WORK EXPERIENCE

TEXT/ WORK BOOK FOR CLASS-VI.

(Continuous Comprehensive Evaluation)

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Strictly as per the syllabus prescribed by the

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A Perspective

Our Education has got to be revolutionized. The brain must be educated through the hand. If I were a poet, I would write poetry on the possibilities of five fingers. Those who do not train their hands, who go through the ordinary rut of education, lack MUSIC in their life.

-Mahatma Gandhi

INDEX

1. Scope of Work Education

April

GIST OF THE LESSON:

- To know the role of Work Experience in the School curriculum.
- Identify the need of Work Experience.
- Acquaint oneself with productive/ non-productive in the life.

Learning Objective

- Develop respect for manual work and for manual workers.
- Inculcates socially desirable values such as self reliance, helpfulness, Co-cooperativeness team work, tolerance etc
- Develop proper work habits and values such as regularity, punctuality, Discipline, honesty, efficiency, love of excellence and dedication to Duty.
- Develop self esteem and confidence through achievement productive Work and services.
- Develop awareness of socio-economic problem of the society.
- Appreciate the utility of productive work and services to the Community.

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Work education is viewed as purposive and meaningful work organized as integral part of learning process resulting into good or services useful to community. The competencies to be developed in this field should include knowledge, understanding skills and values through need based life activity.

As per Gandhiji's *'Nai Talim'*, student participation in productive work under conditions approximating to real-life situations is pedagogically linked to learning and simultaneously becomes the medium of *knowledge acquisition, developing values and skill formation*.

Engagement with work will promote multi-dimensional attributes in the cognitive, affective and Psycho-motor domains in a holistic manner i.e. by integrating '**head, hand and heart'** by the children in School. Such attributes are admittedly missing in the education system. In this sense, placing **productive work** at the **centre of curriculum** will act as a **powerful** corrective to the 'bookish', information-oriented and generally unchallenging character of school education and, in turn, help relate the latter to life needs of the child. Pedagogical experience in using work is thus viewed as an effective and critical developmental tool at different stages of childhood and adolescence.

WORLD OF WORK:

The world of work includes factories, industries (small & large scale), productive units (Electricity, PVC industries etc), Railway, police Service, etc. These are introduced to the young future generations and present students in the curriculum itself make the mindset different and purposive. The children are motivated positively to the future needs. Any have, as our country India is growing fast to the future **Super Power Country** in economical, cultural, social, technical etc. by which such trained students can make that dream come true. The needs of future generating jobs, challenges, needs are faced and fulfilled easily by these children.

Worksheet-1

Q1. Write five names of factories do you know?
Ans: _____

_____

Q2. Write five names of Industries do you know?
Ans: _____

_____

Q3. Write five names of Service providing centers do you know?
Ans: _____

_____

Q4. Write five names of Schools do you know?
Ans: _____

_____

Q5. Write five names of Colleges do you know?
Ans: _____

_____

Q6. Write five names of Hospitals do you know?
Ans: _____

_____

Q7. Write five names of Research and Development centers do you know?
Ans: _____

_____

Q8. Write different occupations do you know?
Ans: _____

_____

Q9. What is '*Nai talim'* described by Mahatma Gandhiji?
Ans: _____

_____

2. Safety Precautions while working on Electrical system

July

GIST OF THE LESSON:

Learning Objectives:

- *To aware safety gadgets/ devices available.*
- *To develop proper work habits.*
- *To make them aware of the safety precautions.*
- *To motivate children towards practical skill with carefulness.*

Teacher Activity:

Teacher explains the Safety Precautions while working on electrical system. Do's and Don'ts should be taught while working with the electrical system.

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Self safety is the prime concern so always is careful. The following are some safety precautions those are to be followed while doing with Electrical system.

- You should not energies any conductor unless you are sure that all is clear and there is none working on it.
- Do not use Pliers as a Hammer.
- You should not disconnect any plug by pulling the flexible wire.
- Before replacing a blown fuse, always, remember to put the switch "OFF".
- While handling an electrical appliance like table fan, iron etc. be sure that they are disconnected from the supply, switching off is not enough. Leaky insulation may give serious shock.
- Every fire extinguisher can not be used for electric fire but only CO_2 extinguisher is used for this purpose.
- In case of electric fire, do not throw water on live conductor and equipment.
- Do not use tool like files, knife, screw driver etc. without handle otherwise it can injure your hand.
- Live wires should always be connected through switch.
- You should not tamper unnecessarily any alive electrical gear.
- Safety demands good earthing. Hence always keep earth connections in good condition.
- Do not put a sharp edged tool in your pocket.

Look up and live

Electrical fatalities can be caused by accidental contact with overhead power lines, so always "Look up and Live". Electricity can spark across a gap, so stay well away from power lines-up to 275,000 volts may be present.

- Never climb electrical towers or poles, or enter electrical substations-this is dangerous and can lead to severe burns or an electrical fatality.

- Never fly kites or model aeroplanes near power lines-if one does become entangled don't try to retrieve it, call the electricity distributor,licensed electrical contractor.

Because water conducts electricity, water and electricity are a dangerous combination. Use extra caution when using electrical appliances near water or in damp areas.

- Never touch appliances, switches, power points or lights with wet hands or a damp wash cloth.

- Always tell Never wash or immerse appliances in water unless manufacturer's instructions allow it.

Cords, plugs and power points

- Always read and follow the manufacturer's instructions on the use and maintenance of your electrical appliances.

Using and maintaining appliances

- Damaged cords, incorrect connections, plugs and power points are a common cause of electric shocks and fatalities.

Safety Switches

Safety Switches provide additional protection against electric shock. If they detect an earth fault they switch off the power in less than 300 milliseconds, preventing severe electric shock and minimising the fire danger. Safety Switches are only a back-up. They may not be protecting ALL wiring and electrical appliances, and WILL NOT prevent ALL electrical shocks.

Tips for heaters

- Always keep combustible materials like bedding, curtains, furnishings, clothes and newspapers clear of all heaters, especially heaters on a time switch – fires can be caused by

heaters, so be careful.

Students Activity:

Worksheet-2

Ques. 1- Write at least 15 electrical appliances generally used in home?

1._____ 2._____ 3._____

4. _____ 5. _____6._____

7. _____ 8. _____ 9._____

10._____ 11. _____12._____

- _____14. _____15._____

Ques. 2-What precautions do you take when you see an open electric wire fallen on the road?

Ans: _____

_____

Ques. 3-What safety precautions will you adopt for changing fuse?

Ans: _____

_____

Ques. 4- What precautions will you adopt for removing plug from wall socket?

Ans: _____

_____

Ques.5- Which extinguisher we should use for electric fire?

Ans: _____

_____

Ques. 6- Why should we look –up to live as precaution of electric shock?

Ans: _____

_____

Ques. 7- Why we should not fly kites nearby to electrical power lines?

Ans: _____

_____

3.1. Identification of Electrical Accessories & Components.

July

GIST OF THE LESSON:

Learning Objectives:

- To identify electrical accessories and components
- To know the functions of accessories
- To differentiate accessories and components

Teacher Activity:

Teacher explains about various electrical accessories and components by showing them physically

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Small electrical fittings which help to operate the electrical appliances are called electrical accessories. Eg. Switch, Socket, Bulb Holder, Fuse etc.

1. **SWITCH**: It is a small electrical fitting used to 'ON' or 'OFF' of any electrical appliance like Fan, Tube Light, Bulb etc. A normal switch contains only two positions as 'ON' and 'OFF'. It is called one-way switch or single-pole single-touch switch. Its circuit symbol is shown below.

Different switches like two-way or single-pole double-touch switches are also available. They are mostly made up of PVC (poly vinyl chloride). They are available in different shapes and sizes with different current ratings as 5A, 10A, 15A etc.

2. **BULB HOLDER**:

It is a small electrical fitting used to fix the bulb or to hold the bulb. It contains two connections with two contact pins. The pins are fitted with spring action inside. These are all molded in a PVC case. A groove is provided to hold the bulb. Holders are available as hanging type or wall fixing type

3. **SOCKET**:

It is also a simple electrical part which allows an electrical appliance to be connected through voltage. It is available as Two-Pin, Three-Pin and Five-Pin. It is also made up of PVC material. It is also available with different current ratings like 5A, 10A and 15A. In Two-Pin socket, one point is Phase and the other is Neutral. In 5 pin, one is Phase, other is Neutral and the third is Earth.

4. **FUSE**:

It is a simple safety device used in all electrical wirings as well as in most of the electrical or electronic equipment. It is provided with a fuse wire. These wires are available with different current ratings like 5A, 10A, 32A etc fitted with the suitable loads. When more than rated current flows through the fuse, it burns out and opens the circuit by which it saves the costly equipment or appliance connected through it. Now day's fuses are also available with different models, shapes and sizes.

Worksheet No. 3

1. **Identify the following electrical accessories and write their names in the box provided?**

3 PIN PLUG

5 A SWITCHES

3 SQUARE PLUGS AND SOCKET

MCB: MINIATURE CIRCUIT BREAKER

BULB

TUBE LAMP

CFL: COMPACT FLOUROSCENT LAMP

CFL

MAINS SWITCH

3.2. Awareness and recognition of electrical appliances *July*

GIST OF THE LESSON:

Learning Objectives:

- To know, recognize the electrical appliances
- To develop proper maintenance of each appliance
- To develop proper work habits while working with appliances
- To make them aware of the safety precautions.
- To motivate children towards practical skill with carefulness.

Teacher's Notes:

Now a day, without electricity and electrical appliances, the daily life is not running. As we know that reliable, sophisticated electrical devices are available in the market for various purposes. The children should know its use, maintenance unless they may miss some important objective in their routine. To aware, Teacher should help in this regards.

Children are asked to write some of the electrical appliances those are used in their home daily. Find what they know about them. Explain their uses, applications, maintenance to them. Explain them with the real appliances if possible. Maintain them safely and effectively for long run is also explained.

Teacher Activity:

Teacher explains the working/ maintenance and use of each electrical appliance on ORAL, after which the teacher asks to write in the lines given against each of the following electrical appliance recognized.

Worksheet No.4

Name of the electrical appliance	Write what you know about figure shown?
	
	

1. IDENTIFY & WRITE:

Recognise & write their name of the following electrical appliances.

1._____ 2._____

3._____ 4._____

5._____ 6._____

4.1. Precautions to be observed while carrying tools from one place to another

4.2. Electrical tools and their uses.

September

GIST OF THE LESSON:

Learning Objectives:

- Precautions to be observed while carrying tools from one place to other
- Electrical tools and their uses.
- Identification of the given Tools.
- Usage of the tool
- Safety precautions while handling the given tool

Tools: These are the instruments by which a person can perform his work easily. The following are the commonly used tools, their uses and precautions while using them mentioned below:

S.No.	Tools	USES	PRECAUTIONS
1	**Screw driver**	Used for loosening or tightening or to keep screws in position.	Don't keep in pocket. Don't through it. Use proper size.
2	**Combination Pliers**	For holding, twisting, or cutting wires.	Don't cut steel wires. Don't use in place of hammer.
3	**Side cutting pliers**	For cutting wires, and removing insulation.	Don't cut steel wires. Protect from rust.
4	**Hammer**	Used for fixing clips, making holes on the walls on the wood etc.	Never use loose handled hammer, handle should not be greasy Should not be oily. Avoid flat head.
5	**Tester**	To test the presence of power supply (Phase)	Don't drop it. Don't use it as screw driver if not specified

6	**Electrician Knife**	Removing insulation of wires	Handle carefully, always force towards outside
7	**Drilling Machine**	To drill holes on walls, wood, metal sheets etc.	Do not use drilling bits for the wood, metal or wall same. Use each for every task such variety.
8	**Multi-meter**	Uses to measure resistance, current, voltage. Also continuity without power lines.	Use knob of multi-meter accordingly to the measurement before pointing the leads.
9	**Test Lamp**	To check the continuity of wires, circuit, appliance etc.	Use lamp always in series to the circuit.
10	**Extension Board**	To extend our connecting electrical points.	Take care while connecting it to electric power.

Worksheet No.-5

Q.1. Identify the following tool and write its name:

1_____

2_____

3_____

4._____

1_____

2_____

3_____

2. _____

3. _____

4. _____

5. _____

1_____

2_____

3_____

4_____

5. _____

5.1. Study of accessories like Switch, Holder, Plug, Socket etc.

October

GIST OF THE LESSON:

Learning Objectives:

- Knowing different electrical accessories practically.
- Electrical accessories and their uses.
- Identification of the given accessory.
- Dismantling and refit the given electrical accessory.
- Safety precautions while using accessory.

1. TYPES OF SWITCHES: 6/15 Amp. Switches, SPST, SPDT, DPDT Switches, Push-to-on, Push-to-off switches, Toggle switches etc.
2. TYPES OF SOCKETS: 6/15 Amp sockets, 3-pin or 5-pin socket etc.
3. TYPES OF FUSES/ SAFETY DEVICES: 5 Amp, 10 Amp fuses, 10, 20, 30 Amp MCBs, 40/63 Amp Isolators, Very big Circuit breakers etc.
4. TYPES OF BULB HOLDERS: Pendent holder, Straight holder, Angle holder etc.
5. TYPES OF SOCKETS: 6/16 Amp sockets-3pin, 5-pins each, various varieties of sockets are studied.

STUDENT'S ACTIVITY:-

1. Children are asked to assemble and dismantle some of the above said electrical accessories and asked to demonstrate any one of them in the class.
2. **Activity (projects/Practical): Please collect the above electrical accessories, paste on a chart and write their names.**

EVALUATION:-

Student's practical works are observed and asked some questions based on the theory as well as practical. Their class works are checked and evaluated. They are also asked to submit the projects based on the syllabus.

5.2. Identification of Wire Joints

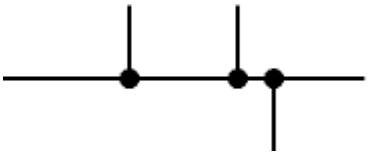
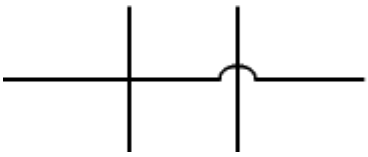
October

GIST OF THE LESSON:

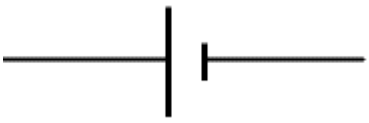
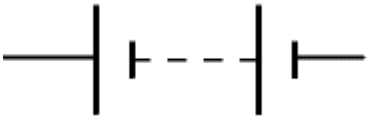
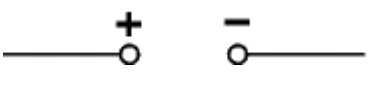
Learning Objectives:

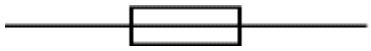
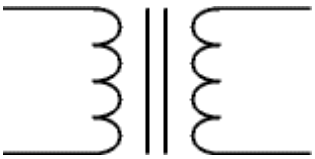
- Knowing the circuit elements. Drawing different electrical circuit components
- Identification of the given circuit element. Representing standard pictorial nomenclature
- Do's and don'ts in circuit drawing

The following are some such elements and components those commonly used.

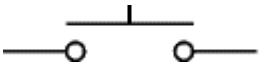
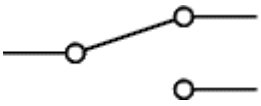
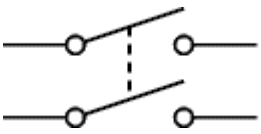
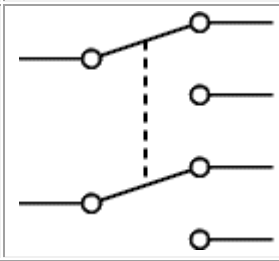
Wires and connections		
Component	**Circuit Symbol**	**Function of Component**
Wire		To pass current very easily from one part of a circuit to another.
Wires joined		A 'blob' should be drawn where wires are connected (joined), but it is sometimes omitted. Wires connected at 'crossroads' should be staggered slightly8++++++++++++++----------++ to form two T-junctions, as shown on the right.
Wires not joined		In complex diagrams it is often necessary to draw wires crossing even though they are not connected. I prefer the 'bridge' symbol shown on the right because the simple crossing on the left may be misread as a join where you have forgotten to add a 'blob'!

Circuit symbols for commonly used components:

Power Supplies		
Component	**Circuit Symbol**	**Function of Component**
Cell		Supplies electrical energy. The larger terminal (on the left) is positive (+). A single cell is often called a battery, but strictly a battery is two or more cells joined together.
Battery		Supplies electrical energy. A battery is more than one cell. The larger terminal (on the left) is positive (+).
DC supply		Supplies electrical energy. DC = Direct Current, always flowing in one direction.
AC supply		Supplies electrical energy.

		AC = Alternating Current, continually changing direction.
Fuse		A safety device which will 'blow' (melt) if the current flowing through it exceeds a specified value.
Transformer		Two coils of wire linked by an iron core. Transformers are used to step up (increase) and step down (decrease) AC voltages. Energy is transferred between the coils by the magnetic field in the core. There is no electrical connection between the coils.
Earth (Ground)		A connection to earth. For many electronic circuits this is the 0V (zero volts) of the power supply, but for mains electricity and some radio circuits it really means the earth. It is also known as ground.

