In order to explore the microstructural evolution of materials in a fusion reactor environment, it is necessary to fundamentally understand the behavior of lattice defects and helium atoms in the materials, particularly with respect to their interactions with various sinks, such as dislocations and grain boundaries. The dimer method for determining transition state saddle point energies has been used to systematically search possible migration paths of vacancies, He interstitials and He-vacancy (He/V) clusters at two representative grain boundaries (GBs), i.e. the $\Sigma_{11} <110> \{323\}$, and the $\Sigma_{3} <110> \{111\}$, in alpha-Fe. Individual vacancies can migrate to and become trapped at the GBs, and these trapped vacancies can diffuse along the GBs with migration energies much less than that within a perfect crystal. Long-time dynamics simulations of diffusion pathways based on the dimer method has been employed to study the behavior of individual vacancies within the GBs. The results show that vacancies migrate one-dimensionally along specific directions in both GBs: directly along close-packed rows in the $\Sigma_{3}$ GB and in zigzag paths within the $\Sigma_{11}$ GB. Also, dimer saddle point searches show that He interstitials can diffuse along the GBs with migration energies of 0.4-0.5 eV, similar to those of individual vacancies at the GBs. There are two equivalent energy paths for He in the $\Sigma_{3}$ GB, one along the GB axis and another along the direction perpendicular the GB axis, which may provide an explanation for the observed behavior in molecular dynamics simulations, i.e. that He atoms migrate two-dimensionally in the $\Sigma_{3}$ boundary at low temperatures. The present simulations demonstrate that vacancies and He interstitials are mobile at GBs with similar migration energies. The rate controlling activation energy for migration of a He-divacancy cluster in the GBs determined using the dimer method is about 0.9 eV. This is comparable to the migration energy for a He-divacancy cluster in bulk alpha-Fe. Further results for small He/V cluster migration are compared to those obtained in a perfect crystal with the same empirical potentials.