Dilatação Térmica dos Líquidos – Lista 2: Resolução

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1. B

2.
$\gamma = 3 . \alpha$
$\gamma = 3 . 40.10^{-6}$
$\gamma = 1{,}2.10^{-4}\ ºC^{-1}$

$\Delta V_{ap} = V_0\ \gamma_{ap}\ \Delta T$
$6.10^{-2} . 1.10^{-7} = 1.10^{-5} . 1{,}2.10^{-4} . (Ts - 12)$
$Ts = 17ºC$

3.
$\Delta V_{líq} = \Delta V_{frasco}$
$V_{0\ líq}\ \gamma_{líq}\ \Delta T = V_{0\ frasco}\ \gamma_{frasco}\ \Delta T$
$0{,}8 . V_{0\ frasco}\ \gamma_{líq} = V_{0\ frasco}\ \gamma_{frasco}$
$\gamma_{frasco} / \gamma_{líq} = 0{,}8$

4.
$\gamma_{líq} = \gamma_{ap} + \gamma_{frasco}$
$180.10^{-6} = \gamma_{ap} + 9.10^{-6}$
$\gamma_{ap} = 1{,}71.10^{-4}\ ºC^{-1}$

$\Delta V_{ap} = V_0\ \gamma_{ap}\ \Delta T$
$\Delta V_{ap} = 0{,}5 . 1{,}71.10^{-4} . [90 - (-10)]$
$\Delta V_{ap} = 8{,}55.10^{-3}\ cm^3$

$S = S_0\ [1 + \beta\ \Delta T]$
$S = 3.10^{-4}\ \{1 + 6.10^{-6} . [90 - (-10)]\}$
$S = 3{,}0018.10^{-4} cm^2$
(observe que, apesar de bem pouco, a área da secção transversal também dilata)

$V = S . h$
$8{,}55.10^{-3} = 3{,}0018.10^{-4} . h$
$h \approx 28{,}48cm$

5.
$\Delta V_{ap} = V_0\ \gamma_{ap}\ \Delta T$
$0{,}04\ V_0 = V_0\ \gamma_{ap}\ (80 - 0)$
$\gamma_{ap} = 5.10^{-4}\ ºC^{-1}$

$\gamma_{líq} = \gamma_{ap} + \gamma_{frasco}$
$\gamma_{líq} = 5.10^{-4} + 27.10^{-6}$
$\gamma_{líq} = 5{,}27.10^{-4}\ ºC^{-1}$

6.
$\gamma_{líq} = \gamma_{ap} + \gamma_{frasco}$
$10{,}7.10^{-4} = \gamma_{ap} + 0{,}7.10^{-4}$
$\gamma_{ap} = 1.10^{-3}\ ºC^{-1}$

$\Delta V_{ap} = V_0\ \gamma_{ap}\ \Delta T$
$\Delta V_{ap} = V_0\ 1.10^{-3}\ (35 - 15)$
$\Delta V_{ap} = 0{,}02 . V_0$
Transborda 2% do volume inicial de líquido.

7.
O frasco estará completamente cheio quando os volumes finais do frasco e do líquido forem iguais:
$V_{frasco} = V_{líq}$
$V_{0\ frasco} . [1 + \gamma_{frasco}\ \Delta T] = V_{0\ líq} . [1 + \gamma_{líq}\ \Delta T]$
$V_{0\ frasco} . [1 + 5{,}1.10^{-5} . (T - 10)] = 0{,}95 . V_{0\ frasco} . [1 + 5{,}8.10^{-4} . (T - 10)]$
$T = 110ºC$

8.
a)
$\Delta V_{líq} = V_{0\ líq} . \gamma_{líq} . \Delta T$
$\Delta V_{líq} / V_{0\ líq} = 9.10^{-4} . 40$
$\Delta V_{líq} / V_{0\ líq} = 0{,}036$
$\Delta V_{líq} / V_{0\ líq} = 3{,}6\%$
b)
$V_{frasco} = V_{0\ frasco} . [1 + \gamma_{frasco}\ \Delta T]$
$V_{frasco} = V_{0\ frasco} . [1 + 1.10^{-5} . 40]$
$V_{frasco} = V_{0\ frasco} . 1{,}0004$

$V_{líq} = V_{0\ líq} . [1 + \gamma_{líq}\ \Delta T]$
$V_{líq} = 0{,}97 . V_{0\ frasco} . [1 + 9.10^{-4} . 40]$
$V_{líq} = V_{0\ frasco} . 1{,}00492$

Como $V_{líq} > V_{frasco}$, o líquido transborda.
c)
$\Delta V_{líq} = V_{0\ líq} . \gamma_{líq} . \Delta T$
$\Delta V_{líq} = 40 . 9.10^{-4} . 40$
$\Delta V_{líq} = 1{,}44L$

Economia = 1,44L . 2,50 reais/L = R$3,60.

9. C

10.
$\gamma_{líq} = \gamma_{ap} + \gamma_{frasco}$
$X = \gamma_{ap} + Y$
$\gamma_{ap} = X - Y$

$\Delta V_{ap} = V_0 . \gamma_{ap} . \Delta T$
$V_H = V_B . (X - Y) . 1$
$V_H / V_B = X - Y$