Circuit symbols for commonly used components:

Switches		
Component	**Circuit Symbol**	**Function of Component**
Push Switch (push-to-make)		A push switch allows current to flow only when the button is pressed. This is the switch used to operate a doorbell.
Push-to-Break Switch		This type of push switch is normally closed (on), it is open (off) only when the button is pressed.
On-Off Switch (SPST)		SPST = Single Pole, Single Throw. An on-off switch allows current to flow only when it is in the closed (on) position.
2-way Switch (SPDT)		SPDT = Single Pole, Double Throw. A 2-way changeover switch directs the flow of current to one of two routes according to its position. Some SPDT switches have a central off position and are described as 'on-off-on'.
Dual On-Off Switch (DPST)		DPST = Double Pole, Single Throw. A dual on-off switch which is often used to switch mains electricity because it can isolate both the live and neutral connections.
Reversing Switch (DPDT)		DPDT = Double Pole, Double Throw. This switch can be wired up as a reversing switch for a motor. Some DPDT switches have a central off position.

6.1. Line Tester-Construction & Uses.

November

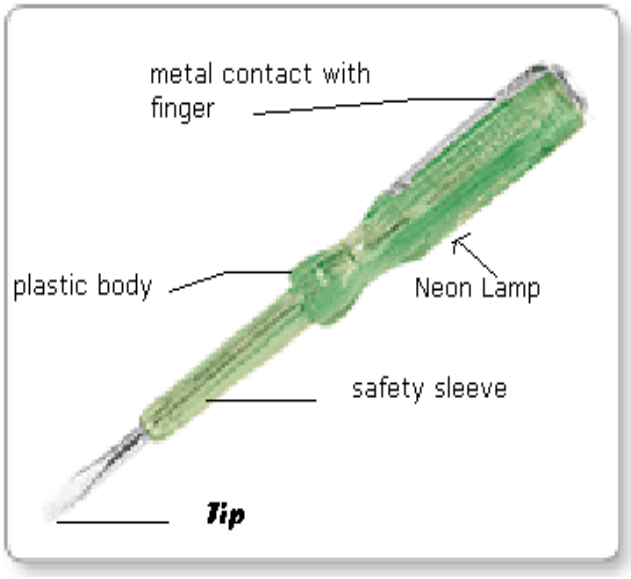
GIST OF THE LESSON:

Learning Objectives:

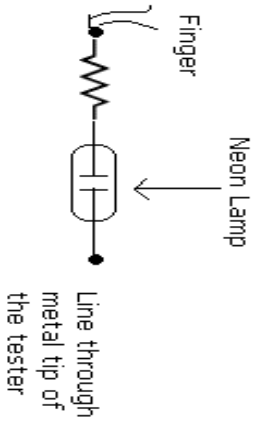
- Precautions to be observed while using line tester.
- Dismantling the given line tester.

LINE TESTER:

This is an electrical instrument, useful every time, needed for testing whether line (current) is passing through the wire joints, socket, appliance, gadget or any part of it. It shows line presence by glowing Neon lamp, kept inside of plastic frame as shown in the figure (left). The neon lamp is connected with resistance in series, which is encapsulated by the plastic frame is as shown in the figure (right).



Inside view of line tester.



Precautions while using Line Tester:

1. Care should be taken that your finger is not touched metal tip of line tester before you use it.
2. Your fingers always should touch with metal contact or top cap, unless neon lamp does not glow.
3. Don't use Tester to fit nut-bolt or other purposes other than line testing.
4. Always use branded line tester to avoid electric shocks due to leakage in resistor.

6.2. Assembling of a Test Lamp & its use

November

GIST OF THE LESSON:

- To assemble the test lamp
- To know the uses of test lamp
- To test some appliances using test lamp.

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Teacher's activity:

Aim: To assemble a test lamp.

Material required:

1. 60/40 Watt, 230V bulb - one
2. Pendent Bulb holder - one
3. 3/20 or 1/18 PVC wire - two meters

Tools required:

1. Screw driver/Tester - one
2. PVC insulation tape - one

Circuit Diagram:

Procedure:

1. Take two meters of wire and cut into two pieces equally
2. Take pendent holder and connect wire to the holder at one end
3. Connect bulb to the holder
4. Cut other two ends of wire to open copper leads which will be used as testing probes.
5. Cut small pieces of insulation tape and stick on two wire to join together up to half of length of the wire
6. Then the testing lamp is ready to use.

Precautions:

1. Test the test lamp before using your test lamp every time to confirm its function.
2. Don't touch open wires at nay time.

Uses:

1. To check the continuity of the electrical circuit
2. To check an appliance in series or parallel way
3. To check the body touch or short circuit.

Learning Objects: - Testing of Iron Box using test lamp

S.No	Tools Required	Qty	Materials Required	Qty	Equipment Required	Qty
1 2 3 4 5	Test Lamp, Tester, Switch board Screwdriver Cutting pliers	01 01 01 01 01	Iron box	01	Multimeter Testing Board (with voltmeter, Ammeter & series	01 01

Procedure:

1) First test the main chord plug terminals to the other end of main chord with test lamp.
2) Test the coil terminals with series lamp weather continuity is there or not
3) Open the cover of the iron Box and test the thermostat is contacting or not with series test lamp with controlling the thermostat.
4) If the coil continuity is not there. Then replace the coil

Precautions:

1) At the time of fixing the coil keep one layer mica sheet under the coil to avoid the leakage of the current to avoid the leakage of the current.
2) Keep one asbestos sheet up of coil to protect heat for the handle
3) After fixing the coil, test the leakage test from earth terminal to coil terminal of both.
4) Earth terminal should connect properly

7.1. Sources of Electricity

November

GIST OF THE LESSON:

- To know the sources of conventional energy
- To know the importance of electricity
- To know the various sources of electricity generating methods
- To know the future electric generating methods.

There are number of sources of energy those are naturally available such as firewood, cow dung, charcoal, coal, kerosene, cooking gas, petrol, diesel, natural gas etc.

Electricity is yet another source of energy and is produced at **conventional power plant** by following method.

Learning Objectives: To know the basic source of electricity.

(a) Hydroelectric power- In this giant-sized electric generator coupled to turbines which are rotated by the energy of water or steam at high pressure to rotate the turbine.

(b) Thermal power- By using coal, natural gas, the heat produced by burning is utilized to produce steam at the high pressure to rotate the turbine.

(c) Atomic power- Atomic fuel used and heat produced by nuclear reaction is utilized to produce steam at the high pressure to rotate the turbine. Thereafter electrical power is produced through mechanical motion of turbines.

We know that formation of fossil fuels have occurred over a million of year. Now fossil fuels are rare and also a major causes for environmental pollution. The sun is the main source of energy on the earth. Electricity is produced by following **non conventional method** also.

(i) Solar energy (ii) Wind energy (iii)Tides energy(iv) Ocean wave energy (v) Energy harnessed from flowing water (vi) Biogas energy (vii) Chemical energy(viii) Geothermal energy (ix). Hydrogen and Alcohol are considered to be two potential source of energy of the future.

Worksheet No.-6

1. What is the necessity of electricity?

Ans.

_____

_____

2. What is the fossils fuel?

Ans.

_____

_____

3. What are the sources of electricity?

Ans.

_____

_____

4. What will be the source of electricity in future?

Ans.

_____

_____

5. What are the advantages of non conventional source of electricity?

Ans. _____

_____

7.2. Study of electrical terms & Definitions

November

GIST OF THE LESSON:

- *Definitions of various electrical terms*
- *Units of measuring electrical quantities*

******

The electrical terms pronounced commonly by the people by knowing or un- knowingly. But once the definition of such electrical term or quantity is used appropriately for correct meaning shall be known when we know their definitions correctly.

The following electrical quantities are defined as follows:

1. **ELECTRICAL CHARGE:** (Q)

   The electrical charge, we generally defined as the charge of an electron, where an electron is an element in an atom.

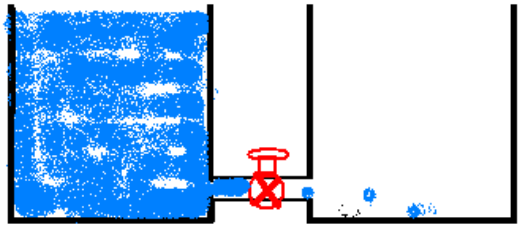
- Each electron having a negative charge of one unit i.e.: -1.602×10^{-19} Coulomb.
- Charge is denoted by **capital** 'Q' or **small** 'q'.

Where 'Coulomb' is the unit of measuring electric charge in SI system.

Why electric charges are moves from one point to another point?

The reason for moving electric charges from one point to another point in a conductor can be explained by the following illustration.

Suppose, the two water tanks are connected in the following way as shown in the figure, where water levels are shown, then tell how water is flown, if tank valve is opened? And say why?



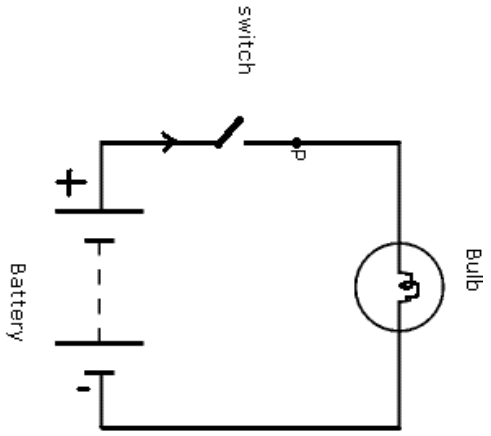
Now, we can see that Water flows from tank containing more water to tank containing low water. Till water level becomes equal, water flow done.

Similarly, from the point where electrons density is more to less electron density point, the electrons flow. Here electrons move with the speed of light i.e 3×10^8 meter/second. This is the reason why electrons moves from one point to another point with in the conductor.

2. ELECTRICAL CURRENT (I):

It is the quantitative measurement of electric charges flown through a point of the conductor 'p' per unit time.

If switch is closed in the given figure, then electric charges are flown through the point, 'p' for the time't', then the total charge flown is let 'q',



Current (I) = charge (q) ÷ Time (t) Ampere

$$\mathbf{I = \frac{Q}{t}}$$

UNITS: The current is measured in Ampere (A)

3. ELECTRICAL VOLTAGE (V):

On supplying electricity to an appliance, there will be a work done on the system. The estimation of work done (W) on the system per unit supply of electric charge (Q) is called Voltage.

Voltage (V) = Work done (W) ÷ Electric charge (Q)

$$\text{Voltage (V)} = \frac{\text{Work done (W)}}{\text{Electric charge (Q)}} \qquad \mathbf{V = \frac{W}{Q}}$$

UNITS: The units of measuring voltage is 'Volt'

4. ELECTICAL POWER (P):

In general, the work done on the system per unit time is called power.

Power (P) = Work Done (W) ÷ Time (t)

$$\mathbf{P = \frac{W}{t}}$$

$$\boldsymbol{P = \frac{W}{Q} \; x \; \frac{Q}{t}}$$

Electrical power (P) = Voltage x Current

UNITS: The Electric power is measured in Watt (W)

Worksheet No.

I. Fill in the blanks

1. Electrical power is defined as product of Voltage and _____
2. The unit of measuring current is _____
3. Domestic power contains _____ volt
4. _____ is the unit of electrical power
5. 100 Watt bulb: it means bulb consumes _____ power.

II. Match the following:

1. Voltage	a. Coulomb
2. Current	b. Volt
3. Power	c. Electric Power
4. Charge	d. Product of Voltage and Current
5. Watt	e. Ampere

8.1. Introduction to Cell, Battery, Generator etc.

December

Cell, battery, generator etc are the sources of electricity/electric current. Where as, Cell and battery are such sources where electric energy is generated from chemical energy. Chemicals like Copper sulphate solution can give raise ions on reacting with copper and graphite rods dipped in it. Theses ions are root cause of electric charges (electrons) passing through the closed circuit when cell is connected to any load.

CELL:

A cell is simple package of chemical compounds which can give a little amount of current. Cell is represented by both positive and negative electrodes as shown in the figure.

BATTERY:

Two or more cells together combine to form a battery. Here the current generated by each cell is added by to get more current by the battery. The battery is represented as shown in the following figure.

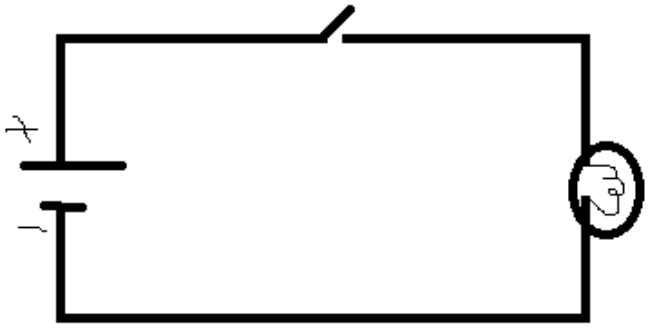
8.2. Assembling of a simple electric circuit

December

GIST OF THE LESSON:

- Electrical tools and their uses.

The Plug of the appliance is inserted in to the concern socket and switch is operated to operate the appliance.



9. Conductors and Insulators

January

Conductor: conductor are those material which allow the current (electric charges, electrons) to flow trough them easily.example-cu.al.

Insulator: Insulator are those material which do not allow the current (electric charges, electrons) to flow trough them example-mica, glass, wood.

To check up the conductor and insulating materials with test lamp:

Procedure: Now to test the conducting and insulating material with the help of test lamp, first prepare the test lamp by connecting the two wires to the two terminals the holder and fixing the bulb to it. Take the supply wires and connecting wires to any one wire to test lamp and insulate if connect the ends to see the continuity of the supply. Touch the free ends to see the continuity of the supply. Touch this to free ends to the ends of the materials turn by turn all the same time. If the lamp glows, material will be considered as conductor and if not give lights the material will be as insulator.

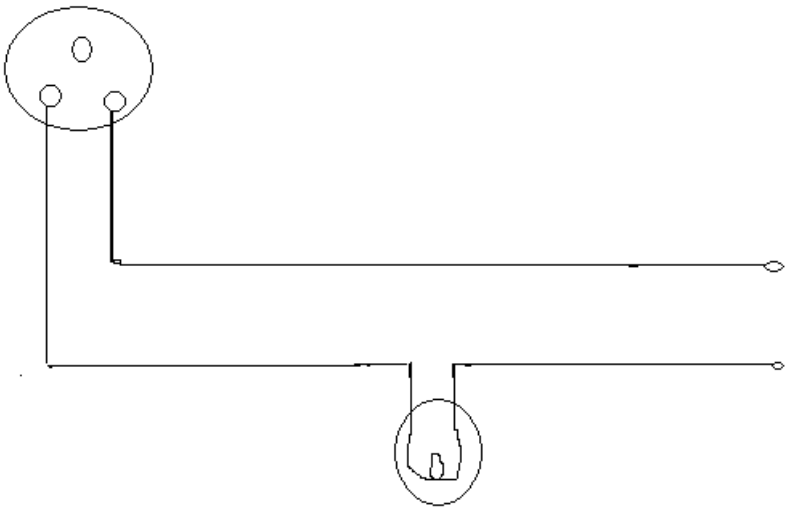


Figure 1

Precautions

1. Connect the test lamp with the power supply wires before switching on.
2. Insulate your self on the dry wooden piece before checking the continuity of supply or conducting and insulating material.

Student Activity (Important Question):

1. Prepare the list of conductor and insulator.
2How to check the given material are conductor or insulator
3. Difference between conducting and insulating material.

10. DOMESTIC APPLIANCES

February/March

GIST OF THE LESSON:

- Electric domestic appliances and their uses.
- Dismantling and refit any domestic appliance.
- Know the repairing and maintenance of given appliance.

****

There are so many domestic appliances we studied about in the previous chapter. Here, in this lesson, we are going to learn about a particular domestic electrical appliance of your choice. However, here we are considering electric iron as an appliance of learning.

Electric Iron Box:

It works under the principle of heating effect of current. On supplying current, the element inside iron box is heated up which is kept in a mica sheet. Mica is an insulating but heat transfer material as shown in the figure. This mica sheet element is attached with steel/ aluminum plate which is used to iron the clothes. If steel is used, iron box is heavy but aluminum it is light in weight. This is again enclosed by the metal/ plastic body (which can withstand for heat) with a handle. This is a basic model of domestic iron box.

An automatic iron box is also be used. This is having control over heat. The person sets a temperature of their choice. A bimetallic strip is used to operate current flow which intern controlled by the user pre-determined temperature. Bimetallic strip cut or flows current till temperature of choice is determined.

WORK EXPERIENCE

TEXT/ WORK BOOK FOR CLASS-VIII.

(Continuous Comprehensive Evaluation)

S. Vijaya Kumar

B. Tech (E & C E)

TGT (WE)

KENDRIYA VIDYALAYA

NALLAPADU

GUNTUR

Strictly as per the syllabus prescribed by the

CLASS-8: MONTH-WISE TOPIC INDEX

April	**Safety rules**
July	**Fuse**
August	**House Wiring**
September	**Study of resistors**
October	**Series parallel connections**
November	**Atomic Structure**
December	**Work, Power and energy**
January	**Sources of Energy**
February	**Magnet**
March	**Electromagnet**

Safety Precautions

April

Learning objectives:

- ***To acquaint students with various safety rules***
- ***To develop skills of shock treatment to be followed as a first aid***

Gist of topics

- The Indian Electricity Rules are available. They deal with safety rules, shock treatment etc. Charts containing the detailed information for treating a person suffering from electrical shock are also available.

