Springfield High School

Final Examination 2025

Subject:	Science
Date:	August 2025
Duration:	3 Hours
Maximum Marks:	100

Instructions:
1. Answer all questions.
2. Marks are indicated against each question.
3. Write neatly and clearly.
4. Read each question carefully before answering.

Answer in One Sentence

1. What is the main function of the cuticle?

Answer: The main function of the cuticle is to prevent the loss of water from the plant surface.

Difficulty Reasoning:
A straightforward question that tests the direct understanding of a key term's function. Difficulty is 7/10 as it's a core concept.

Citation:
section 6.1.1: 'The outside of the epidermis is often covered with a waxy thick layer called the cuticle which prevents the loss of water.'

2. What are subsidiary cells?

Answer: Subsidiary cells are specialized epidermal cells in the vicinity of the guard cells, differing in shape and size.

Difficulty Reasoning:
This question asks for the definition of a specific term, requiring a precise answer. Hence, a 7/10.

Citation:
section 6.1.1: 'Sometimes, a few epidermal cells, in the vicinity of the guard cells become specialised in their shape and size and are known as subsidiary cells.'

3. What is the function of root hairs?

Answer: Root hairs absorb water and minerals from the soil.

Difficulty Reasoning:
This question tests the function of a specific plant structure, a fundamental concept in plant anatomy. Difficulty is 7/10.

Citation:
section 6.1.1: 'The root hairs are unicellular elongations of the epidermal cells and help absorb water and minerals from the soil.'

4. What is mesophyll?

Answer: Mesophyll is the ground tissue in leaves, which consists of thin-walled chloroplast-containing cells.

Difficulty Reasoning:
This question requires the student to define a specific tissue type found in leaves. The specificity makes it a 7/10.

Citation:
section 6.1.2: 'In leaves, the ground tissue consists of thin-walled chloroplast containing cells and is called mesophyll.'

5. What are trichomes?

Answer: Trichomes are epidermal hairs found on the stem of a plant.

Difficulty Reasoning:
This question asks for a simple definition of a term, making it a moderately difficult question, hence a 7/10.

Citation:
section 6.1.1: 'On the stem the epidermal hairs are called trichomes.'

6. What are the two main functions of stomata?

Answer: The two main functions of stomata are to regulate transpiration and gaseous exchange.

Difficulty Reasoning:
This question requires the student to recall two functions of stomata, which is a core concept. Thus, a 7/10.

Citation:
section 6.1.1: 'Stomata regulate the process of transpiration and gaseous exchange.'

7. What is the composition of the ground tissue?

Answer: The ground tissue is composed of simple tissues like parenchyma, collenchyma, and sclerenchyma.

Difficulty Reasoning:
This question tests the student's knowledge of the components of the ground tissue, a fundamental aspect of plant anatomy. Thus, a 7/10.

Citation:
section 6.1.2: 'It consists of simple tissues such as parenchyma, collenchyma and sclerenchyma.'

Fill in the Blanks

8. The epidermal hairs on the stem are called _____.

Answer: trichomes

Difficulty Reasoning:
This question tests the knowledge of a specific term. It's a direct recall, but the term itself is specific, making it a 7/10.

Citation:
section 6.1.1: 'On the stem the epidermal hairs are called trichomes.'

9. Each stoma is composed of two bean-shaped cells known as _____ cells.

Answer: guard

Difficulty Reasoning:
A direct recall question, but it requires the student to remember the specific name of the cells, hence a 7/10.

Citation:
section 6.1.1: 'Each stoma is composed of two beanshaped cells known as guard cells which enclose stomatal pore.'

10. In leaves, the ground tissue consists of thin-walled chloroplast containing cells and is called _____.

Answer: mesophyll

Difficulty Reasoning:
This question asks for a specific term, making it moderately difficult. Thus, a 7/10.

Citation:
section 6.1.2: 'In leaves, the ground tissue consists of thin-walled chloroplast containing cells and is called mesophyll.'

11. The outside of the epidermis is often covered with a waxy thick layer called the _____.

Answer: cuticle

Difficulty Reasoning:
This question tests the knowledge of a key term. It is a direct recall question, but the term is important, making it a 7/10.

Citation:
section 6.1.1: 'The outside of the epidermis is often covered with a waxy thick layer called the cuticle...'

Answer in Brief

12. Describe the structure of stomata.

Answer: Stomata are structures in the epidermis of leaves. Each stoma has a stomatal pore enclosed by two bean-shaped guard cells. The inner walls of the guard cells are thick, while the outer walls are thin. In grasses, the guard cells are dumb-bell shaped. Some epidermal cells near the guard cells can be specialized and are known as subsidiary cells. The stomatal aperture, guard cells, and subsidiary cells together form the stomatal apparatus.

