



Revision & Test Session

# EVENING COACHING

## 10<sup>TH</sup> NOTES PHYSICS

### Volume 2

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House # 115 Main Road Pakistan Town Phase 1

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## FEDERAL BOARD BOOK

### Ch#14(Current Electricity)

**Q.1 Can current flow through a circuit without potential difference? Explain.**

Ans: If no potential difference then no work is being done on charge so there should be no net displacement of charge but we know that the current flows. Current flows from higher potential to lower potential but across two ends potential is same its mean potential difference is zero, so no current should flow through the circuit.

**Q.2 If aluminum and copper wires of the same length have the same resistance, which has the larger diameter? Why?**

Ans: Resistance of any material is given as:  $R =$

Where R is the resistance, A is the cross sectional area, L is the length and  $\rho$  is the resistivity of material. Now, resistance and length is same, so the area will depend on the resistivity of the material. Area (A)  $\propto$  Resistivity ( $\rho$ )  
Resistivity of copper =  $1.68 \times 10^{-8} \Omega\text{m}$ , Resistivity of aluminum =  $2.65 \times 10^{-8} \Omega\text{m}$  Since, resistivity of aluminum is higher than resistivity of copper so the area is higher for aluminum.

**Q.3 What is resistance across open switch and close switch of a circuit?**

Ans "Short circuit" is usually equivalent to "closed switch" whereas "open circuit" is equivalent to "open switch". The resistance of a closed switch is considered to be zero as current will flow without any opposition. Whereas, the resistance of an open switch is considered to be infinity as no current will flow.

**Q.4 A bird is sitting on a high voltage transmission line, but it is not electrocuted. Why? When it tries to fly, it touches another bird that is sitting on second transmission line of the pole. Now, it is heavily electrocuted. Why?**

Ans: A bird sitting on a high voltage transmission line do not electrocuted because the bird is sitting on a wire don't touch the ground (or anything in contact with the ground), so electricity does not flows through the bird.

When the bird tries to fly and it touches another bird that is sitting on second transmission line of the pole then electricity gets the path to flow from the bird hence it is heavily electrocuted.

**Q.5 You are given five resistances of different magnitudes. But you are asked to form a circuit whose resistance is smaller than any given resistance. How can you make such circuit with given resistances?**

Ans: For the resultant resistance to be smaller than the given resistances, we should connect the given resistance in a parallel combination. Because the equivalent resistance is smaller than smallest of individual resistance in parallel combination of the resistances. The resistances are connected in parallel to decrease resistance.

**Q.6 You are given n wires, each of resistance R. What is the ratio of maximum to minimum resistance obtainable from these wires?**

Ans: Maximum resistance can be obtained when the resistance are connected in series and minimum resistance can be obtained when the resistances are connected in parallel.

**Q.7 Two electric bulbs marked 100W, 220V and 200W, 220V have tungsten filaments of the same length. Which bulb will have thicker filament?**

Ans:

If both have same length and made of same material.

$$R_1 > R_2, \text{ then } A_2 > A_1$$

Hence 200W, 220V bulb has more thickness of filament.

**Q.8 Why are we advised not to touch electric switches with wet hand, first dry your hands?**

Ans: One should not touch electrical appliances with wet hands. When we wash our hands with tap water which contains a lot of salt and ions this gets transmitted to our hands. Small amounts of mineral salts present naturally in water are beneficial for human health. However, these salts make water conducting. So, we should never handle electrical appliances with wet hands

**Q.9 Why is it dangerous to touch a live wire while standing on earth bare footed?**

Ans: The live wire is dangerous one because it is at 230V. If you touch a live wire while standing on earth with bare footed, you may complete a circuit between the live wire and the earth. As the current flows when two points are at different potential so the current will flow from body which will results a shock.

**Q.10 Sometimes, if your one of the car's head lamp is burnt or not working but second lamp still gives light. What do you conclude about connection of head lamps from this observation?**

Ans: The head lights in a car are connected in parallel. So, if one of the car's head lamp is burnt or not working then second lamp will gives light. The alternative of connecting bulbs in series would be that if one failed then all those in series would go out.

**Q.11 Show that volt ampere is equal to watt (SI unit of power).**

Ans: Watt is a SI unit of power. If a machine or any entity is producing one Joule of work or energy in one second, then we'll say that power of the machine is 1 watt. As

$$P = VI$$

$$\text{Watt} = \text{Volt Ampere}$$

## PUNJAB BOARD

**1. Define and explain the term electric current.**

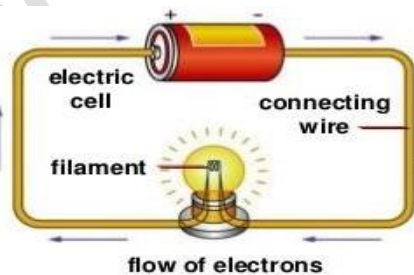
Ans: **Electric current:** "The rate of flow of electric charge through any cross-sectional area is called current." If the charge  $Q$  is passing through any area in time  $t$ , then current  $I$  flowing through it will be given by.  $I = \frac{Q}{t}$  **Unit:** SI unit of current is **ampere (A)**

**One ampere:** "If a charge of one coulomb passed through a cross-sectional area in one second, then current is one ampere."

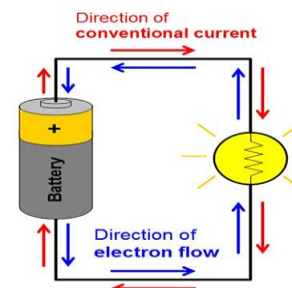
**2. What is the difference between electronic current and conventional current?**

Ans:

Rate of flow of charges through any cross sectional area from negative terminal to positive terminal is called electronic current.



Current flowing from positive terminal to negative terminal of a battery due to the flow of positive charges is called conventional current.



**3.What do you mean by the term e.m.f? Is it really a force? Explain.**

Ans: **E.m.f:** "It is the energy supplied by a batter to a unit positive charge when it flows through the closed circuit."

$$\text{e.m.f} = \frac{\text{energy}}{\text{charge}} = \frac{w}{Q}$$

**Unit:**The unit for e.m.f is  $\text{JC}^{-1}$  which is equal to volt (V) in SI system.

E.m.f is not a force, it is actually a voltage between terminals of battery, when no current flows is circuit.

**4. How can we differentiate between e.m.f and potential difference?**

Ans: Difference between emf and potential difference: E.m.f of a battery is total energy supplied in driving one coulomb of charge in complete circuit in which the cell is connected. The complete circuit includes cell and external circuit. Whereas, potential difference determines the energy required between two terminals of circuit to move charge (only external circuit).

**5.Explain Ohm's law. What are its limitations?**

Ans: Ohm's law:"The amount of current passing through a conductor is directly proportional to the potential difference applied across its ends, provided the temperature and the physical state of the conductor does not change."

**Mathematical form:**

$$V \propto I \quad , \quad V=IR$$

Where R is the constant proportionality and is the resistance of the conductors. Its SI units is ohm, denoted by a symbol  $\Omega$ .

**Limitations of Ohm's law:**

- i.Ohm's law is applicable when temperature of conductor is kept constant.
- ii.Conductors obey Ohm's law as the electric current through them is not very large.
- iii.The physical state of the conductor also remains same.

**6.Define resistance and its units.**

Ans: Resistance:"The property of a substance which offers opposition to the flow of current through, it is called its resistance." Unit: Its unit is Ohm  $\Omega$  .

**Ohm:**

"When a potential difference of one volt is applied across the ends of a conductor and one ampere of current passes through it." Its resistance will be one ohm.



**Symbol:**



7. What is the difference between conductors and insulators?

Ans.

Conductors	Insulators
<i>“Conductors are those substances from which electricity and heat can pass easily.”</i>	<i>“Insulators are those substances from which electricity and heat can’t pass easily.”</i>
<b>e.g.</b> Metals are mostly conductor.	<b>e.g.</b> Rubber glass etc.

8. Explain the energy dissipation in a resistance. What is Joule’s law?

Ans: **Energy dissipation:** The electrical energy can be utilized for different useful purposes. For example, bulb converts electrical energy into light and heat. Heater and iron into heat and fans into mechanical energy.

$$\text{Energy dissipated} = W = I^2Rt$$

**Joule’s law:** *“The amount of heat generated in resistance due to flow of charges is equal to the product of square of current I, resistance R and the time duration.”*

9. What is the difference between A.C and D.C?

Ans: **A.C:** *“The current which changes its direction again and again is known as alternating current (A.C).”*

**D.C:** *“The current which always flows in one direction is called direct current (D.C).”*

10. Discuss the main features of parallel combination of resistors.

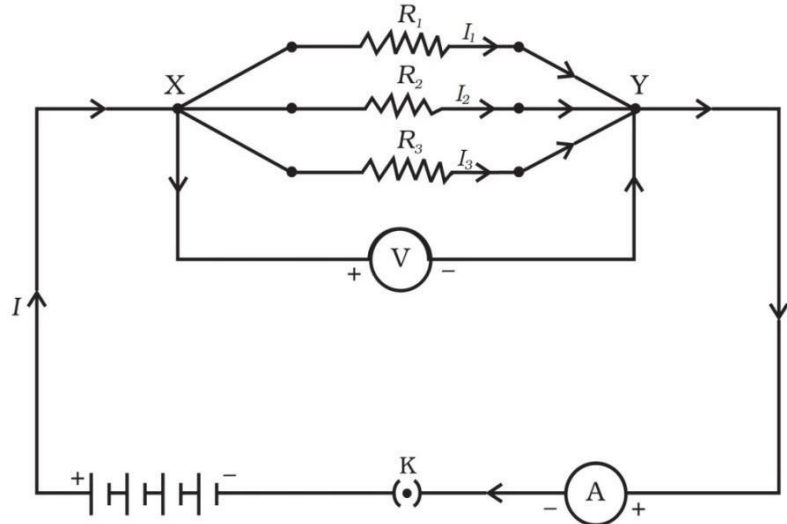
Ans: **Parallel combination of resistor:**

- i. The voltage is same across each resistor which is equal to the voltage of the battery.

$$V = V_1 = V_2 = V_3$$

- ii. The current through each resistor is not same.