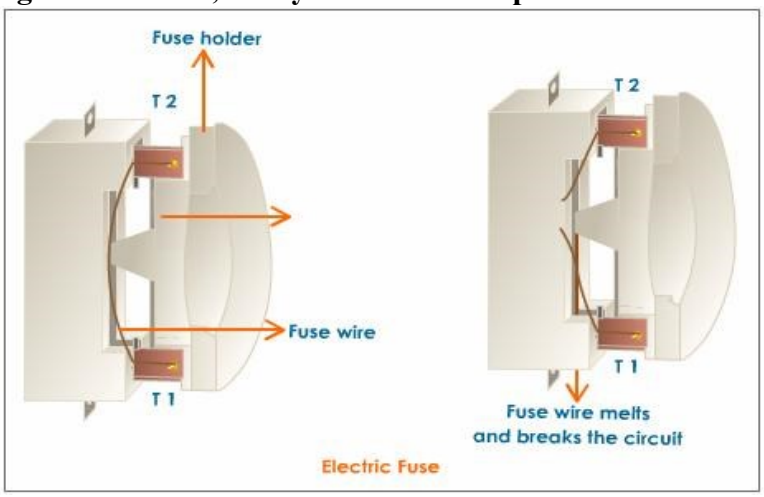
- Safety precautions are very important while working on electrical system , because electricity is not only give us comforts but it is very dangerous unless we follow certain precautions.

- You should not energize any conductor unless you are sure that all is clear and there is none working on it.

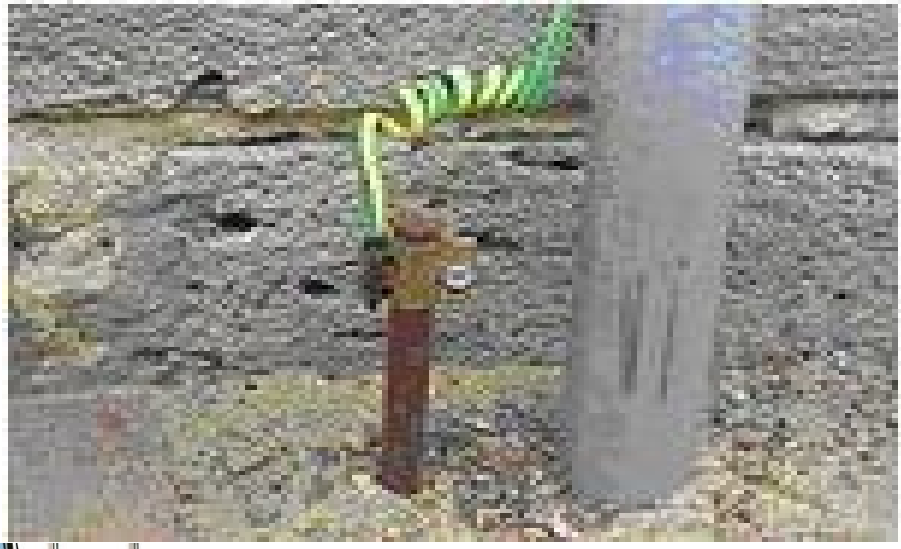
- You should not tamper unnecessarily with any live electrical gear.

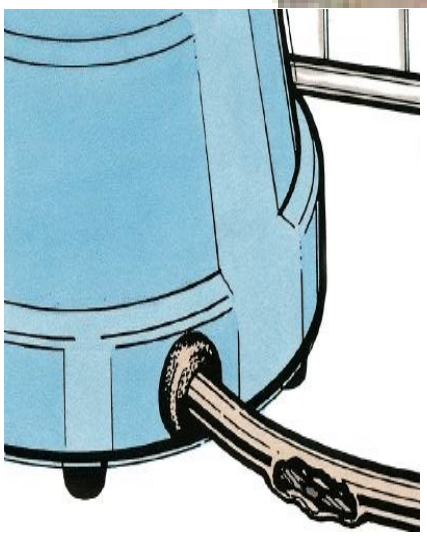
- You should not disconnect any plug by pulling the flexible cable.

- **Before replacing a blown fuse, always remember to put the switch off.**



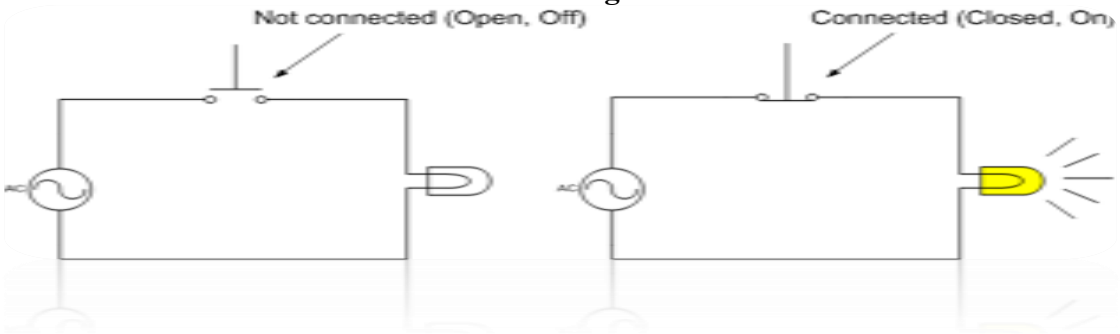
- **Safety demands good earthing. Hence always keep earth connection in good condition.**





- **While handling any electrical appliance like table fan, iron, heaters etc. be sure that they are disconnected from the supply.**

- **Live wires should be connected through switch**



- **Switching off is not enough.**
- **Leaky insulation may give serious shock.**

Electrical Shock:

Strange as it may seem, most fatal electrical shocks happen to people who should know better. Here are some electro medical facts that should make you think twice before taking chances.

It's not the voltage but the current that kills. People have been killed by 100 volts AC in the home and with as little as 42 volts DC. The real measure of a shock's intensity lies in the amount of current (in milliamperes) forced through the body. Any electrical device used on a house wiring circuit can, under certain conditions, transmit a fatal amount of current.

Currents between 100 and 200 milliamperes (0.1 ampere and 0.2 ampere) are fatal. Anything in the neighborhood of 10 milliamperes (0.01) is capable of producing painful to severe shock. Take a look at Table.

Readings		Effects
Safe Current Values	1 mA or less	Causes no sensation - not felt.
	1 mA to 8 mA	Sensation of shock, not painful; Individual can let go at will since muscular control is not lost.
Unsafe current values	8 mA to 15 mA	Painful shock; individual can let go at will since muscular control is not lost.
	15 mA to 20 mA	Painful shock; control of adjacent muscles lost; victim cannot go by themselves.
	50 mA to 100 mA	Ventricular fibrillation - a heart condition that can result in death - is possible.
	100 mA to 200 mA	Ventricular fibrillation certainly occurs.
	200 mA and over	Severe burns, severe muscular contractions - so severe that chest muscles clamp the heart and stop it for the duration of the shock. (This prevents ventricular fibrillation).

FIRST AID FOR ELECTRIC SHOCK:

Shock is a common occupational hazard associated with working with electricity. A person who has stopped breathing is not necessarily dead but is in immediate danger. Life is dependent on oxygen, which is breathed into the lungs and then carried by the blood to everybody cell. Since body cells cannot store oxygen and since the blood can hold only a limited amount (and only for a short time), death will surely result from continued lack of breathing.

However, the heart may continue to beat for some time after breathing has stopped, and the blood may still be circulated to the body cells. Since the blood will,

for a short time, contain a small supply of oxygen, the body cells will not die immediately. For a very few minutes, there is some chance that the person's life may be saved.

The process by which a person who has stopped breathing can be saved is called artificial ventilation (respiration). The purpose of artificial respiration is to force air out of the lungs and into the lungs, in rhythmic alternation, until natural breathing is reestablished. Records show that seven out of ten victims of electric shock were revived when artificial respiration was started in less than three minutes. After three minutes, the chances of revival decrease rapidly.

Artificial ventilation should be given only when the breathing has stopped. ***Do not give artificial ventilation to any person who is breathing naturally.*** You should not assume that an individual who is unconscious due to electrical shock has stopped breathing. To tell if someone suffering from an electrical shock is breathing, place your hands on the person's sides at the level of the lowest ribs. If the victim is breathing, you will usually be able to feel movement.

Once it has been determined that breathing has stopped, the person nearest the victim should start the artificial ventilation without delay and send others for assistance and medical aid. The only logical, permissible delay is that required to free the victim from contact with the electricity in the quickest, safest way. This step, while it must be taken quickly, must be done with great care; otherwise, there may be two victims instead of one.

In the case of portable electric tools, lights, appliances, equipment, or portable outlet extensions, the victim should be freed from contact with the electricity by turning off the supply switch or by removing the plug from its receptacle. If the switch or receptacle cannot be quickly located, the suspected electrical device may be pulled free of the victim. Other persons arriving on the scene must be clearly warned not to touch the suspected equipment until it is de-energized.

The injured person should be pulled free of contact with stationary equipment (such as a bus bar) if the equipment cannot be quickly deenergized or if the survival of others relies on the electricity and prevents immediate shutdown of the circuits. This can be done quickly and easily by carefully applying the following procedures:

1. Protect yourself with dry insulating material.
2. Use a dry board, belt, clothing, or other available nonconductive material to free the victim from electrical contact. Do NOT touch the victim until the source of electricity has been removed.

Once the victim has been removed from the electrical source, it should be determined whether the person is breathing. If the person is not breathing, a method of artificial respiration is used.

In case of electric fire do not throw water on live conductor and equipment as it is dangerous. The best remedy is to disconnect the electric supply immediately and then throw sand or dust on the fire.

Every fire extinguisher cannot be used for electric fire, but only CO2 extinguisher is used for this

- **Before starting the work above ground on a pole or tower, you must use safety belt and ladder.**
- **Do not tie the wire with the pole on which clothes are to be dried.**

Shock treatment practice:

If the victim has breathing difficulty after the shock gives artificial respiration at once by the following steps of artificial respiration.

Procedure:

Position 1: Place the victim's face down with his arms folded one over other and head resting on them. Kneel on one or both knees at the victims back beyond the line of armpits with your finger spread outwards and thumbs touching each other.

Position 2: As you count one, two, three, rock forward keeping arms straight until they are nearly vertical, thus steadily pressing victims back. This completes expiration.

Position 3: As you proceed to count four, rock backwards, releasing pressure and slide your hand downwards along the victim's arms and grasp his upper arm just above elbow. Continue to rock backwards.

Position 4: As you rock back counting five, six, seven, raise and pull the victim's arms towards you until you feel tension in his shoulders. This expands his chest and results in inspiration.

Questions:

1. **Why switch is always connected in phase wire only?**

……
……

2. **What happens if we throw water on electrical fire?**

……
……

3. **Which type of fire extinguisher is used for electrical fire?**

……
……

Learning objectives:
1. Functions
2. Types of fuses
3. Uses and their diagram
4. Importance of fuse
5. Possible accidents without a fuse

Gist of topics:

1. Function- Fuse is a safety device .it protects the circuit against over load and short circuit. When the current exceed the permissible limit the fuse wire melts and breaks the circuit. And the current ceases to flow.
2. Type of fuses:
   1. Re-wirable fuses (semi enclosed) eg. Kit kat fuse
   2. Enclosed fuse Eg. Glass cartridge fuse, HRC fise

In kit-kat fuse the base and fuse carrier are made up of porcelains, the insulating material. The fuse wire for 5 A and 15 A for house hold purpose is wired using lead and tin alloy.

3. Uses and their diagram:

Uses: All electrical circuits are protected by the fuse.

Diagram

4. Possible accidents without fuse:

Short circuit and overload

If short circuit and overload occurs the wires get heated up the current exceeds the permissible limit there is a chance of fire

QUESTIONS:

1. **What is a short circuit?**

……
……

2. **What is an open circuit?**

……
……

3. **What is a fuse?**

……
……

4. **What material is used for fuse wire?**

……
……

5. **What materials are used in making fuse base and carrier?**

……
……

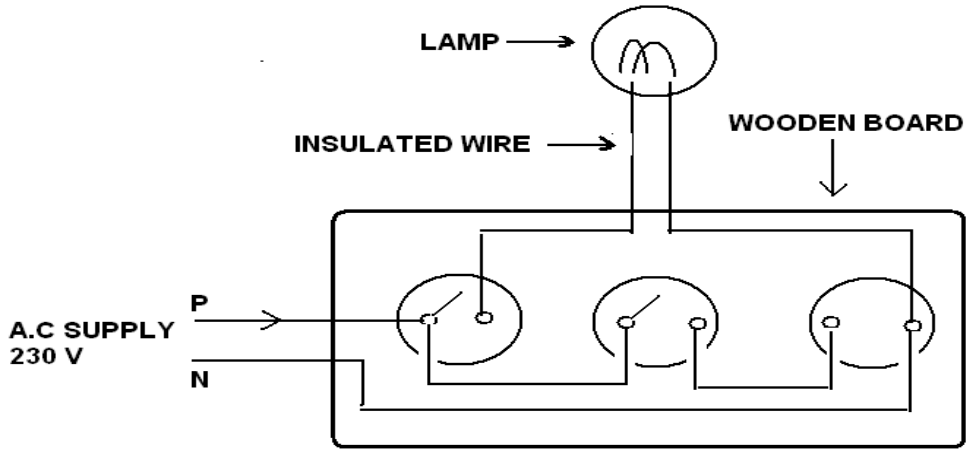
House Wiring

AUGUST

House wiring rules:

- ***This circuit is used in house wiring. Therefore, it is necessary to know the connections for students.***
- ***A Single pole switch is connected in series.***
- ***A Single pole switch is used to control a lamp***
- ***And another to control a two pin plug socket.***
- ***The function of both the switches for the lamp and the socket is to put the circuit ON and OFF***

MODEL CIRCUIT:



Evaluation by Questions

1) What is the purpose of insulation tape?

……
……

2) What is the purpose of Earthing?

……
……

3) What are the safety measures you can take in house wiring?.

.....
.....

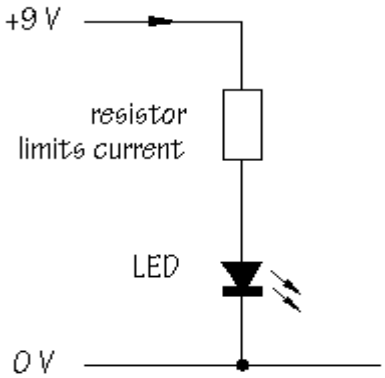
Types of Resistors

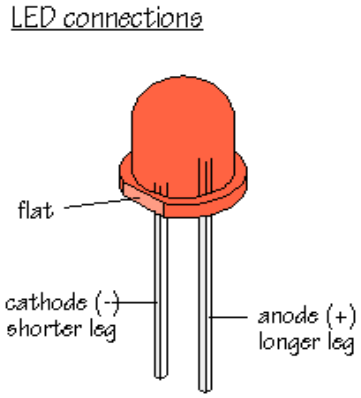
SEPTEMBER

Gist: Identification of different types of resistors,
Classification of resistors, definition of resistors, types and their values

What do resistors do?

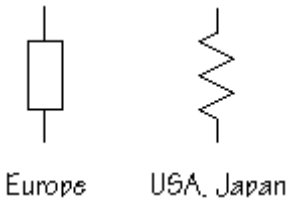
Resistors limit current. In a typical application, a resistor is connected in series with an LED:





Enough current flows to make the LED light up, but not so much that the LED is damaged. Later in this Chapter, you will find out how to calculate a suitable value for this resistor. (LEDs are described in detail in Chapter 5.)

The 'box' symbol for a fixed resistor is popular in the UK and Europe. A 'zig-zag' symbol is used in America and Japan:



Resistors are used with transducers to make sensor subsystems. Transducers are electronic components which convert energy from one form into another, where one of the forms of energy is electrical. A light dependent resistor, or LDR, is an example of an input transducer. Changes in the brightness of the light shining onto the surface of the LDR result in changes in its resistance. As will be explained later, an input transducer is most often connected along with a resistor to to make a circuit called a potential divider. In this case, the output of the potential divider will be a voltage signal which reflects changes in illumination.

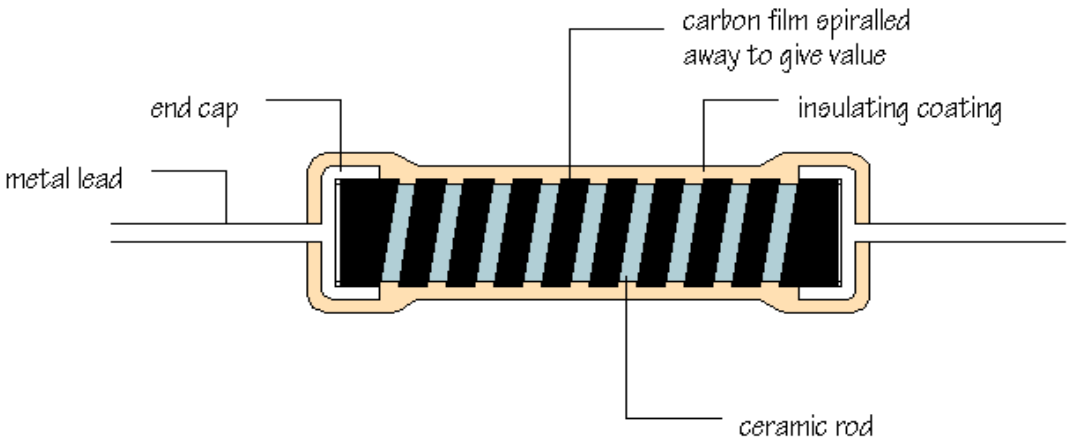
Microphones and switches are input transducers. Output transducers include loudspeakers, filament lamps and LEDs. Can you think of other examples of transducers of each type?

In other circuits, resistors are used to direct current flow to particular parts of the circuit, or may be used to determine the voltage gain of an amplifier. Resistors are used with capacitors (Chapter 4) to introduce time delays.

Most electronic circuits require resistors to make them work properly and it is obviously important to find out something about the different types of resistor available, and to be able to choose the correct resistor value, in Ω, kΩ, or MΩ, for a particular application.

