APPENDIX

Property Values of Dry air at one atm. pressure

Temperature t °C	*Density kg/m³*	*Coefficient of viscosity μ, kg/ms or Ns/m²*	*Kinematic Viscosity ν, m²/s*
– 50	1.584	14.61×10^{-6}	9.23×10^{-6}
– 40	1.515	15.20×10^{-6}	10.04×10^{-6}
– 30	1.453	15.69×10^{-6}	10.80×10^{-6}
– 20	1.395	16.18×10^{-6}	11.61×10^{-6}
– 10	1.342	16.67×10^{-6}	12.43×10^{-6}
0	1.293	17.16×10^{-6}	13.28×10^{-6}
10	1.247	17.65×10^{-6}	14.16×10^{-6}
20	1.205	18.14×10^{-6}	15.06×10^{-6}
30	1.165	18.63×10^{-6}	16.00×10^{-6}
40	1.128	19.12×10^{-6}	16.96×10^{-6}
50	1.093	19.61×10^{-6}	17.95×10^{-6}
60	1.060	20.10×10^{-6}	18.97×10^{-6}
70	1.029	20.59×10^{-6}	20.02×10^{-6}
80	1.000	21.08×10^{-6}	21.09×10^{-6}
90	0.972	21.48×10^{-6}	22.10×10^{-6}
100	0.946	21.87×10^{-6}	23.13×10^{-6}
120	0.898	22.85×10^{-6}	25.45×10^{-6}
140	0.854	23.73×10^{-6}	27.80×10^{-6}
160	0.815	24.52×10^{-6}	30.09×10^{-6}
180	0.779	25.30×10^{-6}	32.49×10^{-6}
200	0.746	25.99×10^{-6}	34.85×10^{-6}
250	0.674	27.36×10^{-6}	40.61×10^{-6}
300	0.615	29.71×10^{-6}	48.20×10^{-6}

1 Ns/m^2 = 0.102 kgf/m^2 = 0.1 Poise, $\beta = 1/T$, T in K

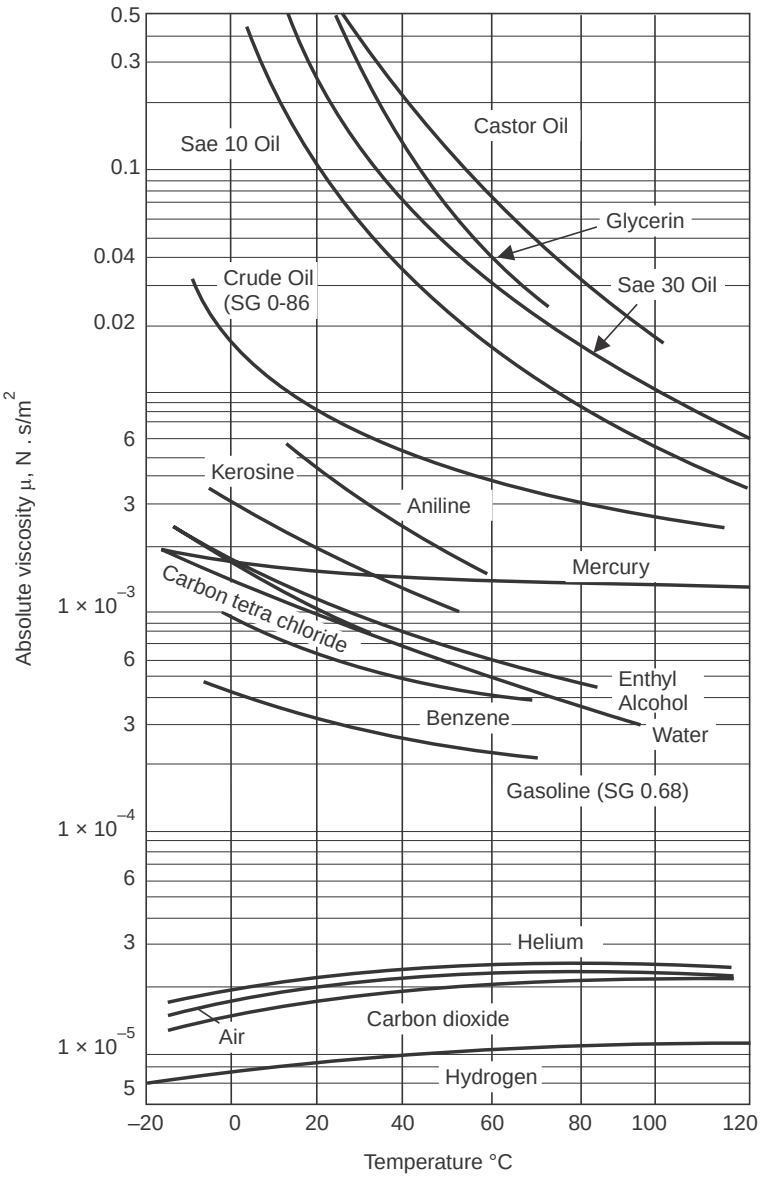
Property Values of Water in Saturated State

Temperature t °C	*Density kg/m³*	*Kinematic Viscosity ν, m²/s*
0	1002	1.788×10^{-6}
20	1000	1.006×10^{-6}
40	995	0.657×10^{-6}
60	985	0.478×10^{-6}
80	974	0.364×10^{-6}
100	961	0.293×10^{-6}
120	945	0.247×10^{-6}
140	928	0.213×10^{-6}
160	909	0.189×10^{-6}
180	889	0.173×10^{-6}
200	867	0.160×10^{-6}
220	842	0.149×10^{-6}
240	815	0.143×10^{-6}
260	786	0.137×10^{-6}
280	752	0.135×10^{-6}
300	714	0.135×10^{-6}

