**TOPIC: “PASSIVE COMPONENTS OF A CIRCUIT”**

**STUDY READING**

**VARIANT I**

**~~Задание 1. Убедитесь, что Вы правильно произносите следующие слова. Проверьте себя по словарю.~~**

Certain; circuit; high; allow; isolate; equation; require; contain; weight; gain; capacitance; quantity; determine; measure; value; technique; unique; unipolar; liquid; typical; heater; advantage; unidirectional; portable.

**Задание 1. Переведите следующие интернациональные слова.**

**Две колонки – в одной англ. , в другой дать перевод**

Component; constant; tendency; material; determine; energy; transfer (n, v); mechanism; symbol; characteristics; typical; diode; resistor; voltage; indicator; apparatus; characteristic; proportional; instrument; phase; battery.

**Задание 2.\* Сгруппируйте слова согласно их частям речи и переведите их.**

а) - n / существительные, б) - v / глаголы,

в) - adj / прилагательные, г) - adv / наречия.

1. measurement; 2. electric; 3. commonly; 4. circuit; 5. equation;

6. restrict; 7. сollide; 8. heat; 9. often; 10. electrical; 11. length 12. offer; 13. high; 14. inversely; 15. proportional.

1. **n 2 – adj 3 - adv 4 – n 5 – n 6 – v 7 – v 8 – n 9 – adv 10 – adj 11 – n 12 – v 13 – adj 14 – adv 15 – adj**

**Задание 3. Подготовьте чтение и перевод текста.**

**TEXT I**

|  |  |
| --- | --- |
| restrict - ограничивать  flow - поток  resistance - сопротивление  amount - количество  determine - определить  equation - равенство  voltage - напряжение  inversely - обратно  hence - следовательно  reduce – уменьшить | circuit – cхема  figure – рисунок  terminal – клемма  insulator - изолятор  conductor - проводник  whereas – в то время как  сross sectional area – площадь поперечного сечения  сollide - сталкиваться |

**Passive Components of a Circuit (~ 4100)**

(1)A passive component of a circuit is an electronic component containing1 no source of power, in contrast to active components. (2)The three basic elements used2 in electric circuits are the resistor, capacitor, and inductor. (3)They are considered to be important components of an electric circuit. (4)They also have their own standard symbols and units of measurement.

(5)Restricting3 the flow of electrons or electric current to a certain level is called4 *resistance* and the device or component used to restrict5 the electric current is called *resistor*.

(6)The amount of electric current restricted by the resistor is determined by using6 the [Ohm’s Law](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/semiconductor/ohmslaw.html) equation.

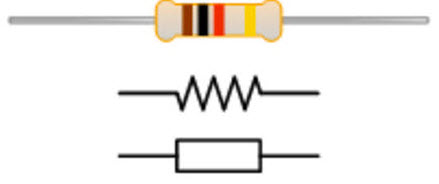


where R = Resistance, V = Voltage, I = Electric current

(7)The electric current flowing7 through a resistor is inversely proportional to the resistance of a resistor and directly proportional to the[*voltage*](http://www.physics-and-radio-electronics.com/electromagnetics/electrostatics/potential-difference.html) applied8 across the resistor.

(8)In other words, the amount of electric current flowing through the resistor is expected to decrease with increasing9 the resistance of a resistor (if voltage applied across resistor is kept constant) and increases with increasing the voltage applied across the resistor (if resistance of a resistor is kept constant) . (9)Georg Simon Ohm (16 March 1789 – 6 July 1854) discovered the relationship between voltage and current in electrical circuits (“Ohm's Law”).

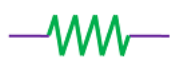
(10)Resistors are the most commonly used electronic components in the circuits. (11)A resistor is an electronic component that reduces or restricts the flow of electrons or electric current to certain level.



(12)How much electric current a resistor blocks depends on the resistance of a resistor. (13)The resistors with more resistance will block large amount of electric current and allow very small amount of electric current. (14)The resistors with less resistance is sure to block very small amount of electric current and allow large amount of electric current. (15)The electric current blocked by the resistor is wasted in the form of heat.

(16)Resistors are the passive components. (17)Hence, they cannot control10 the flow of electrons or electric current through them. (18)However, they can restrict11 the electric current to certain level.

(19)The symbol for a resistor is a zigzag line as shown below. (20)The letter "R" is used in equations. (21)The resistor consists of two terminals. (22)The terminals of the resistors are used to connect with other components through an electrical wire.



