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## EXAM VERSION "A"

***Cellular phones, unauthorized electronic devices or course notes are not allowed during this exam. Phones and devices must be turned off and put away in your bag. Do not keep them in your possession, such as in your pockets. If caught with such a device or document, the following may occur: you will be asked to leave immediately the exam, academic fraud allegations will be filed which may result in you obtaining a 0 (zero) for the exam.***

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Family Name: \_\_\_\_\_ First Name \_\_\_\_\_

Student Number \_\_\_\_\_

### **Bio 2137: Introduction to Plant Science: Biodiversity to Biotechnology Final exam**

December 2021  
Closed book exam

Professor Julian R. Starr  
Two Hours

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**Replace blanks with the most appropriate answer (41 questions, 42 points total):**

1. Unlike other angiosperms, the ANITA grade is distinguished by ovaries where the carpels may be fused in their superior portion by only a secretion and not a continuous epidermis. This characteristic is known as: \_\_\_\_\_ (1 pt)
2. What type of cell is found in the wood of Anthophyta, but not in the wood of Coniferophyta?  
\_\_\_\_\_ (1 pt)
3. Flowers pollinated by \_\_\_\_\_ are most likely to produce no nectar, have dull colors, to be relatively small, and to flower in the spring. (1 pt)
4. A simple fruit in which the whole ovary wall (pericarp) is fleshy is known as a(n)  
\_\_\_\_\_ (1 pt)
5. In the seed of Anthophyta, what is the origin (i.e., paternal, filial, maternal, or embryonic) of the seed coat? \_\_\_\_\_ (1 pt)
6. Why do plants produce complex secondary metabolites like nicotine or caffeine?  
\_\_\_\_\_ (1 pt)
7. What enzyme in the Calvin Cycle catalyzes the fixation of inorganic carbon to organic carbon?  
\_\_\_\_\_ (1 pt)
8. What colour of visible light do plants use **LEAST** for photosynthesis? \_\_\_\_\_ (1 pt)
9. Of all the pigments we discussed in class, which **SPECIFIC** pigment molecule is essential for photosynthesis in land plants?  
\_\_\_\_\_ (1 pt)
10. How many CO<sub>2</sub> molecules are required for the Calvin cycle to produce its primary sugar phosphoglyceraldehyde (PGAL)? \_\_\_\_\_ (1 pt)

11. What process commonly occurs within C<sub>3</sub> plants when oxygen levels are high and CO<sub>2</sub> levels are low? \_\_\_\_\_ (1 pt)

12. Why is noncyclic electron flow necessary for the Calvin Cycle to function? \_\_\_\_\_ (1 pt)

13. What molecule is a waste product of photosynthesis, but the essential reagent of respiration? \_\_\_\_\_ (1 pt)

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➤ For questions 14 – 17, associate the following characteristics with the appropriate cell or tissue type (use letters **a**, **b**, **c** or **d** as answers):

**a.** parenchyma      **b.** collenchyma      **c.** sieve tubes      **d.** vessel elements

14. Tube-like cells for conducting water and minerals in Anthophyta \_\_\_\_\_ (1 pt)

15. Conducting cells with primary cell walls only, living at maturity \_\_\_\_\_ (1 pt)

16. Cells where photosynthesis and storage take place \_\_\_\_\_ (1 pt)

17. Support tissue formed of living cells with unevenly thickened, non-lignified primary walls \_\_\_\_\_ (1 pt)

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18. The products of photosynthesis are transported in \_\_\_\_\_ cells. (1 pt)

19. The \_\_\_\_\_ helps the root penetrate the soil, secretes mucigel and protects the root apical meristem. (1 pt)

20. The presence of \_\_\_\_\_ in the root forces substances entering and leaving the vascular cylinder to pass through the protoplasts of endoderm cells. (1 pt)

21. Name the 9 essential nutrients that plants must obtain in large quantities to complete their life cycle:  
\_\_\_\_\_ (1 pt)

22. Nutrients can only enter or be used by plants when they are in \_\_\_\_\_ form (1 pt)

23. A nutrient deficiency is more likely to produce symptoms in younger leaves than in older leaves if the element is: \_\_\_\_\_ (1 pt)

24. As water is lost from leaves, two properties of water, \_\_\_\_\_ (1 pt) and \_\_\_\_\_ (1 pt), can explain the ascent of water from roots to leaves without chemical energy being used.

25. Water and solutes can travel from cell to cell on the inside of plasma membranes via these structure \_\_\_\_\_ (1 pt)

26. Plant nutrients required in small amounts function mainly as \_\_\_\_\_ for enzymes. (1 pt)

27. Legumes (Fabaceae; the pea family) have a special symbiosis with bacteria in what part of the plant? \_\_\_\_\_ (1 pt)

28. Nitrogen fixation consists of converting atmospheric nitrogen into \_\_\_\_\_ (1 pt)

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➤ For questions 29 – 33, associate the hormones with the appropriate response or application in plants (use letters **a**, **b**, **c**, **d** or **e** as answers):

- a.** auxins                      **b.** cytokinins                      **c.** ethylene                      **d.** abscisic acid                      **e.** gibberellins

29. Causes seeds to remain dormant until suitable conditions return \_\_\_\_\_ (1 pt)

30. Is a gas involved in fruit ripening \_\_\_\_\_ (1 pt)

31. Stimulates the growth of lateral buds making plants bushy \_\_\_\_\_ (1 pt)

32. Is involved in phototropic and gravitropic responses in stems and roots \_\_\_\_\_ (1 pt)

33. Causes cells walls to breakdown in petioles resulting in leaf loss in the fall \_\_\_\_\_ (1 pt)

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34. The shape of your Christmas tree is due to auxins that inhibit the growth of lateral buds relative to their distance from the shoot tip where the auxins are produced. This phenomenon is known as \_\_\_\_\_ (1 pt)

35. The most important stimulus for a plant is light. The relative lengths of day and night are known as a \_\_\_\_\_ (1 pt)

36. Many arctic flowering plants have leaves that resemble those found on gymnosperms like spruce (*Picea*) and pine (*Pinus*). This type of leaf morphology is an adaptation to \_\_\_\_\_ environments. (1 pt)

37. Why cannot even shrubs grow beyond the “shrubline” in the far north (cold is not the answer)? \_\_\_\_\_ (1 pt)

38. Bulbils are found on arctic species like *Saxifraga cernua* (nodding saxifrage) and *Pericarica vivipara* (bistort). What purpose do these structures serve? \_\_\_\_\_ (1 pt)

39. One of the purposes of abundant hairs on arctic and alpine plants is to maintain a layer of still air around the plant. This diminishes water loss and it helps with development by trapping warm air, but hairs are also involved in protecting the plant from another abiotic (non-living) factor in its environment. What exactly? \_\_\_\_\_ (1 pt)

40. Why do deciduous trees shed their leaves in the fall? \_\_\_\_\_ (1 pt)

41. Why are there so few annual species in the arctic? (annuals complete their life cycle in a single year) \_\_\_\_\_ (1 pt)