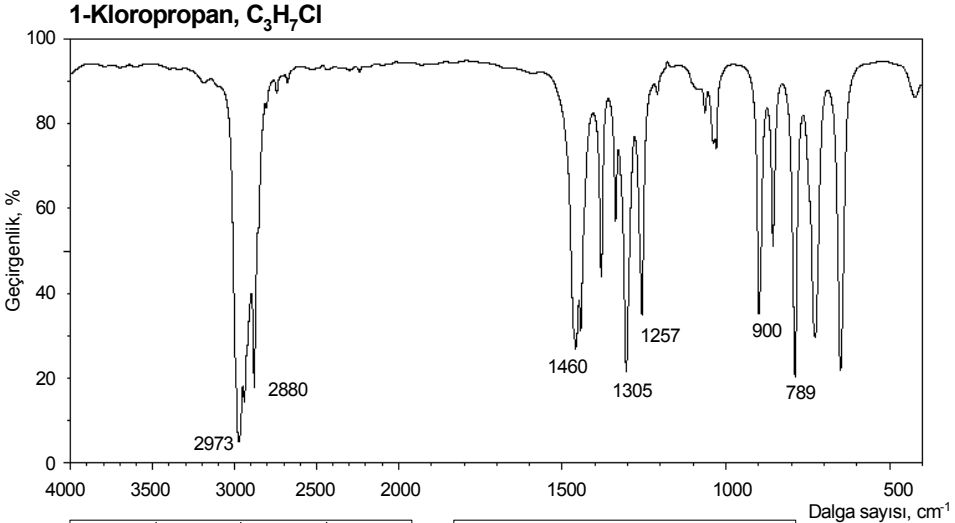
Fluorobenzen, C_6H_5F



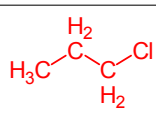
3087	72	1596	9	1156	35	686	19
3064	70	1527	77	1066	53	519	53
3051	86	1495	4	1021	84	511	81
1961	86	1480	49	896	57	499	42
1937	84	1459	68	831	74		
1854	84	1328	84	806	23		
1716	84	1220	14	763	9		



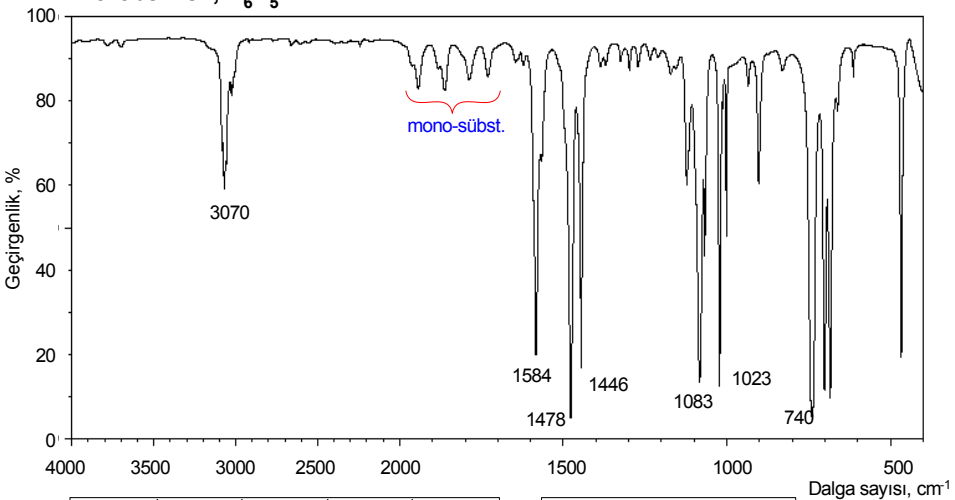
1-Kloropropan, C_3H_7Cl



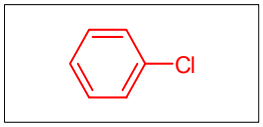
2973	4	1381	42	1030	72
2941	13	1338	55	900	34
2880	17	1305	20	857	49
2743	84	1257	33	789	19
2678	86	1210	84	728	28
1460	25	1065	79	651	20
1444	30	1038	72	426	84