## Resistors in Parallel



11. Determine the equivalent resistance of series combination of resistors.

Ans: Series combination:

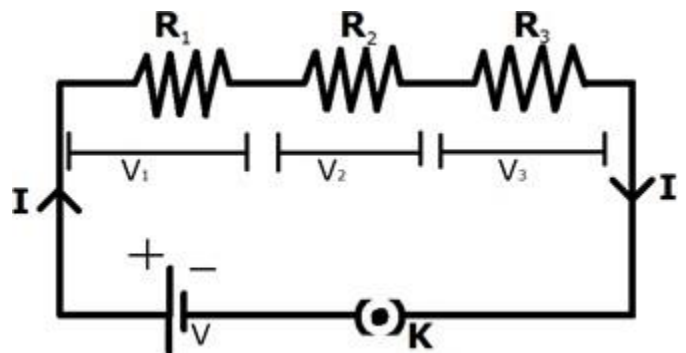
- i. The current passing through each resistor is the same. i.e.  $I = I_1 = I_2 = I_3$
- ii. The total voltage in a series circuit divides among the individual resistors.

$$V = V_1 + V_2 + V_3$$

According to Ohm's law

$$V = IR_1 + IR_2 + IR_3$$

$$V = I(R_1 + R_2 + R_3)$$



12. Describe briefly the hazards of household electricity.

Ans: **Insulation damage:** All electrical wires are well insulated with some plastic cover for the purpose of safety. But when electrical current exceeds the rated current carrying capacity of the conductor, it can produce excess current that can damage insulation due to overheating cables. This results into a short circuit which can severely damage electrical devices or persons.


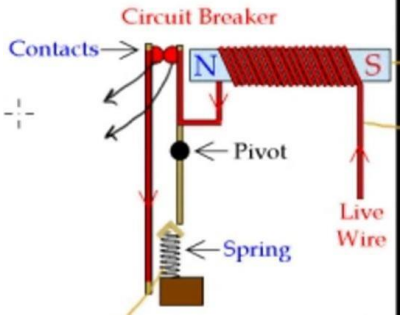
**Damp conditions:** Dry human skin has a resistance of 100,000 ohms or more! But under damp conditions (wet environment) resistance of human skin is reduced drastically to few hundred ohms, which cause fatal accidents.

**13. Describe four safety measures that should be taken in connection with the household circuit.**

Ans. In order to protect persons, devices and property from the hazards of electricity there is a need of extensive safety measures in household electricity.

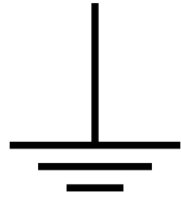
- i. Fuse
- ii. Circuit breaker
- iii. Earth wire
- iv. Neutral wire

**14. Define the following.**

<u>Fuse</u>	<u>Circuit breaker</u>
<p>Fuses are sacrificial devices used to protect much more expensive electrical components from the damaging effects of over current. Fuses consist of a low-resistance metal or wire that is used to close a circuit.</p>	<p>A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit. Its basic function is to interrupt current flow after a fault is detected.</p>
	

Earth wire

The earth wire is connected to a large metal plate buried deep in the ground.



Neutral wire

A wire having Zero potential with respect to Earth is a Neutral wire.

**15. What is house wiring?**

Ans: House wiring consists of an electrical wiring system that distributes energy to be used in equipment and appliances around the house. It also involves the proper installation and operation of the electrical outlets, switches, breakers, meter base and different electrical circuits.

All appliances are connected in parallel with each other.

**16. Differentiate between A.C & D.C?**

<b>Alternating current</b>	<b>Direct current</b>
Alternating current is defined as the flow of charge that changes direction periodically. The result obtained will be, the voltage level also reverses along with the current. Basically, AC is used to deliver power to industries, houses, office buildings, etc.	In a DC circuit, electrons emerge from the minus or negative pole and move towards the plus or positive pole. Generally, the basic source of direct current is produced by batteries, electrochemical, and photovoltaic cells.
<p style="text-align: center;">Alternating Current</p>	<p style="text-align: center;">Direct Current</p>

**17. Give use of Ammeter & Voltmeter?**

Ans: **Ammeter:** The device which is used to measure the current flowing through circuit is called ammeter. Its range is 1A-10A.

**Voltmeter:** The device which is used to measure the potential across the circuit is called Voltmeter.

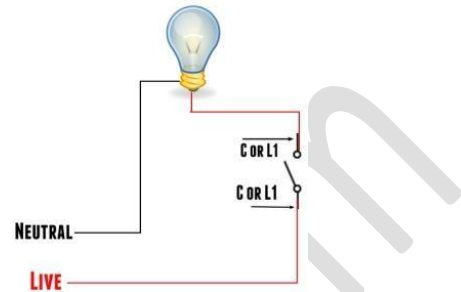
**18. Design a circuit diagram for a study room that needs the following equipments in parallel:**



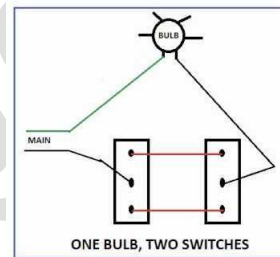
- (a) One 100W lamp operated by one switch.
- (b) One reading lamp fitted with a 40W bulb which can be switched ON and OFF from two points.
- (c) What is the advantage of connecting the equipments in parallel instead of series combination?

Following is the circuit diagram of part

(a)



- (b) One reading lamp fitted with a 40W bulb which can be switched ON and OFF from two points.



- (b) What is the advantage of connecting the equipments in parallel instead of series combination?

Ans: The circuit of parallel combination is better than series combination because in parallel combination each appliance gains voltage equal to voltage of battery.

- 19. Why in conductors charge is transferred by free electrons rather than by positive charges?

Ans: Positive charges are bound to nucleus and cannot move randomly while free electrons are not bound to the force of nucleus and can move randomly. These electrons travel in specific direction, when conductor is connected with battery.

- 20. What is the difference between cell and battery?

Ans: **Cell:** A cell consists of two metal electrodes dipped into an electrolyte. It is a device which converts chemical energy into electrical.

**Battery:** Batter is the group of large number of cells. Batteries store larger energy as compared to cell.

- 21. Can current flow in a circuit without potential difference?

Ans: No, current can't flow in a circuit without potential difference.

- 22. Two points on an object are at different electric potentials. Does charge necessarily flow between them?

Ans: Yes, due to potential differences, charges always flow from higher to lower potential.

**23. In order to measure current in a circuit, why ammeter is always connected in series?**

Ans: Ammeter is always connected in series so that current flowing in series combination always remains same and the current flowing through the circuit will be equal to current flowing through ammeter.

**24. In order to measure voltage in a circuit voltmeter is always connected in parallel. Discuss.**

Ans: Voltmeter is connected parallel to the circuit so that the voltage in the parallel combination always remains same and the voltage across the circuit will be equal to voltage of voltmeter.

**25. How many watt-hours are there in 1000 joules?**

**26. From your experience in watching cars on the roads at night, are automobile connected in series, or in parallel?**

Ans: The headlamps of automobiles are connected in parallel so that the potential at both sides of headlamps remains same.

**27. A certain flash light can use a 10 ohm bulb or a 5 ohm bulb. Which bulb should be used to get the brighter light? Which bulb will discharge the battery first?**

Ans: Bulb with 5 ohm resistance will be more brighter and will discharge first. As lower resistance means larger current will pass through and it will glow more brightly. When larger current passes through circuit, battery will discharge quickly.

**28. It is impracticable to connect an electric bulb and an electric heater in series. Why?**

Ans: If these appliances are connected in series the voltage across both the appliances change and the circuit will be short. As it will increase resistance of circuit and decrease current as well as power through appliances.

## Ch#15(Electromagnetism)

**Q.1 Two parallel straight conductors carrying current in same direction, attract each other? Explain why. What will you conclude if direction of current in conductors is opposite?**

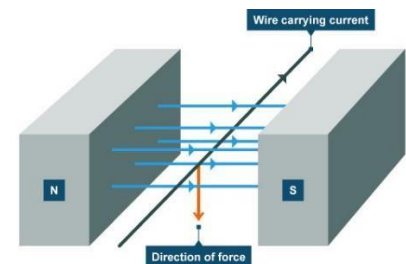
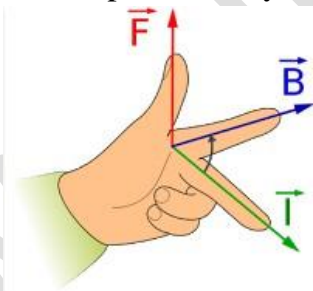
**Ans:** Whenever current flows, it creates magnetic field around the wire which can be obtained by right hand thumb rule. Magnetic field can be expressed in terms of lines of force. Then we will apply Fleming's left hand rule to see forces applying on the wires. We will observe that two current carrying conductors attract each other when the current is in the same direction and repel each other when the current is in opposite direction.

**Q.2 Bar magnets are dropped in long pipes made up of plastic and copper (of same length) simultaneously. Bar magnet comes out later through copper pipe than through plastic pipe, why?**

**Ans:** The moving magnet in the copper pipe induces a current in the copper pipe. The change in magnetic flux determines the induced current (Faraday's Law), in the pipe. The currents in the copper pipe then circulate, creating closed loops called eddy currents. The eddy current itself creates a magnetic field, one that opposes the falling magnet's field, slowing it down. While plastic pipe is an insulator so such currents or magnetic fields do produced in it.

**Q.3 What is direction of magnetic force on this current carrying conductor placed in magnetic field? Also Label the diagram, with current, magnetic field and force.**

**Ans:** The direction of this force is always right angles to the plane containing both the conductor and the magnetic field, and is predicted by Fleming's Left-Hand Rule.



**Q.4 What is direction of rotation of coil (shown in figure) when the switch is closed? Label the diagram with direction of forces forming couple and rotation of coil.**

**Ans:** When a steady current flows through the circuit, a magnetic field is set up by the rectangular coil due to the passage of current. The magnetic field in the coil is at right angles to the magnetic field of the permanent magnet. Thus, a magnetic couple acts, which rotates the coil.

By Fleming's left hand rule, we can see that the coil rotates in clockwise direction.

**Q.5 A bar magnet is moving the ring, what is direction of induced current in the ring when:**

**(a) Magnet is moving towards ring (b) Magnet is moving away from the ring**

**Ans:** (a) When we bring a north pole of the bar magnet near a metallic ring applying Lenz's law the

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ring will behave as north pole so that repulsion occurs. So according to right hand rule direction of current induced in it will be anticlockwise.

**Ans:** (b) When south pole of the bar magnet moving away from the metallic ring applying Lenz's law the ring will behave as north pole so that attraction occurs. So according to right hand rule direction of current induced in it will be clockwise

### **6 Why output of a transformer is zero if DC voltage is applied on its primary coil?**

**Ans:** When a DC voltage is applied to the transformer, the core becomes an electromagnet and the polarity does not change, and the magnetic flux through the secondary winding remains unchanged. Consequently, electromagnetic induction does not occur, and no current is generated in the secondary winding. Hence the output of a transformer will be zero if DC voltage is applied on its primary coil.

### **7 Why are coils of transformer wound on iron core?**

**Ans:** The central iron core of most transformers is made of a highly permeable material, which is typically thin silicon steel laminations. These thin laminations are joined together to provide the necessary magnetic path while minimizing magnetic losses. Thus, iron is used in transformers to provide the necessary magnetic path and to minimize magnetic losses.

