Supplementary Information

A Rapid Identification of Hit Molecules for Target Proteins via Physico-Chemical Descriptors

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Supplementary Table 1. PDBIDs and Physico-Chemical parameters of 63 Protein-ligand complexes (training set)

PDBID	PD	PA	PP	PMR	Volume	DD	DA	P	MR	W	BE (Expt.)	BE (Pred)
1a4w	5	5	0.81	38.19	1122	6	11	2.27	165.9	4854.69	-8.1	-10.2
1a9m	8	7	2.22	65.11	1228	13	14	-2.35	157.59	6315.12	-9.4	-11.1
1afl	5	3	0.49	9.71	594	4	18	-5.76	91.49	1754.48	-8.5	-8.5
1apv	7	7	1.06	50.01	1204	6	10	0.91	130.56	3760.75	-12.4	-9.6
1ba8	5	5	0.87	30.41	1092	7	11	-2	118.29	2829.55	-12.3	-8.7
1bdr	7	6	1.9	53.56	885	4	8	4.97	151.87	4502.18	-9.1	-12
1bim	6	7	0.63	48.79	1101	4	11	4.03	187.69	7755.98	-12.1	-10.4
1bra	5	3	0	4.49	1675	4	2	-0.33	37.85	59.09	-2.5	-4.8
1c2t	5	4	1.52	32.09	1309	4	12	-3.17	113.59	3547.35	-11.1	-9.7
1cbs	7	5	1.72	47.42	716	0	2	4.27	91.13	1021.33	-9.8	-9.9
1d4l	7	7	2.3	71.32	944	5	10	4.57	167.93	5257.99	-11.9	-12
1dmp	7	6	1.28	35.18	974	6	7	4.23	158.07	4096.16	-13	-12.5
1dr1	3	3	1.24	23.94	733	6	8	-1.21	58.38	379.75	-7.6	-5.9
1drf	4	4	1	19.28	1315	5	13	-3.38	108.15	2907.69	-10.1	-8.8
1dwc	4	3	0.4	16.56	1113	7	11	-1.47	129.3	2866.11	-10.1	-8.6
1dwd	6	5	1.49	49.37	1371	6	9	1.92	143.1	3639.76	-11.1	-10.2
1dy9	4	3	0.95	21.44	1046	3	12	-1.6	111.35	3507.21	-10.3	-9.1
1ela	5	5	0.94	34.38	1404	5	7	2.2	113.49	2765.65	-8.7	-8.2
1epo	5	6	0.57	35.11	1242	6	12	1.83	165.62	7093.18	-10.9	-9.7
1hbv	7	7	2.25	73.14	1225	5	10	2.17	164.18	5858.58	-8.7	-11.6
1hge	2	2	0	3.95	718	5	10	-4.55	66.95	836.85	-3.1	-4.1
1hgg	5	4	0.58	29.68	1315	12	20	-9.56	127.42	5214.9	-3.4	-5.6
1hgh	3	2	0	6.7	1033	5	10	-4.55	66.95	836.85	-3.9	-4.3
1hgi	2	2	0	6.21	1171	4	11	-3.98	76.5	1155.64	-3.7	-4.5
1hgj	2	2	0	6.71	1217	7	10	-5.3	67.62	838.98	-2.3	-3.1
1hri	6	6	2.38	79.07	790	1	4	3.6	82.95	1026.72	-5.9	-7.2
1hvi	8	7	2.52	79.22	794	6	14	3.69	221.89	13644.07	-13.7	-13.7
1hvk	8	8	3.48	96.5	1211	6	14	3.69	221.89	13644.07	-13.8	-14.3
1hvr	7	6	2.71	81.53	1077	2	5	7.38	184.26	5902.99	-13	-12.4
1hxw	8	7	3.36	93.88	1230	4	11	5.91	196.9	9308.03	-14.5	-13.5
1lyb	8	9	3.29	103.15	1432	7	14	0.13	179.62	9453.34	-15.6	-12.2
1mcb	4	5	0.58	45.18	1294	6	14	-2.32	142.07	5066.32	-6.6	-6.8
1mch	6	6	0.49	52.92	978	8	18	-3.31	177.33	10126.48	-7	-7.8
1mcj	4	4	0.31	26.33	964	5	10	-0.34	115.9	2551.9	-5.2	-7.5
1mtw	5	4	0.75	37.35	1226	6	7	0.44	127.15	2874.06	-10.1	-8.2
1ola	7	5	0.76	24.22	852	8	10	-1.94	101.73	1956.49	-9.5	-9.4
1pgp	5	2	0	0	1792	4	10	-5.97	43.97	446.94	-7.8	-4.5
1qbr	9	8	3.54	100.01	980	4	11	6.49	209.38	9537.35	-14.4	-14.9

1qbu	8	7	2.41	76.27	720	3	8	4.99	166.76	5233.91	-14	-12.7
1rbp	7	7	2.76	73.41	586	1	1	5.51	93.21	900.25	-9.2	-9.9
1rgk	3	3	0.22	10.44	311	5	12	-1.97	71.74	807.91	-5.9	-5.9
1rgl	3	2	0.19	7.07	670	5	13	-3.96	71.83	887.63	-6	-5.4
1sre	4	3	1.03	30.4	583	1	5	2.17	63.06	463.42	-5.5	-6.3
1tlc	6	5	1.74	45.7	997	2	10	0.85	130.86	3901.61	-11	-11.6
1tng	5	3	0	9.92	1262	3	1	0.81	34.33	63.25	-4	-4.3
1tnj	4	4	0	13.35	558	3	1	0.47	37.9	75.12	-2.7	-4.1
1tnk	4	4	0	24.05	554	3	1	0.86	42.52	111.04	-2	-3.2
2acs	2	1	0	0	1088	1	7	-5.25	29.2	213.61	-2.8	-2.5
2cgr	5	4	0.36	36.6	644	2	6	2.26	109.12	1771.2	-9.9	-7.1
2cmd	5	1	0	0	506	1	7	-5.25	29.2	213.61	-6.2	-4.7
2msb	1	1	0	0	532	15	25	-10.59	170.17	11954.29	-3.9	-4.7
2wea	5	6	0.25	25.89	1609	2	9	2.88	145.38	3491.12	-8.4	-9.8
2wec	5	6	0.7	33.99	1285	2	9	2.95	142.76	4124.83	-6.8	-9.9
2ypi	5	2	0	5.16	369	0	6	-3.42	19.94	55.82	-6.6	-4.4
4dfr	6	4	1.4	34.63	1003	6	13	-2.19	113.97	2997.15	-13.2	-9.9
4est	8	7	1.19	64.67	1491	3	9	1.97	127.54	3880.27	-9.6	-9
4phv	6	6	1.48	51.27	1111	5	7	4.16	175.65	7243.22	-12.5	-11.1
4ts1	5	5	0	3.29	1335	4	4	-1.7	43.49	218.04	-7.6	-5.7
5hvp	9	8	3.48	98.69	1246	7	14	-0.89	165.84	7848.16	-10.5	-13.1
5tim	6	0	0	0	1117	0	4	-0.26	10.52	5	-3.1	-4.7
7dfr	6	4	1.58	28.54	861	5	13	-2.3	105.48	2830.36	-10.1	-10.8
8gpb	6	3	0	6.79	1187	4	12	-3.13	70.59	842.57	-4.9	-7.1
1a4k	6	4	0.94	20.21	1201	2	10	-0.05	104.3	2232.54	-6.8	-10.9

Supplementary Table 2. PDBIDs and Physico-Chemical parameters of 352 Protein-ligand complexes (test set)

PDBID	PD	PA	PP	PMR	Volume	DD	DA	P	MR	W	BE (Exp)	BE (Pred)
1a30	4	4	1.01	28.23	1009	1645.36	5	11	5.97	78.86	-5.8	-6
1aaq	8	8	3.35	92.94	970	5942.44	8	12	0.56	152.83	-11.4	-12.4
1ae8	5	4	0.62	19.44	1282	2374.41	7	9	0.23	112.96	-9	-8.9
1afk	5	3	0.76	15.08	1215	1754.48	4	18	5.76	91.49	-9	-8.3
1ajv	7	7	2.63	76.24	1155	3947.5	2	8	4.95	156.4	-10.6	-12.3
1ajx	7	6	1.26	34.64	1148	4157.84	2	7	4.74	152.83	-10.9	-12.8
1anf	4	3	0.48	18.49	1434	962.92	8	11	5.4	68.62	-7.4	-4.3
1apt	6	7	0.68	37.42	1399	3754.35	7	10	0.53	133.79	-12.8	-9.4
1apu	6	7	0.67	36.87	1065	3424.13	4	9	2.16	131.63	-10.5	-9.8
1apw	6	7	0.66	39.01	1385	3564.44	5	9	1.59	129.4	-10.9	-9.1
1b38	6	5	1.07	25.66	573	1711.54	4	18	4.16	89.35	-9.4	-9.6
1b39	6	5	0.86	21.75	820	1711.54	4	18	4.16	89.35	-9	-9.3
1b5g	6	6	1.12	47.62	1267	4742.12	8	10	0.19	154.28	-10.9	-10.1
1b6j	8	7	2.91	84.59	1037	8739.9	10	15	2.19	179.62	-10.8	-12.2
1b6k	7	7	2.73	74.58	1161	8325.84	7	12	1.03	184.56	-11.9	-13.2
1b6l	6	6	1.75	47.94	970	4426.75	7	11	1.04	144.79	-11.3	-11.4
1b6m	7	7	2.33	70.25	1242	5888.35	6	10	2.09	164.54	-11.4	-12
1bb0	5	4	0.88	24.46	846	3574.22	6	11	0.05	130.56	-11.4	-10.4
1bil	7	7	0.85	52.13	1509	6649.58	5	10	4.18	178.19	-12.6	-10.5
1bmm	5	5	1.12	43.81	1242	3389.8	8	11	1.2	131.38	-9.8	-8.4
1bmn	6	5	1.09	42.58	1145	3794.8	7	11	0.36	139.03	-11.6	-9.9
1bv7	9	8	3.95	107.59	1048	9537.35	4	11	6.49	209.38	-12.6	-15.1
1c5c	5	3	0.67	19.03	1156	557.61	1	8	2.77	74.27	-9.5	-7.7
1c83	6	3	0.94	30.33	1042	435.59	2	7	1.78	56.27	-6.6	-6.7
1c84	6	3	0.89	28.89	867	506.96	1	6	1.11	61.92	-6.8	-7.4
1c86	6	3	0.98	23.01	815	430.1	1	7	2.36	54.71	-7.1	-7.7
1c87	5	3	0.99	23.07	956	430.1	1	7	2.36	54.71	-6.6	-7
1c88	5	3	0.96	31.17	846	433.69	3	7	3.81	55.55	-8.9	-5.5
1c8k	3	3	0.34	14.04	763	1462.84	4	6	1.73	104.14	-6.8	-7.4
1cf8	7	6	1.28	75.66	1271	3228.77	2	9	1.78	121.44	-8.2	-7.3
1com	4	1	0	0	769	365.74	1	6	3.08	46.36	-5.4	-5.3
1cqp	3	3	0.56	16.86	813	2045.71	1	5	4.2	110.84	-6.6	-8
1ctr	2	3	1	20.67	1933	1676.31	0	3	4.95	107.57	-5.8	-7.4
1d3h	4	4	1.02	31.83	821	620.83	2	4	2.16	60.86	-6	-5.9
1d3p	7	6	1.25	55.48	951	4638.36	1	6	6.21	158.31	-10.1	-10.7
1d4p	5	5	1.11	39.06	1310	1749.21	5	5	1.73	107.29	-8.6	-8.1

1dg5	3	3	0.71	13.38	1279	715.08	4	7	1.26	79.76	-5.5	-7
1dhf	5	4	1.46	27.33	1201	2886.87	5	13	2.65	105.88	-10.1	-9.8
1dog	2	2	0	0	655	132.78	5	5	2.97	36.9	-5.5	-3
1dwb	3	3	0	4.49	661	59.09	4	2	0.33	37.85	-4	-4
1eap	6	4	0.28	29.3	960	947.42	1	7	0.78	81.06	-8.5	-7.2
1elc	7	6	0.92	46.05	1154	3722.38	6	7	2.94	130.83	-9.8	-9
1epp	8	8	1.73	73.04	1108	6161.4	8	12	1.42	167.73	-9.8	-11
1etr	4	4	0.38	15.92	1599	2866.11	7	11	1.47	129.3	-10.1	-8.7
1ets	7	6	1.49	49.88	1452	3639.76	6	9	1.92	143.1	-11.2	-10.9
1ett	4	4	0.37	22.21	1143	1855.31	5	7	1.96	117.32	-8.4	-7.8
1fax	7	6	1.01	45.18	996	2898.95	5	7	1.35	127.26	-10.1	-9.9
1fkg	3	3	0.94	24.01	1060	2837.39	0	5	5.29	128.47	-8.8	-9
1flr	6	3	0.46	32.25	905	930.48	1	5	1.83	90.18	-6.3	-7.4
1g2k	7	7	2.44	75.06	1148	5122.03	3	10	4.31	169.79	-10.8	-12.5
1gno	7	7	2.09	67.39	1076	6315.12	13	14	2.35	157.59	-10.6	-9.9
1gpy	5	2	0	0	1370	325.4	4	9	4.37	43.83	-6.4	-5
1hdt	4	4	0.36	19	1442	5211.92	9	12	2.08	148.14	-10.7	-8.4
1hew	5	3	1.18	26.76	634	5289.26	11	19	7.14	136.05	-8.2	-8.6
1hih	7	6	1.22	39.62	1043	5229.88	5	10	2.31	159.26	-11	-12.3
1hii	6	6	1.73	48.43	1035	5229.88	5	10	2.31	159.26	-9.9	-12
1hiv	8	8	3.03	86.44	1153	14528.96	6	14	4.57	223.6	-12.6	-14
1hos	9	8	3.83	107.34	1403	10442.37	4	12	5.9	209.22	-11.7	-14.5
1hpo	6	6	1.97	53.9	933	3000.38	2	7	6.84	134.12	-11.8	-10.8
1hps	9	8	3.33	93.6	667	7648.47	4	9	6	181.73	-12.7	-14
1hpv	7	6	1.88	51.73	921	2999.86	4	9	3.48	133.28	-12.6	-11.7
1hpx	6	6	2.05	61.83	1100	7210.7	4	11	2.37	181.49	-12.5	-12.4
1hrn	7	6	0.96	51.17	1488	4064.21	5	6	3.98	142.2	-10.9	-9
1hsg	7	7	2.79	81.16	925	6952.26	4	9	2.63	173.13	-12.9	-12.6
1hsh	7	7	2.67	78.93	1332	6952.26	5	9	1.22	172.26	-11.7	-12.4
1hte	5	4	1.34	35.34	1228	2336.73	4	7	0.44	116.54	-7.7	-9.8
1htg	8	8	3.64	99.88	1261	12138.69	7	12	3.51	213.39	-13.2	-13.9
1hvh	7	7	2.52	69.23	1249	5134.68	5	8	3.07	167.87	-10.8	-12.9
1hvj	7	7	2.51	78.63	1237	13280.22	5	13	4.71	220.5	-14.3	-12.8
1hvl	8	8	3.44	97.9	1510	13644.07	6	14	3.69	221.89	-12.3	-13.9
1hxb	7	7	1.99	62.78	1148	8320.63	7	11	1.68	187.34	-13.5	-12.6
1ida	9	8	3.03	88.49	1315	9859.17	4	10	5.15	207.73	-11.9	-14.7
1mcf	4	4	0.56	35.23	1172	10126.48	8	18	3.31	177.33	-7	-8
1mcs	3	3	0.35	21.62	1093	5066.32	6	14	2.32	142.07	-6.6	-7.7
1nnb	6	3	0	0	1029	669.06	5	9	4.4	60.67	-5.5	-6.8
1nsd	6	3	0	0	1089	669.06	5	9	4.4	60.67	-7.2	-6.8
1phh	3	2	0	0	610	110.1	2	4	0.54	34.1	-4	-4.5
1ppc	5	5	0.96	39.04	1013	3639.76	6	9	1.92	143.1	-8.4	-9.5

