

VASCULAR PLANT DEVELOPMENT

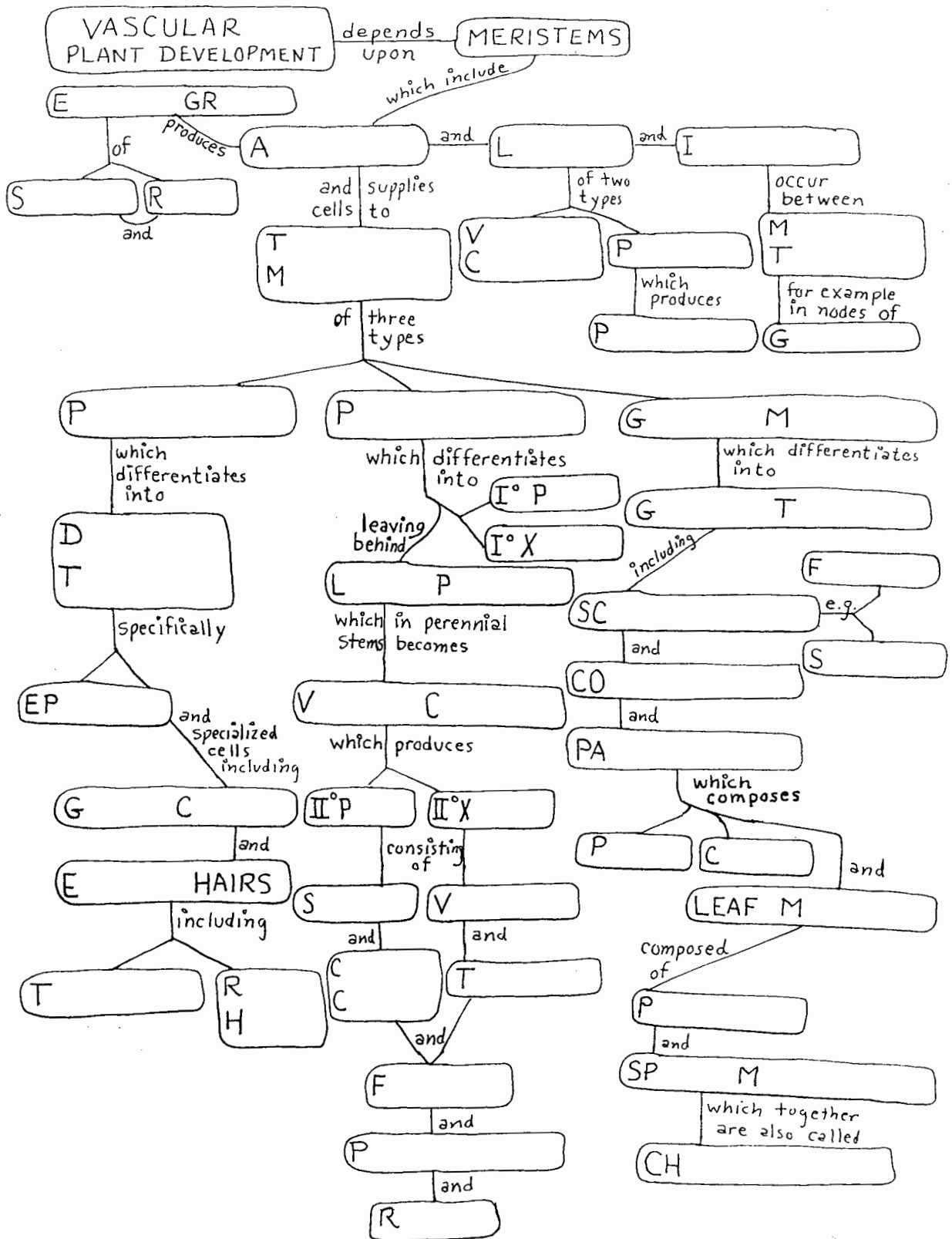
PROCEDURE: The following is a summary of the relationships between meristems and the differentiated tissues which they produce. Read the summary and note the relationships among italicized words. Then use the summary to complete the attached "concept map." Note that the reduced-size copy of the concept map included can be left blank for your review. You may be asked to submit the completed enlarged version to be graded.

Vascular plant growth depends upon the activity of regions of active cell division known as *meristems* which are of four major types: *apical*, *lateral*, *intercalary*, and *primary* (or *transitional*) *meristems*. Apical meristems cause elongation growth and may be of two types: *shoot apical* and *root apical meristems*; each occurs at the tips of shoots and roots, respectively. *Lateral meristems* are of two types: *vascular cambium* and *cork cambium* (or *phellogen*). *Intercalary meristems*, common in grass stems, are actively dividing cells located between mature tissues. Finally, three *primary* (or *transitional*) *meristems* originate from the *apical meristems*. They are *ground meristem* which develops core tissues between epidermis and vascular tissue, *protoderm* which forms epidermis, and *procambium* which forms vascular tissue.

