**Тема:** **Electromagnet**.

**Цели:** Активизировать в речи учащихся использование новой лексики, связанную с   электромагнитом.

**Задачи**:

1) читать текст с пониманием основного содержания

2) воспринимать текст на слух, добиваясь в случае необходимости понимания с помощью переспроса, уточняющих реплик;

 3) повторение лексического материала

**Тип урока:** Обяснение новой темы

**Оборудование:** ИКТ, лекция соответствующая содержанию урока

**Procedure of the lesson:**

**Task 1. Translate into Russian the following word-combinations.**To be wound, side by side, a donut shape, ferromagnetic core, the right-hand rule, a
continuous supply of electrical energy, tiny magnets, flow of positive charge, the wire wrapped
around the iron.

**Read and translate the text. Electromagnet**.

 Electromagnet is a type of magnet in which the magnetic field is produced by the flow of
electric current. The magnetic field disappears when the current ceases.
 A wire with an electric current passing through it, generates a magnetic field around it, this
is a simple electromagnet. The strength of magnetic field generated is proportional to the amount of current.
 In order to concentrate the magnetic field generated by a wire, it is commonly wound into
a coil, where many turns of wire sit side by side. The magnetic field of all the turns of wire passes through the center of the coil. A coil forming the shape of a straight tube, a helix (similar to a corkscrew) is called a solenoid; a solenoid that is bent into a donut shape so that the ends meet is a toroid. Much stronger magnetic fields can be produced if a "core" of ferromagnetic material, such as soft iron, is placed inside the coil. The ferromagnetic core magnifies the magnetic field to thousands
of times the strength of the field of the coil alone, due to the high magnetic permeability μ of the
ferromagnetic material. This is called a ferromagnetic-core or iron-core electromagnet.
 The direction of the magnetic field through a coil of wire can be found from a form of the
right-hand rule. If the fingers of the right hand are curled around the coil in the direction of current flow (conventional current, flow of positive charge) through the windings, the thumb points in the direction of the field inside the coil. The side of the magnet that the field lines emerge from is defined to be the North Pole.
 The main advantage of an electromagnet over a permanent magnet is that the magnetic field can be rapidly manipulated over a wide range by controlling the amount of electric current.
However, a continuous supply of electrical energy is required to maintain the field.
 The material of the core of the magnet (usually iron) is composed of small regions called
magnetic domains that act like tiny magnets (see ferromagnetism). Before the current in the
electromagnet is turned on, the domains in the iron core point in random directions, so their tiny
magnetic fields cancel each other out, and the iron has no large scale magnetic field. When a current is passed through the wire wrapped around the iron, its magnetic field penetrates the iron, and causes the domains to turn, aligning parallel to the magnetic field, so their tiny magnetic fields add to the wire's field, creating a large magnetic field that extends into the space around the magnet. The larger the current passed through the wire coil, the more the domains align, and the stronger the magnetic field is. Finally all the domains are aligned and further increases in current only cause slight increases in the magnetic field: this phenomenon is called saturation.
 When the current in the coil is turned off, most of the domains lose alignment and return to a random state and the field disappears. However in some materials some of the alignment persists, because the domains have difficulty turning their direction of magnetization, leaving the core a weak permanent magnet. This phenomenon is called hysteresis and the remaining magnetic field is called remanent magnetism. The residual magnetization of the core can be removed by degaussing.

**Vocabulary:**

**a helix** – винтовая линия, спираль
**a donut shape** – кольцевая форма
**a toroid** – тороид, тородоидальный сердечник
**the crosse** – крест, пересечение, крестовина
**the dot** - точка
**random direction** – произвольное направление
**to align** - выравнивать
**to degauss** – размагничивать

**Answer the questions:**
1. What is the main purpose of an electromagnet?
2. When does the magnetic field disappear?
3. Why is the magnetic field generated by a wire commonly wound into a coil?
4. What coil is called a solenoid?
5. When can much stronger magnetic fields be produced?
6. What is the quantity of the magnetic field magnified by the ferromagnetic core?
7. What rule can be applied to find the direction of the magnetic field? Explain this rule.
8. What is the advantage of an electromagnet over a permanent magnet?
9. What is called a magnetic domain?
10. Tell about the domains alignment.
11. When do the domains lose alignment?
12. What phenomenon is called hysteresis?
13. What can the residual magnetization of the core be removed by?

**Task 2. Define the part of speech of the following words.**Flow, magnetic, through, around, proportional, in order to, many, strength, coil, donut,
stronger, permeability, ferromagnetic, advantage, winding, permanent, maintain, act, tiny, domain.

