



**■ - BASF**

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# Plant Science Certification

## Study Guide

# CERTIFICATION OVERVIEW

The BASF Plant Science Certification verifies individuals have a solid understanding of plant science, including plant processes, nutrition, genetics and evaluation. In addition, the certification exam assesses major topics in the plant science industry, including water resources and measurement, crop production, fertilizer and pesticide safety, pests and diseases, and scientific classification.

## EXAM OVERVIEW

The BASF Plant Science Certification is hosted on the iCEV testing platform. The certification exam is a 100-question, randomized assessment. Exam questions are in the format of multiple choice, sort order, diagramming, matching, labeling and other question types meant to fully evaluate an individual's competency of the industry standards. The certification exam should be proctored within a controlled environment. The proctor of the exam must review and verify all exam procedures and provide electronic documentation through the exam platform.

More information about the certification exam and testing platform, including optional preparation materials offered by iCEV, can be found at <https://www.icevonline.com/plantscience>.

## ABOUT BASF

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. More than 117,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of €59 billion in 2019. BASF shares are traded on the stock exchange in Frankfurt (BAS) and as American Depositary Receipts (BASFY) in the U.S. Learn more at <https://agriculture.basf.us/crop-protection/Plant-Science-Certification.html>.

# INDUSTRY STANDARDS

The certification exam assesses knowledge and skills from the following weighted industry standards set by BASF:



## PLANT ANATOMY- 10%

Plant Cell Biology  
Plant Structures



## CLASSIFICATION & NOMENCLATURE- 5%

Plant Type  
Plant Classification  
Taxonomic Hierarchy  
Cells, Tissues, Organs & Organ Systems



## PLANT PROCESSES- 15%

Cell Cycle  
Plant Life Cycle  
Plant Cycle  
Plant Hormones & Growth Regulators  
Photosynthesis, Respiration & Transpiration  
Plant Nutrition



## PLANT GENETICS- 10%

Plant Reproduction  
Plant Biology  
Plant Breeding  
Biotechnology



## **CROP PRODUCTION- 5%**

- Midwest Region
- Northeast Region
- Southern Region
- Northern Region



## **PLANT PESTS- 25%**

- Bacterial Disease
- Fungal Diseases
- Viruses
- Chewing Insects
- Sucking Insects
- Vertebrates
- Weeds



## **FERTILIZERS, PESTICIDES & HERBICIDES- 15%**

- Application Methods
- Equipment
- Records & Schedules
- Proper Handling & Storage
- Effects on the Environment



## **WATER RESOURCES- 15%**

- Properties of Water
- Sources of Water
- Hydrologic Cycle
- Freshwater Storage
- Water Quality & Pollution
- Wastewater
- Water & Watershed Conservation

# Industry Standard Overview

To pass the BASF Plant Science Certification exam, certification candidates must have adequate knowledge of the industry standards. The following outlines an in-depth overview of the industry standards and sub-standards:

## Industry Standard: Plant Anatomy



- Cells
  - Parenchyma Cells
  - Sclerenchyma Cells
  - Collenchyma Cells
  - Xylem tissue Cells
  - Phloem tissue Cells
  - Epidermal Cells
- Cell Membrane
- Cell Wall
- Chloroplast
- Cytoplasm
- Golgi Apparatus
- Mitochondria
- Nucleus
- Ribosomes
- Rough Endoplasmic Reticulum
- Smooth Endoplasmic Reticulum
- Vacuole
- Plant Parts
  - Roots
  - Stems
  - Leaves
  - Flowers
  - Fruit
  - Seeds

## Industry Standard: Classification & Nomenclature



- Taxonomic Hierarchy
  - Kingdom
  - Division
  - Class
  - Order
  - Family
  - Genus
  - Species

