

①

$$\left\{ \begin{array}{l} a_1 \\ a_2 = a_1 + r \\ a_3 = a_1 + 2r \\ a_4 = a_1 + 3r \end{array} \right.$$

$$a_1 + a_2 + a_3 + a_4 = 38$$

$$(a_1 + (a_1 + r)) + (a_1 + 2r) + (a_1 + 3r) = 38$$

$$2a_1 + 3r = 19 \quad \text{--- } ①$$

$$a_4 - a_1 = 9$$

$$(a_1 + 3r) - a_1 = 9 \Rightarrow r = 3$$

$$\underline{a_1 = 5}$$

Por el tanto

$$a_1 = 5$$

$$a_2 = 8$$

$$a_3 = 11$$

$$a_4 = 14$$

$$\text{Luego } \underline{\underline{a_2 + a_3 = 19}}$$

(2)

$$f(x) = Ax + B$$

$$(3, g) \in \text{grafico de } f \Rightarrow f(3) = A \cdot 3 + B \\ g = 3A + B \quad \dots \quad (1)$$

$$(n-1, n-1) \quad " \quad \rightarrow \quad n-1 = (n-1)A + B \quad \dots \quad (2)$$

$$(n, n-3) \quad " \quad \rightarrow \quad n-3 = nA + B \quad \dots \quad (3)$$

luego

$$\left\{ \begin{array}{l} 3A + B = g \\ nA - A + B - n = -1 \\ nA + B - n = -3 \end{array} \right. \quad (-1)$$

$$\begin{array}{r} 3A - A + B - n = -1 \\ -nA - B + A = 3 \\ \hline -A = 2 \Rightarrow A = -2 \\ B = 15 \end{array}$$

luego

$$f(x) = -2x + 15$$

$$A + B = (-2) + 15$$

$$A + B = 13$$

③

$a = \text{edad de Javier}$   
 $b = \text{edad de Cesar}$   
 $c = \text{u u Miguel}$

$$\left\{ \begin{array}{l} a = 2k \\ b = 3k \\ c = 4k \end{array} \right. \quad \text{--- (1)} \quad \wedge \quad \left\{ \begin{array}{l} a + g = 7m \\ b + g = 9m \\ c + g = 11m \end{array} \right. \quad \text{--- (2)}$$

$$\text{(1) e (2)} \quad \left\{ \begin{array}{l} 2k + g = 7m \\ 3k + g = 9m \\ 4k + g = 11m \end{array} \Rightarrow \right. \quad \left\{ \begin{array}{l} 2k - 7m = -g \quad \text{--- (1)} \\ k - 3m = -3 \quad \text{--- (**)} \\ 4k - 11m = -g \quad \text{--- (xxx)} \end{array} \right.$$

resolviendo (\*\*); (\*\*\*)

$$\left\{ \begin{array}{l} 2k - 7m = -g \\ k - 3m = -3 \end{array} \right. \quad \text{--- (2)}$$
$$\begin{array}{r} 2k - 7m = -g \\ k - 3m = -3 \\ \hline -2k + 6m = +6 \\ -m = -3 \end{array} \Rightarrow \boxed{m = 3}; \boxed{k = 6}$$

Verificando en (\*\*\*) Se tiene

$$\begin{aligned} 4k - 11m &= -g \\ 4(6) - 11(3) &= -g \\ -g &= -g \end{aligned}$$

∴  $m = 3, k = 6$  es solución

luego  $\begin{cases} a = 12 \\ b = 18 \\ c = 24 \end{cases} \Rightarrow \text{edad de Miguel} = 24$

