(1)

MASSA = 2.56 gr

V = 500 mL H_2O

DENSITA' = d = 1 gr/cm^3

$cm^3 = mL$

$$\text{molalità} = \frac{\text{moli SOLUTO}}{\text{MASSA SOLVENTE}}$$

$PM_{ACIDO} = 118.10$ gr/mol

$$M_{ACIDO} = \frac{\text{MASSA}}{PM_{ACIDO}} = \frac{2.56}{118.10} =$$

$= 2.17\ 10^{-2}$ moli

MASSA SOLVENTE = $V \cdot d = 500 \cdot 1$

$= 500$ gr $= 0.5$ kg

$$\text{molalità} = \frac{2.17\ 10^{-2}}{0.5} = \underline{\underline{4.34\ 10^{-2}\ m}}$$

FRAZIONE MOLARE

$$n_{H_2O} = \frac{500}{18} = 27.7 \text{ moli}$$

$18 \rightarrow PM_{H_2O}$

$$\chi_{ACIDO} = \frac{n_{ACIDO}}{n_{ACIDO} + n_{H_2O}} = \frac{2.17\ 10^{-2}}{2.17\ 10^{-2} + 27.7}$$

$$= 7.83\ 10^{-4}$$

PERCENTUALE IN PESO

$$\%\ \text{PESO ACIDO} = \frac{M_{ACIDO}}{M_{ACIDO} + M_{H_2O}} \cdot 100$$

$$= \frac{2.56}{2.56 + 500} \cdot 100$$

$$= 0.51\ \%$$

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(2)

$$[CO_2] = 0.0506\ m$$

$$K_H = 4.48\ 10^{-5}\ M/\text{mmHg}$$

$$P_{CO_2} = K_H / \Lambda$$

APPROSSIMO $m \rightarrow M$

1000 gr DI SOLUTO $H_2O \approx 1\ L$

QUINDI $0.0506\ m \approx 0.0506\ M$

$$P_{CO_2} = K_H / 0.0506 = 1129.44\ mmHg$$

$$= 1.49\ atm$$

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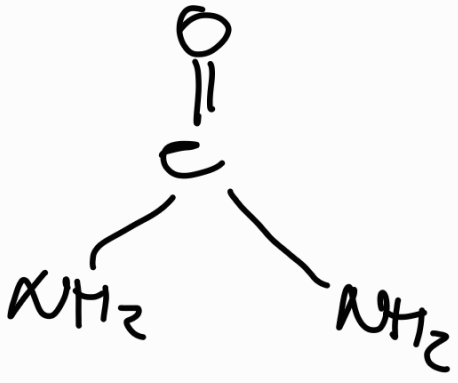
(3)

UREA



$PM_{UREA} = 60.06\ gr/mol$

$0.5\ Kg\ H_2O$

$$n_{UREA} = \frac{MASS}{PM_{UREA}} = 15 / 60.06 = 0.25\ moli$$

molalità UREA $= n_{UREA} / MASSA_{H_2O}$

$= 0.25 / 0.5 = 0.5\ m$

$\Delta T_{EB} = K_b \cdot m_{UREA} = 0.512 \cdot 1 \cdot 0.5$

$= \underline{0.26\ °C}$

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(4)

$\Delta T = K_f \cdot m$

$K_f = 1.86\ °C/m$

$m = \Delta T / K_f = \frac{16.0}{1.86} = 8.6\ m$

b) $\%\ PESO = \frac{MASSA\ ETANOLO}{MASSA\ ETANOLO + MASSA\ H_2O}$

CONSIDERANDO 1 kg DI H_2O AVRO'

8.6 moli ETANOLO DATA LA CONCENTRAZ.

MASSA ETANOLO $= n_{ETANOLO} \cdot PM_{ETANOLO}$

$= 8.6 \cdot 46.07$

$= 396.2$ gr

$\%$ PESO ETANOLO $= \dfrac{396.2}{396.2 + 1000} \cdot 100$

$\downarrow$

H_2O

$= \underline{\underline{28.4\ \%}}$

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(5)

0.255 g di X (X = $C_{10}H_8Fe$ FORM. MINIMA)

