Q60

Nitro density = 1.59 g/mL

Temp = 0°C = 273K

Vol = 1mL = 0.001L

$4\ C_3H_5O_9N_3 \longrightarrow 12\ CO_2 + O_2 + 6\ N_2 + 10\ H_2O$

density = 1.59 g/mL
vol = 1 ml
∴ m = 1.59 g

$n = \frac{m}{MM} = \frac{1.59}{227} = 0.007$

$n_{C_3H_5O_9N_3} = 0.007 \text{ moles}$

0.007 moles

4 : 12	4 : 1	4 : 6	4 : 10
1 : 3	1 : 0.25	1 : 1.5	1 : 2.5
n_{CO_2}	n_{O_2}	n_{N_2}	n_{H_2O}
$= 0.007 \times 3$	$= 0.007 \times \frac{1}{4}$	$= 0.007 \times 1.5$	$= 0.007 \times 2.5$
$= 0.021$ moles	$= 0.00175$ moles	$= 0.0105$ moles	$= 0.0175$ moles

$n_{TOTAL} = n_{CO_2} + n_{O_2} + n_{N_2} + n_{H_2O}$

$= 0.021 + 0.0075 + 0.0105 + 0.0175$

$= 0.051 \text{ moles}$

$PV = nRT$

$P = \frac{nRT}{V}$

$= \frac{0.051 \times 8.31 \times 273}{0.001}$

$= 115{,}700 \text{ kPa}$

Q61

$V = 40\,L$

$T = 120°C = 393\,K$ } const

a) Partial Pressure of NO?

b) Total Press?

$PV = nRT$

and

$P_T = P_A + P_B + \ldots$

$4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NO_{(g)} + 6H_2O_{(g)}$

$m = 34\,g$

$n = \frac{m}{MM} = \frac{34}{17}$

$n_{NH_3} = 2$ moles

$m = 96\,g$

$n = \frac{m}{MM} = \frac{96}{32}$

$n_{O_2} = 3$ moles

$m = ?$

$m_{NO_2} = 60\,g$

use to calculate its pressure

$m = n \times MM$

$= 2 \times 30\,g$

$= 60\,g$

R:N Ratio

4 : 5

excess O_2

limiting reagent = NH_3

4 : 4

1 : 1

2 : 2

$n_{NH_3} = 2$ moles

$n_{NO} = 2$ moles

P_{NO_2}: $PV = nRT$

$= \frac{nRT}{V}$

$= \frac{2 \times 8.31 \times 393\,K}{40\,L}$

$= 163.3\ kPa$

(b) $P_{TOTAL} = P_{NO} + P_{H_2O} + P_{O_2} + P_{NH_3}$

$=$ 2 moles produced + 3 moles produced + 0.5 moles left over + 0 moles left over

(gases present are NO, H_2O which are produced and O_2 which remain left over)

Total n. moles = 5.5 moles

$P_{TOTAL} = 449\ kPa$