**WHERE TO GET VALUES FOR PROPERTIES OF VARIOUS PURE SUBSTANCES**

| PROPERTIES OF PURE SUBSTANCES | SOURCE |
|---|---|
| **GENERAL INFORMATION FOR PURE SUBSTANCES**: | |
| **M** (kg/kmol), **R, $T_{cr}$, $P_{cr}$, $\bar{v}_{cr}$** (gases and liquids) | Table A-1 |
| **FOR IDEAL GASES: $O_2$, $N_2$, air, $H_2$, He, (NOT R-134a or water)** | |
| **P, V, T, *v*, m, R** | $Pv = RT$, $PV = mRT$ (check: $T \gg T_{cr}$ & $P \ll P_{cr}$) $\Delta u = C_v\Delta T$, $\Delta h = C_P\Delta T$ |
| **$C_p$, $C_v$** (T = 300 K for many gases) | Table A-2(a) |
| **$C_p(T)$, $C_v(T)$** for various temperatures for air, $N_2$, $CO_2$, $H_2$, CO, $O_2$ (250 K < T < 1,000 K; | Table A-2(b) |
| **$C_p(T)$, $C_v(T)$** (polynomial coefficients, many gases, 273 < T < 1800 K) | Table A-2(c) |
| **FOR IDEAL LIQUIDS (INCOMPRESSIBLE):** | |
| BOILING at 1 atm: **$T_{sat}$, $h_{fg}$ (latent heat of vaporization).** FREEZING AT 1 ATM **$T_{solid}$, $h_{if}$ (latent heat of fusion).** **ρ, $C_p$ at a few selected values of T.** | Table A-3(a) Constant P: $\Delta u = \Delta h = C_P\Delta T$ Constant T (pump): $\Delta h = v\Delta P$ |
| **NON-IDEAL PURE SUBSTANCES: SATURATED LIQUID AND VAPOR, SUPERHEATED VAPOR, AND COMPRESSED LIQUIDS** | |
| **WATER/STEAM** | |
| *saturated liquid/vapor* | |
| Given T AND one of: v, h, u, s, or x, get: **$P_{sat}$, $v_f$, $v_g$, $u_f$, $u_g$, $u_{fg}$, $h_f$, $h_g$, $h_{fg}$, $s_f$, $s_g$, $s_{fg}$.** Then get any property of a liquid-vapor mixture. | Table A-4 |
| Given P AND one of: v, h, u, s, or x, get **$T_{sa}$** **$_t$, $v_f$, $v_g$, $u_f$, $u_g$, $u_{fg}$, $h_f$, $h_g$, $h_{fg}$, $s_f$, $s_g$, $s_{fg}$.** Then get any property of a liquid-vapor mixture. | Table A-5 |
| *superheated water vapor* | |
| P , T, *v*, **u, h, s**: given any two, get all others | Table A-6 |
| **REFRIGERANT (R134a)** | |
| *saturated liquid/vapor* | |
| Given T AND one of: v, h, u, s, or x, get: **$P_{sat}$, $v_f$, $v_g$, $u_f$, $u_g$, $u_{fg}$, $h_f$, $h_g$, $h_{fg}$, $s_f$, $s_g$, $s_{fg}$.** Then get any property of a liquid-vapor mixture. | Table A-11 |
| Given P AND one of: v, h, u, s, or x, get **$T_{sat}$, $v_f$, $v_g$, $u_f$, $u_g$, $u_{fg}$, $h_f$, $h_g$, $h_{fg}$, $s_f$, $s_g$, $s_{fg}$.** Then get any property of a liquid-vapor mixture. | Table A-12 |
| *superheated refrigerant vapor* | |
| P , T, *v*, **u, h, s**: given any two, get all others | Table A-13 |
| **COMPRESSED LIQUID (WATER AND R-134a)** | |
| P, T, *v*, **u, h, s**: given any two, get all others | Table A-4 (water) or A-11 (R-134a) $v \approx v_f$ @ T $u \approx u_f$ @ T $h \approx h_f$ @ T $s \approx s_f$ @ T |