

Class:7	Subject: Science	Topic: Electric Current and Its effects
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SUMMARY SHEET		
Learner Previous Knowledge	Electric Cell, Electric circuit, Working of electric circuit in a torch Hands on experience in building a circuit Conductors and insulators-meaning, role and its use	
Target Knowledge for this Topic	Recap of electric current Represent the various components of electric circuits along with their symbols; Differentiate and summarize the key features of different kinds of circuits; Introduction to electromagnetism (bringing in link between magnetism and electric current) and its application; Electromagnet to be introduced here Effects of electric current Experiment about the various effects of electric current (heat and magnetic effect); Study the application of the effects of current (fuse and electric bell); Activities based on Electricity	
Learning Goals		
<i>More Complex Learning Goal-</i> Students will be able to identify and explain logical errors in given electrical circuits, electromagnets and fuse and also describe effects of current.		
<i>Target Learning Goal-</i> Students will be able to describe the effects of current, and explain functioning of fuse, electric bell, and applications of electromagnets and also depict a circuit of given components using symbols.		
<i>Simpler Learning Goal-</i> Students will be able to identify the symbols of electric circuit, define fuse and list the effects of current.		
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	Recall how to connect a simple electrical circuit and parts of it.	- Board and markers - Worksheet 1 - Activity: two drawing pins, a safety pin, two wires, small sheet of thermocol, torch cell, bulb

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



2	Deduce heating effect of current.	- Board and markers - Worksheet 2 - Activity 1: (for each group) two drawing pins, a safety pin, two wires, small sheet of thermocol, one torch cell, bulb - Activity 2:(for each group) piece of nichrome wire coated in wax, two nails, one cell, board
3	Demonstrate how fuse works and then explain it in their words.	- Board and markers - Worksheet 3 - Activity: (for each student) piece of thin steel wool wire, two nails, two or more cells, board
4	Deduce magnetic effect of current by hypothesizing on the basis of a given experiment.	- Board and markers - Worksheet 4 - Activity: (for each group) cardboard square, electric wire, compass needle, electrical cell, switch
5	Demonstrate the working of electromagnet and explain its principle.	- Board and markers - Worksheet 5 - Activity: (for each group) insulated electric wire, long iron nail, cell, switch, pins
6	Describe uses of electromagnet and deduce the working of electric bell in detail.	- Board and markers - Worksheet 6 - Reference sheet 1

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Lesson Plan 1

Lesson Objectives

At the end of this lesson students will be able to:

- Recall how to connect a simple electrical circuit and parts of it.

Teaching Learning Materials required

- Board and markers
- Worksheet 1
- Activity: two drawing pins, a safety pin, two wires, small sheet of thermocol, torch cell, bulb

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate the prior knowledge	<u>Recalling previous knowledge of electric current and circuit</u> - Introduce the topic 'electricity' by asking a few students what they know about electrical circuit and current. Pose questions such as: - What is a cell? - What kind of terminals does a cell have? how it is useful and write all the responses on the board. - What helps in generating electricity with a cell? - What is a circuit? - What is closed and open circuit? - Collate all answers and ensure that all students are on the same page.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activity</u> - Distribute worksheet 1 to all the students on the screen. - Ask the students to read the activity as an exercise in recalling how a circuit is arranged for current to flow. - Ask them to attempt at drawing circuits independently given in part 2 of the worksheet. They can then tally their answers in groups. - Let there be a whole class discussion and all the answers can be discussed together. - Ensure that the whole class is on the same page.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Recap students' learning	Wrap up the class by clearing any doubts that the students may have.
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Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Worksheet 1

Skill: Observation & Investigation

Part 1

Activity to recall knowledge of circuit

Material: two drawing pins, a safety pin, two wires, small sheet of thermocol, torch cell, bulb

Instructions:

1. Fix one drawing pin through the closed end of safety pin, on to the thermocol. The safety pin must rotate freely.
2. Fix the other pin at a distance, such that the free end of the safety pin touches it.
3. This safety pin is your switch.
4. Now make a circuit as done in previous activities with the help of the bulb, wire and cell. Make the attachment as shown in the figure.



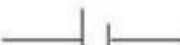
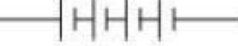
Recall your knowledge!!

