droxide (10%) was refluxed for one hour followed by cooling and acidification with dilute hydrochloric acid.

Benzoylation.—The benzoyl derivative (Schotten–Baumann method) was crystallized slowly from alcohol, as colorless crystals, m.p. 111°. It is insoluble in aqueous sodium hydroxide solution (10%) (Found: C, 68.3; H, 4.3; N, 3.5. $C_{20}H_{15}O_5N$ requires C, 68.8; H, 4.3; N, 4.0.). The benzoyl derivative was refluxed with aqueous sodium hydroxide solution (10%) for one hour, allowed to cool and acidified with dilute hydrochloric acid, the deposit was crystallized from benzene–petroleum-ether mixture and proved to be (Va or VIa) (m.p. and mixed m.p.).

The syntheses of the other substances mentioned in the theoretical part are listed in the Tables I and II.

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The Osmotic and Activity Coefficients of Calcium, Strontium and Barium Perchlorate at 25°

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Nicholson[1] has deduced the activity coefficients of magnesium, calcium, strontium and barium perchlorate from freezing point measurements; his results for the magnesium salt are in good agreement with those derived[2] from isopiestic vapor pressure measurements at 25°, the latter being higher by 0.003 in γ at 0.1 *m*. If the two sets of data are adjusted relative to the same value of γ = 0.587 at 0.1 *m*, the isopiestic values at other concentrations are higher, the difference rising to 0.043 at 1 *m*. Some time ago we made isopiestic measurements on calcium perchlorate and we have recently made measurements on the strontium and barium salts which can be compared with the data of Nicholson.

The stock solutions were prepared by adding a slight excess of the carbonate to perchloric acid (of "analytical" purity), filtering off the excess of carbonate and analyzing for the metal. Isopiestic measurements were made with calcium chloride as reference salt (Table I) and the osmotic and activity coefficients (Table II) calculated in the usual way. It proved very difficult to get reproducible results with the barium salt at concentrations less than 1 *m* and the results in this region should be accepted with caution. These solutions seemed to have a very low rate of evaporation and gave a degree of difficulty we have not experienced with any other solutions. The activity coefficients are of the magnitude we would expect for highly dissociated and hydrated salts. The curves for the calcium and strontium salts resemble those plotted from Nicholson's data at the freezing point but the barium salt exhibits a large temperature variation. For example, recalculating the freezing point data to refer to γ = 0.523 at 0.1 *m*, the activity coefficient of 0.512 at 1 *m* and 25° contrasts with 0.434 at the freezing point.

(1) D. E. Nicholson (with W. A. Felsing), THIS JOURNAL, **72**, 4469 (1950); **73**, 3520 (1951).
(2) R. H. Stokes and B. J. Levien, *ibid.*, **68**, 333 (1946).

TABLE I

MOLALITIES OF ISOPIESTIC SOLUTIONS AT 25°

$CaCl_2$	$Ca(ClO_4)_2$	$CaCl_2$	$Ca(ClO_4)_2$	$CaCl_2$	$Ca(ClO_4)_2$	$CaCl_2$	$Ca(ClO_4)_2$
0.1176	0.1133	1.584	1.392	3.135	2.722	6.074	5.270
.2879	.2695	1.968	1.717	3.210	2.784	6.795	5.799
.3879	.3587	2.017	1.760	3.656	3.176	6.810	5.812
.5528	.5047	2.202	1.916	4.118	3.584	7.385	6.181
.6407	.5807	2.471	2.148	4.330	3.771	7.970	6.540
.8038	.7236	2.483	2.159	4.771	4.163	8.658	6.919
1.121	.9933	2.795	2.427	5.321	4.651		
$CaCl_2$	$Sr(ClO_4)_2$	$CaCl_2$	$Sr(ClO_4)_2$	$CaCl_2$	$Sr(ClO_4)_2$	$CaCl_2$	$Sr(ClO_4)_2$
0.1051	0.1038	1.066	0.9794	3.817	3.602	6.968	6.833
.1692	.1645	1.233	1.128	4.199	4.000	7.475	7.279
.2429	.2346	1.722	1.569	4.801	4.642	8.468	8.071
.3177	.3044	2.444	2.244	5.377	5.258	8.561	8.139
.4637	.4388	2.804	2.594	6.269	6.174	8.705	8.250
.8449	.7804	3.362	3.143				
$CaCl_2$	$Ba(ClO_4)_2$	$CaCl_2$	$Ba(ClO_4)_2$	$CaCl_2$	$Ba(ClO_4)_2$	$CaCl_2$	$Ba(ClO_4)_2$
0.2429	0.2409	1.611	1.665	2.437	2.641	3.828	4.502
.5100	.5041	1.917	2.017	2.757	3.053	4.462	5.462
.8711	.8651	2.163	2.319	3.303	3.766	4.629	5.694
1.270	1.292						

TABLE II

OSMOTIC AND ACTIVITY COEFFICIENTS AT 25°

	$Ca(ClO_4)_2$		$Sr(ClO_4)_2$		$Ba(ClO_4)_2$	
m	φ	γ	φ	γ	φ	γ
0.1	0.883	(0.565)	0.864	(0.532)	0.857	(0.523)
.2	.911	.540	.886	.497	.868	.480
.3	.942	.540	.915	.491	.884	.463
.4	.976	.552	.947	.497	.905	.458
.5	1.014	.573	.982	.511	.929	.461
.6	1.051	.598	1.017	.529	.954	.468
.7	1.089	.627	1.052	.550	.977	.476
.8	1.131	.664	1.090	.577	1.000	.486
.9	1.175	.706	1.130	.608	1.024	.499
1.0	1.219	.754	1.170	.643	1.046	.512
1.2	1.310	.866	1.249	.723	1.094	.544
1.4	1.405	1.007	1.329	.818	1.141	.580
1.6	1.503	1.179	1.413	.935	1.188	.621
1.8	1.605	1.393	1.492	1.067	1.233	.673
2.0	1.710	1.659	1.577	1.229	1.279	.717
2.5	1.992	2.66	1.789	1.767	1.394	.866
3.0	2.261	4.27	2.008	2.59	1.509	1.045
3.5	2.521	6.86	2.196	3.71	1.619	1.284
4.0	2.769	10.93	2.372	5.24	1.713	1.542
4.5	3.005	17.28	2.538	7.35	1.791	1.822
5.0	3.233	27.1	2.693	10.16	1.862	2.13
5.5	3.454	42.3	2.834	13.83	1.945	2.53
6.0	3.655	64.7	2.962	18.56	...	...
6.5	3.828	95.7	3.074	24.4	...	...
7.0	3.989	139.3	3.166	31.3	...	...
7.5	...	...	3.241	39.3	...	...
8.0	...	...	3.308	48.6	...	...

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