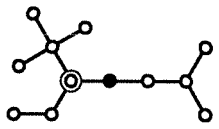
2
Centers & Centroids ($v \leq 12$)

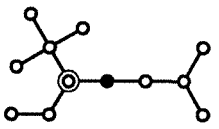
A CENTER of a tree is a vertex that minimizes the maximum distance to the other vertices. From a center it is easiest/fastest/cheapest to reach the rest of the tree. But a center is not necessarily unique. There may be two adjacent centers in a tree.

From this center (solid dot) any vertex is reachable in at most 3 steps. From any other vertex the maximum distance is 4 or more. Three, then, is the *radius* of the tree.



A CENTROID (also called barycenter or center of mass) of a tree is a vertex that minimizes the maximum weight of branches that emanate from any vertex. This partitions the tree into branches of most uniform size. A centroid is not necessarily unique. Odd trees — those with an odd number of vertices — have only one, but even trees may have one or two adjacent centroids.

This centroid (circled) has branches of weights 5, 4, and 2. Any other vertex has a maximum branch weight of 7 or more. Five, then, is the *load* of the tree.

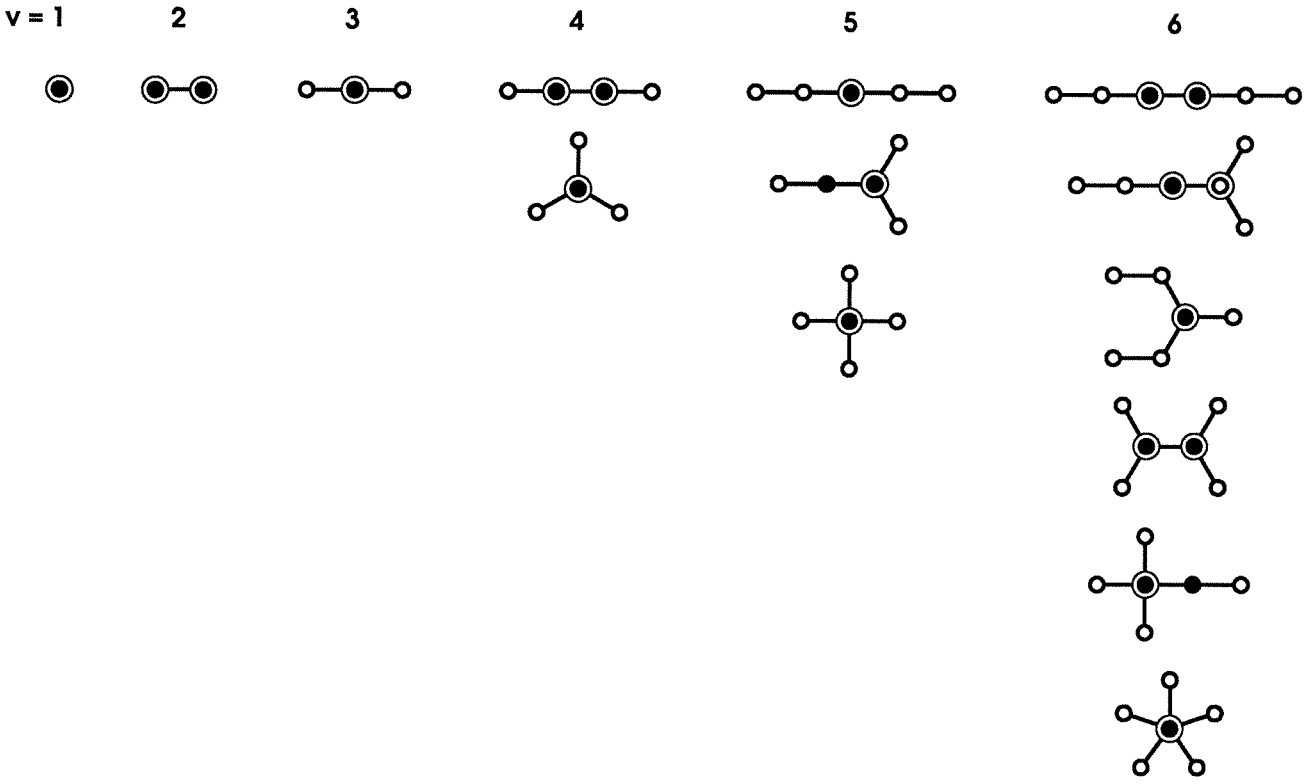


This chapter uses the same drawings shown in pages 3 – 22, overlaid with centers and centroids. Tables at the end of the chapter (p. 63) show the number of trees by radius (maximum distance from the center) and the number of trees by load (maximum branch weight from the centroid).

