

**CHRIST KING HR. SEC. SCHOOL, KOHIMA**  
**3<sup>RD</sup> TERM 2020**  
**CLASS -10**  
**SUBJECT: SCIENCES (PHYSICS & CHEMISTRY)**

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**UNIT-I**

**CHAPTR-5 (PERIODIC CLASSIFICATION OF ELEMENTS)**

**In-text questions Page- 85**

**1. Did Döbereiner's triads also exist in the columns of Newlands' Octaves? Compare and find out.**

Ans: Döbereiner's triads did exist in the columns of Newlands' Octaves.

E.g.- The elements Lithium (Li), Potassium (K) and Sodium (Na) constitute a Dobereiner's Triad but are also found in the second column of Newland's Octaves.

**2. What were the limitations of Döbereiner's classification?**

Ans: The limitation of Dobereiner's classification are:

(i) They were not applicable for very low mass or very high mass elements.

(ii) All the elements couldn't fit into Dobereiner's triads.

(iii) As the methods to calculate atomic mass improved, Dobereiner's triads validity began to decrease.

E.g.- In the triad of F, Cl and Br, the arithmetic mean of atomic masses of F and Br are not equal to the atomic mass of Cl.

**3. What were the limitations of Newlands' Law of Octaves?**

Ans: The limitations of Newlands' Law of Octaves are:

(i) Newlands' Law of Octaves applicable to elements up to Calcium

(ii) Newland assumed there are 56 elements in the nature and no more elements would be discovered in the future.

(iii) To fit elements into table Newland put two elements into one slot. Newland introduced unlike elements with different properties into one column.

(iv) Iron (Fe) was placed away from elements that resembles in properties. E.g- Nickel and cobalt

**In-text questions Page - 89**

**1. Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements: K, C, Al, Si, Ba.**

Ans:

K-  $K_2O$

C-  $C_2O_4$  or  $CO_2$

Al-  $Al_2O_3$

Si-  $Si_2O_4$  or  $SiO_2$

Ba-  $Ba_2O_2$  or  $BaO$

\* Note: (Oxygen is a member of group VI A in Mendeleev's periodic table. Its valency is 2. Similarly, the valencies of all the elements listed can be predicted from their respective groups. This will help in writing the formulae of their oxides.

(i) Potassium (K) is a member of group IA. Its valency is 1. Therefore, the formula of it is  $K_2O$ .

(ii) Carbon (C) is a member of group IV A. Its valency is 4. Therefore, the formula of it is  $C_2O_4$  or  $CO_2$ .

(iii) Aluminium (Al) belongs to groups III A and its valency is 3. The formula of its oxide is  $Al_2O_3$ .

(iv) Silicon (Si) is present in group IV A after carbon. Its valency is also 4. The formula oxide is  $Si_2O_4$  or  $SiO_2$ .

(v) Barium (Ba) belongs to group II A and the valency of the element is 2. The formula of oxide of the element is  $Ba_2O_2$  or  $BaO$ .)

**2. Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table? (Any two)**

Ans: Germanium and Scandium are the element that are left by Mendeleev in his Periodic Table since its discovery.

**3. What were the criteria used by Mendeleev in creating his Periodic Table?**

Ans: Mendeleev concentrated on various compounds formed by the elements with Hydrogen and Oxygen. Among physical properties, he observed the relationship between the atomic masses of various elements while creating his periodic table.

#### 4. Why do you think the noble gases are placed in a separate group?

Ans: Noble gases are placed in a separate group because of their inert nature and low concentration in our atmosphere. They are kept in a separate group called Zero group so that they don't disturb the existing order.

#### In-text questions Page - 94

##### 1. How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?

Ans: (a) In the Modern Periodic table elements are arranged in the increasing order of their atomic number. This removes the anomaly regarding certain pairs of elements in Mendeleev's periodic table.  
(b) Atomic number of cobalt is 27 and nickel is 28. Hence, cobalt will come before nickel even though its atomic mass is greater.  
(c) All isotopes of the same elements have different atomic masses, but same atomic number; therefore, they are placed in the same position in the modern periodic table.

##### 2. Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

Ans: Calcium and Beryllium are similar to Magnesium because all the three elements belong to the same group and have 2 valence electrons in their outer shell.

##### 3. Name

(a) Three elements that have a single electron in their outermost shells.

(b) Two elements that have two electrons in their outermost shells.

(c) Three elements with filled outermost shells

Ans:

(a) Lithium (Li), Sodium (Na) and potassium (K) have a single electron in their outermost shells.

(b) Magnesium (Mg) and Calcium (Ca) have two electrons in their outermost shells

(c) Neon (Ne), Argon (Ar) and Xenon (Xe) filled outermost shells

##### 4. (a) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(b) Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

Ans: (a) All these elements have one electron in the outermost shell of their atoms.

