LESSON PLAN

National High School of Computer Science “Tudor Vianu”
Teacher: Marinescu Mirela
Subject: Biology
11th Grade
Topic: The spinal cord – structure and functions
Lesson aim: knowing the structure of the spinal cord and the way the nervous system functions based on the reflex arc.
Type of lesson: acquiring new information
Types of interaction: teacher-students, student-student, group work

<table>
<thead>
<tr>
<th>Targeted aims</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Using learning by discovery for highlighting the structure and the functions of the human body</td>
<td>O1 – be able to identify the elements of the spinal cord and of the spinal nerves, with the help of illustrations, worksheets and atlases of human anatomy</td>
</tr>
<tr>
<td>A2 Using the correct and adequate scientific terminology</td>
<td>O2 – be able to correctly define and/or explain the terminology used throughout the lesson</td>
</tr>
<tr>
<td>A3 Presenting, using anatomical models, the functions of human organs and systems of organs</td>
<td>O3 – be able to identify the components of the reflex arc</td>
</tr>
<tr>
<td>A4 Using the knowledge about the influence environmental factors have on the functions of the human body in our daily lives</td>
<td>O4 – be able to explain the transmission of information within the reflex arc after watching a video/short film and studying the illustration of the structure of spinal cord and that of the spinal nerves</td>
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<tr>
<td></td>
<td>O5 – be able to apply the acquired knowledge for the lesson on the patellar reflex</td>
</tr>
</tbody>
</table>

Materials:
Didactic materials: atlas of human anatomy, large illustrations of the structure of spinal cord, spinal nerves and the reflex arc, textbook, work and evaluation sheets, models of a cross-section of a human heart, computers and educational software
Methods: explanation, conversation, demonstration, observation, working with models
Bibliography: 1. D.Cristescu, C. Niculescu, R.Carmaciu – Biology textbook, 11th grade, Corint Publishing House
2. I. Rosu, A. Ardelean – Biology textbook, 11th grade, Corint Publishing House
3. T. Tiplic – Biology textbook, 11th grade, Niculescu Publishing House
4. C. Ioan – Biology in images and schematics, Studenteasca Publishing House
5. T. Tiplic – Tests for matriculation exam, Aramis Publishing House
<table>
<thead>
<tr>
<th>No.</th>
<th>Aim</th>
<th>Targeted aims</th>
<th>Teacher activity</th>
<th>Students’ activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anticipatory set - Identifying the students’ prior knowledge</td>
<td></td>
<td>The teacher asks questions about the nervous system; based on the ss’ contributions, the teacher connects prior knowledge to the new lesson by highlighting that the spinal cord is a bundle of nervous tissue that acts both as a conduit for motor information and for sensory information. The teacher then announces the title and the objectives of the lesson.</td>
<td>The students answer the questions.</td>
</tr>
</tbody>
</table>
| 2.  | Direct instruction - Presenting the main components of the lesson    | O1            | - the spinal cord has 2 functions: it conducts sensory information via the white matter and it conducts motor information from the brain via the reflex arc;  
- the teacher distributes the worksheets, the atlases, illustrations and also makes sure the correct images are visible on the computers;  
- the teacher points the location of the spinal cord using a scale model of the human body;  
- the teacher draws on the board the schematic representation of a cross-section through the spinal cord and spinal nerves;  
- the teacher encourages ss to draw conclusions regarding the structure of the spinal cord and its importance for the human body. | The students discuss the computer images and fill in the evaluation chart, after working in groups.  
- the ss present the structure of the spinal cord using the computer images or the illustrations, as well as the information from their worksheets;  
- the ss draw the structure of the spinal cord and the reflex arc; they explain the reflex arc. |
|     | - Warm-up (getting ss’ interested)                                   | O2, O3, O4, O5|                                                                                                                                                                                                                                                                                                                                                     |                           |
|     | - Guiding students during teaching                                   |               |                                                                                                                                                                                                                                                                                                                                                     |                           |
| 3.  | Consolidating knowledge                                             |               | - it is done throughout the entire lesson                                                                                                                                                                                                                                                                                                      |                           |
| 4.  | Feed-back                                                           | O2, O3, O4    | - the ss are asked to correctly match elements learned during the lesson using exercises from the educational software                                                                                                                                                                                                                       | Students solve the required problems. |
| 5.  | Evaluation                                                          |               | - evaluation test  
- the teacher corrects the tests and gives marks to ss who were active participants during class.                                                                                                                                                                                                                                      | - the ss solve the exercises in writing, using the evaluation sheets. |
WORKSHEET

- the spinal cord is located inside the v…….. c…….. and it is protected by the spinal meninges, a structure made up of 3 layers of tissue: dura mater (which comes into direct contact with bones/bone tissue), the arachnoid and pia mater (which come into direct contact with the nervous system); between the arachnoid and the pia mater there is a space which contains cerebrospinal fluid.

