Vaja

Pri stalni prostornini in temperaturi 298 K želimo povečati tlak plina iz 114 na 18
kPa. Za koliko kelvinov moramo segreti plin?

V = konst.
$T_1 = 298\,K$
$p_1 = 114\,kPa$
$p_2 = 189\,kPa$

$T_2 = 494\,K$
$\Delta T = 196\,K$

V = konst. ⇓

$$\frac{p_1}{T_1} = \frac{p_2}{T_2} \Rightarrow T_2 = \frac{p_2 \cdot T_1}{p_1}$$

$$T_2 = \frac{189\,kPa \cdot 298\,K}{114\,kPa}$$

$$T_2 = 494\,K$$

$$\Delta T = |T_2 - T_1|$$
$$\Delta T = |494\,K - 298\,K|$$
$$\Delta T = 196\,K$$

O: Plin moramo segreti za 196 kelvinov.

Vaja

Izračunajte molsko maso plina, katerega 43,2 mg zavzema pri 100 kPa in 15 °C prostornino 23,5 mL.

$m = 43{,}2\,mg = 0{,}0432\,g$

$p = 100\,kPa$

$T = 288\,K$

$V = 23{,}5\,mL = 0{,}0235\,L$

$M = 44{,}0\,g/mol$

$p \cdot V = nRT$

$p \cdot V = \frac{m}{M} RT$

$p \cdot V \cdot M = m \cdot R \cdot T$

$M = \frac{mRT}{pV}$

$M = \frac{0{,}0432\,g \cdot 8{,}314\,\frac{kPaL}{molK} \cdot 288\,K}{100\,kPa \cdot 0{,}0235\,L}$

$M = 44{,}0\,g/mol$

R → plošna plinska konstanta

↳ $8{,}314\,\frac{kPaL}{molK}$

Vaja

Pri konstantni temperaturi zmanjšamo tlak plina za 70 kPa. Pri tem naraste prostornina iz 100 L na 200 L. Kolikšen je prvoten tlak?

T = konst.

$V_1 = 100\,L$

$V_2 = 200\,L$

$p_2 = p_1 - 70\,kPa$

$p_1 = 140\,kPa$

$p_1 = x \Rightarrow p_2 = x - 70\,kPa$

$p_1 V_1 = p_2 V_2$

$x \cdot 100 = (x - 70) \cdot 200$

$100x = 200x - 14000$

$-100x = -14000 \;/:(-100)$

$x = 140$

$p_1 = x = 140\,kPa$

$p_2 = 140\,kPa - 70\,kPa$

$p_2 = 70\,kPa$

Vaja

Pri 20°C ima nek plin normalen tlak. Kolikšen je tlak tega plina, če pri nespremenjeni prostornini dvignemo temperaturo na 190°C?

$T_1 = 293\,K$

$T_2 = 463\,K$

$p_1 = 100\,kPa$

$V = konst$

$p_2 =$

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$p_2 = \frac{p_1 T_2}{T_1}$$

$$p_2 = \frac{100\,kPa \cdot 463\,K}{293\,K}$$

$$p_2 = 158\,kPa$$

Vaja

Kolikšno prostornino dobimo, če 110 dm3 plina pri normalnih pogojih segrejemo na 700°C in zmanjšamo tlak na 10 kPa?

$V_1 = 110\,L$

$p_1 = 100\,kPa$

$p_2 = 10\,kPa$

$T_2 = 973\,K$

$V_2 = 3653\,L$

$T_1 = 293\,K$

n = konst

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

$$V_2 = \frac{p_1 \cdot V_1 \cdot T_2}{T_1 \cdot p_2}$$

$$V_2 = \frac{100\,kPa \cdot 110\,L \cdot 973\,K}{293\,K \cdot 10\,kPa}$$

$$V_2 = 3653\,L$$

Vaja

Univerza v Ljubljani
Pedagoška fakulteta

Relativna gostota nekega plina glede na dušik je 1,57. Izračunajte gostoto neznanega plina pri tlaku 91,2 kPa in temperaturi 137 °C.

$D(N_2) = \frac{M(x)}{M(N_2)}$

$p = 91{,}2\ kPa$

$T = 410\ K$

$D(N_2) = \frac{M(x)}{M(N_2)} \Rightarrow M(x) = D(N_2) \cdot M(N_2)$

$M(x) = 1{,}57 \cdot 28\ g/mol$

$M(x) = 43{,}96\ g/mol$

Zmeraj se moramo vprašaj kaj imamo podane.

$\varrho = \frac{m}{V}$

$n = \frac{m}{M}$

$m = n \cdot M$

$\varrho = \frac{n \cdot M}{V} \Rightarrow n = \frac{\varrho \cdot V}{M}$

$p \cdot V = nRT$

$p \cdot V = \frac{\varrho \cdot V \cdot R \cdot T}{M} \Rightarrow \varrho = \frac{p \cdot V \cdot M}{V \cdot R \cdot T}$

$\varrho = \frac{91{,}2\ kPa \cdot 43{,}96\ g/mol}{8{,}314\ \frac{kPa\,L}{mol\,K} \cdot 410\ K}$

$\varrho = 1{,}2\ g/L$

Vaja

Univerza v Ljubl
Pedagoška fakul

Koliko molekul je v 1,0 L kateregakoli plina pri normalnih pogojih?

$V = 1\,L$

$p = 100\,kPa$

$T = 293\,K$

$N = ?$

$pV = nRT \qquad n = \frac{N}{N_A}$

$pV = \frac{N \cdot R \cdot T}{N_A}$

$N = \frac{pVN_A}{RT}$

$N = \frac{100\,kPa \cdot 1\,L \cdot 6{,}023 \cdot 10^{23}\,\frac{molekul}{mol}}{8{,}314\,\frac{kPaL}{molK} \cdot 293\,K}$

$N = \frac{602{,}3 \cdot 10^{23}\,molekul}{2436} = 0{,}247 \cdot 10^{23}\,molekul = 24{,}7 \cdot 10^{21}\,molekul$

Vaja

Koliko litrov ogljikovega dioksida nastane pri 18 °C in 95,0 kPa iz 200 gramov kalcijevega karbonata in žveplove(VI) kisline? Zapišite urejeno enačbo kemijske reakcije.

$$CaCO_{3(s)} + H_2SO_{4(aq)} \longrightarrow CaSO_{4(aq)} + CO_{2(g)} + H_2O_{(e)}$$

$T = 291\,K$

$p = 95\,kPa$

$m(CaCO_3) = 200\,g$

$V(CO_2) =$

$$\frac{n(CaCO_3)}{n(CO_2)} = \frac{1}{1} \Rightarrow n(CaCO_3) = n(CO_2)$$

$M(CaCO_3) = 100{,}1\ g/mol$

$$\frac{m(CaCO_3)}{M(CaCO_3)} = n(CO_2)$$

$$n(CO_2) = \frac{200\,g}{100{,}1\,g/mol} = 2\,mol$$

$pV = nRT$

$pV = mRT$

$n = \frac{pV}{RT}$

$$V = \frac{nRT}{p} = \frac{2\,mol \cdot 8{,}314\,\frac{kPaL}{molK} \cdot 291\,K}{95\,kPa} = 50{,}9\,L$$