SHORT ANSWER QUESTIONS

Q.1. Repulsion is the sure test of electrification. Explain?

Ans: Electrostatic attraction is observed between oppositely charged bodies and also between a charged (+ve or –ve) and an uncharged body. But, however, only two charges of the same kind (both +ve or both –ve) can repel each other. Hence, repulsion is the sure test of electrification.

Q.2. Will a solid metal sphere hold a large electric charge then a hollow sphere of the same diameter? Where the charge does resides in each case?

Ans: A solid metal sphere will hold the same amount of charge as is held by a hollow sphere of the same diameter. This is due to the fact that any excess electric charge resides only on the outer surface of a conductor.

Q.3. Explain why is it so much easier to remove an electron from an atom of large atomic mass than it is to remove a proton?

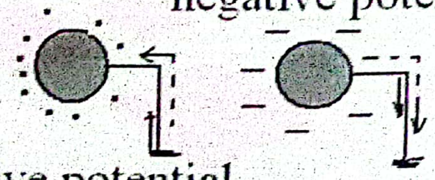
Ans: In an atom of large atomic mass, the number of both protons and electrons is large. This big atom contains many orbits (or shells). So it is easier to remove an electron from its outermost orbit. The heavy positive nucleus exerts weaker coulomb attraction force on it as compared to an electron in the innermost shell (e.g. K shell). However, protons are in the nucleuses which are held very strongly by strong nuclear forces.

Q.4. Why is it not correct to say that potential difference is the work done in movinga unit positive charge between the points concerned?

Ans: The potential difference is the increase in electric potential energy (or work) per unit charge. So, if a small positive charge (q_o) is moved against the electric field between the two points, then the work divided by the amount of charge (w/q_o) gives the p.d.

Q.5. Why is it logical say that the potential of an earth connected object is zero? What can be said about the charge on the earth?

Ans: Practically, the earth is taken to be at zero potential. If a charged body is connected to the earth by a conductor, electron flow takes place such that the charge of the body is neutralized. The earth is a



reason sly good conductor It is a huge neutral body. It is considered as an Infinite sink to which electrons can easily migrate Without changing its potential

Q.6. Can an electric potential exist at a point in a region where the field is zero? Can the potential be zero at a place where the electric field intensity is not zero? Give example to illustrate your reasoning.

Ans: Yes. Electric potential can exist where the electric intensity is zero. The electric charge resides on the outer surface of a hollow sphere. At all points inside the sphere, the electric field intensity is zero. Otherwise the field lines would link the charges of opposite sign in the sphere. Thus no work is done when a charge is moved between two points inside the sphere. Hence, potential is the same at all points throughout the sphere, and equals that at the surface, i.e. potential is constant inside and no the surface.

✓ Electric potential can be zero at a point where electric intensity is not zero. For example, consider a point in the middle of two equal and opposite charges. There the electric potential is

$$V = K\,q/r \quad + k \quad -q/r \;= 0$$

But the net electric intensity is toward the negative charge.

✓ Both the potential and intensity are zero for a point at infinity.

Q.7. An air capacitor is charged to a certain potential difference. It is then immersed in oil. What happens to its (a) charge (b) potential and (c) capacitance?

Ans: The dielectric constant ϵ_r of oil is greater than that of air. When an air capacitor is immersed in oil (after disconnecting the battery), then:

1. its change remain constant (since there is no path for charge transfer);
2. p.d. between the plates decreases (and also the electric field is weakened) by a factor $1/\epsilon_r$.
3. the capacitance increase (since $C= q / V$) by a factor ϵ_r.

Q.8. Two unlike capacitors of different potential and charges are joining in parallel. What happens to their potential difference? How are their charges distributed? Is the energy of the system affected?

Ans: When two unlike capacitors of different potentials and charges are joined in parallel, then:

1. The resultant p.d. will be less than the highest applied p.d. on one capacitor. This resultant p.d. will be the same for the two capacitors in parallel;

2. The charge is redistributed and the capacitor of higher capacitance will have more charge (since q = CV) ;
3. The energy of the system will decrease. The missing energy is used in heating the wires.

Q.9. Four similar capacitors are connected in series and joined to a 36 v battery. The mid point of the group is earthed. What is the potential of the terminal of the group?

Ans: If two similar capacitors are connected in series, joined to a 36v battery and if the mid point of the group is earthed, then there is no transfer of charge. This mid point is between two oppositely charged plates (of C_2 and C_3). Hence p.d. across the end of the group will remain the same (i.e. 36v).

