

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

Temperature °K		95.03% C ₂ H ₆ — 4.97% N ₂ Mixture							% Average Deviation
		Density in Gram Moles per Liter							
		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%.

Temperature °K		85.01% C ₂ H ₆ — 14.99% N ₂ Mixture							% Average Deviation	
		Density in Gram Moles per Liter								
		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	2.82	2.28*

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

Temperature °K		70.27% C ₂ H ₆ — 29.73% N ₂ Mixture							% Average Deviation	
		Density in Gram Moles per Liter								
		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)

Temperature °K		50.26% C ₂ H ₆ — 49.74% N ₂ Mixture						% Average Deviation	
		Density in Gram Moles per Liter							
		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	
	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	1.10
294.27	Experimental	44.631	72.918	98.945	125.50	157.66	200.40	260.96	
	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	1.29
283.17	Experimental	42.216	67.923	90.787	113.73	141.53	178.50	231.78	
	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	1.70
266.54	Experimental	38.493	60.513	78.470	96.237	117.79	146.60	188.81	
	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	3.37
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%.

Temperature °K		29.96% C ₂ H ₆ — 70.04% N ₂ Mixture						% Average Deviation	
		Density in Gram Moles per Liter							
		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	
	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	0.20
294.27	Experimental	33.431	57.989	92.808	127.62	165.33	209.18	264.01	
	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	0.33
283.17	Experimental	31.920	55.042	87.323	119.16	153.33	192.89	242.61	
	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	0.50
266.54	Experimental	29.661	50.626	78.967	106.48	135.36	168.69	210.40	
	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	0.55
249.83	Experimental	27.368	46.486	70.638	93.570	117.28	144.38	178.31	
	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	1.46
238.72	Experimental	25.857	—	—	85.370	105.22	128.30	157.28	
	Calculated	25.842	—	—	83.746	102.66	123.83	150.00	
	% Error	0.06	—	—	1.90	2.43	3.48	4.63	2.50
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%.