Fixed value resistors

The diagram shows the construction of a carbon film resistor:



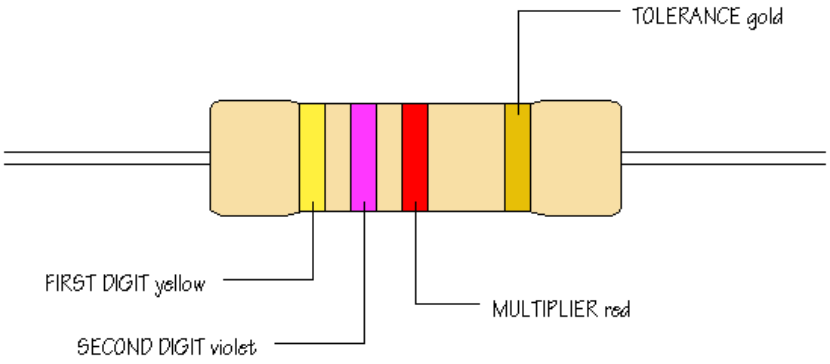
During manufacture, a thin film of carbon is deposited onto a small ceramic rod. The resistive coating is spiralled away in an automatic machine until the resistance between the two ends of the rod is as close as possible to the correct value. Metal leads and end caps are added, the resistor is covered with an insulating coating and finally painted with coloured bands to indicate the resistor value.

Carbon film resistors are cheap and easily available, with values within ±10% or ±5% of their marked, or 'nominal' value. Metal film and metal oxide resistors are made in a similar way, but can be made more accurately to within ±2% or ±1% of their nominal value. There are some differences in performance between these resistor types, but none which affect their use in simple circuits.

Wire wound resistors are made by winding thin wire onto a ceramic rod. They can be made extremely accurately for use in multimeters, oscilloscopes and other measuring equipment. Some types of wire wound resistors can pass large currents without overheating and are used in power supplies and other high current circuits.

Colour code

How can the value of a resistor be worked out from the colours of the bands? Each colour represents a number according to the following scheme:



Number	*Colour*
0	black
1	brown
2	red
3	orange
4	yellow
5	green
6	blue
7	violet
8	grey
9	white

The first band on a resistor is interpreted as the FIRST DIGIT of the resistor value. For the resistor shown below, the first band is yellow, so the first digit is 4:

The second band gives the SECOND DIGIT. This is a violet band, making the second digit 7. The third band is called the MULTIPLIER and is not interpreted in quite the same way. The multiplier tells you how many knots you should write after the digits you already have. A red band tells you to add 2 knots. The value of this resistor is therefore 4 7 0 0 ohms, that is, 4700 Ω, or 4.7 kΩ. Work through this example again to confirm that you understand how to apply the colour code given by the first three bands.

The remaining band is called the TOLERANCE band. This indicates the percentage accuracy of the resistor value. Most carbon film resistors have a gold-coloured tolerance band, indicating that the actual resistance value is with + or - 5% of the nominal value. Other tolerance colours are:

Tolerance	*Colour*
±1%	brown
±2%	red

±5%	gold
±10%	silver

When you want to read off a resistor value, look for the tolerance band, usually gold, and hold the resistor with the tolerance band at its right hand end. Reading resistor values quickly and accurately isn't difficult, but it does take practice!

Questions:

1. What is a resistor?

.....
.....

2. What types of resistors are there?

.....
.....

3. How do you calculate the value of resistor with colour code ?

.....
.....

4. What do you mean by tolerance?

.....
.....

Electrical Measuring Instruments

SEPTEMBER

Gist: Measuring Instruments are required to measure the electrical quantities such as voltage, current, resistance, power etc.

The meters are voltmeter, Ammeter, Ohm meter, Energy meter, Galvanometer,

Voltmeter:

It is used to measure both AC and Dc Voltage in different ranges.

Ammeter:

It is used to measure both AC and DC current in different ranges.

Multimeter:

Multimeter can be used for measuring resistance, voltage, current in AC DC supply.

These meters are available in Analog and Digital

Galvanometer:

It is used to measure in very low current of the order of 30micro A.

Energy meter:

It measures the energy consumption for a house

Precautions: Ammeters are connected always in series with the supply

Voltmeters are connected in parallel

Galvanometer is not used for high currents.

Questions:

1. Which quantity can be measured by Voltmeter?

……
……

2. What is the necessity of Energy meter?

……
……

3. Which meter is used for many electrical quantities?

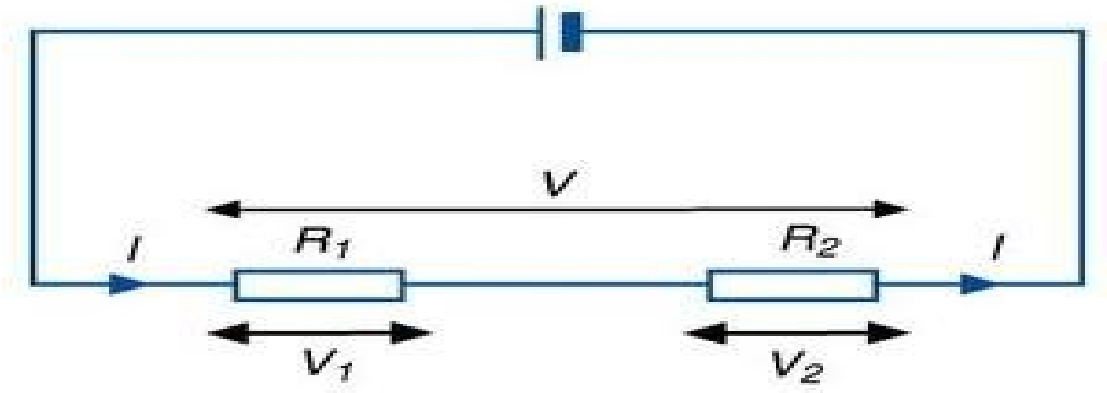
……
……

Series and Parallel Connection

October

Gist: - When two resistances/ bulbs are connected in series, the total resistance of the circuit increases and the bulbs glow dim. When two bulbs are connected in parallel, the total resistance of the circuit will decrease. Hence the two bulbs will glow bright.

SERIES CIRCUIT



1. total resistance of the circuit R = sum of the individual resistance= (R_1+R_2)

R= (R_1+R_2) ohms.

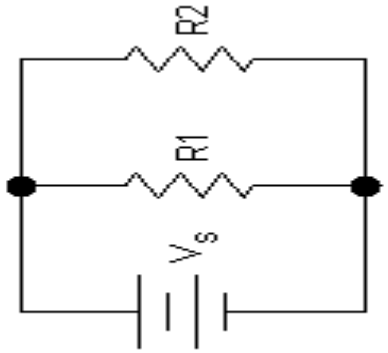
2. Total voltage will be divided into two parts V_1 and V_2, i.e. voltage drop across r_1 and voltage drop across r_2

= V= V_1+V_2

3. The current (I) passes through $r_1$and r_2 is same.

4. Since the resistance of the circuit is more and there are voltage drops, if we connect two bulbs in series, both the bulbs will glow dim.

PARALLEL CIRCUIT



1. Total resistance = 1/R = 1/R1+1/R2

R = R1x R2/R1+R2 Ω

Reciprocal of the total resistance = the sum of the reciprocals of the individual resistances.

2. The total voltage of the circuit i.e. V acts across individual resistances.

3. The total current divides into two parts i.e. i1 and i2 through

R1 and R2

I = i1 + i2 (Amperes)

4. Since full voltage acts across each bulb, both the bulbs will glow bright

Important Questions

* What is the total resistance of the circuit, when the resistance R1 and R2 are connected in series?

……

……

* What is the total resistance of the circuit, when the resistance R1 and R2 are connected in parallel?

……
……

* Which type of connection is used in house wiring?

……
……

DO YOUR SELF Project: - Connect the circuits as per diagrams given above and see the effect of light in which connection is better.

Semiconductors

November

A semiconductor is a material with electrical conductivity due to electron flow (as opposed to ionic conductivity) intermediate in magnitude between that of a conductor and an insulator. Semiconductor materials are the foundation of modern electronics, including radio, computers, telephones, and many other devices. Such devices include transistors, solar cells, many kinds of diodes including the light-emitting diode, the silicon controlled rectifier, and digital and analog integrated circuits. Similarly, semiconductor solar photovoltaic panels directly convert light energy into electrical energy. In a metallic conductor, current is carried by the flow of electrons. In semiconductors, current is often schematized as being carried either by the flow of electrons or by the flow of positively charged "holes" in the electron structure of the material. Actually, however, in both cases only electron movements are involved. Common semi conducting materials are solids, but liquid semiconductors are known. Silicon is used to create most semiconductors commercially. Dozens of other materials are used, including germanium, gallium arsenide, and silicon carbide. A pure semiconductor is often called an *"intrinsic"* semiconductor. The electronic properties and the conductivity of a semiconductor can be changed in a controlled manner by adding very small quantities of other elements, called *"dopants",* to the intrinsic material. The process of adding impurities of boron or phosphorus to the intrinsic semiconductor is called *"doping"*.

The range of energy level possessed by electrons are called energy band. The free electron energy is the energy required for an electron to escape entirely from the material. The energy band created by the valence electrons is known as the valence band and that by free electrons is called conduction band. Semiconductors and insulators are distinguished from metals because the valence band in them is nearly filled with electrons under usual operating conditions, while very few (semiconductor) or virtually none (insulator) of them are available in the conduction band, the band immediately above the valence band.

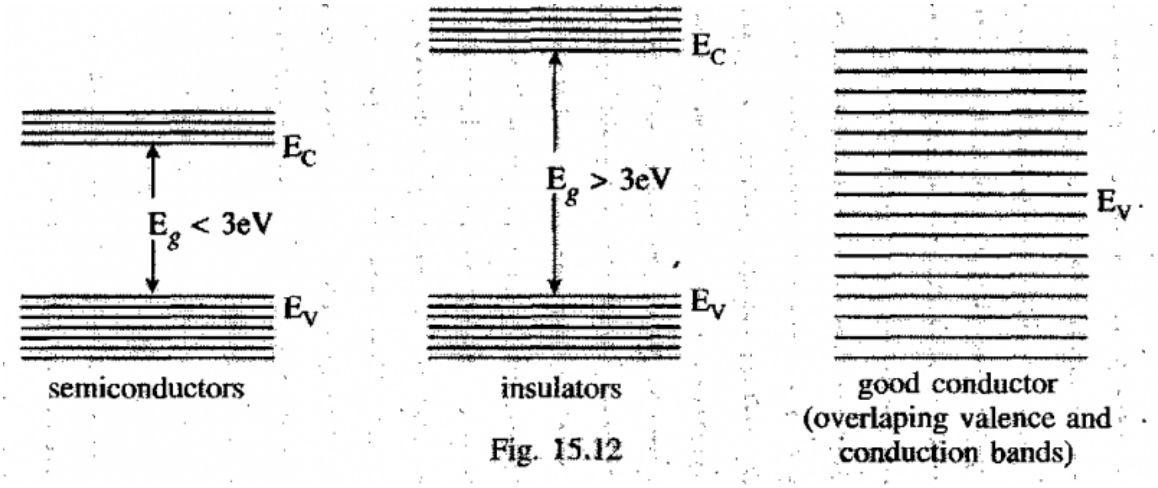


Fig. 15.12

Ec – conduction band Ev – valence band

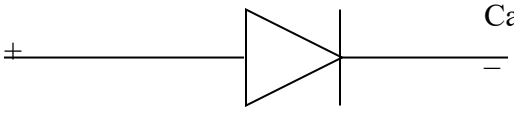
The ease with which electrons in a semiconductor can be excited from the valence band to the conduction band depends on the band gap between the bands. The size of this energy band gap serves as an arbitrary dividing line (roughly 4 eV) between semiconductors and insulators.

Diodes

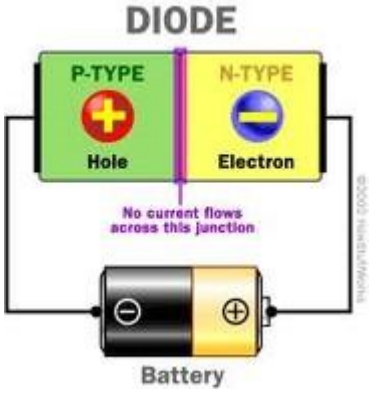
A device that blocks current in one direction while letting current flow in another direction is called a diode. Diodes can be used in a number of ways. For example, a device that uses batteries often contains a diode that protects the device if you insert the batteries backward. The diode simply blocks any current from leaving the battery if it is reversed.

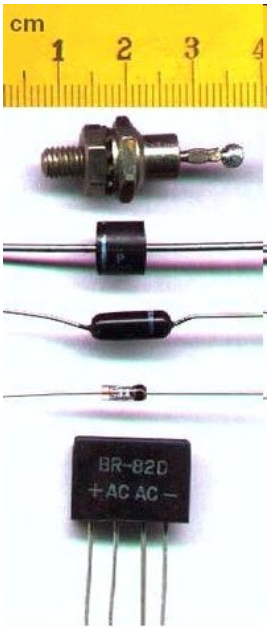
LEDs , Si diode, Ge diode

Anode Cathode



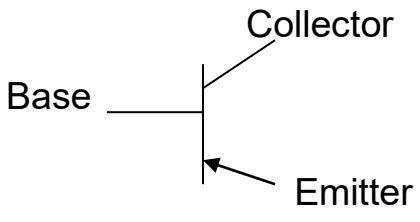
Symbol of diode



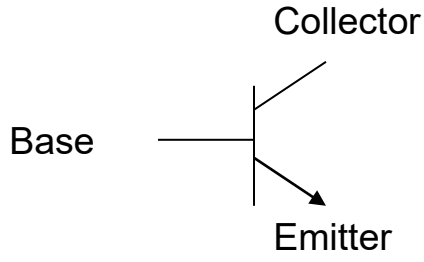


Transistors

A transistor is created by using three layers rather than the two layers used in a diode. You can create either an NPN or a PNP sandwich. A transistor can act as a switch or an amplifier.



PNP



NPN

A transistor looks like two diodes back-to-back. You'd imagine that no current could flow through a transistor because back-to-back diodes would block current both ways. And this is true. However, when you apply a small current to the center layer of the sandwich, a much larger current can flow through the sandwich as a whole. This gives a transistor its switching behavior. A small current can turn a larger current on and off. It has three terminals called Emitter, Base and Collector.

A silicon chip is a piece of silicon that can hold thousands of transistors

QUESTIONS

1. What is a semiconductor?

……
……

2. What is doping? How it is important in the field of semi conductors?

……
……

3. What is a diode? Give two examples.

……
……

4. How many leads are there for a transistor?

……
……

ACTIVITY: students are assigned to identify various types of transistors and diodes

Gist: To make aware of the children about the definitions of work, power and energy.

Work: Work is said to be done when force acting on a body causes the body to change its sate, work is done

Work done= Force X Distance moved

The mechanical unit work is Joule.
The electrical unit of work is the Watt –second, 1 Watt sec. of work is said to be done in a circuit electrically when two points in a circuit having a potential difference of 1 volt, has one ampere of current flowing through it for one second.

1 Watt= 1 Volt x 1 Amp.

Power: It is measured in Watts and instrument measuring electrical power is wattmeter. The electrical is calculated as a product of voltage and current.

W stands for watts, for example Lamps are available in 25 W, 40W, 60W etc.
W= V X I Watts

Energy: It is measured in Kilowatt-hour (1 KWH = 1000Watt hours)
A meter which measures energy consumption is known as Energy meter or KWH meter. The electricity Board provides meters in every house to record the consumption of electrical energy.

kWH is also expressed as a unit of Power. Energy is calculated by equations
Energy = Power in KW X no. of hours consumed

Applications: We can observe the details given on electrical appliances like lamps, electrical Iron, Heater, fan to know their capacities.

Potential energy: The energy possessed by a body which is at certain height is called Potential Energy.

Example: Water stored in tanks

Kinetic Energy: The energy possessed by a body which is in movement is called Kinetic Energy
Example: Flowing water.

Questions:

1. What is the unit of power?

……
……

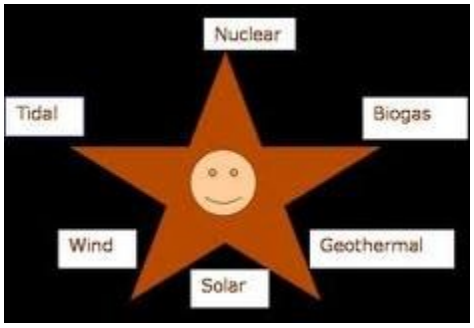
2. What are the types of Energies?

……
……

Source of Energy

Gist: The electrical energy can be derived by the following methods.

1. Thermal power
2. Hydro power
3. Nuclear power
4. Solar power
5. Wind power



Energy is an important requirement for us. From running our air conditioners to fueling our vehicles, our daily survival depends upon energy. Energy requirements have led countries to war and continues to be a bone of contention between many nations. Energy comes in various forms. The most convenient of all of them is electrical energy. Not only is it easy to generate, but it can also be generated through a number of different ways with the help of different types of power plants.

Different Types of Power Plants

Nuclear Power Plants

Nuclear power plants work on the chemical process of fission. Fission is a type of nuclear reaction in which, when the atoms of certain elements called nuclear fuels absorb free neutrons, they split into two or more smaller nuclei and some free neutrons. In the process, a large amount of energy is released. The free neutrons further strike the atoms of other fissile materials, thus setting off a chain reaction. The energy released from this chain reaction is harnessed in nuclear power plants to generate electricity.