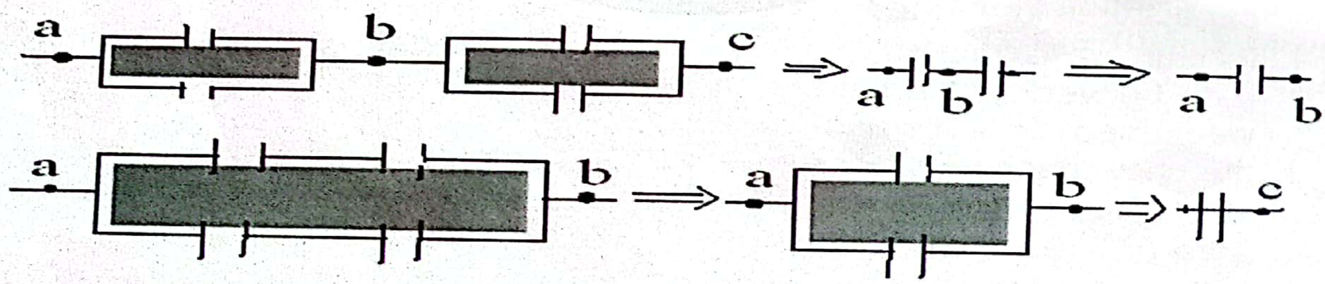
Q.10. A point charge is placed at the centre of a spherical Gaussian surface. Is the flux changed?

1. If the spherical Gaussian surface is replaced by a cube of the same volume.
2. If the sphere is replaced by a cube of 1/10 of this volume.
3. If the charge is moved from the centre in the sphere.
4. If the charge is moved outside the sphere.
5. If a second charge is placed inside the sphere.

Ans: 1. No 2. No 3. No 4. Yes 5. Yes

Q.11. Four capacitors each of 2uF connected in such a way that the total capacitance is also 2uF. Show what combination gives this value?

Ans: To get an equivalent capacitance of 2uF, the four capacitors, each of 2uF, can be combined in (i) two pairs of parallel combination or (ii) two pairs of series capacitors combined in parallel.



Q.12. A capacitor is charged by a battery. The battery is disconnected and a slab of some dielectric is slipped between the plates. Describe what happens to the charge, potential difference, capacitance and the stored energy?

Ans: When a capacitor is charged, battery is disconnected, and a slab of some dielectric (of relative permittivity ϵ_r) is inserted, then:

1. The charge remains constant (since there is no path for transfer of the charge);
2. The p.d. decreases (and also the electric field is weakened) by a factor ϵ_r ;
3. The capacitance increase (since C = q / v) by a factor
4. The energy stored will decrease by a factor 1 / ϵ_r (since , energy = ½ qV), which is used in polarizing the dielectric.

Q.13. Answer Question 12. if the battery is not disconnected?

Ans: When a capacitor is charged and the battery is not disconnected, and a slab of some dielectric (of relative permittivity ϵ_r) is increased, then;

1. The charge increase (additional charge is delivered by the battery).
2. The p.d. (and also the electric field) remains constant.
3. The capacitance increase (since C = q / v).
4. The energy stored will increase (since, energy ½ qV = ½ CV^2).

Q.14. A capacitor is connected across a battery. Why does each plate receive a charge of the same magnitude? Will it be true if the plates are of different sizes?

Ans: When a capacitor is connected to a battery, such that +ve, terminal 'b' is at higher potential than the plate B, then electrons are drawn toward, 'b' from B. however, the –ve terminal 'a' is at potential than the plate A, so the electrons are drawn the plate A from 'a'. Thus B is positively charged. The charging stops when V_{AB} = V. if the sizes of the plates are different, then the plate of larger area will receive more amount of charge.

Q.15. Write electric field statements analogous to the following in gravitationalfield. 1. Water flows from a higher level to a lower level; 2. Water always maintains its level; 3. The total mass is conserved; 4. When a body falls through a height 'h' it losses potential energy and gains kinetic energy?

Ans: The analogous statements are:

1. Electric charge flows from a higher potential to a lower potential.
2. Charge always maintains its potential.
3. The total charge is conserved.
4. When a charge body falls through a potential difference, it losses its electrical potential energy and gains kinetic energy.

Q.16. Is it true that "an alternating current can pass through a capacitor while a direct current". Explain?

Ans: A capacitor is said to 'block' direct current or voltage. That is, there is no current through a capacitor by a steady direct voltage. However, when the capacitor is connected across an a.c. supply, the capacitor (or plates) are continuously charged and discharged (during alternate quarter cycle), and charged the other way round by the alternating voltage. The current thus flows round the circuit. A capacitance that allows alternating current offers opposition (in ohms), called capacitive reactance (X-C).

Q.17. The unit of permittivity $C^2 N^{-1}$ is the same as Fm^{-1}. How?

Ans:

$$\frac{F}{M} = \frac{C/V}{m} = \frac{C}{V} \times \frac{1}{m} = \frac{C}{J/C} \times \frac{1}{m} = \frac{C^2}{J.m} = \frac{C^2}{N.m.m} = \frac{C^2}{N.m^2}$$

Q.18. What happens if a charge is moved in an electric field?

Ans: A charge is displaced in two ways:

1. Against the electric field (say from point A to B): then work is done on the charge. This increase electric potential energy thus Δ (P.E.) = $q\Delta V$.
2. in the direction of the electric field (from B to A): then p.e. decreases which appears as increase in K.E. thus Δ (K.E.) = $\frac{1}{2} mv^2$

$$\text{Since } \Delta \text{ P.E} = \Delta \text{ K.E}$$
$$q\Delta V = \tfrac{1}{2} mV^2$$

Q.19. What will be the flux through a closed surface which does not contain any charge?