(b) They have filled outermost shells.

##### 5. In the Modern Periodic Table, which are the metals among the first ten elements?

Ans: Lithium and Beryllium are the metals among the first ten elements in Modern Periodic Table.

##### 6. By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristic? Ga Ge As Se Be

Ans: Be.

#### Exercise questions (Page - 95-97)

##### 1. Which of the following statements is not a correct statement about the trends when going from left to right across the periods of periodic Table?

- (a) The elements become less metallic in nature.
- (b) The number of valence electrons increases.
- (c) The atoms lose their electrons more easily.
- (d) The oxides become more acidic

Ans : ( c )

##### 2. Element X forms a chloride with the formula $XCl_2$ , which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as

- (a) Na
- (b) Mg
- (c) Al
- (d) Si

Ans: (b) Mg

##### 3. Which element has

- (a) Two shells, both of which are completely filled with electrons?
- (b) The electronic configuration 2, 8, 2?
- (c) A total of three shells, with four electrons in its valence shell?
- (d) A total of two shells, with three electrons in its valence shell?
- (e) twice as many electrons in its second shell as in its first shell?

- Ans : (a) Neon has two shells which are completely filled.  
 (b) Magnesium has the electronic configuration 2, 8, 2  
 (c) Silicon has a total of three shells, with four electrons in its valence shell  
 d) Boron a total of two shells, with three electrons in its valence shell  
 e) Carbon has twice as many electrons in its second shell as in its first shell

4. (a) **What property do all elements in the same column of the Periodic Table as boron have in common?**  
 (b) **What property do all elements in the same column of the Periodic Table as fluorine have in common?**

- Ans:  
 (a) All the elements have three electrons in their valence shells.  
 (b) All elements have seven electrons in their valence shell.

**5. An atom has electronic configuration 2, 8, 7.**

- (a) What is the atomic number of this element?  
 (b) To which of the following elements would it be chemically similar? (Atomic numbers are given in parentheses.) N (7), F (9), P (15), Ar (18)

- Ans:(a) The atomic number is 17.  
 (b) F (9)

6. The position of three elements A, B and C in the Periodic Table are shown below—  
 Group 16 Group 17

-	-
-	A
-	-
B	C

- (a) State whether A is a metal or non-metal.  
 (b) State whether C is more reactive or less reactive than A.  
 (c) Will C be larger or smaller in size than B?  
 (d) Which type of ion, cation or anion, will be formed by element A?

- Ans:  
 (a) Element A is a non-metal  
 (b) Element C is less reactive than Element A  
 (c) C is smaller in size than B  
 (d) A will form anion

7. **Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more electronegative? Why?**

- Ans:  
 Nitrogen: 2,5  
 Phosphorous: 2,8,5  
 Nitrogen is more electronegative than phosphorus. The electronegativity decreases down the group with increase in size.

**8. How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?**

- Ans: Three number of valence electrons decides an atom's position in the periodic table while the electronic configuration decides the number of valence electrons.

**9.Explain why:**

- (a) The elements of the same group have similar chemical properties.  
 (b) The elements of the same period have different properties.

- Ans: (a) There are 18 group in periodic table and each group is an independent group. All the elements present in a group have same electronic configuration of the atoms the physical and chemical properties of elements depends on the number of valence electrons. Elements present in the same group have the same number of valence electrons. Therefore, elements present in the same group have similar physical and chemical properties.

- (b) Elements in the same period have the same number of electrons shells moving across period (so progressing from group to group), elements gain electrons and protons and becomes less metallic. This arrangement reflects the periodic recurrence of similar properties as the atomic increases.

**10. The electronic configuration of an element 'X' is 2, 8, 8, 2. To which period and group of the modern periodic Table does 'X' belong? State its valency. Justify your answer in each case.**

Ans: (a) 4th period, because it has four shells.

(b) 2nd group, because it has two valence electron.

It will show valency of 2(+2) because it will lose two electron to become stable.

**11. (a) State two main characteristics of elements on which Modern Periodic Table is based.**

(b) No fixed position can be assigned to Hydrogen in the periodic table. Why?

Ans: (a) Two main characteristics of elements on which Modern Periodic Table is based are mentioned below:

(i) The periodic table has 18 vertical columns called groups and seven horizontal row called periods.

(ii) The elements of group 1,2,13,14,16,17 are known as the main group of representative elements.

(iii) The elements of group 3,4,5,6,7,8,9,10,11 and 12 are known as transition elements.

(iv) Element 18 are called noble gas (or) inert gases.

(b) Hydrogen resembles both alkali metal and halogen. It can lose one electron like alkali metals and also gain one electron like halogen. It forms diatomic molecule and combines with metal and non-metal to form covalent compound. Therefore, position assigned to hydrogen in the periodic table is considered anomalous.