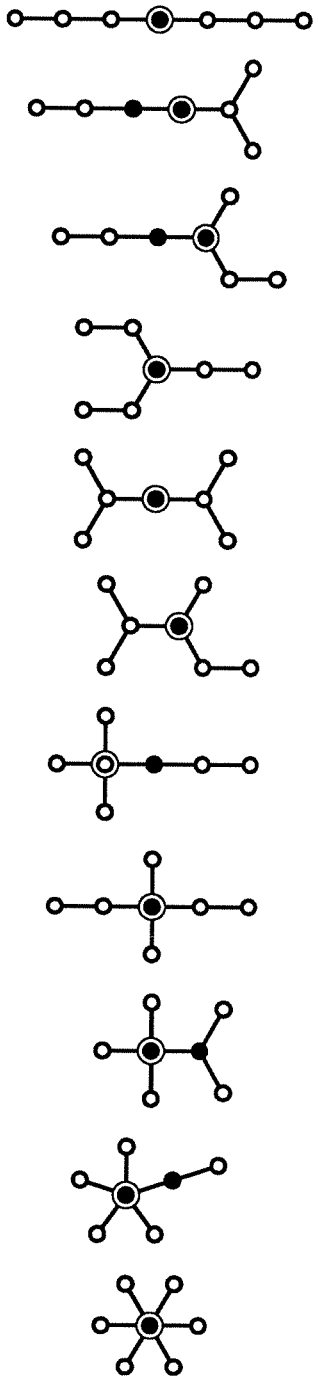
● center (minimizes maximum distance)

◎ centroid (minimizes maximum branch weight)

