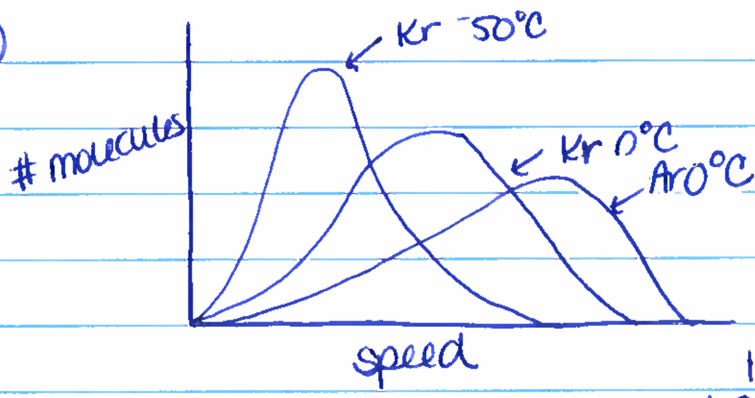
Chapter 10

(4) a) decreases   3 moles reactants → 2 moles prod.
↓ moles, ↓ volume since V & n are directly proportional
b) decreases   n & P are directly prop.

(5) each container will have 4 blue and 3 red
Blue has greater partial pressure since moles Blue > moles red

(6) a) red < yellow < blue
b) $P_{red} = 0.90 \times \frac{2 \text{ red}}{10 \text{ total moles}} = 0.18$ atm 2 s.f.
$P_{yellow} = 0.9 \times \frac{3}{10} = 0.27$ atm 2 s.f.
$P_{blue} = 0.9 \times \frac{5}{10} = 0.45$ atm 2 s.f.

(7)


↑ T, ↑ # molecules at higher sp.
Temp is avg. KE so not all molecules are same speed
If 2 molecules are at same temp. but have diff. masses ↑m, ↓v

(8) a) He has less mass than O_2 so He are faster B = He A = O_2
b) ↑ T, ↑ KE, ↑ v   A = low B = high temp.

Chapter 10 continued...

(9) a) i = 7 mol   ii = 3 mol   iii = 7 mol

ii < i = iii

b) i = $\frac{5}{7}$ He   ii = $\frac{3}{4}$ He   iii = $\frac{2}{7}$ He

iii < i < ii

c) $D = \frac{mass}{V}$ i = 5×4.0026 + 2(2×14.007) = 76g

ii = (2×14.007) + 3×4.0026 = 40 g

iii = 5(2×14.007) + 2×4.0026 = 148 g

ii < i < iii

d) same temp = same KE

i = ii = iii

(25) a) 4 x pressure

b) half the pressure

c) half the pressure

(26) a) $P_1V_1 = P_2V_2$ ↑P, ↓V

$(752/760)(4.38) = (1.88)V_2$

$V_2 = 2.31$ L   3 s.f.

b) $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\frac{4.38}{(21+273)} = \frac{V_2}{(175+273)}$

$V_2 = 6.7$ L   2 s.f. due to T   ↑T, ↑V

Chapter 10 continued...

(28)
$$\frac{1.2\,L\,N_2 \mid 2\,NH_3}{\mid 1\,N_2} = 2.4\,L\,NH_3 \quad 2\,s.f.$$

OR

$$\frac{3.6\,L\,H_2 \mid 2\,NH_3}{\mid 3\,H_2} = 2.4\,L\,NH_3 \quad 2\,s.f.$$

(34) a) $PV = nRT$

$(.985)V = (1.5)(.08206)(-6+273)$

$V = 33\ L \quad 1\ s.f. \quad 30\ L$

b) $(750)(.325) = (3.33\times10^{-3})(62.36)\,T$

$T = 1173\ K \quad 1200\ K \quad 2\ s.f.$

c) $P(.413) = (.0467)(.08206)(138+273)$

$P = 3.81\ atm \quad 3\ s.f.$

(46) SO_2 = 64.06 g/mol

HBr = 80.9079 g/mol

CO_2 = 44.011 g/mol

$CO_2 < SO_2 <$ HBr

Density = mass / volume

↑ mass, ↑ Density (directly proportional)

Chapter 10 continued...

