Carnot Cycle model
Dr A. French. September 2017

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Carnot
(1796-1832)

Input parameters

Hot reservoir temperature /Celsius	100
Cold reservoir temperature /Celsius	25
Mass of gas /g	1000.00
Volume of gas at lowest volume and hightest pressure /litres	10.00
Volume of gas after isothermal expansion /litres	30.00
Degrees of freedom of molecular motion	3
Molar mass of gas /gmol^-1	28.966

Outputs

Heat input during isothermal expansion /kJ	117.618
Heat output during isothermal compression /kJ	93.968
Total work done by gas on surroundings /kJ	23.650
Entropy change during isothermal stages /JK^-1	315.330
Efficiency (work done / heat input)	0.201

Theoretical efficiency	0.201

$$\eta = 1 - \frac{T_C}{T_H}$$

Note all temperatures incorporated into calculations
will be converted to Kelvin first - i.e. add 273 to Celsius number.

Pressure, volume coordinates of heat cycle

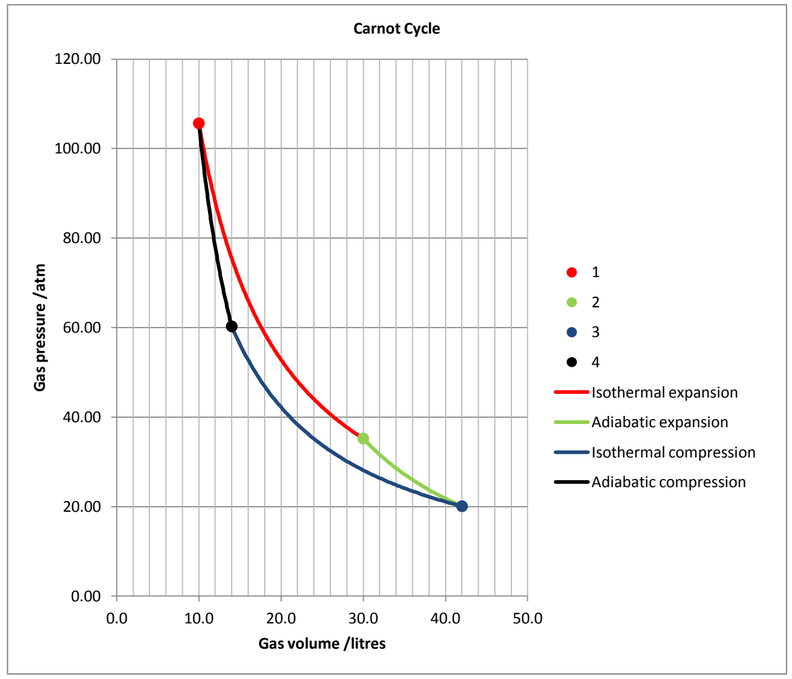
p1	105.66
V1	10.0
p2	35.22
V2	30.0
p3	20.09
V3	42.01
p4	60.28
V4	14.0

Note all pressures are quoted in atmospheres. 1atm = 101,325 Pa. Volumes in litres. T in K.

