

**Special Problem 9c - Methane-Air at different Stoichiometric Ratios**

Hout - Hin Method										Heat Capacity Data (from JANAF)					Cp Units: kJ/gmol-K					T units are in K																																							
Cp coefficients (kJ/gmol-K)										a					bT					cT^2					dT^3					eT^4					fT^5																								
	a	b	c	d	e	f	DelH	f			a	bT	cT^2	dT^3	eT^4	fT^5		a	bT	cT^2	dT^3	eT^4	fT^5		a	bT	cT^2	dT^3	eT^4	fT^5		a	bT	cT^2	dT^3	eT^4	fT^5																						
CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	-74.85			CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	CH4	0.0120541	8.573E-05	-3.199E-08	5.745E-12	-4.678E-16	1.243E-20	
O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	0			O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	O2	0.0252337	1.587E-05	-8.678E-09	2.646E-12	-3.902E-16	2.175E-20	
N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	0			N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	N2	0.0273299	5.033E-06	1.001E-09	-1.074E-11	2.276E-16	-1.521E-20	
CO2	0.023422	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20	-393.5			CO2	0.02342203	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20	CO2	0.02342203	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20	CO2	0.02342203	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20	CO2	0.02342203	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20	CO2	0.02342203	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20	CO2	0.02342203	5.607E-05	-3.370E-08	1.001E-11	-1.428E-15	7.807E-20								
H2O(g)	0.0314637	3.956E-06	9.979E-09	-5.213E-12	9.602E-16	-6.079E-20	-241.83			H2O	0.03146368	3.956E-06	9.979E-09	-5.213E-12	9.602E-16	-6.079E-20	H2O	0.03146368	3.956E-06	9.979E-09	-5.213E-12	9.602E-16	-6.079E-20	H2O	0.03146368	3.956E-06	9.979E-09	-5.213E-12	9.602E-16	-6.079E-20	H2O	0.03146368	3.956E-06	9.979E-09	-5.213E-12	9.602E-16	-6.079E-20	H2O	0.03146368	3.956E-06	9.979E-09	-5.213E-12	9.602E-16	-6.079E-20															
CO	0.0267818	7.418E-06	-9.372E-10	-4.217E-13	1.292E-16	-9.707E-21	-1.105E+02			CO	0.02678178	7.418E-06	-9.372E-10	-4.217E-13	1.292E-16	-9.707E-21	CO	0.02678178	7.418E-06	-9.372E-10	-4.217E-13	1.292E-16	-9.707E-21	CO	0.02678178	7.418E-06	-9.372E-10	-4.217E-13	1.292E-16	-9.707E-21	CO	0.02678178	7.418E-06	-9.372E-10	-4.217E-13	1.292E-16	-9.707E-21																						
Guess: T_ad= 1817 C										2090.1 K					2727																																												
In										Out																																																	
	T(K)	n	Hhat	H	T(K)	n	Hhat	H	T (Celsius)		T(K)	n	Hhat	H	T (Celsius)		T(K)	n	Hhat	H	T (Celsius)		T(K)	n	Hhat	H	T (Celsius)		T(K)	n	Hhat	H	T (Celsius)																										
CH4	323	1	-7.40E+01	-7.40E+01	2.09E+03	0	5.70E+01	0.00E+00	1.82E+03	CH4	323	1	-7.40E+01	-7.40E+01	2.09E+03	0	5.70E+01	0.00E+00	1.82E+03	CH4	323	1	-7.40E+01	-7.40E+01	2.09E+03	0	5.70E+01	0.00E+00	1.82E+03	CH4	323	1	-7.40E+01	-7.40E+01	2.09E+03	0	5.70E+01	0.00E+00	1.82E+03	CH4	323	1	-7.40E+01	-7.40E+01	2.09E+03	0	5.70E+01	0.00E+00	1.82E+03										
O2	323	2.4	7.35E-01	1.76E+00	2.09E+03	0.40	6.27E+01	2.51E+01		O2	323	2.4	7.35E-01	1.76E+00	2.09E+03	0.40	6.27E+01	2.51E+01		O2	323	2.4	7.35E-01	1.76E+00	2.09E+03	0.40	6.27E+01	2.51E+01		O2	323	2.4	7.35E-01	1.76E+00	2.09E+03	0.40	6.27E+01	2.51E+01		O2	323	2.4	7.35E-01	1.76E+00	2.09E+03	0.40	6.27E+01	2.51E+01											