Ground meristem forms ground (or core) tissues of three major types: *parenchyma*, *collenchyma*, and *sclerenchyma*. Parenchyma tissues compose the green, photosynthetic cells of leaf mesophyll (called *chlorenchyma*), the storage tissues of stems (called *pith* and *cortex*), and storage tissues of roots (*cortex*).

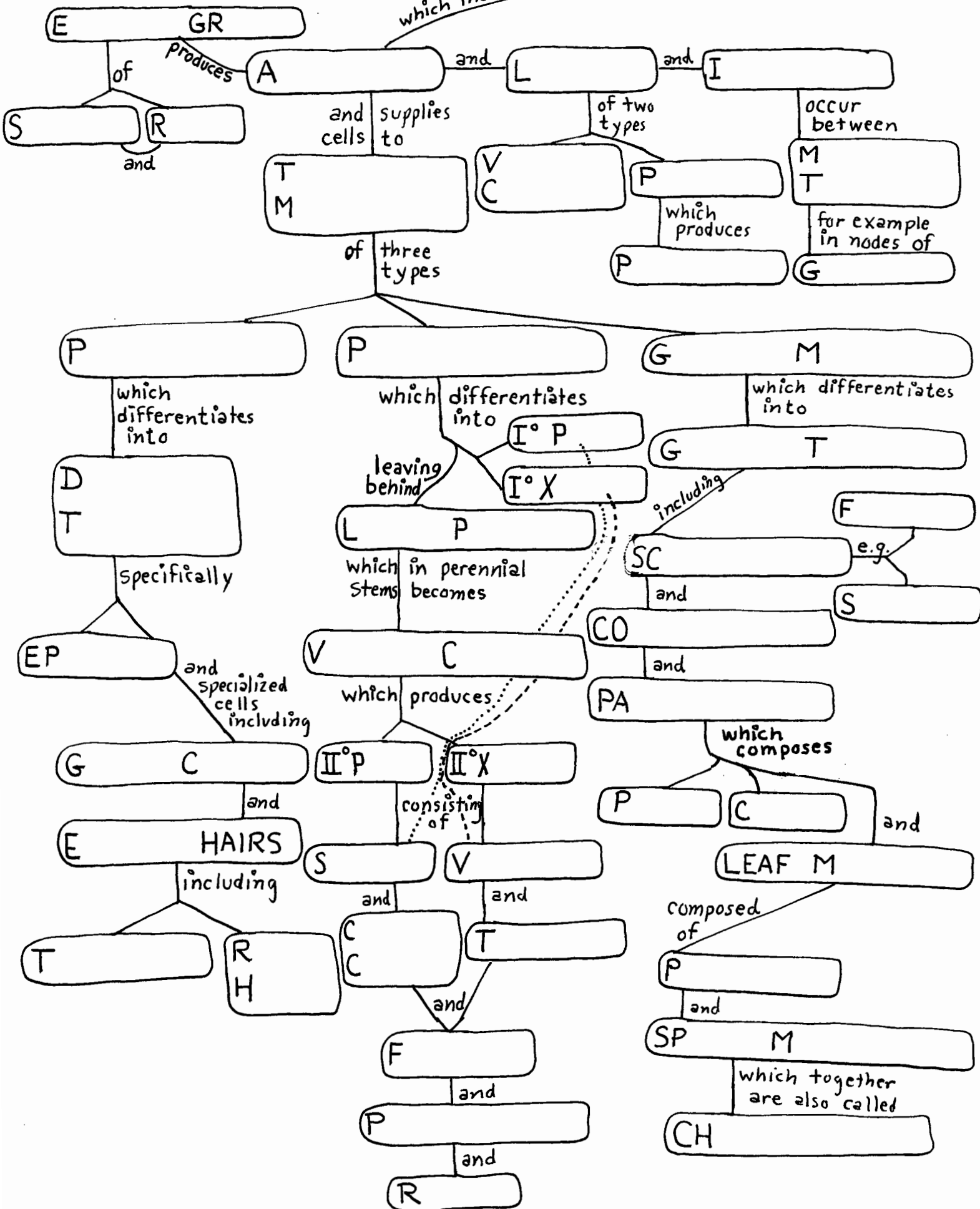
Protoderm forms dermal tissues which are the outermost layer of leaves (including *guard cells* and *leaf hairs*) and roots (including *root hairs*).

Procambium forms *primary phloem* and *primary xylem* while the young stem is still elongating. As this primary growth is completed the procambium still remains as a *latent* (i.e. "waiting") *procambium*. The latent procambium produces one of the two *lateral meristems* (see above) known as *vascular cambium* which, in turn, produces *secondary xylem* and *secondary phloem*. Xylem consists of vessels (in Magnoliophyta but not Pinophyta), tracheids, fibers, rays, and parenchyma. Phloem consists of sieve elements, companion cells (or albuminous cells in ferns and conifers), fibers, rays, and parenchyma.



