**Assignments and guidelines for IWS.**

**ASSIGNMENT AND RECOMMENDATIONS ON SRSP.**

“Physiological basis of plants productivity

*Lector: prof. Kenzhebayeva S.S*

Quest for the CDS to the thematic cluster 1
Date - Week 1-15

Number of scores - 20 scores
**Title 1.** Importance of agricultural productivity, its main components  Main internal factors affecting on productivity**.** Objective: The study of Importance of agricultural productivity, its main components  Main internal factors affecting on productivity Analysis of the physiological components affecting on productivity.
***Form of: Oral and written survey***.
***Assignments:***
1. Drought Resistance by Engineering Plant Tissue-Specific Responses.

Stomatal-Mediated Drought Responses.

Cuticular Wax Production.

Carbon Allocation. Root Traits.

 Transforming C3 crops into C4.

Questions:
1. The plants main physiological processes.

Stages of development of plant physiology.
3. The main approaches to the study of plant physiology processes of life.

4. . Membranes, their structure and function. Physiological plant responses of crops to stresses involve mechanisms to prevent membrane
6. The cell wall. The chemical composition and structure (middle lamella, primary,
secondary, tertiary wall). Formation of the cell wall.
8. Mitochondria. Structure and function.
9. Compartmentation of cellular metabolism.
10. The structure and function of biological membranes. Communication functions and structures.
11. Types of transport of substances across cell membranes.

**MODULE 2 Title .** Environmental factors affecting crop yields

**Title 2:** Importance of photosynthesis and crop yield.

1. .***Purpose:*** To study the impact of photosynthesis metabolism on plants productivity.
**Form of:** Oral and written survey.
**Assignments:**
1. Drought Resistance by Engineering Plant Tissue-Specific Responses.
2. Stomatal-Mediated Drought Responses.
3. Cuticular Wax Production.
4. Carbon Allocation. Root Traits.
5. Transforming C3 crops into C4.
6. Plant secondary metabolites production
7. the light phase of photosynthesis.
8. Dark phase of photosynthesis

 **Questions:**
1. Improvement of rhe root system of a body of water absorption
2. Osmotic water absorption.

3. The plant cell as an osmotic system
5. Transpiration and the top end engine.
6. Indicators of transpiration.
7. Stomatal regulation of transpiration.
8. Make the task of the calculation of the rate of transpiration, transpiration rate, productivity, transpiration, relative transpiration - thrift transpiration

**Theme :** Photosynthesis as a target to improve plants productivity..
**Purpose:** To study the physiological importance of light and dark phase of photosynthesis.
**Form of:** Oral and written survey.
**Assignments:**
1. Prepare a message about the importance of photosynthesis in plant life.
2. Prepare as graphics or tables description of the Calvin cycle.
3. Prepare as graphics or tables description C4 - way of photosynthesis.
4. Prepare as graphics or tables description of himself - the way of photosynthesis.

1. Primary Processes of Photosynthesis
2. Structure, Function and Biogenesis of the Photosynthetic Apparatus
3. Photosystem II and Water Oxidation Mechanism
4. Energy Transfer and Trapping in Photosystems
5. Photosystem I and Bacterial Photosynthesis
6. Carbon Fixation (C3 and C4) and Photorespiration
7. Artificial Photosynthesis for Hydrogen and Carbon-based Solar Fuels
8. Regulation of Photosynthesis and Environmental Stress
9. Systems Biology of Photosynthesis: Integration of Genomic, Proteomic, Metabolomic and Bioinformatic Studies
10. Applied aspects of Photosynthesis: BioH2 and Bioelectricity
11. Emerging Techniques for Studying Photosynthesis

Students should think of the structural features of leaf photosynthesis as a body, to know the

device to absorb light, gas exchange and transport the products of photosynthesis. Chloroplast -

organelle performing photochemical and biochemical reactions of photosynthesis. Necessary to

analyze the differences in the structure of the sheet and the structure of chloroplasts in plants

C3 - and C4 - types of carbon dioxide assimilation.

Analyzing the processes that make up the light stage of photosynthesis, remember that the

main result is the formation of its assimilative power - NADPH and ATP.

Characterizing the electron transport system, the student must pay attention to component

composition, the final structure of the electron donors and ETC, ETC noted areas in which

electron transport requires energy from the outside, and ETC sites in which electron transport

occurs spontaneously and is accompanied by the release of energy. You should know how the

storage of energy in the form of ATP. Discussing the nature of phosphorylation, it is useful to

recall the structure of chloroplasts, select compartments, which forms a membrane organelle

system, recall organization ETC in thylakoid membranes as proton transport is activated by the

process of electron transport, as well as a gradient of hydrogen ions across the thylakoid

membrane.

Analyzing the Calvin cycle, a sequence of biochemical changes divided into three phases: I)

carboxylation, 2) reduction, 3) regeneration of the acceptor. You should know the primary

acceptor and primary product cycle properties рибулозобисфосфаткарбоксилазы (RuBFK)

and the role of light in the regulation of the dark reactions of photosynthesis. Stimulated

transport of protons and light ions Mg 2 + is a leading factor in the activation of key enzymes of

the Calvin cycle.

**Questions:**
1. Cs-way photosynthesis
2. C4 photosynthetic pathway
3. Photosynthesis by type Crassulaceae
4. Photorespiration
5. Dependence of photosynthesis on environmental factors.

