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| **Unit:** |  | |
| **Teacher name:** |  | |
| **Date:** |  | |
| **Grade:** 11 | Number present: | Number absent: |
| **Theme of the lesson:** | **Growth substances. The mechanism of action of growth substances on the plant.** | |
| **Learning objectives(s) that this lesson is contributing to** | • 11.1.7.3 исследовать механизм действия стимуляторов роста растений | |
| **Lesson objectives** | **Learners will be able to:**  understand an increasing range of supported questions which ask for personal information; respond to questions on an increasing range of general and some curricular topics using me, too and I don’t. Write with support a sequence of short sentences in a paragraph to give basic personal information; | |

**Lesson plan**

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| --- | --- | --- | --- | --- |
| **Planned timings** | **Teacher's actions** | **Pupils` actions** | **Assessment** | **Resources** |
| 0-13 minute  Middle of the lesson  14-20  21-31  32-37 | **Activation of prior knowledge.**  Actualization of knowledge. Brainstorming session.  - What is the growth of plants?(Growth is an irreversible increase in the size and mass of the body, associated, among other things, with the appearance of new parts (cells, tissues, organs). Growth expresses quantitative changes in the body of a plant.)  - How does the growth of a plant differ from the growth of animals and humans? (the constant growth of plants, the constant change of the main organs, growth – the only possibility of moving plants).  - What do you know about substances that stimulate plant growth and why they can not be called plant hormones?   |  |  |  | | --- | --- | --- | | **Russia** | **Englig** | **Kazah** | | **стимуляторы роста** | Growth stimulators | өсу стимуляторлары | | **гормоны** | hormones | гормондар | | **ауксины** | auxin | ауксиндер | | **цитокинины** | cytokinins | цитокининдер | | **гиббереллины** | gibberellins | гиббереллиндер | | **абсцизовая кислота** | abscisic acid | абсцисса қышқылы | | **этилен** | ethylene | этилен | | **промоторы** | promoters | промоторлар | | **ингибиторы** | inhibitors | ингибиторлар | | **испарение** | evaporation | булану |   Students form a topic and get acquainted with the purpose of training.  Group work. Students are divided into 5 groups. Groups clean up the work in the form of a poster.  1. Auxins  2. Cytokines  3abscisic acid  4. Gibberelins  5. Ethylene  **Evaluation criteria**   * knows the main groups of growth promoters; * describes the chemical structure of each growth stimulator; * describes how each growth stimulator affects plants.   After the end of the defense of the topic, all posters are posted on the walls of the office. Based on the knowledge gained, students fill out a table on the types of plant growth stimulants and their effects.   |  |  |  |  | | --- | --- | --- | --- | | **Types of stimulants** | **Chemical structure** | **place of synthesis** | **Mechanism of action** | | Auxins |  |  |  | | Cytokines |  |  |  | | Abscisic acid |  |  |  | | Gibberelins |  |  |  | | Ethylene |  |  |  |   Test  Short test will help individually assess student’s progress. Self-assessment with key terms. | write it down in a notebook | - | **Appendix 1**  **Appendix 2** |
| End of the lesson  38-40 | Reflection  *“I need additional help from teacher with…”*  *‘I enjoyed or did not enjoy the lesson today because…* | stickers | Feedback |  |