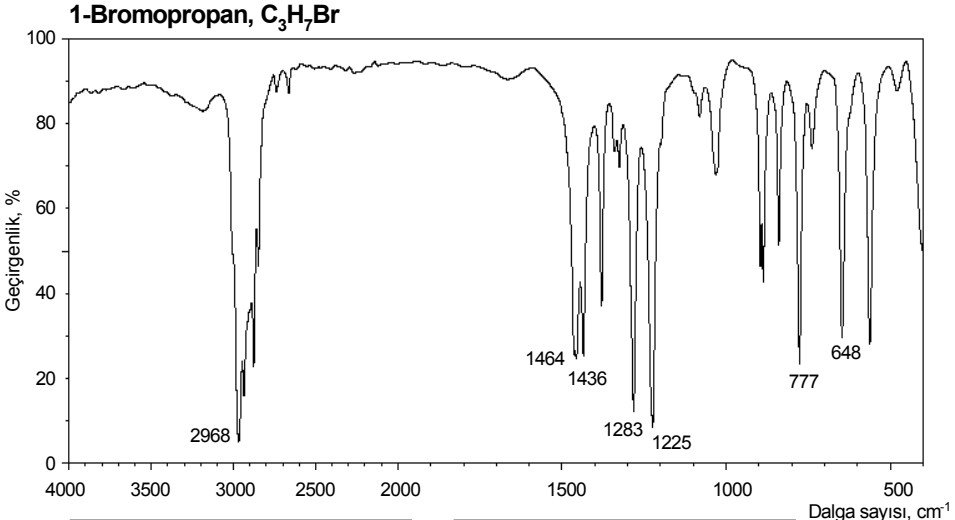
Klorobenzen, C_6H_5Cl



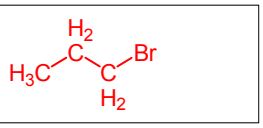
3084	66	1876	84	1478	4	1083	13	831	84
3070	57	1862	79	1446	16	1068	42	740	5
3059	82	1788	81	1298	84	1023	12	702	10
3026	79	1730	81	1273	84	1013	74	685	9
3016	79	1622	84	1172	84	1002	46	662	74
1956	84	1584	18	1165	84	935	81	614	81
1943	79	1566	62	1123	68	903	68	468	18



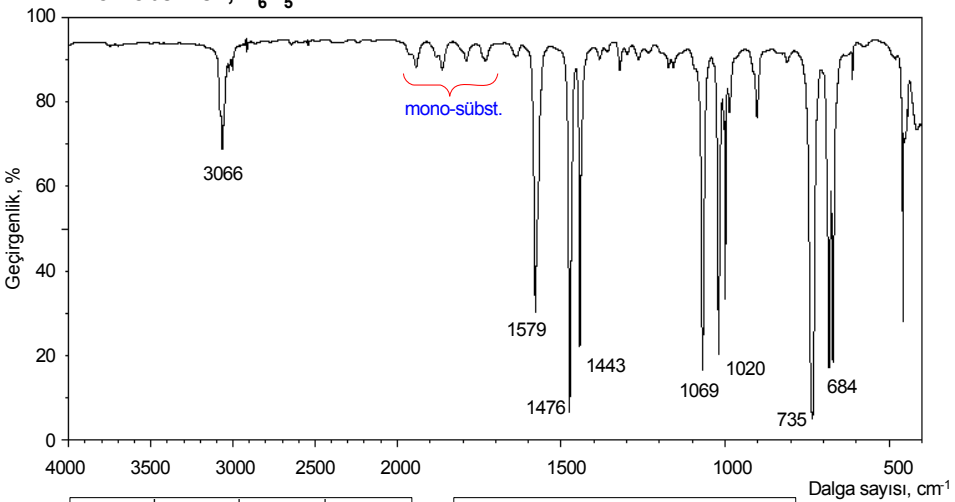
1-Bromopropan, C_3H_7Br



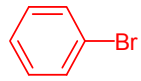
3196	79	2663	84	1283	11	840	49
3186	79	1464	24	1225	8	777	22
2968	4	1457	23	1086	81	739	70
2937	15	1436	23	1080	79	648	28
2877	21	1380	35	1032	66	563	26
2848	44	1340	70	896	44	460	84
2739	84	1326	66	887	41		