### **8 Why step-up transmission is used for long distance transmission?**

**Ans:** Use of transformers in transmission and distribution of energy over long distance. The voltage output of the generator is stepped up, so the current is reduced and consequently I<sup>2</sup>R loss is cut down. It is then transmitted over long distances to an area substation near the consumers. There the voltage is stepped down. It is further stepped down at the distributing substations and utility poles before a power supply of 240V reaches at homes.

### **9 When you are pushing a bar magnet towards coil of single turn, you feel and opposing force on your hand. If this magnet is pushed towards coil of many turns, now you will feel greater opposing force. Why?**

**Ans:** By pushing the bar magnet towards the coil a current would be induced into the coil by the physical movement of the magnetic flux inside it. This induced current depends upon the area of the coil and the change in magnetic field.

If we push the magnet towards the coil of single turn, we feel opposing force on our hand due to Lenz's law. If we increase the number of turns in the coil this will increase the area of the coil and it induces more current in the coil hence we will feel more opposing force on our hand.

### **10. In what way split rings (commutators) in DC motor differ slip rings in AC motor in working?**

**Ans:** The split ring in the electric motor also known as a commutator reverses the direction of current flowing through the coil after every half rotation of the coil. Due to this the coil continues to rotate in the same direction.

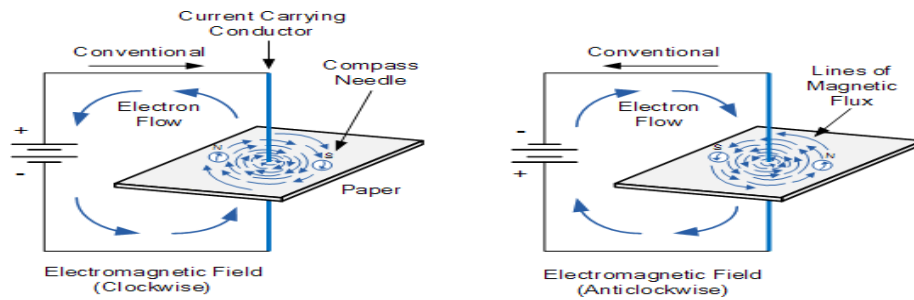
Whereas slip rings provide a continuous transfer of power in AC motors

## **PUNJAB BOARD**

**1. Demonstrate by an experiment that a magnetic field is produced around a straight current carrying conductor.**



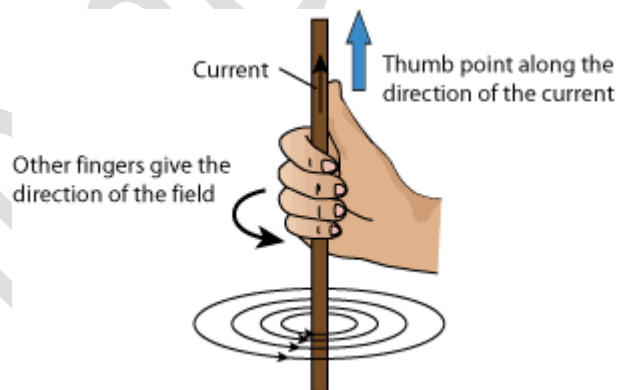
Ans: Experiment: We take a straight conductor wire and pass it vertically through cardboard and then connected the two ends with opposite battery terminals now current flows in clockwise direction. The lines of force of the magnetic field produced around the wire would be in the form of concentric



circles. If we place a compass needle at different points in the region of magnetic field, it will align along the direction of magnetic field. i.e. clockwise direction. If we reverse the direction of the current by reversing the terminals of the battery, the compass needle also reverses its direction. The magnetic field lines will align in the anticlockwise direction.

**2.State and explain the rule by which the direction of the lines of the force of the magnetic field around a current carrying conductor can be determined?**

Ans: Right hand grip rule: Direction of the lines of force of magnetic field can be determined by right hand grip rule stated as follows:



“Grasp a wire with your right hand such that your thumb is pointed in the direction of current. Then curling fingers of your hand will point in the direction of the magnetic field.”

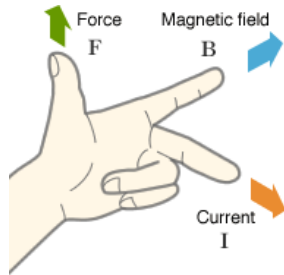
**3.You are given an unmarked magnetized steel bar and bar magnet, its north and south ends are marked N and S respectively . State how you determine the polarity at each end of the unmarked bar?**

Ans: When the north pole of marked bar magnet attracts the unmarked magnet this shows that there is a south pole on unmarked magnet and if magnets repel each other then there is a north pole.

**4.When a straight current carrying conductor is placed in a magnetic field, it experiences a force. State the rule by which the direction of this force can be found out?**

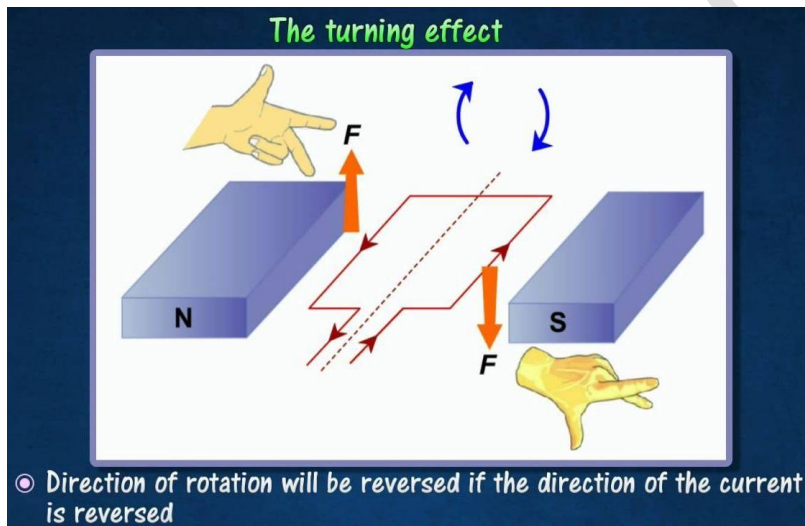
Ans: Fleming’s left hand rule: The direction of the force on a current-carrying wire in a magnetic field can be found by using Fleming’s left hand rule stated as:

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Stretch the thumb, forefinger and the middle finger of the left hand mutually perpendicular to each other. If the forefinger points in the direction of the magnetic field, the middle finger in the direction of the current, then the thumb would indicate the direction of the force acting on the conductor.



5.State that a current carrying coil in a magnetic field experiences a torque.

Ans: Place a current carrying loop inside the magnetic field the loop will rotate due to the torque acting on the coil because when we placed the loop in magnetic field i.e. in North, pole and south and connected the end points of the loop with battery terminals. Now current flows through the loop and with the help of Fleming's left hand rule to each side of the coil. We can see force is acting upward on one side on other side force acts downward thus this couple produces a torque.



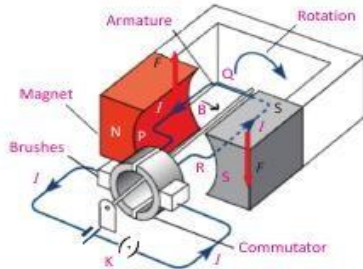
6.What is an electric motor? Explain the working principle of DC motor.

Ans:**Electric motor:**“Electric motor is a device which converts electrical energy into mechanical energy.”

**Working principle:** Current carrying coil in a magnetic field produces torque. (electromagnetism)

**Working of DC motor:** D.C. motor consists of a rectangular coil PQSR mounted on a shaft or axle. Coil is placed in a field of permanent magnet or in a field which is produced by an electromagnet called field of coil.

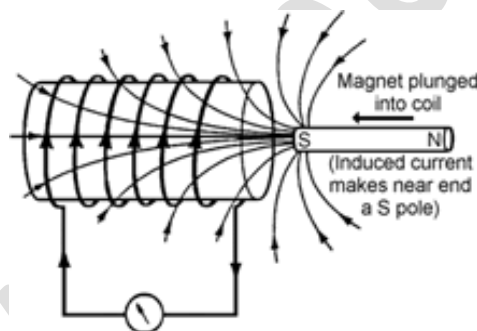
When the coil of the motor is connected to the battery, then current starts flowing through it. Simple coil cannot rotate more than 90 degree and in vertical position no force acting on this loop so the loop will not continue to turn because both upward and downward forces are balanced so if we change the direction of current with the help of commutator which is also connected to the brushes then this reversal of current will allow the coil to rotate continuously. In this way, electrical energy is converted into mechanical energy.



**7. Describe a simple experiment to demonstrate that a changing magnetic field can induce e.m.f in a circuit.**

**Ans: Principle:** If we change the number of magnetic lines of force through a coil by moving it in the magnetic field, this will induce an e.m.f in the coil.

**Experiment:** Take a bar magnet and a coil, due to relative motion of coil and bar magnet, current flows through the coil placed at different distances from the magnet.



**8. What are the factors which affect the magnitude of the e.m.f induced in a circuit by a changing magnetic field?**

**Ans: Factors:** The magnitude of induced e.m.f in a circuit depends on the following factors:

- i. Speed of relative motion of the coil and the magnet.
- ii. Number of turns of the coil.

**9. Describe the direction of an induced e.m.f in a circuit. How does this phenomenon relate to conservation of energy?**

**Ans: Direction of induced e.m.f:** "The induced e.m.f is always opposite to the cause which produces it."

**Relation between e.m.f and conservation of energy:** When we put the wire loop in a magnetic field, work is done on the magnet to bring it close to coil. This work appears as electrical energy in the conductor. Hence, this phenomenon is manifestation of law of conservation of energy.

**10. What do you understand by the term mutual induction?**

Ans: **Mutual induction:** "The phenomenon of production of induced current in one coil due to change of current in a neighboring coil is called mutual induction."

**SI unit:** The SI unit of mutual induction is Henry.

**Henry:** "The mutual inductance of two coil is one henry if the current to changing at the rate of one ampere per second in primary coil produces an e.m.f of 1 volt in secondary coil."

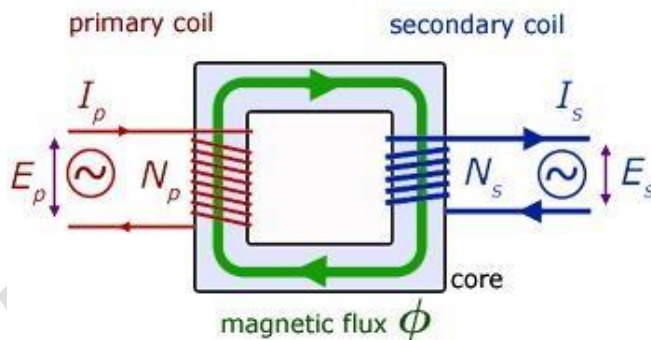
**11 What is a transformer? Explain the working of transformer in connection with mutual induction.**

Ans: **Transformer:** "Transformer is an electrical device which is used to increase or decrease the value of alternating voltage."

