Let $S$ be the set of all $n$ letter words in two letters, say $a$ and $b$. Define an equivalence relation on $S$ as follows: given a word $W$, the reverse of $W$, the complement of $W$ (that is, change all $a$'s and $b$'s and all $b$'s to $a$'s), and the reverse of the complement are all equivalent to $W$. Find the number of equivalence classes of $S$ that do not contain any palindromes.