MASSA BENZENE $= 11.0$ gr

$\Delta T_{EB} = 80.26 - 80.10 = 0.16\ ^\circ C$

$\Delta T_{EB} = K \cdot m$ $\qquad K = 2.53\ ^\circ C/m$

DA CUI POSSO DETERMINARE MOLALITA' X

$m_X = \Delta T_{EB} / K = 6.32\ 10^{-2}\ m$

$m_x = m_X / \text{MASSA BENZENE}$

$m_X = \text{MASSA BENZENE} \cdot m_{.X}$

$\simeq 11.12\ 10^{-3} \cdot 6.32\ 10^{-2} = 7.03\ 10^{-4}$ moli

QUINDI $7.03\ 10^{-4}$ moli di X PESANO 0.255 gr

$$m_X = \frac{\text{MASSA } X}{PM_X}$$

$$PM_X = \frac{\text{MASSA } X}{m_X} = \frac{0.255}{7.03\ 10^{-4}} = 362.73 \text{ gr/mol}$$

$PM_{\text{FORMULA MINIMA}} = 10 \cdot 12.01 + 8 \cdot 1.01 + 55.85$

$= 184.03$ gr/mol.

$PM_X / PM_{\text{FORMULA MINIMA}} = \frac{362.73}{184.03} \simeq 2$

DEVO MOLTIPLICARE LA FORMULA MINIMA PER 2 $\Rightarrow C_{20} H_{16} Fe_2$

(6)

MASSA (LiF) = 52.5 gr

MASSA (H_2O) = 306 gr

$PM_{LiF} = 25.94$ gr/mol

$$m_{LiF} = \frac{52.5}{25.94} = 2.02 \text{ mol}$$

$$m_{LiF} = \frac{m_{LiF}}{\text{MASSA}(H_2O)} = \frac{2.02}{306\,10^{-3}} = 6.61 \text{ m}$$

$$\Delta T = i \cdot K \cdot m_{LiF}$$

LiF ELETTROLITA QUINDI $i = 2$

$LiF \rightarrow Li^+ + F^-$

$$\Delta T = 2 \cdot 1.86 \cdot 6.61 = \underline{24.59\ ^\circ C}$$

(7)

$\pi = 3.1$ mm Hg $\quad T = 25^\circ C = 298\ ^\circ K$

[INS.] = 1 gr/L

$\tilde{\Pi} = M \cdot R \cdot T$ NON ELETTROLITA E

QUINDI $i = 1$

$$M = \tilde{\Pi} / R \cdot T$$

$$\tilde{\Pi} = 3.1 / 760 = 4.08 \ 10^{-3} \text{ atm}$$

QUINDI:

$$M = \frac{4.08 \ 10^{-3}}{R \cdot 298} = 1.67 \ 10^{-4} \text{ mol/L}$$

QUINDI IN 1 L DI SOLUZIONE CONTIENE $1.67 \ 10^{-4}$ moli E 1.00 gr DI INSULINA:

$$PM_{INS.} = 1.00 / 1.67 \ 10^{-4} = 5.99 \ 10^{3} \text{ gr/mol}$$

$\simeq 6000$ gr/mol.

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(8) $P_{SOLUZIONE} = P_{SOLVENTE} \cdot X_{SOLUENTE}$

a) 0.35 MOLI IN 1 Kg H_2O

$$M_{H_2O} = \frac{1000}{18} = 55.5 \text{ moli}$$

$$X_{H_2O} = \frac{55.5}{55.5 + 0.35} = \underline{0.994}$$

b) NON ELETTROLITA QUINDI $i = 1$

$$X_{H_2O} = \frac{55.5}{55.5 + 0.5} = \underline{0.991}$$

c) KBr ELETTROLITA QUINDI $i = 2$

$KBr \rightarrow K^+ + Br^-$

QUINDI MOLI SOLUTO $0.20 \cdot 2 = 0.40$

$$X_{H_2O} = \frac{55.5}{0.40 + 55.5} = \underline{0.993}$$

d) Na_2SO_4 ELETTROLITA

$Na_2SO_4 \rightarrow 2Na^+ + SO_4^{2-}$

QUINDI AVRO' $3 \cdot 0.20 = 0.60$ moli

DI SOLUTO

$$X_{H_2O} = \frac{55.5}{55.5 + 0.60} = \underline{0.989}$$

i) Na_2SO_4 < ZUCCHERO < KBr < GLICOLE ET.

$d < b < c < a$

ii)

$\Delta T = (i \cdot m) \cdot K$

a) $i \cdot m = 0.35 \ m$

b) $i \cdot m = 0.50 \ m$

c) $i \cdot m = 0.40 \ m$

d) $i \cdot m = 0.60 \ m$

IN PRATICA COME OVVIO ORDINAMENTO CONTRARIO:

$a < c < b < d$

P. VAPORE PIÙ BASSA COMPORTA UN PIÙ ALTO PUNTO DI EBOLLIZIONE.