**Working principle:** Transformer works on the principle of "Mutual induction."

Working of a transformer: A transformer has two coils, electrically insulated from each other, but wound around the same iron core. One coil is called the primary coil. The other coil is called the secondary coil. Number of turns on the primary and the secondary coils are represented by  $N_p$  and  $N_s$  respectively.

The e.m.f induced in the secondary coil, called the secondary voltage  $V_s$ . The secondary voltage also depends on the ratio of the number of turns on the secondary coil to the number of turns on the primary coil, as shown by the following expression:



**12. Define Armature? How forces acting on it increase.**

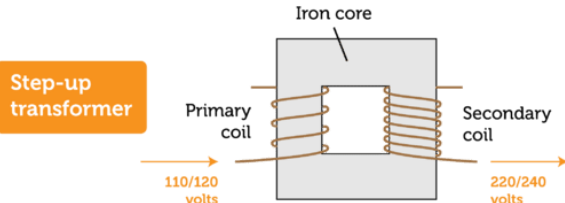
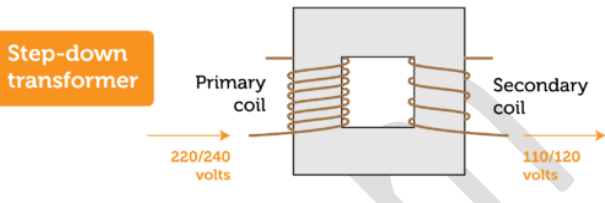
Ans: In practice electric motor the coil is used called armature. It is made of many loops mounted on shaft. The total forces on armature increased by:

- i) Increasing number of turns in coil.
- ii) Increasing current in coil.
- iii) Increasing strength of magnetic field.
- iv) Increasing Area of coil.



13. Differentiate b/w Step-up & Step-down transformer?

Ans: The main difference between step-up and step-down transformer is that, step-up transformer increases the voltage whereas a step-down transformer decreases the voltage.

Step up transformer	Step down transformer
<p>The secondary voltage of step-up transformer is more than that of its primary voltage</p> $V_s > V_p \text{ or}$ $N_s > N_p$ 	<p>The secondary voltage of step-down transformer is less than its primary voltage.</p>  $V_s < V_p \text{ or}$ $N_s < N_p$

14. Differentiate b/w Generator & DC-motor?

Ans.

Generator	DC-motor
<ol style="list-style-type: none"> <li>1. Generator converts mechanical energy into an electrical energy.</li> <li>2. DC generators, generated EMF is more than its terminal voltage (<math>E_g &gt; V</math>).</li> </ol>	<ol style="list-style-type: none"> <li>1. DC motor converts electrical energy into mechanical energy.</li> <li>2. Furthermore, in DC motors, EMF in the armature is less than its terminal voltage (<math>E_b &lt; V</math>).</li> </ol>

15. The voltage chosen for the transmission of electric power over large distance is many times greater than the voltage of the domestic supply. State two reasons why electric power is transmitted at high voltage?

Ans: Power is transmitted over long distances at high voltages because:

- To minimize the loss of energy in form of heat during transmission.
- This voltage is transmitted and further stepped down at main or city sub-stations.
- A high power transformer can reduce the voltage keeping power constant.

That's why alternating voltage is stepped-up at generating station.

16. Why is the voltage used for the domestic supply much lower than the voltage at which the power is transmitted?

Ans: The voltage used for domestic supply is much lower than voltage at generating station because required domestic voltage is 220V, but there is some loss of energy in form of heat during

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transmission. This power loss can be reduced by using high (Stepped-up) voltage at generating station.

**17. Suppose someone handed you three similar iron bars and told you one was not magnet, but the other two were. How would you find the iron bar that was not magnet?**

Ans: Similar poles of magnet repel each other while opposite poles attract each other. The non magnetic bar is not repelled by magnetic bar. But attract the no magnetic bar. The iron bar which is not repelled by magnetic bar is the non magnetic bar.

**18. Suppose you have a coil of wire and a bar magnet. Describe how you could use them to generate an electric current.**

Ans: By changing magnetic flux through coil we can generate electric current. Both coil and bar magnet move back and forth to change magnetic flux. This change of flux produces current in the coil.

**19. Which device is used for converting electrical energy into mechanical energy?**

Ans: D.C motor is used to convert electrical energy into mechanical energy.

**20. Suppose we hang a loop of wire so that it can swing easily. If we now put a magnet into the coil, the coil will start swinging. Which way will it swing relative to the magnet and why?**

Ans: When we put a bar magnet into the coil, the coil will starts swinging because when we put magnet into coil, the magnetic flux changes in the coil, so e.m.f is induced in the coil. The magnetic field produced by it, that opposes the motion of bar magnet. Direction is determined by Fleming's left hand rule.

**21. A conductor wire generates a voltage while moving through a magnetic field. In what direction should the wire be moved, relative to the field to generate the maximum voltage?**

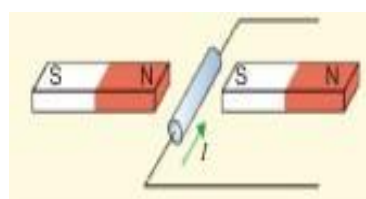
Ans: When conductor wire is held perpendicular to direction of magnetic lines of force, maximum lines pass through it and hence maximum voltage is induced. While minimum voltage is produced by placing conductor horizontally to magnetic field.

**22. What reverses the direction of electric current in the armature coil of DC motor?**

Ans: The direction of current is reversed in coil of DC motor with the help of split rings (commutator).

**23. A wire lying perpendicular to an external magnetic field carries a current in the direction shown in the diagram in front. In what direction will the wire move due to resulting magnetic force?**

Ans: According to Fleming's left hand rule. It will move in downward direction.



**24. Can a transformer operate on direct current?**

Ans: No, the transformer does not operate on direct current. As transformer works on principle of mutual induction and mutual induction is shown always by alternating current.

## FEDERAL BOARD BOOK

### Ch#16(Introductory Electronics)

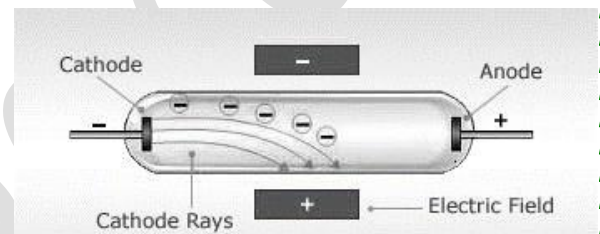
#### Q.1 What are free electrons?

Ans: The electrons that are not bound within the atom and free to move are called free electrons. Electrons in the valence shell of an atom, generally known as valence shell electrons, are loosely bound with the nucleus of the atom.

As we know that the movement of electrons is the electric current. So, the free electrons tend to move freely and can conduct electricity. Metals are good conductors of electricity and thus they possess free electrons.

#### Q.2 How can you say that cathode rays are negatively charge?

Ans: A beam of electrons emitted from the cathode of a high vacuum tube is known as cathode rays. When voltage is applied to two electrodes fitted in an evacuated glass tube, it shows deflection of the cathode ray. The cathode rays are negatively charged, they will get deflected away from the negatively charged electrode and will move towards the positively charged electrode.



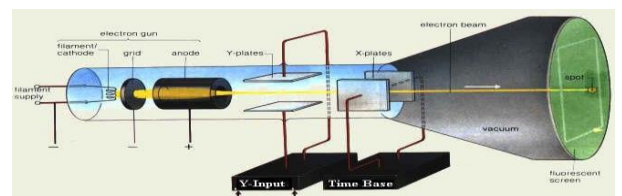
#### Q.3 Why image is distorted when a magnet is brought close to old television screens or monitors with cathode ray tube (CRT) inside?

Ans: When a magnet is brought close to the picture tube, the interaction between the flying electrons and the magnetic field creates a force that throws the electrons off course. Now the electrons are hitting the screen in places they were not intended to strike and the picture becomes distorted. Hence the image is distorted when a magnet is brought close to old television screens or monitors with cathode ray tube (CRT) inside.



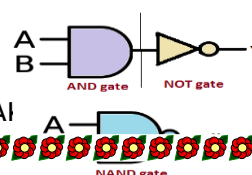
#### Q.4 How can you control brightness of waveform on screen of CRO?

Ans: By changing the negative potential of the grid, we can control the number of electrons per unit time or the current in the cathode ray tube which changes the brightness.



### 5 All modern devices e.g. mobile phone, calculators, laptops etc use digital signals for their working. Why is digital signal used?

Ans: Digital signals can convey information with less noise, distortion, and interference. Digital signals are a more reliable form of transmitting information because a small error in the amplitude or frequency value would have to be very large in order to cause a jump to a different value. So all modern devices e.g. mobile phone, calculators, laptops etc use digital signals for their working





**6 Is NAND gate reciprocal of AND gate?**

**Ans:** An AND gate is connected to NOT gate in series. The bubble at the output of the NAND gate is the symbol of NOT gate. A NOT gate is used for inverting the output results. Thus, A NAND gate is reciprocal of an AND gate.

**7 What is the difference to produce a LOW (0) output for an OR gate and NAND gate?**

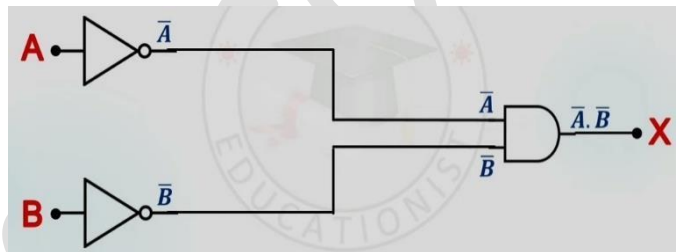
The output of an OR gate will be LOW (0) if its both inputs are LOW (0).  
While the output of a NAND gate will be LOW (0) if its both inputs are HIGH (1).

**8 What is the difference to produce a HIGH (1) output for an AND gate and NOR gate?**

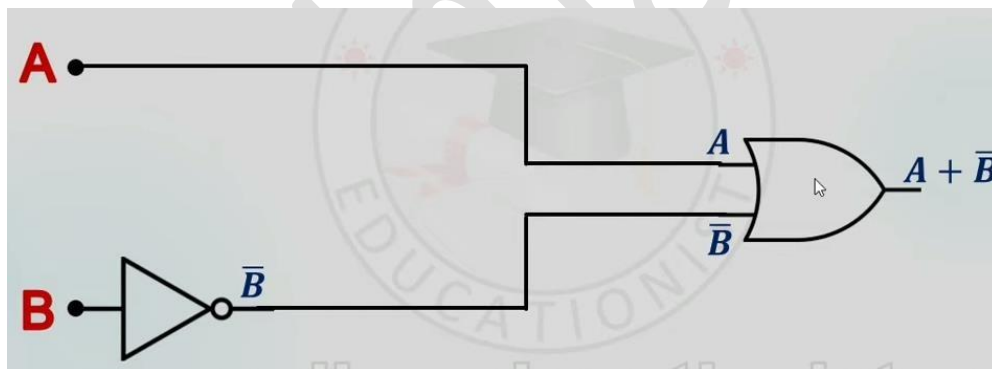
**Ans:** The output of an AND gate will be HIGH (1) if its both inputs are HIGH (1). While the output of a NOR gate will be HIGH (1) if its both inputs are LOW (0).