**12. The elements Be, Mg and Ca each having two electrons in their outermost shells are in periods 2,3 and 4 respectively of the Modern Periodic Table. Now, answer the following questions, giving justification in each case:**

(i) Write the group to which these elements belong.

(ii) Name the least reactive element.

(iii) Name the element having largest atomic radius.

Ans: (i) These elements belong to Group 2 because they have same number of valence electron.

(ii) Least reactive element is 'Be' because chemical reactivity increase for metals in a group from top to bottom.

(iii) Element having largest atomic radius is 'Ca' as the atomic size increase from top to bottom in a group Ca has four shells.

**13. In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these have physical and chemical properties resembling calcium?**

Ans: This element with atomic numbers 12 and 38 have physical and chemical properties resembling calcium because they belong to same group.

**14. Compare and contrast the arrangement of elements in Mendeleev's Periodic Table and the Modern Periodic Table.**

Ans:

Mendeleev's Periodic Table	Modern Periodic Table
(i) Element are arranged in the increasing order of their atomic masses.	(i) Element are arranged in the increasing order their atomic numbers.
(ii) There are 8 groups	(ii) There are 18 groups
(iii) Each groups are subdivided into sub 'a' and 'b'	(iii) Groups are not subdivided into sub-groups.
(iv) Groups for Noble gas was not present as noble gases were not discovered by that time	(iv) A separate groups is meant for noble gases.
(v) There was no place for isotopes.	(v) This problem has been rectified as slots are determine according to atomic number.

**TICK THE CORRECT OPTION:**

1. Ans: (a) Germanium

2. Ans: (b) Metalloid

3. Ans: (b) Three triads

4. Ans: (d) Mendeleev

**UNIT-IV**  
**CHAPTER-13 (MAGNETIC EFFECTS OF ELECTRIC CURRENT)**

**In-text question page-235**

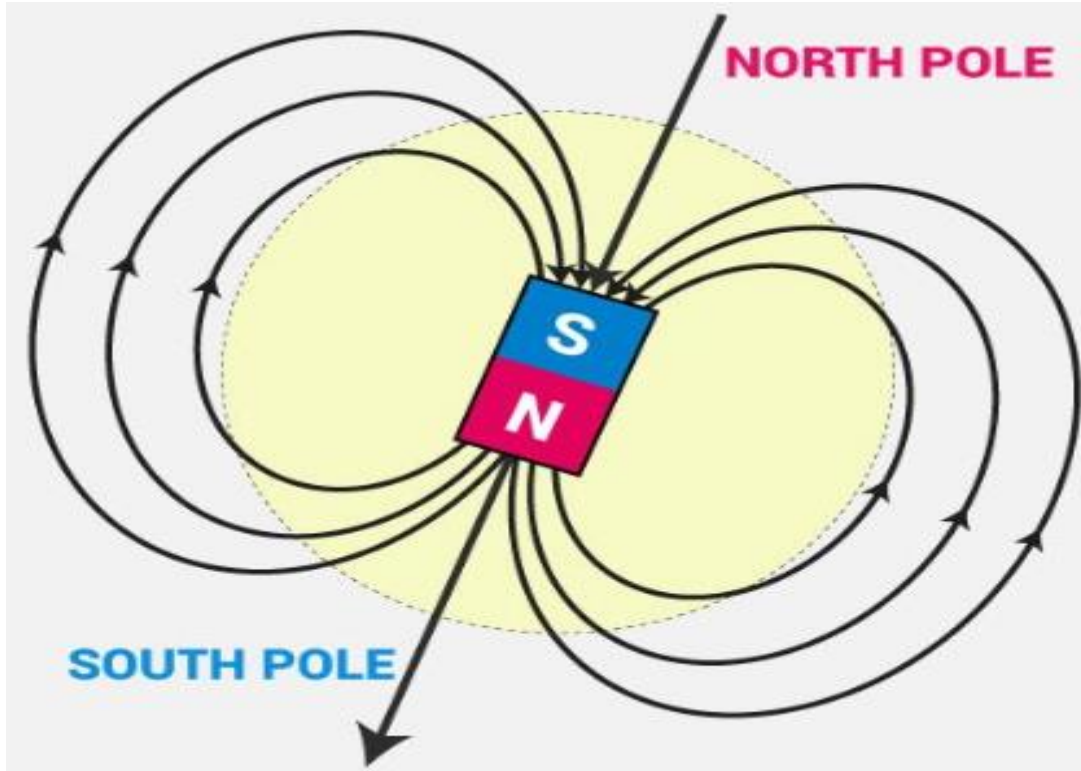
**1. Why does a compass needle get deflected when brought near a bar magnet?**

**Ans:** The compass needle is a small magnet. When the compass needle is brought close to a bar magnet, the magnetic field lines of the compass needle interact with the magnetic field lines of bar magnet, which causes the compass needle to deflect.

