$$
\boxed{\begin{aligned}
H_c = {} & \frac{1}{2n}\sum_{l=0}^{n}(-1)^l (n-l)^{p-2} \sum_{l_1+\cdots+l_p=l} \prod_{i=1}^{p} \binom{n_i}{l_i} \\
& \cdot \left[(n-l)-(n_i-l_i)\right]^{n_i-l_i} \cdot \left[(n-l)^2 - \sum_{j=1}^{p}(n_i-l_i)^2\right].
\end{aligned}} \tag{1}
$$

$$
\begin{aligned}
H_c = {} & \boxed{\frac{1}{2n}\sum_{l=0}^{n}(-1)^l (n-l)^{p-2} \sum_{l_1+\cdots+l_p=l} \prod_{i=1}^{p} \binom{n_i}{l_i}} \\
& \cdot \left[(n-l)-(n_i-l_i)\right]^{n_i-l_i} \cdot \left[(n-l)^2 - \sum_{j=1}^{p}(n_i-l_i)^2\right].
\end{aligned} \tag{2}
$$

$$
\begin{aligned}
H_c = {} & \frac{1}{2n}\sum_{l=0}^{n}(-1)^l (n-l)^{p-2} \sum_{l_1+\cdots+l_p=l} \prod_{i=1}^{p} \binom{n_i}{l_i} \\
& \cdot \left[(n-l)-(n_i-l_i)\right]^{n_i-l_i} \cdot \boxed{\left[(n-l)^2 - \sum_{j=1}^{p}(n_i-l_i)^2\right].}
\end{aligned} \tag{3}
$$