**9 What is the output of the following circuit?**

**Ans:** So the output of the given circuit will



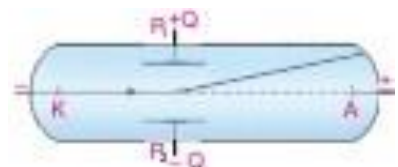
**10. Draw a logic circuit for the logic equation  $X = A + \bar{B}$**



(PUNJAB BOARD)

1. Describe, using one simple diagram in each case, what happens when a narrow beam of electrons is passed through (a) a uniform electric field (b) a uniform magnetic field. What do these results indicate about the charge on electron?

**Ans:** (a) Deflection of electrons by electric field: When an electron beam passed between the two plates, it can be seen that the electrons are deflected towards the positive plate. The degree



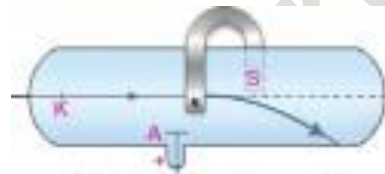


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of deflection of electron from their original direction is proportional to the strength of the electric field applied

(b) **Deflection of electrons by magnetic field:** Now we apply magnetic field at right angle to the beam of electrons by using a horseshoe magnet. We will notice that the spot of the electrons beam on the screen is getting deflected from its original direction.

**2. Define electronics?**

Ans: The branch of applied physics which deals with behavior of electrons using different devices for



various purposes is called electronics.

**3. Define thermionic-emission?**

Ans: The process of emission of electrons from the hot metals surface is called thermionic emission.

**4. How thermionic emission produced?**

Ans: There are many ways by which thermionic emission produced given below:

- There are a number of free electrons in metals but are not in position to escape at room temperature due to forces of atomic nucleus .If metals are heated at high temperature some electrons gain sufficient energy to escape & emission produced.
- It can also be produced by heating a fine tungsten filament.

**5. Differentiate between analogue electronic and digital electronic. Write down the names of five analogue and five digital devices that are commonly used in everyday life.**

Analogue Electronics	Digital Electronics
<p><i>“The branch of electronic which deals with analogue quantities is called analogue electronics.”</i></p> <p><b>Devices:</b> Radio, Amplifier, loudspeakers, Microphone, Television.</p>	<p><i>“The branch of electronic which deals with digital quantities is called digital electronics.”</i></p> <p><b>Devices:</b> Computers, Radar system, Modern CD and DVD players.</p>

6.What do you understand by digital and analogue quantities?

Ans:

Analogue Quantities	Digital Quantities
<i>“The quantities whose values vary continuously are called analogue quantities.”</i>	<i>“The quantities whose values vary in non continuous manner are called digital electronics.”</i>

**Examples:** Temperature, time, pressure **Examples:** Radar system, digital watches,

7.Define Logic-gates,Boolean-Algebra&Truth-Table?

Ans: **Logic-Gates:-**Logic gate is a switching circuit which is used to implement certain logic which have only one of two possible states. Either HIGH or LOW, ON or OFF, 1 or 0.

**Boolean-Algebra:** The algebra used to describe logic operations by symbols is called Boolean Algebra.

**Truth-Table:-**Truth-Table is a table which is used to give relation b/w output due to certain input.

8.What are logic states/logic variables?

Ans: Digital devices operate on binary values so there are only two allowable digital states. Each of these states is called logic state.

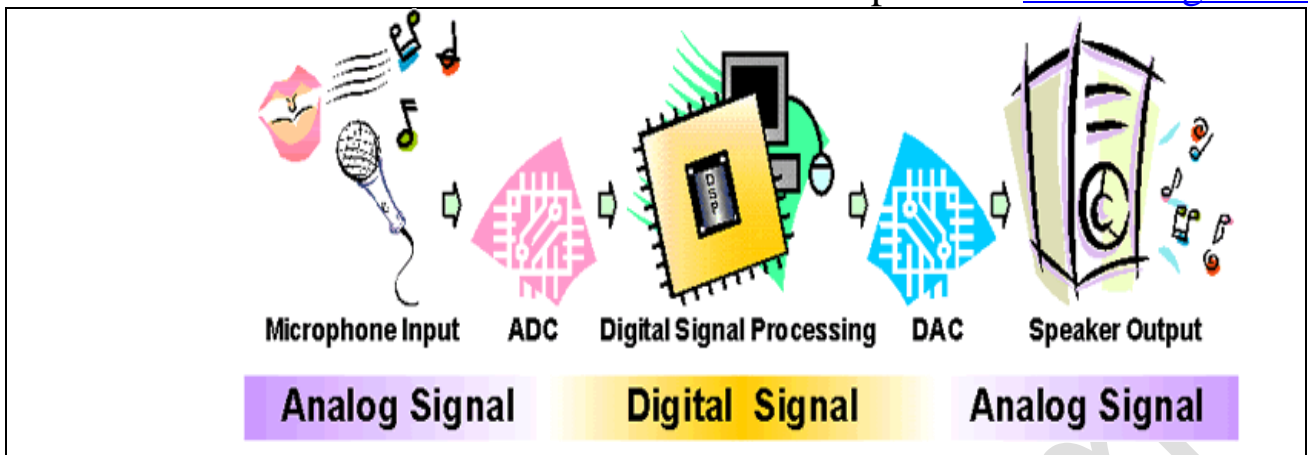
9.What is Binary variable?

Ans: A binary variable is a variable with only two values. For example:

- 1 / 0.
- Yes / No.
- Success / Failure.
- Male / Female.
- Black / White

10.Differentiate b/w ADC & DAC ?

ADC	DAC
ADC converts the analog signal collected by audio input equipment, such as a microphone, into a digital signal that can be processed by computer.	DAC converts the processed digital signal back into the analog signal that is used by audio output equipment such as a speaker.



11. Explain the working of different parts of oscilloscope.

Ans: The cathode-ray oscilloscope (C.R.O) consists of the following components:

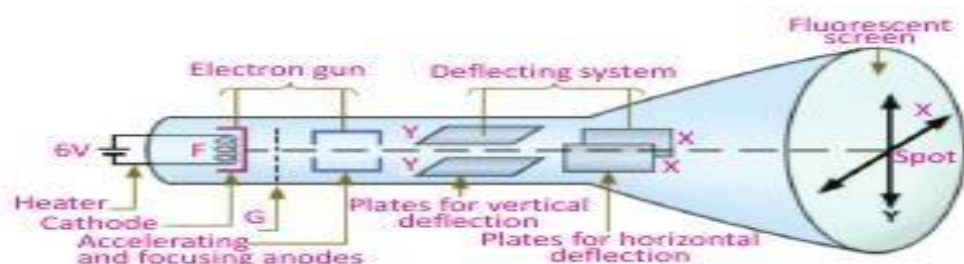
**Components:**

i). The electron gun ii). The deflection plates iii). A fluorescent screen

**The electron gun:** Produces a beam of act moving electrons with the help of filament, grid and set of anodes.

**The deflection plates:** After leaving the electron gun, the electron beam passes between a pair of horizontal plates. A potential difference applied between these plates deflects the beam in a vertical plane.

**The fluorescent screen:** The screen of a cathode-ray tube consists of a thin layer of phosphor, which is a material that gives light as a result of bombardment by fast moving electrons.



12. Name some uses of oscilloscope.

Ans: **Uses of oscilloscope:**

- i. Oscilloscope is used for displaying wave form.
- ii. Measuring voltages.
- iii. Range finding (In Radar).
- iv. Echo (by sound find the depth of sea).
- v. In medical instrument i.e. show heart beat.

13. What is electron gun? Describe the process of thermionic emission.

Ans: **Electron gun:** The electron gun consists of an electron source which is an electrically heated cathode that ejects electrons.

**Process:** Electron gun also has an electrode called grid G for controlling the flow of electron in the beam. The grid is connected to a negative potential. The more negative this potential, the more electrons will be repelled from the grid. The negative potential of the grid can be used as brightness control. The anode is connected to positive potential and hence is used to accelerate the electrons. The electrons are focused into a fine beam as they pass through the anode.

14. Write down some benefits of using digital electronics over analogue electronics.

Ans: **Advantages of digital electronics:**

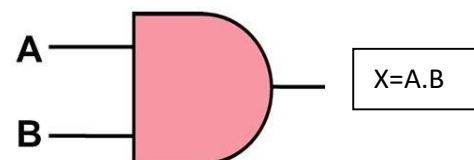
- i. The big advantage of digital electronic is quality.
- ii. There is no interference or loss of strength in digital signal travelling in an optical fibre.
- iii. Digital technology in TV gives excellent view and allow you to be interactive.
- iv. Smart ID cars are being developed. Passport, national insurance card and driving license, all of this data would be held digital in the tiny chip.
- v. Now, today everything is going digital like digital cameras are fast replacing traditional film equipment.

15. What are the three universal logic gates? Give their symbols and truth tables.

Ans: **AND-Gate**

“The circuit which implements the AND operation is known as AND gate.”

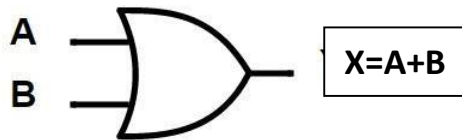
Input		Output
A	B	$X=A.B$
0	0	0
0	1	0
1	0	0
1	1	1





**OR-GATE:-**

“The electronic circuit which implements the OR operation is known as OR gate.”

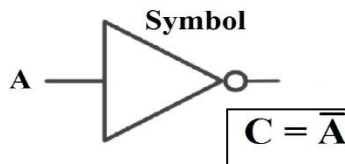


Input		Output
A	B	$X=A+B$
0	0	0
0	1	1
1	0	1
1	1	1

**NOT-GATE**

“NOT gate performs the basic logical function called inversion or complementation.”

**NOT Gate**



**Truth Table**

INPUT	OUTPUT
A	NOT A
0	1
1	0

**16. Give uses of Logic-Gates?**

Ans: We can use logic-gates in electronic circuit to do useful tasks some given below:

- i) These circuits used in Light depending circuits(LDR"s)to keep input low. An LDR can act as switch that closed when illuminated & open in dark.
- ii) We can use logic gate to make burglars alarm.This can be done by using NAND gate, an LDR,a push-button, & an alarm.

