

Question 6.

Given 50ml of liquid nitrogen, what is its volume at room temperature and pressure?

1 atm
300K
1.44 mol
Volume ?

nitrogen

$m = \rho V = (0.808 \text{ g/ml}) \cdot (50 \text{ ml}) = 40.4 \text{ grams}$	$\rho = 0.808 \text{ g/ml}$
$n_{\text{nitrogen}} = 40.4/28 \text{ mol} = 1.44 \text{ mol}$	$1 \text{ mol N}_2 = 28 \text{ g}$

Calculate the volume at 1 atm, 300K

$$V = nRT/P = (1.44 \text{ mol})(0.08206 \text{ atm} \cdot \text{L}/(\text{mol} \cdot \text{K}))(300 \text{ K})/(1 \text{ atm}) = 35 \text{ L}$$

$$\text{Volume of air + nitrogen} = 2 \text{ L} + 35 \text{ L} = 37 \text{ L}$$