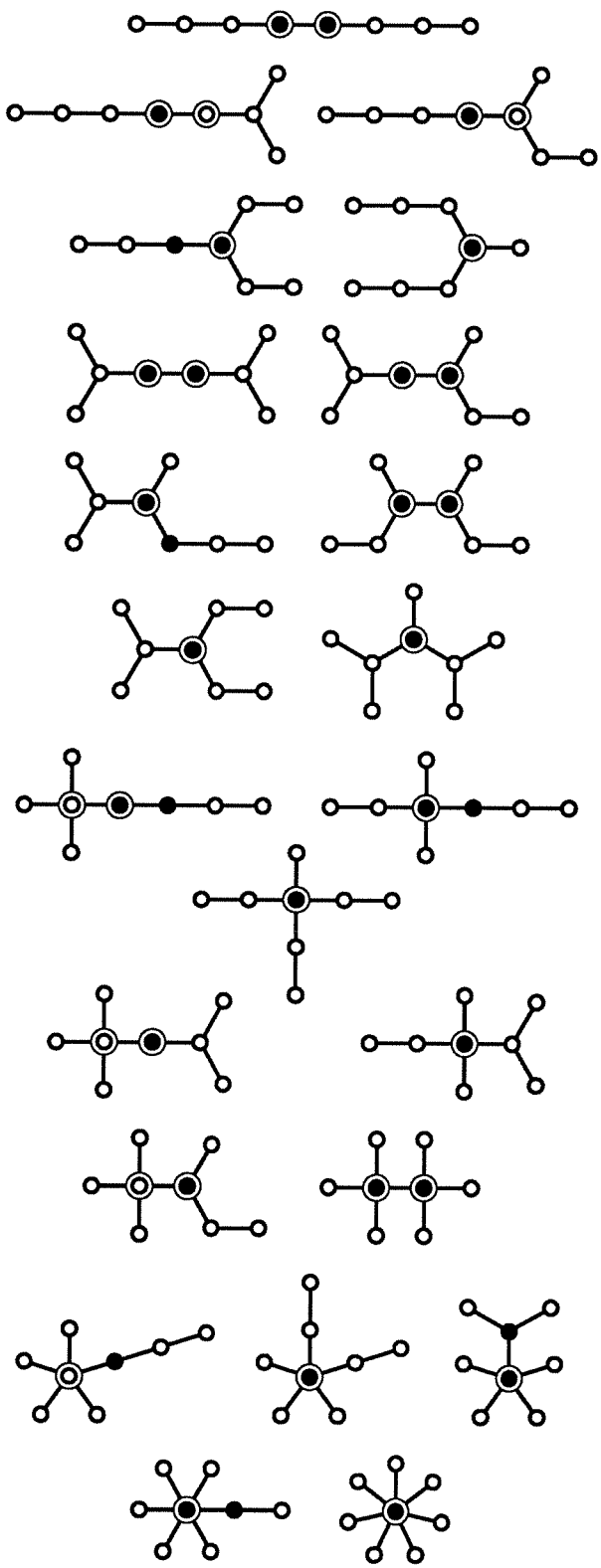
◉ both a center and a centroid



