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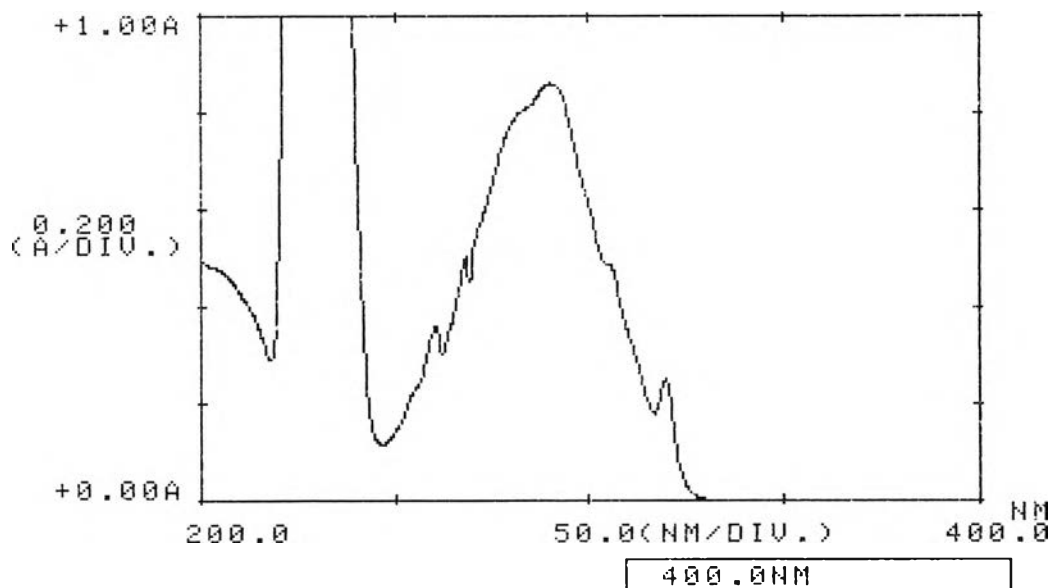


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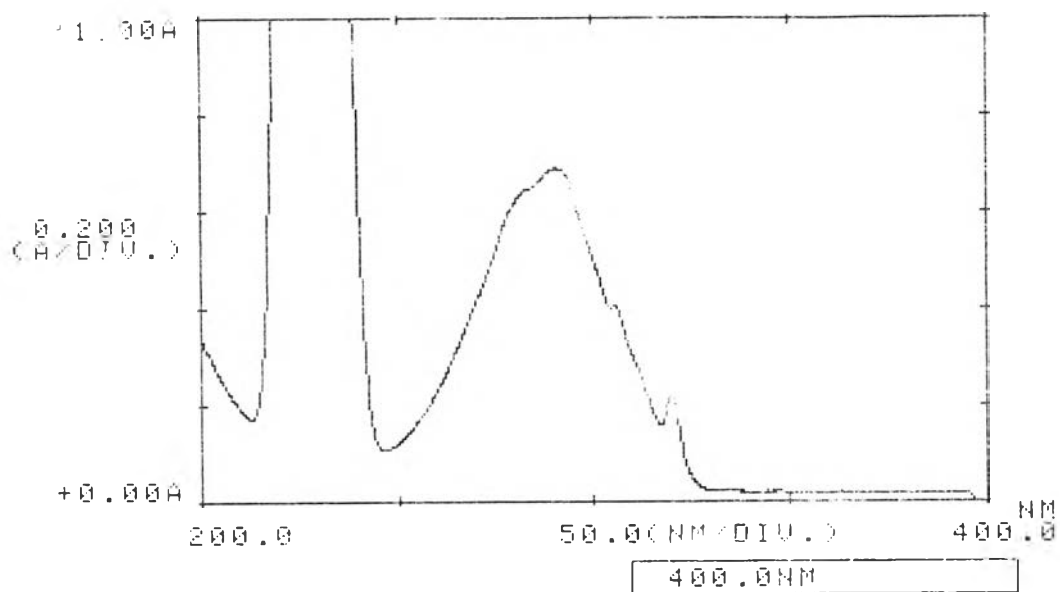
## **APPENDICES**

## Appendix A

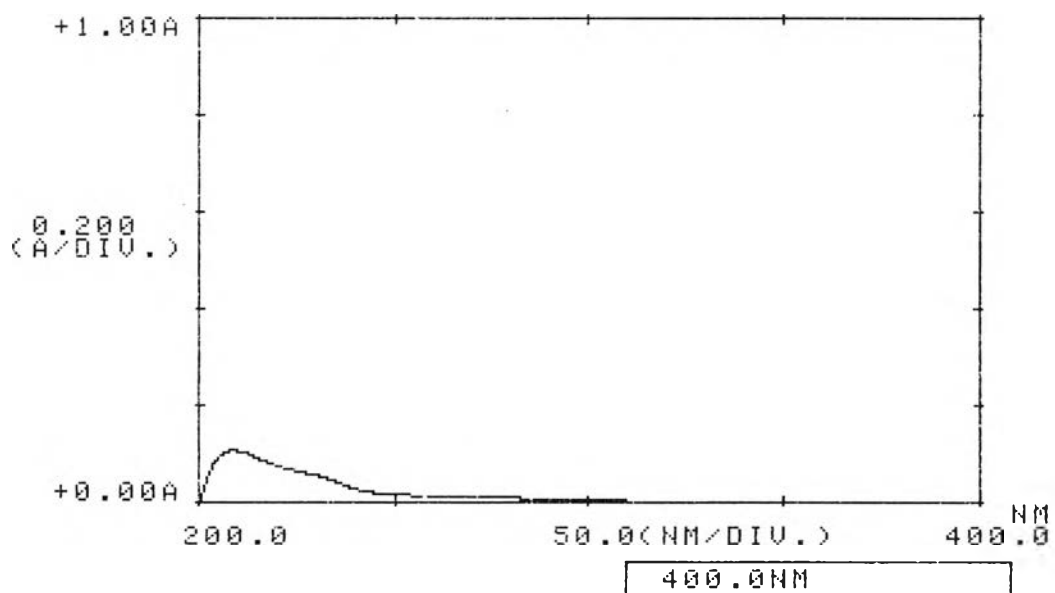
The UV/visible spectrophotometry was used to determine the amount of propranolol hydrochloride at 289 nm which was the  $\lambda_{\text{max}}$  of drug absorbances in methanol, acid buffer pH 1.2 and phosphate buffer pH 6.8. The absorbance spectra in methanol and acid buffer are displayed in Figures 151-152. Additionally, the main composition of coating formulations and core pellets may be absorbed UV light at the same wavelength of propranolol hydrochloride (289 nm). Hence, the blank pellets were coated with coating formulations A16 and B16 and also determined at 289 nm by UV/visible spectrophotometry. The absorbance characteristics of each formulation in both media are shown in Figures 153-156. It could be observed that the absorbance characteristics of blank pellets coated with coating formulations A16 and B16 did not interfere in the drug absorbances.



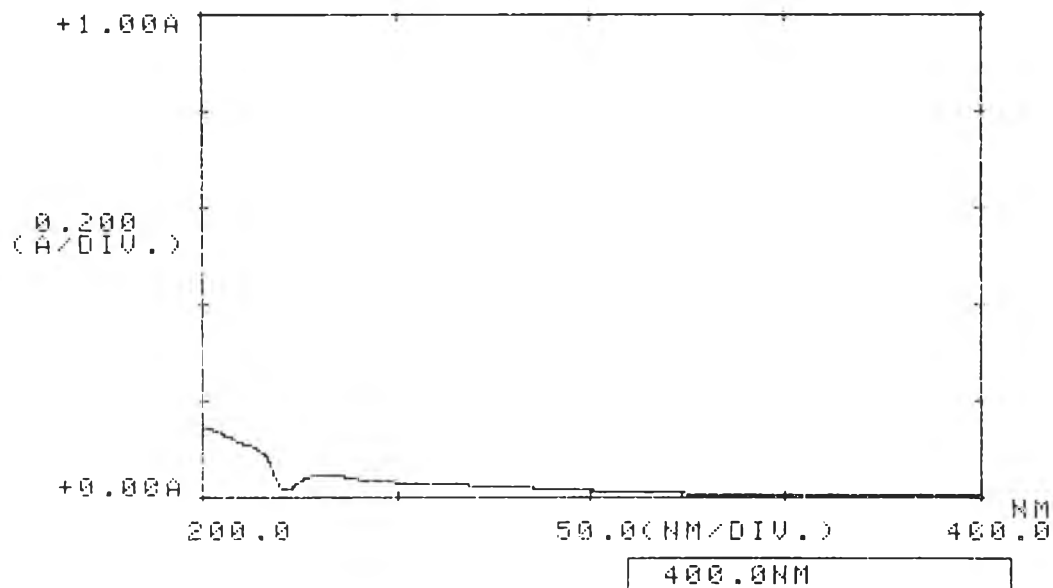
**Figure 151** The sample scan of propranolol HCl in methanol