4

Nota

Media aritmética

$$MA = \frac{a+b}{2}$$

u Geométrica

$$MG = \sqrt{ab}$$

Por lo tanto

$$MA = \frac{\overline{ab} + \overline{ba}}{2}$$

$$66 = \frac{(10a+b) + (10b+a)}{2} = \frac{11(a+b)}{2}$$

$$\underline{a+b=12}$$

luego  $\begin{cases} a^2 + b^2 = 72 \\ a+b = 12 \end{cases}$

$$\text{en } (a+b)^2 = 12^2$$

$$\underline{a^2 + b^2 + 2ab = 144}$$

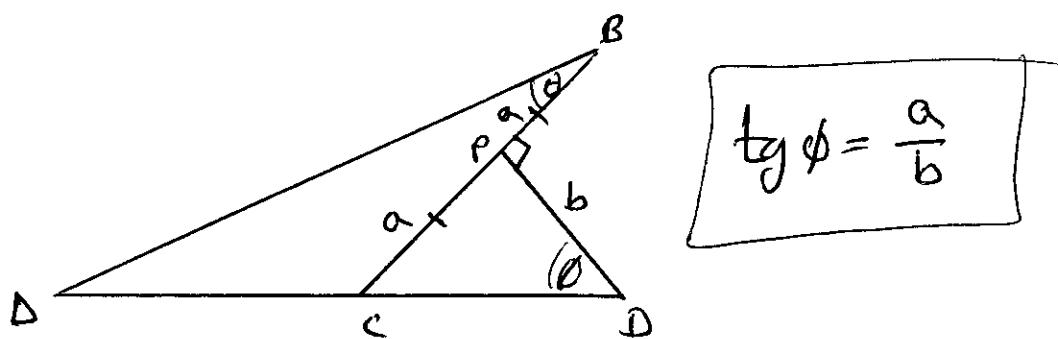
$$72 + 2ab = 144 \Rightarrow ab = 36$$

luego  $MG = \sqrt{ab}$

$$MG = \sqrt{36}$$

$MG = 6$

5



$$\operatorname{tg} \phi = \frac{a}{b}$$

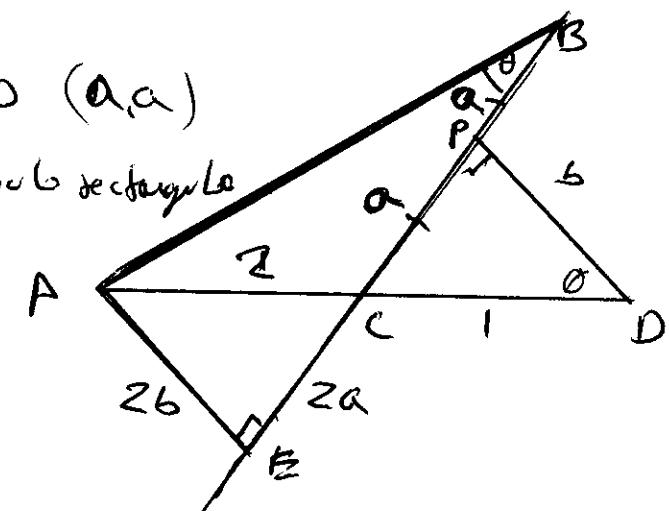
1. Prolongando  $BC$  y trazando  $AE \parallel PD$ , se tiene

2.  $\triangle ACP \sim \triangle CPD$  (aa)

3.  $\triangle ABE$  es triángulo rectángulo

4.