**17. Name two factors which can enhance thermionic emission.**

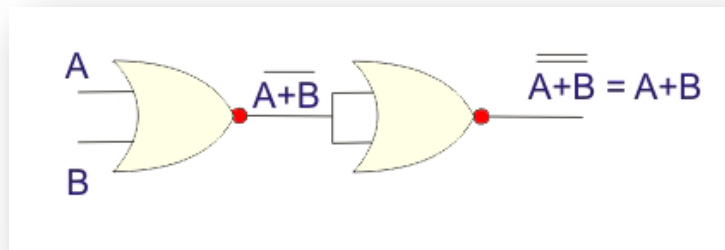
Ans: **Factors:** The two factors which can enhance thermionic emission are:

- i. By increasing temperature of Filament.
- ii. By increasing voltage.

**18. How can you compare the logic operation  $X = A.B$  with usual operation of the multiplication?**

Ans: According to the truth table of AND gate operation ( $X=A.B$ ) it is clear that ( $X=A.B$ ) behave as multiplicative inverse. Every time the result is zero when multiplied with Boolean variable. So, logic operation  $X=A.B$  act as operation of multiplication.

**Truth Table**

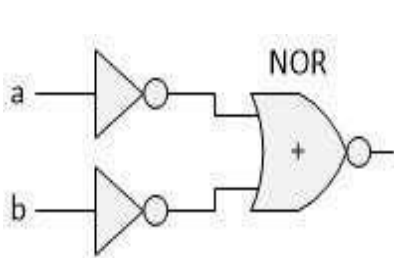


19. Show that the circuit given below acts OR gate.

A	B	$X=A+B$	$X=\overline{A+B}$	$X=\overline{\overline{A+B}}$
0	0	0	1	0
0	1	1	0	1
1	0	1	0	1
1	1	1	0	1

20. Show that the circuit given below acts as AND gate.

Ans: In this circuit two NOT operations are working as inputs terminals of NOR gate. From the following table it is clear that this circuit acts as AND gate:



A	B	$\overline{A}$	$\overline{B}$	$\overline{A+B}$	$\overline{\overline{A+B}}$
0	0	1	1	1	0
0	1	1	0	1	0
1	0	0	1	1	0
1	1	0	0	0	1

(INFORMATION AND COMMUNICATION TECHNOLOGY)

FEDERAL BOARD BOOK

**Ch#17 ICT(Information and communication Technology)**

**Q.1** What is the difference between data and information?

	Data	Information
1	The word 'data' is derived from the Latin word 'datum', which means something that is given.	The word 'information' is derived from the Latin word 'information', which means 'formation or conception'.
2	Data refers to raw facts that have no specific meaning	Information refers to processes data that has a purpose and meaning
3	The data is independent of the information.	Information is dependent on data.
4	Data or raw data is not enough to make a decision	The information is sufficient to help make a decision in the respective

**Q.2** Briefly explain the process of transfer of information via radio waves through air.

**Ans:** Radio waves are generated artificially by an electronic device called a transmitter. A transmitter encodes or modulates messages by varying the amplitude or frequency of the wave. Transmitter is connected to an antenna which radiates the waves. They are received by another antenna connected to a radio receiver. Receiver tuned to the same wavelength picks up the signal and 'decodes' it back to the desired form.

**Q.3** What is the difference between primary and secondary memory? Why do we need both in computers?

**Ans:** Primary memory is known as computer's main memory and stores data temporarily. It is quite fast. It is the region in a computer system where data is stored by the computer's CPU for quick, easy and direct access, for example hard disk, etc.

Secondary memory is external memory and saves data permanently. It is very slow in contrast to primary memory. It is stored on secondary storage devices such as hard drives, DVDs, CD-ROMs, and so on.

Computer uses its memory (primary memory) to run programs, and it uses storage (secondary memory) to save files, programs, & other data. That's why we need both primary memory and secondary memory to use a computer.

**Q.4** What is difference between RAM and ROM of computers?

	RAM	ROM
1	RAM is a temporary storage.	ROM is a permanent storage.
2	RAM stores data in MBs.	ROM stores data in GBs.
3	It is a volatile memory.	It is a non-volatile memory.
4	It is used in normal operations.	It is used for startup process of computer.

5 Writing data is faster in RAM. Writing data is slower in ROM.

**Q 5. Why optical fiber is better than electric wire for communication process ?**

Optical fiber transmits data in the form of light. Optical fibers transmit information over large distances via light, with minimum loss of energy. One of the most important reasons to choose fiber optics over regular wire cables is that they offer much higher data speeds. Fiber optic cables are capable of transmitting data at speeds of up to 100 Gbps, which is significantly higher than the best that regular cables can manage (around 30 Gbps).

**Q 6 Why is the storage capacity of hard disk greater than a floppy disc or DVD usually?**

**Ans:** Hard disks store much more data per square inch of recording surface. Because aluminum platters are less sensitive than floppy disk or DVD to variations in temperature and humidity and to mechanical stress. This allows the hard disks to have more tracks per radial inch and to write more bits per inch along each track.

**Q7 What is the main difference between telephone and cellular phone?**

**Ans:** Landlines use electrical currents to send the sound of voice to the receiver, while cellphones use wireless technology. Cellphones use only electromagnetic radio waves to send and receive the sound but telephones use wires for this purpose. Telephone is fixed on a place but we can carry cellular phone anywhere.



**Q 8 How is data stored in a Hard disk? Describe briefly.**

**Ans:** Data is stored on the hard disk in the form of 0 and 1. The part of the hard disk that stores the data is known as platters, each accessed via read/write head on a moveable arm. Platters are circular disk made of a nonmagnetic material (aluminum alloy, glass or ceramic) coated with a thin layer of a magnetic material. Platters are further separated in to the tracks and sectors. Hard disk stores information in the form of magnetic fields. Data is stored digitally in the form of tiny magnetized regions on the platter where each region represents a bit. To write a data on the hard disk, a magnetic field is placed on the tiny field

**PUNJAB BOARD**

**1. What is the difference between data and information?**

**Ans:** **Data:** "Data is the collection of acts and figures that are used by programs to produce useful information."

**Information:** "Computer processes data and converts it into useful information. Data after process is called information."

**2. Define Communication?**

**Ans:** The method that is used to communicate information to far off places instantly is called telecommunication.

**3. What do you understand by information and Communication Technology (ICT)?**



Ans: **Information and Communication Technology:** Information and Communication Technology is defined as the scientific methods and means to store, process and transmit vast amounts of information in seconds with the help of electronic equipments.

**4. What are the components of information technology” clearly indicate the function of each component.**

Ans: Components of Information Technology:

**Hardware:** The term hardware refers to machinery. This includes the central processing unit (CPU) and all of its support equipments.

**Software:** The term software refers to computer programs and the manuals that support them.

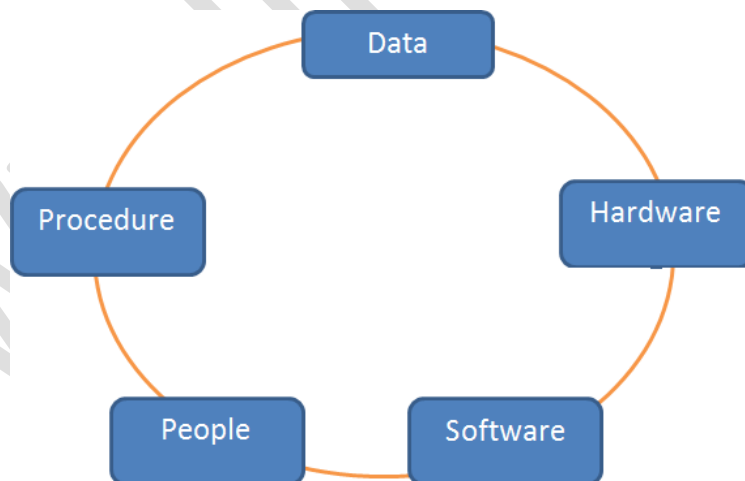
**Data:** Data are facts and figures that are used by programs to produce

useful information. **Procedures:** These are set of instruction and rules to

design and use information system. These are written in manuals and

documents for use.

**People:** Every CBIS needs people if it is to be useful, who influence the success or failure of information systems. People design and operate the software, they feed input data.



**5. Differentiate between primary memory and secondary memory.**

Primary memory	Secondary memory
<i>The main memory of computer is called primary memory.</i>	<i>The secondary level memory of computer is secondary memory.</i>
It is used in computer as temporary memory	It is used to store data permanently in computer

It vanishes when computer is switched off.	When we open a program, data is moved from secondary storage into primary storage.
RAM is primary memory.	The secondary storage devices are audio-video, cassettes, hard disk.

**6. Name different information storage devices and describe their uses.**

**Information storage devices:**

**Primary memory:** It is based on electronics and consists of integrated circuits (ICs).



**Random access memory (RAM),** is used in computer as temporary memory. RAM vanishes when the computer is switched off.

**Primary Memory**

This is storage that the CPU (processor) can access directly. There are two types of primary memory:

<p><b>RAM</b> Random Access Memory</p>	<p><b>ROM</b> Read Only Memory</p>
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**7. Explain briefly the transmission of radio waves through space?**

Ans: **Transmission of radio waves through space:** Information in the form of audio

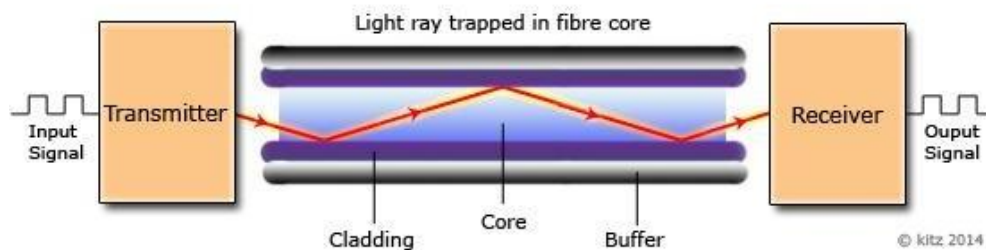
frequency (AF) signals may be transmitted directly by cable. However, in order to send information over a long distance, it has to be superimposed on electromagnetic waves. The transmission by radio waves consists in two parts i.e radio station and receiver. In radio station sound waves changed into electromagnetic waves and through in space and receiver receive these signals through space and convert into again sound waves.

### 8. How light signals are sent through optical fibre?

Ans: **Light signals through optical fibre:** Waves of visible light have a much higher frequency than that of radio waves. This means, rate of sending information with light beams is larger than that with radio waves or microwaves. An optical fibre has been used as transmission channel for this purpose. An optical fibre with a coating of lower refractive index is a thin strand of high-quality glass that absorbs very little light.

*Light that enters the core at one end of the optical fibre goes straight and hits the inner wall (the cladding) of fibre optics. If the angle of incidence with cladding is less than the critical angle, some of the light will escape the fibre optics and is lost.*

## Optical Fibre Transmission



### 9. What is the difference between hardware and software? Name different softwares.

Ans: **Hardware:** "The term hardware refers a machinery (physically existence)." This includes the central processing unit (CPU), and all of its supporting equipments.