1pph	4	3	0.38	26.81	1102	1841.37	5	7	1.44	116.13	-8.5	-7.2
1qbt	10	9	4.82	123.22	1344	14312.69	6	13	7.33	237.34	-14.5	-16.3
1tmt	5	5	1.4	41.06	1532	2404.24	8	10	3.01	107.8	-8.5	-7.7
1tnh	4	3	0	15.98	1156	66.49	3	1	0.57	32.99	-4.6	-3
1tni	4	3	0	18.63	628	156.97	3	1	1.25	47.14	-2.3	-3.7
1tnl	5	4	0	16.4	1176	97.02	3	1	0.78	40.48	-2.6	-4.2
1tph	4	3	0.39	15.06	778	72.02	1	7	2.59	23.71	-3.1	-4
1ulb	3	2	0.43	7.88	795	96.37	4	6	0.9	37.34	-2.8	-4.5
1uvs	3	3	0.41	16.93	1350	2691.09	3	9	2.71	123.55	-7.4	-8
2ifb	8	6	1.64	51.71	826	941.19	0	2	4.22	75.32	-7.4	-9.1
2upj	9	8	3.49	96.03	958	5598.63	3	8	6.48	156.88	-10.1	-13.1
2web	6	6	0.46	40.49	583	3489.96	2	9	2.95	142.74	-7	-9.7
3cla	2	2	0	0	1173	702.44	3	7	0.91	72.57	-6	-5.7
3ptb	4	4	0	4.5	1231	59.09	4	2	0.33	37.85	-6.1	-4.6
4hmg	3	2	0	6.58	644	750.7	6	10	5.21	62.16	-3.5	-3.9
5cna	3	2	0	3.97	592	197.84	4	6	2.57	40.78	-2.7	-3.8
7gpb	7	3	0	7.55	1435	842.57	4	12	3.13	70.59	-7.5	-7.6
1a4q	9	6	0.38	9.07	1146	1766.51	3	8	0.67	100.56	-11.8	-12.6
1ac4	2	3	0	0	1126	38.66	0	1	1.19	34.97	-3.8	-4.1
1aco	8	3	0	0	452	167.91	0	6	4.45	27.72	-5.2	-7.3
1aeb	2	4	0	0	1026	14.87	0	1	0.57	25.49	-4.8	-3.9
1aee	2	2	0	0	1220	29.33	2	1	1.27	30.85	-4	-3.1
1ai4	2	2	0	0	649	157.14	2	4	0.61	38.48	-3.5	-4.1
1ai5	2	2	0.26	5.3	1398	194.24	0	5	0.11	41.81	-5.1	-4.6
1ai6	4	2	0.25	11.61	1088	127.71	1	3	0.32	36.82	-5.5	-4.6
1ajn	3	3	0.24	16.4	630	207.26	0	5	0.22	41.92	-3.6	-4.5
1ajp	2	2	0.28	5.8	642	159.64	2	4	0.05	39.13	-3.1	-4.3
1apb	4	3	0	0	416	122.96	4	5	2.19	34.57	-7.9	-4.8
1b9t	5	3	0	0	745	846.9	7	9	4.34	78.31	-7	-7
1c85	5	2	0.7	19.09	883	283.72	1	6	2.26	44.41	-6.4	-5.9
1c9d	4	3	0.85	22.44	713	376.31	1	4	1.44	61.53	-8.7	-6.7
1cdg	2	1	0.5	10.55	580	962.92	8	11	5.4	68.62	-3.3	-3.9
1cpi	7	7	2.95	85.65	1005	8721.87	8	15	0.56	179.5	-10.1	-12.3
1csc	8	7	2.27	65.96	1498	9700.65	6	25	5.64	165.84	-9.8	-11.8
1ctt	3	3	0	0	670	345.76	4	7	2.04	52.14	-6.2	-5.2
1cvu	5	4	1.51	45.25	648	1517.65	0	2	4.88	93.41	-10.8	-8
1cw2	5	3	0.84	25.42	495	371.46	1	5	1.06	62.6	-8.5	-7.3
1cx2	6	4	1.29	30.27	696	1105.75	2	5	5.24	93.28	-10.9	-9.4
1cx9	5	3	0.82	24.65	492	350.22	2	4	1.05	64.66	-9.3	-7.2
1d3t	6	6	1.08	47.15	1309	4511.03	0	6	6.55	156.03	-7.8	-10.4
1die	3	2	0	0	1115	132.78	5	5	2.97	36.9	-2.9	-3.4
1elb	5	5	0.67	24.37	1386	3056.71	5	7	3.46	121.44	-9.8	-8.8

1eld	4	3	0.75	20.37	997	3010.99	3	6	3.44	105.81	-9.1	-7.9
1ele	4	4	0.98	24.78	903	2161.15	3	6	2.85	90.5	-9.3	-7.7
1ent	8	8	2.31	84.17	1437	6808.41	5	13	2.86	174.54	-9.6	-11.7
1enu	3	3	0.41	19.92	702	159.39	2	5	0.78	43.44	-7	-4.2
1ezq	7	6	0.93	49.11	899	3264.65	7	7	1.43	132.57	-12.5	-9.1
1f0r	5	4	0.85	32.77	925	1995.97	3	8	3.59	119.96	-10.6	-8.9
1f0t	4	4	0.82	29.43	811	1824.27	6	9	0.63	112.14	-8.3	-8.2
1f0u	6	6	0.96	45.68	854	3264.65	7	7	1.43	132.57	-9.9	-9
1htf	7	7	2.17	63.75	1088	5303.51	5	8	2.56	161.91	-11	-12.4
1imb	4	4	0	0	1289	305.72	5	9	4.98	43.89	-5.7	-4.6
1ivf	6	3	0	0	691	669.06	5	9	4.4	60.67	-6.7	-7
1k1l	4	5	0.84	36.83	753	2285.09	6	8	1.23	129.11	-9.6	-8.5
1k1n	5	5	0.72	31.84	1410	4783.73	6	12	0.21	154.9	-8.8	-10.3
1mrk	4	4	0	19.21	567	512.62	6	9	1.91	62.81	-6.2	-4.4
1pdz	5	1	0	0	1066	55.82	0	6	3.42	19.94	-5	-4.4
1ppk	8	8	1	49.38	1516	3329.68	3	10	2	134.17	-10.4	-11
1pso	8	8	2.84	94.61	1216	9453.34	7	14	0.13	179.62	-14.1	-11.8
1rne	8	8	2.24	80.2	859	9323.47	5	11	5.98	201.44	-11.9	-12.6
1snc	5	2	0	15.72	719	1062.89	1	13	3.38	71.2	-9.2	-6.1
2ak3	5	3	0.35	15.6	1324	842.57	4	12	3.13	70.59	-5.3	-6.4
2er7	9	11	4.13	127.04	1885	32981.51	10	24	0.78	287.86	-12.3	-12.8
2mcp	3	2	0	0	835	119.54	0	5	1.46	37.83	-7.1	-4.9
2pk4	3	2	0.55	11.52	417	106.68	3	3	1.46	31.23	-5.9	-4.2
2r04	8	8	2.76	88.54	884	1805.75	0	5	4.33	97.32	-8.5	-9.6
2sim	6	2	0	0	814	669.06	5	9	4.4	60.67	-8.8	-6.7
3er5	13	13	5.33	162.81	1427	50659.05	17	29	3.2	329.2	-12.4	-11.5
4er2	8	8	1.94	73.46	2127	9453.34	7	14	0.13	179.62	-11	-11.4
5enl	6	2	0	0	1076	98.26	1	7	4.06	25.95	-5.2	-5.3
6enl	6	2	0	0	1331	53.49	0	6	3.42	19.94	-4.1	-5.1
6rnt	3	3	0	0	557	772.44	4	12	3.13	70.59	-3.2	-6.3
6tim	5	4	0.48	15.92	928	85.39	2	6	2.82	28.02	-4.4	-4.9
9hvp	9	8	3.83	107.25	1089	11116.46	5	11	5.7	206.94	-11.4	-14.2
1E2J	3	2	0	9.62	674	411.95	3	7	1.09	55.51	-7.2	-4.5
1G6N	5	4	1.02	24.27	984	695.92	3	11	1.45	68.77	-10.3	-7.9
1HXD	6	5	1.31	38.79	553	444.81	2	5	0.54	58.96	-9.9	-7.8
1K1J	4	5	0.76	33.35	1325	3366.96	5	9	1.69	139.79	-10.4	-8.9
2EWN	9	7	1.62	48.29	596	4216.07	6	15	0.74	129.81	-14	-12.9
2IKG	4	3	0.87	21.42	1095	1133.01	1	5	2.3	87.22	-8.5	-8
2IKH	3	3	0.82	20.95	598	420.73	0	9	0.3	53.06	-7.5	-6.3
2IKJ	4	3	2.11	46.45	1134	1296.24	1	8	1.31	86.22	-10	-8.6
1ECM	5	2	0	0	538	334.32	1	6	3.05	45.49	-7.6	-6.2
10GS	5	4	1.08	39.53	1331	2884.28	5	9	1.85	117.78	-8.7	-8.2

1AVN	1	2	0	0	1710	53.22	3	3	0.09	31.35	-5.3	-2.4
1JYS	2	3	0	0	1016	65.66	3	5	0.06	36.1	-4.8	-4
1P1Q	4	3	0	0	576	205.67	4	6	2.41	38.29	-6.7	-5
1PB9	4	3	0	0	416	32.94	3	4	1.62	22.07	-4.9	-4.3
1UTP	4	4	0	22.22	1022	156.97	3	1	1.25	47.14	-2	-3.4
1Y1M	4	2	0	0	1119	73.62	3	3	1.71	29.09	-2.5	-4.1
1GIC	2	2	0	0	573	197.84	4	6	2.57	40.78	-5.5	-3.6
1FDQ	5	3	0.16	7.72	1091	1916.07	0	2	5.21	102.46	-10.1	-8.5
1KZN	6	6	1.78	52.29	1165	8087.28	5	13	4.88	176.46	-9.8	-11.6
1HWI	5	4	0.6	13.48	584	2087.67	2	5	3.21	112.29	-9	-10.2
1HWL	6	5	0.71	15.91	1845	2594.65	2	9	2.07	119.38	-12.3	-11.1
1RD4	5	5	2.97	65.07	1177	2710.55	0	8	4.88	132.53	-10.7	-11.9
2I4Q	5	5	1.13	49.26	1006	2763.06	4	8	3.83	128.85	-9.3	-8.1
2IKO	4	5	0.93	42.38	1389	1443.25	5	5	3.38	100.58	-7.5	-5.9
2IKU	5	5	1.14	45.88	1244	2094.54	4	6	4.02	128.24	-9.8	-8.5
2IL2	6	6	1.16	54.84	1134	5566.93	4	11	5.45	172.48	-9.8	-10.2
1A69	5	3	0.36	12.45	724	528.84	5	9	2.03	60.92	-7.2	-6.4
1BCU	3	4	0.18	20.37	1382	272.85	4	3	2.55	68.07	-4.5	-4.1
1F5K	3	3	0	10.59	906	59.09	4	2	0.33	37.85	-5.1	-3.3
1FCX	5	5	2.91	68.63	661	1822.62	1	3	4.4	113.14	-9.8	-10.3
1J17	5	6	0.99	52.16	1208	3035.02	0	7	4.72	133.52	-7.1	-8.4
1JQD	5	5	1.03	37.73	828	1375.71	7	11	3.49	89.28	-7	-6.7
1NC1	4	4	1.23	29.33	668	567.62	4	7	0	76.25	-8.4	-7.9
1PR5	4	3	0.33	11.42	1084	496.3	5	8	1.38	64.95	-5.3	-6
1ZS0	6	6	2.07	59.46	815	1153.5	2	7	3.25	97.93	-8.4	-9.4
2B1V	2	2	0.51	9.34	556	561.7	2	3	2.8	72.8	-7.8	-6
2BRB	4	5	1.02	32.35	879	1020.03	2	5	3.96	98.25	-6.6	-8
2GSS	4	3	0.88	31.32	792	564.31	0	4	2.27	70.73	-6.7	-6.4
3GSS	2	2	0	7.62	945	564.31	0	4	2.27	70.73	-7.9	-5.1
1J16	4	4	0.28	10.23	1051	59.09	4	2	0.33	37.85	-5.2	-4.8
1KV5	4	2	0	5.19	717	55.82	0	6	3.42	19.94	-5.8	-3.6
1XPO	5	4	0	0	894	680.64	6	9	3.3	67.39	-6	-6.9
1YV5	6	3	0	0	1079	290.27	1	8	2.9	50.85	-8.8	-7.3
2FLB	6	6	0.54	39.62	1068	1023.04	7	7	0.46	88.25	-7.8	-6.5
2FQW	4	4	0.84	20.22	629	510.18	4	9	2.1	60.85	-8.9	-6.6
2FQY	5	4	1	23.46	540	493.96	5	9	1.98	62.74	-8.8	-7.3
1bma	6	5	0.99	41.24	1025	3874.24	3	7	4.52	135.94	-6.3	-9.5
1d3d	7	6	1.09	50.55	1220	4118.82	1	4	7.7	161.55	-12.4	-10.7
1hdc	6	5	1.54	58.54	1409	4958.57	0	7	4.16	148.56	-8.2	-9.9
1nis	7	3	0	0	433	207.51	1	8	4.12	31.44	-4.1	-6.8
1nsc	6	3	0	0	1617	750.7	6	10	5.21	62.16	-4.1	-6.3
2abh	8	2	0	0	141	5.68	1	4	0.05	11.2	-8.9	-6.8

