1) Phase ① - a state of matter that is uniform throughout, not only in chemical composition but also in physical state.

Constituent - any chemical species present in the system.

Component - a chemically independent constituent of the system. It is best understood in relation to the phrase "number of components" which is the minimum number of independent species necessary to define the composition of all the phases present in the system.

Degree of freedom (i.e. variance) - the number of intensive variables that can be changed without disturbing the number of phases in equilibrium.

2) i) Below a denaturant concentration of 0.1 only the native and unfolded forms are stable; the 'molten globule' form is not stable.

ii) At denaturant concentration of 0.1T only the native form is stable below a temperature of about 0.6T. At temperature 0.6T the native and molten-globule forms are at equilibrium. Heating above 0.6T causes all native forms to become molten globules. At temperature 0.8T, equilibrium between molten globule & unfolded protein is observed & above this T only the unfolded form is stable

3) At the lowest T shown on the PD, ∃ 2 liquid phases; a water-rich phase ($x_B = 0.05$) & a methyl-propanol-rich phase ($x_B = 0.88$). The latter phase is ca. 10x as abundant as the former according to the lever rule, because it is ca. 10x closer in composition (0.88 − 0.80 vs 0.80 − 0.05). On heating, the compositions of the 2 phases change, the water-rich phase increasing significantly in methyl-propanol & the methyl-propanol-rich phase more gradually increasing in water. The relative proportions of the phases continue to be given by the lever rule. Just before the isopleth intersects the phase boundary, the methyl-propanol-rich phase ($x_B = 0.8$) is in equilibrium with a vanishingly small water-rich phase ($x_B = 0.36$). Then, at T_1, the phases merge, and a single-phase region is encountered with $x_B = 0.8$

4) mathematically the dependence of μ on p, $\left(\frac{\partial\mu}{\partial p}\right)_T = V_m$, follows from the μ's status as a ~~[illegible]~~ G_m ($\bar{G}$) and from the dependence of G on conditions as expressed in the fundamental eq. of chemical TD $dG = Vdp - TdS + \sum_J \mu_J dn_J$.

The question implies that the dependence of μ on p is not intuitive for an incompressible phase. The dependence is more comprehensible for a compressible phase, because ↑p does W on the phase (dV) cont... (2)

In that case, you can imagine a compressible phase (cf. vapour) in equilibrium w. an incompressible phase (cf. liquid) in a closed container. As $p \uparrow$, μ of the ~~phas~~ vapour $\uparrow$, yet ~~the~~ μ of the 2 phases in equilibrium remain equal ($\mu_{vap} = \mu_{liq}$), therefore ~~the~~ μ of the liquid must also $\uparrow$ with p.

5) The Gibbs-Duhem equation relates changes in μ of a mixture's components to the composition: $d\mu_E = -\frac{n_W}{n_E} d\mu_W$. For a small macroscopic change: $\delta\mu_E = -\frac{n_W}{n_E}\delta\mu_W = -\frac{0.60}{0.40} \cdot 0.25\ \mathrm{J\ mol}$

$= -0.38\ \mathrm{J\ mol^{-1}}$

$n_W + n_E = 1.0$

6) At the triple point, T_3, the vapour pressure of liquid and solid are equal to

$$10.5916 - \frac{1871.2\,K}{T_3} = 8.3186 - \frac{1425.7\,K}{T_3}$$

~~and log(p3/Torr) = - 1871.2K / 196.0K +10~~

$\Rightarrow \underline{\underline{T_3 = 196.0\,K}}$

and $\log(p_3/\mathrm{Torr}) = -\frac{1871.2\,K}{196.0\,K} + 10.5916 = 10.447$

$$\underline{\underline{p_3 = 11.1\ \mathrm{Torr}}}$$