N2	323	9.0285714	7.24E-01	6.54E+00	2.09E+03	9.0286	5.93E+01	5.35E+02		N2	323	9.0285714	7.24E-01	6.54E+00	2.09E+03	9.0286	5.93E+01	5.35E+02		N2	323	9.0285714	7.24E-01	6.54E+00	2.09E+03	9.0286	5.93E+01	5.35E+02		N2	323	9.0285714	7.24E-01	6.54E+00	2.09E+03	9.0286	5.93E+01	5.35E+02		N2	323	9.0285714	7.24E-01	6.54E+00	2.09E+03	9.0286	5.93E+01	5.35E+02											
CO2	323	0	-3.93E+02		2.09E+03	1.0	-2.96E+02	-2.96E+02		CO2	323	0	-3.93E+02		2.09E+03	1.0	-2.96E+02	-2.96E+02		CO2	323	0	-3.93E+02		2.09E+03	1.0	-2.96E+02	-2.96E+02		CO2	323	0	-3.93E+02		2.09E+03	1.0	-2.96E+02	-2.96E+02		CO2	323	0	-3.93E+02		2.09E+03	1.0	-2.96E+02	-2.96E+02											
H2O	323	0	-2.41E+02		2.09E+03	2.0	-1.65E+02	-3.29E+02		H2O	323	0	-2.41E+02		2.09E+03	2.0	-1.65E+02	-3.29E+02		H2O	323	0	-2.41E+02		2.09E+03	2.0	-1.65E+02	-3.29E+02		H2O	323	0	-2.41E+02		2.09E+03	2.0	-1.65E+02	-3.29E+02		H2O	323	0	-2.41E+02		2.09E+03	2.0	-1.65E+02	-3.29E+02											
CO	323	0	-1.10E+02		2.09E+03	0.0	-5.06E+01	0.00E+00		CO	323	0	-1.10E+02		2.09E+03	0.0	-5.06E+01	0.00E+00		CO	323	0	-1.10E+02		2.09E+03	0.0	-5.06E+01	0.00E+00		CO	323	0	-1.10E+02		2.09E+03	0.0	-5.06E+01	0.00E+00		CO	323	0	-1.10E+02		2.09E+03	0.0	-5.06E+01	0.00E+00											
Q = 0 = Hout + Hin										Sum= -6.57E+01 kJ/mol																																																	
Q= -1.62E-06 kJ/mol										Use solver to set this to 0																																																	
	In				Out						In				Out						In				Out						In				Out					In				Out															
SR	CH4	O2	N2	CH4	O2	N2	CO2	H2O	CO	Tad (Celsius) in air	T (Celsius) in O2	SR	CH4	O2	N2	CH4	O2	N2	CO2	H2O	CO	Tad (Celsius) in air	T (Celsius) in O2	SR	CH4	O2	N2	CH4	O2	N2	CO2	H2O	CO	Tad (Celsius) in air	T (Celsius) in O2	SR	CH4	O2	N2	CH4	O2	N2	CO2	H2O	CO	Tad (Celsius) in air	T (Celsius) in O2	SR	CH4	O2	N2	CH4	O2	N2	CO2	H2O	CO	Tad (Celsius) in air	T (Celsius) in O2
0.75	1	1.5	5.6428571	0	0	5.6428571	0	2	1	1750	3897	0.75	1	1.5	5.6428571	0	0	5.6428571	0	2	1	1750	3897	0.75	1	1.5	5.6428571	0	0	5.6428571	0	2	1	1750	3897	0.75	1	1.5	5.6428571	0	0	5.6428571	0	2	1	1750	3897	0.75	1	1.5	5.6428571	0	0	5.6428571	0	2	1	1750	3897
0.8	1	1.6	6.0190476	0	0	6.0190476	0.2	2	0.8	1826	4143	0.8	1	1.6	6.0190476	0	0	6.0190476	0.2	2	0.8	1826	4143	0.8	1	1.6	6.0190476	0	0	6.0190476	0.2	2	0.8	1826	4143	0.8	1	1.6	6.0190476	0	0	6.0190476	0.2	2	0.8	1826	4143												
0.9	1	1.8	6.7714286	0	0	6.7714286	0.6	2	0.4	1963	4585	0.9	1	1.8	6.7714286	0	0	6.7714286	0.6	2	0.4	1963	4585	0.9	1	1.8	6.7714286	0	0	6.7714286	0.6	2	0.4	1963	4585	0.9	1	1.8	6.7714286	0	0	6.7714286	0.6	2	0.4	1963	4585												
1	1	2	7.5238095	0	0	7.5238095	1	2	0	2074	4971	1	1	2	7.5238095	0	0	7.5238095	1	2	0	2074	4971	1	1	2	7.5238095	0	0	7.5238095	1	2	0	2074	4971	1	1	2	7.5238095	0	0	7.5238095	1	2	0	2074	4971												
1.1	1	2.2	8.2761905	0	0.2	8.2761905	1	2	0	1937	4908	1.1	1	2.2	8.2761905	0	0.2	8.2761905	1	2	0	1937	4908	1.1	1	2.2	8.2761905	0	0.2	8.2761905	1	2	0	1937	4908	1.1	1	2.2	8.2761905	0	0.2	8.2761905	1	2	0	1937	4908												
1.2	1	2.4	9.0285714	0	0.4	9.0285714	1	2	0	1817	4841	1.2	1	2.4	9.0285714	0	0.4	9.0285714	1	2	0	1817	4841	1.2	1	2.4	9.0285714	0	0.4	9.0285714	1	2	0	1817	4841	1.2	1	2.4	9.0285714	0	0.4	9.0285714	1	2	0	1817	4841												