7tim	5	4	0.46	15.48	751	81.51	2	7	2.76	25.01	-7.4	-4.8
1LOQ	5	3	0.41	13.64	1134	709.05	3	11	3.66	60.12	-5	-6.3
1TRD	5	4	0.46	15.26	577	78.89	2	7	2.76	25.01	-7.4	-4.9
1U88	4	2	0.65	14.28	2019	2230.8	4	9	1.71	102.86	-7.8	-7.8
2AB2	4	3	1.38	25.51	661	1674.55	0	4	4.85	112.21	-11.8	-10.1
1FPU	6	6	2.9	67.64	1104	1859.44	2	7	4.24	111.91	-10.1	-11
2G2H	7	6	1.87	57.6	863	1702.57	2	6	4.54	115.42	-8.2	-10.3
1G3B	4	4	0.43	34.34	1003	453.12	6	6	2.92	59.64	-6.4	-3.1
1G36	5	5	0.75	30.82	795	2476.98	5	7	2.87	129.46	-8.7	-9.3
1GHZ	4	5	0.41	35.25	1457	494.47	6	6	0.43	72.76	-6.5	-4.3
1GI1	5	5	0.41	35.28	1252	482.78	6	5	0.73	73.94	-7.4	-5
1GI6	5	5	0.66	37.36	976	482.78	6	5	0.73	73.94	-7.4	-5.5
1K1I	4	4	0.53	30.22	1386	2876.65	5	9	0.92	134.01	-9	-8.3
1CE5	4	4	0	10.6	658	59.09	4	2	0.33	37.85	-6.5	-4.3
1C5P	3	3	0	10.59	614	59.09	4	2	0.33	37.85	-6.4	-3.4
1NHB	2	2	0.26	5.42	315	49.08	0	0	2.25	35.82	-5.8	-4.1
182L	1	1	0.3	6.31	375	50.67	0	1	2.43	36.21	-5.5	-3.3
184L	1	2	0.24	4.89	536	105.18	0	0	2.89	44.98	-6.5	-3.8
2QWC	5	3	0	0	817	669.06	5	9	4.4	60.67	-4.9	-6.3
2QWD	5	3	0	0	1122	670.98	6	9	4.43	62.64	-6.6	-6.1
1DI8	5	5	1.73	34.41	554	747.97	2	6	3.1	84.03	-8.3	-9.7
1E1V	5	5	1.38	24.45	1159	491.64	3	6	1.89	68.17	-6.8	-8.7
1E1X	5	5	1.37	26.83	891	506.81	4	7	2	68.38	-8.1	-8.4
1GIH	4	5	1.89	37.45	1167	943.36	2	6	2.78	85.4	-9.7	-9
1NVR	4	5	0.84	24.74	1258	2025.94	2	7	4.12	134.71	-11.2	-10.2
1A50	5	3	0.8	27.07	654	495.83	1	5	1.08	61.51	-8.6	-6.8
1ABE	5	3	0	0	541	95.16	4	5	2.58	29.98	-8.9	-5.1
1ADD	4	4	0.53	12.64	621	496.3	5	8	1.38	64.95	-9.2	-6.8
1ADL	4	3	0.7	14.36	1139	1517.65	0	2	4.88	93.41	-9.2	-8.1
1BIR	4	3	0	0	609	887.63	5	13	3.96	71.83	-7.2	-6.6
1CLA	1	1	0	0	1293	702.44	3	7	0.91	72.57	-7.2	-4.7
1CSC	3	1	0	0	418	84.39	3	5	3.2	23.86	-2.2	-3.1
1D3Q	6	5	1.3	51.36	1438	4443.38	0	4	7.11	158.85	-7.4	-10.2
1FBC	6	2	0	0	943	527.66	2	11	4.83	50.54	-8.5	-6.6
1FBF	5	2	0	0	1072	527.66	2	11	4.83	50.54	-8.2	-5.9
1FEL	8	7	3.05	82.59	760	2291.34	2	3	6.86	122.86	-9.2	-11.3
1FKF	3	3	1.13	31.99	1432	11326.58	3	13	4.64	212.59	-12.8	-11.2
1HBP	7	7	2.78	73.82	641	900.25	1	1	5.51	93.21	-9.8	-9.9
1HNL	4	3	0.91	22.38	552	852.96	5	9	5.59	64.72	-5.1	-5.7
1LDM	8	6	2.93	77.97	1237	5384.32	8	21	4.28	136.31	-7.4	-11.1
1LGR	5	4	0.34	9.39	1320	842.57	4	12	3.13	70.59	-4.2	-7.3
1MFA	2	1	0	0	855	2509.89	8	14	4.86	103.24	-5.8	-5.5

1MFE	2	2	0.8	21.87	1038	2345.6	9	14	5.52	98.45	-7.2	-4.8
1RNT	4	3	0	0	611	887.63	5	13	3.96	71.83	-7.1	-6.6
1RUS	4	1	0	0	1173	110.28	1	7	4.06	25.95	-4.2	-3.8
1XIG	3	2	0	0	633	115.19	5	5	2.95	32.19	-4.5	-3.4
1XLI	2	2	0	0	1545	143.46	5	5	2.5	42.49	-2	-3
2CSC	4	2	0	0	332	81.39	2	5	2.43	23.27	-4.6	-4.3
2DBL	5	4	1.21	45.82	1418	2414.44	0	5	3.68	110.02	-11.9	-7.9
2PHH	3	2	0	0	753	86.77	1	3	0.24	32.44	-6.3	-4.5
2QWF	6	4	0	0	978	1067.67	6	10	4.89	81.63	-7.7	-8
2RNT	5	6	0.85	40.46	735	4924.06	10	22	5.1	134	-5.2	-7.7
2XIM	3	2	0.62	13.1	468	115.19	5	5	2.95	32.19	-3.1	-3.6
3PGM	5	2	0	0	668	110.28	1	7	4.06	25.95	-4.4	-4.9
4CLA	2	2	0	0	1324	702.44	3	7	0.91	72.57	-7.5	-5.6
4TIM	4	2	0	0	979	98.26	1	7	4.06	25.95	-2.9	-4.1
5YAS	2	2	0	0	549	111.58	2	2	0.79	19.28	-4.4	-2.9
8RSA	4	2	0	0	404	674.21	3	8	0.95	67.1	-5.9	-7
8XIA	3	1	0	0	607	111.81	4	5	2.74	31.17	-4	-3.3
9LDT	4	0	0	0	714	21.71	2	4	2.78	14.2	-6.5	-3
9RUB	4	2	0	4.59	1360	490.47	2	11	5.03	46.88	-6.4	-4.4
2AYR	5	5	3.08	66.88	887	3574.83	1	6	7.35	146.5	-12.7	-12
2R6W	6	6	3.36	71.46	788	3292.56	2	5	6.32	140.8	-12.8	-12.8
2R6Y	6	6	3.09	68.47	709	2668.67	2	5	5.69	131.63	-12.9	-12.2
1FKH	3	3	0.89	22.99	1189	2927.53	0	5	5.5	129.65	-11.1	-8.9
1FM9	5	4	1.87	48.27	833	5707.22	1	7	5.28	154.76	-12.3	-11.1
1KSN	6	6	1.02	41.11	1116	2974.33	5	8	0.6	123.64	-12.8	-9.6
1PRO	7	6	1.59	42.11	965	4971.3	3	9	4.94	162.59	-15.4	-13.1
2SIM	6	3	0	0	1491	669.06	5	9	4.4	60.67	-4.7	-6.6
1SBG	6	6	1.41	42.26	1080	4502.18	4	8	4.97	151.87	-10.6	-11.2
1XKA	6	5	0.58	33.89	1116	2119.02	5	6	0.94	111.81	-9.4	-8.4
1FKI	0	0	0	0	593	2482.34	0	7	3.96	116.23	-9.5	-6.4
1J4R	4	4	2.25	55.79	1255	6871.84	0	8	6.54	165.78	-10.5	-10.8
1G2L	7	5	0.9	41.29	1438	4281.02	5	10	2.58	150.16	-9.9	-10.5
1XKB	5	5	0.58	33.7	870	2119.02	5	6	0.94	111.81	-9.4	-7.9
1acj	3	3	1.03	21.36	804	239.19	2	2	2.7	62.8	-10.1	-6.2
1f3e	3	3	0.41	20.14	971	193.08	4	6	0.36	47.85	-9.2	-4
2gbp	5	3	0.65	13.75	411	159.27	5	6	3.22	35.99	-10.1	-5.4
1acm	6	3	0	0	1233	340.63	2	9	6.8	40.86	-10.3	-5.7
1L83	0	1	0	0	336	18.03	0	0	1.69	26.44	-5.3	-2.1
1ABF	4	3	0	0	456	122.96	4	5	2.19	34.57	-7.4	-4.8
1bv9	9	8	3.52	100.31	901	9537.35	4	11	6.49	209.38	-12.2	-14.8
2FVD	5	5	1.6	31.7	1126	2067.46	3	9	2.49	105.89	-11.6	-10.4
3LFS	5	4	1.9	35.15	995	804.13	2	4	4.62	90.08	-7.6	-9.6

2XMY	7	6	1.72	34.73	673	1741.41	2	9	3.71	112.21	-13.6	-12.6
1ivb	6	3	0	0	1834	367.01	2	8	0.38	53.4	-4.1	-7.4
3er3	9	10	3.66	112.35	1742	12658.9	10	14	3.33	214.84	-9.7	-13
1b9s	7	3	0	0	1216	796.71	2	6	0.13	75.29	-4.4	-9.5
1b9v	6	3	0	0	1387	1169.88	3	7	0.43	89.74	-5	-9.4
1bwb	9	9	4.3	115.82	1037	14312.69	6	13	7.33	237.34	-10.1	-15.3
1ghb	5	5	0	16.15	1103	495.37	2	5	0.04	64.61	-1.7	-6.4
1ppm	9	9	2.28	87.05	1308	5669.08	3	12	2.65	153.54	-7.9	-11.7
1bwa	9	8	3.91	107.43	692	9537.35	4	11	6.49	209.38	-10.3	-15.1
1eed	8	8	1.83	75.1	1574	7747.17	5	11	2.75	168.68	-6.5	-10.8
2PHH	9	7	1.4	54.12	1788	2971.86	7	19	4.55	108.13	-4.6	-9.3
4SLI	6	4	0	0	948	959.3	5	9	3.58	74.75	-4.1	-8
4MDH	7	5	3.21	80.85	1134	5384.32	8	21	4.28	136.31	-4.4	-10.7
2LDB	7	6	2.93	76.03	1302	5416.42	8	21	4.52	138.65	-5.7	-10.7
5ER2	8	9	2.98	100.45	1187	21189.56	11	18	0.29	254.65	-9	-12.7
1V1K	7	5	1.5	35.89	1239	3014.02	3	7	4.42	116.5	-6.1	-10.9
3LFN	7	6	2.48	49.49	673	1534.83	3	5	5.36	112.9	-7.5	-12.4
1A46	5	5	1.18	44.66	1110	4460.08	8	10	0.14	143.06	-7.8	-9.1
1A5G	6	6	1.27	52.42	1510	5983.1	10	12	2.51	158.04	-13.8	-9
1ADB	9	8	2.95	85.24	615	5446.24	9	21	3.42	138.58	-11.5	-11.8
1AF2	3	2	0	0	778	406.05	4	8	2.51	52.28	-4.2	-4.9
1BAP	4	3	0	0	449	95.16	4	5	2.58	29.98	-9.3	-4.5
1BBZ	8	8	2.91	100.38	1376	29741.51	7	25	4.41	258.47	-7.9	-10.5
1BHF	6	4	0.99	33.48	1162	7094.96	4	16	5.66	145.2	-6	-9.7
1BXO	7	7	1.54	57.87	1191	5512.98	4	13	1.52	161.33	-13.6	-11.8
1BZM	2	3	0.4	6.84	1016	142.91	3	7	1.71	52.59	-8.2	-5
1CBX	5	4	0	8.88	493	331.05	0	4	1.26	48.27	-8.7	-6.4
1E96	6	6	1.18	52.24	1296	1915.23	8	19	1.41	95.99	-7.1	-7
1EXW	8	7	2.63	66.48	1243	1065.92	0	2	6.43	84.14	-5.3	-10.1
1FKB	3	3	1.12	26.91	1203	17338.37	3	14	6.18	245.14	-13.2	-12
1FMO	4	4	1.01	25.29	708	493.96	5	9	1.98	62.74	-11.8	-6.4
1HSL	4	3	0	5.56	527	135.54	4	5	2.69	33.97	-10	-4
1INC	4	4	0	21.54	1415	1148.7	2	6	3.64	93.46	-10.9	-5.8
1MNC	3	3	0.81	20.2	705	1400.89	4	7	0.92	93.78	-12.3	-7.6
1STA	4	2	0	15.21	1007	1069.88	1	13	3.38	71.2	-7.3	-5.4
1TET	8	7	2.19	83.92	1149	56163.26	26	37	13.03	317.25	-8.5	-2
1TLP	4	4	0.41	8.36	1628	3544.5	6	13	1.74	127.05	-10.3	-9.4
1TMN	4	4	0.65	12.53	1536	3496.05	3	8	0.7	128.88	-10.2	-10.4
1YYY	4	4	0.39	34.39	864	1991.52	6	11	1.79	100.41	-6.9	-5.6
1ZZZ	4	4	0.39	34.31	801	1991.52	6	11	1.79	100.41	-7	-5.7
2CTC	4	3	0	0	711	173.67	1	3	0.66	41.16	-5.3	-5.9
2QWB	3	2	0	8.32	570	750.7	6	10	5.21	62.16	-3.7	-3.8