Key Points:
• Structures in the epidermis of leaves
• Stomatal pore enclosed by two guard cells
• Bean-shaped or dumb-bell shaped guard cells
• Thick inner walls and thin outer walls of guard cells
• May have surrounding subsidiary cells

Difficulty Reasoning:
This question requires the student to describe the structure of stomata in detail, including the different types of cells involved. This makes it a 7/10.

Citation:
section 6.1.1: The description of stomata is spread throughout this section.

13. Explain the role of trichomes.

Answer: Trichomes are epidermal hairs found on the stem. They are usually multicellular and can be branched or unbranched, and soft or stiff. They may also be secretory. The primary function of trichomes is to help in preventing water loss due to transpiration.

Key Points:
• Epidermal hairs on the stem
• Usually multicellular
• Can be branched or unbranched, soft or stiff
• May be secretory
• Help in preventing water loss

Difficulty Reasoning:
This question asks for a comprehensive explanation of the role of trichomes, requiring the student to recall multiple details. Thus, a 7/10.

Citation:
section 6.1.1: 'On the stem the epidermal hairs are called trichomes. The trichomes in the shoot system are usually multicellular. They may be branched or unbranched and soft or stiff. They may even be secretory. The trichomes help in preventing water loss due to transpiration.'

14. What is the ground tissue system and what does it consist of?

Answer: The ground tissue system includes all tissues in a plant except for the epidermis and vascular bundles. It is made up of simple tissues, namely parenchyma, collenchyma, and sclerenchyma. In primary stems and roots, parenchymatous cells are found in the cortex, pericycle, pith, and medullary rays. In leaves, the ground tissue is called mesophyll and contains chloroplasts.

Key Points:
• All tissues except epidermis and vascular bundles
• Consists of parenchyma, collenchyma, and sclerenchyma
• Parenchyma is found in cortex, pericycle, pith, and medullary rays
• In leaves, it is called mesophyll

Difficulty Reasoning:
This question requires a comprehensive understanding of the ground tissue system, its components, and its location in different parts of the plant. This makes it a 7/10.

Citation:
section 6.1.2: The entire section describes the ground tissue system.

15. Describe the characteristics of epidermal cells.

Answer: Epidermal cells form the outermost, usually single, continuous layer of the primary plant body. They are elongated and compactly arranged. These cells are parenchymatous, containing a small amount of cytoplasm and a large vacuole. The outer surface of the epidermis is often covered by a waxy cuticle, which is absent in roots.

Key Points:
• Outermost, single, continuous layer
• Elongated and compactly arranged
• Parenchymatous with a small amount of cytoplasm and a large vacuole
• Covered by a cuticle (except in roots)

Difficulty Reasoning:
This question asks for a detailed description of epidermal cells, requiring the student to recall several characteristics. Thus, a 7/10.

Citation:
section 6.1.1: 'The epidermis is the outermost layer of the primary plant body. It is made up of elongated, compactly arranged cells, which form a continuous layer. Epidermis is usually singlelayered. Epidermal cells are parenchymatous with a small amount of cytoplasm lining the cell wall and a large vacuole. The outside of the epidermis is often covered with a waxy thick layer called the cuticle...Cuticle is absent in roots.'

16. What are the differences between the inner and outer walls of guard cells?

Answer: The outer walls of guard cells, which are away from the stomatal pore, are thin. In contrast, the inner walls, which are towards the stomatal pore, are highly thickened. This structural difference is crucial for the opening and closing mechanism of the stomata.

Key Points:
• Outer walls are away from the stomatal pore and are thin
• Inner walls are towards the stomatal pore and are highly thickened
• This difference is important for stomatal movement

Difficulty Reasoning:
This question focuses on a specific detail about the structure of guard cells, which is important for their function. The specificity makes it a 7/10.

Citation:
section 6.1.1: 'The outer walls of guard cells (away from the stomatal pore) are thin and the inner walls (towards the stomatal pore) are highly thickened.'

Answer in Detail

17. Explain the epidermal tissue system in plants.

Answer: The epidermal tissue system is the outermost covering of the entire plant body. It comprises epidermal cells, stomata, and epidermal appendages like trichomes and root hairs. The epidermis, a single layer of compactly arranged, elongated cells, forms a continuous protective layer. These parenchymatous cells have a large vacuole and a thin layer of cytoplasm. A waxy cuticle often covers the epidermis, preventing water loss, though it is absent in roots. Stomata, present on the epidermis of leaves, regulate transpiration and gaseous exchange. Each stoma consists of a pore surrounded by two guard cells, which can be bean-shaped or dumb-bell shaped (in grasses). The epidermal appendages include unicellular root hairs for water and mineral absorption, and multicellular trichomes on the stem that help prevent water loss.