$$\operatorname{tg} \theta = \frac{2b}{4a}$$

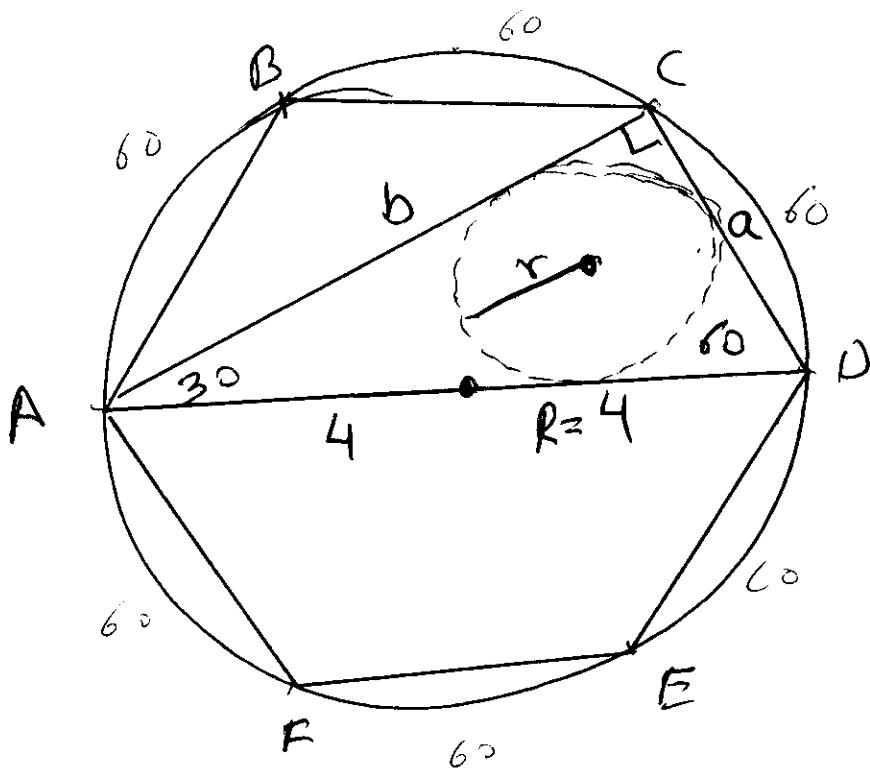


$$\text{ luego } R = \operatorname{tg} \theta \cdot \operatorname{tg} \phi$$

$$R = \frac{2b}{4a} \cdot \frac{a}{b}$$

$$\underline{R = \frac{1}{2}}$$

(6)



$$\operatorname{Sen} 30 = \frac{a}{8} \Rightarrow \frac{1}{2} = \frac{a}{8} \Rightarrow a = 4$$

$$\cos 30 = \frac{b}{8} \Rightarrow \frac{\sqrt{3}}{2} = \frac{b}{8} \Rightarrow b = 4\sqrt{3}$$

Por el teorema de Poncelet.

$$2r + 2R = \overline{AC} + \overline{CD}$$

$$2r + 2 \cdot 4 = 4\sqrt{3} + 4$$

$$2r = 4\sqrt{3} - 4$$

$$\underline{r = 2(\sqrt{3} - 1)}$$

7

$$3 \cot x + 4 \operatorname{sen} x = 2 \cos x \cdot \operatorname{tg} x$$

$$3 \cdot \frac{\cos x}{\sin x} + 4 \sin x = 2 \cos x \cdot \frac{\sin x}{\cos x}$$

$$3 \cos x + 4 \sin^2 x = 2 \sin^2 x$$

$$2 \sin^2 x + 3 \cos x = 0$$

$$2(1 - \cos^2 x) + 3 \cos x = 0$$

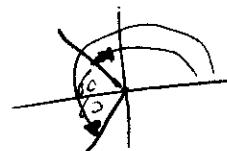
$$2 \cos^2 x - 3 \cos x - 2 = 0$$

$$\frac{2 \cos x}{\cos x} \longrightarrow -2$$

$$(2 \cos x + 1)(\cos x - 2) = 0$$

$$2 \cos x + 1 = 0$$

$$\cos x = -\frac{1}{2}$$

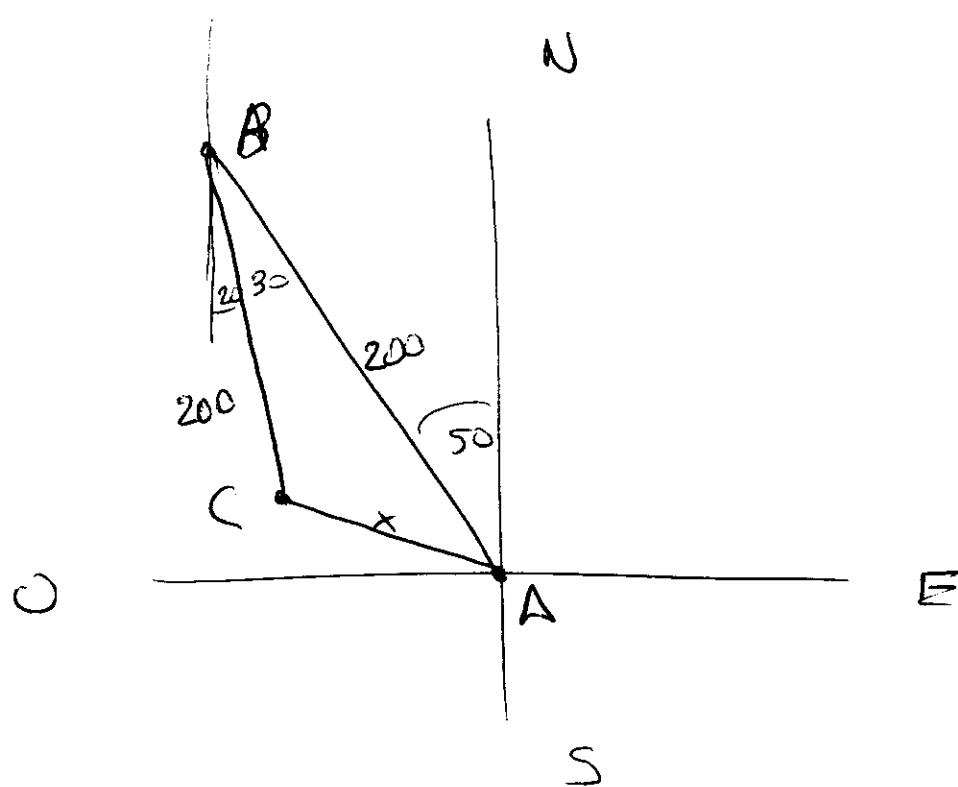


$$\begin{aligned} \cos x - 2 &= 0 \\ \cos x &= 2 \\ \text{Not tiene sol.} \end{aligned}$$