2QWE	6	4	0	0	859	945.96	9	11	7.04	72.8	-10.2	-6.6
2QWG	6	3	0	0	668	753.27	4	8	3	70.17	-11.5	-8
2SNS	4	2	0	15.88	338	1069.88	1	13	3.38	71.2	-9.1	-5.6
2TMN	3	2	0.2	4.05	1433	191.93	3	6	1.7	44.55	-8	-4.5
2XIS	2	2	0	0	933	115.19	5	5	2.95	32.19	-7.9	-2.6
3CPA	5	4	0	0	1032	218.04	4	4	1.7	43.49	-5.5	-6
3FX2	5	5	0.38	33.85	663	1978.76	4	13	1.9	103.42	-12.7	-7.3
3TMN	3	3	0.48	8.71	1187	922.22	5	6	0.79	80.45	-8	-6.8
4SGA	5	4	0.61	42.06	677	3342.02	2	10	1.03	119.83	-10	-7.8
4TLN	3	3	0	0	810	118.56	5	4	0.95	36.21	-5.1	-4.1
4XIA	4	3	0.54	11.42	1546	191.32	6	6	3.59	38.2	-2.1	-4
5ABP	5	3	0	0	402	159.27	5	6	3.22	35.99	-9.1	-5.2
5P21	7	6	1.35	44.95	1125	1925.37	9	19	1.84	98.04	-7.3	-8.8
5SGA	5	5	0.6	41.63	847	3632.42	3	11	1.32	121.5	-3.9	-7.8
5TLN	4	4	0.42	7.68	1049	1121.97	4	8	0.93	80.39	-8.7	-7.9
6ABP	4	3	0	0	441	95.16	4	5	2.58	29.98	-7.7	-4.5
7ABP	4	3	0	0	510	122.96	4	5	2.19	34.57	-7.6	-4.8
7EST	4	3	0.77	21.01	1578	2385.13	3	6	3.24	95.12	-10.4	-7.1
7TLN	3	2	0.21	4.42	1372	266.27	1	5	0.71	49.71	-3.4	-5.3
8ABP	4	3	0	0	343	159.27	5	6	3.22	35.99	-5.5	-4.6
9AAT	6	4	0.68	26.18	663	297.27	3	7	1.1	52.3	-11.2	-6.6
9ABP	5	3	0	0	391	159.27	5	6	3.22	35.99	-10.9	-5.2

Supplementary Table 3: Variation of correlation coefficient between experimental and predicted binding energies on both training and test sets as a function of different sets of distance cut offs.

Cutoff for calculating hydrogen bond donors and acceptors	Cutoff for calculating hydrophobicity and polarizability	Training (63 complexes)	Test (320 complexes)
MaxD	MaxD	0.723	0.637
MaxD+1	MaxD+1	0.772	0.650
MaxD+2	MaxD+2	0.784	0.629
MaxD+1	MaxD	0.761	0.638
MaxD+2	MaxD	0.759	0.651
MaxD+3	MaxD	0.76	0.653
MaxD+4	MaxD	0.767	0.620
MaxD+5	MaxD	0.767	0.607
MaxD+3	MaxD+1	0.769	0.681
MaxD+2.9	MaxD+1	0.78	0.676
MaxD+3.1	MaxD+1	0.785	0.657
MaxD+3	MaxD+1.1	0.772	0.679
MaxD+3	MaxD+1.5	0.772	0.668
MaxD+3	**MaxD+0.9**	**0.766**	**0.686**

MaxD is the maximum distance of the ligand atom (including hydrogen) from its centre of mass. (COM)

Supplementary Table 4: Details of Statistical Test Formula performed for the validation of the empirical scoring function.

S. No.	Statistical Test Formula
1.	$q^2 = 1 - \left(\frac{\sum_N (y_{pred} - y_{exp})^2}{\sum_N (y_{exp} - \bar{y}_{exp})^2} \right)$
2.	$R = \frac{\sum_N (y_{exp} - \bar{y}_{exp})(y_{pred} - \bar{y}_{pred})}{\sqrt{\sum_N (y_{exp} - \bar{y}_{exp})^2 \sum (y_{pred} - \bar{y}_{pred})^2}}$
3.	$K = \frac{\sum_N y_{exp} y_{pred}}{\sum_N y_{pred}^2}$
4.	$K' = \frac{\sum_N y_{exp} y_{pred}}{\sum_N y_{exp}^2}$
5.	$y_{exp}^{r_0} = K\, y_{pred}$
6.	$y_{pred}^{r_0} = K'\, y_{exp}$
7.	$R_0^2 = 1 - \frac{\sum_N (y_{pred} - y_{exp}^{r_0})^2}{\sum_N (y_{pred} - \bar{y}_{pred})^2}$
8.	$R_0'^2 = 1 - \frac{\sum_N (y_{exp} - y_{pred}^{r_0})^2}{\sum_N (y_{exp} - \bar{y}_{exp})^2}$
9.	$RMS\ error = \sqrt{\frac{\sum_N (y_{pred} - y_{exp})^2}{N}}$
10.	$S_{PRESS} = \sqrt{\frac{\sum_N (y_{pred} - y_{exp})^2}{N - c - 1}}$

where, R is the correlation coefficient, y_{pred} is the predicted binding free energy, y_{exp} is the experimental binding free energy, N is the total number of complexes in the training set, c is the number of independent variables.

Supplementary Table 5. Correlation coefficients for various combinations of the parameters in eq. (2) of main text.

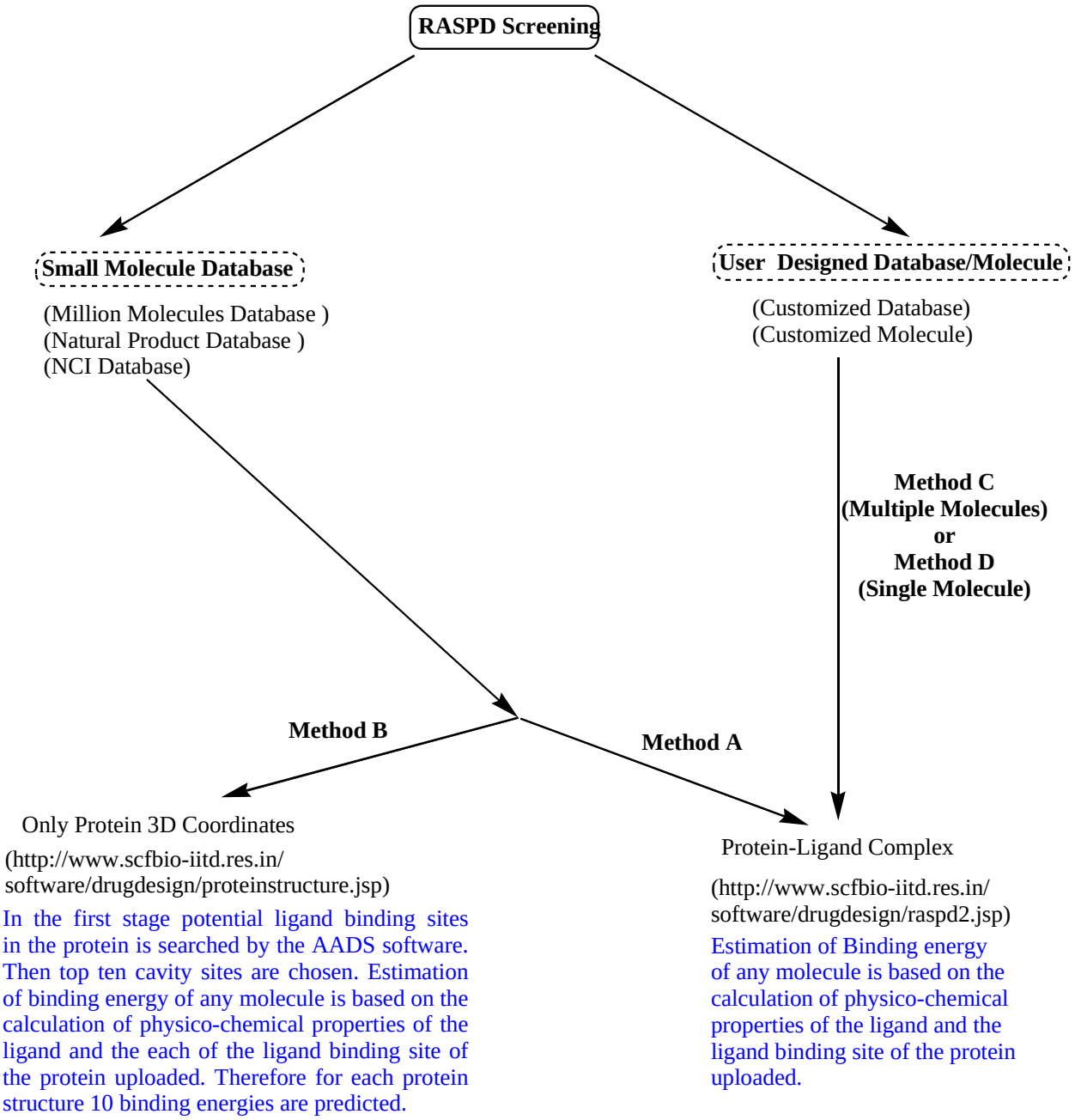
1	WI	0.592
2	PD	0.707
3	PA	0.724
4	DD	0.071
5	DA	0.179
6	P	0.000
7	PP	0.738
8	MR	0.736
9	PMR	0.713
10	V	0.048
11	WI+V	0.595
12	PD+PA+DD+DA	0.784
13	P+PP	0.742
14	MR+PMR	0.772
15	WI+MR+PMR+V	0.789
16	WI+P+PP+V	0.772
17	WI+PD+PA+D+A+V	0.789
18	WI+MR+PMR+V	0.789
19	WI+P+PP+V	0.772
20	P+PP+MR+PMR	0.830
21	W+P+PP+MR+PMR+V	0.842
22	W+PD+PA+DD+DA+P+PP+V	0.806
23	W+PD+PA+DD+DA+MR+PMR+V	0.840
24	PD+PA+DD+DA+P+PP+MR+PMR	0.870
25	PD+PA+DD+DA+P+PP+MR+PMR+V	0.871
26	WI+PA+DD+DA+P+PP+MR+PMR+V	0.860
27	WI+PD+DD+DA+P+PP+MR+PMR+V	0.874
28	WI+PD+PA+DA+P+PP+MR+PMR+V	0.870
29	WI+PD+PA+DD+P+PP+MR+PMR+V	0.875
30	WI+PD+PA+DD+DA+PP+MR+PMR+V	0.870
31	WI+PD+PA+DD+DA+P+MR+PMR+V	0.843
32	WI+PD+PA+DD+DA+P+PP+PMR+V	0.827
33	WI+PD+PA+DD+DA+P+PP+MR+V	0.854
34	WI+PD+PA+DD+DA+P+PP+MR+PMR	0.875
35	WI+PD+PA+DD+DA+P+PP+MR+PMR+V	0.875

Supplementary Table 6: Experimental and predicted binding energies of 28 HIV 1 Protease complexes.

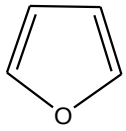
PDBID	Expt. Energy#	Pred. Energy#
1a30	-5.8	-6
1aaq	-11.4	-12.4
1ajv	-10.6	-12.3
1ajx	-10.9	-12.8
1b6j	-10.8	-12.2
1b6k	-11.9	-13.2
1b6l	-11.3	-11.4
1b6m	-11.4	-12
1bv7	-12.6	-15.1
1g2k	-10.8	-12.5
1gno	-10.6	-9.9
1hih	-11	-12.3
1hiv	-12.6	-14
1hos	-11.7	-14.5
1hps	-12.7	-14
1hpx	-12.5	-12.4
1hsg	-12.9	-12.6
1hsh	-11.7	-12.4
1hte	-7.7	-9.8
1htg	-13.2	-13.9
1hvh	-10.8	-12.9
1hvj	-14.3	-12.8
1hvl	-12.3	-13.9
1hxb	-13.5	-12.6
1qbt	-14.5	-16.3
2upj	-10.1	-13.1
1SBG	-10.6	-11.2
1OHR	-11.8	-12.1

kcal/mol

Computational Flow Chart for Indentifying Hit Molecules for a Target Protein



Supplementary Figure 1. Computational flowchart of RASPD protocol.



