Disordered systems have been subject of extensive study due to the richness of physical properties that they present. Among these, we can highlight the spin glass phase (SG) that represents one of the most challenging problems in statistical mechanics. This phase is even more interesting in the presence of a random magnetic field (RF). In this case, there are two sources of disorder: one coming from the interactions and another from the RF. The Sherrington and Kirkpatrick (SK) model in the presence of RFs can be used to study such complex systems. It can present good results for some thermodynamic quantities as the freezing temperature ($T_f$) and the non-linear susceptibility ($\chi_3$). However, within the usual replica mean-field treatment, this model can be not adequate enough to study the specific heat ($C_m$). In order to improve this point, we present a clusters version for the SK model in RFs. This cluster model allows us to include long-range disordered interactions among distinct clusters, and ferromagnetic short-range interactions (FE) within the clusters $J_1$, besides a local RF for each spin of cluster. The RF is assumed to be a Gaussian distribution with the standard deviation $\Delta$. We adopted the replica formalism to obtain a single-cluster problem, which is solved exactly. We obtain as results phase diagrams, $C_m$ and the $\chi_3$. In the absence of RF ($\Delta = 0$), we note that the $C_m$ curve as a function of the temperature $T$ can show a broad maximum at a temperature $T^{**}$, which is 30% above $T_f$, as expected for SG systems. The increase of $J_1$ shifts $T^{**}$ for higher temperatures at the same time as the maximum of $C_m$ becomes smaller. In the presence of RFs this scenario changes, $C_m$ still exhibits the broad maximum at $T^{**}$ that is weakly dependent on $\Delta$. However, the $T_f$ decreases as $\Delta$ increases, enhancing the ration $T^{**}/T_f$. On the other hand, when $\Delta = 0$, the $\chi_3$ exhibits a divergence at $T_f$, identifying the SG phase transition. However, this divergence becomes an arroved maximum at a temperature $T^*$ in the presence of RFs. Although $T_f$ and $T^*$ decrease with $\Delta$, the $T^*$ no longer coincides with $T_f$ located by $\lambda_{AT}$. It means that $T^*$ can be not adequate to locate the $T_f$ in the presence of RFs. Furthermore, the RFs increase the ratio $T^{**}/T_f$ to values above those found in canonical SG systems. Acknowledgments: CNPq and CAPES.