$$x_1 = 120^\circ, x_2 = 240^\circ$$

$$\begin{aligned} \text{Luego } x_1 + x_2 &= 120 + 240 = 360^\circ \\ &= 2\pi \quad \cancel{Y} \end{aligned}$$

(8)



$$x^2 = 200^2 + 200^2 - 2 \cdot 200 \cdot 200 \cos 30$$

$$x^2 = 200^2 + 200^2 - 2 \cdot 200^2 \cdot \frac{\sqrt{3}}{2}$$

$$x^2 = 200^2 (1 + 1 - \sqrt{3})$$

$$x = \sqrt{200^2 (2 - \sqrt{3})}$$

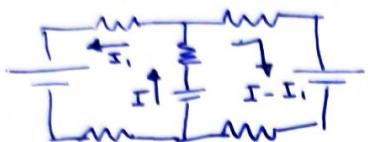
$$x = 200 \sqrt{2 - \sqrt{3}}$$

↙

Examen de Ingreso

FÍSICA

F9.



$$\begin{cases} 4 - 4I - 2I_1 - 2 = 0 \\ 4 - 4I - 2(I - I_1) - 2 = 0 \end{cases}$$

$$\begin{cases} 4I + 2I_1 = 2 \\ 6I - 2I_1 = 2 \end{cases}$$

$$10I = 4$$

$$\boxed{I = \frac{2}{5}}$$

$$4\left(\frac{2}{5}\right) - 2 = -2I_1$$

$$\frac{8 - 10}{5} = -2I_1$$

$$-\frac{2}{5} = -2I_1$$

$$\boxed{I_1 = \frac{1}{5}}$$

$$P = I^2 R$$

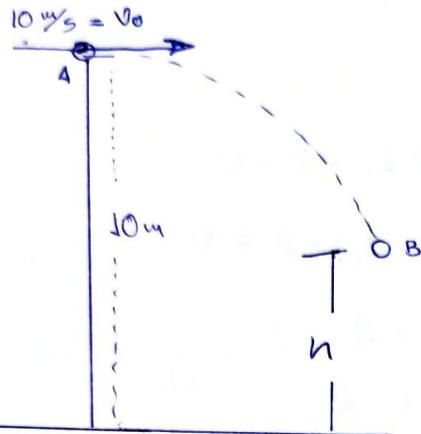
$$P = \left(\frac{2}{5}\right)^2 \cdot 4 = \frac{4}{25} \cdot 4 = \frac{16}{25}$$

$$\therefore W = Pt$$

$$W = \frac{16}{25} \cdot 500$$

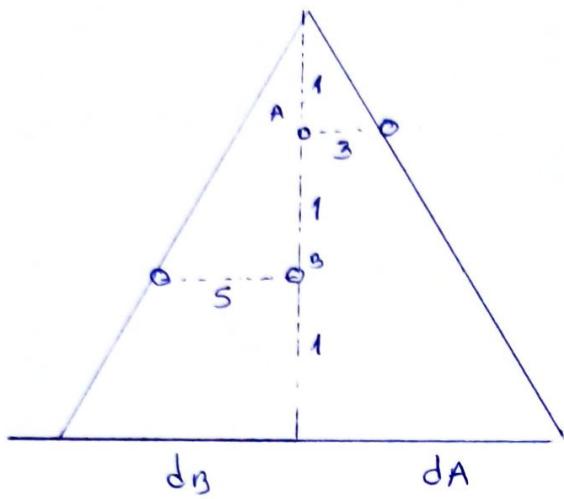
$$\boxed{W = 64 J}$$

F-10



$$\begin{aligned} \text{At } A: \quad & E_A = \frac{1}{2} m (10^2) + m (10)(10) \\ & = m (50 + 100) = 150 m \\ \text{At } B: \quad & E_{c_B} = 4 E_{p_B} = 4 mgh \\ E_{M_B} &= E_{c_B} + E_{p_B} \\ E_{M_B} &= 4 mgh + mgh = 5 mgh \\ E_A &= E_B \\ 150 m &= 5 mgh \\ 150 &= 50 h \\ h &= 3 \text{ [m]} \end{aligned}$$

