

Données sourcées :

- Ceau : [capacité thermique massique de l'eau](#)
- capacité thermique molaire :

Isobaric Data for P = 0.10130 MPa

Temperature (K)	Pressure (MPa)	Density (kg/m ³)	Volume (m ³ /kg)	Internal Energy (kJ/mol)	Enthalpy (kJ/mol)	Entropy (J/mol*K)	Cv (J/mol*K)	Cp (J/mol*K)	Sound Spd. (m/s)	Joule-Thomson (K/MPa)	Viscosity (uPa*s)	Therm. Cond. (W/m*K)	Phase
273.16	0.10130	999.84	0.0010002	3.3633e-05	0.0018589	0.00012295	75.970	76.014	1402.4	-0.24141	1791.1	0.55568	liquid
273.26	0.10130	999.85	0.0010001	0.0076334	0.0094587	0.027940	75.966	76.008	1402.9	-0.24131	1784.9	0.55593	liquid
273.36	0.10130	999.86	0.0010001	0.015233	0.017058	0.055744	75.962	76.001	1403.4	-0.24122	1778.7	0.55619	liquid
273.46	0.10130	999.86	0.0010001	0.022831	0.024656	0.083536	75.958	75.995	1403.9	-0.24112	1772.6	0.55644	liquid
273.56	0.10130	999.87	0.0010001	0.030429	0.032254	0.11132	75.954	75.989	1404.4	-0.24102	1766.5	0.55670	liquid
273.66	0.10130	999.88	0.0010001	0.038027	0.039852	0.13908	75.950	75.983	1404.9	-0.24092	1760.4	0.55695	liquid
273.76	0.10130	999.88	0.0010001	0.045623	0.047449	0.16684	75.946	75.977	1405.4	-0.24083	1754.3	0.55720	liquid
273.86	0.10130	999.89	0.0010001	0.053220	0.055045	0.19458	75.942	75.971	1405.9	-0.24073	1748.3	0.55745	liquid
273.96	0.10130	999.89	0.0010001	0.060815	0.062640	0.22231	75.938	75.965	1406.4	-0.24063	1742.3	0.55771	liquid
274.06	0.10130	999.90	0.0010001	0.068410	0.070235	0.25003	75.934	75.960	1406.9	-0.24054	1736.4	0.55796	liquid
274.16	0.10130	999.90	0.0010001	0.076005	0.077830	0.27773	75.930	75.954	1407.4	-0.24044	1730.4	0.55821	liquid
274.26	0.10130	999.91	0.0010001	0.083598	0.085423	0.30543	75.926	75.948	1407.9	-0.24035	1724.6	0.55846	liquid
274.36	0.10130	999.91	0.0010001	0.091192	0.093017	0.33311	75.921	75.942	1408.4	-0.24025	1718.7	0.55871	liquid
274.46	0.10130	999.92	0.0010001	0.098784	0.10061	0.36078	75.917	75.937	1408.9	-0.24015	1712.9	0.55896	liquid
274.56	0.10130	999.92	0.0010001	0.10638	0.10820	0.38843	75.913	75.931	1409.4	-0.24006	1707.1	0.55921	liquid
274.66	0.10130	999.92	0.0010001	0.11397	0.11579	0.41608	75.909	75.926	1409.9	-0.23996	1701.3	0.55945	liquid
274.76	0.10130	999.93	0.0010001	0.12156	0.12338	0.44371	75.905	75.920	1410.3	-0.23987	1695.6	0.55970	liquid
274.86	0.10130	999.93	0.0010001	0.12915	0.13097	0.47133	75.901	75.914	1410.8	-0.23977	1689.9	0.55995	liquid
274.96	0.10130	999.94	0.0010001	0.13674	0.13856	0.49894	75.896	75.909	1411.3	-0.23968	1684.2	0.56019	liquid

pour des variations de température entre 0°C et 50°C, on trouve que la capacité thermique molaire est de 75.67+-0.34J/K/mol

- masse molaire :

https://www.engineeringtoolbox.com/water-thermal-properties-d_162.html

<https://pubchem.ncbi.nlm.nih.gov/compound/Water>

M(eau)=18.015 g/mol

capacité massique = capacité molaire / masse molaire
donc capacité massique = 4200J/K/kg+-20J/K/kg

- λ_{air} : la conductivité thermique de l'air

1ère source :

<https://srd.nist.gov/jpcrdreprint/1.555749.pdf>

Table 1. Skeleton table of the recommended data set. Thermal conductivity [mW/(m·K)] of air