(23)The amount of electric current blocked by the resistor is measured in ohms. (24)The Ohm is often represented12 by the omega symbol: Ω.

(25)Ohm is the amount of electric current blocked by the resistor. (26)It allows one ampere of electric current to flow when an applied voltage of one volt is kept constant.

(27)We know that materials are mainly classified into two types: insulators and conductors.

(28)Insulators block large amount of electric current and allow very small amount of electric current whereas conductors allow large amount of electric current.

(29)Resistors with more resistance are known to act as insulators whereas the resistors with less resistance act as conductors.

(30)Resistance of a resistor depends on two factors: length and cross sectional area.

(31)The resistance of a resistor is directly proportional to the length of a resistor. (32)The long length resistors are likely to offer high resistance because the free electrons have to travel13 large distance. (33)Hence, a large number of [free electrons](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/introduction/free-electrons.html) collide with the [atoms](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/introduction/atom.html). (34)Therefore, large amount of [energy](http://www.physics-and-radio-electronics.com/physics/energy/what-is-energy.html)or electric current will be14 wasted in the form of heat.

(35)The short length resistors offer low resistance because the free electrons have to travel only a short distance. (36)Hence, a small number of free electrons collides the atoms. (37)Therefore, only a small amount of electric current is wasted in the form of heat.

(38)The resistance of a resistor is15 inversely proportional to the cross sectional area of resistor. (39)The resistors with large cross sectional area provide more space for the free electrons to move freely.

(40)Hence, the collision of free electrons with the atoms is less. (41)Therefore, very small amount of electric current is wasted.

(42)The resistors with small cross sectional area provide very small space for the free electrons. (43)Hence, the collision of free electrons with the atoms is more. (44)Therefore, large amount of electric current is wasted.

(45)Advantages of resistors

Resistors are very small. Hence, it is very easy to carry them from one place to another place.

Resistors are very cheap. Hence, it is easy to replace them.

Resistors do not depend on the external source of voltage. Hence, external voltage or energy is not needed for operating the resistors.

Disadvantages of resistors.

Resistors with high resistance oppose large amount of electric current. Hence, large amount of energy is wasted in the form of heat.

**Задание 4 Укажите номера предложений с Complex Subject (Сложное подлежащее).**

**Ответ: 3, 8,29, 32.**

**Задание 5.\* Письменно ответьте на вопросы.(ВОПРОС – НОМЕР ПРЕДЛОЖЕНИЯ)**

1. What is a passive component of a circuit?(1)

2. What are the three basic elements usedin electronic circuits?(2)

3. What is resistance?(5)

4. What device is called resistor? (5)

5. Is the electric current inversely proportional to the resistance of a resistor or to the[voltage](http://www.physics-and-radio-electronics.com/electromagnetics/electrostatics/potential-difference.html) applied across the resistor?(7)

6. When does the amount of electric current flowing through the resistor decrease?(8)

7. What factors does the resistance depend on? (12)

8. What form is the electric current wasted in? (15)

9. Can resistors control the flow of electrons?(17)

10. What is the symbol for resistance?(19)

11. What letter is used for resistance in equations?(20)

12. What are the terminals used for? (22)

13. What is the unit of resistance?(23/24)

14. Does Resistor belong to insulators or conductors?(29)

15. What factors does resistance of a resistor depend on?(30)

16. What are the advantages and disadvantages of resistors?(45)

**Задание 6.\*Сгруппируйте синонимы:**

**Даю пары синонимов их нужно перемешать**

1. including - containing
2. components - elements
3. figures – symbols
4. limited - restricted
5. determined - defined
6. using – employing
7. relationship – correlation
8. flowing – streaming
9. usually – commonly
10. decrease – reduce
11. permit – allow
12. wire – cable
13. measure – evaluate
14. Insulator – dielectric
15. Advantage - benefit

**Задание 7.\* Сопоставьте термины (А) с их определениями (Б). (ДЕЛАЕМ КАК ФОТКУ ВНИЗУ НАЧАЛО И КОНЕЦ)**

|  |  |
| --- | --- |
| **А** | **Б** |
| 1. A passive component of a circuit … | 1. … restricting the flow of electrons or electric current to a certain level. |
| 2. Resistor is … | 2. … the amount of electric current blocked by the resistor and allowed one ampere of electric current when an applied voltage of one volt is kept constant. |
| 3. Resistance is… | 3. … is an electronic component containingno source of power, in contrast to active components. |
| 4. Ohm is… | 4. … large amount of electric current and allow very small amount of electric current. |
| 5. Insulators block … | 5. … the device or component used to restrict the electric current. |
|  | 6. … the property of a conductor to accumulate electric charge. |
|  | 7. … a device consisting of two electrodes having unidirectional conduction. |