(47) C

(48) B

↑ mass ↑ Density
↑ volume ↓ Density

(54) PV = nRT for H_2

$(814)(53.5) = n(0.08206)(21+273)$

$n = 1805$ moles H_2

$$\frac{1805 \text{ moles } H_2}{} \left| \frac{1 \text{ } CaH_2 \text{ moles}}{2 \text{ moles } H_2} \right| \frac{42.0958 \text{ g } CaH_2}{1 \text{ mole } CaH_2}$$

38,000 g CaH_2 (2 S.f.) due to T

(55) $$\frac{24.5 \text{ g } C_6H_{12}O_6}{} \left| \frac{1 \text{ mol } C_6H_{12}O_6}{180.1608 \text{ g } C_6H_{12}O_6} \right| \frac{6 \text{ mol } CO_2}{1 \text{ mol } C_6H_{12}O_6} =$$

$= 0.816$ moles CO_2

PV = nRT for CO_2

$(.970) V = (0.816)(.08206)(37+273)$

$V = 21$ L (2. S.f. due to T)

Chapter 10 continued...

(59) a) V ↑ from 2.0L to 5.0L

P_{N_2} = 0.40 atm = $P_1V_1 = P_2V_2$

(1)(2) = P_2(5)

b) V ↑ from 3.0L to 5.0L

P_{O_2} = $P_1V_1 = P_2V_2$

(2)(3) = P_2(5)

P_{O_2} = 1.2 atm

c) 0.4 + 1.2 = 1.6 atm

$P_{N_2} + P_{O_2} = P_T$

(60) a) $P_A = P_T \cdot$ mole fraction no change ↑P_T, ↓ mole fraction cancel out

b) ↑ n, ↑ P

c) ↑ total moles, ↓ mole fraction

(62) $\frac{51.2g \mid 1 \text{ mol } O_2}{\mid 32 g O_2}$ = 1.6 mol O_2

$\frac{32.6g \mid 1 \text{ mol He}}{\mid 4.0026 \text{ g He}}$ = 8.14 mol He

$P_{O_2}V = nRT$

P_{O_2}(10) = (1.6)(0.08206)(19+273) = 3.8 atm = P_{O_2} 2 s.f.

P_{He}(10) = (8.14)(.08206)(19+273) = 19.5 = 20. atm P_{He} 2 s.f.

P_T = 3.8 + 19.5 = 23.3 atm = 23 atm 2 s.f.

Chapter 10 Conti...

(65) $P_{N_2} = 1.56 \times \frac{.75}{1.2} = 0.98$ atm 2 s.f.
$P_{O_2} = 1.56 \times .3/1.2 = 0.39$ atm 2 s.f.
$P_{CO_2} = 1.56 \times .15/1.2 = 0.20$ atm 2 s.f.

(66) $\frac{10.25 \text{ g } N_2 \mid 1 \text{ mol } N_2}{\mid 28.014 \text{ g } N_2} = 0.366$ mole N_2

$\frac{1.83 \text{ g } H_2 \mid 1 \text{ mol } H_2}{\mid 2.0158 \text{ g } H_2} = 0.908$ mol H_2

$\frac{7.95 \text{ g } NH_3 \mid 1 \text{ mol } NH_3}{\mid 17.037 \text{ g } NH_3} = 0.467$ mol NH_3

$P_{N_2} = 1.85 \times \frac{.366}{1.741} = 0.389$ atm 3 s.f.

$P_{H_2} = 1.85 \times \frac{.908}{1.741} = 0.965$ atm 3 s.f.

$P_{NH_3} = 1.85 \times \frac{.467}{1.741} = 0.496$ atm 3 s.f.

(71) a) ↑ T OR ↓ V OR ↑ P
b) ↓ T
c) ↑ V OR ↓ P
d) ↑ T

(75) a) ↑
b) ↑
c) ↑
d) ↑

Chapter 10 conti...

(76) a) ~~PV~~ = n R ~~T~~ since PVT are same
n must be same

both systems have same # molecules

b) $D = \frac{m}{V}$ $N_2 = 28.014$ g/mol
$CH_4 = 16.0426$ g/mol

$N_2 > CH_4$ Density

c) same T, same average KE
(although CH_4 would travel faster since different masses)

(83) a) ↓ T , ↑ P

b) ↓ T molecules will want to condense into liquid
↑ P , molecules packed together will be attracted to condense