

1.

At 150 °C and 103 kPa, all of the compounds listed in Table 1.2 are gases.

Under these conditions, 0.284 g of one of the compounds occupies a volume of 127 cm³.

Use this information to calculate the M_r of the compound. Hence, identify the compound from those given in Table 1.2.

Show your working.

<i>conversion of units</i>	103000 Pa	127 × 10 ⁻⁶ m ³	423 K
<hr/>			
<i>Use of $pV = (m/M_r)RT$</i>	$M_r = \frac{0.284 \times 8.31 \times 423}{103000 \times 127 \times 10^{-6}}$		
<hr/>			
$M_r = 76.3 \text{ AND compound} = \text{CS}_2$			

2. Conditions necessary for gases to approach ideal gas behaviour

High temperature AND low pressure

3. Explain why N₂(g) behaves more like an ideal gas than CO(g) does at 20.0 °C and 101 kPa.

- CO is polar/ has a permanent dipole; N₂ is non-polar
- IMF in CO are more significant/ larger; IMF in N₂ are less significant/ smaller
- (Size of) N₂ smaller than CO OR volume of N₂ molecules / particles smaller // volume of N₂ molecules / particles is more negligible

NOTE: ideal gases

Assumptions made about ideal gases:

- Gas particles have negligible volume relative to the container
- No / negligible IMFs between gas particles

Closer to ideal gas:

- Very small molecules
- Very weak IMFs

- Gases are made up of molecules which are in constant random motion in straight lines.
- The molecules behave as rigid spheres.
- Pressure is due to collisions between the molecules and the walls of the container.

- All collisions, both between the molecules themselves, and between the molecules and the walls of the container, are perfectly elastic. (no loss of kinetic energy during the collision.)
- The temperature of the gas is proportional to the average kinetic energy of the molecules.

Conditions for ideal gases

- high temperatures & low pressures = greater gas volume = ideal gas
 - low temperatures & high pressures = smaller gas volume = not ideal
4. State the assumptions of the kinetic theory as applied to an ideal gas // State assumptions that are made about the behaviour of particles in an ideal gas.
 - ideal gas particles have mass but negligible volume compared to total volume of gas / container
 - no / negligible VdW forces / forces of attraction / interactions between ideal gas particles
 - collisions between ideal gas particles / with walls of container are perfectly elastic
 5. State and explain the conditions at which a gas behaves most like an ideal gas.
 - low pressure AND high temperature
 - volume of particles is negligible compared to volume of container OR VdW forces are insignificant owing to high kinetic energy of particles
 6. Explain why N₂ does not behave as an ideal gas at very high pressures.
 - IMF become larger / more significant
 - volume of molecules / particles becomes significant / no longer negligible