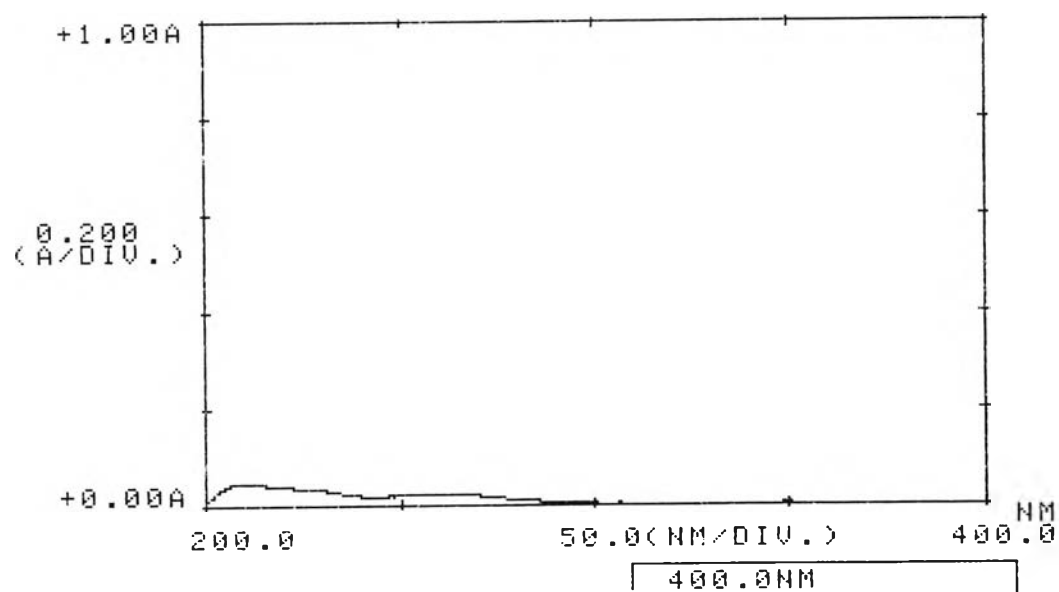
**Figure 152** The sample scan of propranolol HCl in acid buffer pH 1.2



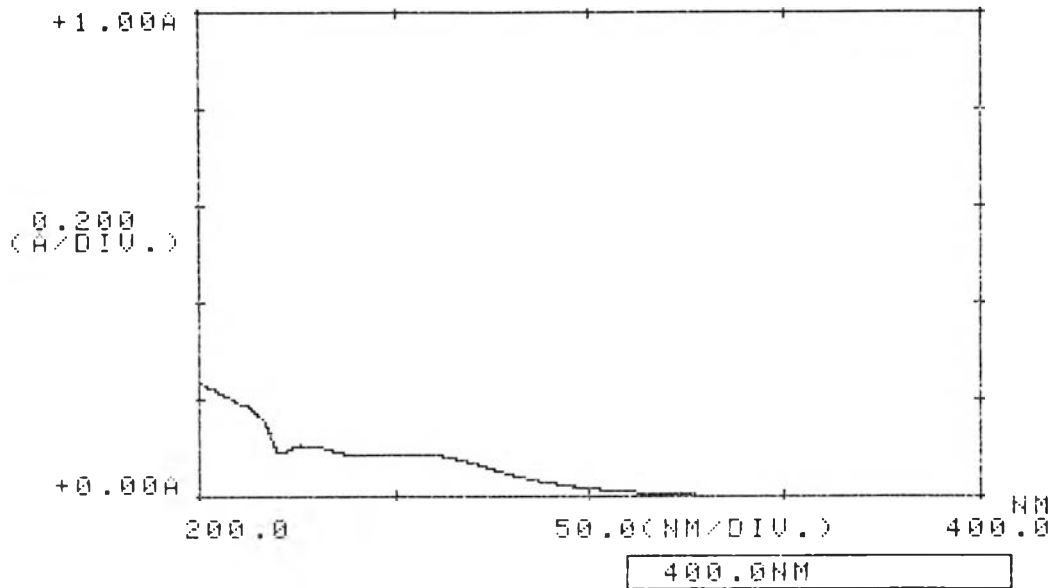
**Figure 153** The sample scan of blank pellets coated with the mixture films of EC:EuRS100 in the ratio of 5:5 with 20% triethyl citrate in acid buffer pH 1.2 (formulation A16)



**Figure 154** The sample scan of blank pellets coated with the mixture films of EC:EuRS100 in the ratio of 5:5 with 20% triethyl citrate in phosphate buffer pH 6.8 (formulation A16)



**Figure 155** The sample scan of blank pellets coated with the mixture films of SR:EuRS30D in the ratio of 5:5 with 15% triacetin in acid buffer pH 1.2 (formulation B16)



**Figure 156** The sample scan of blank pellets coated with the mixture films of SR:EuRS30D in the ratio of 5:5 with 15% triacetin in phosphate buffer pH 6.8 (formulation B16)

## Appendix B

### Calibration Curve

The concentration versus absorbance of propranolol hydrochloride in methanol, acid buffer pH 1.2 and in phosphate buffer pH 6.8 at 289 nm are presented in Tables 17, 18, and 19, respectively. The calibration curve obtained by regression analysis of these data are depicted in Figures 157, 158, and 159, respectively

**Table 17** Absorbance of propranolol hydrochloride in methanol at 289 nm

Concentration (mcg/ml)	Absorbance
10.01	0.212
15.01	0.305
20.02	0.406
25.02	0.512
30.02	0.621
40.03	0.829

Coefficient of determination = 0.9995;  $y = 0.0207x - 0.0027$

( y = absorbance ; x = concentration )

**Table 18** Absorbance of propranolol hydrochloride in acid buffer pH 1.2 at 289 nm

Concentration (mcg/ml)	Absorbance
10.13	0.202
15.19	0.297
20.26	0.395
25.32	0.499
30.38	0.594
40.51	0.792

Coefficient of determination = 0.9999;  $y = 0.0195x + 0.0029$

(  $y$  = absorbance ;  $x$  = concentration )

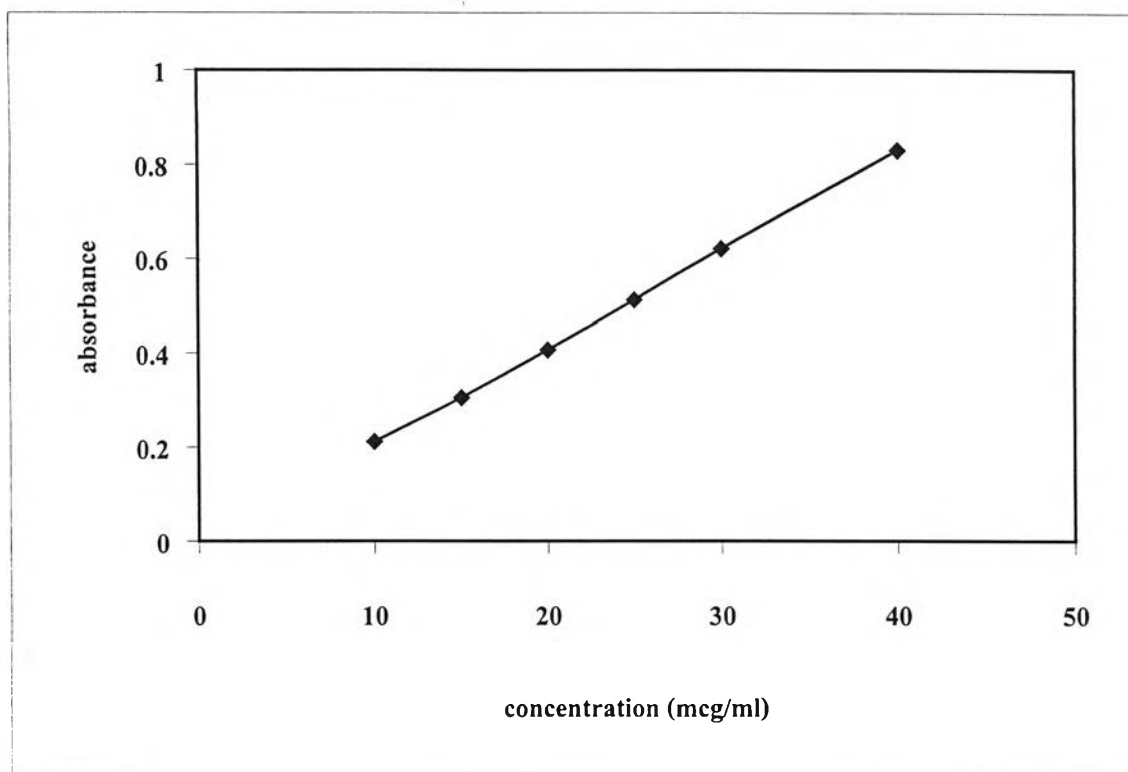
**Table 19** Absorbance of propranolol hydrochloride in phosphate buffer pH 6.8 at 289 nm

Concentration (mcg/ml)	Absorbance
10.04	0.202
15.06	0.294
20.08	0.388
25.10	0.493
30.12	0.586
40.16	0.775