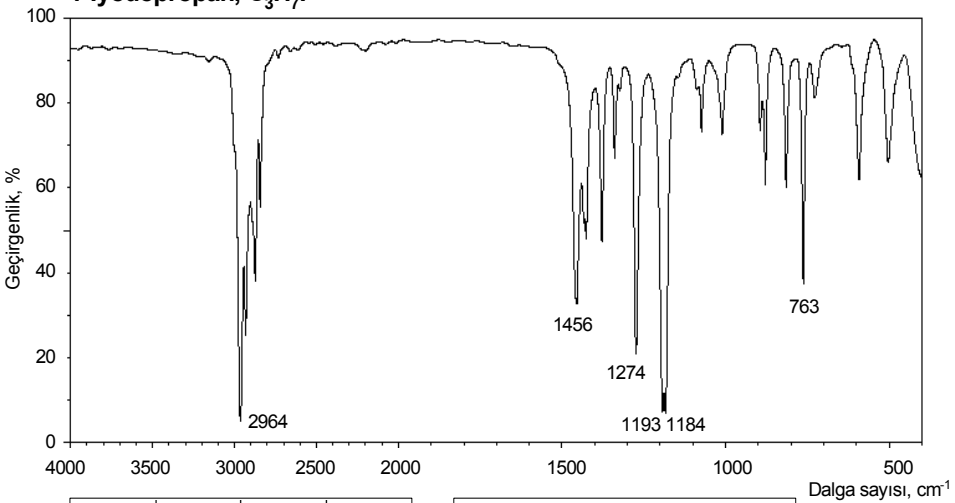
Bromobenzen, C_6H_5Br



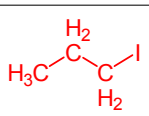
3077	74	1790	86	1168	84	812	85
3066	66	1730	86	1069	15	735	4
3055	72	1579	29	1020	19	684	15
3024	84	1476	6	1005	70	672	17
3003	84	1443	21	1000	32	613	81
1942	84	1322	84	986	74	457	25
1862	84	1174	84	903	72	447	72



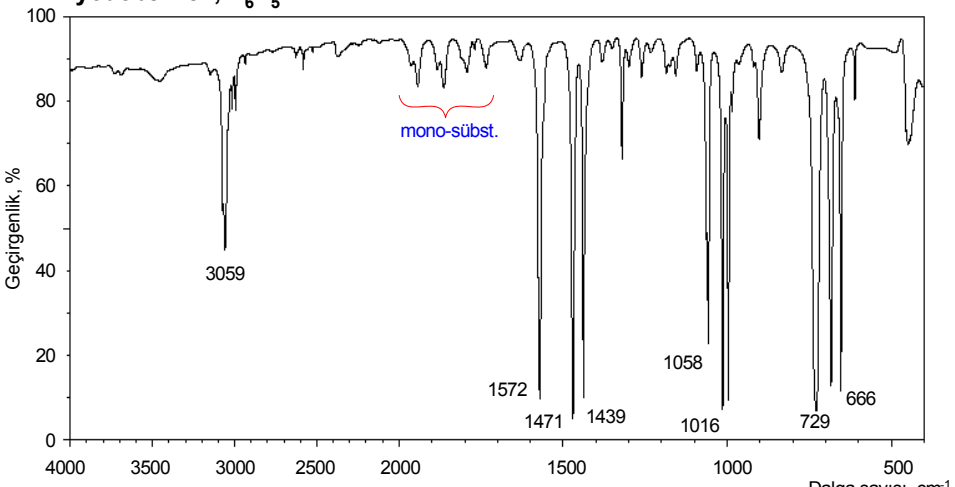
1-İyodopropan, C_3H_7I



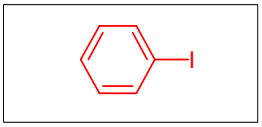
3155	86	1427	46	1089	79	728	79
2964	4	1379	46	1074	70	604	79
2933	23	1340	64	1011	70	594	58
2873	36	1324	79	896	70	505	64
2843	53	1274	20	879	58		
1456	31	1193	7	816	58		
1434	49	1184	6	763	36		