CROSS - SECTION OF THE SPINAL CORD

a. – grey matter located in the …………. in the shape of …………. ; it is made up of n…….. c…….. b…………; forms structures called h…………
- horns – anterior with m……………. function (contain motor/efferent neurons)
- ………….with sensory function (contains s…………….. neurons and interneurons)
- lateral with reflex function (½ posterior with viscerally-sensitive function
½ anterior with v……….. function)

b. - white matter located in …………. ; made up of c…………. (a………, p………, l……….. ); contains ascendent and d…………. pathways

  1. – ascendent pathways (s………..)
  2. - …………….pathways (motors )

Conclusion: ½ anterior part of the spinal cord has a …………. nature
½ posterior part of the spinal cord has a …………. nature
- in the central part there is the …………. canal where …………. fluid can be found

Structure of spinal nerve

- the spinal nerve connects the spinal cord with r……….. and e………..

  Structure
  * - 2 r………….1. – posterior (s…………….); on its pathway there is the s……………
g……………. (here we find …………. neural cell which send their dendrites towards r………….;
  2. – anterior (m……………); on its pathway there are motor neural a………..
  * - t……………. ( mixed); comes from the combination of the 2 roots
  * - b …………. which it is directed towards e………..

REFLEX ARC REPRESENTATION

- place the neurons in the schematic representation, according to the one-way direction of the transmission of nervous impulse.
**SPINAL CORD – STRUCTURE AND FUNCTIONS**

**Structure of spinal cord**
- grey matter – forms horns
  - anterior (motor function)
  - posterior (sensory function)
  - lateral (vegetative/reflex function)
- white matter – forms columns

**Structure of a spinal nerve**
- 2 roots
  - ventral root (carry efferent motor axons)
  - dorsal root (carry afferent sensory axons); along its path there is a spinal ganglion
- trunk (mixed)
- branches (carrying signals toward effectors)

**Schematic representation of the reflex arc**

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stimulus ➔ RECEPTOR ➔ CNS ➔ EFFECTOR ➔ reaction
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**CROSS SECTION OF SPINAL CORD AND SPINAL NERVE**

(illustration)
EVALUATION SHEET

- fill in the following table with adequate conclusions

**The structure of the spinal cord**

<table>
<thead>
<tr>
<th>no.</th>
<th>Structure of the spinal cord</th>
<th>Localization</th>
<th>Contains the following part of the neuron</th>
<th>Forms the following structure</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White matter</td>
<td>axon, ........</td>
<td>............................</td>
<td>-anterior, p......, l......</td>
<td>- pathways for transmission of nervous impulses</td>
</tr>
<tr>
<td>2</td>
<td>..................</td>
<td>interior .....</td>
<td>............................</td>
<td>horns: -anterior (...........), p........(s...........), l........(v........../reflex)</td>
<td>- ........  ........../nerve plexus</td>
</tr>
</tbody>
</table>

**Structure of spinal nerve**

<table>
<thead>
<tr>
<th>no.</th>
<th>Spinal nerve structure</th>
<th>Function of spinal nerve in human body</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>- 2 roots: anterior p........</td>
<td>-t........</td>
</tr>
<tr>
<td>2</td>
<td>functions</td>
<td>- m........</td>
</tr>
<tr>
<td>3</td>
<td>The structure of spinal nerve elements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-anterior root contains .... of ........ n........</td>
<td>-contains a..... and d....... which are formed by the combination of the 2 r.......</td>
</tr>
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</table>
- fill in the following table with adequate conclusions

### The structure of the spinal cord

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<tr>
<td>1.</td>
<td>White matter</td>
<td>exterior</td>
<td>axon, dendrite</td>
<td>columns: -anterior, posterior, lateral</td>
<td>- pathways for transmission of nervous impulses</td>
</tr>
<tr>
<td>2.</td>
<td>Grey matter</td>
<td>interior</td>
<td>neural cell bodies</td>
<td>horns: -anterior (motor), posterior (sensory), lateral (vegetative/reflex)</td>
<td>- nervous centre/nerve plexus</td>
</tr>
</tbody>
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### Structure of spinal nerve

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<tr>
<td>1.</td>
<td>- 2 roots: anterior posterior - trunk - branches</td>
<td>- connects <strong>human body</strong> with <strong>Receptor</strong> and <strong>Effector</strong>, making possible the survival of the human body in a given environment.</td>
</tr>
<tr>
<td>2.</td>
<td>functions</td>
<td>- mixed -mixed</td>
</tr>
<tr>
<td>3.</td>
<td>The structure of spinal nerve elements</td>
<td></td>
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- anterior root contains axons of motor neurons
- posterior root contains dendrites and spinal ganglion on the pathway, which contains neural cell bodies
- contains axons and dendrites which are formed by the combination of the 2 roots
- contains dendrites which come in contact with Receptors and axons with terminal buttons which come in contact with Effectors