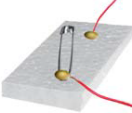
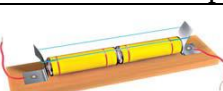
1. What kind of circuit is shown in the given picture? _____.
2. What kind of circuit is required for current to flow? _____
3. Name the terminals of a cell. _____
4. What is the difference between a cell and battery? _____

Part-2

Information

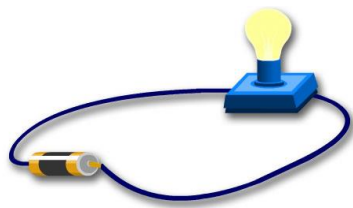
While studying electricity in Physics, scientists have to draw circuits very often. To make their work easier, each component of a circuit is assigned with symbols and these symbols are then used to represent a circuit. These symbols are common worldwide. Observe the given symbols.

Component of electrical circuit	Symbol
Connecting wires	
Switch in the 'OFF' position	
Bulb	
Cell	
Switch in the 'ON' position	
Battery	

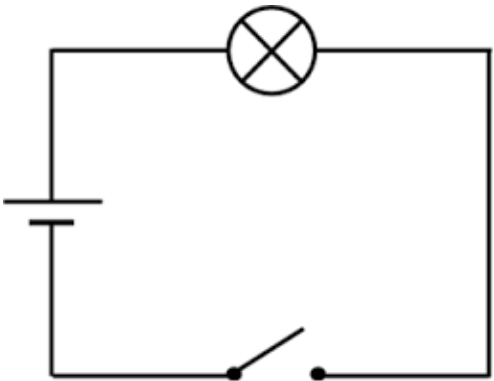
Picture of circuit component
 Wire
 Switch in OFF position
 Bulb
 Cell
 Switch in OFF position
 Battery

* Bulb is also shown as 

I. Observe the circuit and draw a diagram using symbols.

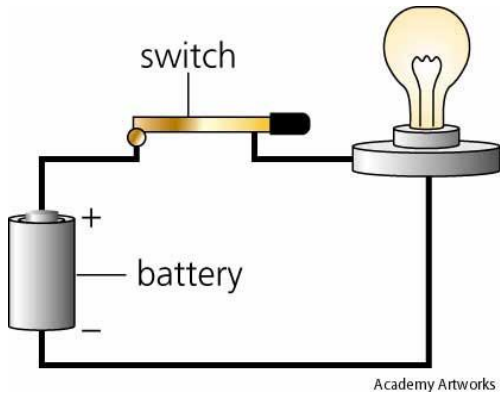


II. Observe the circuit and draw a diagram using components.



Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

III. Observe the circuit and draw a diagram using symbols.



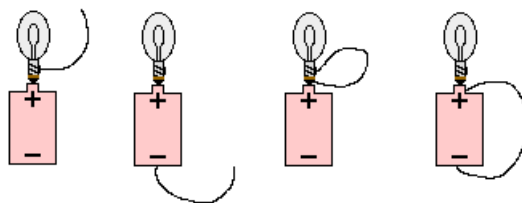
IV. Classify the following as conductors and insulators.

pencil piece of foil glass bangle cloth copper wire eraser rubber gloves paper bag
plastic ruler drawing pin steel ruler board pin key plastic cup textbook cardboard metallic ruler

Conductors

Insulators

V. Which of the following is/are open circuit? Give reason for your answer.



Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



VI. Is switch a necessity for a circuit to work? Can a bulb glow even if there is no switch in a circuit?

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Lesson Plan 2

Lesson Objectives

At the end of this lesson students will be able to:

- Deduce heating effect of current.

Teaching Learning Materials required

- Board and markers
- Worksheet 2
- Activity 1: (for each group) two drawing pins, a safety pin, two wires, small sheet of thermocol, one torch cell, bulb
- Activity 2:(for each group) piece of nichrome wire coated in wax, two nails, one cell, board

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Note: Divide class into three groups. Distribute the activities among them, so that they are able to have better understanding in less time.