**1-3; 2-5; 3-1; 4- 2; 5- 4**

**Задание 8.\* Закончите предложения.(КАК В ПРЕДЫДУЩЕМ)**

|  |  |
| --- | --- |
| 1. Resistance, capacitance and inductance have … | 1. … inversely proportional to the resistance of a resistor and directly proportional to the[voltage](http://www.physics-and-radio-electronics.com/electromagnetics/electrostatics/potential-difference.html) applied across the resistor. |
| 2. The amount of electric current is determined by … | 2…. increasing the voltage applied across the resistor. |
| 3. The electric current flowing through a resistor is … | 3. … two types: insulators and conductors. |
| 4. The amount of electric current flowing through the resistor decreases with … | 4. … the resistance of a resistor. |
| 5. The amount of electric current flowing through the resistor increases with … | 5. … the flow of electrons or electric current through them. |
| 6. The amount of electric current a resistor blocks depends on … | 6. … their own standard symbols and units of measurement. |
| 7. The electric current blocked by the resistor is wasted … | 7. … more space for the free electrons to move freely. |
| 8. Resistors cannot control … | 8. … increasing the resistance of a resistor |
| 9. Materials are mainly classified into … | 9…. in the form of heat. |
| 10. The resistors with large cross sectional area provide … | 10. … using the [Ohm’s Law](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/semiconductor/ohmslaw.html) equation. |

**1-6; 2-10; 3-1; 4-8; 5-2; 7-9; 8-5; 9-3; 10-7**

**AVERAGE READING**

**VARIANT I**

**Задание 1. Просмотрите текст и выберите к нему заглавие из предложенных Вам.** **(ОБЫЧНЫЙ ВОПРОС)**

a) Electronic components applications.

b) The concept of Color Code System.

c) **Passive components in electrical circuits**.

**Задание 2. Определите главную идею статьи из предложенных Вам вариантов.** **(ОБЫЧНЫЙ ВОПРОС)**

a) The article deals with some information on advantages and drawbacks of passive components.

b) The article is about different electronic components applications.

c) The aim of the article is to provide the reader with some data on the types of electronic components.

**d) The main** idea of the article is to give the reader specifications, values, ratings and application of passive components in electrical circuits.

**Задание 3. Просмотрите список вопросов. На какие вопросы Вы можете ответить, не читая текст? Просмотрите текст и ответьте на данные вопросы письменно.**

1. What is an electronic color code system?(11)

2. When was it developed?(12)

3. In what components are the color codes used?(10)

4. What are the disadvantages of the color code technique? (17 , 18)

5. Is it possible to use the color coding technique in variable resistors?(18)

6. Why are color codes used in resistors instead of directly printing the resistance value?(13)

7. What is a capacitor?(22)

8. What is the capacitance?(23)

9. What is the symbol for capacitance? (30)

10. What are the functions of capacitors in electronic circuits?(32)

11. What are the labelling schemes of capacitors?(40)

12. What is an inductor?(44)

13. What is the unit of an inductor's ability to store magnetic energy?(46)

14. How will the inductance of a coil change if we increase the number of turns in the coil?(47)

15. What is the unit for inductance?(53)

16. What do inductors do when the current in electronic circuit is constant? ***(51)***

**17.** What happens when an electric current passes through the wire coil?(52)

**Text (~ 3 540)**

Multimeter – авометр, ампервольтометр, универсальный измерительный прибор

drawback – недостаток

band – полоса, диапазон

coated – покрытый

(1)[Resistors](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/passive-components/resistors/resistors.html)are the passive components used in the electrical circuits to reduce the flow of electric current to certain level. (2)The ability to restrict the flow of electric current is called resistance. (3)The resistors with high resistance value will restrict large amount of electric current whereas the resistors with low resistance value will restrict only a small amount of electric current. (4)The resistance of a resistor is measured in Ohms (Ω), kilohms (1,000Ω=1kΩ) or Megohms (1,000,000Ω =1MΩ) Resistors can go in the circuit either way round.

(5)The value is marked on the device with a colour code, or it can be measured with almost any multimeter. (6)Generally, code refers to a representation of information in another form by using symbols, signals, and letters for the purposes of secrecy. (7)Here, the signals or symbols act as codes. (8)In the similar way, in resistors we use different colors as codes to specify the resistance (information) of the resistor. (9)Here, the different colors coated on the resistor act as codes.

