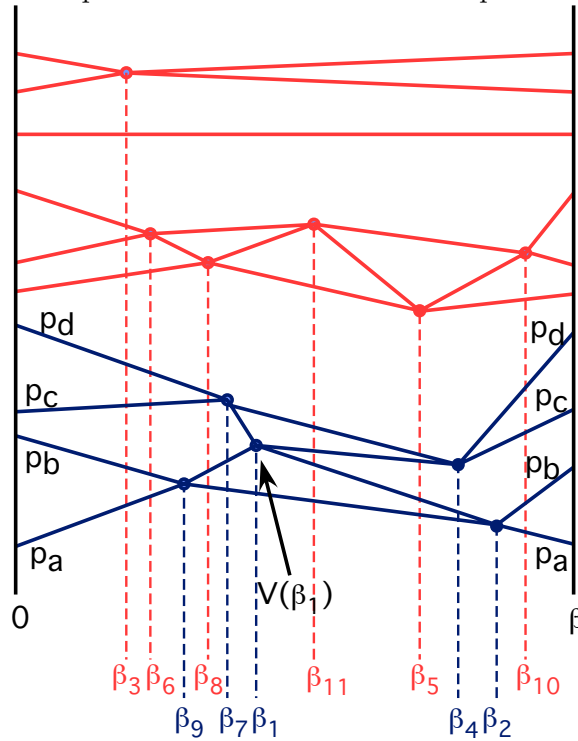


1. The diagram represents a perturbative calculation of the partition function.



Consider the connected diagram involving $p_a \rightarrow p_d$ which when used to calculate the pressure contributes at order n in perturbation theory and to order m in powers of $e^{\beta\mu}$, i.e., the prefactor is $e^{m\beta\mu}$. Circle one of the below:

$n = 4, m = 4$	$n = 4, m = 5$	$n = 4, m = 12$
$n = 5, m = 4$	$n = 5, m = 5$	$n = 5, m = 12$
$n = 12, m = 4$	$n = 12, m = 5$	$n = 12, m = 12$

none of the above

2. Consider a virial expansion for a non-relativistic two-dimensional gas of electrons of mass m at temperature T ,

$$\frac{P}{\rho T} = 1 + \sum_{m=2}^{\infty} A_m \left(\frac{\rho}{\rho_0} \right)^{m-1}, \quad \rho_0 \equiv \frac{mT}{2\pi\hbar^2}.$$

Ignoring interactions between the spin-1/2 electrons, calculate A_2 .