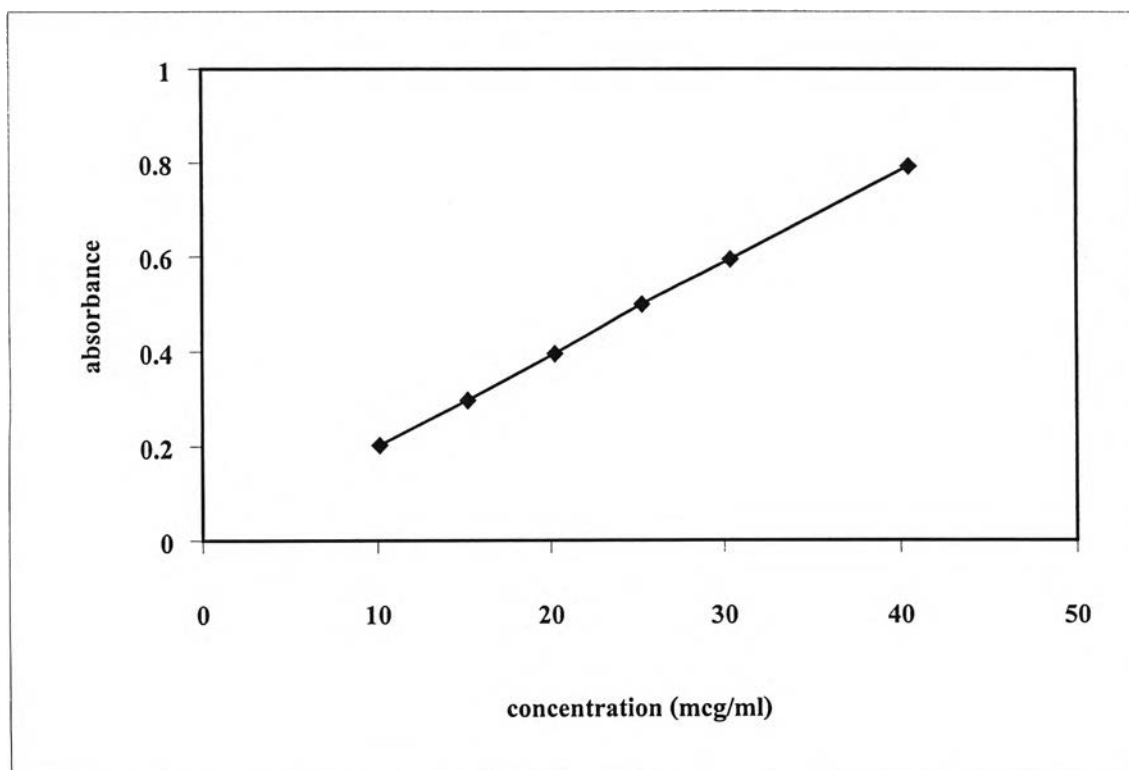
Coefficient of determination = 0.9998;  $y = 0.0191x + 0.008$

(  $y$  = absorbance ;  $x$  = concentration )

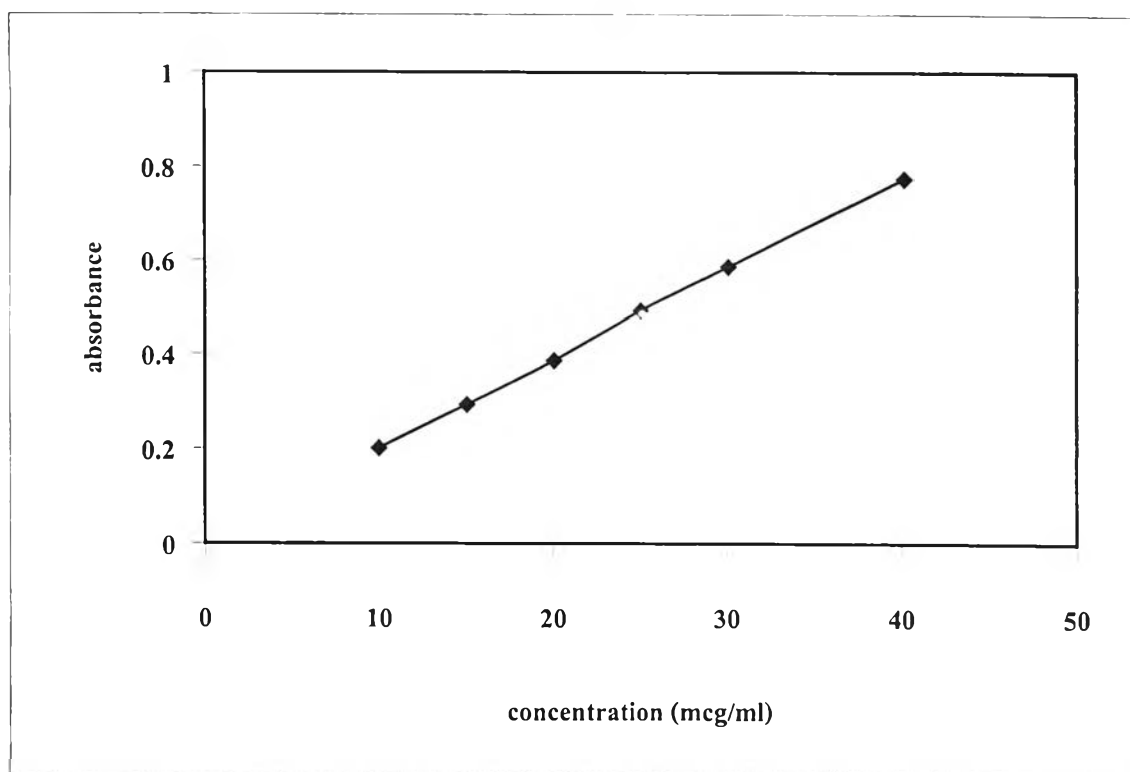




**Figure 157** Calibration curve of propranolol hydrochloride in methanol at 289 nm



**Figure 158** Calibration curve of propranolol hydrochloride in acid buffer pH 1.2 at 289 nm



**Figure 159** Calibration curve of propranolol hydrochloride in phosphate buffer pH 6.8 at 289 nm

## Appendix C

### % Strain at break, Stress at break, Young's Modulus, Toughness and Thickness

**Table 20** % Strain at break of free films from various formulations

Formulations	% Strain at break						Mean	S.D.
	1	2	3	4	5	6		
A1	1.285	1.410	1.393	1.426	1.354	1.244	1.352	0.073
A2	1.294	1.215	1.293	1.314	1.290	1.159	1.261	0.061
A3	1.521	1.293	1.274	1.663	1.400	1.482	1.439	0.148
A4	9.621	11.225	10.846	7.914	8.856	9.480	9.657	1.232
A5	0.990	0.979	0.981	0.933	0.884	0.929	0.950	0.041
A6	1.489	1.391	1.343	1.222	1.183	1.233	1.310	0.118
A7	0.573	0.525	0.518	0.432	0.575	0.612	0.539	0.063
A8	1.610	1.617	1.683	1.631	1.733	1.602	1.646	0.052
A9	1.024	0.976	1.014	1.116	0.982	1.078	1.032	0.055
A10	1.170	1.192	1.153	1.220	1.056	1.178	1.161	0.056
A11	1.046	1.161	1.331	1.130	1.204	1.191	1.177	0.094
A12	1.368	1.502	1.394	1.381	1.405	1.249	1.383	0.081
A13	2.008	2.009	1.762	1.406	1.758	1.662	1.768	0.227
A14	17.628	12.982	17.058	15.537	16.870	16.721	16.133	1.689
A15	0.877	0.812	0.980	0.855	0.953	0.855	0.889	0.065
A16	1.854	1.661	1.850	1.665	1.819	1.750	1.767	0.088
A17	0.713	0.667	0.760	0.738	0.696	0.786	0.727	0.044
A18	2.153	2.010	1.938	1.999	1.999	1.856	1.992	0.098
A19	0.836	0.844	0.909	0.873	0.900	0.907	0.878	0.032
A20	1.125	1.217	1.164	1.186	1.343	1.155	1.198	0.077

**Table 20(cont.)** % Strain at break of free films from various formulations

Formulations	% Strain at break						Mean	S.D.
	1	2	3	4	5	6		
B1	5.142	5.878	5.007	5.668	6.029	5.484	5.535	0.404
B2	11.801	12.481	9.491	9.747	9.389	10.276	10.531	1.302
B3	1.865	1.846	1.749	1.354	1.986	1.781	1.763	0.217
B4	26.956	12.194	22.154	24.159	30.537	26.211	23.702	6.303
B5	6.063	5.409	5.628	6.690	5.368	5.296	5.742	0.541
B6	7.537	7.943	5.298	5.281	5.278	4.564	5.984	1.395
B7	1.136	1.279	1.325	1.315	1.307	1.366	1.288	0.080
B8	5.001	5.355	5.712	6.230	4.957	6.382	5.606	0.609
B9	3.325	4.528	4.444	3.540	4.548	4.552	4.156	0.566
B10	4.236	4.597	4.711	4.365	4.729	4.210	4.475	0.234
B11	5.248	4.404	4.583	5.079	4.238	5.333	4.814	0.465
B12	5.722	6.013	5.466	4.978	5.878	7.046	5.851	0.690
B13	2.306	2.282	2.453	2.426	2.647	2.352	2.411	0.133
B14	7.139	6.267	7.376	8.126	8.291	10.726	7.987	1.527
B15	1.975	3.229	1.881	3.236	3.358	2.417	2.683	0.675
B16	7.813	5.882	6.623	4.307	2.103	4.877	5.268	1.989
B17	1.030	1.022	1.010	1.080	0.947	0.952	1.007	0.050
B18	4.127	4.048	4.319	5.293	4.083	2.949	4.137	0.747
B19	3.512	3.554	3.893	4.904	3.358	3.927	3.858	0.559
B20	4.737	4.930	4.880	4.856	5.307	5.440	5.025	0.280

