

THERMODYNAMICS: COMPRESSIBILITY

Compressibility:

Ideal gasses follow the formula $PV = mRT$, but real gasses fall on a spectrum of compressibility, denoted by z . This is a ratio of the actual volume of a gas to the volume that is predicted by an ideal gas version at a given temperature and pressure.

Z may be greater than or less than 1. A value of 1 indicates an ideal gas.

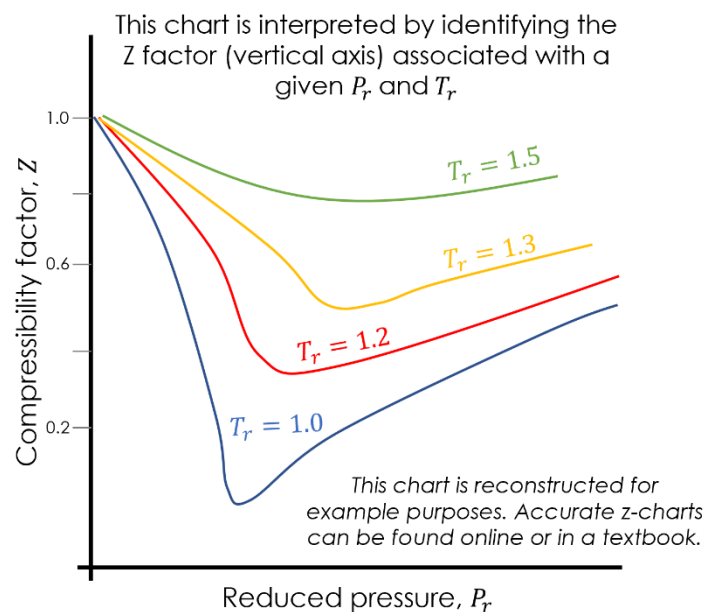
$$z = \frac{Pv}{RT} = \frac{PV}{rmT}$$

Subscript R indicates "reduced", and subscript C indicates "critical". These are used to create a general graph that can be applied to any gas, rather than graphs specifically for each type of gas.

$$P_R = \frac{P}{P_c} = \text{reduced pressure}$$

$$T_R = \frac{T}{T_c} = \text{reduced temperature}$$

$$v'_R = \frac{v}{R} = \text{psuedo - reduced specific volume}$$



Once the compressibility factor is known, the modified ideal gas equation can be used to continue solving a given problem:

$$Pv = zRT$$

For more information, visit a [tutor](#). All appointments are available in-person at the Student Success Center, located in the Library, or online. Adapted from Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. B. (2014). *Fundamentals of Engineering Thermodynamics*. Hoboken, NJ: Wiley.