Nuclear power plants have ways to control or stop these reactions when they seem to go out of control and become threatening. The nuclear fuel used in the nuclear power plants are Uranium-235 or Plutonium-239. Every country is in the race of becoming capable of harnessing nuclear energy. It is so because the free energy released by nuclear material is millions times more than that contained in an equal amount of any other traditional fuel. However, what raises the concern about these reactions is that a lot of radioactive material is created in the process. These substances remain radioactive for long. This raises the problem of managing nuclear waste.

Thermal Power Plants

These power plants generate electrical energy from thermal energy (heat). Since heat is generated by burning fossil fuels like coal, petroleum, or natural gas, these power plants are also collectively referred to as the fossil fueled power plants. Coal power plants were the earliest of the fossil power plants to have been built. The heat generated by burning the fossil fuels is used to turn a rotating machinery, most commonly a steam turbine or a gas turbine that changes the thermal energy into mechanical energy. The

rotating turbine is attached to an alternator that coverts the mechanical energy of the rotating turbine into electrical energy.

Hydro Power Plants

These plants use the kinetic energy of flowing water to produce electrical energy. Hydro power plants store water in large reservoirs. Water in these reservoirs flow down the dam and rotate a turbine. As the blades of a turbine turn, so do the magnets inside the generator which is connected to the turbine. These magnets rotate past copper coils and with each rotation, electricity is produced. There are more than 2,000 hydro power plants in the US, making it the largest source of energy in the country. Despite their utility, the major drawback of hydro power plants is that they are highly dependent on the hydrological cycle of the area where they are built.

Solar Power Plants:

Solar energy is one of the most abundant natural resources that is capable of providing more power than the current demand requires. Most of the solar power plants are concentrating solar power plants in which the rays of the Sun are concentrated into a single beam using lenses and mirrors. The beam is then used to heat a working fluid that is used to generate power. Besides the concentrating solar power plants, multi-megawatt photovoltaic plants have also been built in recent times. In these plants, Sun rays are concentrated on photovoltaic surfaces which convert the Sun's energy into electrical energy using the photoelectric effect.

Other than these, there are the geothermal energy power plants, wind turbines and renewable power plants that generate electricity for human consumption. Despite the different types of power plants, man is still on the lookout for more ways of generating power. Although fission is the only way of producing energy in nuclear power plants, efforts are on to use nuclear fusion and radioactive decay for energy production.

Use of Windmills to Generate Electricity

The basic structure of the windmill hasn't changed, it still has three large sails (blades) connected by a long vertical shaft. The sails are turned by the force of the wind. Presently wind turbines are used to harness the wind energy or power to turn large metal blades, which in turn spins the generator that produces electricity. Throughout the 1970s, the United States government worked with NASA and the private engineering sector to build windmills for electricity, by enabling the production and installation of large commercial turbines. This promoted the use of windmills to generate electricity on a large scale for both, domestic as well as commercial use. Denmark and Germany are known for harnessing the wind power to produce electricity on a large scale.

The generation of electricity through the windmill follows a very simple mechanic. A windmill has large blades which are connected to the shaft, which is connected to the generator. It is based on the basic principle of conversion of mechanical energy to electrical energy. The wind energy moves the large blades, swirling or rotating them. The speed the blades move with is determined by the different air pressures created on their surface. Low and high pressures on the blade force the windmill blades to move.

As the blades rotate, operated by the wind turbine tilted at an angle, they produce mechanical energy, which is converted into electrical energy by the electrical generator. The wind turbines are fitted with brakes that can be applied to stop the blades, if the wind blowing is too hard. The turbines creates quite a bit of noise, probably the reason why the windmills are built nearly eight stories and above. For a windmill to generate electricity, it has to be located at a place where wind blows at a speed of 12 to 14 miles per hour. A ten storied windmill with three 50 feet blades can produce approximately between 50 to 300 kilowatts of electricity. A larger turbine has the capacity to generate up to 6MW of power. Windmills grouped together are known as wind farms.

As an efficient, inexpensive, renewable and alternative energy source, windmills for electricity is being advocated and promoted for a wide scale domestic use. Small wind turbines that have the capacity to produce about ten kilowatts of windmill electricity are usually enough for providing sufficient electric power for a house. However, before installing a windmill, one must investigate and satisfy legal requirements of the local ordinances, zoning and building codes. The electricity generated through wind power can be made available when the wind blows, and when it stops, the local electric connection can be used. The advantage of having a personal windmill would account for a lesser amount of electricity bill, and a deed for saving the Earth by using its pollution free and renewable energy source.

Questions:

1. **What are the sources of energy?**

……
……

2. **What are the requirements needed to produce thermal power?**

……
……

3. **What are the requirements are required to get Atomic power?**

……
……

Gist:

Magnet is a natural material which attracts magnetic materials (Fe, Co, Nickel etc.)

Bar magnet, horse shoe magnet, solenoid, ball ended magnets and needle compass are the various types of magnets.

It is mainly used in loud speakers, motors, generators, compass etc.

Main properties of magnets are 1) Like poles repel where as unlike poles attract. 2) It attracts magnetic materials 3) When cut into two, each piece will become a magnet 4) It loses its property, when strikes, falls or heats.

Important Questions

1) **What is a magnet?**

……
……

2) **What are the types of magnet?**

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……

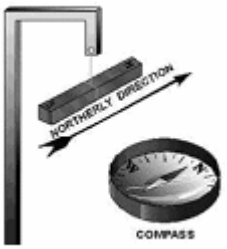
3) **What are the uses of magnets?**

……
……

4. **What are the properties of magnets?**

……
……

ACTIVITY



Aim: Identifying north and South Pole of a bar magnet

Materials required: Bar magnet - 1 no
Compass - 1 no
Cotton thread - small piece

Procedure :

1) Take the bar magnet and tie the cotton thread at the centre of the bar magnet so as to hang the magnet parallel to the ground.

2) Fix this to the vertical stand.
3) Identify the north and south pole with the help of compass

Result

Verified the north and South Pole of the given bar magnet.

Electromagnet

March

Gist:

When a current flows through a coil wound around a core, it produce magnetic field around it. A current carrying of coil of an insulated wire wrapped around a piece of iron is called an electro magnet.

Electro magnets are used in many devices. Electro magnets in electric crane can be made very strong to lift very heavy loads. Electro magnets are also used to separate magnetic materials from the junk, Doctors use tiny electro magnets to take out small pieces of magnetic material that have accidentally fallen in the eye, in electric bells, relays, motors, generators, many toys etc.

Difference between magnet and electro magnet

Magnet	**Electro magnet**
Natural	Artificial
Permanent	Temporary
Low magnetic power	High magnetic power
No energy is required	Electric energy is required

Important Questions

1) What is an electromagnet?

……
……

2) What is the principle of electro magnet?

……
……

3) What are the uses of electro magnets?

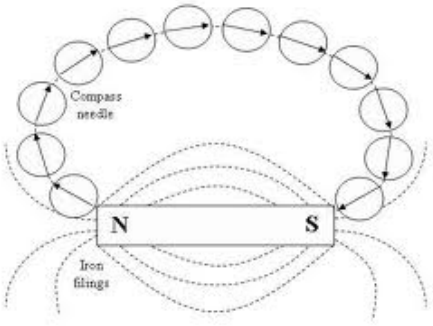
……
……

4) Write main two differences between magnets and electro magnets?

……
……

ACTIVITY

Aim: Draw the magnetic lines of force of bar magnet with the help of a compass.



Materials Required:

1. Bar Magnet
2. Needle compass
3. Chart paper
4. Pencil
5. Drawing pin

Procedure:

1. Fix the paper on the drawing board using drawing pin
2. Place the bar magnet and draw its outline.
3. Mark a dot against the north pole of the compass
4. Move the compass and mark it
5. Continue this process till the south pole of the bar magnet is reached
6. Draw a smooth curve
7. Similarly draw some more lines

Result: Magnetic lines of force are plotted.

WORK EXPERIENCE

TEXT/ WORK BOOK FOR CLASS- IX.

(Continuous Comprehensive Evaluation)

S. Vijaya Kumar

B. Tech (E & C E)

TGT (WE)

KENDRIYA VIDYALAYA

NALLAPADU

GUNTUR

Strictly as per the syllabus prescribed by the

KENDRIYA VIDYALAYA SANGATHAN

Class IX (THEORY)

1. **Safety device** — April
   - Fuse (already in lower class)
   - Circuit breakers (Earth leakage Circuit breaker, Miniature circuit breaker)
   - Isolators (Two poles & Four poles)
2. **Earthing** — July
   - Importance
   - Use
   - Types of earthling, diagrams
3. **Electromagnetism** — August
   - Faraday's law of Electromagnetism
   - Fleming's left hand rule
   - Fleming's right hand rule
4. Motor and Generator — September
   - **Motor**: principle, types, uses
   - **Generator**: Principles, types and use
5. **House wiring (Part B)** — October
   - Basic principle of switch board connections
   - Why a switch is to be connected in phase wire only and never in neutral wire
6. **Switch Boards** — November

Connection of Switch board of following types:

a) One load, one switch
b) Two loads, two switches
c) One load, two switches
d) Two loads, one switch
e) Bed switch
f) Fuse in a switch board
g) Tube light connection

7. **Bulbs / Tubes** — December
   (In brief)
   - Basic principle
   - Types of bulb
   - Domestic and Industrial bulbs
   - Power saving bulbs i.e. CFL
   - Tube lights
8. **Electrical Instruments** — December
   - Ammeter: principle, use and types
   - Voltmeter: principle, use and types
   - Multi meter: importance, Principle, use and types
9. **Electronics** — January

a) **Soldering Iron**

- Working Principle
- Types , use

b) **Basic electronics materials**

- Resistors: functions & use, Color code
- Capacitors: functions & use
- LED : Function & use

10. Diodes and their characteristics | February

Transistors

- Working Principle
- Types , use

11. **Ohm's law** | March

- Explanation of Ohm's law

1. SAFETY DEVICES

APRIL

1. **Topic – Safety Devices**

2. **Learning Objective -** Why fuse is required in the circuit? Knowing about circuit breaker (Earth Leakage Breaker, Miniature Circuit Breaker), Knowing about Isolator etc.

Sl. No.	Tools Required	Qty	Materials Required	Qty	Equipment Required	**Qty**
1.	Tester	1	Fuse of two types	02		
2.	Pliers	1	Fuse Wire	03		
3.	Slide Wrench	1	MCB	01		
4.	Screw Driver	1	Switch	01		

3. **Procedure – Description/Diagram :**

a) Fuse - a **fuse comes from** a Latin word "fusus" meaning to melt is a type of over current protection device. Its essential component is a metal wire or strip that melts when too much current flows, which interrupts the circuit in which it is connected. Short-circuit overload or device failure is often the reason for excessive current. A fuse interrupts excessive current (blows) so that further damage by overheating or fire is prevented. Wiring regulations often define a maximum fuse current rating for particular circuits. Over current protection devices are essential in electrical systems to limit threats to human life and property damage. Fuses are selected to allow passage of normal current and of excessive current only for short periods. The fuse element is made of zinc, copper, silver, aluminum, or alloys of tin and

lead to provide stable and predictable characteristics. The fuse ideally would carry its rated current indefinitely, and melt quickly on a small excess. The element must not be damaged by minor harmless surges of current, and must not oxidize or change its behavior after possibly years of service.

b) Circuit Breaker: A **circuit breaker** is an automatically-operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Its basic function is to detect a fault condition and, by interrupting continuity, to immediately discontinue electrical flow. Unlike a fuse, which operates once and then has to be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation. Circuit breakers are made in varying sizes, from small devices that protect an individual household appliance up to large switchgear designed to protect high voltage circuits feeding an entire city.

C) Isolator- In electricity isolator **switch** is used to make sure that an electrical circuit can be completely de-energized for service or maintenance. Such switches are often found in electrical distribution and industrial applications where machinery must have its source of driving power removed for adjustment or repair. High-voltage isolation switches are used in electrical substations to allow isolation of apparatus such as circuit breaker and transformer, and transmission lines, for maintenance. Often the isolation switch is not intended for normal control of the circuit and is only used for isolation.

4. Students activity (Project / Practical): i) Students will be asked to see the fuse provided to them carefully and make a switch board incorporating Fuse.

ii) Students will be asked to see the fuse installed in their house wiring under the supervision of Guardians.

2. EARTHING

JULY

1. **LEARNING OBJECTIVES**:- # Importance of earthing
Uses of earthing.
Types of earthing and its definition.

GIST

s.no	Tools Required	Qty.	Material Required	Qty	Equipment Required	Qty.
1	spade	1	Charcoal & salt	3kg	Multimeter	1
2	Pliers	1	G.I. Pipe	1 mtr		
3	Tester	1	Copper plate & wire	5mtr &45cm		

3**. DISCRIPTION**: - **Earthing**- The process to connect metallic body of all electrical equipment to the huge mass of earth.

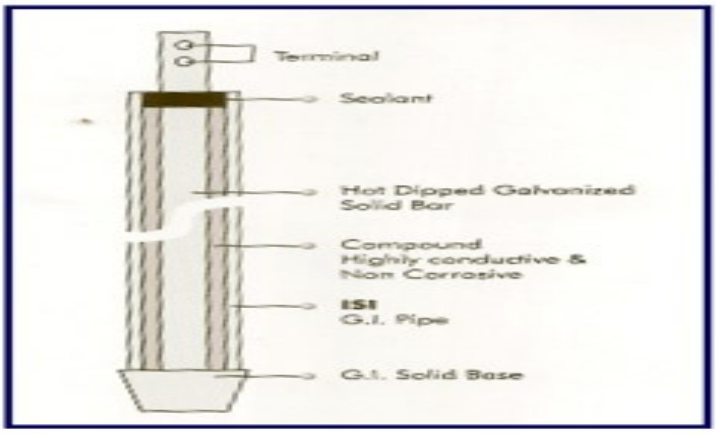
Importance- when any live wire touches the metallic part of a machine. And if any person touches it without insulating himself will get a severe shock. so to avoid the this danger we need earthing .

Uses- to earth motor, computer, generator, boiler, heater &all electrical appliances having metallic body.

TYPES OF EARTHING: - Earthing through water mains- in this a copper wire is tightened firmly with the body of machine and to the metallic pipe of main water supply

Pipe & plate earthing;- in this a copper plate of nearly 45 cm. square is buried in a vertically upright position in the ground at depth of wetness of the soil this plate is surrounded by a powder of sand and charcoal.

Rod earthing- in this a copper rod is inserted into the earth &connection is made through it. This type of earthing is not safe.



TEACHER ACTIVITY – Show the procedure and demo connection to the students.

5. **STUDENTS ACTIVITY**- Student will do indoor and outdoor earthing activity in presence of teacher without any live wire.

QUESTIONS-

1. What is earthing and its uses.

……
……

2. What happens when there is no earhing.

……
……

3. What are the different types of earthing explain.

……
……

3. ELECTROMAGNET

AUGUST

1. **Topic:** Electromagnetism
2. **Learning Objectives:** To understand the working principle of electric motor and generator.

3.

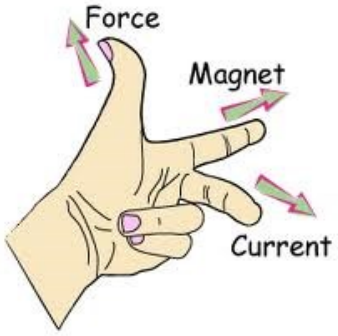
S. No.	Tools Required	Qty	Materials Required	Qty	Equipment Required	Qty
1	Screw Driver	1	12V Battery	1	12V DC Motor	1

4. Procedure:- Description/Diagram (Teacher Activity):

Faraday's Law electromagnetic induction

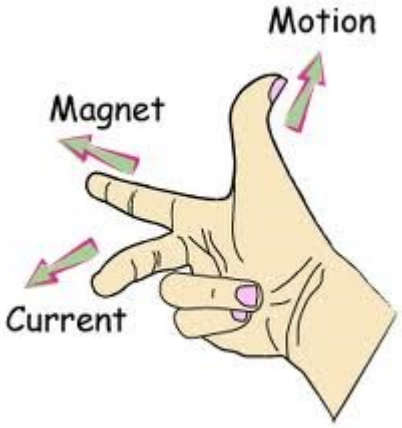
It states that the induced e m f (electro motive force) in a closed loop is directly proportional to the rate of change of the magnetic flux through the coil.

Fleming's left hand rule



Also known as the Motor Rule, this is a way of determining the direction of a force on a current carrying conductor in a magnetic field. The thumb, the first and the second fingers on the left hand are held so that they are at right angles to each other. If the first finger points in the direction of the magnetic field and the second finger in the direction of the current in the wire, then the thumb will point in the direction of the force on the conductor.

Fleming's right hand rule



Also known as the Generator Rule, this is a way of determining the direction of the induced emf of a conductor moving in a magnetic field. The thumb, the first and the second fingers on the right hand are held so that they are at right angles to each other. If the first finger points in the direction of the magnetic field and the thumb in the direction of the motion of the conductor then the second finger will point in the direction of the induced emf in the conductor.