**Table 21** Stress at break of free films from various formulations

Formulations	Stress at break (MPa)						Mean	S.D.
	1	2	3	4	5	6		
A1	11.861	12.246	12.181	11.344	11.556	11.314	11.828	0.426
A2	9.848	9.382	9.814	9.809	9.746	9.824	9.737	0.177
A3	6.385	7.166	7.536	8.161	8.208	7.632	7.515	0.680
A4	1.617	2.108	2.167	2.994	3.096	2.924	2.484	0.604
A5	9.140	8.875	8.805	8.580	8.577	8.798	8.796	0.210
A6	7.516	6.760	6.768	7.034	6.498	6.448	6.837	0.394
A7	3.268	3.330	3.265	2.768	3.315	3.334	3.213	0.220
A8	3.391	3.468	3.373	3.514	3.679	3.349	3.462	0.123
A9	10.268	9.594	9.432	9.832	9.080	10.287	9.749	0.477
A10	7.837	7.885	7.453	7.791	7.381	7.633	7.663	0.210
A11	11.150	11.838	11.821	11.548	11.879	10.897	11.522	0.412
A12	10.121	10.831	10.347	10.206	10.074	9.340	10.153	0.483
A13	6.977	7.589	8.338	7.557	8.086	7.503	7.675	0.479
A14	2.580	1.294	2.695	1.086	2.167	1.370	1.865	0.703
A15	8.483	7.983	8.683	7.595	8.163	8.790	8.283	0.455
A16	4.571	4.132	4.868	4.540	4.873	4.683	4.611	0.274
A17	5.449	4.384	5.556	5.572	5.381	6.216	5.426	0.592
A18	2.539	2.829	2.575	2.648	2.542	2.467	2.600	0.126
A19	8.264	8.820	8.971	8.280	8.336	8.035	8.451	0.363
A20	6.580	6.585	6.058	6.741	7.156	6.686	6.634	0.353

**Table 21(cont.)** Stress at break of free films from various formulations

Formulations	Stress at break (MPa)						Mean	S.D.
	1	2	3	4	5	6		
B1	2.391	1.434	2.223	2.473	2.231	2.002	2.126	0.375
B2	1.213	1.060	1.372	1.217	0.988	1.304	1.192	0.145
B3	7.184	6.669	5.923	5.005	6.169	6.555	6.251	0.749
B4	1.475	1.415	1.605	1.992	2.018	2.141	1.775	0.313
B5	2.796	1.833	2.548	1.835	2.148	2.402	2.260	0.391
B6	0.966	1.669	0.600	0.769	0.699	1.306	1.002	0.411
B7	3.645	3.817	3.836	3.596	4.033	4.007	3.822	0.180
B8	2.718	2.511	2.703	1.938	2.111	1.260	2.207	0.562
B9	2.945	3.126	2.823	2.996	2.772	3.246	2.985	0.180
B10	0.968	0.791	2.216	2.085	2.425	1.658	1.691	0.679
B11	4.150	4.320	3.824	4.710	3.951	4.052	4.168	0.315
B12	3.629	3.437	3.451	2.011	3.098	3.469	3.182	0.600
B13	6.597	6.241	3.556	6.293	6.117	5.824	5.771	1.114
B14	3.640	3.592	1.628	1.902	1.425	3.926	2.686	1.148
B15	3.439	3.049	2.240	3.001	2.577	3.234	2.923	0.441
B16	0.684	0.843	0.703	1.381	3.015	1.159	1.298	0.885
B17	4.283	4.397	4.326	4.652	4.081	4.023	4.294	0.227
B18	3.872	3.708	3.570	3.402	3.835	3.262	3.608	0.243
B19	3.057	2.248	2.272	2.255	2.441	2.139	2.402	0.335
B20	2.911	3.235	3.390	3.412	3.273	3.450	3.278	0.198

**Table 22** Young's Modulus of free films from various formulations

Formulations	Young's Modulus (MPa)						Mean	S.D.
	1	2	3	4	5	6		
A1	1206.57	1142.58	1113.76	1054.77	1105.91	1164.00	1127.84	48.59
A2	1009.71	969.40	974.32	944.51	969.08	1084.78	991.97	50.05
A3	638.80	855.67	872.76	900.58	962.22	890.29	853.38	111.23
A4	195.48	148.81	187.53	274.80	275.38	240.30	220.38	51.39
A5	1129.37	1135.74	1076.50	1076.28	1163.50	1142.34	1120.62	36.14
A6	782.82	725.75	706.40	828.00	760.55	739.76	757.21	43.71
A7	609.94	689.20	667.97	666.06	624.71	596.13	642.33	37.18
A8	381.71	398.23	368.39	391.75	405.10	344.53	381.53	22.45
A9	1187.42	1153.95	1113.48	1102.87	1099.64	1166.15	1137.25	36.86
A10	860.54	889.24	854.67	835.00	902.28	893.17	872.48	26.31
A11	1251.84	1244.55	1141.45	1229.53	1201.81	1135.04	1200.70	51.37
A12	968.56	1010.58	986.32	996.40	984.11	934.75	980.12	26.23
A13	661.52	734.02	868.46	846.52	867.28	787.59	794.23	83.50
A14	270.50	260.13	274.27	258.08	260.23	250.18	262.23	8.76
A15	1125.58	1131.36	1011.46	960.99	958.39	1187.21	1062.50	98.00
A16	427.74	408.63	456.20	447.10	463.47	453.51	442.78	20.66
A17	880.14	701.00	844.73	870.16	869.91	916.54	847.08	75.26
A18	262.50	293.73	278.23	258.35	265.72	258.59	269.52	13.93
A19	1119.65	1237.66	1175.82	1106.69	1068.74	1042.45	1125.17	71.58
A20	765.51	720.55	689.99	798.55	722.57	768.57	744.29	39.92

Table 22(cont.) Young's Modulus of free films from various formulations

Formulations	Young's Modulus (MPa)						Mean	S.D.
	1	2	3	4	5	6		
B1	104.392	90.913	103.533	103.671	98.187	84.400	97.516	8.215
B2	37.138	36.494	43.881	51.212	49.606	52.856	45.198	7.165
B3	714.596	689.443	725.010	645.863	672.851	703.887	691.942	29.132
B4	411.251	421.946	405.527	409.703	463.414	476.554	431.399	30.657
B5	194.117	134.302	169.095	130.690	150.359	147.053	154.269	23.789
B6	96.180	96.134	87.119	93.890	99.831	90.306	93.910	4.566
B7	467.823	481.547	453.324	417.077	478.906	470.076	461.459	23.911
B8	213.635	257.592	208.464	203.406	184.200	164.564	205.310	31.376
B9	175.527	168.327	164.162	170.215	154.743	177.866	168.473	8.344
B10	97.283	83.494	104.121	110.674	124.808	84.419	100.800	15.907
B11	203.276	209.570	187.972	215.995	196.052	205.367	203.039	9.918
B12	182.720	172.019	167.397	185.323	147.958	165.750	170.195	13.499
B13	817.797	752.763	740.809	804.734	821.715	920.883	809.784	64.162
B14	642.223	536.611	612.773	689.486	565.245	599.862	607.700	54.450
B15	287.679	255.060	221.707	260.625	223.225	283.251	255.258	28.338
B16	173.373	169.637	166.093	148.515	344.935	126.280	188.139	78.775
B17	554.469	566.210	554.797	594.799	541.305	535.502	557.847	21.114
B18	385.807	367.906	331.368	308.640	351.348	336.996	347.011	27.488
B19	165.278	132.520	130.845	127.731	138.035	129.444	137.309	14.150
B20	151.732	166.465	180.283	171.973	165.975	178.751	169.197	10.438



**Table 23** Toughness of free films from various formulations

Formulations	Toughness (MPa)						Mean	S.D.
	1	2	3	4	5	6		
A1	0.089	0.101	0.097	0.095	0.090	0.081	0.094	0.008
A2	0.074	0.065	0.073	0.074	0.072	0.066	0.071	0.004
A3	0.060	0.058	0.059	0.090	0.073	0.073	0.069	0.013
A4	0.202	0.206	0.220	0.212	0.248	0.251	0.223	0.021
A5	0.052	0.049	0.048	0.045	0.043	0.046	0.047	0.003
A6	0.070	0.058	0.054	0.052	0.046	0.048	0.055	0.009
A7	0.010	0.009	0.009	0.006	0.010	0.011	0.009	0.002
A8	0.036	0.038	0.038	0.038	0.043	0.034	0.038	0.003
A9	0.059	0.052	0.054	0.063	0.050	0.063	0.057	0.006
A10	0.053	0.055	0.050	0.055	0.045	0.054	0.052	0.004
A11	0.064	0.078	0.090	0.073	0.080	0.074	0.077	0.009
A12	0.081	0.098	0.084	0.083	0.084	0.066	0.083	0.010
A13	0.093	0.103	0.097	0.066	0.094	0.080	0.089	0.014
A14	0.470	0.339	0.489	0.371	0.439	0.441	0.425	0.058
A15	0.041	0.036	0.046	0.035	0.042	0.041	0.040	0.004
A16	0.056	0.044	0.059	0.048	0.058	0.053	0.053	0.006
A17	0.021	0.015	0.023	0.023	0.020	0.027	0.022	0.004
A18	0.039	0.039	0.035	0.036	0.035	0.031	0.036	0.003
A19	0.038	0.041	0.045	0.040	0.041	0.040	0.041	0.003
A20	0.043	0.047	0.041	0.048	0.057	0.045	0.047	0.006