T [K]	p [bar]								
	1.00	10.00	20.00	30.00	40.00	50.00	60.00	80.00	100.00
70.00	6.59								
80.00	7.53	143.30	144.03	144.73	145.43	146.10	146.77	148.08	149.37
90.00	8.48	128.71	129.65	130.55	131.43	132.29	133.11	134.76	136.33
100.00	9.42	113.23	114.49	115.68	116.85	117.99	119.08	121.19	123.17
120.00	11.27	12.60	14.91	81.74	84.79	87.41	89.72	93.72	97.13
130.00	12.18	13.36	15.10	18.28	61.03	67.80	72.32	78.87	83.84
140.00	13.09	14.15	15.59	17.58	21.13	32.66	48.15	61.73	69.42
160.00	14.87	15.77	16.89	18.20	19.80	21.87	24.65	33.05	42.89
180.00	16.61	17.40	18.33	19.36	20.51	21.81	23.32	27.09	31.94
200.00	18.31	19.01	19.82	20.68	21.61	22.61	23.70	26.19	29.17
220.00	19.97	20.60	21.32	22.07	22.85	23.68	24.56	26.48	28.65
240.00	21.59	22.16	22.81	23.48	24.16	24.88	25.62	27.21	28.94
260.00	23.16	23.69	24.28	24.88	25.50	26.13	26.78	28.15	29.61
280.00	24.70	25.18	25.73	26.28	26.84	27.41	27.99	29.20	30.47
300.00	26.19	26.65	27.16	27.67	28.18	28.70	29.23	30.31	31.44
320.00	27.66	28.08	28.56	29.03	29.51	29.99	30.47	31.46	32.48
340.00	29.10	29.49	29.93	30.37	30.82	31.27	31.71	32.62	33.56

2eme source:

https://fr.wikipedia.org/wiki/Liste_de_conductivit%C3%A9s_thermiques

Air	0,024	273
	0,025	293
	0,0262	300

On prendra donc $\lambda_{\text{air}} = 0,24 \text{ W/(m}\cdot\text{K)}$ au vu des informations trouvées

- R_{terre} : le [rayon de la Terre](#)

On a pris la valeur du rayon moyen de la Terre retenue actuellement qui est de 6371km.

- ρ_{eau} : la [masse volumique de l'eau](#)

pour des variations de température entre 0°C et 50°C, on trouve $\rho_{\text{eau}} = 993.94 \text{ kg/m}^3$ $\pm 6.00 \text{ kg/m}^3$

- d_r : [profondeur à partir de laquelle la température de la terre varie de moins de 1°C](#) au cours d'une journée

TD chapitre 11 exo 1 : $d_r = 0.39 \text{ m}$

- C_{glace} : https://www.engineeringtoolbox.com/specific-heat-solids-d_154.html

https://fr.wikipedia.org/wiki/Diffusivit%C3%A9_thermique?

	Masse volumique (ρ) (10 ³ kg/m ³)	Chaleur spécifique (c_p) (kJ/(kg·K))
Polyméthacrylate de méthyle (Plexiglas)	1,18	1,44
Asphalte	2,12	0,92
Béton	2,4	0,88
Glace (0 °C)	0,917	2,04
Humus (grossier)	2,04	1,84
Sol sableux (sec)	1,65	0,80
Sol sableux (humide)	1,75	1,00

Cterrehmide :

https://fr.wikipedia.org/wiki/Diffusivit%C3%A9_thermique?

	Masse volumique (ρ) (10 ³ kg/m ³)	Chaleur spécifique (c_p) (kJ/(kg·K))
Polyméthacrylate de méthyle (Plexiglas)	1,18	1,44
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Béton	2,4	0,88
Glace (0 °C)	0,917	2,04
Humus (grossier)	2,04	1,84
Sol sableux (sec)	1,65	0,80
Sol sableux (humide)	1,75	1,00

https://www.engineeringtoolbox.com/specific-heat-solids-d_154.html

- Cdesert :

https://www.researchgate.net/figure/Determined-values-of-specific-heat-capacity-c-0-of-dry-s-and_tbl1_275540875

Measurement number	θ (°C)	θ_p (°C)	θ_k (°C)	m_v (kg)	m (kg)	c_0 (J/(kg.K))
1	19.72	49.53	48.93	8.059	0.762	918
2	19.74	49.42	48.78	7.991	0.806	923
3	19.40	49.18	48.58	8.059	0.762	919
4	18.80	50.18	49.55	8.031	0.758	917
5	19.29	49.36	48.76	8.066	0.755	918
Average value						919