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	<u>Whole Class Discussion</u> • Ask the students to recap and share their observations of the previous class. • You may pose questions such as: ○ Does the length of the wire affect the circuit? ○ To complete a circuit how should the terminals of a battery be connected? ○ Circuit is complete when_____ • Collect the responses and arrive at a common consensus. • Now put the question to the students: 'When electricity flows through filament it glows to give out light. Why?' Inform the students that they will find out the answer to this question with an activity
Lesson Middle <u>Time:</u> 25 min.	<u>Activity & Worksheet</u> • Inform the students that they will now find out what is the effect of current.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



<u>Purpose:</u> • Develop conceptual understanding	• Distribute Worksheet 2 to all students. • Ask each group to do the experiment. • Let the groups then attempt questions. • After the students have attempted the questions, let there be a discussion on the answers within the groups. • Each group must now share their work with the rest of the class. • Let the groups discuss arrive at a common consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up • Homework Assignment	<u>Finish Up</u> • Wrap up the class by clearing doubts. <u>Homework Assignment</u> • Find out how does a bulb work. • List the applications which you use at home working on the principle of the heating effect of the current. You may ask your mother if you wish! • Find out the meaning of fuse and circuit breakers from the internet or your textbook. Ask your father to show you where the fuse box/circuit breaker is located in your house and observe it.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

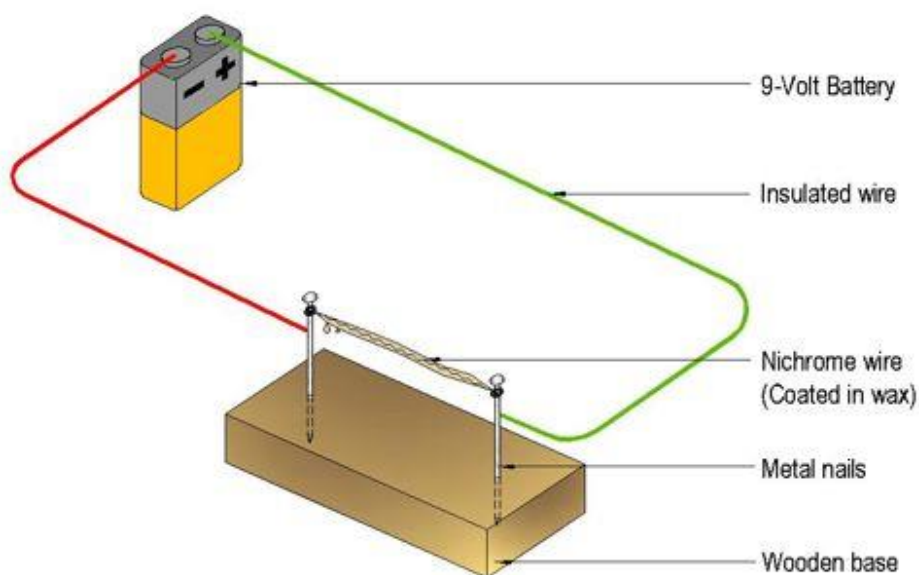
Worksheet 2

Skill: Drawing Inferences

Material: piece of nichrome wire coated in wax, two nails, one cell, board/thermocool

Instructions

1. Arrange the circuit as shown in the picture.



2. Make the connections and observe what happens.
3. After a minute touch the wire.

Observation Questions

1. What did you observe with respect to the wax coated nichrome wire?

2. What did you observe when you touched the wire?

Based on this observation, you can say that when the circuit is complete and the current flows, the nichrome wire becomes _____.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Period 3

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate how fuse works and then explain it in their words.

Teaching Learning Materials required

- Board and markers
- Worksheet 3
- Activity: (for each group) piece of thin steel wool wire, two nails, two or more cells, board

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	• Ask the students to share their homework in their group. Instruct the students to exchange information and frame their definition of a fuse. Give each group a fuse used in buildings and a fuse used in electrical appliances. Let the students observe it carefully. They must exchange their knowledge about circuit breakers too, in case they have found out. • Inform the students that they will now find out why fuse and circuit breakers are required.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Activity</u> • Distribute worksheet 3 to all groups. • Let them do the activity and observe how fuse works. • They can attempt questions based on it. • Ask the students now to share their observations and answers to all the questions. • Ensure that the whole class arrives at a consensus.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> - Wrap up the class by clearing their doubts. - Ask the students following questions? - What did you understand by short circuit? - What causes it?
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Worksheet 3