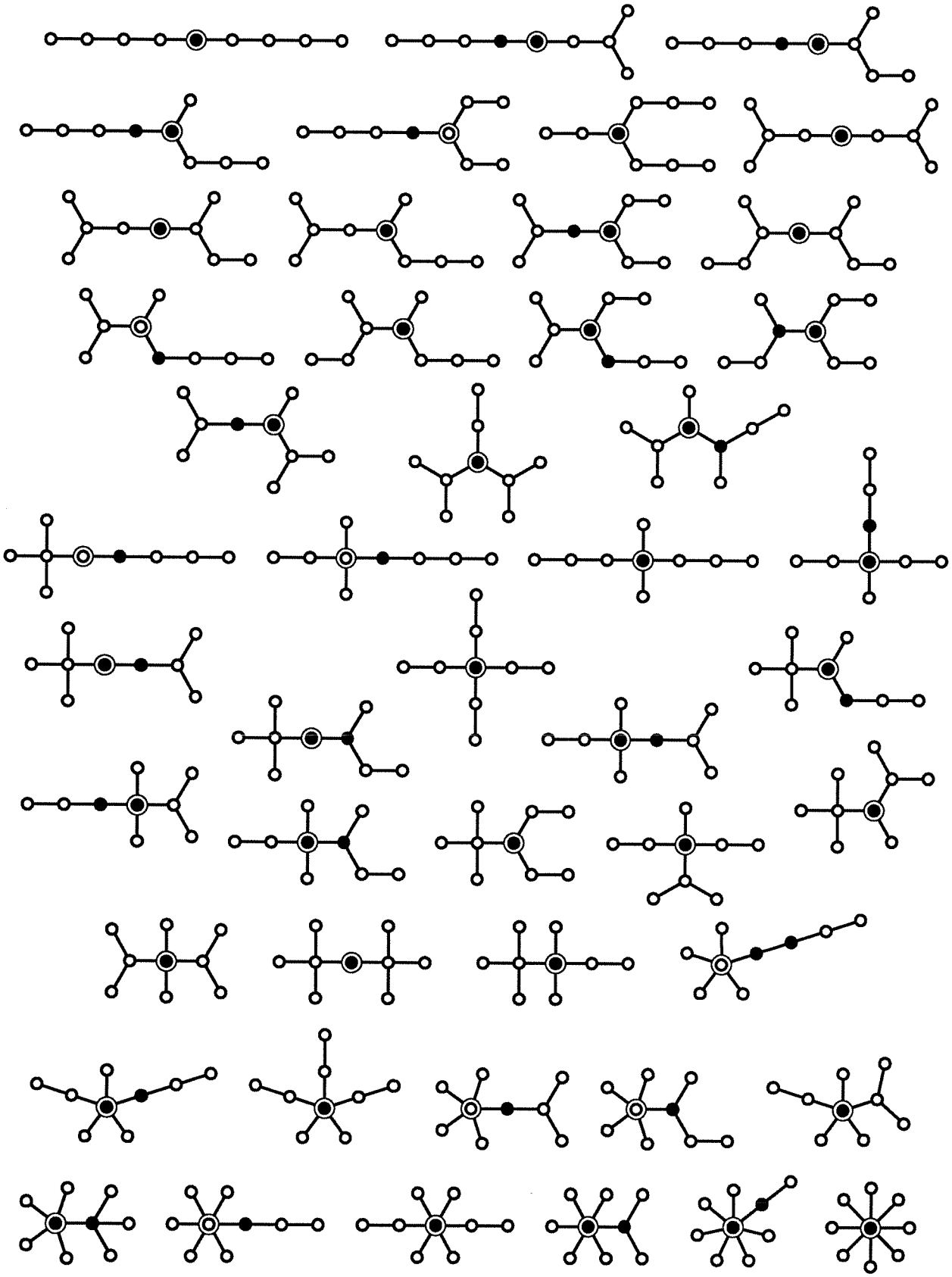
v = 7



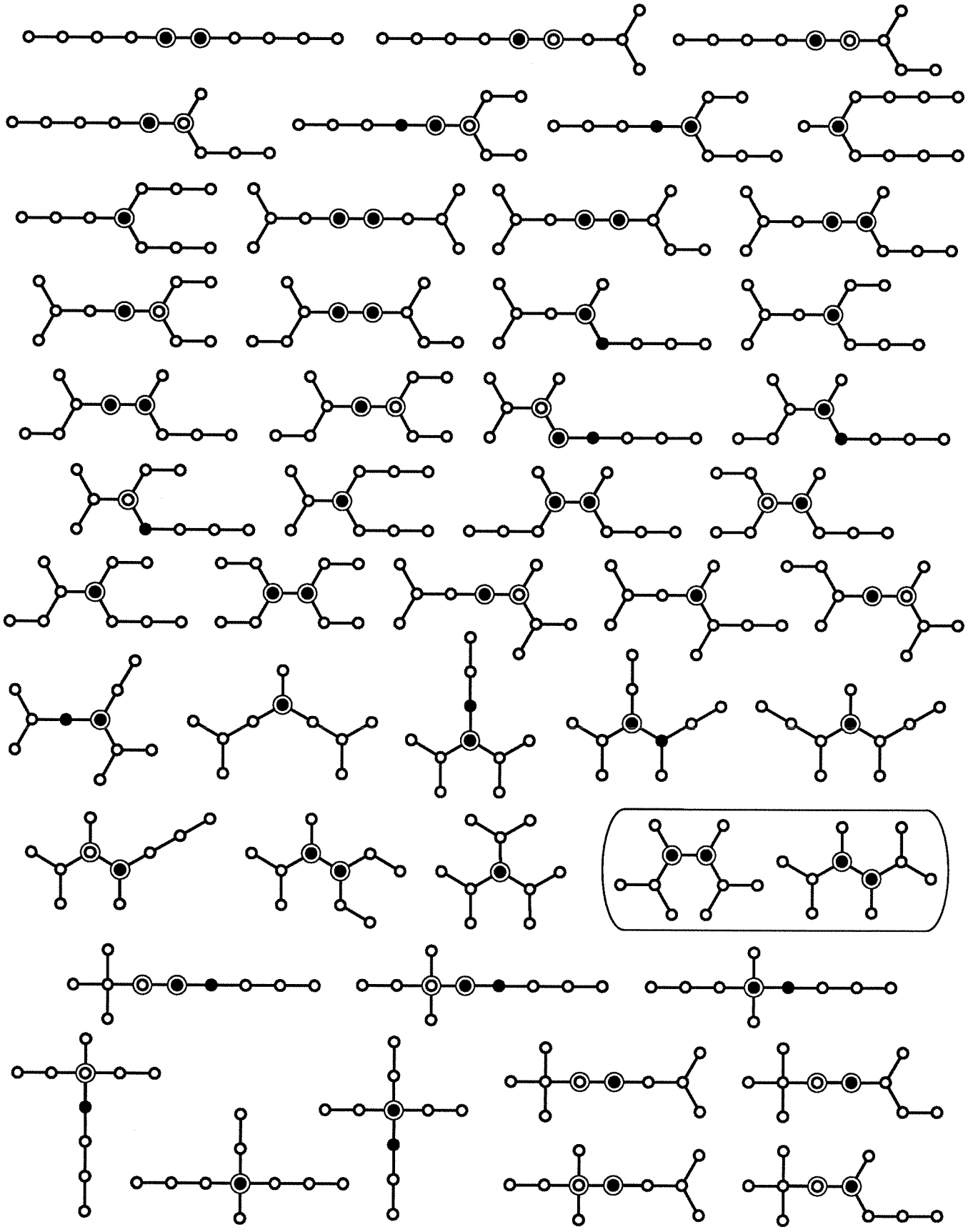