**In-text questions Page – 239**

**1. Draw magnetic field lines around a bar magnet.**

**Ans:** Magnetic field lines of a bar magnet emerge from the North Pole and terminate at the South Pole as shown in the figure below.



**2. List the properties of magnetic field lines.**

**Ans:** The properties of magnetic field lines are as follows:

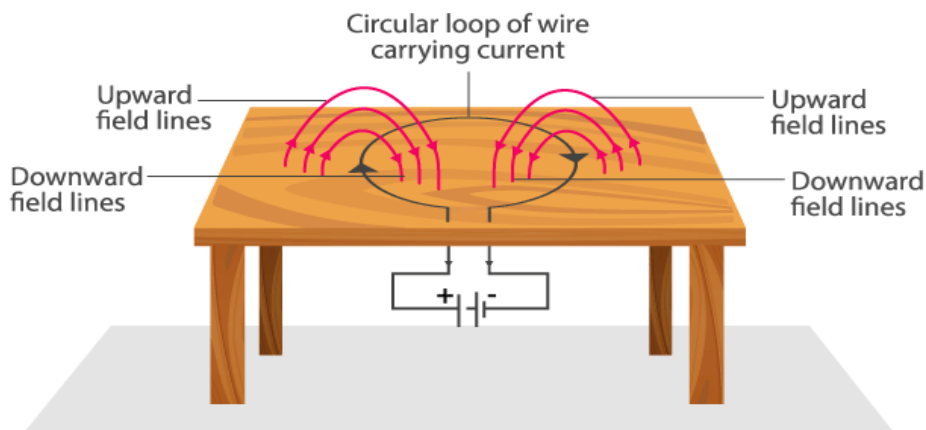
- (a) Magnetic field lines do not intersect with each other.
- (b) They emerge from the North Pole and terminate at the South Pole.
- (c) Inside the magnet, the direction of the field lines is from the South Pole to the North Pole.

**3. Why don't two magnetic field lines intersect each other?**

**Ans:** If two magnetic field lines intersect then at the point of intersection the compass needle shows two different directions, which is not possible, hence they do not intersect with each other.

1. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.

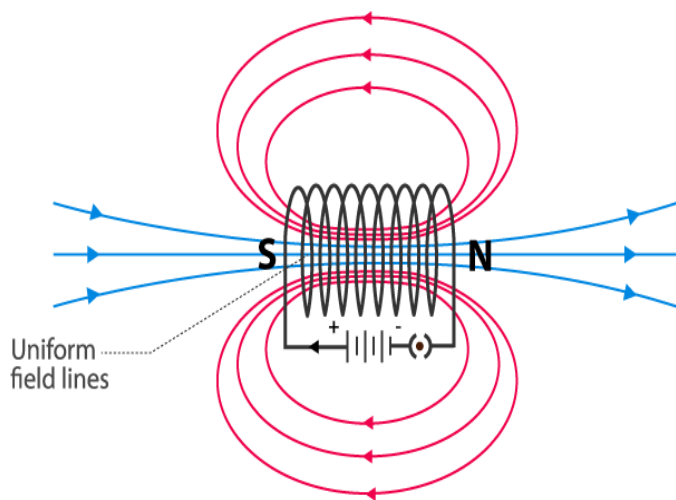
Ans:



For the downward direction of the current, the direction of the magnetic field will be as if emerging from the table outside the loop and merging with the table inside the loop. Similarly, for current flowing in an upward direction, the direction of the magnetic field will be as if they are emerging from the table outside the loop and merging with the table inside the loop, as shown in the above figure.

2. The magnetic field in a given region is uniform. Draw a diagram to represent it.

Ans:



3. Choose the correct option.

The magnetic field inside a long straight solenoid-carrying current

- (a) is zero.
- (b) decreases as we move towards its end.
- (c) increases as we move towards its end.
- (d) is the same at all points.

Ans: (d) is the same at all points.

\*(Note: The magnetic field inside a long straight current carrying solenoid is uniform therefore it is the same at all points.)

### **In-text Page -242 to 243**

**1. Which of the following property of a proton can change while it moves freely in a magnetic field?**

(There may be more than one correct answer.)

**(a) Mass (b) Speed (c) Velocity (d) Momentum**

**Ans:** (c) and (d)

\* (Note-When a proton enters the region of magnetic field, it experiences magnetic force. Due to which the path of the proton becomes circular. As a result, the velocity and the momentum change.)

**2. In Activity 13.7, how do we think the displacement of rod AB will be affected if (i) current in rod AB is increased; (ii) a stronger horse-shoe magnet is used; and (iii) length of the rod AB is increased?**

**Ans:** A current carrying conductor when placed in a magnetic field experiences force. The magnitude of this force will increase with the increase in the amount of current, length of conductor and the strength of the magnetic field. Hence, the strength of the magnetic force exerted on the rod AB and its displacement will increase if (i) The current in rod AB is increased (ii) Stronger horse shoe magnet is used (iii) When the length of the rod AB increases.

