

**Discussion Session 6**  
**KMTG and Real Gases – Solutions**

1. Freon-12 is  $\text{CF}_2\text{Cl}_2$  (molar mass = 119.0 g/mol).

2.  $P_1(\text{ideal}) = 123.1 \text{ atm}$ ;  $P_1(\text{real}) = 60.6 \text{ atm}$

$P_2(\text{ideal}) = 0.246 \text{ atm}$ ;  $P_2(\text{real}) = 0.246 \text{ atm}$

Sample 2 behaves more ideally (low pressure).

3. Note that these answers use  $d = 50 \text{ pm}$  ( $1 \text{ pm} = 10^{-12} \text{ m}$ ).

At  $P = 3.0 \text{ atm}$ ,  $Z_{\text{ab}} = 1.0 \times 10^9 \text{ collisions/s}$ ,  $\lambda = 1.3 \times 10^{-6} \text{ m}$ .

At  $P = 3.0 \times 10^{-6} \text{ atm}$ ,  $Z_{\text{ab}} = 1000 \text{ collisions/s}$ ,  $\lambda = 1.2 \text{ m}$ .

The results are consistent with expectations, because at lower pressure there are fewer particles per unit volume, hence fewer collisions and longer distances traveled between collisions.