v = 8

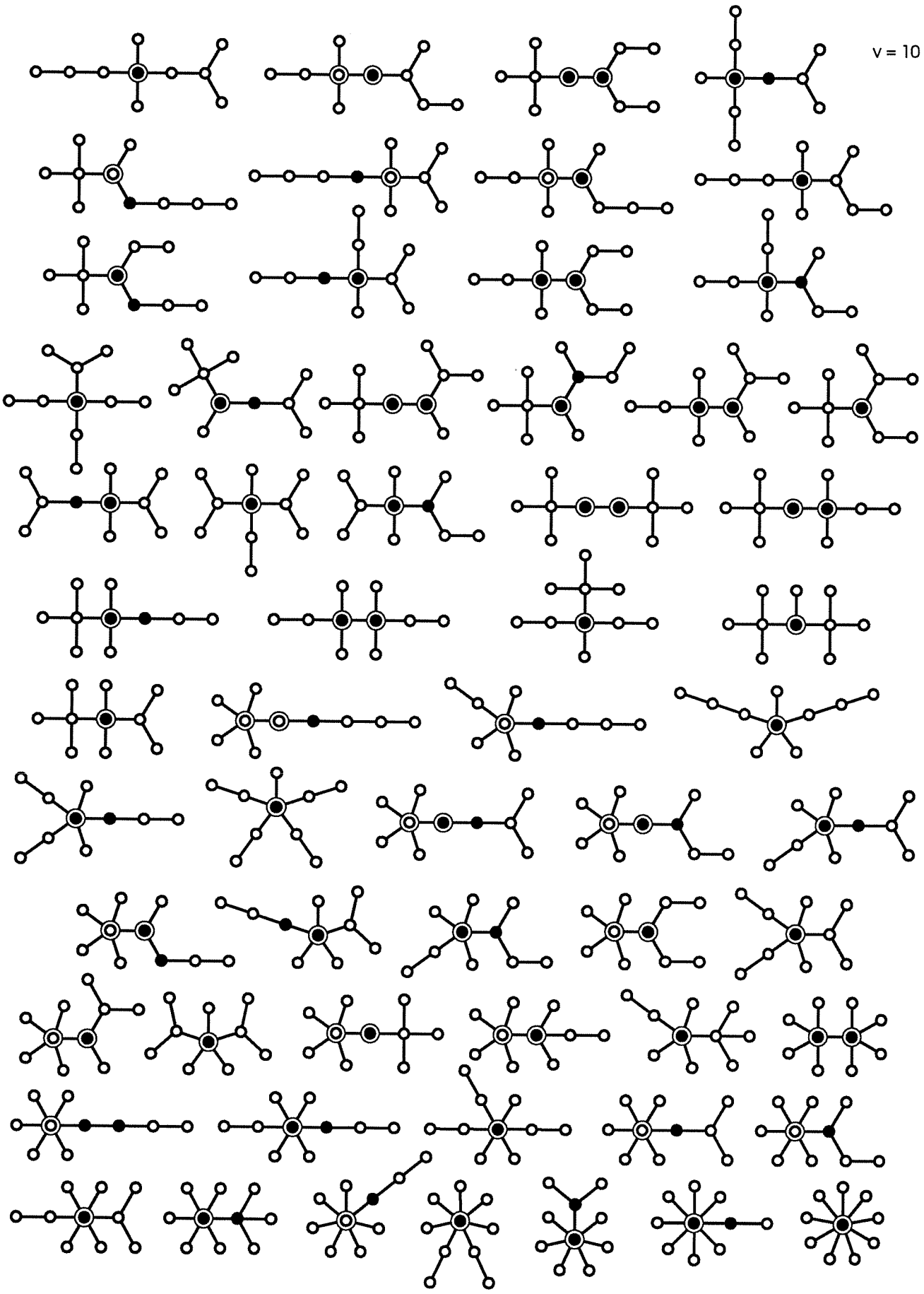


v = 9

