1. Rank the following gases in order of increasing van der Waals "a" and van der Waals "b" values: Cl_2, HCl, H_2

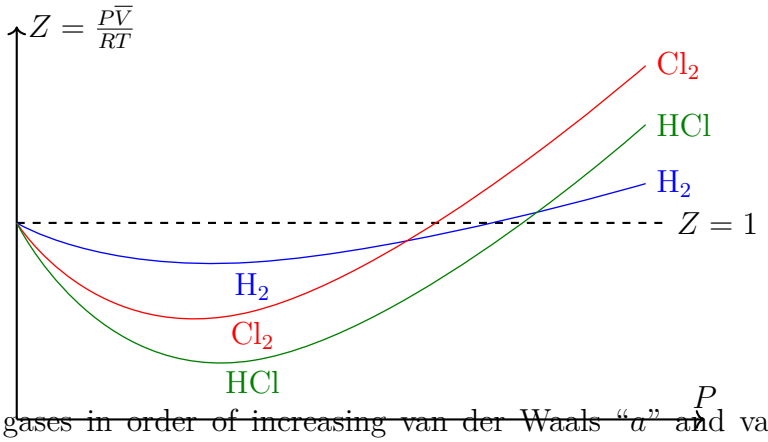
   (a) van der Waals a:

   H_2 < Cl_2 < HCl

   (b) van der Waals b:

   H_2 < HCl < Cl_2

   (c) Sketch a Z vs P diagram for Cl_2, HCl, H_2



2. Rank the following gases in order of increasing van der Waals "a" and van der Waals "b" values: Kr, N_2O, C_2HF

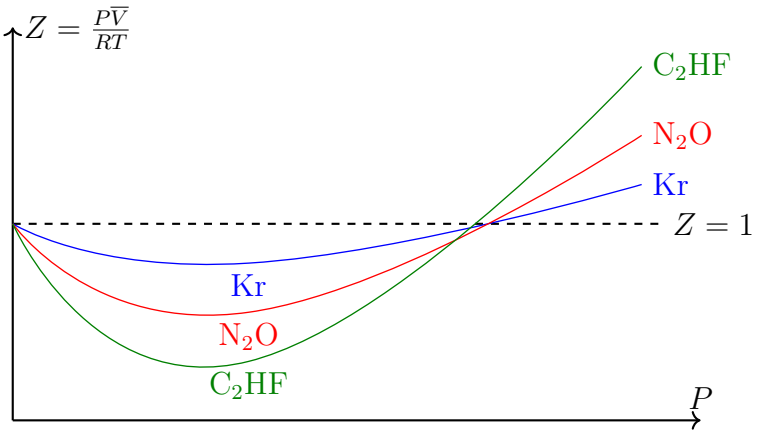
   (a) van der Waals a:

   Kr < N_2O < C_2HF

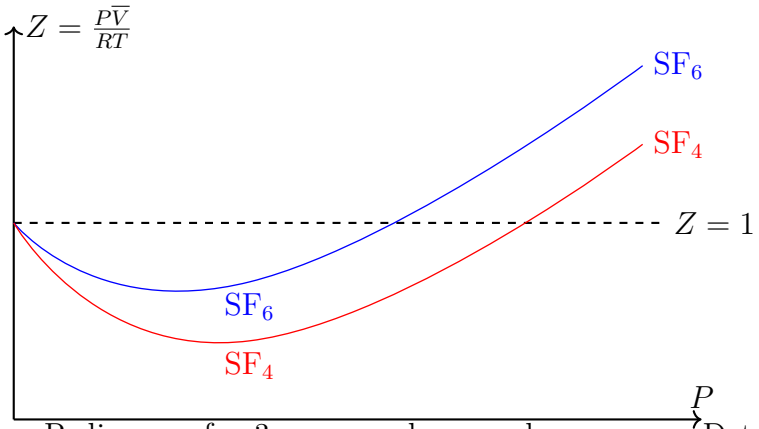
   (b) van der Waals b:

   Kr < N_2O < C_2HF

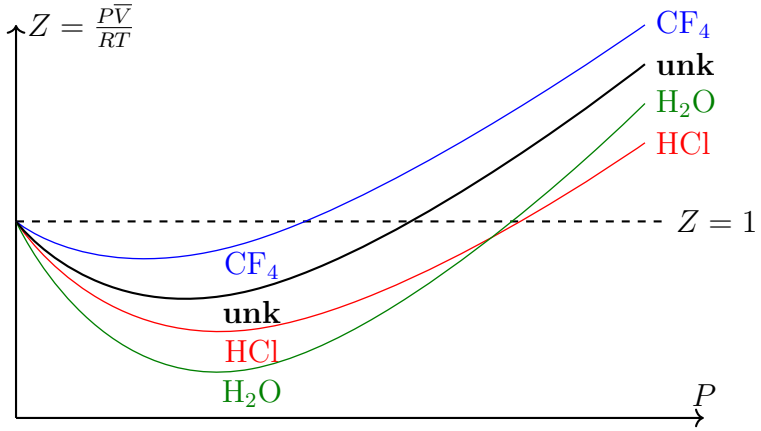
   (c) Sketch a Z vs P diagram for Kr, N_2O, and C_2HF