**Task 3. Find the right translation of the giving words.**1. the strength of the magnetic field a) выравнивать
2. a coil b) случайное направление
3. a donut shape c) закручивать(ся) в спираль
4. ferromagnetic material d) насыщение
5. iron-core electromagnet e) размагничивание
6. curl f) кольцевая форма
7. magnetic domain g) электромагнит с железным сердечником
8. random direction h) катушка
9. align i) напряженность магнитного поля
10. saturation j) ферромагнитный материал
11. degaussing k) магнитный домен

**Task 4. Fill in the missing words. Define the prepositions and conjunctions among them.**1. Electromagnet is a type \_\_\_ magnet in which the magnetic field is produced \_\_\_ the flow
of electric current.
2. A wire \_\_\_ an electric current passing \_\_\_ it, generates a magnetic field \_\_\_ it.
3. \_\_\_ concentrate the magnetic field generated by a wire, it is commonly wound \_\_\_ a coil,
\_\_\_ many turns of wire sit side by side.
4. Much stronger magnetic fields can be produced \_\_\_ a "core" of ferromagnetic material,
such as soft iron, is placed \_\_\_ the coil.
5. The material \_\_\_ the core \_\_\_ the magnet (usually iron) is composed \_\_\_ small regions
called magnetic domains.
6. \_\_\_ the current in the electromagnet is turned on, the domains in the iron core point \_\_\_
random directions.
7. \_\_\_ some materials some of the alignment persists, \_\_\_ the domains have difficulty turning
their direction of magnetization, leaving the core a weak permanent magnet.

**Task 5. Restore the sentences.**1. The magnetic field \_\_\_\_\_\_\_\_\_\_ (исчезает) when the current \_\_\_\_\_\_\_(приостанавливается).
2. \_\_\_\_\_\_ (напряженность) of magnetic field generated is proportional to \_\_\_\_\_(количеству тока).

3. The magnetic field of all \_\_\_\_ (обмоток провода) passes through the center of the coil.
4. \_\_\_\_\_(ферромагнитный сердечник) magnifies \_\_\_\_\_\_\_\_\_\_ (магнитное поле) to
thousands of times the strength of the field of the coil alone.
5. The direction of the magnetic field through a coil of wire can be found \_\_\_\_\_\_\_ ( на основе правила правой руки).
6. The material of the core of the magnet (usually iron) is composed of small regions called
\_\_\_\_\_\_\_\_\_\_ (магнитные домены) that act like tiny magnets (see ferromagnetism).
7. \_\_\_\_ (Чем больше) the current passed through the wire coil, \_\_\_\_\_\_\_\_\_\_ (тем больше) the domains align, and \_\_\_\_\_\_\_\_\_\_ (тем сильнее) the magnetic field is.
8. \_\_\_\_\_\_(Остаточная намагниченность) of the core can be removed by \_\_\_(размагничиванием).

**Task 6. Define the explanation of the following terms.**1. Electromagnet is a type of magnet in which the magnetic field is produced by the flow of
electric current.
2. A wire with an electric current passing through it, generates a magnetic field around it.
3. A coil forming the shape of a straight tube, a helix (similar to a corkscrew).
4. The ferromagnetic core magnifies the magnetic field to thousands of times the strength of
the field of the coil alone, due to the high magnetic permeability μ of the ferromagnetic material.
5. The material of the core of the magnet (usually iron) is composed of small regions that act
like tiny magnets (see ferromagnetism).
6. Finally all the domains are aligned and further increases in current only cause slight
increases in the magnetic field.
7. In some materials some of the alignment persists, because the domains have difficulty
turning their direction of magnetization, leaving the core a weak permanent magnet.

a) A solenoid.
b) Saturation.
c) A simple electromagnet.
d) Hysteresis
e) Electromagnet
f) Magnetic domains
g) A ferromagnetic-core or iron-core electromagnet

**Task 7. Translate into English.**

1. Электромагнит — устройство, создающее магнитное поле при прохождении электрического тока.

2. Обычно электромагнит состоит из обмотки и ферромагнитного сердечника,
который приобретает свойства магнита при прохождении по обмотке тока.

3. В электромагнитах, предназначенных, прежде всего, для создания механического
усилия также присутствует якорь (подвижная часть магнитопровода), передающий усилие.

4. Обмотки электромагнитов изготовляют из изолированного алюминиевого или
медного провода, хотя есть и сверхпроводящие электромагниты. Магнитопроводы
изготовляют из магнитно-мягких материалов — обычно из электротехнической или
качественной конструкционной стали, литой стали и чугуна, железоникелевых и
железокобальтовых сплавов.

5. Солено́ ид (от греч. σωλήνας — трубка, είδος — вид), — катушка провода,
намотанного на цилиндрическую поверхность.

6. Если длина соленоида намного больше его диаметра и не используется магнитный
материал, то при протекании тока по обмотке внутри катушки создаётся магнитное поле,
направленное вдоль оси, которое однородно и для постоянного тока по величине равно

7. В нейтральных электромагнитах постоянного тока сила притяжения зависит только
от величины тока в обмотке и не зависит от направления тока.

8. В электромагнитах переменного тока питание обмотки осуществляется от источника
переменного тока, магнитный поток периодически изменяется по величине и направлению, а
однонаправленная сила притяжения меняется только по величине, в результате чего сила
притяжения пульсирует от нуля до максимального значения с удвоенной частотой по
отношению к частоте питающего тока.