Exercise No. 1:

$P_f = P_{atm} + \rho_p . g . (0{,}8) + \rho_e . g . (0{,}6)$

$P_f = 1{,}13 \, . 10^5 \, Pa.$

Exercise No. 2:

1) RFH for Gasoline : $P_2 - P_1 = \rho_{essence} . g . (Z_1 - Z_2)$

$\boxed{P_2 = P_1 + \rho_{essence} . g . h}$ A.N. $\boxed{P_2 = 10^5 + 700.9{,}8.0{,}728 = 1{,}05.10^5 \; pascal = 1050 \; mbar}$

2) RFH for Mercury : : $P_2 - P_3 = \rho_{mercure} . g . (Z_3 - Z_2)$

$\boxed{P_3 = P_2 - \rho_{merc} \; . g . h'}$ A.N. $\boxed{P_3 = 1050.10^3 - 13600.9{,}8.0{,}15 = 1{,}03.10^5 \; pascal = 1030 \; mbar}$

Exercise No. 3:

1) RFH between B & A: $P_B - P_A = \rho_1 g (Z_A - Z_B)$ Or $P_A = P_{atm}$ et $Z_A - Z_B = h_1$

So: $\boxed{P_B = P_{atm} + \rho_1 g . h_1}$ A.N. $\boxed{P_B = 10^5 + 850.9{,}81.6 = 150031 \; Pa = 1{,}5 \; bar}$

2) RFH between A & E : $P_A - P_E = \rho_1 g (Z_E - Z_A)$ Or $P_A = P_E = P_{atm}$

So $\boxed{Z_E = Z_A = h_1 + h_2}$ A.N. $\boxed{Z_E = 6 + 5 = 11 \, m}$

3) RFH between C & B : $P_C - P_B = \rho_2 g (Z_B - Z_C)$ Or $Z_B - Z_C = h_2$

So: $\boxed{P_C = P_B + \rho_2 g . h_2}$ A.N. $\boxed{P_C = 150031 + 1000.9{,}81.5 = 199081 \; Pa = 2 \; bar}$

4) RFH between C &D : $P_C - P_D = \rho_2 g (Z_D - Z_C)$ Or $P_D = P_{atm}$ & $Z_C = 0$

So : $\boxed{Z_D = \dfrac{P_C - P_{atm}}{\rho_2 . g}}$ A.N. $\boxed{Z_D = \dfrac{199081 - 10^5}{1000.9{,}81} = 10{,}1 \, m}$

Exercise No. 4:

According to (RFH), chapter 2, we can write:

$P_1 - P_0 = \rho_1 . g . (Z_0 - Z_1)$ / $P_2 - P_1 = \rho_2 . g . (Z_1 - Z_2)$ / $P_3 - P_2 = \rho_3 . g . (Z_2 - Z_3)$

With : $P_0 = P_3 = P_{atm}$, making the sum of these three equations gives:

$\rho_1 . (Z_0 - Z_1) + \rho_2 . (Z_1 - Z_2) + \rho_3 . (Z_2 - Z_3) = 0$

$\Rightarrow \quad (Z_2 - Z_1) = \dfrac{\rho_1}{\rho_2} . (Z_0 - Z_1) - \dfrac{\rho_3}{\rho_2} . (Z_3 - Z_2)$ A.N: $(Z_2 - Z_1) = 0{,}0096$ m

or $(Z_1 + Z_2) = 1{,}0$ m So: $\boxed{Z_2 = 0{,}5048 \text{ m}}$ & $\boxed{Z_1 = 0{,}4952 \text{ m}}$

$(Z_3 - Z_2) = 0{,}1$ m so $\boxed{Z_3 = 0{,}6048 \text{ m}}$

$(Z_0 - Z_1) = 0{,}2$ m so $\boxed{Z_0 = 0{,}6952 \text{ m}}$