**Examples:** CPU, monitor, mouse, printer.

**Software:** "The term software refers to computer programs

and the manuals that support them." **Examples:** Microsoft window,

Microsoft Excel, Microsoft word

**10. What do you understand by the term word processing and**

**data managing?**

Ans: **Word processing:** "Word processing is such a use of computers through which we can write a letter, article book or prepare a report."

**Data managing:** "To collect all information regarding a subject for any purpose more than one inter linked files which may help when needed is called data managing."

**11. What is internet? Internet is a useful source of knowledge and information. Discuss.**

Ans: **Internet:** "Internet is a system in which many computer networks all over the world are connected together to communicate with each other through communication medium."

OR

**The internet is the interconnection of millions of computers.**

**Importance of internet:** In internet, millions of computers remain connected together through well laid communication system. Thus like a telephone system any computer of any city can establish a connection with any other computer of any other city and exchange data or message with it. It is essential that every educated person becomes familiar with computer. The ability to use computer is basic and necessary to a person's formal education as reading, writing and arithmetic. The internet is connection of millions computers all over the world. So, people exchange information and knowledge at international level.

**12. Discuss the role of information technology in school education.**

Ans: **Role of IT in education:** The role of IT in school education cannot be ignored. In fact, use of computer in school education has made it easier for teachers to impart knowledge and for students to acquire it. Today teachers are using multimedia in classrooms to make the teaching and learning process more effective. The use of audio-video visuals in class room teaching invites greatest interests for students.

**13. What is CPU?**

**CPU.** Stands for "Central Processing Unit." The **CPU** is the primary component of a computer that processes instructions. ...

The **CPU** contains at least one **processor**, which is the actual chip inside

the **CPU** that performs calculations.

**14. Give importance of computer?**



Ans: Computer plays an important role in our daily-life:

- i) In offices computers are used for preparing letters, documents & reports.
- ii) In hotels computers are used for advance booking of rooms, preparing bills etc
- iii) Doctor uses it for diagnosing illness & treatment of diseases.
- iv) Architects use them for building, designing & it planning.

**15. What is floppy?**

Ans: A **floppy disk** is a magnetic storage medium for computer systems. The **floppy disk** is composed of a thin, flexible magnetic **disk** sealed in a square plastic carrier. In order to read and write data from a **floppy disk**, a computer system must have a **floppy disk drive (FDD)**.

**16. Give uses of internet?**

Ans: The main services used on internet include:

- i) Web-Browsing : This function allows user to view web pages using a web browser.
- ii) E-Mail : This allows people to send & receive text messages.
- iii) Internet has proved to be very beneficial to us some given below:
  - i) Faster communication
  - ii) E-Commerce
  - iii) Big source of information
  - iv) Source of entertainment
  - v) Access to social media
  - vi) Access to online service
- iv)

**17. Define Browser? Give names of common Browser.**

Ans: A browser is an application which provides a window to web. All browsers are designed to display pages of information. Most popular browser are: Internet-explorer, The world, Opera, Safari, Mozilla, Fire-Fox & Chrome.

**18. What is electronic mail? Give advantages.**

Ans: One of the most widely used applications is electronic mail which gives very fast delivery of messages to any enabled site on internet. Some advantages of e-mail are:

i)Fast-communication ii) Simple to use iii) Cost free service iv) More efficient.

**19. Give Hazards of ICT to society & environment?**

Ans: Today information & communication technology is important but blind faith is dangerous as follows:

- i) Over use of computer is dangerous for health.
- ii) Computers crime a real so very common these days.
  - i) Hacking is still another illegal activity which is committed on computer.
  - i) There is also word theft are used for steal money ,goods information etc.

**20. Differentiate between Byte & bit.**

Ans:- **A Bit** This is the most basic unit of digital measurement. A bit is one binary unit, meaning it can either have a value of "0" or "1". With computers, this can indicate "true" or "false".

**A Byte**

A byte is a collection of 8 bits.

**21. Why optical fibre is more useful tool for the communication process?**

Ans: In optical fibre data transferred in form of light waves. So, very large amount of data can be sent over long distances without any interruption on other hand. Copper cables are interrupted by large data, long distance and noise etc.

**22. Which is more reliable floppy disk or hard disk?**

Hard Disk	Floppy Disk
1. Hard disk can hold hundreds or thousands of megabytes of information.	1. Floppy disk can hold 3 megabytes.
2. It can store data for long time	2. It can store data for short time
3. Data can be transferred quickly.	3. Data cannot be transferred quickly.

**23. What is the difference between RAM and ROM memories?**

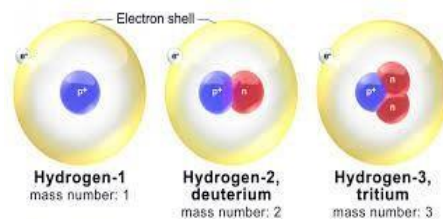
RAM	ROM
1. RAM stands for <i>Random Access Memory</i> .	1. Rom stands for <i>Read Only Memory</i> .
2. It is main memory of computer and vanishes when the computer is switched.	2. This memory is permanent and does not vanish when computer is switched off.
3. It is <i>primary memory</i> .	3. It is <i>secondary memory</i> .

## Ch#18(Radio Activity)

**Q1.What is common in isotopes of an element and what is different in them?**

**Ans:** Isotopes are members of a family of an element that all have the same number of protons but different numbers of neutrons. So protons are common in isotopes of an element and neutrons are different in isotopes of an element

Example :



**Q2.It happens that a nuclear radiation emits from an atom of element, it moves one step ahead in periodic table? Explain**

**Ans:** It happens that a nuclear radiation emits from an atom of element, if it moves one step ahead in periodic table then it is a beta decay. During alpha - decay, atomic number of the nucleus increases by 1 units. So, the nucleus shifts to the right in the periodic table. When beta particle emits, the atomic number increases by 1 and the mass number remains unchanged.

Example

**Q3.Why nuclei of atoms with atomic number greater than 82 emit radiations?**

**Ans:** The isotopes of elements with the atomic number (Z) greater than 82 are said to be radioisotope. The nucleus of an atom becomes radioactive when the number of neutrons exceeds the number of protons in the nucleus. They undergo radioactive decay and are also known as the 'Unstable isotopes'. The stability of the atoms of different elements is dependent on their nuclear binding energy. If the nuclear binding energy of an atom is more than the repulsive forces between the nucleons, it is stable; else unstable.

**Q4. - particle is emitted from the neutron of the nucleus. Write nuclear equation for this reaction.**

**Ans:** In  $\beta$  decay, the original 'parent' nuclide is converted to a daughter nuclide by the emission of a

$\beta$  particle. The atomic number increases by one, whereas no change in the mass number

Equation:



**Q5.Why range of - particle is greater than a- particle in air with same energy?**

**Ans:**  $\beta$  - particle has smaller mass and charge, so it interacts less with electrons of matter as compared to a particle. Therefore, its penetration power is more which increases its energy. As

**Q6. Why ionization power of  $\alpha$  – particle is greater than  $\beta$  – particle in solid with same energy?**

**Q.1 Ans:** Alpha particles are highly ionizing because of their double positive charge, large mass (compared to a beta particle) and because they are relatively slow. They can cause multiple ionizations within a very small distance.

**Q7. What fraction of a radioactive element will be left after 4 half-lives have elapsed?**

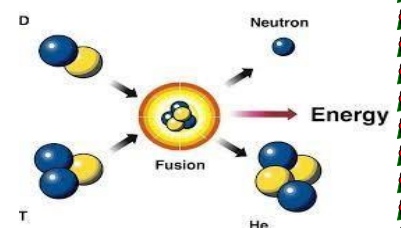
**Ans:** If original radioactive element is  $N_0$  then after  $n = 4$  half-lives the remaining fraction can be calculated by  $n$

**Q8. In a nuclear reaction denote?**

**What particle does W**

**Q9. Why is energy released when lighter nuclei fuse with heavier nuclei?**

**Ans:** In a fusion reaction, two light nuclei merge to form a single heavier nucleus. The process releases energy because the total mass of the resulting single nucleus is less than the mass of the two original nuclei. The leftover mass becomes energy.





**Q10.** When a nucleus  $^{232}\text{U}$  absorbs a slow neutron, it subsequently emits two  $\alpha$ -particles.  $_{92}\text{Pb}$  What is resulting element?

**Q11.** How long will a radioactive element take to decay completely?

A radioactive element will take infinite time to decay completely. For example: Let original quantity is 1000g So

So the life time of any radioactive element is unlimited and is difficult to measure.

## PUNJAB BOARD

### (ATOMIC AND NUCLEAR PHYSICS)

#### 1. Define Atom?

Ans: The smallest particle of matter that can not be divided further. The word atom is derived from "Greek" with "atomos" meaning indivisible.

#### 2. Give Parts of Atom?

Ans: Rutherford discovered that positive charge in an atom was concentrated in a small region called nucleus. The nucleus contains protons & neutrons which are called nucleons. Atom also contains electrons which revolve in circular orbits around nucleus.

#### 3. Define Nucleon?

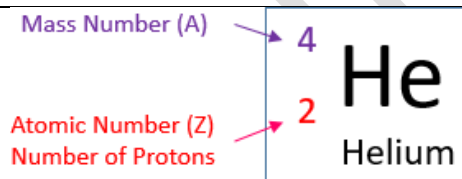
Ans: Positively charged nucleus at center of atom contains protons & neutrons which collectively are called nucleons.

#### 4. What is difference between atomic number and atomic mass number? Give a

Ans:A

Atomic number	Mass number
1. The number of protons inside the nucleus is called the atomic number.	1. The sum of protons and neutrons present inside the nucleus of an atom is called its atomic mass number.
2. Atomic number depends upon the number of protons or electron of an atom.	2. Atomic mass number depends upon the number of neutrons.
3. Atomic number is represented by <b>Z</b> .	3. It is represented by „A“ which is written as: $A = Z + N$
4. It is written at the bottom left side of the symbol of an element e.g	4. It is written at the top left side of the symbol of an element e.g

${}^4_2\text{He}$  here 2 is atomic Numb  
 Symbolic representation of an element is  ${}^A_Z\text{X}$



**5. What do you mean by the term radioactivity? Why some elements are radioactive but some are not?**

Ans: **Radioactivity:** "The spontaneous emission of radiations by unstable nuclei is called natural radioactivity."

**Radioactive elements:** "The elements which emit such radiations are called radioactive elements." e.g uranium, polonium and radium etc. the element whose atomic number is less than 82, does not emit such radiations because they are stable.

**6. How can you make radioactive elements artificially? Describe with a suitable example.**

Ans: The process in which bombardment of protons and neutrons on the stable nuclei makes it radioactive element which is also called artificial radioactivity. When an element whose atomic number is less than 82 is bombarded with protons or neutrons, it starts emitting radiations. e.g

**7. What are the three basic radioactive decay processes and how do they differ from each other?**

Ans: There are three basic radioactive decay processes and they differ by change in the atomic number and mass number.