**Table 23(cont.)** Toughness of free films from various formulations

Formulations	Toughness (MPa)						Mean	S.D.
	1	2	3	4	5	6		
B1	0.088	0.094	0.080	0.101	0.100	0.077	0.090	0.010
B2	0.111	0.107	0.100	0.090	0.090	0.107	0.101	0.009
B3	0.087	0.081	0.072	0.044	0.086	0.077	0.074	0.016
B4	0.704	0.339	0.582	0.606	0.841	0.733	0.634	0.172
B5	0.139	0.082	0.118	0.110	0.093	0.099	0.107	0.020
B6	0.103	0.116	0.049	0.061	0.061	0.048	0.073	0.029
B7	0.026	0.031	0.032	0.029	0.033	0.034	0.031	0.003
B8	0.116	0.129	0.125	0.129	0.090	0.111	0.117	0.015
B9	0.067	0.106	0.095	0.074	0.095	0.111	0.091	0.018
B10	0.055	0.052	0.075	0.067	0.085	0.050	0.064	0.014
B11	0.173	0.139	0.130	0.181	0.123	0.171	0.153	0.025
B12	0.164	0.166	0.145	0.141	0.143	0.200	0.160	0.023
B13	0.118	0.108	0.107	0.121	0.133	0.130	0.119	0.011
B14	0.295	0.240	0.277	0.316	0.279	0.448	0.309	0.073
B15	0.043	0.074	0.028	0.074	0.066	0.054	0.056	0.019
B16	0.122	0.093	0.094	0.051	0.046	0.051	0.076	0.031
B17	0.026	0.026	0.025	0.030	0.022	0.022	0.025	0.003
B18	0.132	0.126	0.128	0.156	0.126	0.074	0.124	0.027
B19	0.073	0.056	0.064	0.086	0.056	0.062	0.066	0.012
B20	0.104	0.121	0.125	0.124	0.134	0.146	0.126	0.014

**Table 24** Thickness of free films from various formulations

Formulations	Thickness (MPa)						Mean	S.D.
	1	2	3	4	5	6		
A1	0.122	0.141	0.155	0.157	0.153	0.144	0.147	0.012
A2	0.139	0.145	0.149	0.150	0.149	0.124	0.143	0.010
A3	0.157	0.152	0.144	0.149	0.144	0.152	0.150	0.005
A4	0.147	0.167	0.155	0.156	0.144	0.145	0.152	0.009
A5	0.130	0.139	0.140	0.139	0.134	0.144	0.138	0.005
A6	0.145	0.147	0.138	0.142	0.147	0.150	0.145	0.004
A7	0.215	0.202	0.204	0.205	0.198	0.214	0.206	0.007
A8	0.190	0.183	0.193	0.179	0.182	0.187	0.186	0.005
A9	0.144	0.149	0.157	0.148	0.146	0.148	0.149	0.004
A10	0.138	0.140	0.135	0.142	0.124	0.123	0.134	0.008
A11	0.138	0.146	0.152	0.151	0.151	0.142	0.147	0.006
A12	0.126	0.144	0.140	0.145	0.147	0.141	0.140	0.008
A13	0.140	0.140	0.152	0.150	0.152	0.142	0.146	0.006
A14	0.163	0.154	0.171	0.120	0.176	0.166	0.158	0.020
A15	0.141	0.145	0.144	0.142	0.150	0.138	0.143	0.004
A16	0.165	0.182	0.165	0.173	0.161	0.169	0.169	0.008
A17	0.141	0.129	0.172	0.161	0.155	0.126	0.147	0.018
A18	0.202	0.170	0.196	0.182	0.206	0.203	0.193	0.014
A19	0.146	0.123	0.138	0.140	0.147	0.150	0.141	0.010
A20	0.129	0.141	0.143	0.123	0.142	0.127	0.134	0.009

**Table 24(cont.)** Thickness of free films from various formulations

Formulations	Thickness (MPa)						Mean	S.D.
	1	2	3	4	5	6		
B1	0.107	0.119	0.118	0.116	0.111	0.110	0.114	0.005
B2	0.135	0.139	0.136	0.113	0.129	0.138	0.131	0.010
B3	0.158	0.158	0.165	0.176	0.178	0.169	0.167	0.009
B4	0.140	0.147	0.150	0.147	0.133	0.130	0.141	0.008
B5	0.141	0.178	0.155	0.188	0.183	0.147	0.165	0.020
B6	0.157	0.145	0.172	0.152	0.161	0.172	0.160	0.011
B7	0.138	0.138	0.132	0.119	0.142	0.127	0.133	0.009
B8	0.139	0.138	0.127	0.104	0.101	0.097	0.118	0.019
B9	0.126	0.124	0.128	0.122	0.129	0.126	0.126	0.003
B10	0.141	0.143	0.138	0.138	0.134	0.143	0.140	0.004
B11	0.161	0.153	0.156	0.143	0.152	0.146	0.152	0.007
B12	0.127	0.132	0.131	0.111	0.140	0.126	0.128	0.010
B13	0.125	0.136	0.155	0.118	0.125	0.111	0.128	0.016
B14	0.130	0.143	0.122	0.136	0.143	0.119	0.132	0.010
B15	0.142	0.142	0.154	0.135	0.150	0.131	0.142	0.009
B16	0.170	0.159	0.188	0.207	0.118	0.215	0.176	0.036
B17	0.112	0.122	0.126	0.117	0.116	0.132	0.121	0.007
B18	0.124	0.127	0.130	0.134	0.128	0.108	0.125	0.009
B19	0.139	0.191	0.191	0.195	0.187	0.210	0.185	0.024
B20	0.181	0.119	0.120	0.118	0.122	0.120	0.130	0.025



**Table 26** Percentage amount of propranolol hydrochloride pellets from formulations A1-A3

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A1	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.20	0.26	0.17	0.21	0.04	0.52	0.38	0.03	0.31	0.25
	1	0.15	0.43	0.06	0.21	0.20	0.15	0.32	0.12	0.20	0.11
	2	0.75	2.47	1.35	1.52	0.87	1.23	0.91	0.38	0.84	0.43
	3	1.61	3.84	3.31	2.92	1.16	2.46	1.50	0.97	1.64	0.76
	4	2.60	5.32	5.34	4.42	1.57	3.80	2.51	1.85	2.72	0.99
	5	3.52	6.69	7.03	5.75	1.94	4.83	3.32	2.60	3.58	1.14
	6	4.36	8.08	8.51	6.98	2.28	5.87	4.09	3.61	4.52	1.19
	8	6.15	10.91	10.97	9.34	2.77	8.17	6.03	5.80	6.67	1.31
	10	7.53	12.83	12.86	11.07	3.07	9.60	7.05	7.03	7.89	1.48
	12	8.87	14.75	14.69	12.77	3.38	11.16	8.29	8.74	9.40	1.54
A2	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.20	0.34	0.37	0.30	0.09	0.12	0.14	0.20	0.15	0.04
	1	0.40	0.26	0.12	0.26	0.14	0.12	0.03	0.03	0.06	0.05
	2	0.73	0.66	0.46	0.62	0.14	0.12	0.03	0.23	0.14	0.09
	3	0.98	1.23	0.97	1.06	0.15	0.38	0.32	0.70	0.46	0.20
	4	1.19	1.67	1.55	1.47	0.25	0.61	0.55	1.11	0.76	0.30
	5	1.54	2.28	2.30	2.04	0.43	0.94	0.93	1.67	1.18	0.42
	6	1.73	2.67	2.84	2.41	0.60	1.15	1.17	2.12	1.48	0.55
	8	2.26	3.46	3.94	3.22	0.87	1.56	1.62	2.72	1.97	0.65
	10	2.76	4.12	4.66	3.85	0.98	2.01	1.98	3.38	2.46	0.80
	12	3.33	4.87	5.42	4.54	1.09	2.44	2.35	3.96	2.92	0.91
A3	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.81	0.98	0.75	0.85	0.12	0.29	0.12	0.29	0.24	0.10
	1	1.69	3.85	2.55	2.70	1.09	0.21	0.15	0.41	0.26	0.14
	2	5.09	8.72	7.09	6.97	1.82	3.36	2.94	2.86	3.05	0.27
	3	9.89	12.63	12.80	11.77	1.64	6.78	6.98	6.51	6.75	0.24
	4	15.63	18.60	19.56	17.93	2.05	9.21	9.65	10.28	9.71	0.54
	5	26.10	30.68	31.12	29.30	2.78	12.93	15.02	15.95	14.63	1.55
	6	49.22	50.94	54.00	51.39	2.42	22.84	22.89	24.06	23.26	0.69
	8	89.94	86.30	90.56	88.93	2.30	60.48	61.83	60.03	60.78	0.94
	10	94.83	91.57	94.88	93.76	1.89	88.36	87.67	87.43	87.82	0.49
	12	97.88	94.73	97.64	96.75	1.75	95.36	95.10	93.97	94.81	0.74