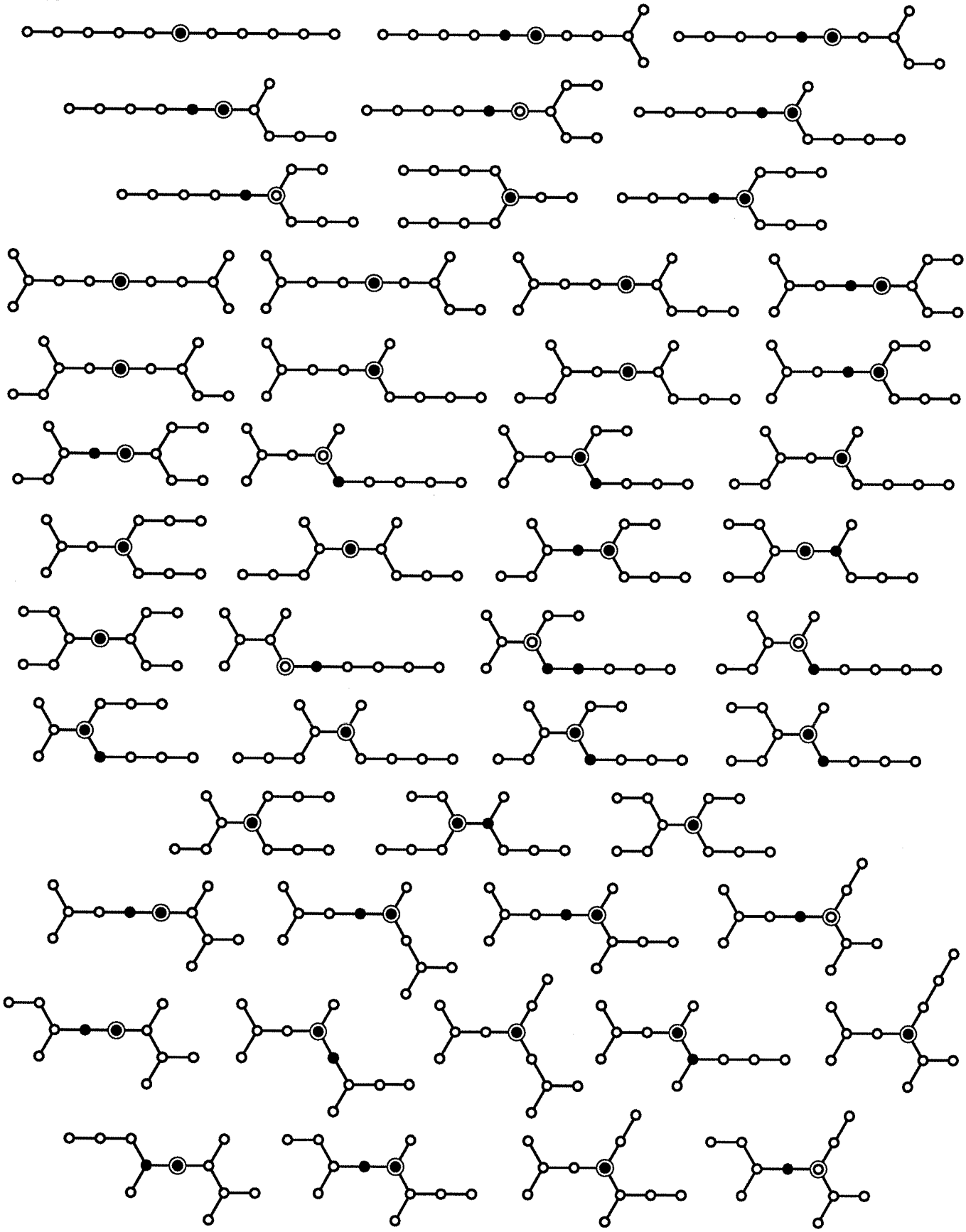


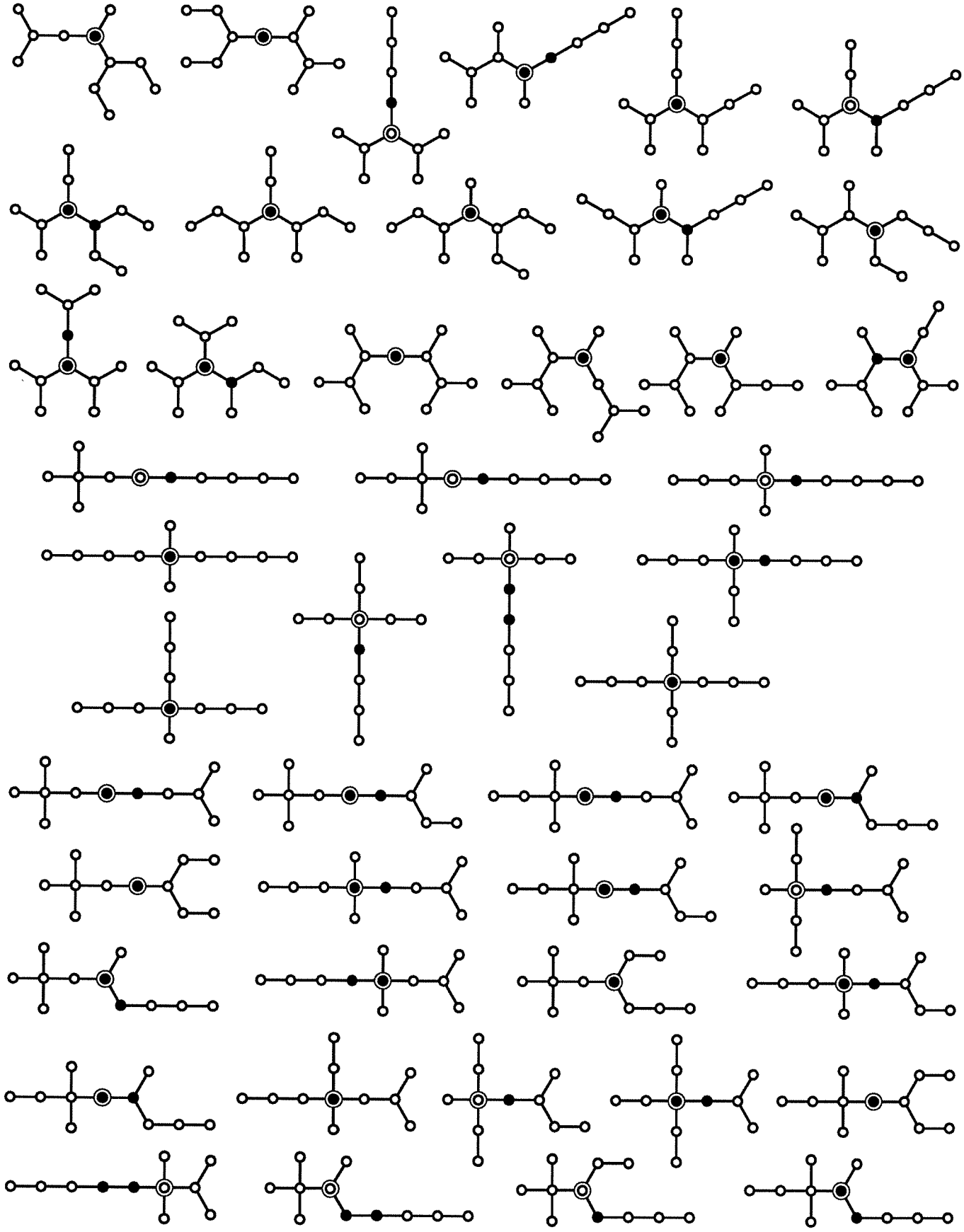
v = 10



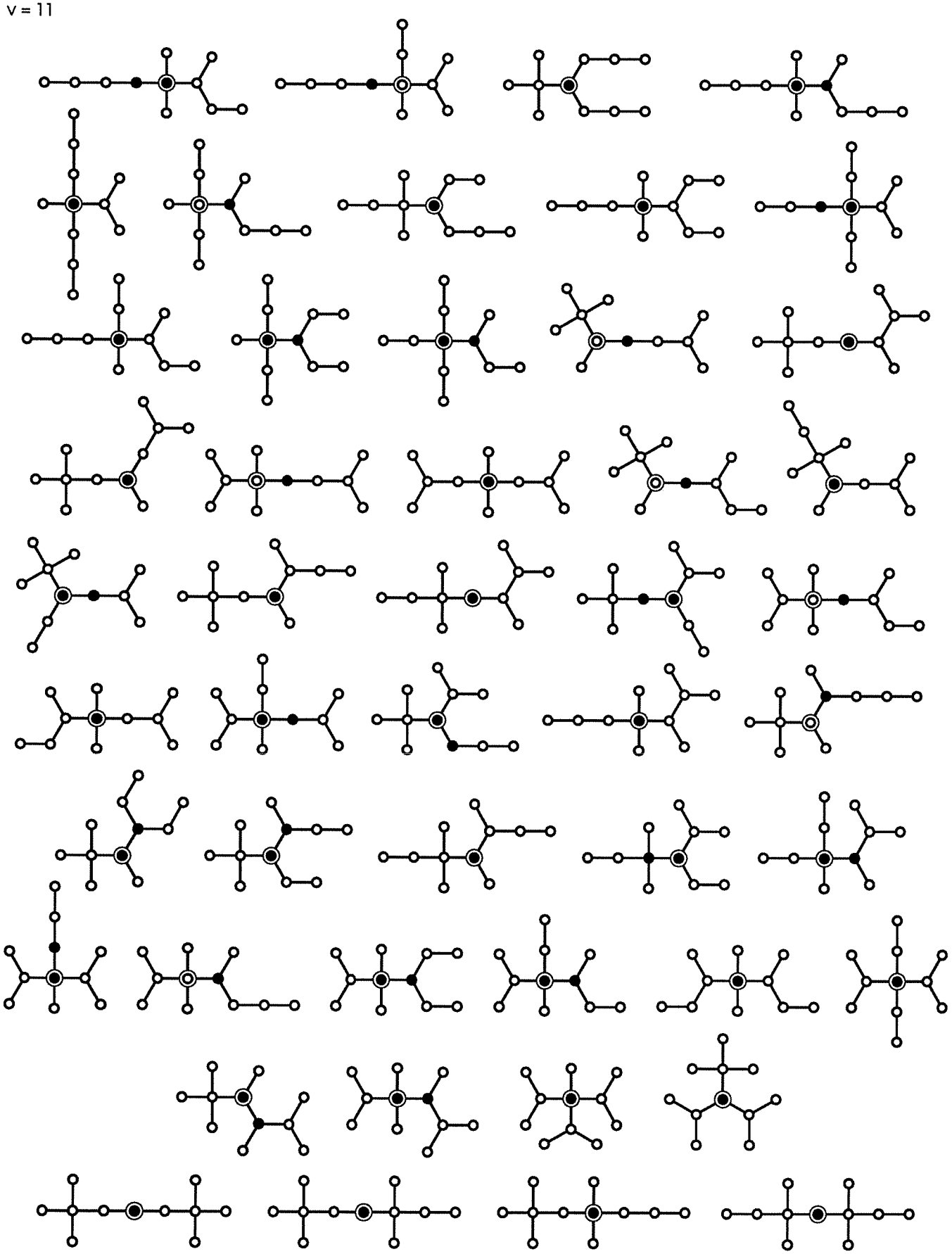

v = 10

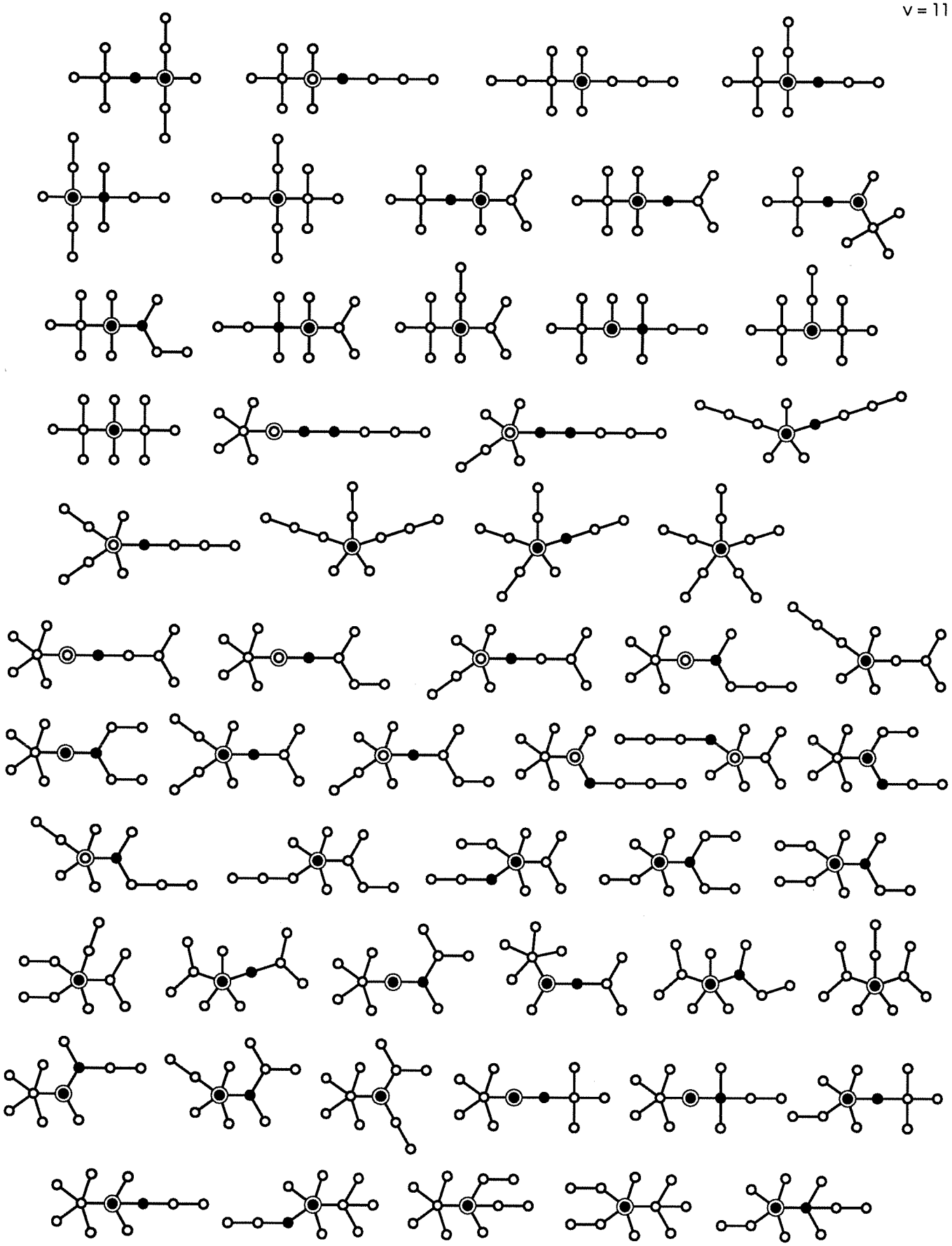