**3. A positively-charged particle (alpha-particle) projected towards the west is deflected towards north by a magnetic field. The direction of magnetic field is (a) towards south (b) towards east (c) downward (d) upward**

**Ans:** The direction of the magnetic field can be determined using the Fleming's Left hand rule. According to the rule, if we arrange our thumb, forefinger and the middle finger of the left hand right perpendicular to each other, then the thumb points towards the direction of the magnetic force, the middle finger the direction of current and the forefinger the direction of magnetic field. Since the direction of positively charged particle is towards west, the direction of the current will also be towards the west. The direction of the magnetic force is towards the north; hence the direction of magnetic field will be upward according to Fleming's Left hand rule.

### **In-text Page-244**

**1. State Fleming's left-hand rule.**

**Ans:** Fleming's Left hand rule states that if we arrange our thumb, forefinger and middle finger of the left hand at right angles to each other, then the thumb points towards the direction of the magnetic force, the forefinger points towards the direction of magnetic field and the middle finger points towards the direction of current.

**2. What is the principle of an electric motor?**

**Ans:** The working principle of electric motor is based on the magnetic effect of current. A current carrying conductor when placed in a magnetic field experiences force and rotates. The direction of the rotation of the conductor can be determined by Fleming's Left hand rule.

**3. What is the role of split ring in an electric motor?**

**Ans:** Split ring plays the role of commutator in an electric motor. The commutator reverses the direction of the current flowing through the coil after each half rotation of the coil. Due to this reversal of current, the coil continues to rotate in the same direction.

### **In-text Page -247**

**1. Explain different ways to induce current in a coil.**

**Ans:** Following are the different ways to induce current in a coil:

(i) If the coil is moved rapidly between the two poles of horse shoe magnet, electric current is induced in the coil.

(ii) When a magnet is moved relative to the coil, an electric current is induced in the coil.

### **In-text Page -248**

**1. State the principle of an electric generator.**

**Ans:** Electric generator works on the principle of electromagnetic induction. In a generator, electricity is generated by rotating a coil in the magnetic field.

**2. Name some sources of direct current.**

**Ans:** DC generator and cell are some sources of direct current.

**3. Which sources produce alternating current?**

**Ans:** Power plants and AC generators are some of the sources that produce alternating current.

#### 4. Choose the correct option.

A rectangular coil of copper wires is rotated in a magnetic field. The direction of the induced current changes once in each

- (a) two revolutions (b) one revolution (c) half revolution (d) one-fourth revolution

Ans: (c) half revolution

\* (Note-When a rectangular coil is rotated in magnetic field, the direction of the induced current changes once in half revolution. As a result, the direction of the current in the coil remains the same.)

#### In- text Page -249

##### 1. Name two safety measures commonly used in electric circuits and appliances.

Ans: Two safety measures commonly used in electric circuits and appliances are: Fuse wire and earthing.

\* (Note- Each circuit should be connected to a fuse because a fuse prevents the flow of excessive current through the circuit. When the current in the circuit exceeds the maximum limit of the fuse element, the fuse melts to stop the flow of current protecting the appliance connected to circuit. -Earthing protects the user from electric shocks. Any leakage of current in an appliance is transferred to the ground by earthing and the people using the appliance is prevented from getting electrocuted.)

##### 2. An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect? Explain.

Solution: The current drawn by the electric oven can be calculated using the formula

$$P = V \times I$$

$$I = P/V$$

Substituting the values, we get

$$I = 2000 \text{ W}/220 \text{ V} = 9.09 \text{ A}$$

The current drawn by the electric oven is 9.09 A which exceeds the safe limit of the circuit. This causes the fuse to melt and break the circuit.

##### 3. What precaution should be taken to avoid the overloading of domestic electric circuits?

Ans: Precautions to be taken to avoid the overloading of domestic electric circuits are as follows:

- (a) Connecting too many devices to a single socket should be avoided
- (b) Using too many appliances at the same time should be avoided
- (c) Faulty appliances should not be connected to the circuit

#### Exercise questions (Page 251 to 253)

##### 1. Which of the following correctly describes the magnetic field near a long straight wire?

- (a) The field consists of straight lines perpendicular to the wire.
- (b) The field consists of straight lines parallel to the wire.
- (c) The field consists of radial lines originating from the wire.
- (d) The field consists of concentric circles centered on the wire.

Ans: (d) The field consists of concentric circles centered on the wire.

##### 2. The phenomenon of electromagnetic induction is

- (a) the process of charging a body.
- (b) the process of generating magnetic field due to a current passing through a coil.
- (c) producing induced current in a coil due to relative motion between a magnet and the coil.
- (d) the process of rotating a coil of an electric motor.