F-11



(A)

$$d = v_A t$$

$$d = 0,3(10) \Rightarrow d_A = 3$$

(B)

$$d = v_B t$$

$$d = 0,5(10) \Rightarrow d_B = 5$$

Por relación

$$\frac{1}{3} = \frac{3}{d_A} \Rightarrow \boxed{d_A = 9 \text{ m}}$$

$$\frac{2}{5} = \frac{3}{d_B} \Rightarrow d_B = \frac{15}{2}$$

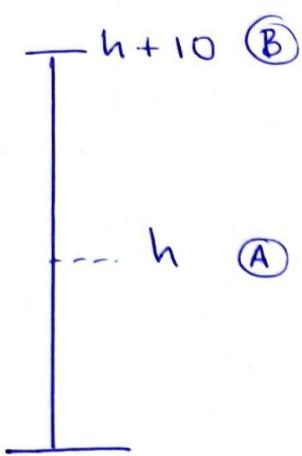
$$d_B = 7,5 \text{ m}$$

$$D = d_A + d_B$$

$$D = 9 + 7,5$$

$$\boxed{D = 16,5 \text{ m}}$$

F-12



$$\textcircled{A} \quad 0 = h - 5t^2 \rightarrow h = 5t^2$$

$$\textcircled{B} \quad 0 = h + 10 - 5(t+1)^2$$

$$0 = 5t^2 + 10 - 5t^2 - 10t - 5$$

$$10t = 5$$

$$\boxed{t = 0,5 \text{ [s]}}$$

$t$  en  $\textcircled{A}$

$$h = 5(0,5)^2$$

$$\boxed{h = 1,25 \text{ [m]}}$$

$$H = h + 10$$

$$H = h + 10$$

$$\boxed{H = 11,25 \text{ [m]}}$$

**QUIMICA**

Q13. Se prepara una solución disolviendo 171 g de sacarosa ( $C_{12}H_{22}O_{11}$ ) en un litro de agua. Considerando que para el agua  $K_c = 1,86 \text{ } ^\circ\text{C}\cdot\text{kg/mol}$  y la densidad igual a 1 g/mL, ¿a qué temperatura en grados centígrados congelará la solución?

- A) -1,86      B) -0,5      C) -1      D) Ninguna      E) -0,93

$$n_{C_{12}H_{22}O_{11}} = \frac{m}{M} = \frac{171 \text{ g}}{342 \text{ g/mol}} = \frac{1}{2} \text{ mol} \quad m_{H_2O} = 1 \text{ l} \cdot \frac{1 \text{ kg}}{1 \text{ l}} = 1 \text{ kg}$$