NAME _____

VASCULAR PLANT DEVELOPMENT depends Upon MERISTEMS



SECONDARY GROWTH IN STEMS AND STEM MODIFICATIONS

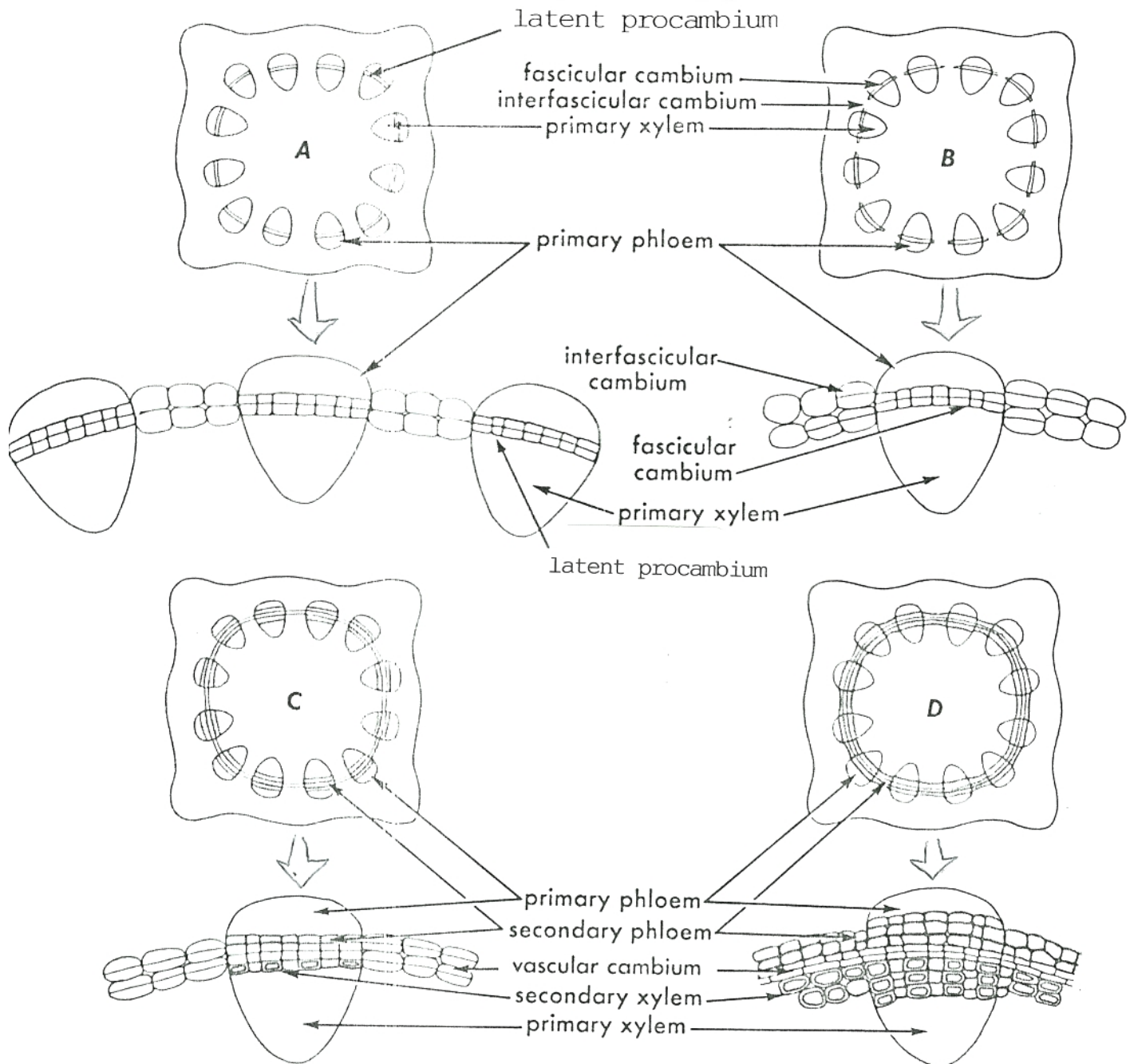


Diagram showing activation of the vascular cambium from fascicular and interfascicular cambium, and the initiation of secondary growth. *A*, primary tissues present with latent procambium remaining between primary xylem and primary phloem; *B*, intermediate stage showing division of the fascicular cambium (from latent procambium) and interfascicular cambium (from parenchyma between vascular bundles); *C*, later intermediate stage; *D*, complete ring of vascular cambium present (from joining of the fascicular and interfascicular cambium) which divides to form cells of secondary xylem (toward the inside) and secondary phloem (toward the outside).