**Table 27** Percentage amount of propranolol hydrochloride pellets from formulations A4-A6

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A4	0	0	0	0	0	0	0	0	0	0	0
	0.5	1.52	1.02	1.21	1.25	0.25	0.17	0.09	0.37	0.21	0.15
	1	7.38	4.60	5.33	5.77	1.44	0.83	0.52	0.95	0.77	0.22
	2	16.68	15.73	17.05	16.48	0.68	3.64	4.76	5.83	4.74	1.09
	3	24.74	24.15	23.74	24.21	0.51	7.83	11.73	13.10	10.89	2.73
	4	32.18	30.04	31.02	31.08	1.07	12.87	20.10	21.58	18.18	4.66
	5	38.43	36.14	38.67	37.74	1.40	17.79	29.16	27.51	24.82	6.14
	6	49.38	47.08	48.64	48.37	1.18	23.79	37.77	34.54	32.04	7.32
	8	79.84	79.78	77.97	79.20	1.07	46.23	59.07	53.66	52.99	6.45
	10	92.23	93.02	93.70	92.99	0.74	73.06	80.45	76.14	76.55	3.71
	12	95.47	95.72	96.68	95.96	0.64	85.87	89.33	87.85	87.68	1.74
A5	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.70	0.99	0.55	0.75	0.22	0.47	0.59	0.97	0.68	0.26
	1	0.27	0.19	0.27	0.24	0.05	0.09	0.04	0.10	0.08	0.04
	2	0.56	0.62	0.74	0.64	0.09	0.39	0.07	0.19	0.21	0.16
	3	1.09	2.19	1.67	1.65	0.55	1.01	0.39	0.63	0.68	0.31
	4	1.88	3.49	2.68	2.68	0.80	1.55	0.84	1.08	1.16	0.36
	5	2.89	4.97	3.95	3.94	1.04	2.07	1.17	1.45	1.56	0.46
	6	5.00	6.67	5.99	5.89	0.84	2.50	1.62	1.84	1.99	0.46
	8	18.22	19.2	21.65	19.93	1.72	4.30	3.82	3.22	3.78	0.54
	10	47.36	45.96	47.62	47.62	1.81	11.71	11.01	9.09	10.60	1.36
	12	72.19	73.19	73.56	73.56	1.60	24.99	23.89	21.11	23.33	2.00
A6	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.18	0.06	0.18	0.14	0.07	0	0	0	0	0
	1	0.15	0.15	0.26	0.19	0.07	0	0	0	0	0
	2	0.81	0.70	0.93	0.81	0.12	0.03	0.03	0.06	0.04	0.02
	3	1.92	1.51	1.61	1.68	0.21	0.12	0.06	0.09	0.09	0.03
	4	2.83	2.08	1.74	2.22	0.56	0.56	0.12	0.12	0.27	0.25
	5	4.39	3.05	2.19	3.21	1.11	0.74	0.44	0.41	0.53	0.18
	6	5.96	4.76	2.73	4.49	1.63	1.28	0.80	0.83	0.97	0.27
	8	10.41	9.83	6.60	8.95	2.05	2.35	1.60	2.13	2.02	0.38
	10	24.36	23.33	23.85	23.85	0.52	5.13	4.25	4.91	4.76	0.46
	12	50.99	50.69	53.41	51.70	1.49	14.34	11.13	14.05	13.17	1.78

**Table 28** Percentage amount of propranolol hydrochloride pellets from formulations A7-A9

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A7	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.23	0.15	0.44	0.27	0.15	0.18	0.35	0.26	0.26	0.09
	1	0.64	0.21	0.56	0.47	0.23	0.03	0.03	0.03	0.03	0
	2	2.56	2.43	3.13	2.71	0.37	1.12	0.48	0.21	0.60	0.47
	3	4.76	4.20	5.91	4.96	0.87	3.54	1.86	0.83	2.08	1.37
	4	7.77	6.32	8.92	7.67	1.30	5.64	3.33	1.63	3.53	2.01
	5	14.31	11.74	14.82	13.62	1.65	7.50	4.84	2.59	4.98	2.46
	6	30.46	23.84	25.51	26.60	3.44	10.82	8.04	5.21	8.02	2.80
	8	71.76	72.37	73.01	72.38	0.62	27.38	23.02	23.51	24.64	2.39
	10	90.36	92.24	92.73	91.77	1.25	62.84	58.60	62.45	61.30	2.34
	12	93.95	94.26	94.61	94.27	0.33	84.56	82.95	84.76	84.09	1.00
A8	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.64	0.23	0.46	0.45	0.20	0	0	0	0	0
	1	1.48	0.64	1.77	1.30	0.58	0.06	0.06	0.03	0.05	0.02
	2	4.04	2.67	5.47	4.06	1.40	0.44	0.65	0.41	0.50	0.13
	3	6.77	5.93	7.98	6.89	1.03	2.09	1.71	1.18	1.66	0.46
	4	11.03	8.37	10.44	9.94	1.40	3.35	3.58	2.01	2.98	0.85
	5	15.62	11.17	14.50	13.76	2.31	4.77	5.74	3.12	4.54	1.32
	6	22.28	18.78	23.13	21.40	2.31	6.73	8.36	4.91	6.67	1.72
	8	52.06	51.37	54.75	52.73	1.79	19.73	22.96	19.16	20.61	2.05
	10	82.79	85.44	85.90	84.71	1.68	45.65	49.39	48.72	47.92	1.99
	12	92.50	93.16	93.03	92.90	0.35	75.38	76.08	77.41	76.29	1.03
A9	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.58	0.26	0.67	0.50	0.21	0.21	0.26	0.32	0.27	0.06
	1	0.56	0.35	0.24	0.38	0.16	0.09	0.09	0.15	0.11	0.03
	2	2.01	1.52	0.88	1.47	0.57	0.62	0.03	1.24	0.63	0.60
	3	3.46	2.72	1.70	2.62	0.88	1.37	0.24	2.41	1.34	1.08
	4	4.74	3.94	2.55	3.74	1.11	2.06	0.68	3.43	2.06	1.37
	5	5.72	4.85	3.25	4.61	1.25	2.46	0.96	3.85	2.42	1.45
	6	6.47	5.66	3.86	5.33	1.34	3.02	1.58	4.43	3.01	1.42
	8	7.65	6.88	5.00	6.51	1.36	4.20	2.34	5.15	3.90	1.43
	10	8.94	8.17	6.41	7.84	1.30	5.25	3.22	5.94	4.80	1.42
	12	10.78	10.14	8.53	9.82	1.16	6.54	4.40	6.83	5.93	1.33



**Table 29** Percentage amount of propranolol hydrochloride pellets from formulations A10-A12

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A10	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.09	0.03	0.23	0.12	0.10	0	0	0	0	0
	1	0.21	0.29	0.29	0.26	0.05	0	0	0	0	0
	2	0.47	0.96	0.67	0.70	0.25	0	0	0	0	0
	3	0.79	1.58	1.00	1.12	0.41	0	0.18	0	0.06	0.10
	4	1.18	1.94	1.27	1.46	0.42	0.03	0.21	0.03	0.09	0.10
	5	1.39	2.34	1.49	1.74	0.52	0.12	0.39	0.09	0.20	0.16
	6	1.67	2.68	1.68	2.01	0.58	0.30	0.57	0.21	0.36	0.19
	8	1.97	3.29	2.07	2.44	0.73	0.27	0.93	0.33	0.51	0.36
	10	2.37	3.78	2.38	2.84	0.81	0.42	1.52	0.51	0.82	0.61
	12	3.18	4.78	3.22	3.72	0.91	0.69	1.95	0.92	1.19	0.67
A11	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.15	0.09	0	0.08	0.07	0	0	0.19	0.06	0.11
	1	0.15	0.12	0.09	0.12	0.03	0.03	0.03	0.24	0.10	0.12
	2	0.99	0.85	0.70	0.84	0.15	0.83	1.39	1.01	1.07	0.29
	3	1.98	1.69	1.40	1.69	0.29	2.19	2.88	2.05	2.37	0.44
	4	3.16	2.67	2.32	2.72	0.43	3.57	4.50	3.22	3.76	0.66
	5	4.33	3.57	3.22	3.71	0.57	4.64	5.73	4.23	4.87	0.77
	6	5.65	4.59	4.26	4.83	0.72	6.73	8.18	6.46	7.12	0.93
	8	8.11	6.50	6.25	6.95	1.01	7.71	9.27	7.27	8.08	1.05
	10	10.43	8.39	8.28	9.03	1.21	9.48	11.14	9.14	9.92	1.07
	12	12.91	10.42	10.49	11.27	1.42	11.29	13.15	11.01	11.82	1.16
A12	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.41	1.45	1.39	1.08	0.59	0.38	0.53	0.56	0.49	0.10
	1	0.04	0.08	0.11	0.07	0.03	0.03	0.15	0.04	0.07	0.07
	2	0.01	0.14	0.13	0.09	0.07	0.06	0.36	0.15	0.19	0.15
	3	0.07	0.25	0.14	0.15	0.09	0.45	0.60	0.48	0.51	0.08
	4	0.18	0.49	0.22	0.30	0.16	0.63	0.87	0.84	0.78	0.13
	5	0.30	0.69	0.34	0.45	0.22	0.87	1.18	1.26	1.10	0.21
	6	0.45	0.93	0.61	0.66	0.25	0.85	1.16	1.27	1.10	0.22
	8	1.12	1.87	1.42	1.47	0.38	1.98	2.18	2.47	2.21	0.25
	10	2.17	3.19	2.60	2.65	0.51	3.27	3.41	3.79	3.49	0.27
	12	3.39	4.58	3.93	3.97	0.60	4.57	4.62	5.04	4.74	0.26