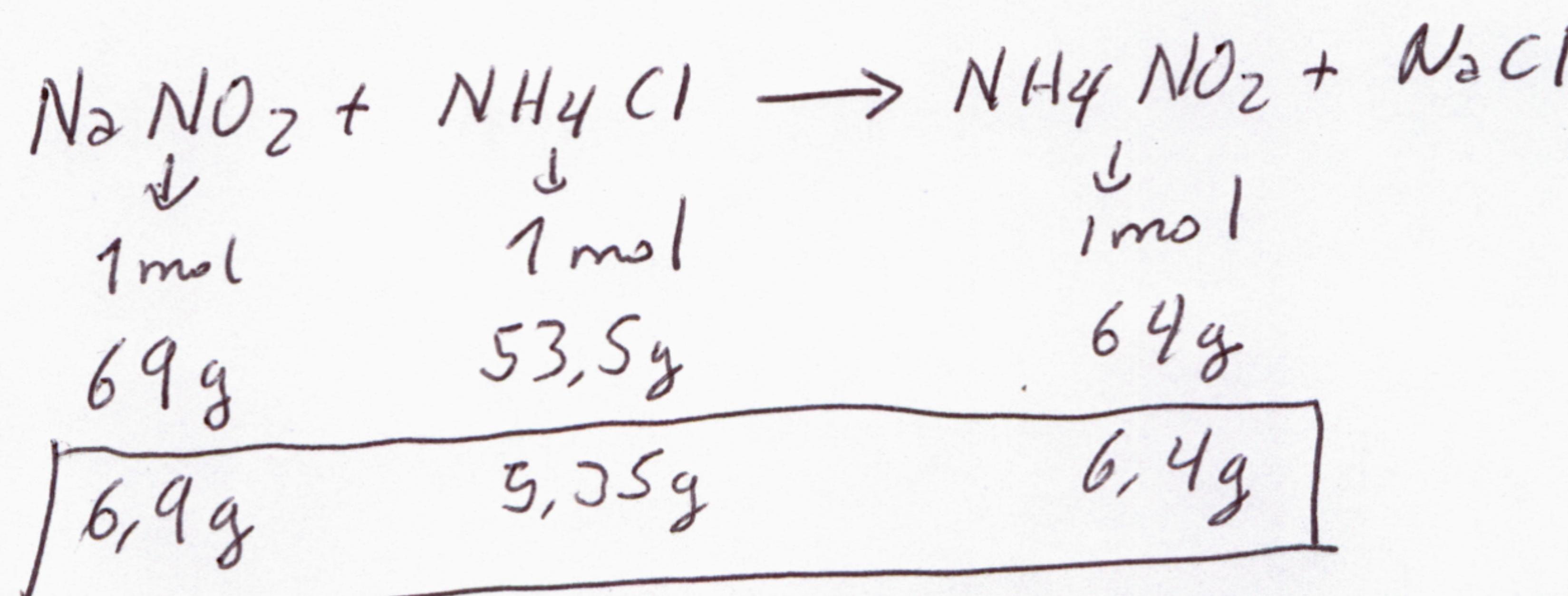
$$M_o = \frac{n_s}{m_{H_2O}} = \frac{\frac{1}{2} \text{ mol}}{1 \text{ kg}} = \frac{1}{2} \text{ mol/kg}$$

$$\Delta T_c = K_c \cdot M_o = 1,86 \frac{\text{Kg} \cdot \text{C}}{\text{mol}} \cdot \frac{1}{2} \frac{\text{mol}}{\text{kg}} = 0,93 \text{ } ^\circ\text{C}$$

$$\boxed{T_{c,sol} = T_c d - \Delta T_c = 0 - 0,93 = -0,93 \text{ } ^\circ\text{C}}$$

Q14. La combinación de nitrito de sodio y cloruro de amonio produce nitrito de amonio y cloruro de sodio. Determinar la masa en gramos de nitrito de amonio si se combinan 6,9 gramos de nitrito de sodio con 5,35 gramos de cloruro de amonio.

- A) 13,85      B) 128      C) Ninguna      D) 64      E) 6,4



Q15. Cierto elemento hipotético A tiene dos isotopos naturales:  $A_{20}^{40}$  y  $A_{20}^{42}$ . La abundancia relativa de ambos es 80% y 20% respectivamente. El peso atómico promedio del elemento A es:

- A) 82,0      B) 41,0      C) 40,5      D) 42,8      E) Ninguna

$$\bar{A} = A_1 X_1 + A_2 X_2$$

$$\boxed{X_i = \frac{1}{100}}$$

$$\bar{A} = 40 \cdot 0,8 + 42 \cdot 0,2$$

$$\boxed{\bar{A} = 40,4}$$

Q16. A nivel del mar, una solución acuosa de amoníaco que contiene disuelto 5,1 gramos de amoníaco, ebulle a 100,52 °C. Considere que para el agua  $K_e = 0,52 \text{ } ^\circ\text{C}\cdot\text{kg/mol}$  y la densidad igual a 1 g/mL. Calcular los mililitros del solvente presente en la solución.

- A) 300      B) 200      C) 0,2      D) 0,3      E) Ninguna

$$\left[ n_s = \frac{5,1 \text{ g}}{17 \text{ g/mol}} = 0,3 \text{ mol} \right] \quad \Delta T_e = T_{esol} - T_{esolu} = 100,52 - 100 = 0,52 \text{ } ^\circ\text{C}$$

$$M_o = \frac{\Delta T_e}{K_e} = \frac{0,52 \text{ } ^\circ\text{C}}{0,52 \text{ } ^\circ\text{C} \cdot \text{kg/mol}} = 1 \text{ mol/kg} = \frac{n_s}{m_{H_2O}}$$

$$m_{H_2O} = \frac{n_s}{M_o} = \frac{0,3 \text{ mol}}{1 \text{ mol/kg}} = 0,3 \text{ kg} = 0,3 \text{ L} = 300 \text{ mL}$$