

SOLUTIONS TO THE STUDY GUIDE FOR MODULE #15

1. a. Physiology – The study of life processes in an organism
 - b. Nastic movement – A plant's response to a stimulus such that the direction of the response is preprogrammed and not dependent of the direction of the stimulus
 - c. Pore spaces – Spaces in the soil that determine how much water and air the soil can hold
 - d. Loam – A mixture of gravel, sand, silt, clay, and organic matter
 - e. Cohesion – The phenomenon that occurs when individual molecules are so strongly attracted to each other that they tend to stay together, even when exposed to tension
 - f. Translocation – The process by which organic substances move through the phloem of a plant
 - g. Hormones – Chemicals that circulate throughout multicellular organisms, regulating cellular processes by interacting with specifically targeted cells
 - h. Phototropism – A growth response to light
 - i. Gravitropism – A growth response to gravity
 - j. Thigmotropism – A growth response to touch
 - k. Perfect flowers – Flowers with both stamens and carpels
 - l. Imperfect flowers – Flowers with either stamens or carpels, but not both
 - m. Pollination – The transfer of pollen grains from the anther to the carpel in flowering plants
 - n. Double fertilization – A fertilization process that requires two sperm to fuse with two other cells
 - o. Seed – An ovule with a protective coating, encasing a mature plant embryo and a nutrient source
 - p. Fruit – A mature ovary that contains a seed or seeds
2. A plant uses water for photosynthesis, turgor pressure, hydrolysis, and transport. Since a plant can wilt without dying, turgor pressure can be ignored for a short time.
 3. The first plant is using nastic movements and the second is using phototropism. Nastic movements refer to movements that happen in a pre-programmed direction. Phototropism is directional, depending on the direction of the stimulus.
 4. The cohesion-tension theory states that when water evaporates through the stomata in a plant's leaves, a deficit of water is created. This causes the water molecules just below those that evaporated to move up and take their place. Since water molecules like to stay together, however, the water

molecules just below the ones that moved up also move up, in order to stay close. This causes a chain reaction, eventually causing water from the roots to move up into other parts of the plant.

5. Xylem cells need not be alive for xylem to do their job. Since we think that the cohesion-tension theory of water explains how water and dissolved nutrients travel up a plant, the xylem cells need not play an active role in the transport.
6. Phloem cells must be alive in order for the phloem to do their job, because the phloem cells take an active part in translocation.
7. Xylem contain water and dissolved minerals, while phloem contain sugar and organic substances.
8. Insectivorous plants do not really eat insects. They decompose the insects and use their raw materials for biosynthesis. Insectivorous plants produce their own food via photosynthesis just like other plants.
9. Vegetative reproduction leads to offspring with genetic codes which are identical to the parent. Sexual reproduction leads to offspring with genetic codes which are similar to, but not identical to, the parents' genetic codes.
10. The gardener must have grafted limbs from a tree that produces normal-sized apples to his crabapple tree.
11. The stamen is the male reproductive organ, and the carpel is the female reproductive organ. The carpel is sometimes called the pistil.
12. Both structures are multicellular, and they both reproduce using gametes. This is the basic definition of the gametophyte generation in an alternations of generation life cycle.
13. There is at least one sperm cell, and there is a tube nucleus.
14. Typically, there are seven cells in an embryo sac. Remember, the megaspore undergoes mitosis three times to make eight nuclei. Then, the cell segments into six small cells and one large cell that has two nuclei. Two of these cells get fertilized. One becomes the zygote, and one becomes the endosperm.
15. a. stigma b. style c. ovary d. ovule e. sepal f. anther g. filament h. petal i. receptacle j. pedicel
16. Parts a, b, and c make up the carpel.
17. Parts f and g make up the stamen.
18. Pollination is simply the transfer of pollen from an anther to a stigma, while fertilization is the act of the sperms fusing with the egg and the large central nucleus in the embryo sac. You can use the terms "stamen" and "carpel" instead of "anther" and "stigma," but the latter are more precise.
19. Two sperms cells are used, because plants engage in double fertilization.

20. The endosperm comes from the fertilization of the large, two-nucleus cell that is at the center of the embryo sac. It provides nutrition for the developing embryo.

21. Cotyledons either absorb the endosperm or aid in the transfer of nutrients from the endosperm to the embryo. This is how cotyledons provide a plant with nutrition before germination. After germination, they often perform the first photosynthesis in the plant.

22. The three basic parts are the radicle, the hypocotyl, and the epicotyl. The radicle becomes the root, the hypocotyl the stem, and the epicotyl gives rise to the first true leaves of the plant.

23. A fruit allows for the dispersal of seeds to places away from the parent.

24. There are many possible answers. The student needs at least three:

wind, bees, beetles, birds, moths, or butterflies

25. They form leaf-life structures if they end up rising above ground with the seedling. They often even carry out photosynthesis for a while.