**Appendix 1**

**“Jigsaw reading”**

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| **Auxin**  [Auxins](https://en.wikipedia.org/wiki/Auxin) are compounds that positively influence cell enlargement, bud formation and root initiation. They also promote the production of other hormones and in conjunction with [cytokinins](https://en.wikipedia.org/wiki/Cytokinin), they control the growth of stems, roots, and fruits, and convert stems into flowers. Auxins were the first class of growth regulators discovered.They affect cell elongation by altering cell wall plasticity. They stimulate [cambium](https://en.wikipedia.org/wiki/Cambium_(botany)), a subtype of [meristem](https://en.wikipedia.org/wiki/Meristem) cells, to divide and in stems cause [secondary xylem](https://en.wikipedia.org/wiki/Secondary_xylem) to differentiate. Auxins act to inhibit the growth of buds lower down the stems ([apical dominance](https://en.wikipedia.org/wiki/Apical_dominance)), and also to promote lateral and adventitious root development and growth. Leaf abscission is initiated by the growing point of a plant ceasing to produce auxins. Auxins in seeds regulate specific protein synthesis, as they develop within the flower after [pollination](https://en.wikipedia.org/wiki/Pollination), causing the flower to develop a fruit to contain the developing seeds. Auxins are toxic to plants in large concentrations; they are most toxic to [dicots](https://en.wikipedia.org/wiki/Dicot) and less so to [monocots](https://en.wikipedia.org/wiki/Monocot). |
| **Cytikinins**  Cytikinins were discovered by Skoog and Miller 1957 ; while working on the callus under in vitro conditions. They found the callus that develops from the stem explants, containing both pith and vascular elements, develops well.  But the explants containing just pith cells produces callus, but further growth of its stops, even in the presence of optimal concentration of auxins.  This is because the cell in the callus somehow rendered incapable of cell division.  If such callus is supplanted with vascular tissues, extract of vascular tissues, coconut milk or malt extracts, the growth of the callus will be restored and the cells exhibit mitotic activity.  This effect has been attributed to the presence of some active principle in the supplanted coconut milk.  Cytokinins in coconut milk  have various functions in association with other hormones or its accessories. Thidiazuron is a new class of cytokinin, it inhibits cytokinin oxidase that is why it is extensively used in plant tissue culture. There are 200 or more synthetic cytokinins. |
| [**Gibberellins**](https://en.wikipedia.org/wiki/Gibberellin)  [Gibberellins](https://en.wikipedia.org/wiki/Gibberellin) (GAs) include a large range of chemicals that are produced naturally within plants and by fungi. They were first discovered when Japanese researchers, including Eiichi Kurosawa, noticed a chemical produced by a fungus called [*Gibberella fujikuroi*](https://en.wikipedia.org/wiki/Gibberella_fujikuroi) that produced abnormal growth in rice plants. It was later discovered that GAs are also produced by the plants themselves and they control multiple aspects of development across the life cycle. The synthesis of GA is strongly upregulated in seeds at germination and its presence is required for germination to occur. In seedlings and adults, GAs strongly promote cell elongation. GAs also promote the transition between vegetative and reproductive growth and are also required for pollen function during fertilization. |
| **Abscisic acid**  [Abscisic acid](https://en.wikipedia.org/wiki/Abscisic_acid) (also called ABA) is one of the most important plant growth inhibitor. It was discovered and researched under two different names before its chemical properties were fully known, it was called *dormin* and *abscicin II*. Once it was determined that the two compounds are the same, it was named abscisic acid. The name "abscisic acid" was given because it was found in high concentrations in newly abscissed or freshly fallen leaves.  This class of PGR is composed of one chemical compound normally produced in the leaves of plants, originating from [chloroplasts](https://en.wikipedia.org/wiki/Chloroplast), especially when plants are under stress. In general, it acts as an inhibitory chemical compound that affects [bud](https://en.wikipedia.org/wiki/Bud) growth, and seed and bud dormancy. It mediates changes within the apical meristem, causing bud dormancy and the alteration of the last set of leaves into protective bud covers. Since it was found in freshly abscissed leaves, it was thought to play a role in the processes of natural leaf drop, but further research has disproven this. In plant species from temperate parts of the world, it plays a role in leaf and seed dormancy by inhibiting growth, but, as it is dissipated from seeds or buds, growth begins. In other plants, as ABA levels decrease, growth then commences as [gibberellin](https://en.wikipedia.org/wiki/Gibberellin) levels increase. Without ABA, buds and seeds would start to grow during warm periods in winter and be killed when it froze again. |
| **Ethylene**  [Ethylene](https://en.wikipedia.org/wiki/Ethylene) is a gas that forms through the breakdown of methionine, which is in all cells. Ethylene has very limited solubility in water and does not accumulate within the cell but diffuses out of the cell and escapes out of the plant. Its effectiveness as a plant hormone is dependent on its rate of production versus its rate of escaping into the atmosphere. Ethylene is produced at a faster rate in rapidly growing and dividing cells, especially in darkness. New growth and newly germinated seedlings produce more ethylene than can escape the plant, which leads to elevated amounts of ethylene, inhibiting [leaf expansion](https://en.wikipedia.org/wiki/Leaf_expansion). As the new shoot is exposed to light, reactions by [phytochrome](https://en.wikipedia.org/wiki/Phytochrome) in the plant's cells produce a signal for ethylene production to decrease, allowing leaf expansion. Ethylene affects cell growth and cell shape; when a growing shoot hits an obstacle while underground, ethylene production greatly increases, preventing cell elongation and causing the stem to swell. The resulting thicker stem can exert more pressure against the object impeding its path to the surface. If the shoot does not reach the surface and the ethylene stimulus becomes prolonged, it affects the stem's natural [geotropic](https://en.wikipedia.org/wiki/Geotropic) response, which is to grow upright, allowing it to grow around an object. |

**Appendix 2**

**Test**

1.Pruning of plants promotes branching because the axillary buds get sensitized to

A Ethylene

B Gibberellin

C Indole acetic acid

D Cytokinins

2.Induction of cell division and delay in senescence is done by

A CoA

B Cytokinins

C GA

D Auxins

3. Gibberellins can promote seed germination because of their influence on

A Absorption of water through hard seed coat

B Synthesis of abscisic acid

C Rate of cell division

D Production of hydrolyzing enzymes

4. Which is a weedicide? -12

A IAA

B NAA

C 2,4D

D IBA

5.The plant hormone controlling fruit ripening is

A GA

B IAA

C ABA

D Ethylene