Ans: (c) Producing induced current in a coil due to relative motion between a magnet and the coil.

##### 3. The device used for producing electric current is called a

- (a) generator (b) galvanometer (c) ammeter (d) motor

Ans: (a) generator

##### 4. The essential difference between an AC generator and a DC generator is that

- (a) AC generator has an electromagnet while a DC generator has permanent magnet.
- (b) DC generator will generate a higher voltage.
- (c) AC generator will generate a higher voltage.

1. AC generator has slip rings while the DC generator has a commutator.



**Ans:** (d) AC generator has slip rings while the DC generator has a commutator.

**5. At the time of short circuit, the current in the circuit**

**(a) reduces substantially. (b) does not change. (c) increases heavily. (d) vary continuously.**

**Ans:** (c) increases heavily

**6. State whether the following statements are true or false.**

**(a) An electric motor converts mechanical energy into electrical energy.**

**(b) An electric generator works on the principle of electromagnetic induction.**

**(c) The field at the center of a long circular coil carrying current will be parallel straight lines.**

**(d) A wire with a green insulation is usually the live wire of an electric supply.**

**Ans:** (a) False

(b) True

(c) True

(d) False

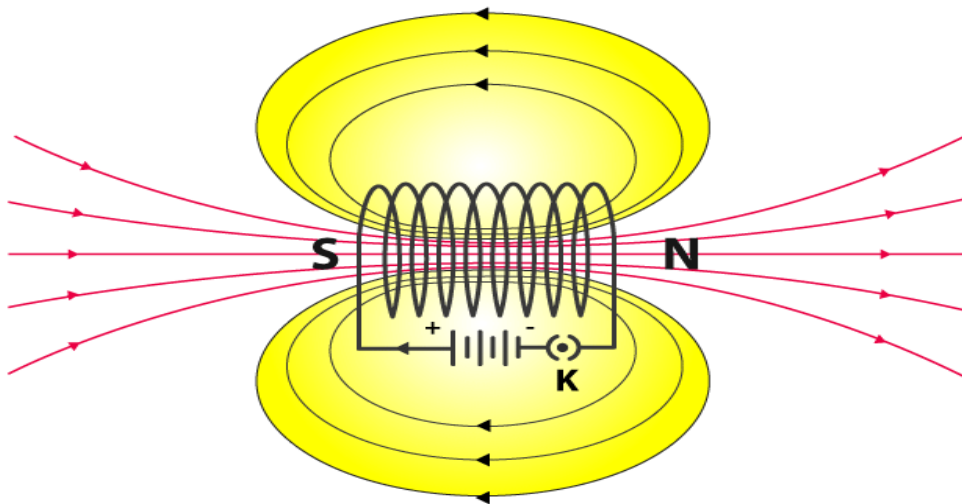
**7. List two methods of producing magnetic fields.**

**Ans:** (a) By using a permanent magnet we can produce magnetic field and it can be visualized by spreading iron filings on a white paper and keeping a magnet beneath the paper.

(b) A current carrying straight conductor produces magnetic field.

**8. How does a solenoid behave like a magnet? Can you determine the north and south poles of a current-carrying solenoid with the help of a bar magnet? Explain.**

**Ans:** A solenoid is a long coil of circular loops of insulated copper wire. The magnetic field produced around the solenoid when the current is passed through it is similar to the magnetic field produced around the bar magnet when current is passed through it. The figure shown below shows the arrangement of magnetic fields produced around the solenoid when current is passed through it.



When the north pole of the bar magnet is brought close to the end connected to the negative terminal of the battery, the solenoid repels the battery. As like poles repel each other, we can infer that the end connected to the negative terminal behaves as a north pole while the end connected to the positive terminal behaves as a south pole.

**9. When is the force experienced by a current-carrying conductor placed in a magnetic field largest?**

**Ans:** When the direction of the current is perpendicular to the direction of the magnetic field is when the force experienced is the largest.

**10. Give the factors on which, magnetic field produced by a current carrying solenoid depends.**

**Ans:** (i) Number of turns in the solenoid: -The larger the number of turns in the solenoid, stronger is the magnetic field produced.

(ii) Strength of the current: - Greater the current passed through the solenoid, stronger is the solenoid field produced.

(iii) Nature of the core material: - By winding the coil over a soft iron cylinder, called core, the magnetic field can be increased several thousand times.

**11.(a) A compass needle gets deflected when brought near a current carrying conductor. Why?**

Ans: (a) When a magnetic field needle is brought closer to a current carrying conductor then the magnetic needle it gets deflected because the magnetic field of the current carrying conductor exerts a force on the magnetic needle, making it move from one direction to the other.

(b) What happens to the deflection of needle when current in the conductor is increased?

Ans: - The deflection also increased towards the direction of the magnetic field.