5. **Students Activity (projects/Practical):**
   Make a working model of a DC generator.
6. **Evaluation/Questions:**

   1. Whether is it possible to change the direction of induce emf in a DC generator, if yes how?

……
……
……

3. MOTOR AND GENERATOR

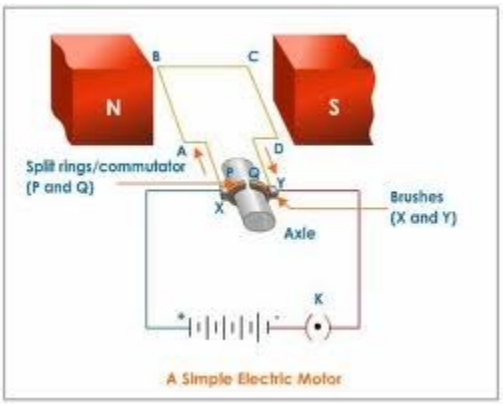
AUGUST

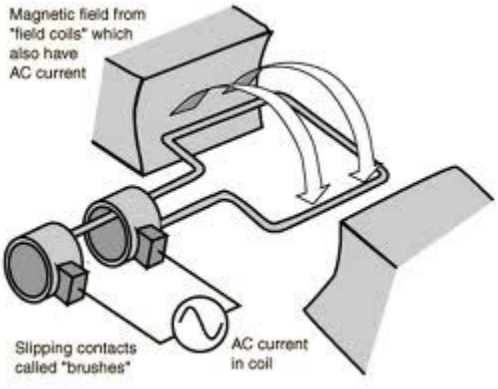
Learning Objectives: To understand the working of Motor and Generator

S. No.	Tools Required	Qty	Materials Required	Qty	Equipment Required	Qty
1	Line Tester	1	Flexible Wire 2 sq. mm	10m	Generator Motor	1 1

Procedure:- Description/Diagram (Teacher Activity):

Motor





DC Motor AC Motor

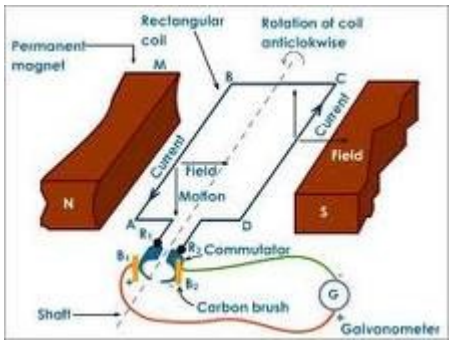
An electric motor is a machine used to convert electrical energy to mechanical energy.

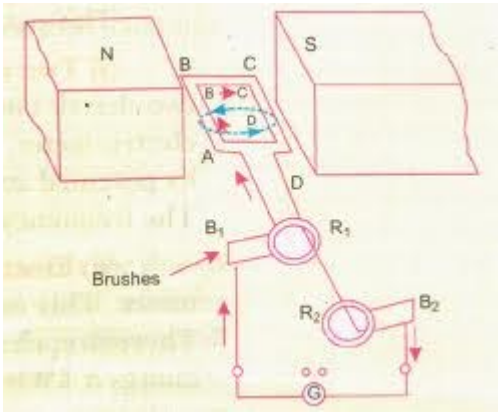
The Motor Principle: when a current-carrying conductor is located in an external magnetic field perpendicular to the conductor, the conductor experiences a force perpendicular to itself and to the external magnetic field.

Types -Electrical motors fall into two broad categories, depending on the type of electrical power applied-direct current (DC) and alternating current (AC) motors.

Used in vacuum cleaners, dishwashers, computer printers, fax machines, video cassette recorders, machine tools, printing presses, automobiles, subway systems, sewage treatment plants and water pumping stations.

Generator





DC Generator AC Generator

An electric generator is a device or machine that is used to convert mechanical energy into electrical energy.

Principle – It is based on the principle of electromagnetic induction. The principle states that when an electric conductor, such as a copper wire, is moved through a magnetic field, electric current will flow through the conductor. The mechanical energy of the moving wire is converted into the electric energy

Types - Electrical generators fall into two broad categories, depending on the type of electrical power generated-direct current (DC) and alternating current (AC) generators**.**

Uses – Used in power generating stations, households and commercial places

Students Activity (projects/Practical):

Visit a Power Generating station.

Evaluation/Questions:

1. Can a generator be converted to a motor and vise verse?

……

……

……

3. HOUSE WIRING

AUGUST

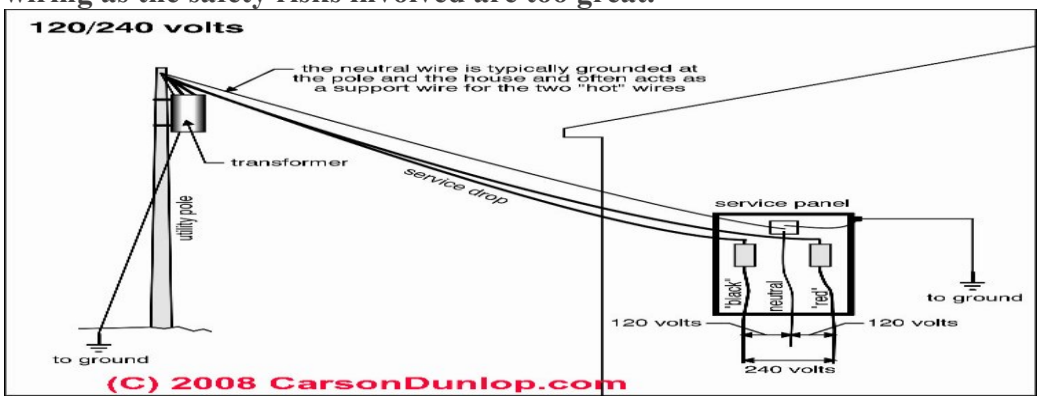
Learning Objective - Why parallel connection is done in house wiring, Identify the main switch, function of energy meter, fuse socket, plug and calculating load for house wiring etc.

Sl. No.	Tools Required	Qty	Materials Required	Qty	Equipment Required	**Qty**
1.	Tester	1	Wire	02	Energy meter	01
2.	Pliers	1	Wiring Pipe	03	Iron clad main switch	01
3.	Slide Wrench	1	Nail & Screw	01	MCB	01
4.	Screw Driver	1	Putty	01	Switch	01
5	Test Lamp	1	Ceiling Rose	01	sockets	01
6	Hammer	1	Junction Box	01	Holder	01
7	Wire Cutter	1	Clamp	01		
8	Drill Machine	1	Switch Board	01		
9	Poker	1	Fuse Box	01		
			PVC Tape	01		
			Big Wooden Board	01		

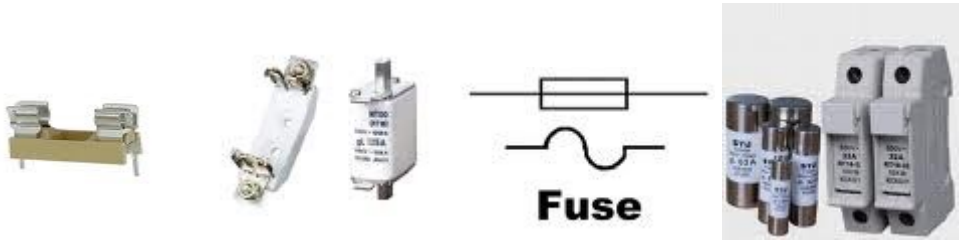
Procedure – Description/Diagram:

Wiring, or what we call house wiring, is the process of providing power to house and structures. Conductors carry electricity, and wiring makes this power available for domestic use. National

and local regulations in a locality have a check on installation of wiring procedures. The wiring in your home is the highway of power that feeds everything electrical in the home. Before you can make electrical connections, you must first know what type wire to use for the installation, what color wire is needed for the application, and what is the proper size wire to handle the load of the circuit. For electricians, wire colors mean everything. They identify whether the wire is a hot, neutral, or a ground wire. If proper precautions are not taken, electricity can be fatal. The point in the house where the electrical service goes from the main grid into the home is called as 'service entry'. Service entry is considered as a critical point in basic electrical wiring. You must make sure that the entry lines are at least ten feet above the ground and inaccessible from the window. It should be free of obstructions like tree branches. The service entry should be installed in the right way that water cannot penetrate the accent point. It is better to call an electrician to do the home wiring as the safety risks involved are too great.

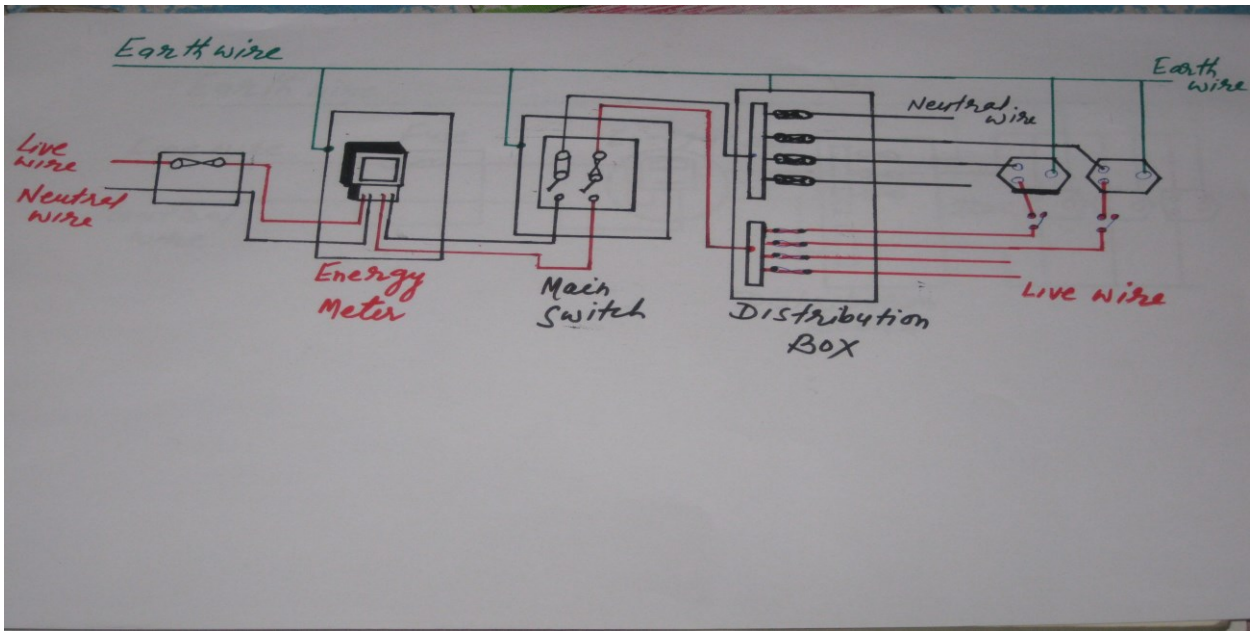


a) Fuse:



b) Circuit Breaker:

C) Isolator-



As per the drawing the service connection will directly connected to Energy meter. From energy meter the line and neutral wire will go to main switch (isolator) of 32A and one earth wire will connected with body of iron clad double pole main switch. In the main switch the phase wire will pass through fuse and neutral wire will be connected to the neutral link. From main switch the line, neutral wire and earth wire will go to distribution box. In distribution box there will be neutral link with many outlet and no. of fuse fuses as per the requirement. From distribution box the pair of line through fuse and neutral wire will go to different places like bed room, kitchen, dining hall, drawing room, verandah, balcony and bathroom and earth wire will also accompany the phase and neutral wire. All the switches will be connected in line wire. Because if the neutral wire is connected in the switches then after switching off the point of bulb or fan, the point will remain alive this may lead to a fatal accident. So always take care that the switches are connected to live wire. In one circuit the total load will never be more than 800 watts.

4. Students activity (Project / Practical): i) Students will be asked to see the fuse provided to them carefully and make a switch board incorporating Fuse.

ii) Students will be asked to see the fuse installed in their house wiring under the supervision of guardians.

3. SWITCH BOARDS

DECEMBER

1. **Learning Objectives: a) One and one switch**
   b) Two loads and two switches
   c) One load and two switches
   d) Two loads and one switch
   e) Bed switch
   f) Fuse in a switch board
   g) Tube light connection

S.No.	Tools requires	Quantity	Materials required	Qty	Equipment required	Quantity
1 a	Tester Connecting	1 5mts	Bulb(100 w) Switch	1 1	Power Supply/ Extension Box	1

	wire		**Two pin plug** **Holder** **Switch Board**	**1** **1** **1**		
b	**Tester** **Connecting wire**	**1** **5mts**	**Bulbs (100w)** **Holders** **Switches** **Switch board**	**2** **2** **2** **1**	**Power Supply/ Extension Box**	**1**
c	**Tester** **Connecting wire**	**1** **5mts**	**Bulb(100 w)** **Holder** **Switches** **Switch Board**	**1** **1** **2** **1**	**Power Supply/ Extension Box**	**1**
d	**Tester** **Connecting wire**	**1** **5mts**	**Bulbs (100 w)** **Holders** **Switch** **Switch Board**	**2** **2** **1** **1**	**Power Supply/ Extension Box**	**1**
e	**Tester** **Connecting wire**	**1** **5mts**	**Bed lamp (15 w)** **Bed switch** **Holder** **Switch Board**	**1** **1** **1** **1**	**Power Supply/ Extension Box**	**1**
f	**Tester** **Connecting wire**	**1** **5mts**	**Fuse carrier & Holder** **Fuse indicator** **Switch Board**	**1** **1** **1**	**Power Supply/ Extension Box**	**1**
g	**Tester** **Connecting wire**	**1** **5mts**	**Tube light Frame** **Tube** **Choke** **Starter** **Side holders**	**1** **1** **1** **1** **2**	**Power Supply/ Extension Box**	**1**

Diagrams:

a) 1) CIRCUIT DIAGRAMS OF (a) to (g) respectively :-

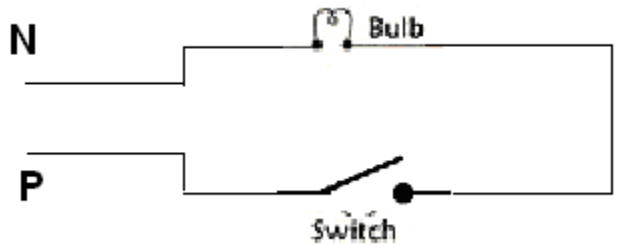


Fig (a)

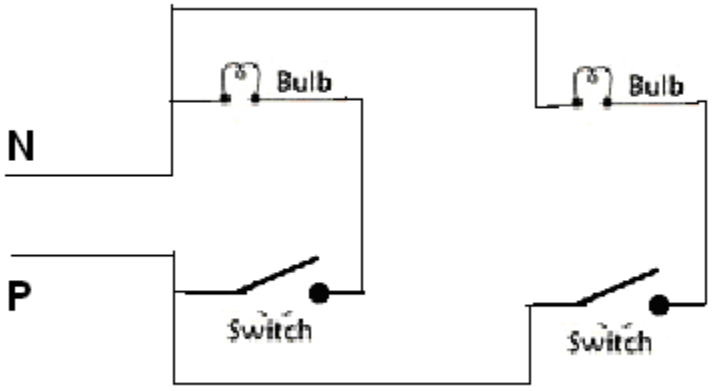


Fig (b)

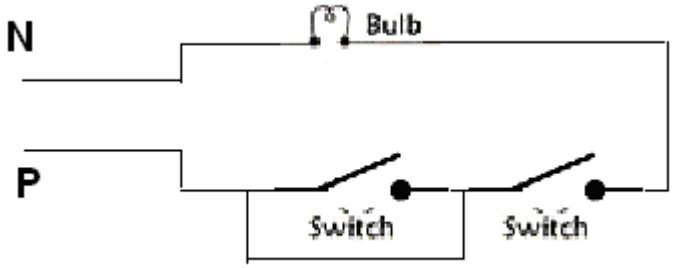


Fig (c)

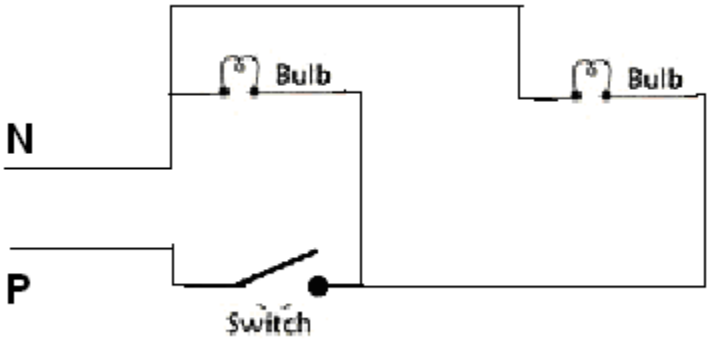


Fig (d)

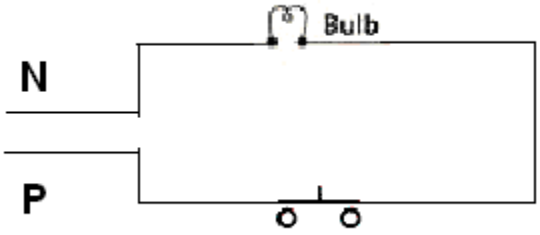


Fig (e)

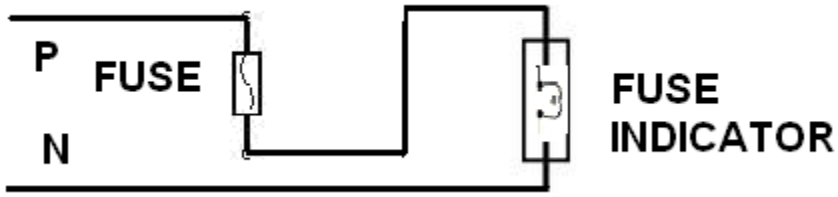


Fig (f)

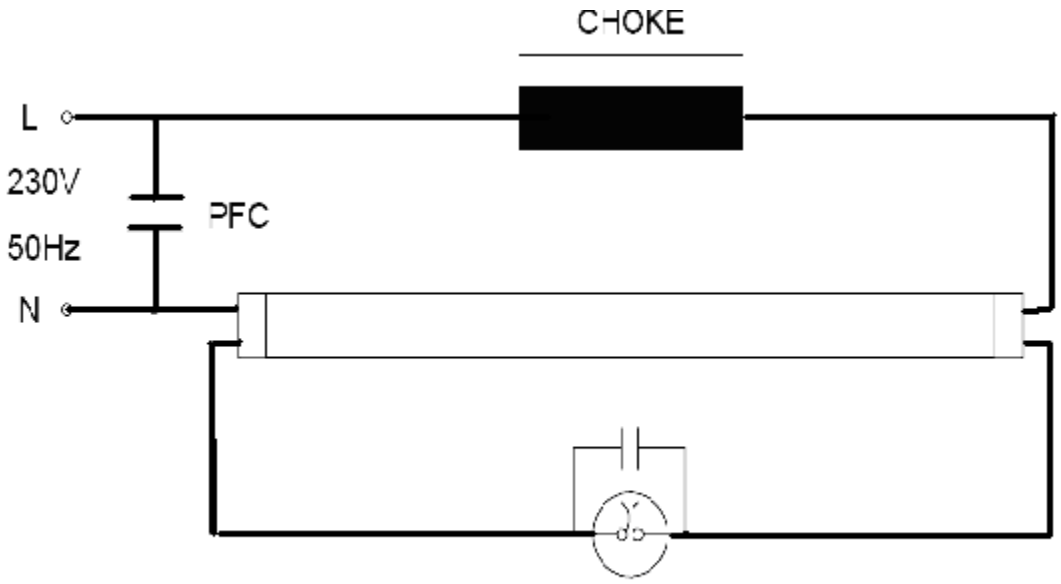


Fig (g)

Students activity:

Students are asked to connect the circuit and to make observations as per the

3. BULBS & TUBES

JANUARY

LEARNING OBJECTIVES: Creating awareness among children on different types of bulbs/tubes, constructional details and their uses.