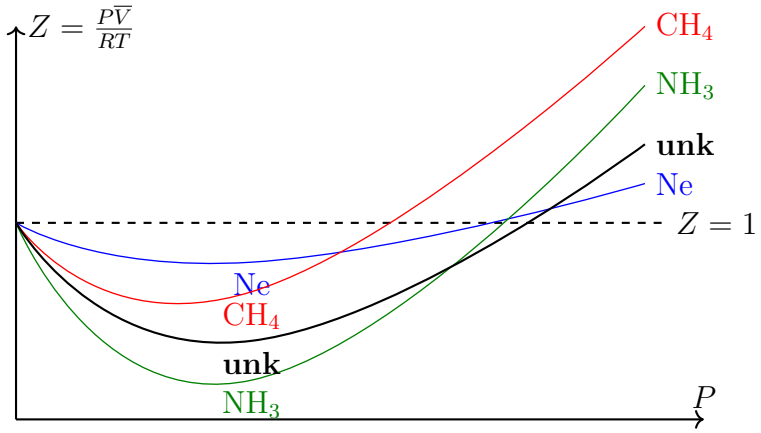
3. Write <, >, X for "cannot be determined". Treat X as = for the purpose of drawing compressibility diagrams.
   (a) van der Waals "a" for SF_4 ___>___ van der Waals "a" for SF_6
   (b) van der Waals "b" for SF_4 ___<___ van der Waals "b" for SF_6
   (c) actual volume at low P for SF_4 ___<___ actual volume at low P for SF_6
   (d) actual volume at high P for SF_4 ___<___ actual volume at high P for SF_6
   (e) Sketch a Z vs P diagram for SF_4 and SF_6



4. Below we have a Z vs P diagram for 3 gases and one unknown gas. Determine 2 possible identities for each of the unknowns, with different molecular geometries.



Cannot be London as there is not a London that satisfies both bigger "a" and smaller "b" simultaneously. So dipole-dipole weaker than HCl, 3-5 atoms, bigger than H_2O
Possible candidates: SO_2, CH_3Cl



Dipole-dipole or strong London or weak H-bond, 1–4 atoms smaller than NH_3
Possible candidates: HCl, H_2S

5. System A: 10.0 g CO_2(g) in a 0.75 L rigid container with a pressure of 1.00 atm.
   System B: 10.0 g N_2O(g) in a volume of 1.50 L and a pressure of 2.00 atm.

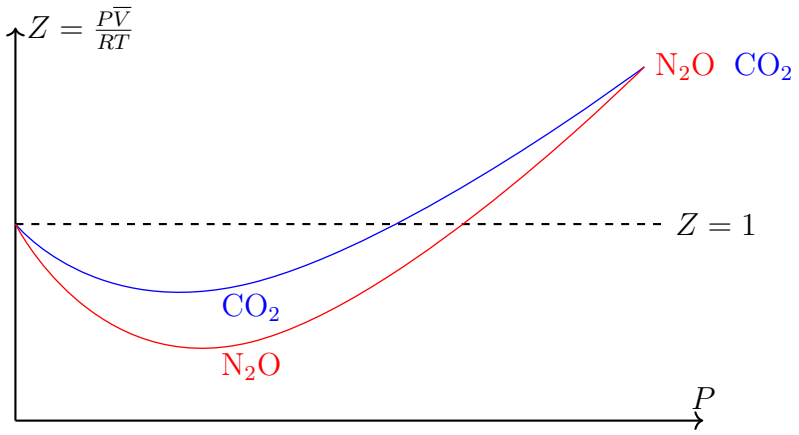
   Write <, >, X for "cannot be determined". Treat X as = for the purpose of drawing compressibility diagrams. Round MW to one decimal place.

   (a) particle density in System A ____>____ particle density in System B

   (b) van der Waals "a" for CO_2 ____<____ van der Waals "a" for N_2O

   (c) van der Waals "b" for CO_2 ____X____ van der Waals "b" for N_2O

   (d) Sketch a Z vs P diagram for CO_2 and N_2O



Homework Problem 10

1. Sketch a Z vs P diagram for NH_3, PH_3, PCl_3, PCl_5