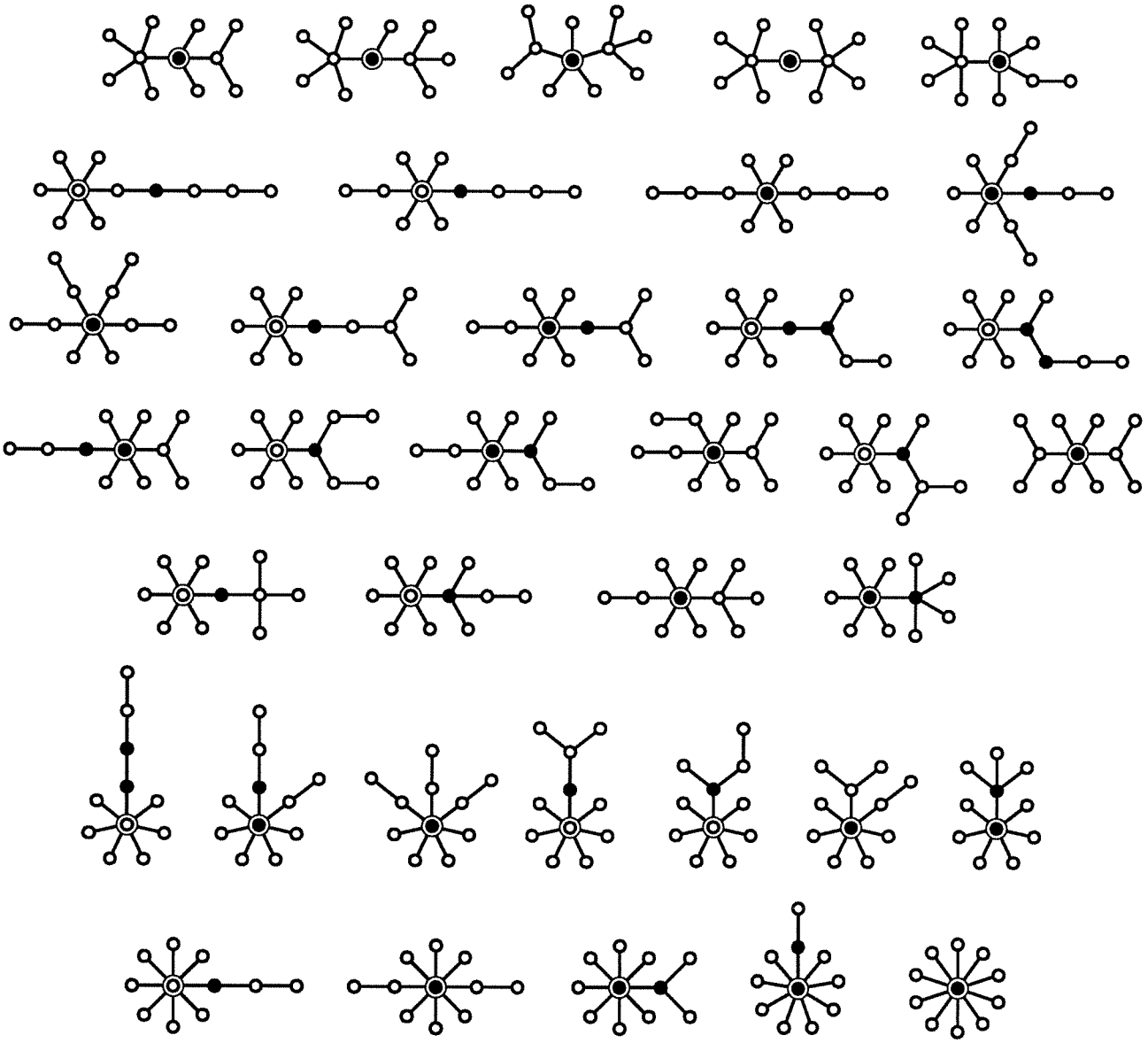
v = 11





v = 11





v = 11