Tools required	Qty	Materials required	Qty	Equipment required	Qty
Cutting plier	1	holder	1	Switch board/ Extension box	1
tester	1	Tubelight frame	1		
stripper	1	choke	1		
		starter	1		
		Side holder	1		

		Wires (1/18)	5mts		
		Two pin plug	1		

1. PROCEDURE/DESCRIPTION WITH FIGURE:

There are many different types of light bulbs around, and they were all designed with a certain use in mind. What follows is a short description of each major type of bulb commonly found in the home, office and factory, how they work, and their uses.

Incandescent

These are the standard bulbs that most people are familiar with. Incandescent bulbs work by using electricity to heat a tungsten filament in the bulb until it glows. The filament is either in a vacuum or in a mixture of argon/nitrogen gas. Most of the energy consumed by the bulb is given off as heat, causing its Lumens per Watt performance to be low. Because of the filament's high temperature, the tungsten tends to evaporate and collect on the sides of the bulb. The inherent imperfections in the filament causes it to become thinner unevenly. When a bulb is turned on, the sudden surge of energy can cause the thin areas to heat up much faster than the rest of the filament, which in turn causes the filament to break and the bulb to burn out.

Traditional Incandescent Bulbs

Incandescent bulbs produce a steady warm, light that is good for most household applications. A standard incandescent bulb can last for 700-1000 hours, and can be used with a dimmer. Soft white bulbs use a special coating inside the glass bulb to better diffuse the light; but the light color is not changed.

Halogen

Halogen bulbs are a variation of incandescent bulb technology. These bulbs work by passing electricity through a tungsten filament, which is enclosed in a tube containing halogen gas. This halogen gas causes a chemical reaction to take place which removes the tungsten from the wall of the glass and deposits it back onto the filament. This extends the life of the bulb. In order for the chemical reaction to take place, the filament needs to be hotter than what is needed for incandescent bulbs. The good news is that a hotter filament produces a brilliant white light and is more efficient (more lumens per watt).

Various types of halogen bulbs

The bad news is that a hotter filament means that the tungsten is evaporating that much faster. Therefore a denser, more expensive fill gas (krypton), and a higher pressure, are used to slow down the evaporation. This means that a thicker, but smaller glass bulb (envelope) is needed, which translates to a higher cost. Due to the smaller glass envelope (bulb), the halogen bulb gets much hotter than other bulbs. A 300 watt bulb can reach over 300 degrees C. Therefore attention must be paid to where halogen bulbs are used, so that they don't accidentally come in contact with flammable materials, or burn those passing by.

To summarize, the halogen has the advantage of being more efficient (although not by much) and having longer life than the incandescent bulb. They are relatively small in size and are dimmable. The disadvantages are that they are more expensive, and burn at a much higher temperature, which could possibly be a fire hazard in certain areas

Precaution: Care must be taken not to touch the glass part of the bulb with our fingers. The oils from our fingers will weaken the glass and shorten the bulb's life. Many times this causes the bulb to burst when the filament finally burns out.

Fluorescent

These bulbs work by passing a current through a tube filled with argon gas and mercury. This produces ultraviolet radiation that bombards the phosphorous coating causing it to emit light (see: "How Fluorescents Work"). Bulb life is very long - 10,000 to 20,000 hours. Fluorescent bulbs are also very efficient, producing very little heat. A

common misconception is that all fluorescent lamps are neutral or cool in color appearance and do not have very good color-rendering ability. This is largely due to the fact that historically the "cool white" fluorescent lamp was the industry standard. It had a very cool color appearance (4200K) and poor CRI rating (62). This is simply no longer the case. Regarding color, a wide variety of fluorescent lamps (T12, T8, T5, etc.), using rare-earth tri-phosphor technology, offer superior color rendition (as high as 95) and a wide range of color temperature choices (from 2700K to 5000K and higher). Fluorescent bulbs are ideal for lighting large areas where little detail work will be done (e.g. basements, storage lockers, etc.). With the new type bulbs, and style of fixtures coming out, fluorescents can be used in most places around the home. Most fluorescent bulb cannot be used with dimmers.



Note that fluorescent bulbs need components called ballasts to provide the right amount of voltage. There are primarily two types - magnetic and electronic. Electronic ballasts solve some of the flickering and humming problems associated with magnetic ballast, and are more efficient, but cost more to purchase. Some ballasts need a "starter" to work along with it. Starters are sort of small mechanical timers, needed to cause a stream of electrons to flow across the tube and ionize the mercury vapor (see: "How Fluorescents Work").

On tube type fluorescent bulbs, the letter T designates that the bulb is tubular in shape. The number after it expresses the diameter of the bulb in eighths of an inch.

Compact Fluorescent Lamps

Compact Fluorescent Lamps (CFLs) are a modern type of light bulbs, that work like fluorescent bulbs, but in a much smaller package. Similar to regular fluorescent bulbs, they produce little heat and are very efficient. They are available to fit screw type base fittings and pin type (snap-in). Most CFLs either consist of a number of short glass sticks, or two or three small tubular loops. Sometimes, they are enclosed in a glass bowl, made to look similar to a regular incandescent bulb. Most CFLs cannot be used with dimmers. They normally last up to 10,000 hours. (For more info on CFLs see: CFL)

Approximate Equivalents to Incandescent Bulbs	
CFL	Incandescent
7–10 Watts	40 Watts
15-18 Watts	60 Watts
20 Watts	75 Watts
20-25 Watts	100 Watts
32 Watts	150 Watts

High-Intensity Discharge Lamps

High Pressure Sodium (HPS), Metal Halide, Mercury Vapor and Self-Ballasted Mercury Lamps are all high intensity discharge lamps (HID). With the exception of self-ballasted lamps, auxiliary equipment such as ballasts and starters must be provided for proper starting and operation of each type bulb. Compared to fluorescent and incandescent lamps, HID lamps produce a large quantity of light from a relatively small bulb.

HID lamps produce light by striking an electrical arc across tungsten electrodes housed inside a specially designed inner glass tube. This tube is filled with both gas and metals. The gas aids in the starting of the lamps. Then, the metals produce the light once they are heated to a point of evaporation.

Standard high-pressure sodium lamps have the highest efficacy of all HID lamps, but they produce a yellowish light. High-pressure sodium lamps that produce a whiter light are now available, but efficiency is somewhat sacrificed. Metal halide lamps are less efficient but produce a whiter, more natural light. Colored metal halide

lamps are also available. HID lamps are typically used not only when energy efficiency and/or long life are desired, but also when high levels of light are required over large areas. Such areas include gymnasiums, large public areas, outdoor activity areas, roadways, pathways, and parking lots. Lately, metal halide is successfully being used in residential environments.

Low-Pressure Sodium Lamps

Low-pressure sodium lamps have the highest efficacy of all commercially available lighting sources. Even though they emit a yellow light, a low-pressure sodium lamp shouldn't be confused with a standard high-pressure sodium lamp. Low-pressure sodium lamps operate much like a fluorescent lamp and require a ballast. There is a brief warm-up period for the lamp to reach full brightness.
With a CRI of 0, low-pressure sodium lamps are used where color rendition is not important but energy efficiency is. They're commonly used for outdoor, roadway, parking lot, and pathway lighting.

LED (Light Emitting Diodes)

Light Emitting Diodes (LED) are bulbs without a filament, that are low in power consumption and have a long life span. LEDs are just starting to rival conventional lighting, but unfortunately they just don't have the output (lumen) needed to completely replace incandescent, and other type, bulbs just yet. Never the less, technology is advancing everyday, and it will not be long until the LED bulb will be the bulb of choice for most applications in the home and work place. (For more info on LEDs see: LED Lighting - the lighting of the future)

STUDENTS ACTIVITY:

Students are asked to identify the type of the bulb out of the given bulbs and to mention its uses.

EVALUATION / QUESTIONS:

1. How many types of bulbs are available for domestic purpose?

……
……

2. What is the difference between fluorescent bulb and CFL?

……
……

3. In what way CFLs are used and where?

……
……

4. What precautions should be taken while handling halogen bulbs?

……
……

5. What are LEDs and where they are preferred to be used?

……
……

ELECTRICAL INTRUMENT

DECEMBER

Electrical Instrument (The instruments which are used to measured electrical quantities are called electrical instrument).

Learning Objective: - The learning about electrical instrument

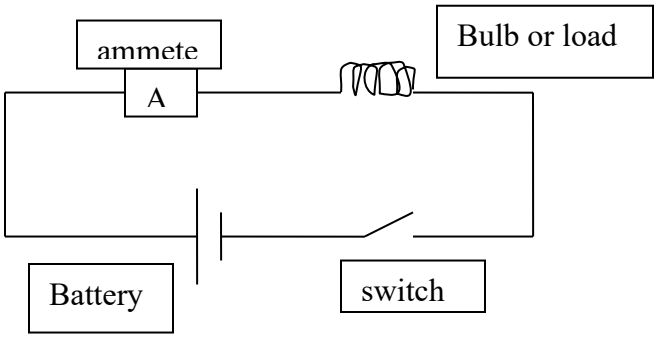
- ☺ Ammeter: Principle, use and types.
- ☺ Voltmeter: Principle, use and types.
- ☺ MultiMatre importance: Principle, use and types.

S.N.	Tools required	Qty	Materials	Qty Qty	Equipment
1.	Screw driver different size	1set	Battery(6, or 12)V	1pc 1pc	Voltmeter (0-10)V
2.	Pliers	1pc	Switch(one way)	3pc 1pc	Ammeter(0-5)A
3.	Tester	1pc	Dc bulb(3-12)V	3pc 1pc	Multimeter
4.	Wire cutter	1pc	Connecting wire	3m……	…….

Procedure:-

Ammeter- Principle: - It is used to measure current of any equipment, appliance, machine. It is found in different ranges i.e. 0-1A, 0-5A, 0-10A, 0-20A, 0-50A, 0-100A etc. It is always connected in series in the circuit because of possessing low resistance.
Use: - Battery charger, sub-station, panel board.
Types: - ac& dc

Activity:



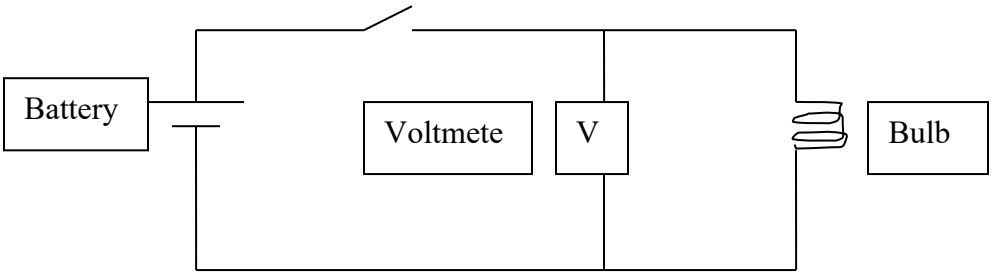
1. Ammeter, battery, switch, bulb or load connected according to fig.
2. Ammeter, switch and bulb are connected in series combination.
3. When switch is in off condition, ammeter not shows any value of current.
4. When switch is in on condition, ammeter shows some value of current. Which is flow through the bulb?

Voltmeter:-

Principle:- It is use to measure the voltage of any appliance, equipment, generator, cell, or supply etc. It is found in different range i.e. 0-10V, 0-15V, 0-30V, 0-110V, 0-250V, 0-300V, 0-500V etc. It is always connected in parallel in the circuit because of possessing high resistance.
Use:- Stabilizer, sub-station, panel board.
Types:- ac & dc

Switch

Activity:-



1. Voltmeter, battery, switch, bulb or load connected according to fig.
2. Voltmeter, battery and bulb are connected in parallel combination.
3. When switch is in off condition voltmeter not shows any value of voltage.
4. When switch is in on condition, voltmeter shows some value of voltage. Which is drop in the bulb?

Multimeter:-

Principle:- It is use to measure the current, voltage, resistance of any circuit and possess different range. Or the meaning of multimeter is, instrument measured to many type quantity, generally, this is making for measured to resistance & ac/dc voltage, current.

Use:- measured to voltage, current & resistance &also test for diode transistor &capacitor.

Types:- ac/dc

Question 1. What is the unit of voltage and current?

Question 2. Define to voltage and current.

Question 3.How to connect voltmeter and ammeter with the supply?

Question 4. In which combination current is divided.

Question 5. If in a circuit voltmeter shows 10 volt and a load of resistance is 20 Ω then what current flow in the resistance.

AIM : - To familiarize the basic electronic components and to study their classification.

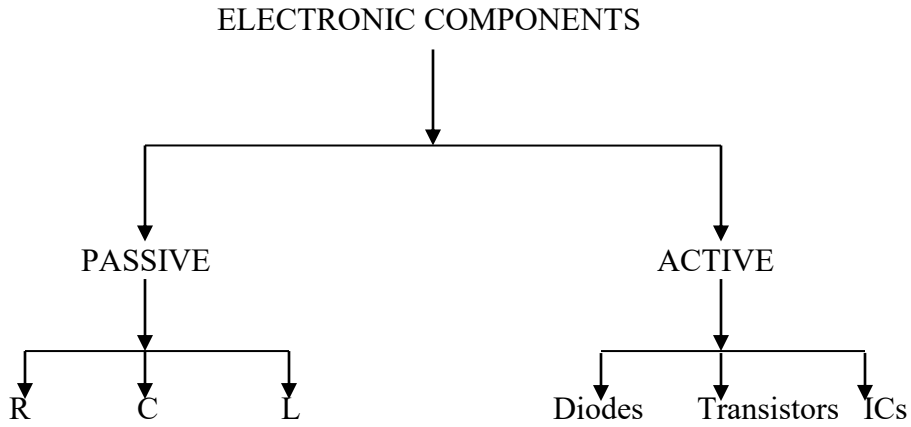
MATERIALS REQUIRED:

1. Resistors
2. Capacitors
3. Inductors
4. Transformers
5. Diodes
6. Transistors
7. ICs

GIST

Basic Electronic Components are classified in to

1. Passive
2. Active



PASSIVE COMPONENTS are those which cannot generate signals on their own.
Egs: Resistors, Capacitors, Inductors.

ACTIVE COMPONENTS are those which can generate signals on their own.
Egs: Diodes, Transistors, ICs.

RESISTORS

A **resistor** is a two-terminal electronic component that produces a voltage across its terminals that is proportional to the electric current through it in accordance with Ohm's law . Resistors are either FIXED or VARIABLE

FIXED RESISTORS : Are resistors in which the value is constant.
Egs: Carbon composition Resistors, Metal Film Resistors, Wire wound resistors etc.

CARBON COMPOSITION RESISTORS

Carbon composition resistors consist of a solid cylindrical resistive element with embedded wire leads or metal end caps to which the lead wires are attached. The body of the resistor is protected with paint or plastic The resistive element is made from a mixture of finely ground (powdered) carbon and an insulating material (usually ceramic). A resin holds the mixture together . Values range from fractions of an ohm to 22 mega ohms.

WIRE WOUND RESISTORS

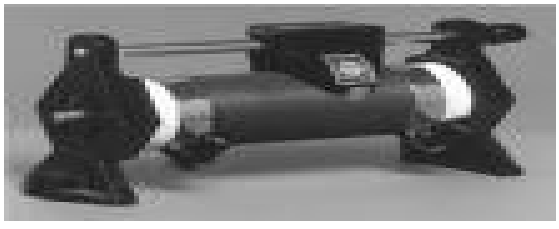
Wire wound resistors are commonly made by winding a metal wire, usually nichrome, around a ceramic, plastic, or fiberglass core. The ends of the wire are soldered or welded to two caps or rings, attached to the ends of the core. The assembly is protected with a layer of paint, molded plastic, or an enamel coating baked at high temperature .

METAL FILM RESISTORS

Metal film resistors are usually coated with nickel chromium (NiCr).

VARIABLE RESISTORS : Are Resistors in which their value can be changed by rotating a shaft or by moving a sliding arm. Egs: Rheostat, Potentiometer, Preset.