Reservoir temperatures in K

T_H	373
T_C	298

Number of moles of gas in engine	34.523
Ratio of specific heats gamma	1.667



	1 to 2		2 to 3		3 to 4		4 to 1	
	Isothermal expansion		**Adiabatic expansion**		**Isothermal compression**		**Adiabatic compression**	
V diff fraction	**p**	**V**	**p**	**V**	**p**	**V**	**p**	**V**
0	105.661	10.000	35.220	30.000	20.094	42.011	60.281	14.004
0.01	103.589	10.200	34.986	30.120	20.229	41.731	60.570	13.964
0.02	101.597	10.400	34.755	30.240	20.365	41.451	60.860	13.924
0.03	99.680	10.600	34.526	30.360	20.504	41.171	61.153	13.883
0.04	97.834	10.800	34.300	30.480	20.644	40.890	61.448	13.843
0.05	96.055	11.000	34.076	30.601	20.787	40.610	61.745	13.803
0.06	94.340	11.200	33.854	30.721	20.931	40.330	62.045	13.763
0.07	92.685	11.400	33.635	30.841	21.077	40.050	62.347	13.723
0.08	91.087	11.600	33.417	30.961	21.226	39.770	62.651	13.683
0.09	89.543	11.800	33.202	31.081	21.376	39.490	62.958	13.643
0.1	88.051	12.000	32.990	31.201	21.529	39.210	63.267	13.603
0.11	86.607	12.200	32.779	31.321	21.684	38.930	63.579	13.563
0.12	85.210	12.400	32.571	31.441	21.841	38.650	63.893	13.523
0.13	83.858	12.600	32.364	31.561	22.000	38.370	64.209	13.483
0.14	82.547	12.800	32.160	31.682	22.162	38.090	64.528	13.443
0.15	81.278	13.000	31.958	31.802	22.326	37.810	64.850	13.403
0.16	80.046	13.200	31.758	31.922	22.493	37.530	65.174	13.363
0.17	78.851	13.400	31.560	32.042	22.662	37.250	65.501	13.323
0.18	77.692	13.600	31.363	32.162	22.834	36.969	65.830	13.283
0.19	76.566	13.800	31.169	32.282	23.008	36.689	66.162	13.243
0.2	75.472	14.000	30.977	32.402	23.185	36.409	66.497	13.203
0.21	74.409	14.200	30.786	32.522	23.365	36.129	66.834	13.163
0.22	73.376	14.400	30.598	32.642	23.547	35.849	67.174	13.123
0.23	72.370	14.600	30.411	32.762	23.733	35.569	67.517	13.083
0.24	71.392	14.800	30.226	32.883	23.921	35.289	67.863	13.043
0.25	70.441	15.000	30.043	33.003	24.113	35.009	68.212	13.003
0.26	69.514	15.200	29.862	33.123	24.307	34.729	68.563	12.963
0.27	68.611	15.400	29.682	33.243	24.505	34.449	68.918	12.923
0.28	67.731	15.600	29.504	33.363	24.705	34.169	69.275	12.883
0.29	66.874	15.800	29.328	33.483	24.910	33.889	69.635	12.843
0.3	66.038	16.000	29.154	33.603	25.117	33.609	69.999	12.803
0.31	65.223	16.200	28.981	33.723	25.328	33.329	70.365	12.762
0.32	64.427	16.400	28.810	33.843	25.543	33.048	70.734	12.722
0.33	63.651	16.600	28.640	33.964	25.761	32.768	71.107	12.682
0.34	62.893	16.800	28.472	34.084	25.983	32.488	71.483	12.642
0.35	62.153	17.000	28.306	34.204	26.209	32.208	71.861	12.602
0.36	61.431	17.200	28.141	34.324	26.439	31.928	72.244	12.562
0.37	60.725	17.400	27.977	34.444	26.673	31.648	72.629	12.522
0.38	60.035	17.600	27.815	34.564	26.911	31.368	73.018	12.482
0.39	59.360	17.800	27.655	34.684	27.154	31.088	73.410	12.442
0.4	58.700	18.000	27.496	34.804	27.401	30.808	73.805	12.402
0.41	58.055	18.200	27.339	34.924	27.652	30.528	74.204	12.362
0.42	57.424	18.400	27.183	35.045	27.908	30.248	74.606	12.322
0.43	56.807	18.600	27.028	35.165	28.169	29.968	75.012	12.282
0.44	56.203	18.800	26.875	35.285	28.435	29.688	75.421	12.242
0.45	55.611	19.000	26.723	35.405	28.705	29.408	75.834	12.202
0.46	55.032	19.200	26.573	35.525	28.981	29.127	76.251	12.162
0.47	54.464	19.400	26.424	35.645	29.263	28.847	76.671	12.122
0.48	53.909	19.600	26.276	35.765	29.550	28.567	77.095	12.082
0.49	53.364	19.800	26.130	35.885	29.842	28.287	77.522	12.042
0.5	52.830	20.000	25.985	36.005	30.141	28.007	77.954	12.002
0.51	52.307	20.200	25.841	36.125	30.445	27.727	78.389	11.962
0.52	51.794	20.400	25.698	36.246	30.756	27.447	78.828	11.922
0.53	51.292	20.600	25.557	36.366	31.073	27.167	79.272	11.882
0.54	50.798	20.800	25.417	36.486	31.396	26.887	79.719	11.842