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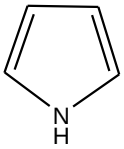

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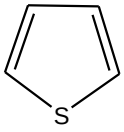

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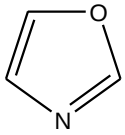

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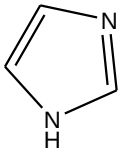

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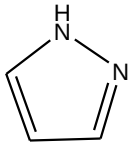

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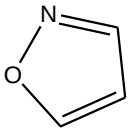

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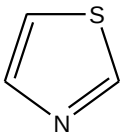

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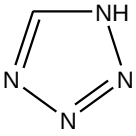

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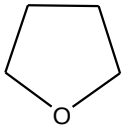

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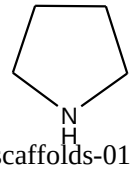

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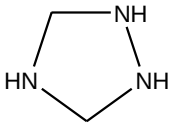

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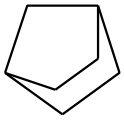

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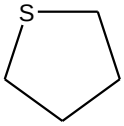

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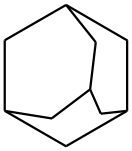

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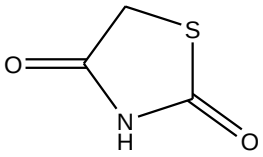

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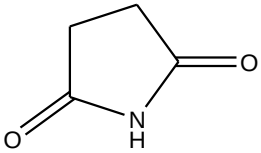

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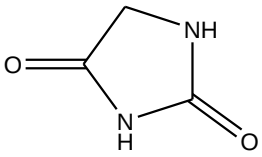

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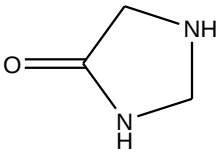

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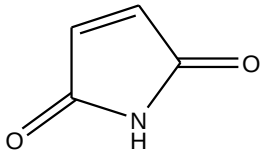

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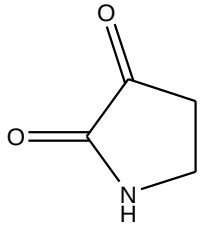

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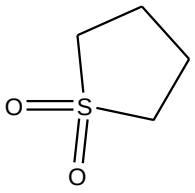

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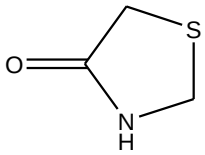

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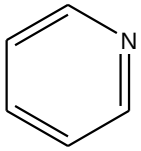

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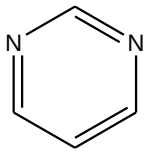

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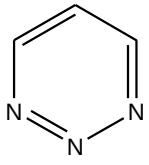

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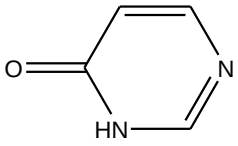

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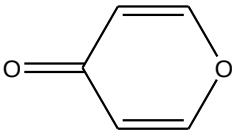

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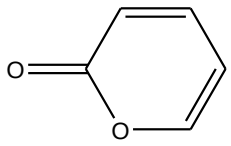

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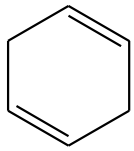

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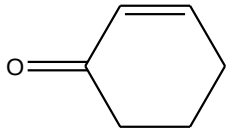

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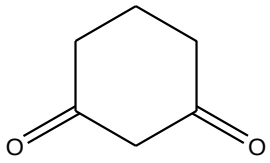

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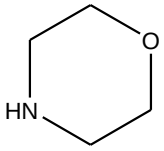

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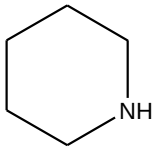

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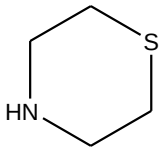

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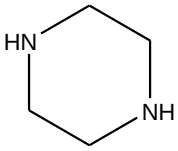

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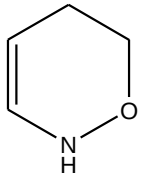

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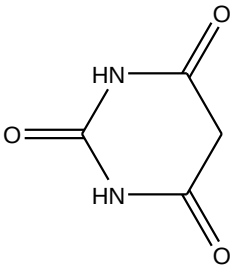

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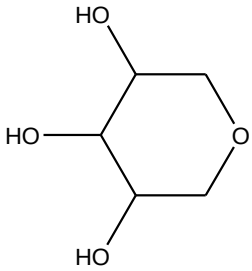

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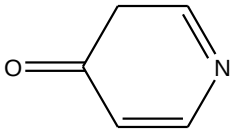

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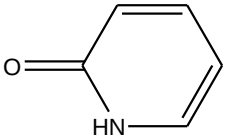

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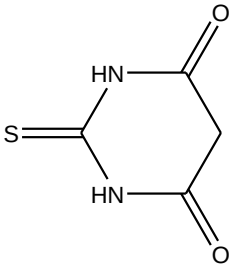

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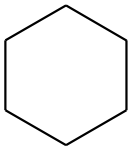

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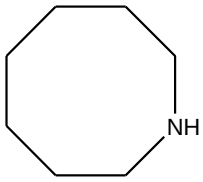

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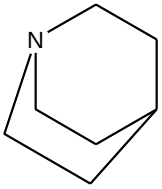

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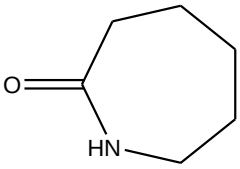

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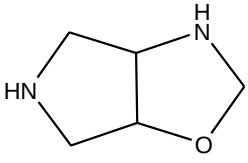

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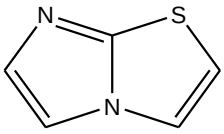

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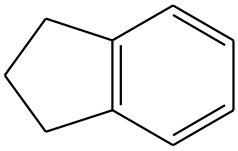

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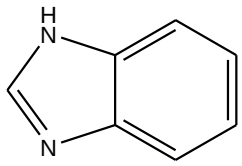

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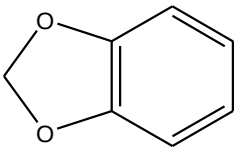

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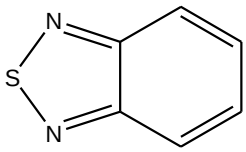

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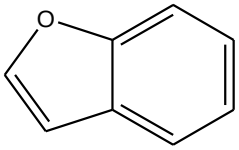

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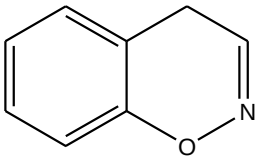

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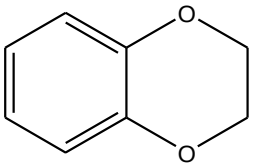

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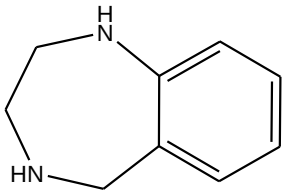

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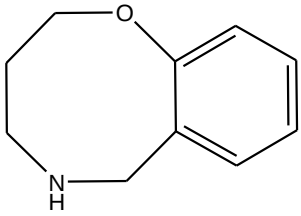

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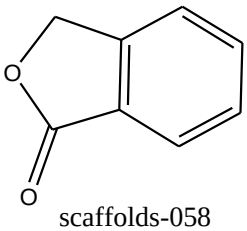

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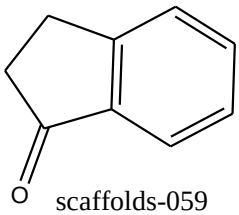

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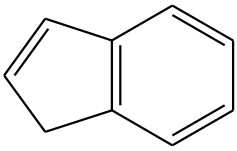

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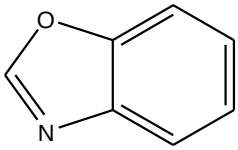

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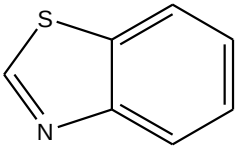

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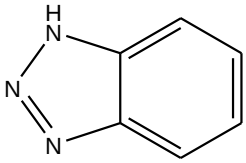

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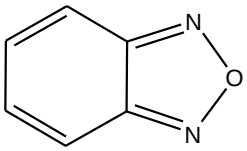

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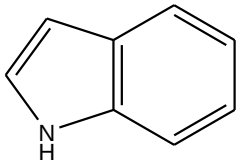

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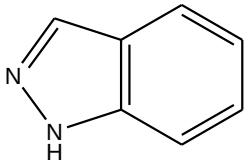

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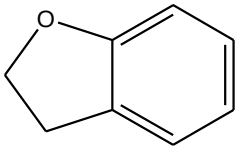

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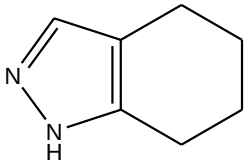

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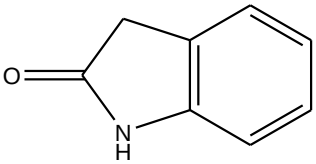

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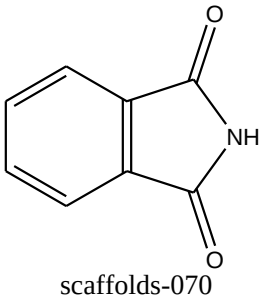

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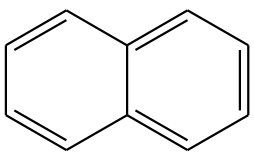

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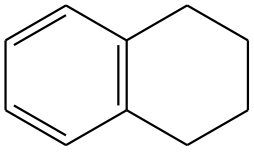

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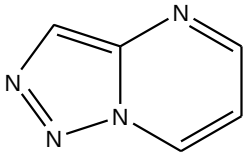

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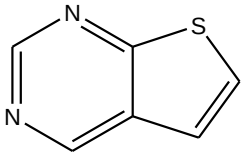

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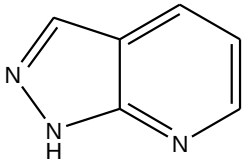

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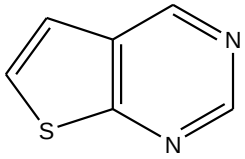

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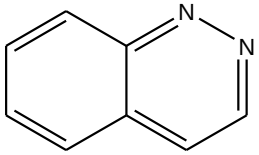

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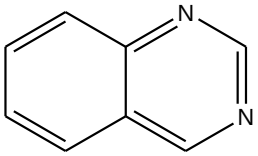

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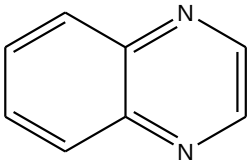

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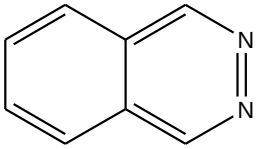

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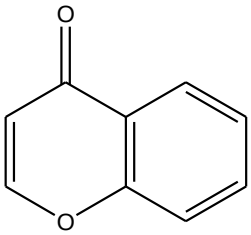

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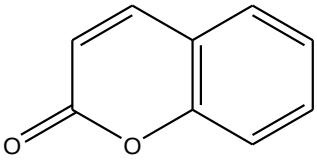

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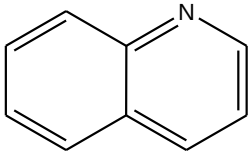

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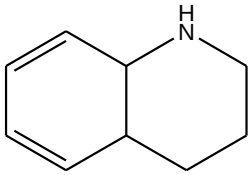

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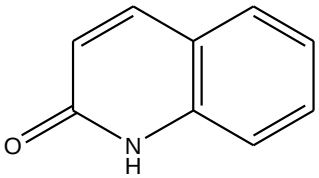

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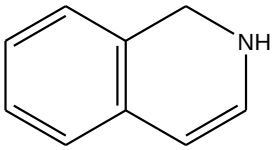

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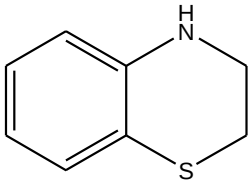

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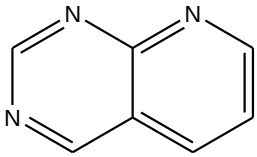

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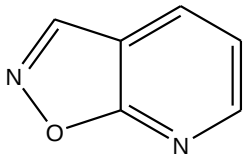

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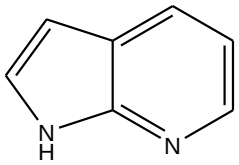

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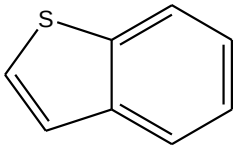

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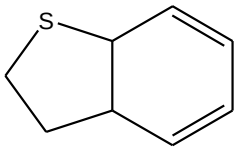

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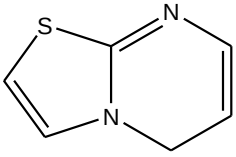

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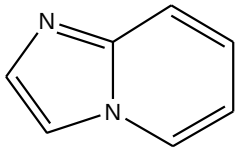

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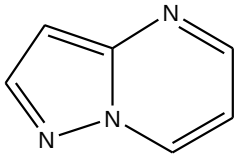

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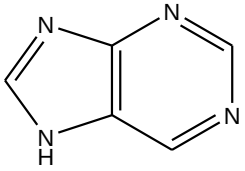

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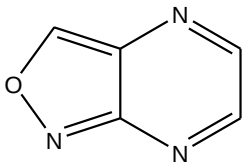

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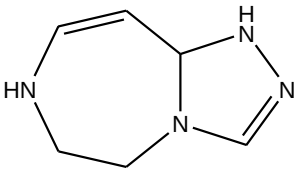

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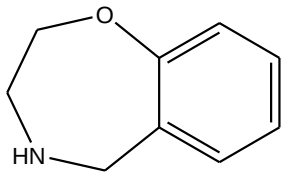

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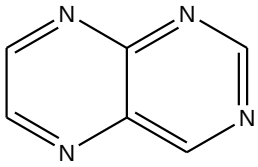

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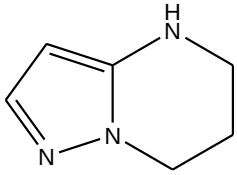