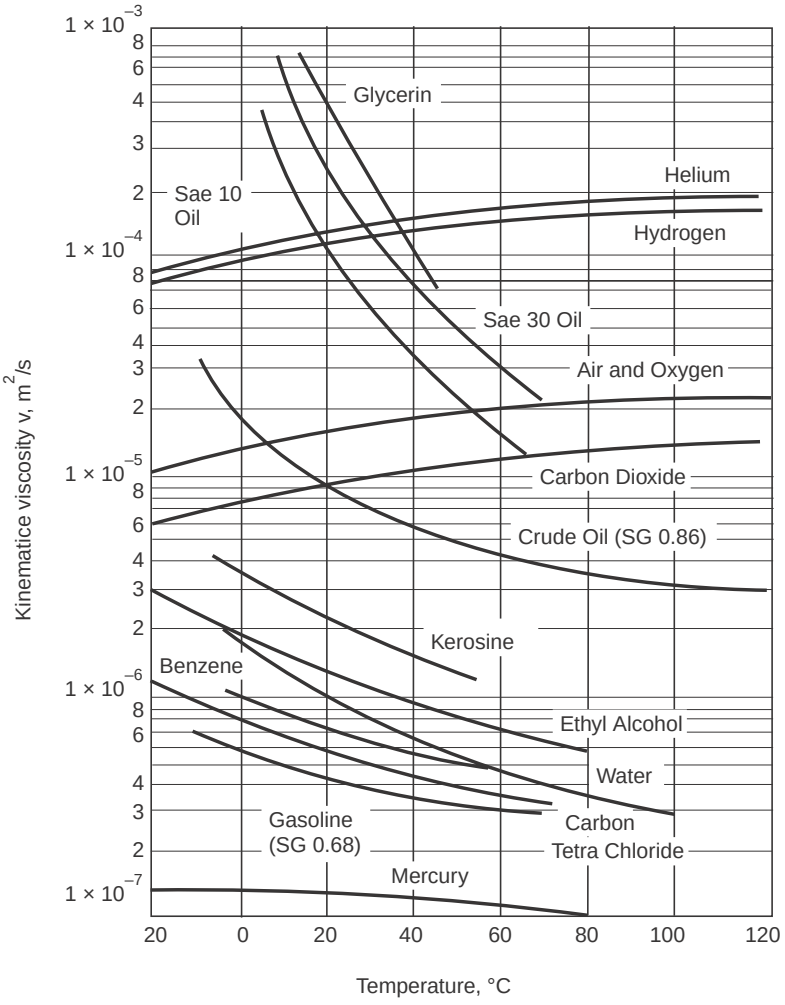
β = (change in density/change in temp.) (1/density)

μ = density × kinematic viscosity, 1 Ns/m^2 = 0.102 kgf/m^2 = 0.1 Poise

ν = 1 m^2/s = 3600 m^2/hr



Absolute Viscosity of common fluids at 1 atm.



Kinematic Viscosity of common fluids at 1 atm.

UNIT CONVERSION CONSTANTS

Quantity	*SI to Metric*	*Metric to SI*
Force	1 N = 0.1019 kg_f	1 kg_f = 9.81 N
Pressure	1 N/m^2 = 10.19 × 10^{-6} kg_f/cm^2	1 kg_f/cm^2 = 98135 N/m^2, (Pascal)
	1 bar = 1.0194 kg_f/cm^2	1 kg_f/cm^2 = 0.9814 bar
Energy	1 kJ = 0.2389 kcal	1 kcal = 4.186 kJ
(heat, work)	1 Nm (= 1J) = 0.1019 kg_f m	1 kg_f m = 9.81 Nm, (J)
	1 kW hr = 1.36 hp hr	1 hp hr = 0.736 kW hr
Power (metric)	1 W = 1.36 × 10^{-3} hp	1 hp = 736 W
Heat flow	1 W = 0.86 kcal/hr	1 kcal/hr = 1.163 W
Specific heat	1 kJ/kg K = 0.2389 kcal/kg °C	1 kcal/kg °C = 4.186 kJ/kg K
Surface Tension	1 N/m = 0.1019 kg_f/m	1 kg_f/m = 9.81 N/m
Thermal Conductivity	1 W/m K = 0.86 kcal/hr m °C	1 kcal/hr m °C = 1.163 W/m K
Convection Coefficient	1 W/m^2 K = 0.86 kcal/hr m^2 °C	1 kcal/hr m^2 °C = 1.163 W/m^2 K
Dynamic Viscosity	1 kg/ms, (Ns/m^2) = 0.1 Poise	1 Poise = 10 kg/ms, (Ns/m^2), Pa s
Kinematic Viscosity	1 m^2/s = 3600 m^2/hr,	1 m^2/hr = 2.778 × 10^{-4} m^2/s
	1 Stoke = 10^{-4} m^2/s	

Universal gas constant = 8314.41 J/kg mol K = 847.54 mkg_f/kg mol K = 1.986 kcal/kg mol K

Gas Constant for Air = 287 J/kg K, c_p = 1005 J/kg K = 0.24 kcal/kg K

Stefan-Boltzmann constant = 5.67 × 10^{-8} W/m^2K^4 = 4.876 × 10^{-8} kcal/hr m^2 K^4

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