ELECTRICITY

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Electricity was first observed by Thales of Miletus, a Greek scientist and mathematician. He observed that when amber is rubbed with fur, it acquires the force to attract small pieces of matter. Electron came into existence from the word amber as amber in Greek is called elektron. This word later gave rise to the term electricity. As it is produced due to flow of electrons.

Static Electricity

Static electricity is produced when electrical charges build up on the surface of a material hence it is called static electricity as the charges are not in motion.

Common examples of static electricity in action are :

- Sometimes when you touch the door knob you may get a mild shock. The electic shock arises due to the accumulation of static charges on the knob.
- You enter your room after coming back from your school and as soon as you pull of your woolen cap, all of a sudden all your hair stand on end. It happens because of static electricity caused due to accumulation of charges on your hair.
- During winter when you take off woollen or synthetic clothes in a dark room you might see some sparkling light with a crackling sound. The sparkles are also produced because of static electricity.

Electrical Charges

As protons, neutrons and electrons have characteristic properties, hence, they are very different from each other. One of the properties of these constituents of atoms is an electrical charges.

Protons are said to have a "positive" (+) charge, electrons have a "negative" (–) charge while neutrons are netutal, i.e., have no charge.

Kinds of electric charges

There are two types of static charges in nature :

- Positive charges
- Negative charges

Two static charges of opposite types attract each other and two static charges of the same type repel each other.

Types of Charged Bodies

Since there are two tpes of charges (+ve and –ve), there are two types of charged bodies :

- Positively charged bodies
- Negatively charged bodies.

When an electron moves away (due to any reason) from an atom, it carries its negative charge with it. The number of electrons also becomes less than the number of protons in the atom. It results in the body having excess positive charge. Thus on loosing an electron, a body is said to get positively charged.

Vice versa, when an electron moves towards an atom it brings its negative charge with it. The number of protons becomes less than the number of electrons in the atom. It results in the body having excess of negative charge. Thus on gaining electrons, a body is said to get negatively charged.

Thus, we conclude that a body gets positively charged if its protons are more and negatively charged if the electrons are more.

Lightning and Thunder

- In 1752, an American scientist Benjamin Franklin proved that the lightning and thunder are caused by the electrical charge in the clouds.

◈ **Lightning**

- The huge masses of clouds get electrically charged due to rubbing of the clouds with the air and due to the presence of dust, carbon and other charged particles in the air. When the two clouds carrying, opposite charges approach each other, a large quantity of electric charge flows rapidly from one cloud to the other through the air. When this happens, an intense spark of electricity is seen in the sky.
- Such rapid flow of charge through the air between the two oppositely charged clouds is called electric discharge or lightning.

◈ **Thunder**

- The electric discharge from one cloud to the other lasts for a very short period of time, but it releases a huge amount of heat and light.
- Due to the heat produced at the time of lightning, the air get heated up and expands suddenly. This rapid expansion of air sends a disturbance through the air producing loud sound. This loud sound is heard as thunder.

◈ **Lightning Strike**

An electric discharge can occur not only between two clouds but also between a charged cloud and the Earth. When a charged cloud passes over a tall building or a tree it induces an opposite charge on them. If the charge built up is large, it leads to an electrical discharge in the form of a lightning strike.

Protection from lightning : The Lightning Conductor

- Highrise building can be protected from lighting by providing a lightning conductors at its highest point.
- A lightning conductor consists of long, thick metal rod/strip having sharp spikes at its upper end. The spikes pointing towards the sky are fixed at the highest points of the building. The lower end of the metal rod/strip is connected to a large copper (or aluminium) plate which is buried deep inside the Earth. This is called **Earthing.**

EXERCISE

SINGLE CORRECT ANSWER TYPE QUESTIONS

Q.1 The smallest particle of matter is .....
(A) an electron (B) a proton
(C) a neutron (D) a atom

Q.2 The neutron carries a charged of .....
(A) 1.66×10^{-19} Coulomb
(B) -1.66×10^{-19} Coulomb
(C) no charge
(D) none of these

Q.3 Static electricity .....
(A) does not flow (B) flows in the circuit
(C) sometimes flows (D) none of these

Q.4 The lightning occurs due to .....
(A) static electricity
(B) dynamic electricity
(C) thunder
(D) none of these

Q.5 Plastic and rubber are .....
(A) charged bodies
(B) conductors
(C) insulators
(D) none of these

Q.6 Which of the following is a good conductor of electricity ?
(A) wood (B) steel spoon
(C) dry air (D) chalk

Q.7 Which of the following is a bad conductor of electricity ?
(A) gold (B) mercury
(C) silver (D) plastics

Q.8 Electric charge can flow only through
(A) insulators (B) conductors
(C) both (A) and (B) (D) None of these

Q.9 Two objects rubbed against each other
(A) will lose electrons
(B) will repel each other
(C) will attract each other
(D) may attract or repel each other

Q.10 The gold leaf electroscope can be used to
(A) detect charge only
(B) detect or measure charge only
(C) detect, measure and find the nature of charge
(D) none of these

Q.11 Which of the following can be charged with static electricity ?
(A) metal (B) alloy
(C) insulator (D) semiconductor

Q.12 When two bodies are rubbed against each other, they acquire
(A) equal and like charges
(B) equal and unlike charges
(C) unequal and like charges
(D) unequal and unlike charges

Q.13 The two objects rubbed against each other
(A) will lose electrons
(B) will gain electrons
(C) one will lose and the other will gain electron
(D) none of these

ANSWER KEY

EXERCISE

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13
Ans.	D	C	A	A	C	B	D	B	C	C	C	B	C