(10)The color codes are used not only in resistors but also in other [electronic components](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/passive-components/basicelectroniccomponents.html) such as capacitors and inductors.

(11)Specifying the values or ratings of electronic components such resistors, capacitors, and inductors by using the color codes printed on them is called electronic color code system. (12)The electronic color code system was developed in the early 1920s by the radio manufactures association, which is now part of Electronic Industries Alliance (EIA).

(13)The color-coding is done only in the fixed resistors but not in variable resistors because the color coding technique shows only a fixed resistance value. (14)The variable resistors have varying resistance. (15)Hence, it is not possible to use the color coding technique in variable resistors.

(16)The color coding technique has some drawbacks. (17)For blind people, it is impossible to find the resistance of the resistor, because they cannot see the colors coated on the resistor.

(18)Another drawback is recognizing the difference between two colors in an overheated resistor. (19)It is very difficult. (20)When the resistor is overheated, the colors on the resistor changes slightly. (21)Therefore, it becomes impossible to recognize the difference between brown color and red color or brown color and orange color.



(22)A capacitor represents the amount of capacitance in a circuit. (23)The capacitance is the ability of a component to store an electrical charge. (24)You can think of it as the "capacity" to store a charge. (25)The capacitance is defined by the equation

**C = q/V**

where q is the charge in coulombs and V is the voltage.

(26)Capacitance is measured in Farads, but one Farad is much too big to be practical.

(27)Useful units are: Micro Farads (μF or uF) = 1/1,000,000th of a Farad , Nano Farads (nF) = 1/1,000,000,000th of a Farad, Pico Farads (pF) = 1/1,000,000,000,000th of a Farad.

(28)Capacitors less than 1uF can normally go in a circuit either way round. (29)Larger capacitors normally have a polarity (normally the negative end is marked) and have to go in a circuit the right way round.

(30)The symbol for capacitance is two parallel lines. Sometimes one of the lines is curved as shown below. (31)The letter "C" is used in equations.

   
Capacitor Symbol

(32)Capacitors store and release small amounts of electrical charge.

(33)In electronic circuits they are used to control the timing of circuits, “smooth out” electrical waveforms and to separate DC and AC components of a signal. (34)In a DC circuit, a capacitor becomes an open circuit blocking any DC current from passing the capacitor. (35)Only AC current will pass through a capacitor.

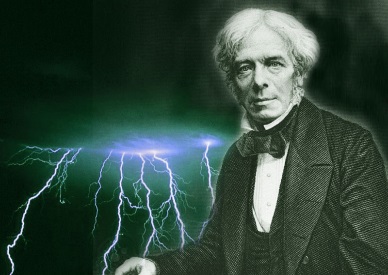
(36)Capacitors come in many different types that are designed for different applications. (37)For this circuit the type used isn't important so we've used the cheap and cheerful options. (38)The small capacitors are “ceramic discs” and the large capacitors are “electrolytic”.

(39)Several labelling schemes are in common use for capacitors. (40)The ceramic discs used in these circuits are labelled with three digit codes. (41)The first two digits are the value and the third digit is the number of zeros making up the capacitance in pF.

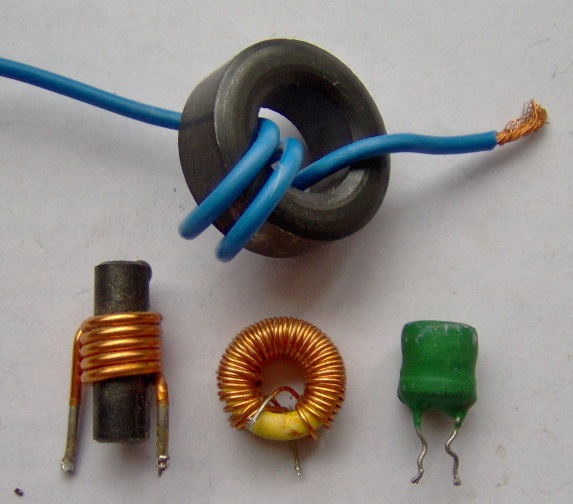
So: 10nF = 10,000 pF = “103” 100nF = 100,000pF = “104”

Michael Faraday

(22 September 1791 – 25 August 1867)



(42)Discovered the fundamental relationship between electricity and magnetism (amongst many things).



(43)Another important component of a circuit is an inductor. (44)It represents the amount of inductance in a circuit. (45)The inductance is the ability of a component to generate electromotive force due to a change in the flow of current.