**Table 30** Percentage amount of propranolol hydrochloride pellets from formulations A13-A15

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A13	0	0	0	0	0	0	0	0	0	0	0
	0.5	1.39	2.11	2.20	1.90	0.44	0.56	0.56	0.53	0.55	0.02
	1	8.74	9.91	9.96	9.54	0.69	1.53	1.65	2.00	1.73	0.24
	2	25.84	25.72	25.13	25.56	0.38	8.92	8.33	10.48	9.25	1.11
	3	41.87	45.80	41.87	43.18	2.27	19.68	17.53	22.61	19.94	2.55
	4	66.02	67.69	63.85	65.85	1.92	32.79	28.06	38.72	33.19	5.34
	5	85.23	86.34	82.89	84.82	1.76	51.21	45.25	59.41	51.95	7.11
	6	94.68	95.66	93.91	94.75	0.88	74.38	69.38	78.41	74.06	4.52
	8	98.30	98.86	97.81	98.33	0.53	94.14	93.19	95.71	94.34	1.28
	10	98.78	99.05	97.70	98.51	0.72	96.92	97.14	99.10	97.72	1.20
	12	98.53	99.53	98.30	98.79	0.65	97.23	97.45	98.84	97.84	0.87
A14	0	0	0	0	0	0	0	0	0	0	0
	0.5	2.45	3.00	2.31	2.59	0.36	0.23	0.73	0.38	0.45	0.26
	1	13.40	15.82	14.11	14.44	1.25	0.82	1.56	1.44	1.28	0.40
	2	38.51	45.02	42.46	42.00	3.28	11.50	7.89	8.79	9.39	1.88
	3	57.66	64.38	60.53	60.86	3.37	26.82	22.88	21.85	23.85	2.62
	4	79.04	81.22	77.79	79.35	1.74	47.19	44.82	38.05	43.35	4.74
	5	93.88	93.77	92.48	93.38	0.78	67.06	64.09	61.50	64.22	2.78
	6	97.78	97.24	96.52	97.18	0.63	85.82	83.57	81.83	83.74	2.00
	8	97.68	97.27	96.83	97.26	0.42	95.26	94.60	95.04	94.97	0.33
	10	97.85	97.59	96.71	97.38	0.60	96.14	95.33	95.63	95.70	0.41
	12	98.59	98.18	97.87	98.21	0.36	96.29	96.21	96.21	96.24	0.05
A15	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.24	0.26	0.26	0.25	0.02	0.24	0.09	0.18	0.17	0.07
	1	1.17	1.11	1.11	1.13	0.03	0.86	0.71	0.68	0.75	0.10
	2	4.90	4.08	4.31	4.43	0.42	3.94	3.35	3.70	3.66	0.30
	3	10.69	9.63	9.47	9.93	0.66	8.10	7.05	7.43	7.53	0.53
	4	18.68	17.83	17.12	17.88	0.78	12.71	11.07	11.30	11.69	0.89
	5	27.89	28.08	26.50	27.49	0.86	17.49	15.21	15.46	16.05	1.25
	6	37.64	39.70	37.24	38.19	1.32	22.56	19.57	20.18	20.77	1.58
	8	55.06	59.85	55.79	56.90	2.58	32.05	27.98	29.44	29.82	2.06
	10	68.02	72.98	68.88	69.96	2.65	42.60	37.89	40.54	40.34	2.36
	12	76.32	80.58	76.45	77.78	2.43	52.37	47.18	49.98	49.84	2.60

**Table 31** Percentage amount of propranolol hydrochloride pellets from formulations A16-A18

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A16	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.03	0.12	0.09	0.08	0.04	0.35	0	0	0.12	0.20
	1	0.06	0	0	0.02	0.03	0.39	0	0	0.13	0.22
	2	0.58	0.44	0.64	0.55	0.10	0.60	0	0	0.20	0.34
	3	2.01	1.74	1.66	1.80	0.18	0.98	0.09	0.26	0.45	0.47
	4	5.12	4.14	4.17	4.48	0.56	2.05	0.50	0.86	1.14	0.81
	5	14.21	10.98	11.42	12.20	1.75	4.28	1.98	2.36	2.88	1.23
	6	30.92	27.40	25.82	28.05	2.61	9.06	5.89	6.59	7.18	1.67
	8	76.97	71.67	70.24	72.96	3.54	27.98	25.71	24.66	26.12	1.70
	10	98.07	95.03	94.31	95.80	1.99	54.91	56.02	53.60	54.84	1.21
	12	101.74	99.25	99.98	100.32	1.28	73.30	73.57	72.71	73.19	0.44
A17	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.12	0.26	0.15	0.18	0.08	0.09	0.09	0.21	0.13	0.07
	1	0.52	0.47	0.35	0.45	0.09	0.06	0.24	0.09	0.13	0.09
	2	3.94	3.88	3.48	3.77	0.25	1.24	2.53	1.47	1.75	0.69
	3	12.83	14.23	9.96	12.34	2.17	4.89	6.99	5.67	5.85	1.06
	4	28.24	27.93	23.45	26.54	2.68	11.41	14.65	13.29	13.12	1.62
	5	49.80	47.87	45.68	47.78	2.06	20.38	23.53	23.15	22.35	1.72
	6	69.57	70.33	66.42	68.77	2.07	31.86	34.01	34.76	33.54	1.50
	8	90.56	90.15	89.56	90.09	0.50	61.75	63.30	63.68	62.91	1.02
	10	94.72	93.15	93.43	93.77	0.84	80.50	82.94	82.03	81.82	1.23
	12	94.45	93.86	93.72	94.01	0.39	89.02	90.60	89.54	89.72	0.81
A18	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.12	0.38	0.61	0.37	0.25	0.03	0.23	0.03	0.10	0.12
	1	1.36	1.77	1.97	1.70	0.31	0.15	0.03	0.12	0.10	0.06
	2	8.86	9.65	9.71	9.40	0.48	2.12	0.18	3.17	1.82	1.52
	3	22.80	22.54	20.37	21.90	1.33	7.19	10.08	8.76	8.68	1.45
	4	42.25	39.98	37.79	40.01	2.23	15.56	19.27	18.44	17.76	1.95
	5	69.72	66.86	63.63	66.74	3.05	26.13	31.47	32.36	29.99	3.37
	6	87.23	89.70	88.74	88.56	1.24	47.42	50.76	50.50	49.56	1.86
	8	98.29	97.90	97.80	98.00	0.26	87.16	86.86	86.16	86.73	0.51
	10	98.20	97.52	97.56	97.76	0.38	94.72	94.28	93.13	94.04	0.82
	12	98.53	97.98	98.46	98.32	0.30	96.49	97.06	95.76	96.43	0.65

**Table 32** Percentage amount of propranolol hydrochloride pellets from formulations A19, A20 and B1

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
A19	0	0	0	0	0	0	0	0	0	0	0
	0.5	1.34	0.84	0.23	0.80	0.55	0.65	0.94	1.10	0.90	0.23
	1	0.08	0.19	0.09	0.12	0.06	0.01	0.04	0.01	0.02	0.02
	2	0.34	0.56	0.32	0.41	0.13	0.30	0.36	0.10	0.26	0.14
	3	0.72	0.98	0.73	0.81	0.14	0.81	0.84	0.40	0.68	0.25
	4	1.10	1.39	1.20	1.23	0.15	1.35	1.35	0.79	1.16	0.32
	5	1.49	1.78	1.48	1.58	0.17	1.87	1.93	1.18	1.66	0.41
	6	1.86	2.26	1.84	1.99	0.24	2.24	2.21	1.40	1.95	0.48
	8	2.84	3.50	2.87	3.07	0.38	3.42	3.36	2.49	3.09	0.52
	10	4.46	5.45	4.41	4.77	0.59	4.93	4.81	3.88	4.54	0.58
	12	6.66	7.86	6.51	7.01	0.74	7.03	6.78	5.88	6.56	0.60
	A20	0	0	0	0	0	0	0	0	0	0
0.5		0.67	0.73	1.19	0.86	0.28	0.32	0.26	0.62	0.40	0.19
1		0.04	0.04	0.07	0.05	0.02	0	0	0.01	0	0
2		0.13	0.04	0.16	0.11	0.06	0	0	0.01	0	0
3		0.21	0.01	0.25	0.16	0.13	0	0.21	0.01	0.07	0.12
4		0.39	0.01	0.43	0.28	0.23	0.18	0.45	0.01	0.21	0.22
5		0.60	0.33	0.63	0.52	0.17	0.27	0.63	0.07	0.32	0.28
6		0.86	0.51	0.90	0.76	0.22	0.36	0.72	0.07	0.38	0.33
8		1.74	1.21	1.95	1.63	0.38	1.07	1.38	0.54	1.00	0.43
10		3.82	3.39	4.46	3.89	0.54	2.50	2.60	1.84	2.31	0.41
12		7.07	6.65	8.21	7.31	0.81	4.73	4.48	3.74	4.32	0.52
B1		0	0	0	0	0	0	0	0	0	0
	0.5	0.90	1.54	0.81	1.08	0.40	1.21	0.41	1.32	0.98	0.50
	1	0.10	0.22	0.07	0.13	0.08	0.10	0.06	0.13	0.10	0.03
	2	0.30	0.31	0.49	0.27	0.07	0.22	0	0.22	0.15	0.12
	3	0.54	0.55	0.65	0.58	0.06	0.87	0.65	1.16	0.90	0.26
	4	0.80	0.96	1.06	0.94	0.13	2.23	2.04	2.70	2.33	0.34
	5	1.04	1.40	1.56	1.33	0.27	3.76	3.80	4.26	3.94	0.28
	6	1.43	1.96	2.07	1.82	0.34	5.13	5.46	5.72	5.43	0.30
	8	2.63	3.66	3.53	3.27	0.56	7.74	8.48	8.40	8.21	0.40
	10	4.53	6.16	5.85	5.51	0.87	10.54	11.52	11.40	11.15	0.53
	12	6.80	8.69	8.22	7.90	0.98	13.12	14.17	14.07	13.79	0.58



**Table 34** Percentage amount of propranolol hydrochloride pellets from formulations B5,B6 and B9

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
<b>B5</b>	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.32	0.55	0.61	0.50	0.15	0.47	0.21	0.29	0.32	0.13
	1	13.23	15.10	14.38	14.24	0.95	10.75	12.36	9.44	10.85	1.46
	2	81.94	83.62	82.19	82.58	0.91	69.89	71.95	70.26	70.70	1.10
	3	97.49	97.26	96.14	96.96	0.72	88.62	89.70	87.70	88.67	1.00
	4	98.71	98.19	97.63	98.17	0.54	94.30	94.96	94.70	94.66	0.33
	5	99.05	99.54	98.40	99.00	0.58	96.66	97.18	96.03	96.62	0.57
	6	99.10	99.17	98.44	98.91	0.40	97.55	97.93	97.07	97.52	0.43
	8	99.43	98.78	98.62	98.94	0.43	98.00	98.68	98.10	98.26	0.37
	10	99.46	98.95	98.35	98.92	0.56	97.86	98.54	97.81	98.07	0.41
	12	-	-	-	-	-	-	-	-	-	-
<b>B6</b>	0	0	0	0	0	0	0	0	0	0	0
	0.5	1.04	1.74	1.27	1.35	0.35	0.53	0.50	0.91	0.65	0.23
	1	21.90	24.95	24.25	23.70	1.60	12.76	11.19	11.91	11.95	0.79
	2	83.23	77.10	81.65	80.66	3.18	66.27	66.48	65.50	66.08	0.52
	3	95.86	95.74	97.41	96.33	0.93	83.64	83.36	82.52	83.18	0.58
	4	99.08	97.94	99.05	98.69	0.65	91.04	91.62	90.77	91.14	0.43
	5	99.14	98.72	99.26	99.04	0.29	94.69	95.11	94.26	94.69	0.43
	6	99.49	98.91	99.32	99.24	0.30	96.00	97.16	96.60	96.59	0.58
	8	99.68	98.95	99.80	99.47	0.46	97.76	98.64	97.63	98.01	0.55
	10	99.71	99.41	99.40	99.51	0.18	97.47	99.54	98.36	98.46	1.04
	12	-	-	-	-	-	-	-	-	-	-
<b>B9</b>	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.93	0.41	0.64	0.66	0.26	0.24	0.06	0.38	0.23	0.16
	1	3.18	0.88	1.75	1.94	1.16	1.39	0.50	1.42	1.10	0.52
	2	6.26	2.25	3.57	4.03	2.04	4.24	1.51	3.41	3.06	1.40
	3	10.71	7.65	8.80	9.05	1.55	10.79	7.28	8.91	9.00	1.75
	4	21.77	22.01	21.93	21.90	0.12	23.58	20.65	21.56	21.93	1.50
	5	37.63	40.00	38.73	38.79	1.19	38.26	36.34	37.29	37.30	0.96
	6	55.02	58.44	55.27	56.24	1.91	53.46	51.65	52.90	52.67	0.93
	8	78.54	80.12	78.07	78.91	1.07	71.32	69.93	71.49	70.91	0.86
	10	91.44	90.57	89.52	90.51	0.96	80.08	79.69	81.27	80.35	0.82
	12	96.79	94.45	94.55	95.26	1.32	84.93	84.39	85.54	84.95	0.58

**Table 35** Percentage amount of propranolol hydrochloride pellets from formulations B10-B12

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
B10	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.15	0.35	0.23	0.24	0.10	0.03	0.03	0.09	0.05	0.03
	1	0.12	0.24	0.15	0.17	0.06	0.32	0	0	0.11	0.19
	2	0.27	0.47	0.30	0.34	0.11	0.36	0.18	0.12	0.22	0.12
	3	1.80	2.27	2.15	2.07	0.24	0.98	1.47	1.50	1.32	0.29
	4	6.00	6.77	6.60	6.46	0.40	3.94	4.60	5.13	4.56	0.60
	5	11.59	12.63	12.38	12.20	0.54	8.93	9.65	10.62	9.73	0.85
	6	17.63	18.85	18.47	18.33	0.64	14.96	15.58	16.67	15.73	0.87
	8	29.44	31.25	30.55	30.42	0.91	26.91	27.54	29.01	27.82	1.08
	10	41.45	43.30	42.90	42.65	0.80	37.60	38.28	39.46	38.45	0.94
	12	54.62	55.62	55.37	55.20	0.52	47.89	48.40	49.59	48.62	0.87
B11	0	0	0	0	0	0	0	0	0	0	0
	0.5	1.48	1.56	0.55	1.20	0.56	0.97	1.06	2.06	1.36	0.60
	1	1.15	0.54	0.56	0.75	0.34	1.31	1.37	1.05	1.24	0.17
	2	4.05	2.98	2.62	3.21	0.75	15.52	15.90	17.10	17.17	1.31
	3	6.70	5.82	5.10	5.87	0.80	40.43	35.54	39.21	38.39	2.55
	4	8.65	7.70	6.86	7.74	0.89	52.52	48.59	51.27	50.79	2.00
	5	9.96	8.86	8.04	8.95	0.96	59.42	54.72	58.01	57.38	2.41
	6	10.96	9.85	8.90	9.90	1.03	63.46	58.41	61.29	61.05	2.53
	8	13.30	12.2	11.11	12.23	1.10	67.53	63.31	65.33	65.39	2.11
	10	16.22	15.18	13.86	15.08	1.18	69.87	66.19	67.36	67.81	1.88
	12	18.96	18.09	16.60	17.89	1.19	74.44	71.02	71.75	72.40	1.80
B12	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.67	1.54	1.82	1.34	0.60	0.41	1.09	1.94	1.15	0.77
	1	0.12	0.31	0.49	0.31	0.18	0.45	0.57	1.35	0.79	0.49
	2	0.42	0.86	1.04	0.77	0.32	5.68	8.31	9.95	7.98	2.15
	3	1.08	1.62	1.77	1.49	0.36	21.04	22.38	25.89	23.10	2.51
	4	1.85	2.37	2.37	2.19	0.30	32.06	32.28	38.54	34.29	3.68
	5	2.62	3.1	2.97	2.86	0.21	39.47	38.22	45.88	41.19	4.11
	6	3.37	3.67	3.61	3.55	0.16	43.73	42.02	49.76	45.17	4.07
	8	5.77	6.08	5.91	5.92	0.16	47.73	45.86	54.12	49.24	4.33
	10	9.09	9.68	9.15	9.31	0.33	51.77	51.06	60.30	54.37	5.14
	12	12.48	13.3	12.54	12.73	0.39	56.44	54.40	62.26	57.70	4.08





**Table 37** Percentage amount of propranolol hydrochloride pellets from formulations B16,B19 and B20

Formulation	time	Acid buffer pH 1.2					Phosphate buffer pH 6.8				
		1	2	3	Mean	SD	1	2	3	Mean	SD
B16	0	0	0	0	0	0	0	0	0	0	0
	0.5	2.70	2.55	3.05	2.77	0.25	2.62	2.62	1.86	2.37	0.44
	1	41.06	39.16	40.22	40.15	0.95	32.15	32.30	29.65	31.37	1.49
	2	92.68	93.50	94.33	93.50	0.83	86.59	86.44	85.10	86.05	0.82
	3	97.03	98.45	99.72	98.40	1.35	97.86	96.68	96.80	97.12	0.65
	4	96.94	98.94	100.67	98.85	1.87	100.11	98.63	98.90	99.21	0.79
	5	97.40	99.44	100.45	99.10	1.55	100.32	98.96	99.23	99.50	0.72
	6	97.43	98.62	100.37	98.81	1.48	100.65	99.28	99.56	99.83	0.72
	8	97.45	99.22	100.71	99.13	1.63	100.98	99.60	100.03	100.20	0.71
	10	-	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-	-
B19	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.49	0.26	0.44	0.40	0.12	0.44	0.41	0.53	0.46	0.06
	1	0.30	0.24	0.21	0.25	0.04	0.74	1.00	0.77	0.84	0.14
	2	0.65	0.84	0.85	0.78	0.11	2.63	2.78	2.78	2.73	0.09
	3	9.14	10.11	10.71	9.99	0.79	9.07	12.49	11.98	11.18	1.85
	4	40.98	42.54	44.25	42.59	1.64	38.81	40.05	40.41	39.76	0.84
	5	74.91	75.90	75.29	75.37	0.50	68.05	68.60	69.15	68.60	0.55
	6	91.47	91.45	90.82	91.25	0.37	83.50	84.65	84.35	84.17	0.59
	8	98.39	98.07	97.58	98.01	0.41	94.27	94.40	94.55	94.41	0.14
	10	100.03	99.57	98.92	99.51	0.56	97.20	98.08	98.23	97.84	0.56
	12	99.37	99.34	98.54	99.08	0.47	97.51	97.95	99.28	98.25	0.92
B20	0	0	0	0	0	0	0	0	0	0	0
	0.5	0.38	0.21	0.09	0.23	0.15	0.27	0.32	0.27	0.29	0.03
	1	0.39	0.21	0.03	0.21	0.18	0.18	0.45	1.25	0.62	0.55
	2	1.90	1.61	1.11	1.54	0.40	1.40	1.99	3.00	2.13	0.81
	3	19.90	16.77	13.58	16.75	3.16	15.15	17.23	17.71	16.70	1.36
	4	61.80	55.59	52.77	56.72	4.62	51.40	51.79	52.46	51.88	0.53
	5	87.07	84.55	82.40	84.67	2.33	77.57	77.78	77.29	77.55	0.24
	6	94.42	95.22	93.19	94.28	1.02	87.31	87.06	88.05	87.47	0.52
	8	97.20	98.87	97.26	97.78	0.95	95.66	95.10	96.56	95.77	0.73
	10	97.81	99.21	98.31	98.44	0.71	98.77	97.46	99.82	98.68	1.18
	12	99.00	100.42	99.21	99.54	0.77	99.68	98.06	99.26	99.00	0.84

## VITA

Miss Suparpun Chungcharoenwattana was born on September 11, 1972 in Bangkok, Thailand. She received her Bachelor of Science in Pharmacy with first class honors from the Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, Thailand in 1994. After graduation, she worked at Beung Boon Hospital, Srisakate, for one year and worked at Bangkok Adventist Hospital, Bangkok, for two years before entering the Master's Degree program in Manufacturing Pharmacy at Chulalongkorn University.

