Question1:

1. Collenchyma cells and sclerenchyma fiber cells both provide mechanical supports to plants. They are both usually elongate with thick cell walls. However, collenchyma cells provide flexible support, are lack of secondary walls, and can grow into various shapes. While sclerenchyma fiber cells provide rigid support because they have secondary walls fortified with lignin. Besides, collenchyma cells are usually in a ring shape or discrete bundles, located just beneath epidermis, while sclerenchyma fiber cells are clustered in groups
2. Collenchyma cells. Annual flowers usually have soft stems and require flexible support to bend which is exactly what collenchyma cells provide.
3. Sclerenchyma fiber cells. Perennial tree usually grows high, thus the trunk needs to have rigid support to withstand many stressors like wind or its own gravity, while flexibility is not a concern. Sclerenchyma can provide such rigid support with lignin reinforced secondary walls.

Question2:

1. The periderm consists of protective layers of tissues produced by cork cambium to prevent the tree from physical damage and predation. The periderm also has suberin, a complex polyester biopolymer to protect the plant from water loss and pathogenic organisms. It functions as a barrier of water and solutes.
2. The epidermis is covered with cuticle and surface waxes which can protect the plants from water loss, light irradiation and pathogen attack. The epidermis may also contain the hair-like trichomes to defend the plant against insects by physical barriers and deterrents to insect movement. Some may secret essential oils to prevent predation, repel insect and antimicrobials.

Question3:

1. SAM and RAM are located at tips of stems and roots, respectively. They are responsible for primary growth and all undifferentiated initial cells are arranged in meristem clusters. They grow in length.

While lateral meristems are located “inside stems”, in the regions of maturation in stems and roots that have completed growing in length. They are cylindrical (in terms of cross section view of trunk). They grow for radial expansion.

1. Lateral buds form between the stem and the leaf petiole. Lateral roots form from pericycle.
2. Dedifferentiation signaled by hormones.

Question 4:

1. Secondary growth allows for an increase in girth, so it can increase mechanical support. New xylem and phloem are produced in secondary growth as well, so it can also increase conduction for water and nutrients. Finally, the new tissues in vascular bundles and cortex can replace old tissues.
2. Gymnosperms have simpler vascular systems which is less efficient than angiosperms. Secondary growth can produce larger amount of vascular tissues to conduct water and nutrients more efficiently to compensate that. Besides, gymnosperms often live in harsh environments and need to deal with many stressors, and secondary growth can provide more mechanical support for them.
3. Monocots do not have a vascular cambium, which is a type of lateral meristem responsible for secondary growth in dicots and gymnosperms.