12.4 grams of NaCl and 18.7 grams of KBr were dissolved in 41 mL of water. What is the mole fraction of NaCl in the solution?

Solution

1.Find chemical amount of NaCl:

$n = m/M$;

M(NaCl) = 23+35.5=58.5 (g/mol);

n(NaCl) = 12.4/58.5 = 0.212 (mole).

2. Find chemical amount of KBr:

$n = m/M$;

M(KBr) = 39+80 = 119 (g/mol);

n(KBr) = 18.7/119 =0.157 (mole).

3. Find chemical amount of water:

$m = \rho \cdot V$;

$\rho = 1 g/cm^3$;

$V = 41$ mL = 41 cm^3;

m = 1·41 = 41 (g).

$n = m/M$;

M(H_2O) = 1·2+16 = 18 (g/mole);

n (H_2O)= 41/18 = 2.278 (mole).

4. Find mole fraction of NaCl in the solution:

$\chi(NaCl) = n (NaCl)/n_{tot}$;

$n_{tot} = n (NaCl) + n(KBr) + n (H_2O)$;

$\chi(NaCl)$ = 0.212/(0.212+0.157+2.278) = 0.08 or 8%.

Answer: 8%.

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