RHEOSTAT



A rheostat is an electrical component that has an adjustable resistance. It is a type of potentiometer that has two terminals instead of three. The two main types of rheostat are the rotary and slider.

POTENTIOMETER

A common element in electronic devices is a three-terminal resistor with a continuously adjustable tapping point controlled by rotation of a shaft or knob. These variable resistors are known as potentiometers when all three terminals are present, since they act as a continuously adjustable voltage divider. A common example is a volume control for a radio receiver.

PRESET

These are miniature versions of the standard variable resistor. They are designed to be mounted directly onto the circuit board and adjusted only when the circuit is built. For example to set the frequency of an alarm tone or the sensitivity of a light-sensitive circuit. A small screwdriver or similar tool is required to adjust presets. Presets are much cheaper than standard variable resistors so they are sometimes used in projects where a standard variable resistor would normally be used.

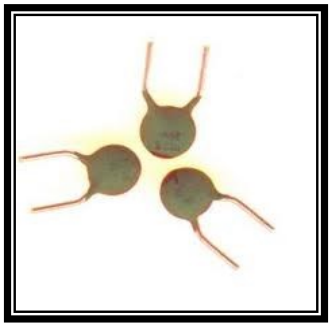
CAPACITORS

A capacitor is a passive electronic component consisting of a pair of conductors separated by a dielectric (insulator). When there is a potential difference (voltage) across the conductors, a static electric field develops in the dielectric that stores energy and produces a mechanical force between the conductors. Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass, in filter networks, for smoothing the output of power supplies, in the resonant circuits that tune radios to particular frequencies and for many other purposes. Capacitors are either FIXED or Variable, POLARISED or UNPOLARISED.

POLARISED CAPACITORS

Electrolytic Capacitors are polarised and they must be connected the correct way round, at least one of their leads will be marked + or -. They are not damaged by heat when soldering. There are two designs of electrolytic capacitors; axial where the leads are attached to each end and radial where both leads are at the same end.

UNPOLARISED CAPACITORS



Small value capacitors are unpolarised and may be connected either way round
Eg. Disc Capacitors, Polyster capacitors.
VARIABLE CAPACITORS

Variable capacitors are mostly used in radio tuning circuits and they are sometimes called 'tuning capacitors'. They have very small capacitance values, typically between 100pF and 500Pf. Eg: Trimmer

TRIMMER

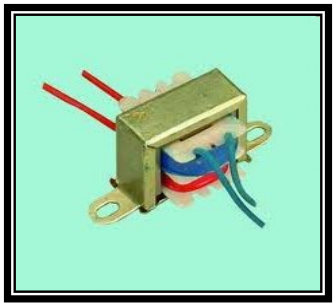
Trimmer capacitors (trimmers) are miniature variable capacitors. They are designed to be mounted directly onto the circuit board and adjusted only when the circuit is built. A small screwdriver or similar tool is required to adjust trimmers. The process of adjusting them requires patience because the presence of your hand and the tool will slightly change the capacitance of the circuit in the region of the trimmer!

Trimmer capacitors are only available with very small capacitances, normally less than 100pF. It is impossible to reduce their capacitance to zero, so they are usually specified by their minimum and maximum values, for example 2-10pF.

INDUCTORS

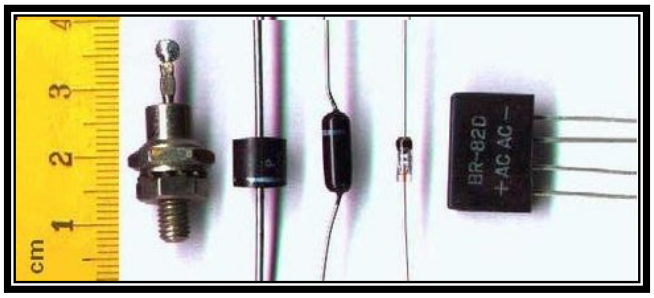
An **inductor** or a **reactor** is a passive electrical component that can store energy in a magnetic field created by the electric current passing through it. An inductor's ability to store magnetic energy is measured by its inductance, in units of henries. Inductors are used extensively in analog circuits and signal processing. Inductors in conjunction with capacitors and other components form tuned circuits which can emphasize or filter out specific signal frequencies.

TRANSFORMER



A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first or *primary* winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic field through the *secondary* winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.

DIODES



A **diode** is a two-terminal electronic component that conducts electric current in only one direction.

Uses of diodes

Light emitting diodes are replacing conventional light bulbs because they require less electricity to produce even more light and it generates a very small or no amount of heat.

Photodiodes have become very useful when it comes to safety in public places

TRANSISTORS

A **transistor** is a semiconductor device used to amplify and switch electronic signals. It is made of a solid piece of semiconductor material, with at least three terminals for connection to an external circuit. A Transistor is either NPN or PNP.

ICs

Integrated circuit (also known as **IC**, **chip**, or **microchip**) is a miniaturized electronic circuit (consisting mainly of semiconductor devices, as well as passive components) that has been manufactured in the surface of a thin substrate of semiconductor material. Integrated circuits are used in almost all electronic equipment in use today and have revolutionized the world of electronics.

LEDs

A **light-emitting diode** (**LED**) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting.

IMPORTANT QUESTIONS:

1. Differentiate between active and passive components.

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……

2. What is the function of a capacitor?

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……
……

3. Name any two variable resistors.

……
……
……

4. Name a polarized capacitor.

……
……
……

5. What is the f unction of an LED?

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……
……

ACTIVITY.

Identify the following components and write their names and uses.

DIODES AND THEIR CHARACTERISTICS

FEBRUARY

LEARNING OBJECTIVES:-

In this topic we will study the symbol, characteristics of different type of Diodes and study of the Transistors with their Working Principle, Types and Uses.

S. N.	Tools required	Qty.	Materials Required	Qty.	Equipment required	Qty.
1	Screw Driver	2	P-N junction Diode	2	Multimeter	2
2	Stripper	2	Zener Diode	2	Bread board	2
3	--	--	NPN Transistors	2	Voltmeter	2
4	--	--	PNP Transistors	2	Ammeter	2
5	--	--	Wires	--	--	--

PROCEDURE / DESCRIPTION:-

A) DIODES:-

a) P-N Junction Diode :-

It is a semiconductor device which allows current to flow through it in only one direction.

It is specifically made to allow current to flow through it in only one direction.

It can be used as a rectifier that converts AC (Alternating Current) to DC (Direct Current) for a power supply device.

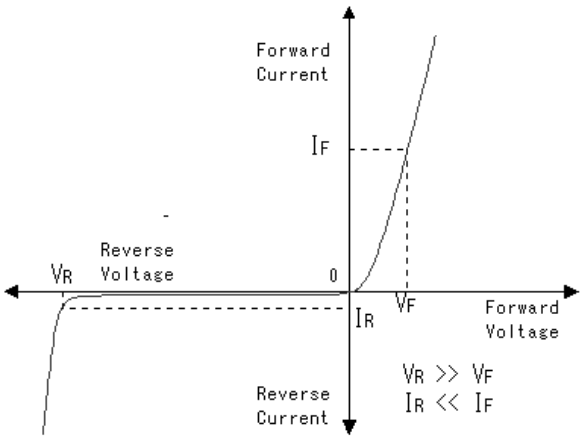
It can be used to separate the signal from radio frequencies.

It can be used as an on/off switch that controls current.

SYMBOL:-

Anode (A)  Cathode (K)

CHARACTERISTICS :-



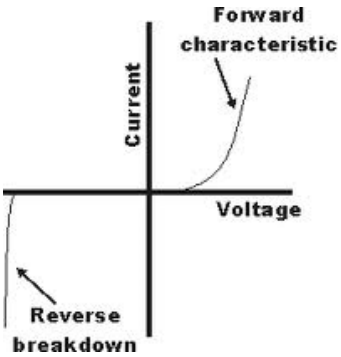
b) ZENER DIODE :-

It is used to regulate voltage, by taking advantage of the fact that Zener diodes tend to stabilize at a certain voltage when that voltage is applied in the opposite direction.

SYMBOL:-

Anode (A)  Cathode (K)

CHARACTERISTICS :-



B) TRANSISTORS:-

TYPES OF A TANSISTORS:-

There are two types of transistors:-

a) **NPN** Transistor and

b) **PNP** Transistor.

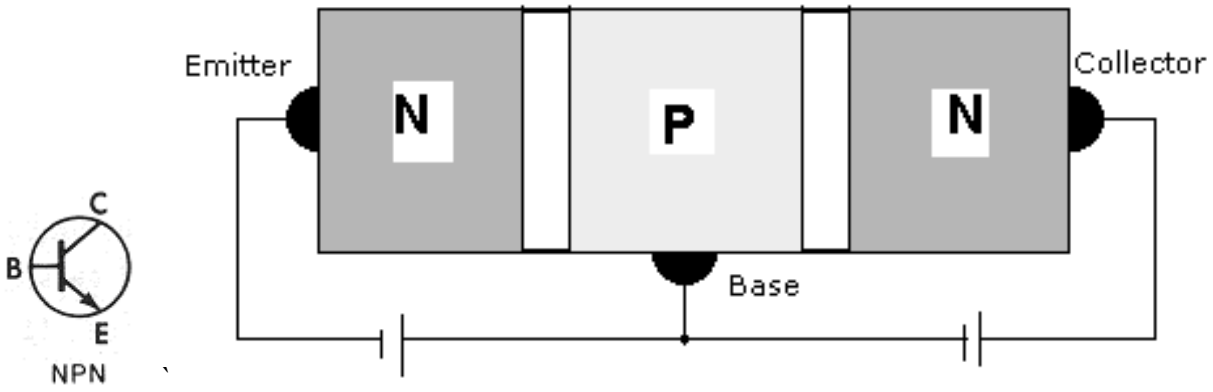
The leads are labelled

Base (B), which is the lead responsible for activating the transistor.

Collector (C) which is the positive lead and

Emitter (E) which is the negative lead.

a) NPN TRANSISTOR:-

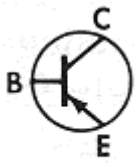


An NPN transistor is a type of bipolar transistor.

They have a PN junction made from n- and p-type semiconductors.

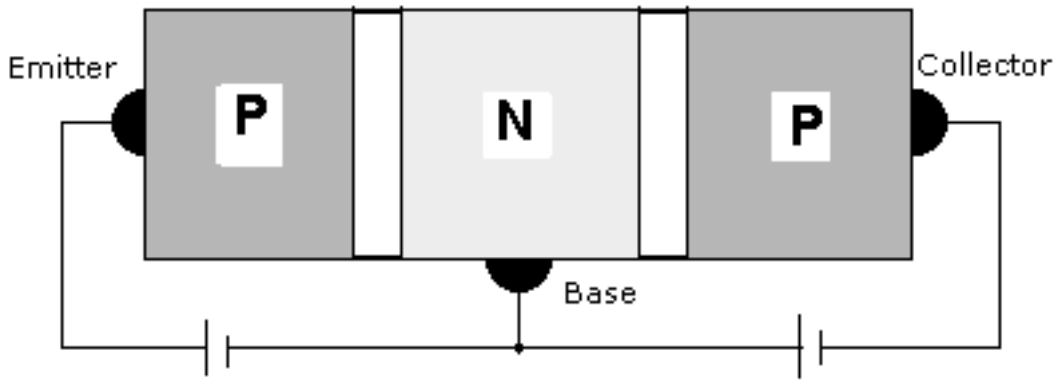
An NPN has a p-type placed between two n-types.

These layers are called the base, emitter, and collector, and each one has a lead or terminal.



PNP

b) PNP TRANSISTOR:-



An PNP transistor is a type of bipolar transistor.

They have a PN junction made from n- and p-type semiconductors.

An PNP has a n-type placed between two p-types.

These layers are called the base, emitter, and collector, and each one has a lead or terminal.

APPLICATIONS / USES OF A TANSISTORS :-

1) A transistor may be used as a **switch**.

2) A transistor is used as an **amplifier.**

STUDENT ACTIVITY (PROJECT /PRACTICAL) :-

A) DIODES:-

Observation Table:-

S.N.	Diode	V_f	I_f	V_r	I_r
1	P – N junction diode				
2					
3	Zener diode				
4					

To draw a V-I characteristics of both the diodes.

B) TRANSISTORS:-

S.N.	Transistors No.	NPN / PNP
1		
2		

From given Transistors identify whether it is NPN or PNP.

Also identify the terminals i.e. Base, Emitter and Collector.

EVALUATION / QUESTIONS :-

1) Draw the symbol of P-N junction diode.

……
……

2) Draw the V-I characteristics of Zener diode.

……
……

3) What are the types of the Transistors?

……
……

4) Draw the symbol of NPN transistor with proper labeling?

……
……

5) List out the applications of the transistors.

……
……

LEARNING OBJECTIVE: Defining the Ohm's law and explaining its applications.

Tools required	Qty	Materials required	Qty	Equipment required	Qty
Cutting plier	1	Resistor	1	Multimeter	1
stripper	1	Cells	4	Ammeter	1
		Wires	2mts	Battery Holder	1
		PCB	1	Soldering Iron	1
		Lead			
		Flux			

PROCEDURE / DESCRIPTION WITH DIAGRAM:

DEFINITION:

Ohm's law states that in any closed electrical circuit at a constant temperature the current is directly proportional to the voltage and inversely proportional to the resistance of the circuit.
i.e., I = E/R where 'I' stands for current in amperes; 'E' stands for voltage in volts and 'R' stands for resistance in ohms.

When applying ohm's law to the whole circuit, the voltage of the whole circuit is divided by the resistance of the whole circuit to find the current of the whole circuit.

When applying ohm's law to a part of the circuit, the voltage of the particular part of the circuit is divided by the resistance of the same part to find the current of the same part

By using Ohm's law, you are able to find the resistance of a circuit, knowing only the voltage and the current in the circuit.

In any equation, if all the variables (parameters) are known except one, that unknown can be found. For example, using Ohm's law, if current (I) and voltage (E) are known, resistance (R) the only parameter not known, can be determined:

Basic formula:

$$I = \frac{E}{R}$$

Remove the divisor by multiplying both sides by R:

$$R \times I = \frac{E}{\cancel{R}} \times \frac{\cancel{R}}{1}$$

Result of step 2: R x I = E
To get R alone (on one side of the equation) divide both sides by I:

$$\frac{R\cancel{I}}{\cancel{I}} = \frac{E}{I}$$

The basic formula, transposed for R, is:

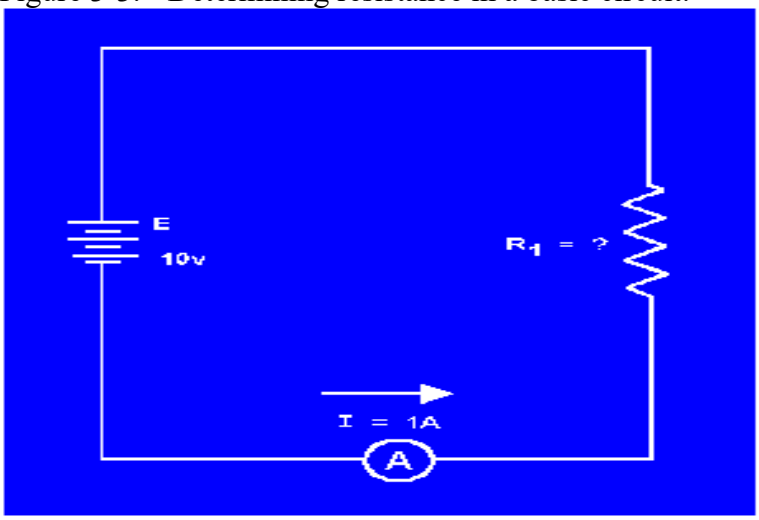
$$R = \frac{E}{I}$$

Refer to figure 3-3 where E equals 10 volts and I equals 1 ampere. Solve for R, using the equation just explained.
Given:
E = 10 volts
I = 1 ampere

Solution:

$$R = \frac{E}{I}$$

Figure 3-3. - Determining resistance in a basic circuit.



Insert the values of the known quantities:

$$R = \frac{10 \text{ volts}}{1 \text{ ampere}}$$

$$R = 10 \text{ ohms}$$

The basic formula can also be used to solve for E:

Take the basic formula: $I = \frac{E}{R}$

multiply both sides by R:

$$I \times R = \frac{E}{R} \times \frac{R}{1}$$

Results: $E = I \times R$

Example: The generator has a resistance of 10 ohms and generates 250 volts at no load. Each line wire has a resistance of 2 ohms. The electric iron when represents the load has a resistance of 11ohms.

QUESTIONS

1. What is the current in the circuit?

……
……

2. What is the voltage drop across the electric iron when 10 amps. current is flowing through it?

……
……

3. What is the voltage drop in the line when a current of 10 amps. flows through the circuit?

……
……

4. What must be the open circuit voltage of the generator in order that it delivers a current of 10 amps. to this circuit?

……
……

Solution:

Total resistance = Resistance of generator + resistance of each lineX2 +resistance of
The electric iron
= 10 + 2X2 + 11
= 25 ohms
Total Voltage = 250 volts
Total I = E / R = 250 / 25 = 10 amps.
The voltage drop in the electric iron = I X R = 10 X 11 = 110 Volts
The Voltage drop in the line = I X R (twice)
=10 X 2 X 2 = 40 volts.
The open circuit voltage of the generator = I X R = 10 X 25 = 250 Volts

STUDENTS ACTIVITY: Students are asked to solve similar problems?

EVALUATION / QUESTION:

What will be the resistance of an electric heater which takes 4.5 amps. at 230 V?

……
……
……
……
……