## Industry Standard: Plant Processes



- Plant Growth
- Germination
- Plant Hormones & Growth Regulators
- Plant Process
  - Absorption
  - Photosynthesis
  - Respiration
  - Transpiration
- The Cell Cycle
  - Interphase
    - G1 phase
    - S phase
    - G2 phase
  - Mitosis (M Phase)
    - Prophase
    - Metaphase
    - Anaphase
    - Telophase
- DNA
- Genes
- Proteins
- Carbohydrates
- Lipids
- Soil

## Industry Standard: Plant Genetics



- Plant Breeding
- Mendel's Principles of Inheritance
- Fundamental Theory of Heredity
- Genotypes
- Genetic Engineering
  - DNA Extraction
  - Gene Cloning
  - Gene Design
  - Transformation
- Backcross Breeding

## Industry Standard: Crop Production



- Seasonal Crops
- Grains
- Vegetables
- Fruit Crops
- Oilseed & Special Purpose Crops
- Forage Crops
- Field Crops
- Nut Crops
- Fiber Crops
- Row Crops
- Sugar Crops

## Industry Standard: Plant Pests



- Pests
  - Insects
  - Vertebrates
  - Nematodes
  - Weeds
  - Pathogens
    - Fungal
    - Bacterial
    - Viral
- Disease
- Fungal Diseases
- Life Cycle of Fungi
- Different Types of Fungi
- Bacterial Diseases
- Viruses
- Mosaic Virus
- Insects
- External Structure of Insects
- Complete Metamorphosis
- Incomplete Morphosis
- Insects
- Techniques of Pest Control
- Pesticides
- Weeds

## Industry Standard: Fertilizers, Pesticides & Herbicides



- Herbicides
- Pesticides
- Types of Fertilizers

## Industry Standard: Water Resources



- Hydroponics
- Watersheds in the U.S.
- Groundwater
- Surface Water
- Acre Feet
- Watersheds
- Indoor & Outdoor Water Conservation

# Optional Preparation Materials Overview

The preparation materials offered by iCEV for the BASF Plant Science Certification was specifically created to prepare candidates for the certification exam. While it is not required to complete the preparatory materials before accessing the certification exam, BASF recommends certification candidates complete some form of training. The following outlines the lessons scope and objectives:

## Lesson 1: Anatomy of Plants

1. To identify plant structures and functions.
2. To describe the structure of plant cells.
3. To explain the process of reproduction in plants.

## Lesson 2: Scientific Classification & Nomenclature of Plants

1. To identify different plant types.
2. To identify techniques used in plant classification.
3. To evaluate the plant naming system.
4. To identify different types of organisms in an ecosystem.
5. To evaluate the levels of organization in multicellular organisms.

## Lesson 3: Fundamental Plant Processes

1. To identify the importance of plants.
2. To discuss the cell cycle.
3. To discuss the plant life cycle.
4. To identify factors which affect plant growth and development.
5. To evaluate the effects of plant growth regulators.
6. To discuss important plant processes.

## Lesson 4: Plant Genetics

1. To identify the process of cell reproduction and growth.
2. To evaluate the importance of DNA in plant cells.
3. To discuss terms related to plant genetics.
4. To evaluate cell structures and functions.
5. To identify the history and use of plant breeding.
6. To discuss technologies used in agricultural plants.

## Lesson 5: Plant Nutrition

1. To identify functions of plant parts.
2. To evaluate plant processes.
3. To analyze the structure and function of organic molecules in plants.
4. To identify plant growth requirements.
5. To evaluate the needs of soil and water for plants.
6. To identify nutrients and nutrient deficiencies in plants.
7. To evaluate the impact of human activity on ecosystems.

## **Lesson 6: Plant Evaluation**

1. To analyze the anatomy and physiology of plants.
2. To evaluate the environmental impacts made on plants.
3. To discuss the physiological disorders impacting plants.
4. To identify diseases affecting plants.
5. To discuss the application of plant evaluation in both urban and agricultural settings.

## **Lesson 7: Crop Production in the United States: Midwest Region**

1. To identify major crops grown in the Midwest region of United States.
2. To discuss the value of crop production in each state located in the Midwest Region.
3. To analyze trends in crop production for the Midwest Region.