İyodobenzen, C_6H_5I



3476	81	2996	74	1439	9	1093	84	835	84
3465	81	1943	81	1321	64	1064	44	729	6
3455	81	1883	84	1300	84	1058	21	685	12
3148	84	1863	79	1262	81	1015	6	655	10
3072	52	1735	84	1186	84	997	8	612	77
3059	43	1572	9	1175	84	985	74	457	70
3017	74	1471	4	1157	81	903	68	450	66



Tipik Fonksiyonel Grupların IR Absorbsiyon Frekansları

Fonksiyonel Grup	Moleküler Hareket	Dalga Sayısı (cm^{-1})
Aklanlar	C-H gerilme	2950-2800
	CH_2 eğilme	~1465
	CH_3 eğilme	~1375
	CH_2 eğilme ($\geq$4)	~720
Alkenler	=CH gerilme	3100-3010
	C=C gerilme (izole)	1690-1630
	C=C gerilme (konjuge)	1640-1610
	C-H düzlem içi eğilme	1430-1290
	C-H eğilme (monosübstitüe)	~990 ve ~910
	C-H eğilme (disübstitüe- E)	~970
	C-H eğilme (disübstitüe - 1,1)	~890
	C-H eğilme (disübstitüe - Z)	~700
	C-H eğilme (trisübstitüe)	~815
Alkinler	asetilenik C-H gerilme	~3300
	C≡C gerilme	~2150
	asetilenik C-H eğilme	650-600
Aromatikler	C-H gerilme	3020-3000
	C=C gerilme	~1600 ve ~1475
	C-H eğilme (mono)	770-730 ve 715-685
	C-H eğilme (orto)	770-735
	C-H eğilme (meta)	~880 ve ~780 ve ~690
	C-H eğilme (para)	850-800
Alkoller	O-H gerilme	~3650 or 3400-3300
	C-O gerilme	1260-1000
Eterler	C-O-C gerilme (dialkil)	1300-1000
	C-O-C gerilme (diari)	~1250 ve ~1120
Aldehitler	C-H aldehit gerilme	~2850 ve ~2750
	C=O gerilme	~1725

Ketonlar	C=O gerilme	~1715
	C-C gerilme	1300-1100
Karboksilik Asitler	O-H gerilme	3400-2400
	C=O gerilme	1730-1700
	C-O gerilme	1320-1210
	O-H eğilme	1440-1400
Esterler	C=O gerilme	1750-1735
	C-C(O)-C gerilme (asetatlar)	1260-1230
	C-C(O)-C gerilme (diğerleri)	1210-1160
Asit Klorürler	C=O gerilme	1810-1775
	C-Cl gerilme	730-550
Anhidritler	C=O gerilme	1830-1800 ve1775-1740
	C-O gerilme	1300-900
Aminler	N-H gerilme (1/ N-H bağı)	3500-3300
	N-H eğilme	1640-1500
	C-N gerilme (alkil)	1200-1025
	C-N gerilme (aril)	1360-1250
	N-H eğilme (düzlem dışı)	~800
Amidler	N-H gerilme	3500-3180
	C=O gerilme	1680-1630
	N-H eğilme	1640-1550
	N-H eğilme (1)	1570-1515
Alkil Halojenürler	C-F gerilme	1400-1000
	C-Cl gerilme	785-540
	C-Br gerilme	650-510
	C-I gerilme	600-485
Nitriller	C≡N gerilme	~2250
İzosiyanatlar	-N=C=O gerilme	~2270
İzotiyosiyanatlar	-N=C=S gerilme	~2125
İminler	R_2C=N-R gerilme	1690-1640
Nitro Grupları	-NO_2 (alifatik)	1600-1530 ve 1390-1300

	-NO_2 (aromatik)	1550-1490 ve 1355-1315
Merkaptanlar	S-H gerilme	~2550
Sülfoksitler	S=O gerilme	~1050
Sülfonlar	S=O gerilme	~1300 ve ~1150
Sülfonatlar	S=O gerilme	~1350 ve ~11750
	S-O gerilme	1000-750
Fosfinler	P-H gerilme	2320-2270
	PH eğilme	1090-810
Fosfin Oksitler	P=O	1210-1140

Yararlanılan Kaynaklar

http://www.chemistry.ccsu.edu/glagovich/teaching/316/ir/ir.html

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

http://infrared.als.lbl.gov/BLManual/IR_Interpretation.pdf