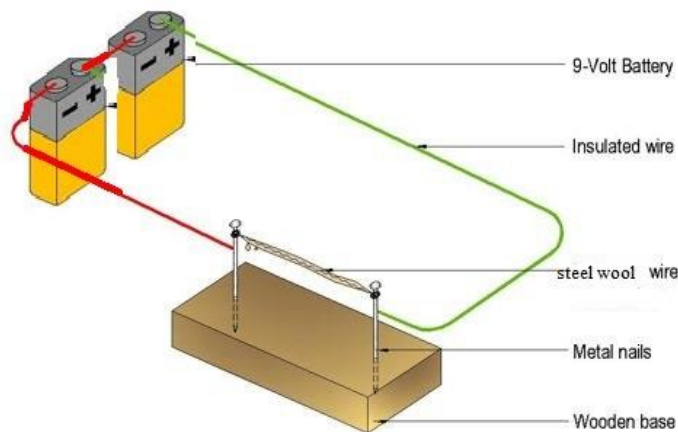
Skill: Drawing Inferences

Activity

Material: piece of thin steel wool wire, two nails, two or more cells, board

Instructions

1. Arrange the circuit as shown in the picture. It is identical to what you did in the activity in the previous class. But use steel wool instead of nichrome and use 2 or more cells



2. Make the connections and observe what happens.
3. After a minute touch the wire.

Question

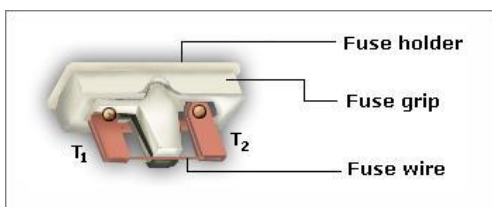
1. What happened when you made the connection?

2. This arrangement tells you how a fuse works. State here how it this arrangement is helpful to you.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Information

- Fuse is a component which helps in protecting electrical circuits and appliances.
- The fuse breaks the circuit if a fault in an appliance causes too much current flow. This protects the wiring and the appliance if something goes wrong. The fuse contains a piece of wire that melts easily. If the current going through the fuse is too great, the wire heats up until it melts and breaks the circuit.
- Fuses are used in buildings, electrical appliances etc. Cars also have fuses. An electrical fault in a car could start a fire, so all the circuits have to be protected by fuses.
- Circuit breakers or Miniature Circuit Breakers [MCB] are switches which automatically turn off when the electric current in circuit exceeds safety limit.
- The circuit breaker does the same job as the fuse, but it works in a different way. A spring-loaded push switch is held in the closed position by a spring-loaded soft iron bolt. An electromagnet is arranged so that it can pull the bolt away from the switch. If the current increases beyond a set limit, the electromagnet pulls the bolt towards itself, which releases the push switch into the open position.
** You will learn about electro magnet later in this topic. When you study it, you may visit this topic again for better understanding.*



Fuse in building



Fuse in electrical appliance



MCB

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Period 4

Lesson Objectives

At the end of this lesson students will be able to:

- Deduce magnetic effect of current by hypothesizing on the basis of a given experiment.

Teaching Learning Materials required

- Board and markers
- Worksheet 4
- Activity: (for each group) cardboard square, electric wire, compass needle, electrical cell, switch

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	• Begin the class by asking questions such as: ○ What is heating effect of current? ○ What effect of current have you studied so far? Is there any other effect also? • Collect response from the students. Inform the students that they will now find out if there is any other effect of current. Tell the students that a scientist in the 18-19th century did experiment to test the effects of current. Instruct the students that they will be given the historical background of this experiment but it is they who have to do the deductions and hypothesis.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Hypothesize and Deduce!</u> • Distribute worksheet 4 to all the groups. • Assign the items needed to do the activity. • Let them follow the instructions in the annexure. • Instruct the students to write their observation and attempt the questions. • After the students have attempted the activity, let there be a discussion on the answers within the groups. Let the groups discuss arrive at a common

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

	consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> - Finish Up - Homework Distribution	<u>Finish Up</u> - Wrap up the class by clearing doubts. <u>Homework Assignment</u> - Find out what is the meaning of electromagnet from your textbook or from the internet.

Worksheet 4

Skill: Drawing Inferences

Hans Christian Oersted

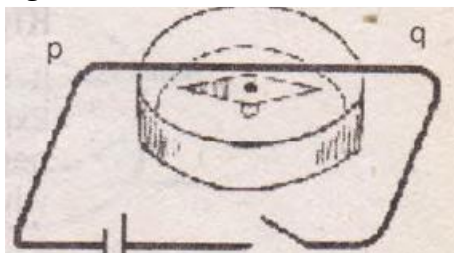
Hans Christian Oersted was a Danish physicist and chemist. He did the following experiment for which he is known worldwide even today! Let us see what he found.