0.55	50.315	21.000	25.278	36.606	31.727	26.607	80.170	11.802
0.56	49.840	21.200	25.140	36.726	32.064	26.327	80.625	11.762
0.57	49.374	21.400	25.004	36.846	32.409	26.047	81.085	11.722
0.58	48.917	21.600	24.869	36.966	32.762	25.767	81.549	11.682
0.59	48.468	21.800	24.735	37.086	33.122	25.487	82.016	11.641
0.6	48.028	22.000	24.602	37.206	33.490	25.206	82.489	11.601
0.61	47.595	22.200	24.470	37.327	33.866	24.926	82.965	11.561
0.62	47.170	22.400	24.339	37.447	34.251	24.646	83.446	11.521
0.63	46.753	22.600	24.210	37.567	34.644	24.366	83.932	11.481
0.64	46.342	22.800	24.081	37.687	35.047	24.086	84.422	11.441
0.65	45.939	23.000	23.954	37.807	35.460	23.806	84.917	11.401
0.66	45.543	23.200	23.828	37.927	35.882	23.526	85.416	11.361
0.67	45.154	23.400	23.702	38.047	36.314	23.246	85.920	11.321
0.68	44.772	23.600	23.578	38.167	36.757	22.966	86.429	11.281
0.69	44.395	23.800	23.455	38.287	37.211	22.686	86.942	11.241
0.7	44.025	24.000	23.333	38.408	37.676	22.406	87.461	11.201
0.71	43.661	24.200	23.212	38.528	38.153	22.126	87.985	11.161
0.72	43.304	24.400	23.092	38.648	38.642	21.846	88.513	11.121
0.73	42.952	24.600	22.973	38.768	39.144	21.566	89.047	11.081
0.74	42.605	24.800	22.854	38.888	39.659	21.285	89.585	11.041
0.75	42.264	25.000	22.737	39.008	40.188	21.005	90.130	11.001
0.76	41.929	25.200	22.621	39.128	40.731	20.725	90.679	10.961
0.77	41.599	25.400	22.506	39.248	41.289	20.445	91.234	10.921
0.78	41.274	25.600	22.391	39.368	41.862	20.165	91.794	10.881
0.79	40.954	25.800	22.278	39.488	42.452	19.885	92.359	10.841
0.8	40.639	26.000	22.166	39.609	43.058	19.605	92.931	10.801
0.81	40.329	26.200	22.054	39.729	43.682	19.325	93.508	10.761
0.82	40.023	26.400	21.943	39.849	44.324	19.045	94.090	10.721
0.83	39.722	26.600	21.834	39.969	44.986	18.765	94.679	10.681
0.84	39.426	26.800	21.725	40.089	45.668	18.485	95.273	10.641
0.85	39.134	27.000	21.617	40.209	46.370	18.205	95.874	10.601
0.86	38.846	27.200	21.509	40.329	47.095	17.925	96.481	10.561
0.87	38.562	27.400	21.403	40.449	47.842	17.645	97.093	10.520
0.88	38.283	27.600	21.298	40.569	48.614	17.364	97.712	10.480
0.89	38.007	27.800	21.193	40.690	49.411	17.084	98.337	10.440
0.9	37.736	28.000	21.089	40.810	50.234	16.804	98.969	10.400
0.91	37.468	28.200	20.986	40.930	51.086	16.524	99.607	10.360
0.92	37.204	28.400	20.884	41.050	51.967	16.244	#####	10.320
0.93	36.944	28.600	20.782	41.170	52.878	15.964	#####	10.280
0.94	36.688	28.800	20.682	41.290	53.823	15.684	#####	10.240
0.95	36.435	29.000	20.582	41.410	54.801	15.404	#####	10.200
0.96	36.185	29.200	20.483	41.530	55.816	15.124	#####	10.160
0.97	35.939	29.400	20.384	41.650	56.869	14.844	#####	10.120
0.98	35.696	29.600	20.287	41.771	57.963	14.564	#####	10.080
0.99	35.457	29.800	20.190	41.891	59.099	14.284	#####	10.040
1	35.220	30.000	20.094	42.011	60.281	14.004	#####	10.000