**12. Explain why a fuse should be joined with the live wire and not with the neutral wire in a domestic circuit.**

Ans: - The force is connected in the live wire because if live wire gets short circuited somewhere within the appliance and results into the high current then the fuse can blow and protect the appliance.

**13. Name and state the rule to determine the direction of a force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it. Name a device that uses current carrying conductor and magnetic field.**

Ans: - It is called Fleming left hand rule. If we stretch out our forefinger, middle finger and thumb such that they are mutually perpendicular to each case other, then the thumb will represent the direction of force, forefinger will represent the direction of magnetic field and middle finger will be the direction of current applied.

**14. Can a freely suspended current carrying solenoid stay in any direction? –Justify your answer. What will happen when the direction of current in the solenoid is reversed?**

Ans: - No, current carrying solenoid fall freely stay in the north-south direction because it behaves as a bar magnet. When current flow through a solenoid is reversed the direction is also reversed.

**15. What does the direction of thumb indicate in the right hand thumb rule? In what way this rule is different from Fleming’s left hand rule?**

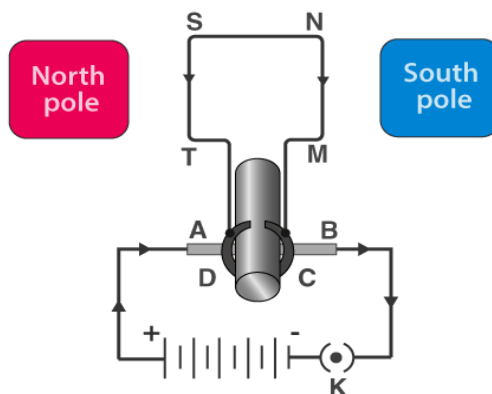
Ans: - The thumb in right hand rule indicates the direction of current in the straight line conductor held by curled fingers whereas the thumb in Fleming’s left hand rule gives the direction of force experienced by current carrying conductor placed in an external magnetic field.

**16. Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of magnetic field?**

Ans: The direction of the magnetic field can be determined using the Fleming’s Left hand rule. The direction of the magnetic field will be perpendicular to the direction of current and the direction of deflection, i.e., either upward or downward. The direction of the current is from the front wall to the back wall because negatively charged electrons move from the back wall to the front wall. The directed of the magnetic force is rightward. Hence, using Fleming’s left hand rule it can be concluded that the direction of the magnetic field inside the chamber is downward.

**17. Draw a labelled diagram of an electric motor. Explain its principle and working. What is the function of a split ring in an electric motor?**

Ans: An electric motor is a device that converts electrical energy to mechanical energy. It works on the principle of magnetic effect of current. The figure listed below shows a simple electric motor.



When current is made to flow through the coil MNST by closing the switch, the coil starts to rotate in the anticlockwise direction. This is due to the downward force acting on the length MN and simultaneously an upward

force acting along the length ST. As a result of which the coil rotates in the anticlockwise direction. Current in the length MN flows from M to N and the magnetic fields act from left to right normal to the length MN. According to Fleming's Left Hand rule, a downward force acts along the length MN. Similarly, the current along the length ST flows from S to T and the magnetic field acts from left to right. Therefore, an upward force acts along the length ST. These two forces together cause the coil to rotate anti-clockwise. After half a rotation, the position of MN and ST interchange. The half ring C come in contact with brush B and the half ring D comes in contact with brush C. Hence the direction of current in the coil MNST gets reversed.

**18. Name some devices in which electric motors are used.**

**Ans:** A few devices in which electric motors are used are: Electric fans, Water pumps, Mixers, Washing machines

**19. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is (i) pushed into the coil, (ii) withdrawn from inside the coil, (iii) held stationary inside the coil?**

**Ans:**(i) When a bar magnet is pushed into the coil, current is induced in the coil momentarily as a result the galvanometer deflects in a particular direction momentarily.

(ii) When the bar magnet is withdrawn from inside the coil, current is induced momentarily but in the opposite direction and the galvanometer deflects in the opposite direction momentarily.

(iii) When the bar magnet is held stationary inside the coil, no current will be induced as a result there will be no deflection in the galvanometer.

**20. Two circular coils A and B are placed closed to each other. If the current in the coil A is changed, will some current be induced in the coil B? Give reason.**

**Ans:** When the current in coil A changes, the magnetic field associated with it also changes. As a result, the magnetic field around coil B undergoes change. The change in the magnetic field of coil B induces current in it.