Experiment Done by Oersted

Material Used: compass, insulated wire, cell, switch

Procedure Followed:

Oersted made a circuit connecting the wires and the cell. He put the compass below the wire at the centre of the loop of circuit. The connections of the wire were right over the needle. [Observe the figure]



What do you think must have happened when the switch is in ON and the current flows? Will it have any effect on the magnetic compass?

Hypothesis

I think when the switch is in ON and the current flows_____

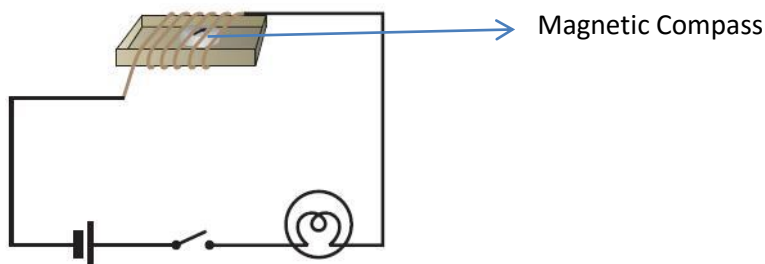
Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Experiment

Material: cardboard square/ empty matchbox, electric wire, compass needle, electrical cell, switch

Instructions

1. Take a cardboard square, put the compass needle on it and wrap an electrical wire several times over it.
2. Connect the circuit as you usually do with a switch with the above arrangement in between. It should look like this:



3. Observe what happens with the switch in ON and OFF position.

Questions

1. What happened to the compass when the switch was ON and the current was flowing in the circuit?

2. What happened to the compass when the switch was OFF and the current was not flowing in the circuit?

- What does this experiment indicate? What do you conclude from this experiment?

I conclude that _____

- Is your conclusion identical to conclusion drawn by Oersted? _____
- Is your hypothesis correct? _____

Information

Hans Christian Oersted discovered that the electric currents can produce magnetic fields. On 21 April 1820, during a lecture, Oersted noticed a compass needle deflected from magnetic north when an electric current from a battery was switched on and off. He confirmed that there was some relationship between electricity and magnetism. He then made intensive investigations and soon published his findings that an electric current produces magnetic effect as it flows through a wire.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Lesson Plan 5

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate the working of electromagnet and explain its principle.

Teaching Learning Materials required

- Board and markers
- Worksheet 5
- Activity: (for each group) insulated electric wire, long iron nail, cell, switch, pins

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	<u>Whole Class Discussion</u> • Begin the class by asking groups to exchange their homework response with one another. • Pose questions such as: ○ What are the effects of electric current? ○ What is Oersted famous for? ○ What is an electromagnet? • Let the whole class discuss answers to the homework and ensure that all agree with the answers. • Inform the students that now they will find out if materials other than wires can be used in a circuit.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Activity</u> • Showcase worksheet 5 to each group on the projector. • Ask the groups to first make an electromagnet. • They must now follow instructions and do the given activity. • They must discuss the questions. • There can be a whole class discussion in which the groups can exchange their observations as well as answers. • Ensure that all the students are on the same page.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Lesson End <u>Time:</u> 5 min <u>Purpose:</u> - Finish Up - Homework Assignment	<u>Finish Up</u> - Wrap up the class by clearing doubts. <u>Homework Assignment</u> - Find out the uses of electromagnet from your textbook or internet.
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Worksheet 5

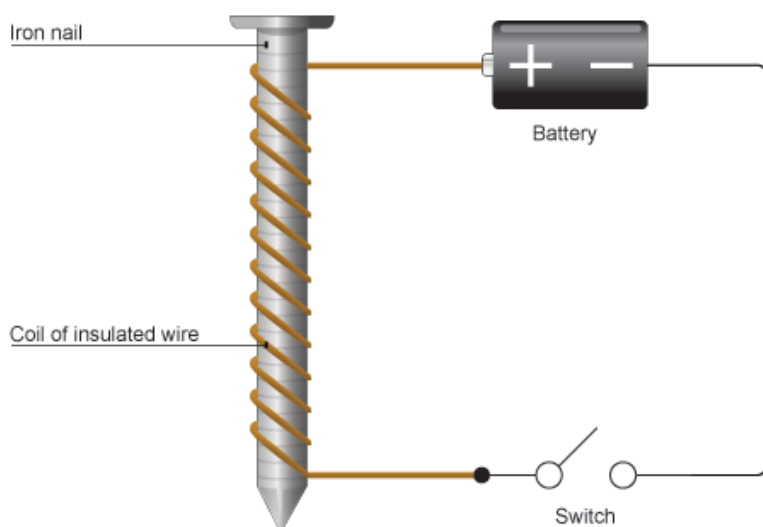
Skill: Drawing Inferences

Activity

Material: insulated electric wire, long iron nail, cell, switch, pins

Instructions:

1. Wrap the wire over the nail carefully so that the coils do not overlap.
2. Connect the ends of the wire through a cell and a switch to form a circuit as shown in figure.
3. Scatter a few pins near the end of the nail.
4. Observe what happens.



Questions:

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



1. What happens when you switch on the current?

2. Why do you think the pins cling to the nail?

3. What happens when you switch off the current?

*** The coils around the nails which act as magnet are called electromagnets.**

Think!!!

If you wish to make your electromagnet stronger (with stronger magnetic effect) what do you think you should do?

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



Lesson Plan 6

Lesson Objectives

At the end of this lesson students will be able to:

- Describe uses of electromagnet and deduce the working of electric bell in detail.

Teaching Learning Materials required

- Board and markers
- Worksheet 6
- Reference sheet 1

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	<u>Whole class Discussion</u> • Begin the class by asking groups to discuss the effects of electric current. Pose questions such as: ○ What is electromagnet? ○ How can you make it stronger? ○ What are its applications? • Gather responses and arrive at a common consensus. • Inform the students that they will now be given a circuit diagram of working of electric bell and they will have to deduce from it, how it works.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Deduce from the diagram!</u> • Distribute worksheet 6 to each group. • Ask the groups to look at the diagram carefully and discuss how it will work. • Let the group attempt the questions based on it. • There can be a whole class discussion in which the groups can exchange their answers. • Discuss the working of electric bell with the help of reference sheet 1. • Ensure that all the students are on the same page.

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--



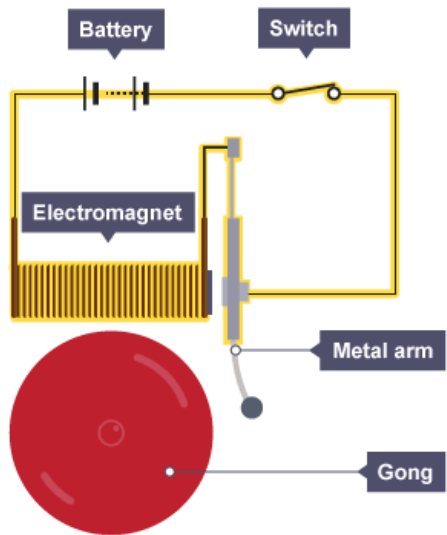
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> - Wrap up the class with a brainstorming session. Pose questions such as: - What happens when the circuit is complete? - How does the electromagnet help in this circuit of electric bell? - Will you get the same result with a simple circuit without electromagnet? Why? - Collate all the answers and ensure that the students are in consensus.
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Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Worksheet 6

Skill: Drawing Inferences

Observe the circuit diagram of an electric bell and answer the questions.



Questions:

1. One end of electromagnet is connected to the battery. What is the other end that the electromagnet is connected to?

2. Draw a line to show the connection between the electromagnet and the metal arm.
3. Draw a line to show path of the current when the circuit is complete.
4. Based on your knowledge of electromagnets, state what can happen when you switch ON and the circuit is complete.

5. Do you think the bell will ring if the place of the gong is changed? Why?

Class:7	Subject: Science	Topic: Electric Current and Its effects
----------------	-------------------------	--

Reference sheet 1

Working of an Electric Bell

Electric bells work due to the action of electromagnets.

It works in the following manner:

- 1) When the switch is pushed closed the circuit is completed and current flows through the electromagnetic coil.
- 2) The metal arm (iron) is attracted to the electromagnet and strikes the bell.
- 3) As the metal arm moves towards the bell, the contact is broken. Electricity stops flowing through the coil which loses its magnetism.
- 4) The spring returns the metal arm to its original position which makes a new contact and so electricity flows again.
- 5) Back to number 1 and the cycle repeats itself. The bell will continue to ring as long as the switch is held closed.

Outward, the bell looks as the given diagram:

