

Norms for 2006 Physical Chemistry Combined Semester Exam.

Simulations are derived from student data from the individual sections. Each norm is calculated with a set of 50 simulations of 1000 student performances. The error bars depend on the location within the percentile (error bars are smaller in the slowly changing portion of the curve). The largest error bars are ± 1.5 using this 50,000 student performance simulation (and the inherent assumption of the independence of measurement for different PChem content.)

Simulated Norm for T+S PH06CS Exam			
50	100	25	40
49	100	24	34
48	100	23	30
47	100	22	25
46	100	21	19
45	100	20	14
44	99	19	11
43	99	18	7
42	99	17	5
41	98	16	3
40	97	15	2
39	96	14	1
38	95	13	1
37	93	12	1
36	91	11	0
35	89	10	0
34	86	9	0
33	83	8	0
32	80	7	0
31	76	6	0
30	71	5	0
29	67	4	0
28	62	3	0
27	55	2	0
26	47	1	0
Mean	26.48	Median	26
Std. Dev.	6.40	KR 21	0.71

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Simulated Norm for Q+S PH06CS Exam			
50	100	25	51
49	100	24	45
48	100	23	40
47	100	22	34
46	100	21	27
45	100	20	21
44	99	19	15
43	99	18	10
42	99	17	6
41	98	16	4
40	97	15	2
39	96	14	1
38	94	13	1
37	93	12	0
36	91	11	0
35	89	10	0
34	87	9	0
33	84	8	0
32	81	7	0
31	78	6	0
30	75	5	0
29	71	4	0
28	67	3	0
27	63	2	0
26	57	1	0
Mean	25.51	Median	25
Std. Dev.	6.77	KR 21	0.74

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Simulated Norm for T+D PH06CS Exam			
50	100	25	33
49	100	24	28
48	100	23	23
47	100	22	18
46	100	21	13
45	100	20	9
44	99	19	7
43	98	18	4
42	98	17	3
41	97	16	2
40	96	15	1
39	94	14	1
38	93	13	0
37	91	12	0
36	88	11	0
35	86	10	0
34	82	9	0
33	79	8	0
32	75	7	0
31	70	6	0
30	66	5	0
29	59	4	0
28	52	3	0
27	45	2	0
26	38	1	0
Mean	27.75	Median	27
Std. Dev.	6.34	KR 21	0.71

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Simulated Norm for Q+D PH06CS Exam			
50	100	25	44
49	100	24	38
48	100	23	32
47	100	22	25
46	100	21	19
45	100	20	13
44	99	19	9
43	99	18	5
42	98	17	3
41	97	16	2
40	95	15	1
39	94	14	1
38	92	13	0
37	90	12	0
36	88	11	0
35	86	10	0
34	84	9	0
33	81	8	0
32	78	7	0
31	74	6	0
30	70	5	0
29	66	4	0
28	61	3	0
27	55	2	0
26	49	1	0
Mean	26.83	Median	26
Std. Dev.	6.76	KR 21	0.74

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Simulated Norm for T+K PH06CS Exam			
60	100	30	32
59	100	29	28
58	100	28	23
57	100	27	18
56	100	26	14
55	100	25	11
54	100	24	8
53	100	23	6
52	99	22	4
51	99	21	3
50	99	20	2
49	98	19	1
48	97	18	1
47	96	17	0
46	95	16	0
45	94	15	0
44	92	14	0
43	90	13	0
42	88	12	0
41	86	11	0
40	83	10	0
39	80	9	0
38	76	8	0
37	72	7	0
36	67	6	0
35	63	5	0
34	57	4	0
33	50	3	0
32	42	2	0
31	36	1	0
Mean	33.02	Median	33
Std. Dev.	6.84	KR 21	0.69

Simulated Norm for Q+K PH06CS Exam			
60	100	30	46
59	100	29	40
58	100	28	35
57	100	27	30
56	100	26	24
55	100	25	19
54	99	24	15
53	99	23	11
52	98	22	9
51	98	21	6
50	97	20	4
49	96	19	3
48	95	18	2
47	93	17	1
46	92	16	1
45	91	15	1
44	89	14	0
43	88	13	0
42	86	12	0
41	83	11	0
40	81	10	0
39	79	9	0
38	76	8	0
37	73	7	0
36	70	6	0
35	67	5	0
34	63	4	0
33	59	3	0
32	53	2	0
31	49	1	0
Mean	32.05	Median	31
Std. Dev.	8.50	KR 21	0.81

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Simulated Norm for Q+K+D PH06CS Exam			
70	100	35	38
69	100	34	33
68	100	33	29
67	100	32	24
66	100	31	20
65	100	30	16
64	100	29	12
63	99	28	9
62	99	27	7
61	99	26	5
60	98	25	4
59	98	24	3
58	97	23	2
57	96	22	1
56	95	21	1
55	94	20	1
54	93	19	0
53	91	18	0
52	90	17	0
51	89	16	0
50	87	15	0
49	85	14	0
48	83	13	0
47	81	12	0
46	78	11	0
45	76	10	0
44	73	9	0
43	70	8	0
42	67	7	0
41	64	6	0
40	60	5	0
39	55	4	0
38	50	3	0
37	46	2	0
36	43	1	0
Mean	38.57	Median	37
Std. Dev.	9.19	KR 21	0.81

Norms for 2006 Physical Chemistry Combined Semester Exam.

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Simulated Norm for T+K+D PH06CS Exam			
70	100	35	27
69	100	34	23
68	100	33	19
67	100	32	15
66	100	31	12
65	100	30	9
64	100	29	7
63	100	28	5
62	100	27	4
61	99	26	3
60	99	25	2
59	99	24	1
58	98	23	1
57	98	22	1
56	97	21	0
55	97	20	0
54	96	19	0
53	95	18	0
52	93	17	0
51	92	16	0
50	90	15	0
49	88	14	0
48	86	13	0
47	83	12	0
46	80	11	0
45	77	10	0
44	73	9	0
43	69	8	0
42	65	7	0
41	59	6	0
40	51	5	0
39	43	4	0
38	38	3	0
37	34	2	0
36	31	1	0
Mean	39.56	Median	40
Std. Dev.	7.55	KR 21	0.71

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Simulations are derived from student data from the individual sections. Each norm is calculated with a set of 50 simulations of 1000 student performances. The error bars depend on the location within the percentile (error bars are smaller in the slowly changing portion of the curve). The largest error bars are ± 1.5 using this 50,000 student performance simulation (and the inherent assumption of the independence of measurement for different PChem content.)

Simulated Norm for Q+D+S PH06CS Exam			
60	100	30	43
59	100	29	38
58	100	28	32
57	100	27	26
56	100	26	21
55	100	25	16
54	100	24	12
53	99	23	8
52	99	22	5
51	99	21	3
50	98	20	2
49	98	19	1
48	97	18	1
47	96	17	0
46	95	16	0
45	93	15	0
44	92	14	0
43	90	13	0
42	88	12	0
41	86	11	0
40	84	10	0
39	81	9	0
38	78	8	0
37	75	7	0
36	71	6	0
35	67	5	0
34	64	4	0
33	59	3	0
32	53	2	0
31	48	1	0
Mean	32.03	Median	31
Std. Dev.	7.53	KR 21	0.70

Norms for 2006 Physical Chemistry Combined Semester Exam.

