

Table 2.—COMPARISON OF EXPERIMENTAL PRESSURES WITH PRESSURES CALCULATED FROM EQUATION OF STATE (B₀ Averaged by Linear Combination)

		95.03% C ₂ H ₆ — 4.97% N ₂ Mixture							% Average Deviation
		Density in Gram Moles per Liter							
Temperature °K		1.8218	3.5735	5.3342	7.6840	10.0000	12.3409	14.1165	
		Pressure in Atmospheres							
316.49	Experimental	35.670	53.151	62.514	72.203	90.827	157.25	294.15	1.20
	Calculated	35.525	53.071	62.271	72.093	90.496	157.25	314.59	
	% Error	0.41	0.15	0.39	0.15	0.36	0.00	-6.95	
305.38	Experimental	33.485	48.149	53.974	58.921	69.339	121.03	242.03	1.39
	Calculated	33.348	48.088	54.050	58.637	68.814	120.44	259.74	
	% Error	0.41	0.13	-0.14	0.48	0.76	0.49	-7.32	
Average % Error		0.41	0.14	0.27	0.32	0.56	0.25	7.14	1.30*

* Overall Average % Error. Excluding the 14.1165 isometric, the average = 0.32%.
By use of Equation 3, the average (excluding the 14.1165 isometric) = 0.25%.

		85.01% C ₂ H ₆ — 14.99% N ₂ Mixture							% Average Deviation	
		Density in Gram Moles per Liter								
Temperature °K		1.6159	3.4824	5.3521	7.2211	8.5540	10.3262	12.1125	13.8822	
		Pressure in Atmospheres								
316.49	Experimental	34.011	58.482	74.439	88.526	101.76	130.06	188.64	—	1.75
	Calculated	33.950	58.091	73.567	87.681	100.12	125.97	180.68	—	
	% Error	0.18	0.67	1.18	0.96	1.64	3.24	4.40	—	
305.38	Experimental	32.145	53.593	65.950	76.177	85.710	106.99	155.49	264.64	1.96
	Calculated	32.104	53.307	65.403	75.421	84.174	103.19	147.51	258.57	
	% Error	0.13	0.53	0.84	1.00	1.82	3.68	5.35	2.30	
294.27	Experimental	30.262	48.662	—	—	70.467	84.964	122.97	217.36	3.33
	Calculated	30.235	48.457	—	—	68.352	80.613	114.22	210.12	
	% Error	0.09	0.42	—	—	3.09	5.40	7.66	3.33	
Average % Error		0.13	0.54	1.01	0.98	2.25	4.11	5.80	2.62	2.28*

* Overall Average % Error. By use of Equation 3, the average = 1.22%.

		70.27% C ₂ H ₆ — 29.73% N ₂ Mixture							% Average Deviation	
		Density in Gram Moles per Liter								
Temperature °K		1.8294	3.5643	5.2988	7.0070	8.7288	10.4764	12.2261	13.9505	
		Pressure in Atmospheres								
316.49	Experimental	39.569	66.909	89.671	111.34	137.44	176.02	238.58	—	1.22
	Calculated	39.772	66.806	88.665	109.88	135.47	172.69	233.88	—	
	% Error	-0.51	0.15	1.13	1.33	1.45	1.93	2.01	—	
305.38	Experimental	37.493	62.133	81.770	99.837	121.68	153.95	208.05	303.38	1.33
	Calculated	37.703	62.129	80.845	98.383	119.35	150.28	202.52	304.33	
	% Error	-0.56	0.01	1.14	1.48	1.95	2.44	2.73	-0.31	
294.27	Experimental	35.431	57.267	73.877	88.500	106.12	132.53	178.10	262.48	1.87
	Calculated	35.615	57.400	72.972	86.880	103.30	127.98	171.21	260.64	
	% Error	-0.52	-0.23	1.24	1.98	2.73	3.55	4.02	0.71	
238.17	Experimental	33.329	51.973	65.685	77.130	90.930	111.42	148.50	221.16	2.83
	Calculated	33.503	52.618	65.042	75.369	87.325	105.82	139.97	216.77	
	% Error	-0.52	-1.23	0.99	2.34	4.13	5.29	6.10	2.03	
Average % Error		0.53	0.40	1.12	1.78	2.56	3.30	3.74	1.02	1.83*

* Overall Average % Error. By use of Equation 3, the average = 0.86%.

