1054-11-201 **Melvyn B. Nathanson*** (melvyn.nathanson@lehman.cuny.edu), Department of Mathematics, Lehman College (CUNY), 250 Bedford Park Boulevard West, Bronx, NY 10468. *Phase transitions in groups with a prescribed infinite set of generators.*

Let G be a group and let A be an infinite set of generators for G. The length of an element $x \in G$ with respect to the generating set A, denoted $\ell_A(x)$, is the length of the shortest representation of x as a finite product of elements in $A \cup A^{-1}$. For every nonnegative integer r, the sphere $S_A(r)$ is the set of all elements $x \in G$ of length exactly r. It is proved that either $|S_A(r)| = \infty$ for all r, or there exists a unique integer r such that $S_A(r')$ is empty for all $r' > r$, $S_A(r')$ is infinite for all $r' < r$, and $S_A(r)$ is nonempty. The integer r is called the *phase transition* of the pair (G, A) and the set $S_A(r)$ is called the *transition set*. A complete description of phase transitions and transition sets can be given for the integers and for certain other abelian groups. (Received September 14, 2009)