## **Lesson 8: Crop Production in the United States: Northeast Region**

1. To identify major crops grown in the Northeast region of the United States.
2. To discuss the value of crop production for each state located in the Northeast region.
3. To analyze trends in crop production for the Northeast region.

## **Lesson 9: Crop Production in the United States: Southern Region**

1. To identify major crops grown in the Southern region of the United States.
2. To discuss the value of crop production in each state located in the Southern Region.
3. To analyze trends in crop production for the Southern Region.

## **Lesson 10: Crop Production in the United States: Western Region**

1. To identify major crops grown in the Western region United States.
2. To discuss the value of crop production in each state located in the Western Region.
3. To analyze trends in crop production for the Western Region.

## **Lesson 11: Hydroponics**

1. To analyze the process of growing plants using hydroponics.
2. To identify hydroponic systems and techniques.
3. To evaluate various plants grown hydroponically.

## **Lesson 12: Plant Pests: Bacterial Diseases**

1. To identify bacterial diseases associated with common plants and crops.
2. To analyze the characteristics associated with common bacterial diseases of plants.
3. To identify the uses and types of prevention and treatment methods.
4. To identify the scientific names, characteristics, environmental conditions, prevention methods and treatment methods.
5. To identify bacterial diseases.

### **Lesson 13: Plant Pests: Fungal Diseases**

1. To identify diseases associated with common plants and crops.
2. To analyze the characteristics associated with common diseases of plants.
3. To identify the uses and types of prevention and treatment methods.
4. To identify fungal disease characteristics, environmental conditions, prevention methods and treatment methods.
5. To identify fungal diseases.

### **Lesson 14: Plant Pests: Viruses**

1. To identify viruses associated with common plants and crops.
2. To analyze the characteristics associated with common viruses of plants.
3. To identify viruses.

### **Lesson 15: Plant Pests: Chewing Insects**

1. To identify pests associated with common plants and crops.
2. To analyze the characteristics associated with common pests of plants.
3. To identify the uses and types of pesticides.
4. To identify plant pests characteristics, effects on plants, prevention methods, treatment, life cycles and economic impact.
5. To identify chewing insects.

### **Lesson 16: Plant Pests: Sucking Insects**

1. To identify pests associated with common plants and crops.
2. To analyze the characteristics associated with common pests of plants.
3. To identify the uses and types of pesticides.
4. To identify plant pests characteristics, effects on plants, prevention methods, treatment, life cycles and economic impact.
5. To identify sucking insects.

### **Lesson 17: Plant Pests: Vertebrates**

1. To identify pests associated with common plants and crops.
2. To analyze the characteristics associated with common pests of plants.
3. To identify vertebrate pests.

### **Lesson 18: Plant Pests: Weeds**

1. To identify pest associated with common plants and crops.
2. To analyze the characteristics associated with common pests of plants.
3. To identify the uses and types of prevention and treatment methods.
4. To identify weeds.

## **Lesson 19: Fertilizers & the Environment**

1. The student will gain a basic knowledge of fertilizers.
2. The student will learn the proper application of plant and crop fertilizers.
3. The student will learn the importance of safety and environmental concerns related to fertilizers.

## **Lesson 20: Pesticides & Herbicides: An Introduction**

1. The student will identify a number of common pests.
2. The student will become familiar with the various types of pesticides and herbicides.
3. The student will learn the proper pesticide and herbicide safety methods.
4. The student will become familiar with IPM (integrated pest management).

## **Lesson 21: Water Resources**

1. Describe the influence of weather factors.
2. Describe the influence of climatic factors.
3. Define watershed boundaries.
4. Identify potential sources of pollution.
5. Discuss policies of ecology management.

## **Lesson 22: Water Measurement**

1. To identify the origin and use of water in a watershed.
2. To describe the dynamics of a watershed.
3. To discuss the measurement of water quality and water resources in a watershed.
4. To describe how water quality is impacted by natural and anthropogenic influences.
5. To identify water and watershed conservation practices.