**21. State the rule to determine the direction of a (i) magnetic field produced around a straight conductor-carrying current, (ii) force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it, and (iii) current induced in a coil due to its rotation in a magnetic field.**

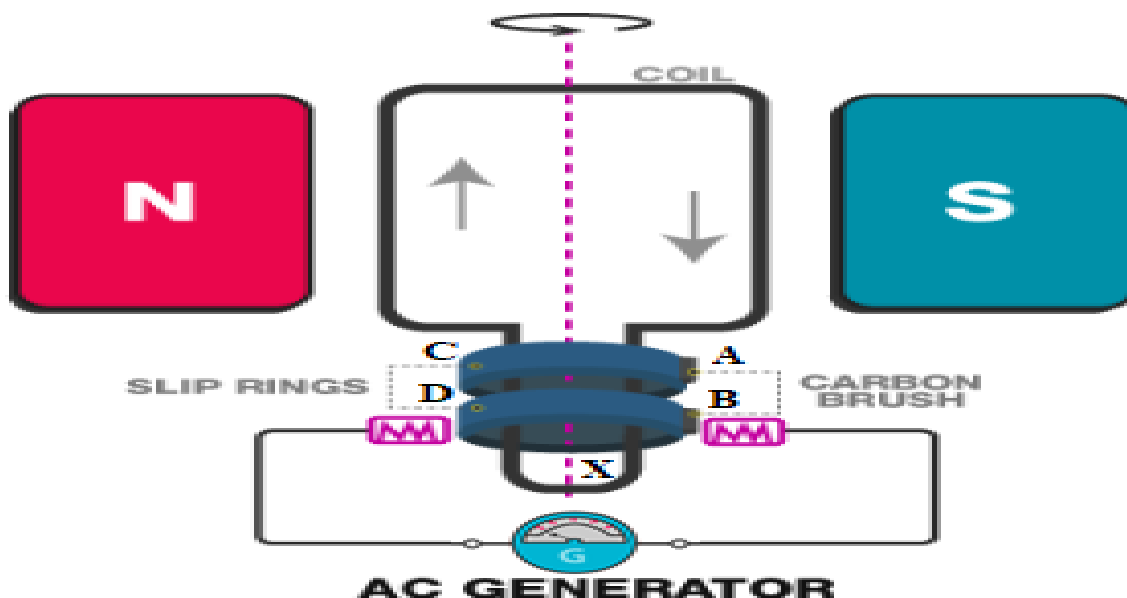
**Ans:**(i) The rule used to determine the direction of the magnetic field produced around a straight conductor-carrying current is the Maxwell's right hand thumb rule.

(ii) The rule used to determine the force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it is the Fleming's left hand rule.

(iii) The rule used to determine the current induced in a coil due to its rotation in a magnetic field is the Fleming's right-hand rule.

**22. Explain the underlying principle and working of an electric generator by drawing a labelled diagram. What is the function of brushes?**

**Ans:** The electric generator converts the mechanical energy into the electrical energy. The working principle of the electric generator is the electromagnetic induction. It generates electricity by rotating a coil in the magnetic field. The figure below shows the construction of a simple AC generator.



In the diagram, A and B are brushes, C and D are slip rings, X is the axle, G is the galvanometer. When the axle X is rotated clockwise, MN moves upwards while ST moves downward. The movement of MN and ST in the magnetic field results in the production of electric current due to electromagnetic induction. MN moves upwards and the magnetic fields act from left to right. Therefore, according to Fleming's right hand rule, the direction of the induced current will be from M to N along the length MN. Similarly, the direction of the induced current will be from S to T along the length ST. The direction of the current in the coil is MNST. Hence, galvanometer shows a deflection in a particular direction.

After half a rotation, length MN starts moving downwards while the length ST starts moving upwards. Now, the direction of the induced current reverses to TSNM. Since the direction of the induced current reverses every half rotation, the current induced is known as alternating current.

**Function of Brushes:**

Brushes are kept pressed on to two slip rings separately. Outer ends of brushes are connected to the galvanometer. Thus, brushes help in transferring current from coil to the external circuit.

**23. When does an electric short circuit occur?**

**Ans:** Two instances of when a short-circuit can occur:

- 1) When too many appliances are connected to a single socket or when high power rating appliances are connected to a light circuit, the resistance of the circuit becomes low as a result the current flowing through the circuit becomes very high. This condition results in a short-circuit.
- 2) When live wires whose insulation have worn off come in contact with each other, the current flowing in the circuit increases abruptly which results in a short circuit.

**24. What is the function of an earth wire? Why is it necessary to earth metallic appliances?**

**Ans:** The metallic body of electric appliances is earthed by means of earth wire. Any leakage of electric wire is transferred to the ground by means of earth wire. This prevents the user of the electric appliance from getting electric shocks. This is the reason why it is important for the metallic appliances to be earthed.

**TICK THE CORRECT OPTION:**

1. Ans: ( C ) Core of the coil
2. Ans : (a) directly proportional to r
3. Ans : (b ) along the axis of the solenoid and parallel to each other
4. Ans: (c) both electric and magnetic field
5. Ans: (d) Fleming's right hand rule

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