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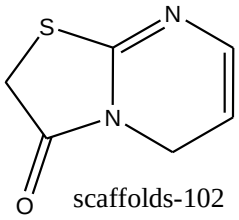

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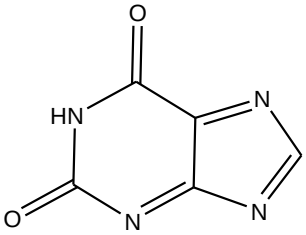

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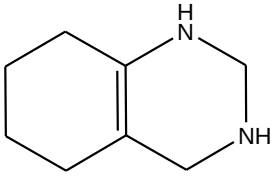

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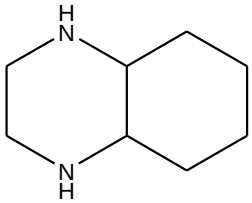

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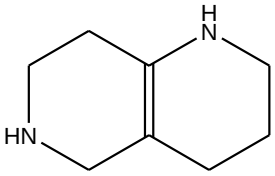

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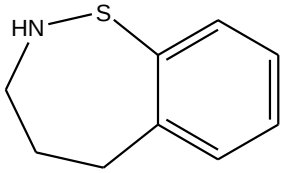

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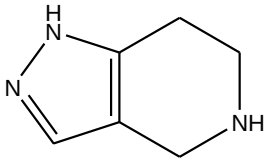

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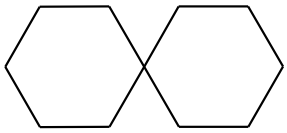
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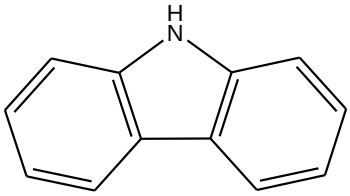

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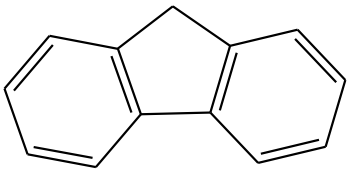
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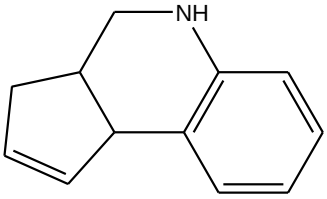

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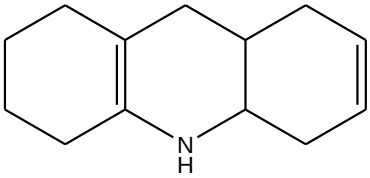

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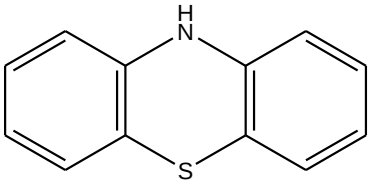

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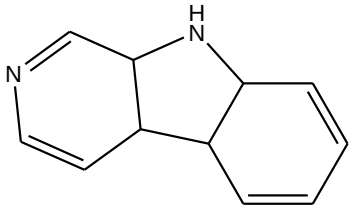

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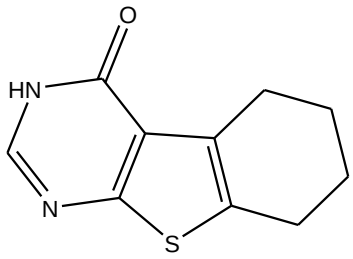

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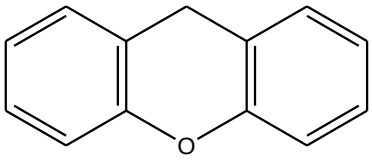

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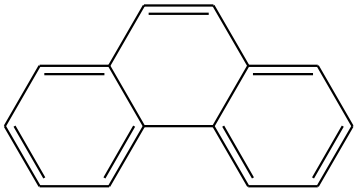

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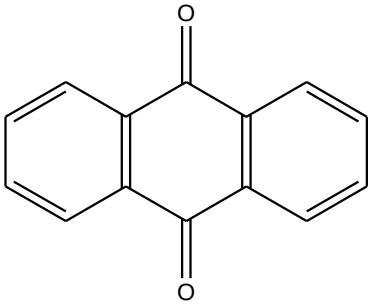

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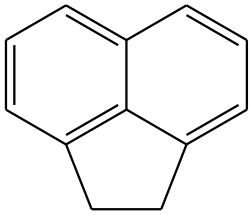

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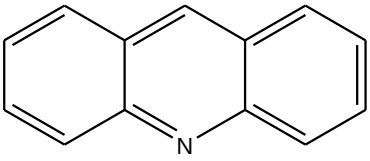

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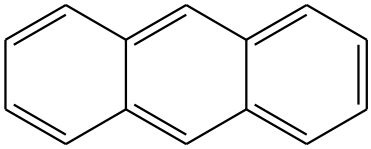

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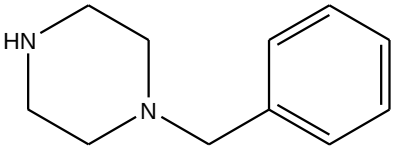

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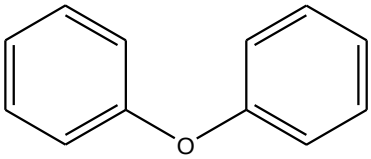

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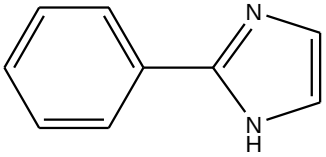

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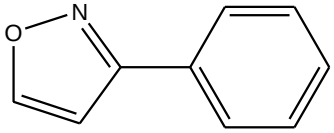

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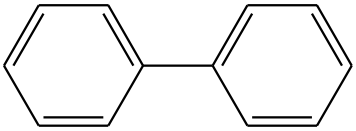

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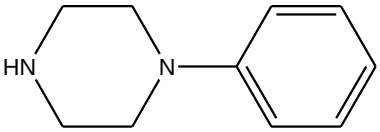

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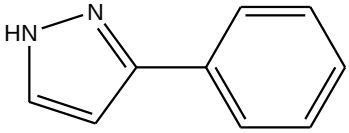

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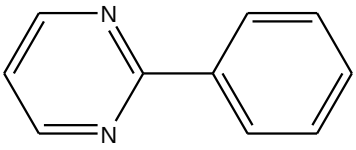

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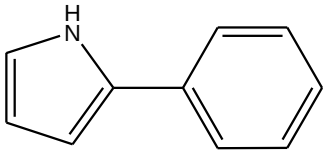

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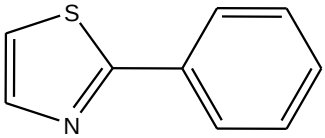

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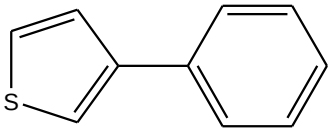

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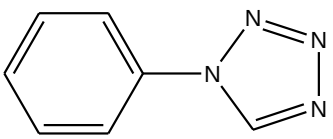

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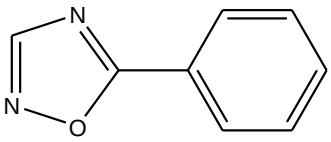

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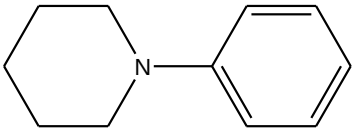

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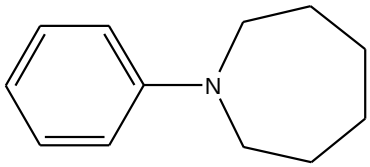

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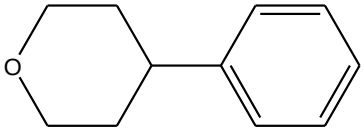

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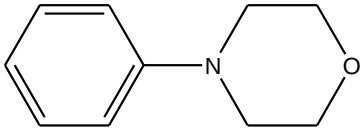

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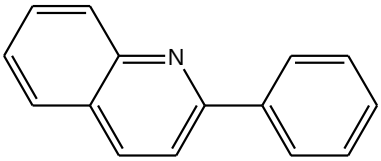

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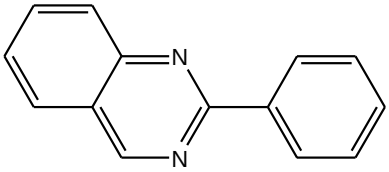

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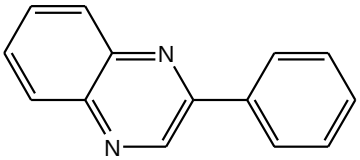

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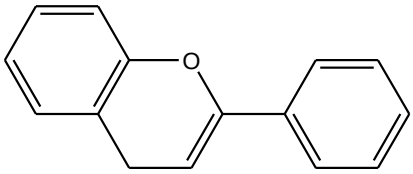
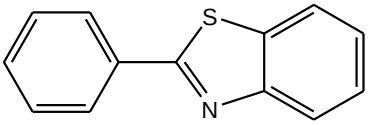


scaffolds-143



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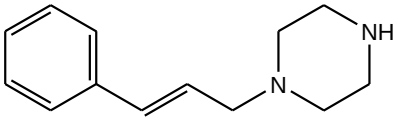

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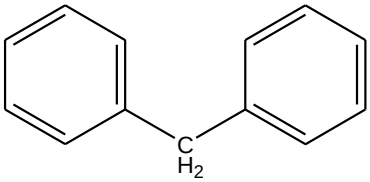

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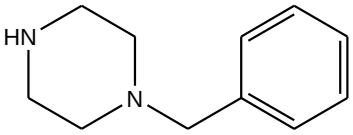

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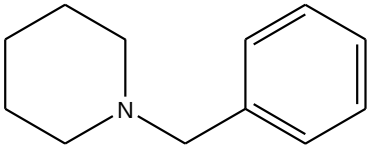

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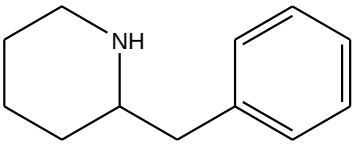

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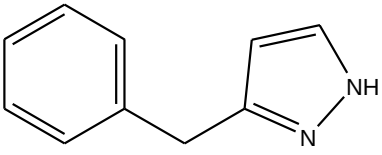

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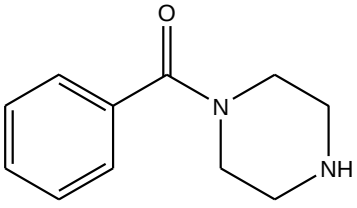

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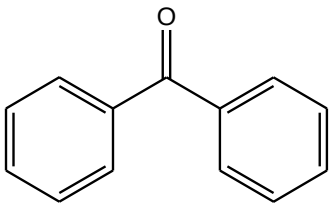

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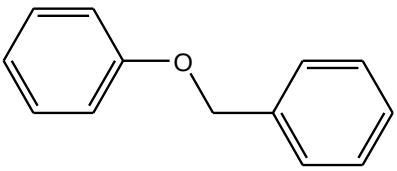
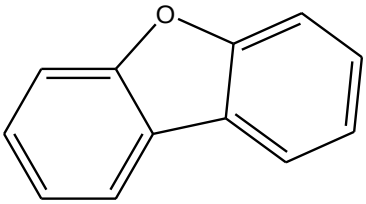
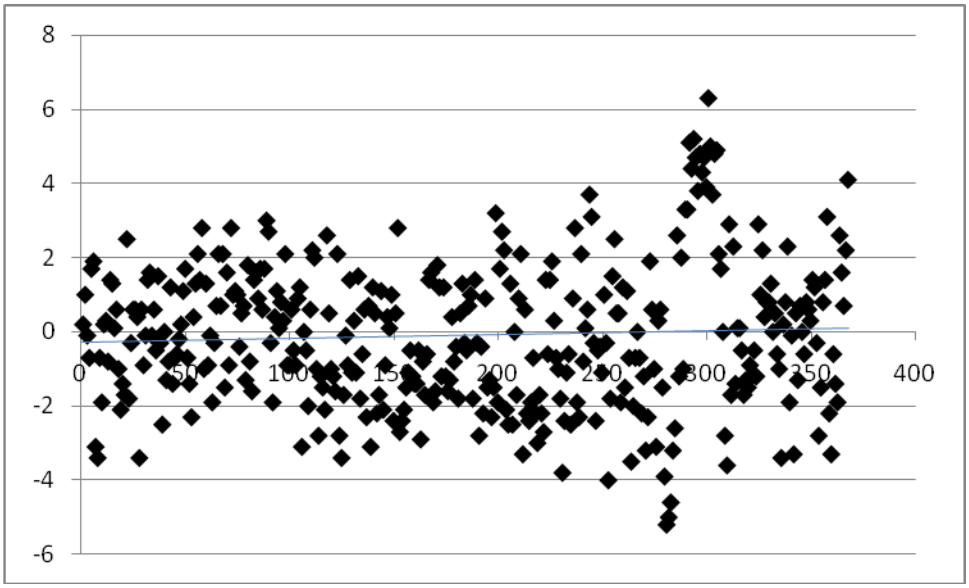


scaffolds-153

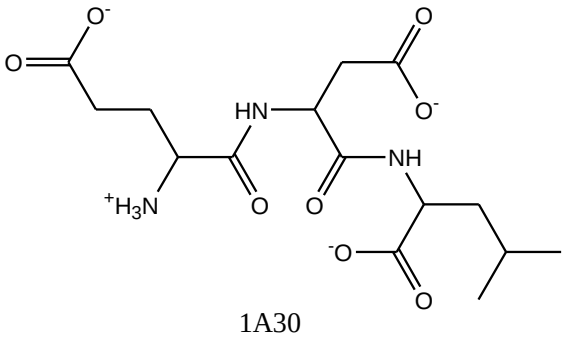


scaffolds-154

Supplementary Figure 2: 154 most commonly found scaffolds in organic chemistry identified from the million molecule library.



Supplementary Figure 3: Standard errors shown against the predicted binding energies for an assessment of model validation.



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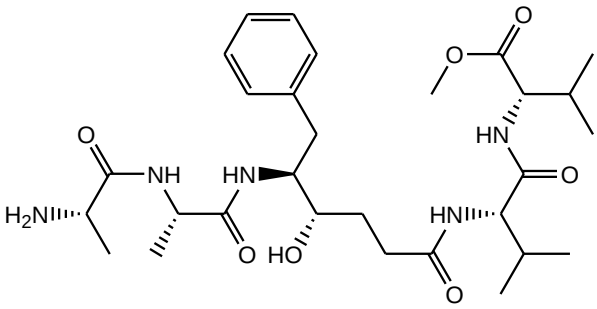

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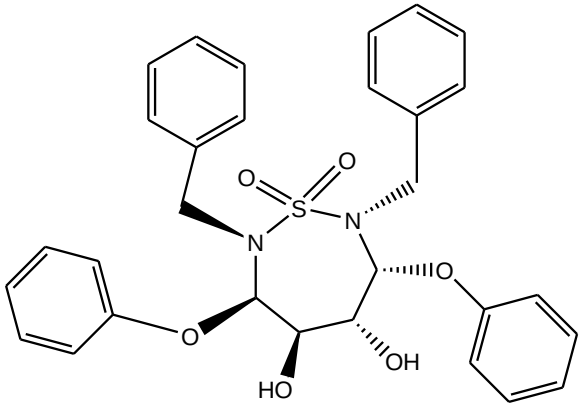

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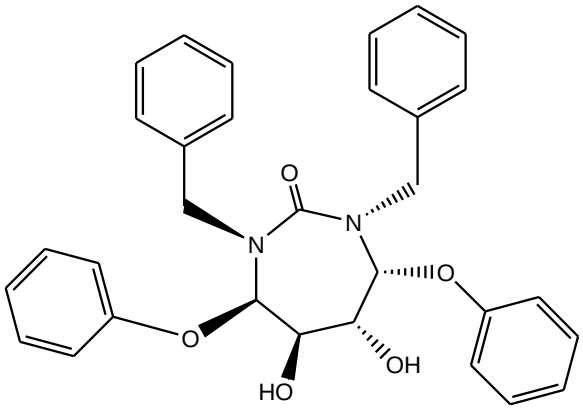

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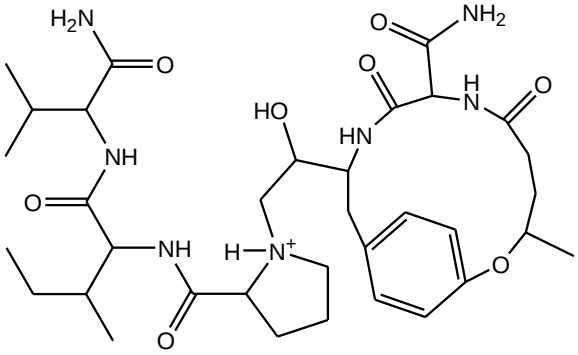

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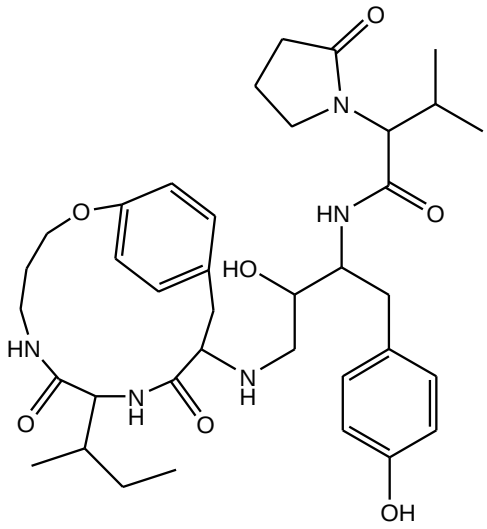

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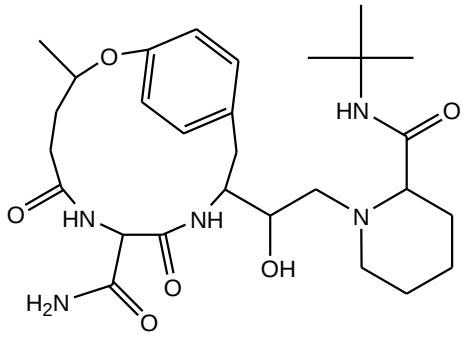

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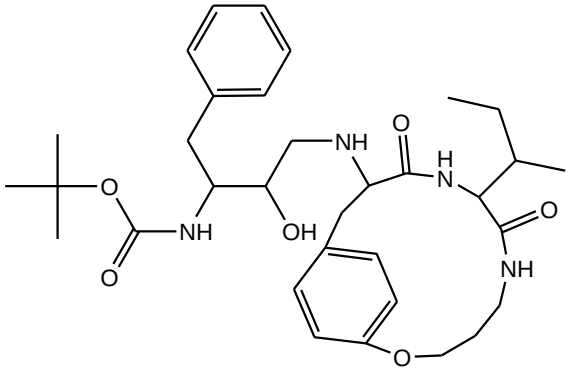

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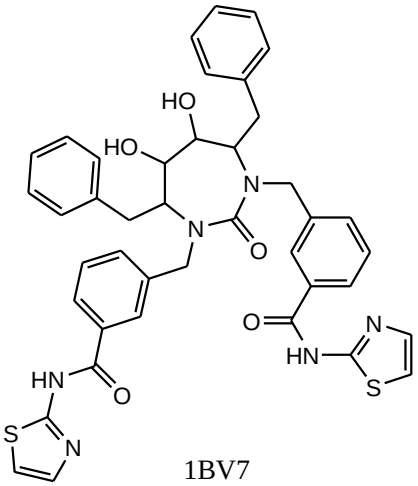

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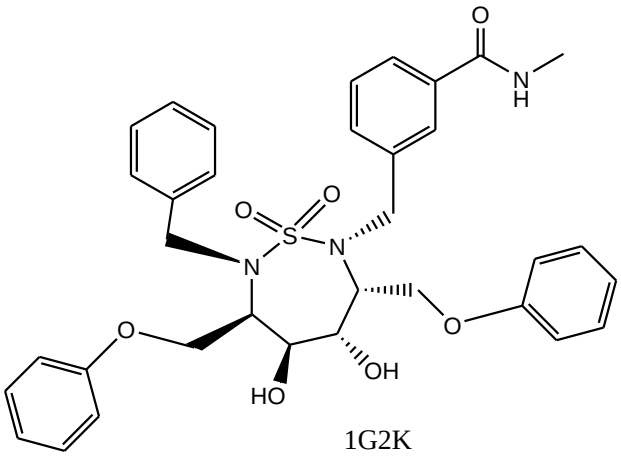

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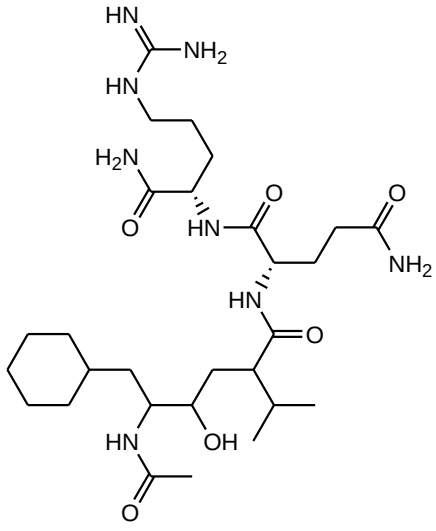

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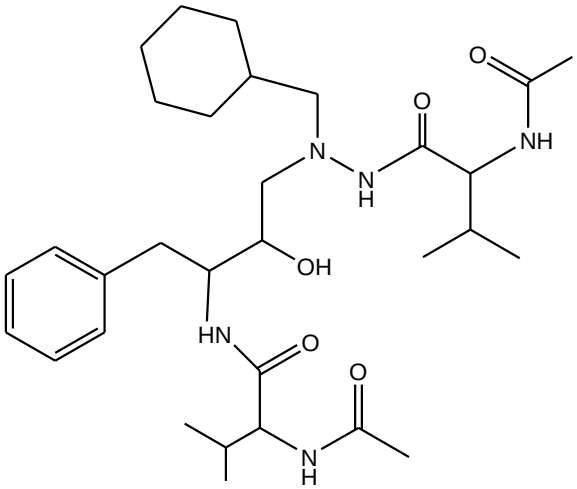
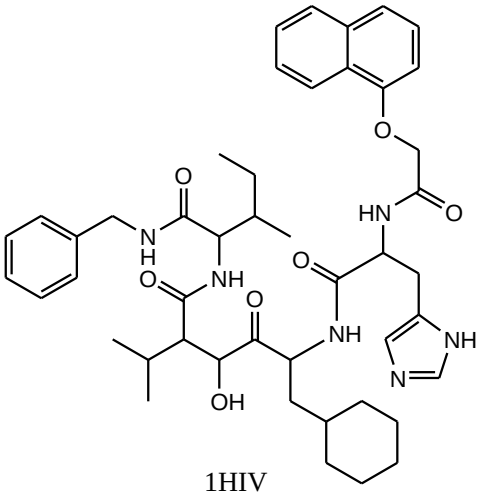


1HIH



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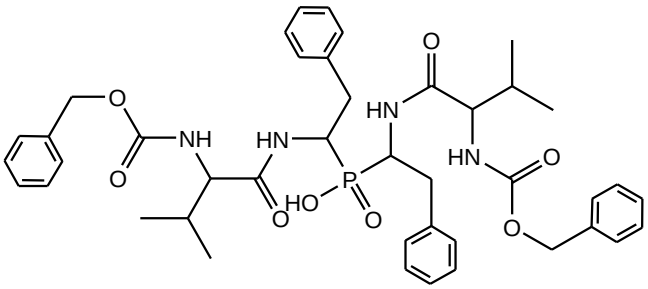

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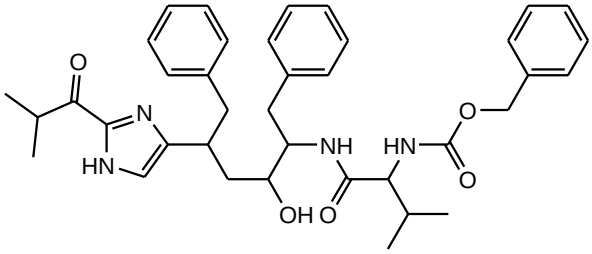

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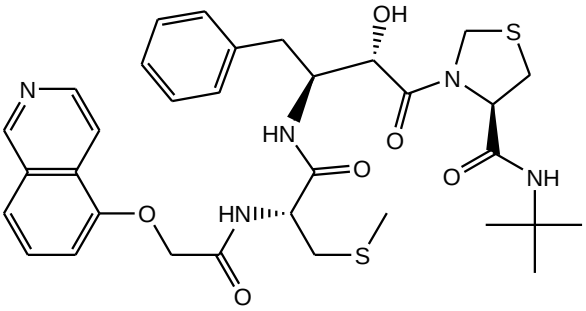

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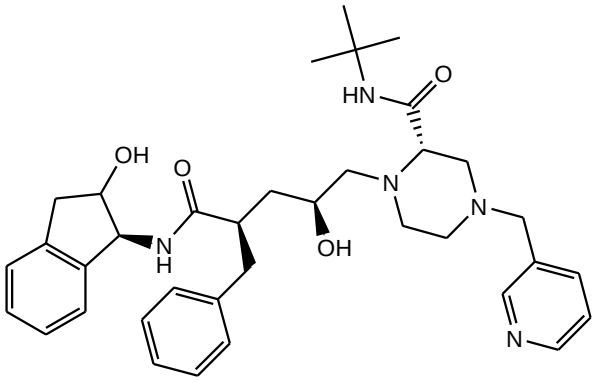

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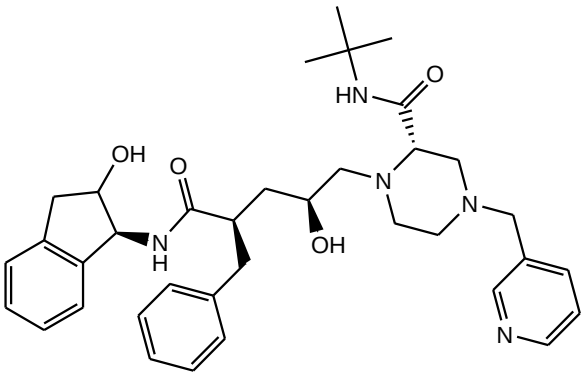

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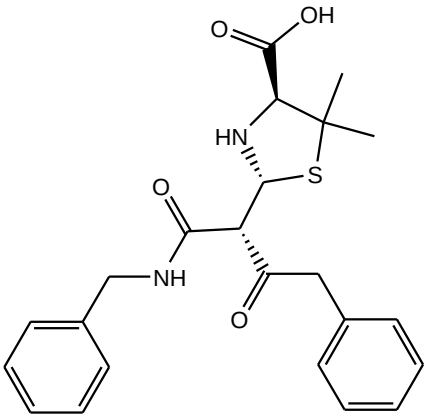

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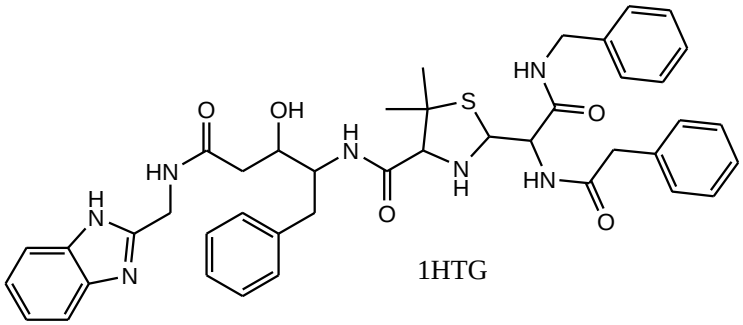

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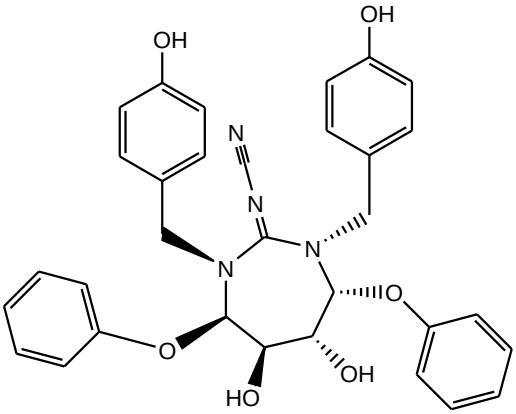

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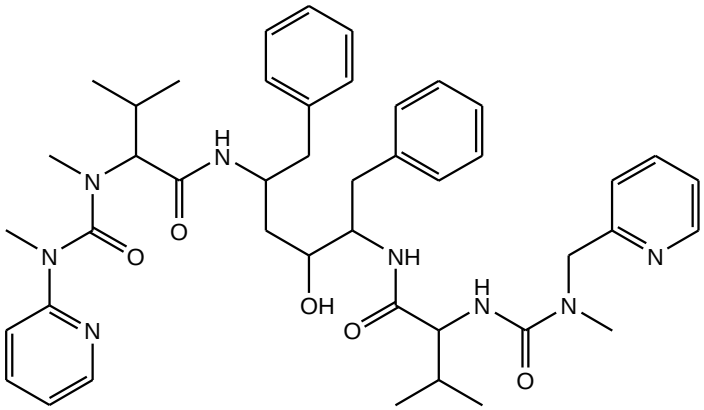

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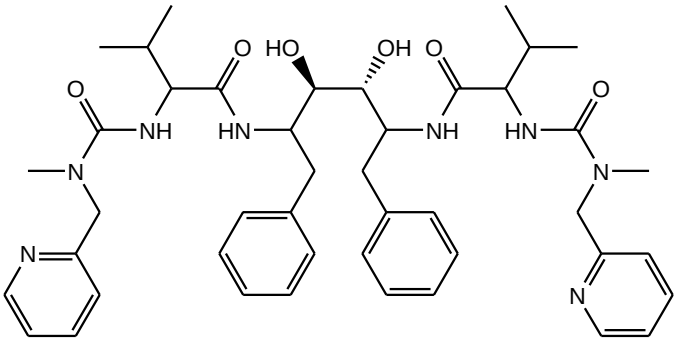

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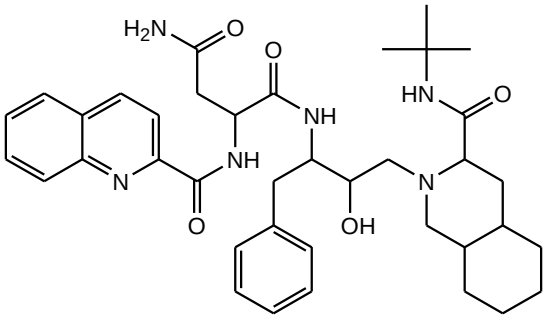

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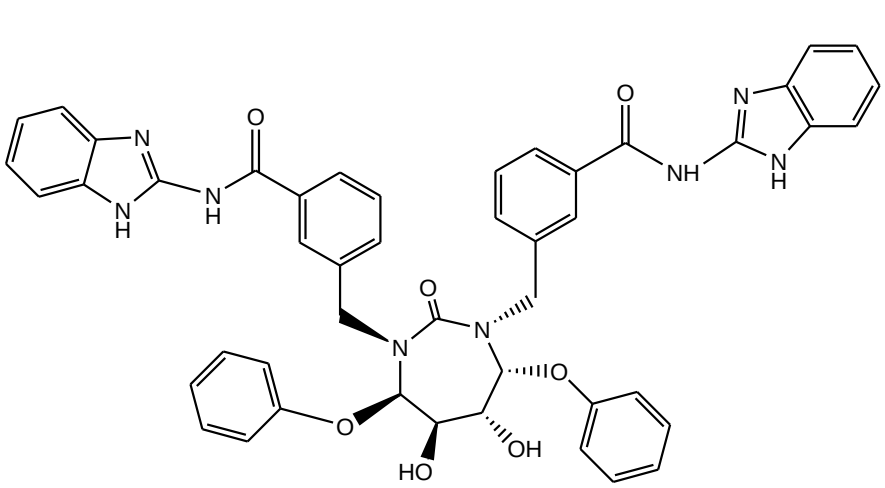

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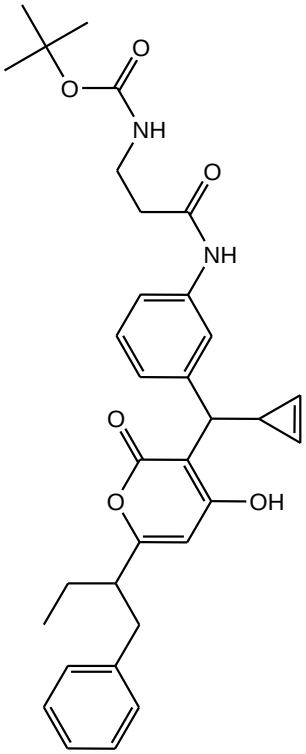

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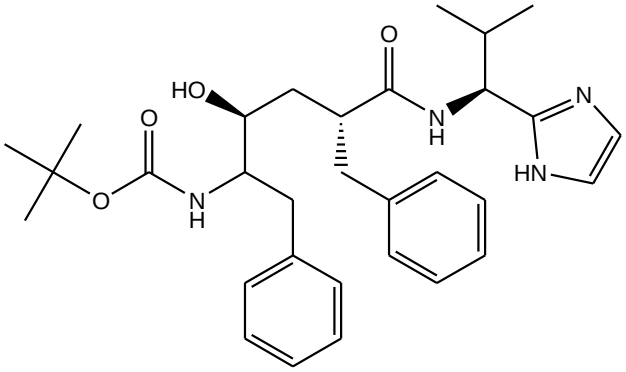
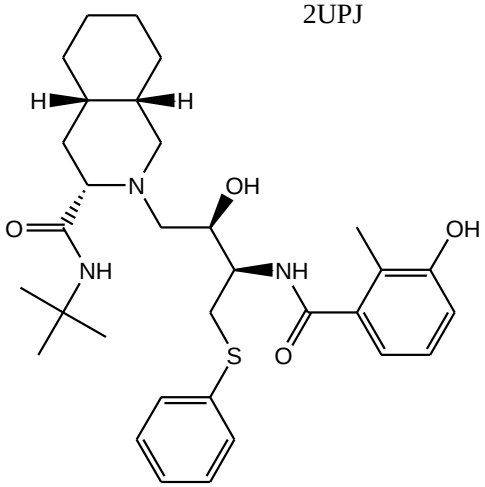


1SBG



1OHR

Supplementary Figure 4: Structures of 28 ligand molecules for HIV 1 Protease

Supplementary Note 1: An illustrative RASPD Calculation for the protein Glucocorticoid receptor (1NHZ) bound to Mifepristone.

Supplementary Table 5. Physico-Chemical Parameters of the drug molecule (Mifepristone) and the active site of the Glucocorticoid receptor (1NHZ) which is bound with Mifepristone

Physico-Chemical Parameter	Active site	Molecule
Hydrogen bond donor	40	1
Hydrogen bond acceptor	31	3
Partition coefficient (logP)	19.20	5.406
Molar refractivity	417.67	129.432
Volume/Wiener Index	990	2219.88

MaxD of the ligand molecule is 7.84 Å.

Regression equation used for estimating the protein-ligand binding energy is given below

$$\Delta E\,(\text{kcal/mol}) = a^{*}\frac{PD}{MaxD} + b^{*}\frac{PA}{MaxD} + c^{*}\frac{PP}{MaxD} + d^{*}\frac{PMR}{MaxD} + e^{*}Volume + f^{*}DD + g^{*}DA + h^{*}|P| + i^{*}MR + j^{*}W + intercept$$

PD: Number of hydrogen bond donor at the active site; PA: Number of hydrogen bond acceptor at the active site; PP: Partition coefficient of the active site residues; PMR: Molar refractivity of the active site residues; Volume: active site volume; DD: Total number of hydrogen bond donor of the ligand/drug molecule; DA: Total number of hydrogen bond acceptor of the ligand/drug molecule; P: Partition coefficient of the ligand/drug molecule; MR: Molar refractivity of the ligand/drug molecule; W: Wiener Index of the ligand/Drug molecule and MaxD is the distance of the farthest atom of the ligand from its COM.

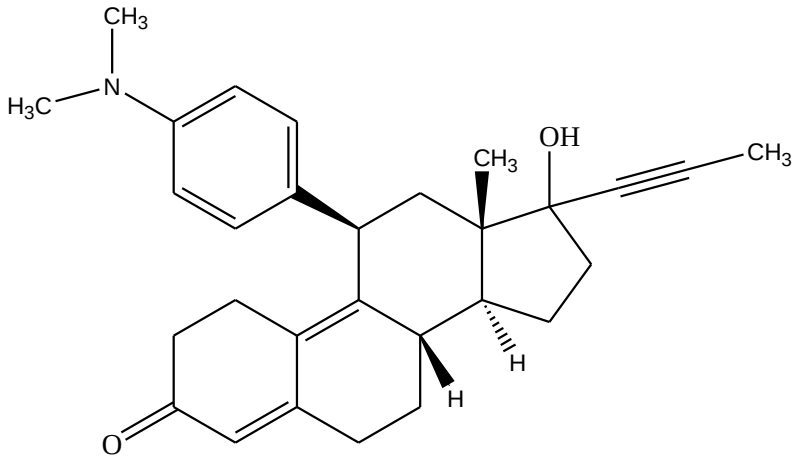
Sample Calculation:

$\Delta E\,(\text{kcal/mol}) =$ (-0.62991*40/7.84)+(-0.24581 *31/7.84)+(-2.55078*19.2/7.84)+(0.108256*417.67/7.84)+ (0.000477*990)+(0.196632*1)+(-0.04004*3)+(0.187565*5.406)+ (-0.06165*129.432)+(0.000264*2219.88)+(-0.67154)

or, $\Delta E\,(\text{kcal/mol}) =$-11.1 kcal/mol.

Predicted binding energy of the 1NHZ- Mifepristone complex is -11.1 kcal/mol.

The corresponding experimental value is -13.63 kcal/mol (source http://www.bindingdb.org/pdb/1nhz)



Mifepristone

Calculation of Physico-Chemical Properties at the active site of Glucocorticoid receptor (1NHZ)

Supplementary Table 7. Number of hydrogen bond donors and acceptors at the active site of the protein. Distance cutoff was (MaxD+3) Å.

Residue	Atom	Residue No.	HBD	HBA
ASN	OD1	35	0	1
ASN	1HD2	35	1	0
ASN	2HD2	35	1	0
GLN	OE1	41	0	1
GLN	1HE2	41	1	0
GLN	2HE2	41	1	0
TRP	HE1	71	1	0
ARG	2HH1	82	1	0
ARG	1HH2	82	1	0
ARG	2HH2	82	1	0
GLN	OE1	113	0	1
GLN	1HE2	113	1	0
GLN	2HE2	113	1	0
Amide Bond			30	28
Total			40	31

Supplementary Table 8. Hydrophobicity and Molar Refractivity* at the active site of the protein. Cutoff distance was (MaxD+0.9) Å.

Residue	Residue number
MET	31
LEU	34
ASN	35
LEU	37
GLY	38
GLY	39
GLN	41
TRP	71
MET	72
MET	75
ALA	76
PHE	94
GLN	113
MET	117
LEU	203

*Hydrophobicity Value: ALA: 1.0262; VAL: 1.6623; LEU: 2.0524; ILE: 2.0524; PRO: 0.3698; MET: 1.7594; TRP: 2.7303; PHE: 2.249.

*Molar Refractivity value: ALA: 21.285; VAL: 30.449; LEU: 35.066; ILE: 35.0662; PRO: 28.660; MET: 38.610; TRP: 57.614; PHE: 45.757; GLY: 16.690; CYS: 29.464; TYR: 47.422; THR: 27.292; SER: 22.697.

Sum of the values of hydrophobic residues is 19.20.

Sum of the values of these residues (except polar one) is 417.67.

Active site volume: 990 $Å^3$.

Supplementary Notes 2: Calculation of the physico-chemical parameters of the ligand.

(a) Wiener Index (W)

The Wiener index value of any molecule is calculated as per literature procedure[29-30]. It is the hydrogen depilated model. Path number between any two pair of atoms is calculated as follow.

$$W_{ij} = \frac{Z_C^2}{B_{ij} Z_i Z_j} = \frac{6^2}{B_{ij} Z_i Z_j}$$

Where W_{ij} is the path number between any two atom i, j respectively. B_{ij} is the bond order between i^{th} and j^{th} pair of atoms. Z_i is the atomic number of the i^{th} atom. Z_C is the atomic number of carbon. A sample calculation between two pair of atoms is tabulated below (Table 1).

Table 1: sample calculation between two pair of atoms

Z_i	Z_j	B_{ij}	Bond type	W_{ij}
C	C	1	Single	1.000
C	C	2	Double	0.500
C	C	3	Triple	0.333
C	N	1	Single	0.857
C	N	2	Double	0.429
C	N	3	Triple	0.286
C	O	1	Single	0.750
C	O	2	Double	0.375

For example the Wiener index value of methyl ether (CH_3-O-CH_3) is 0.75+1.5+0.75=3.

(b) Hydrogen bond donor(s) and acceptor(s)

Hydrogen bond donor is calculated by simple counting OH and NH functional group in a molecule and hydrogen bond acceptor is the total number of nitrogen atoms (N) and oxygen atoms (O) presents in the given molecule.

(c) LogP and Molar Refractivity

Hydrophobicity (logP) and molar refractivity (MR) is calculated as per literature [73].