Key Points:
• Outermost covering of the plant body
• Comprises epidermal cells, stomata, and epidermal appendages
• Epidermis is a single, continuous layer of parenchymatous cells
• Cuticle prevents water loss
• Stomata regulate transpiration and gaseous exchange
• Root hairs absorb water and minerals
• Trichomes prevent water loss

Difficulty Reasoning:
This question requires a comprehensive and detailed explanation of the entire epidermal tissue system, including its components and their functions. This makes it a challenging question, hence a 7/10.

Citation:
section 6.1.1: The entire section is dedicated to the epidermal tissue system.

18. Describe the structure and function of the stomatal apparatus.

Answer: The stomatal apparatus is a crucial component of the epidermal tissue system, primarily involved in regulating gas exchange and transpiration. It consists of the stomatal aperture (the pore), two guard cells, and the surrounding subsidiary cells. The guard cells are specialized, bean-shaped (or dumb-bell shaped in grasses) cells that enclose the stomatal pore. They have thin outer walls and highly thickened inner walls. The guard cells contain chloroplasts and control the opening and closing of the stomata. The subsidiary cells are specialized epidermal cells that are located near the guard cells and differ in shape and size. The entire apparatus works in a coordinated manner to facilitate the exchange of gases like carbon dioxide and oxygen, and to control water loss through transpiration.

Key Points:
• Comprises stomatal aperture, guard cells, and subsidiary cells
• Guard cells enclose the stomatal pore
• Guard cells have thin outer walls and thick inner walls
• Guard cells contain chloroplasts
• Regulates gas exchange and transpiration
• Subsidiary cells are specialized epidermal cells near guard cells

Difficulty Reasoning:
This question requires a detailed description of the stomatal apparatus, including all its components and their functions. The level of detail required makes it a 7/10.

Citation:
section 6.1.1: 'Each stoma is composed of two beanshaped cells known as guard cells which enclose stomatal pore... The stomatal aperture, guard cells and the surrounding subsidiary cells are together called stomatal apparatus (Figure 6.1).'

19. Differentiate between the epidermal appendages: root hairs and trichomes.

Answer: Root hairs and trichomes are both epidermal appendages, but they differ in their location, structure, and function. Root hairs are found on the roots, are unicellular elongations of epidermal cells, and their primary function is to absorb water and minerals from the soil. In contrast, trichomes are found on the shoot system (stem), are usually multicellular, and can be branched or unbranched, and soft or stiff. They may also be secretory. The main function of trichomes is to help in preventing water loss due to transpiration. So, while both are outgrowths of the epidermis, they are adapted for very different roles in the plant.

Key Points:
• Root hairs are on roots, trichomes are on the stem
• Root hairs are unicellular, trichomes are usually multicellular
• Root hairs absorb water and minerals
• Trichomes prevent water loss
• Trichomes can be branched/unbranched, soft/stiff, and secretory

Difficulty Reasoning:
This question requires a detailed comparison of two different structures, highlighting their differences in location, structure, and function. This requires a good understanding of both, making it a 7/10.

Citation:
section 6.1.1: 'The root hairs are unicellular elongations of the epidermal cells and help absorb water and minerals from the soil. On the stem the epidermal hairs are called trichomes. The trichomes in the shoot system are usually multicellular...The trichomes help in preventing water loss due to transpiration.'

20. Explain the ground tissue system and its components in different parts of a plant.

Answer: The ground tissue system encompasses all tissues of a plant except for the epidermis and the vascular bundles. It is composed of simple tissues: parenchyma, collenchyma, and sclerenchyma. The distribution and function of these tissues vary in different parts of the plant. In the primary stems and roots, parenchymatous cells are found in the cortex, pericycle, pith, and medullary rays, where they are involved in storage, photosynthesis, and secretion. In leaves, the ground tissue is specialized into mesophyll, which consists of thin-walled, chloroplast-containing cells and is the primary site of photosynthesis. The ground tissue system, therefore, plays a vital role in various metabolic and structural functions of the plant.

Key Points:
• All tissues except epidermis and vascular bundles
• Composed of parenchyma, collenchyma, and sclerenchyma
• In stems and roots, parenchyma is in cortex, pericycle, pith, and medullary rays
• In leaves, ground tissue is called mesophyll
• Mesophyll contains chloroplasts and is the site of photosynthesis

Difficulty Reasoning:
This question requires a comprehensive explanation of the ground tissue system, including its components and their distribution in different plant organs. This makes it a challenging question, hence a 7/10.

Citation:
section 6.1.2: The entire section is dedicated to the ground tissue system.