Item Statistics for Thermodynamics Items

Derived from 268 student performances from 11 schools

Item	Difficulty Index	Discrimination Index	Distribution of incorrect responses			Item	Difficulty Index	Discrimination Index	Distribution of incorrect responses		
1	0.551	0.269	18.0	15.0	11.2	21	0.719	0.269	8.2	9.7	10.1
2	0.700	0.448	9.4	12.4	8.2	22	0.532	0.299	34.5	3.0	9.4
3	0.596	0.493	7.9	22.1	10.5	23	0.682	0.328	7.1	2.6	22.1
4	0.311	0.403	15.7	31.1	22.1	24	0.446	0.343	11.6	22.5	14.6
5	0.543	0.507	21.7	13.1	10.5	25	0.715	0.522	8.6	11.2	8.6
6	0.738	0.388	8.6	9.7	7.5	26	0.412	0.433	15.0	12.7	31.1
7	0.700	0.373	7.1	14.6	8.2	27	0.614	0.537	9.4	13.9	15.4
8	0.592	0.299	6.7	22.8	11.2	28	0.206	0.299	10.5	28.1	40.8
9	0.663	0.478	20.6	7.1	6.0	29	0.461	0.597	24.0	27.7	2.2
10	0.727	0.373	12.0	6.0	9.4	30	0.697	0.269	12.0	8.6	9.7
11	0.487	0.418	26.2	7.9	17.2	31	0.554	0.358	12.0	17.6	15.0
12	0.644	0.403	4.1	17.2	14.2	32	0.640	0.299	16.1	12.4	7.5
13	0.386	0.239	40.4	9.4	11.2	33	0.322	0.313	9.4	17.2	40.8
14	0.453	0.313	21.7	16.1	16.9	34	0.431	0.433	5.2	7.1	44.6
15	0.730	0.373	9.7	8.6	8.6	35	0.768	0.433	3.0	1.1	19.1
16	0.629	0.284	6.4	20.6	9.7	36	0.375	0.224	22.1	27.7	6.0
17	0.536	0.478	7.5	28.5	10.5	37	0.446	0.537	10.5	26.6	10.9
18	0.412	0.418	15.4	21.7	21.7	38	0.483	0.358	7.5	16.9	20.2
19	0.640	0.254	10.1	17.2	8.6	39	0.442	0.313	26.2	11.6	10.9
20	0.442	0.299	2.2	45.3	8.2	40	0.547	0.448	15.4	1.5	28.1

Item Statistics for Quantum Mechanics Items

Derived from 138 student performances from 11 schools

Item	Difficulty Index	Discrimination Index	Distribution of incorrect responses			Item	Difficulty Index	Discrimination Index	Distribution of incorrect responses		
1	0.281	0.349	38.1	12.9	20.1	21	0.532	0.140	3.6	12.9	29.5
2	0.540	0.256	2.2	2.2	41.0	22	0.626	0.465	13.7	10.1	12.9
3	0.540	0.209	17.3	14.4	13.7	23	0.453	0.279	15.8	27.3	10.8
4	0.727	0.535	7.2	5.0	14.4	24	0.626	0.442	9.4	10.8	15.1
5	0.424	0.488	23.7	2.2	30.9	25	0.259	0.302	39.6	21.6	12.2
6	0.446	0.442	12.2	33.1	9.4	26	0.223	-0.116	2.9	69.8	4.3
7	0.504	0.628	38.8	8.6	1.4	27	0.518	0.302	2.9	15.1	28.8
8	0.590	0.349	21.6	5.0	12.9	28	0.770	0.140	1.4	2.9	18.0
9	0.525	0.465	25.2	21.6	0.0	29	0.640	0.419	11.5	18.7	5.0
10	0.525	0.047	13.7	25.2	7.9	30	0.453	0.326	8.6	16.5	28.1
11	0.460	0.372	35.3	12.2	5.8	31	0.504	0.349	5.8	6.5	36.7
12	0.532	0.233	13.7	28.1	4.3	32	0.791	0.093	12.2	2.9	5.0
13	0.669	0.256	3.6	2.2	25.2	33	0.453	0.209	10.1	13.7	30.2
14	0.583	0.279	15.1	7.2	18.7	34	0.597	0.488	7.2	19.4	12.9
15	0.396	0.302	7.9	44.6	7.2	35	0.532	0.279	1.4	15.1	29.5
16	0.374	0.256	12.2	46.0	3.6	36	0.871	0.163	10.8	0.0	1.4
17	0.568	0.442	23.0	6.5	12.9	37	0.547	0.442	12.9	17.3	14.4
18	0.388	0.442	23.0	17.3	19.4	38	0.194	0.163	43.2	31.7	5.0
19	0.360	0.302	13.7	25.2	24.5	39	0.302	0.256	16.5	39.6	12.9
20	0.568	0.326	10.1	22.3	10.1	40	0.576	0.326	4.3	30.2	7.2

Norms for 2006 Physical Chemistry Combined Semester Exam.

