Consider the same system as in the previous question. A system that can exchange energy with the environment through magnetic work in addition to the regular heat flows and volume work. The magnetic work is represented by the term Bdm , where m is the magnetization and B the applied magnetic field. Adding this term to the differential equation for internal energy results in: $du = Tds - Pdv + Bdm$.

Derive the differential equation for the Gibbs free energy (dg) for energy exchange through heat flows, volume work and magnetic work. Start from the expression for the Gibbs free energy including magnetic work: $g(T, P, B) = u + Pv - Ts - Bm$. State clearly how you do this (if only the answer is given, it is considered wrong).

$g(T, P, B) = u + Pv - Ts - Bm$

$dg = du + Pdv + vdP - Tds - sdT - Bdm - mdB = Tds - Pdv + Bdm + Pdv + vdP - Tds - sdT - Bdm - mdB$

$dg = -sdT + vdP - mdB$