

Real Gas Compressibility Factor Analysis

<https://gemini.google.com/app/a416fbf3df91e461>

Response: Statement **(d)** is the only correct statement.

Statement Analysis

- **(a) Incorrect:** Both real and ideal gases consist of a huge number of molecules moving at a continuous distribution of speeds due to random collisions. Ideal gas particles do not all move at the same speed.
 - **(b) Incorrect:** Liquefaction requires intermolecular attractive forces to pull gas molecules together into a liquid state. Because an ideal gas is assumed to have zero intermolecular forces, it cannot be liquefied under any pressure.
 - **(c) Incorrect:** The Maxwell-Boltzmann distribution curve is asymmetric (right-skewed). It has a long tail extending toward higher speeds because speeds can increase without a strict upper limit, while the lower bound is strictly zero.
 - **(d) Correct:** The compressibility factor $Z = \frac{PV}{nRT}$ for a real gas changes as pressure changes due to the non-zero volume of molecules and the presence of intermolecular forces at varying densities.
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