(46)An inductor's ability to store magnetic energy is measured by its [inductance](http://www.newworldencyclopedia.org/entry/Inductance), in units of henrys. (47)The inductance of a coil is directly proportional to the number of turns in the coil. (48)Inductance also varies with the coil's radius and the material (or "core") around which the coil is wound.

(49)Inductors are used in electronic circuits to reduce or oppose the change in electric current.  (50)In a DC circuit, an inductor looks like a wire. (51)It has no affect when the current is constant. (52)Inductance only has an effect when the current is changing as in an AC circuit.  (53)Inductance is measured in Henrys. (54)The symbol for inductance is a series of coils as shown below. (55)The letter "L" is used in equations.

  Inductor Symbol

***Interesting Facts about Resistors, Capacitors, and Inductors***

* (56)The resistance of a material is the opposite or the inverse of the conductivity.
* (57)The Ohm is named after German physicist George Ohm.
* (58)The Farad is named after English physicist Michael Faraday.
* (59)The Henry is named after American scientist Joseph Henry.
* (60)Combinations of capacitors, inductors, and resistors are used to build passive filters that will only allow electronic signals of certain frequencies to pass through.

***http://www.physics-and-radio-electronics***.

**Задание 4. Укажите номера абзацев, куда могут быть включены данные ниже части текста.**

**Например, а) - № 5**

a) Printing the numbers on large electronic components is very easy, but it is very difficult to print the numbers or resistance values on tiny components. Hence, instead of directly printing the numbers, we print the color codes or color bands. However, by using the latest printing technology we can directly print the numbers on resistors. (10)

b) A simple inductor is made by looping a wire into a coil. When an electric current passes through the coil, a magnetic field is formed around it. This magnetic field causes the inductor to resist changes in the amount of current passing through it. (28)

c) A passive element is an electrical component that does not generate power, but instead dissipates, stores, and/or releases it. Passive elements include resistances, capacitors, and coils (also called inductors). These components are labeled in circuit diagrams as Rs, Cs and Ls, respectively. In most circuits, they are connected to active elements, typically semiconductor devices such as amplifiers and digital logic chips. (11)

~ 500

**Задание 5. Сопоставьте термины (А) с их определениями (Б).**

|  |  |
| --- | --- |
| **А** | **Б** |
| 1. Resistance is ... | 1. … the passive component used in the electrical circuits to reduce the flow of electric current to certain level. |
| 2. [Resistor](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/passive-components/resistors/resistors.html)is… | 2. … the maximum difference of an alternating electric current or potential from the average value |
| 3. A capacitor represents … | 3. … the amount of capacitance in a circuit. |
| 4. The capacitance is … | 4. … the ability of a component to generate electromotive force due to a change in the flow of current. |
| 5. The inductance is … | 5. … the ability of a component to store an electrical charge. |
|  | 6. a process of converting information in coded form |
|  | 7. …the ability to restrict the flow of electric current |

**1-7; 2-1; 3-3; 4-5; 5-4**

**Задание 6.\* Закончите предложения.**

|  |  |
| --- | --- |
| 1. [Resistors](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/passive-components/resistors/resistors.html)are the passive components used in the electrical circuits … | 1. … electronic color code system. |
| 2. In resistors we use different colors as … | 2. … to control the timing of circuits, “smooth out” electrical waveforms and to separate DC and AC components of a signal. |
| 3. Specifying the values or ratings of electronic components by using the color codes printed on them is called … | 3. … Farads; Micro Farads; Nano Farads ; Pico Farads. |
| 4. The color codes are used … | 4. … the number of turns in the coil. |
| 5. Capacitance is measured in … | 5. … its [inductance](http://www.newworldencyclopedia.org/entry/Inductance), in units of henrys. |
| 6. In electronic circuits capacitors are used … | 6. … to reduce the flow of electric current to certain level. |
| 7. An inductor's ability to store magnetic energy is measured by … | 7. … the coil's radius and the material around which the coil is wound. |
| 8. The inductance of a coil is directly proportional to ... | 8. … electronic circuits to reduce or oppose the change in electric current. |
| 9. Inductance also varies with … | 9. … codes to specify the resistance of the resistor. |
| 10. Inductors are used in … | 10. … not only in resistors but also in other [electronic components](http://www.physics-and-radio-electronics.com/electronic-devices-and-circuits/passive-components/basicelectroniccomponents.html). |

1-6; 2-9; 3-1; 4-10; 5-3; 6-2; 7-5; 8-4; 9-7; 10-8