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Table 2 (Cont.).—COMPARISON OF EXPERIMENTAL PRESSURES WITH PRESSURES CALCULATED FROM EQUATION OF STATE (B_0 Averaged by Linear Combination)

50.26% C_2H_6 — 49.74% N_2 Mixture

Temperature °K		Density in Gram Moles per Liter						% Average Deviation	
		2.1574	3.8937	5.6697	7.4174	9.1995	10.9674		12.6908
		Pressure in Atmospheres							
305.38	Experimental	47.101	77.851	107.03	137.14	173.80	222.15	290.35	1.10
	Calculated	46.990	77.579	106.34	135.96	171.68	218.45	285.11	
	% Error	0.24	0.35	0.64	0.86	1.22	2.56	1.80	
294.27	Experimental	44.631	72.918	98.945	125.50	157.66	200.40	260.96	1.29
	Calculated	44.569	72.586	98.160	124.02	155.00	195.70	254.59	
	% Error	0.14	0.46	0.79	1.18	1.69	2.34	2.44	
283.17	Experimental	42.216	67.923	90.787	113.73	141.53	178.50	231.78	1.70
	Calculated	42.131	67.551	89.931	112.04	138.32	172.98	224.04	
	% Error	0.20	0.55	0.94	1.49	2.27	3.09	3.34	
266.54	Experimental	38.493	60.513	78.470	96.237	117.79	146.60	188.81	3.37
	Calculated	38.291	59.749	77.136	93.425	112.42	137.68	176.46	
	% Error	0.52	1.26	1.70	2.92	4.56	6.09	6.54	
	Average % Error	0.23	0.66	0.99	1.61	2.43	3.52	3.53	1.86*

* Overall Average % Error. By use of Equation 3, the average = 0.65%.

29.96% C_2H_6 — 70.04% N_2 Mixture

Temperature °K		Density in Gram Moles per Liter						% Average Deviation	
		1.4661	2.6365	4.3900	6.1381	7.8822	9.6335		11.3803
		Pressure in Atmospheres							
305.38	Experimental	34.941	60.915	98.224	136.00	177.23	225.26	285.40	0.20
	Calculated	34.909	60.813	98.104	135.84	176.88	224.82	283.91	
	% Error	0.09	0.17	0.12	0.11	0.19	0.20	0.52	
294.27	Experimental	33.431	57.989	92.808	127.62	165.33	209.18	264.01	0.33
	Calculated	33.422	57.887	92.620	127.27	164.61	208.52	261.65	
	% Error	0.03	0.18	0.20	0.27	0.44	0.32	0.89	
283.17	Experimental	31.920	55.042	87.323	119.16	153.33	192.89	242.61	0.50
	Calculated	31.922	54.949	87.113	118.68	152.33	191.29	239.40	
	% Error	-0.01	0.17	0.24	0.40	0.65	0.83	1.32	
266.54	Experimental	29.661	50.626	78.967	106.48	135.36	168.69	210.40	0.55
	Calculated	29.663	50.515	78.799	105.72	133.84	166.12	206.02	
	% Error	-0.01	0.22	0.21	0.72	1.12	1.52	2.08	
249.83	Experimental	27.368	46.486	70.638	93.570	117.28	144.38	178.31	1.46
	Calculated	27.375	46.011	70.345	92.565	115.15	140.74	172.37	
	% Error	-0.03	1.03	0.41	1.07	1.81	2.52	3.33	
238.72	Experimental	25.857	—	—	85.370	105.22	128.30	157.28	2.50
	Calculated	25.842	—	—	83.746	102.66	123.83	150.00	
	% Error	0.06	—	—	1.90	2.43	3.48	4.63	
	Average % Error	0.04	0.35	0.24	0.75	1.11	1.48	2.13	0.84*

* Overall Average % Error. By use of Equation 3, the average = 0.50%.