### 1. Alpha ( $\alpha$ )-decay

#### General Equation:



It means in alpha decay, the proton number or atomic number  $Z$  of the parent nuclide reduces by 2 and its mass number or nucleon number  $A$  decreases by 4.

### 2. Beta ( $\beta$ )-decay

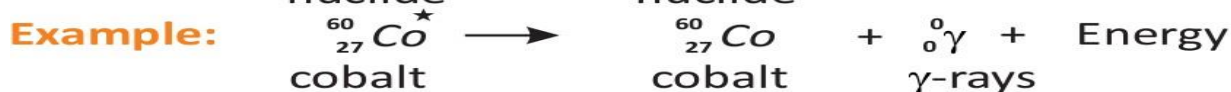
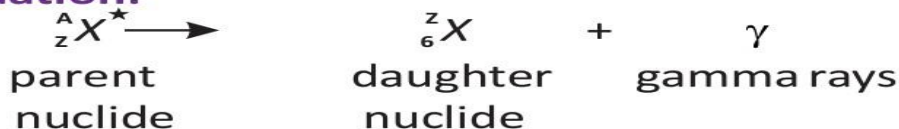
#### General Equation:



In beta ( $\beta$ )-decay, the parent nuclide has its proton number  $Z$  increased by 1 but its mass number or nucleon number  $A$  remains unchanged.

### 3. Gamma ( $\gamma$ )-decay

#### General Equation:



8. What do you mean by the term radioactivity? Why some elements are radioactive but some are not?

Ans: **Radioactivity:** "The spontaneous emission of radiations by unstable nuclei is called natural radioactivity."

**Radioactive elements:** "The elements which emit such radiations are called radioactive elements." e.g. uranium, polonium and radium etc. the element whose atomic number is less than 82, does not emit such radiations because they are stable.

9. How can you make radioactive elements artificially? Describe with a suitable example.

Ans: The process in which bombardment of protons and neutrons on the stable nuclei makes it radioactive element which is also called artificial radioactivity. When an

element whose atomic number is less than 82 is bombarded with protons or neutrons, it starts emitting radiations . e .g

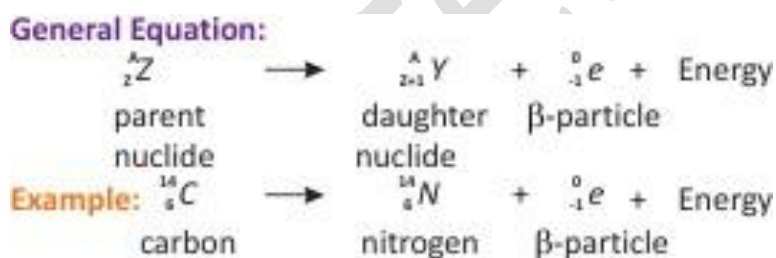
### 10. What do you understand by half-life of a radioactive element?

Ans: Half life: "The time during which half of the unstable radioactive nuclei disintegrate is called the half life of the sample of radioactive element."

The process of radioactivity is random and the rate of radioactive decay is proportional to the number of unstable radioactive nuclei decays in a certain time.

### 11. Is radioactivity a spontaneous process? Elaborate your answer with a simple experiment.

Ans: Yes, radioactivity is a spontaneous process because such elements having atomic number more than 82 are unstable. These elements emit radiations naturally. That's why radioactivity is a spontaneous process .In radioactive decay an unstable parent nuclide X changes into a daughter nuclides Y with the emission of alpha (  $\alpha$  ), beta (  $\beta$  ) and Gamma (  $\gamma$  ) particles.



### 12. What is meant by background radiations? Enlist some sources of background radiations.

Ans: **Background radiations:** "Radiations present in atmosphere due to different radioactive substances are called background radiations."

**Sources:** Everywhere in rocks, soil, water and air of our planet (Earth) there are traces of radioactive elements. They emit the radiation every time, this natural radioactivity is called the background radiation.

### 13. Describe two uses of radioisotopes in medicine, industry or research.

Ans: **In medicine:**

- Radio Iodine -131 is used in curing cancer of thyroid gland.
- P – 32 is used to diagnose the brain tumors.
- To locate the wear and tear of the moving parts of machinery.
- For the location of leaks in underground pipes.
- P – 32, to find how well the plants are absorbing fertilizer

### 14. What are two common radiation hazards? Briefly describe the precautions that are taken



Federal Board All Notes & New Books Download in pdf visit [www.ilmge.com](http://www.ilmge.com) against them.

Ans: **Radiation hazards:**

- i. Radiation burns, mainly due to beta and gamma radiations, which may cause redness and sores on the skin.
- ii. Sterility (i.e. inability to produce children)
- iii. Genetic mutations in both human and plants. Some children are born with serious deformities.

**Precautions to minimize radiation dangers:**

- i. The sources should only handled with tongs and forceps.
- ii. The user should use rubber gloves and hands should be washed carefully after the experiment.
- iii. All radioactive sources should be stored in thick lead containers.

**15. Nuclear fusion reaction is more reliable and sustainable source of energy than nuclear fission chain reaction. Justify this statement with argument.**

Ans: Nuclear fission is more reliable than nuclear fusion.

- i. Nuclear waste doesn't produce.
- ii. Small nuclei combine to form heavy and large nucleus with the evolution of large amount of heat.

**16. A nitrogen nuclide decay to become an oxygen nuclide by emitting an electron. Show this process with an equation.**

**17. Define the following terms.**

(a) Cosmic radiations (b) Secondary radiations (c) Tracers

(d) Carbon dating (e) Fission (f) Fusion Ans:-

**Cosmic radiations:-**

The Earth, and all living things on it also receive radiation from outer space.

This radiation is called cosmic radiation which primarily consists of protons, electrons, alpha particles and larger nuclei.

### Secondary radiations:-

The cosmic radiation interacts with atoms in the atmosphere to create a shower of secondary radiation, including X-rays, muons, protons, alpha particles, electrons, and neutrons.

### Tracers:-

Radioactive tracers are chemical compounds containing some quantity of radio isotope.

### Carbon dating:-

Carbon dating, or radiocarbon dating, is a method used to date materials that once exchanged carbon dioxide with the atmosphere. In other words, things that were living. By measuring the amount of carbon-14 left in the organism, it's possible to work out how old it is.

### Fission:-

Nuclear fission takes place when a heavy nucleus, such as U-235, splits, or fissions, into two smaller nuclei by absorbing a slow moving (low-energy) neutron.

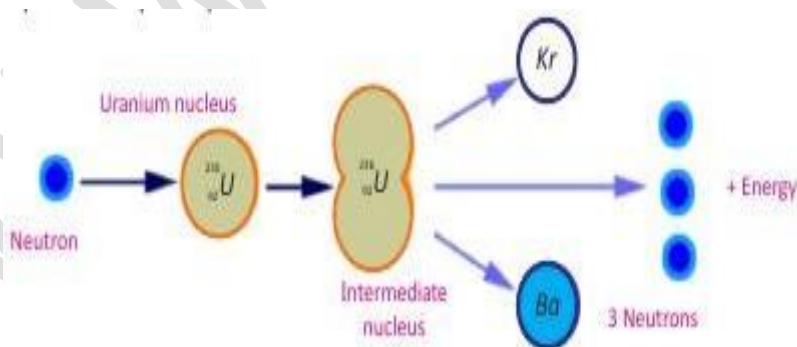
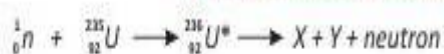


Fig. 18.11: Nuclear fission reaction



**Fusion:-** When two light nuclei combine to form a heavier nucleus, the process is called nuclear fusion.

**18. Is it possible for an element to have different types of atoms? Explain.**

Ans: Yes, it is possible as from the definition of isotopes the element could have same atomic number but different atomic mass. Hydrogen has three isotopes.



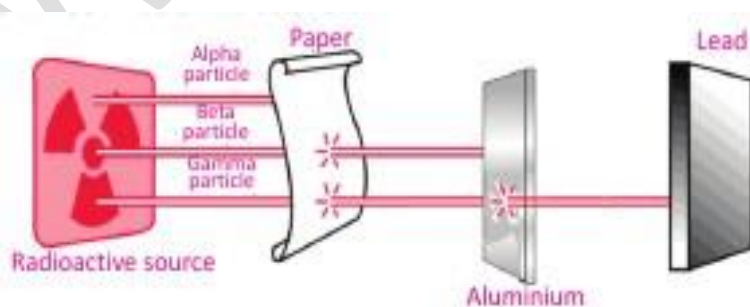
**19. What nuclear reaction would release more energy, the fission reaction or the fusion reaction? Explain.**

Ans: The fusion reaction releases a large amount of energy because two hydrogen atoms combine to form a single helium atom with 25.7 MeV of energy and neutrons.



**20. Which has more penetrating power, alpha particle or gamma ray photon?**

Ans: Gamma rays have more penetrating power, due to negligible ionization in materials, that is why beta particles have a range of several metres in air. On the other hand, alpha particles have high mass and more ionizing power, therefore, its range is only a few centimeters in air.



**21. What is the difference between natural and artificial radioactivity?**

Ans: **Natural radioactivity:** "The spontaneous emission of radiation by unstable nuclei (having atomic no. more than 82) is called natural radioactivity."

**Artificial radioactivity:** "The emission of radiations by stable nuclei (atomic no. 82 or less than 82) with bombardment of neutrons is called artificial radioactivity."

22. How long would you likely have to wait to watch any sample of radioactive atoms completely decay?

Ans: None of elements can ever decay completely. It depends upon the half life of radioactive element.

23. Which type of natural radioactivity leaves the number of protons and the number of neutrons in the nucleus unchanged?

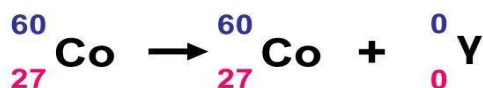
Ans: Gamma decay is a type of natural radioactivity which leaves the number of protons and the number neutrons in the nucleus unchanged.

### Gamma decay

Gamma decay is the emission of electromagnetic radiation from an unstable nucleus

Gamma radiation often occurs after a nucleus has emitted an alpha or beta particle.

Example: Cobalt 60



Cobalt 60 with excess ENERGY decays to

Cobalt 60 with less ENERGY plus gamma radiation.

24. How much of a 1g sample of pure radioactive matter would be left undecayed after four half lives?

25. Tritium,  ${}_1^3\text{H}$  is radioactive isotope of hydrogen. It decays by emitting an electron.

What is the daughter nucleus?

26. What information about the structure of the nitrogen atom can be obtained from its nuclide  ${}^{14}\text{N}$ ? In what way atom in  ${}^{14}\text{N}$  is different from the atom in  ${}^{16}\text{N}$ ?