Butane c4h10 is an easily liquefied gaseous fuel. Calculate the density of butane at 0.857atm and 22 degrees Celsius.

$T = 273 + 22^oC = 295$ K.

$R = 0.082 \frac{atm*litre}{K*mole}$

$P = 0.857$ atm.

According to Mendeleev-Clapeyron equation:

$PV = RT$

Thence

$V = \frac{RT}{P}.$

$V = (0.082 \frac{atm*litre}{K*mole}* 295$ K$) / 0.857$ atm $= 28.23$ l/mole $= 28\ 230$ cm^3/mole.

M (C$_4$H$_{10}$) = 12*4 + 10 = 58 g/mole.

$\rho = \frac{m}{V},$ g/cm^3.

ρ (C$_4$H$_{10}$) = (58 g/mole) / 28 230 cm^3/mole = 0.002 g/cm^3 = 2 g/ litre.

ANSWER: 0.002 g/cm^3 or 2 g/ litre.

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