Item Statistics for Kinetics, Dynamics and Statistical Mechanics Items

Kinetics statistics derived from 128 student performances at 9 schools

Dynamics statistics derived from 143 student performances at 8 schools

Statistical Mechanics statistics derived from 191 student performances at 7 schools

Item	Difficulty Index	Discrimination Index	Distribution of incorrect responses			Item	Difficulty Index	Discrimination Index	Distribution of incorrect responses		
K1	0.469	0.212	6.3	29.7	3.1	D1	0.811	0.243	4.2	3.5	11.2
K2	0.617	0.515	10.9	10.2	3.1	D2	0.692	0.432	16.8	9.1	4.9
K3	0.453	0.364	4.7	7.0	28.1	D3	0.357	0.297	33.6	14.7	15.4
K4	0.500	0.273	40.6	7.8	1.6	D4	0.832	0.189	8.4	7.0	1.4
K5	0.625	0.000	0.8	5.5	31.3	D5	0.671	0.351	8.4	10.5	14.0
K6	0.734	0.455	8.6	2.3	15.6	D6	0.490	0.676	33.6	4.9	12.6
K7	0.539	0.424	4.7	11.7	29.7	D7	0.643	0.541	18.9	14.0	2.8
K8	0.609	0.606	9.4	17.2	12.5	D8	0.699	0.405	2.1	21.7	6.3
K9	0.422	0.061	29.7	5.5	9.4	D9	0.587	0.405	18.9	7.7	14.7
K10	0.695	0.515	19.5	6.3	4.7	D10	0.713	0.135	1.4	21.0	6.3
K11	0.172	0.333	32.0	9.4	40.6	S1	0.550	0.170	23.0	16.2	5.8
K12	0.641	0.333	4.7	13.3	3.9	S2	0.330	0.340	31.9	14.1	20.9
K13	0.813	0.394	0.8	14.1	3.9	S3	0.764	0.170	12.0	5.8	5.8
K14	0.578	0.515	25.0	9.4	7.8	S4	0.607	0.170	12.6	18.3	7.3
K15	0.656	0.606	7.0	5.5	21.9	S5	0.796	0.298	4.2	12.0	4.2
K16	0.641	0.515	2.3	22.7	10.9	S6	0.586	0.426	11.5	14.1	15.7
K17	0.859	0.303	2.3	9.4	1.6	S7	0.524	0.298	15.7	18.3	13.6
K18	0.695	0.121	20.3	3.1	7.0	S8	0.366	0.213	35.6	10.5	17.3
K19	0.430	0.182	23.4	26.6	7.0	S9	0.461	0.340	28.3	9.4	16.2
K20	0.727	0.091	9.4	10.2	7.0	S10	0.293	0.426	14.7	27.7	26.7

Schools providing student data for the determination of norms.

Bradley University / Peoria, IL	Pacific Lutheran College / Tacoma, WA
Brigham Young University – Idaho / Rexburg, ID	Rider University / Lawrenceville, NJ
University of Central Oklahoma / Edmond, OK	Rowan University / Glassboro, NJ
Centre College / Danville, KY	San Jose State University / San Jose, CA
Elmhurst College / Elmhurst, IL	Shawnee State University / Portsmouth, OH
Manhattanville College / Purchase, NY	University of Southern Mississippi / Hattiesburg, MS
University of Mary Washington / Fredericksburg, VA	SUNY – College at Brockport / Brockport, NY
McMurray University / Abilene, TX	Sweet Briar College / Sweet Briar, VA
Millersville University / Millersville, PA	Univ. of Tennessee at Chattanooga / Chattanooga, TN
Mount St. Mary University / Emmitsburg, MD	Texas Tech University / Lubbock, TX
North Central College / Naperville, IL	Warren Wilson College / Asheville, NC
Northeastern State University / Tahlequah, OK	University of Wisconsin – Eau Claire / Eau Claire, WI
University of Northern Colorado / Greeley, CO	