We carry out a comprehensive study of the J-K-Γ model on the triangular lattice which is an extension of the celebrated Kitaev honeycomb model. A global phase diagram of the model was obtained and the nature of those phases as well as the phase transitions between them were clarified. Recently, lots of materials with triangular lattices of magnetic ions were explored and their low energy physics may be described by the model. Thus, our research is timely, provides substantive follow-up developments to Kitaev model and may guide future theoretical and experimental studies in this field.