Number of scores - 20 scores
**Title 3 Topic: Respiration and** **Its Importance and Applications in increase plants productivity**

.**Purpose:** To study the impacts of physiology of respiration in plants productivity.
**Form of:** Oral and written survey.
**Assignments:**
1. . Prepare as graphics or tables description of the anaerobic phase - glycolysis.
2. Prepare as graphics or tables description of the Krebs cycle.
3. Prepare as graphics or tables description of electron transport chain in mitochondria.
4. Prepare as graphics or tables description of the pentose phosphate pathway.
5. Prepare the message "The dependence of respiration on environmental factors"

**Questions:**
1. Krebs cycle. The sequence of reactions. Energy yield.
2. Glyoxylate cycle.
3. Pentose phosphate pathway of glucose oxidation.
4. Mitochondrial electron transport chain.
5. Oxidative phosphorylation. Chemiosmotic theory of Mitchell.
6. Dependence of respiration on environmental factors (oxygen concentration,
carbon dioxide, temperature, water regime, minerals, light)

Date – week8
Number of scores - 20 scores
**Title 4 Theme:** Effect of mineral nutrition of plants on productivity.. Macronutrients.
**Purpose:** To study the physiology of mineral nutrition of plants. The value of macro and microelements.
Form of: Oral and written survey.
**Assignments:**

Impact of major source of micronutrients (Fe, B, Cl, Mn, Zn, Cu, Mo, Ni) on increase plants productivity. Main areas of research work

The effect of macronutrients (N, P, K, Ca, S, Mg, C, O, H) needed for plant growth and development, and productivity.

1. Prepare as graphics or tables describing the history of the theory of mineral nutrition of plants.
2. Prepare as graphics or tables description of the macro, micro and ultramicroelements.
3. Prepare as graphics or tables description of the nitrogen cycle and phosphorus in nature.
4. Prepare as a scheme "The physiological significance of trace elements in the plant."
**Questions:**
1. Content of mineral elements in the plant. The basic nutrients necessary for plant life.
2. Nitrogen. The nitrogen cycle in the biosphere. Available for plants of nitrogen.
3. Reduction of nitrate.
4. Path of assimilation of ammonia. Amino acids and amides in plants.
5. Phosphorus. Available for plants phosphorus compounds. The participation of phosphorus in metabolism.
6. Potassium, calcium, magnesium, and physiological significance.
7. Trace elements and their physiological significance.

**Theme:** The growth and development of plants. Cell ontogeny. Stages of ontogeny of higher plants.
**Purpose:** To study the ontogeny of cells and stages of ontogeny of higher ratseny.
Form of: Oral and written survey.
**Assignments:**
1. "The stages of ontogeny of higher plants." Prepare as graphics or tables.
3. The structure of the ovule. Double fertilization. Represented in the form of a diagram or table.
4. Stages of embryo development.
5. "The influence of external factors on the growth and development of plants." Prepare as a message.
**Questions:**

Date - week 10
Maximum scores -20 scores
**Title 4 Theme** : The growth and development of plants. Hormonal system.

Mechanisms of salinity tolerance. Integrated physiological response to salinity.

Effect of salinity stress on oxidative stress

Effect of salinity stress on plant development
To study the hormonal system of plants.
**Form of:** Oral and written survey.
**Assignments:**
1. "Auxins, structure, physiological significance," Prepare as a chart or table.
2. "Cytokinins, structure, physiological significance," Prepare as a chart or table.
 3. "Gibbereliny, structure, physiological significance," Prepare as a chart or table.
Each class of hormones should be characterized by the following plan:

1. The chemical nature.

2. Place fusion.

3. Transport.

4. Compartmentation.

5. A possible mechanism of action in terms to increase plants productivity.

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**Questions**1. Hormonal regulation of growth and development.
2. Auxins. Structure and function.
3. Cytokinins. Structure and function.
4. Gibberellinе. Structure and function.
5.Abstsiziny. Structure and function.
b. Ethylene. Structure and function.

**Title 6. Theme** : Mechanisms of Resistance of plants to adverse conditions sredy. Salinity and drought.
Purpose: To study the mechanisms of resistance ratseny drought and salinity
Form of: Oral and written survey.
**Assignments:**
1. "Physiology of stress. Strategies to adapt to stressors. " Prepare as graphics or tables

2. "Mechanisms of plant resistance to drought," Prepare as graphics or tables.
3. "Mechanisms of plant resistance to salinity," Mechanisms of plant resistance to drought and salinity "

4. Screening techniques for pest and disease resistance.

5. Field Screening. Laboratory Screening.

Screening Techniques for Diseases Resistance. Types of molecular markers.

6. Marker assisted selection (MAS) for the tolerance to abiotic and biotic stresses, and quality traits.

7. Root Characters Affecting Plant Resilience to Abiotic Stresses

8. Advances in Molecular Breeding Toward Drought

1. Strategies for crop improvement against salinity

**Questions:**

.What is stress and stressors?
2. Strategy of adaptation of plants to stressors.
3. Mechanisms of plant resistance to drought.
4. Mechanisms of plant resistance to salinity.

5. Mechanisms of plant resistance to biotic stress.

6. Plant resistance to patogens (fungi, bactria, viruses).

2. **Forms of knowledge and skills:**
Forms of knowledge and competence in the section: Basics of Plant Physiology
Control works: 1c semester (5 points)
CDS: individual and group tasks, depending on the organization of the CDS technology (abstract, presentation, essay, defense project, analysis and other tasks of design and research character) - 10 points.
Activities at the labs - 5 points
RK: Week 7
Intermediate control: an examination during the examination session.
Criteria for evaluation of knowledge and skills, the scores in%
1 Test (on 7 week) 25
Visiting and activity in laboratory studies (1 point x 5 sessions)       5
Individual or group assignments (CDS) (2 points x 5 job) 10
Intermediate control (test) 40
Miftern examination 100 scores

2 Test (on 14 week) 25

The form of the many foreign controls (written and oral) and the exam - in writing