Ans: As the surface encloses no charge, so the flux is zero.

From Gauses' Law: $\varnothing = q / \epsilon_o = 0 / \epsilon_o = 0$

Q.20. What is the flux, electric field intensity and potential inside a charged sphere?

Ans: Both the flux and the intensity are zero inside a charged sphere. The potential inside a charged sphere is the same as at its surface.

Q.21. An uncharged conducting spherical shell is placed in the field of a positive charge q. what will be the net flux through the shell? What is the unit of electric flux?

Ans: According to Guass' law, the net flux through the shell will be zero as then it contains no charge. The SI unit of electric flux is $N.\ m^2\ C^{-1}$.

Q.22. Is electrical p.d. same as electrical p.e?

Ans: No, electrical p.e. is the total work done in moving certain charge q from one point to another against electric intensity.

Thus, $U_B - U_A = W_{A \rightarrow B} = \Delta W$

Electric p.d. is the work done in moving a unit positive a unit positive charge from one point to another against electric intensity.

Since $$V_B - V_A = \Delta W / q_o = \Delta U / q_o$$

Now, a relation between them is: $\Delta U = q_o \Delta V$

Q.23. Why is water not used as a dielectric?

Ans: The near impossibly of removing all impurities dissolved in water makes it unsuitable in practice as a dielectric.

SHORT ANSWER QUESTIONS

Q.1. Electrons leave a dry cell and flow through a lamp back to the cell. Which terminal the positive or negative is the one from which electrons leave the cell? In which direction is the conventional current?

Ans: Electrons leave the negative terminal of the cell and move towards the positive terminal. However, as a convention, the conventional current is assumed to the consisted of positive electric charges moving from a positive terminal to the negative terminal change flowing through the area per unit time (1 = q/t).

Q.2. Both p.d. and e.m.f. are measured in volts. What is the difference between these concepts?

Ans: P.d. is the work done per unit charge across a resistor in a closed circuit. But e.m.f. the total p.d. across the external and internal resistance, it refers to a source of current and is greater than the potential drop in an external circuit. (e.m.f. = p.d. + internal resistance drop)

Q.3. Can you construct two wires of the same length, one of copper and one of iron, that would have the same resistance at the same temperature?

Ans: Yes, since resistibility is proportional to cross-sectional area. The resistively of iron is about 7 times higher than that of copper. Hence the iron wire must be 7 time thicker than a copper of the same length to have the same resistance at the same temperature.

Q.4. Why does the resistance of a conductor rise with the rise in temperature?

Ans: As the temperature of a conductor rises, the amplitude of the vibration of the atoms in the lattice increases. This, in turn increases the probity of their collision with free electron. This impedes the drift of the electron. Hence the resistance of the conductor increases.

Q.5. Why is heat produced in a conductor due to the flow of electric current?

Ans: As electric charge flows due to certain p.d. through a conductor, it suffers loss of electrical potential energy. The energy is delivered to the lattice atoms. This energy is utilized in increasing their vibration kinetic energy which appears as heat. Consequently, the temperature of the conductor rises.

Q.6. When a metallic object is heated both its dimensions and its resistively increase. Is the increase in resistively likely to be a consequence of the increase in length?

Ans: The receptivity is given by p = RA / L. the increase in receptivity of a conductor due to heat is a consequence of the increase in resistance, and not a consequence of the increase in length.

Q.7. It is sometimes said that an electrical appliance "uses up" electricity. What does such an appliance actually use in its operation?

Ans: An electrical appliance, in its operation, uses the kinetic energy carried by the moving electrons, and not their quantity of charge.

Q.8. Do bends in a wire affect its resistance?

Ans: No, bends in a wire do not affect its resistance. However, it depends upon length, cross sectional area, temperature and nature of the material.

Q.9. Resistances of 10Ω, 30Ω and 40Ω are connected in series. If the current in 10Ω resistance is 0.1A, what is the current through the other?

Ans: When resistors are connected in series, then the same current flows through each 0, them (as there is only one path). Hence the current in this case will be 0.1A through all the three resistors in series.

Q.10. The resistances of different values are connected in parallel. If the p.d. across one of them is 5V, what is the p.d. across the remaining nine resistors?

Ans: When resistors are connected in parallel, then the same p.d. exists across each of them as they all are connected to two common points. Hence the p.d. in this case will be 5V across all the nine resistors in parallel.

Q.11. For a given potential difference V, how will the heat developed in a resistor depend on its resistance R? will the heat be developed at a higher rate in a larger or smaller R.

Ans: The heat developed $H = V^2 / R \times t$.

For a constant p.d. the resistance R should be small to develop heat at a higher rate.

Q.12. Is there any electric field inside a conductor carrying an electric current? Explain motion of charges here?

Ans: When a p.d. is applied across a conductor by connecting it to a battery and electric held E is established inside a conductor (parallel to the conductor, directed form the positive toward the negative terminal). The field exist here because the battery keeps the charges moving and prevents them coming to equilibrium on the outer surface of the conductor (in contrast to the situation in electrostatic), where they would cause the net electric field on the interior to be zero.

Q.13. Can the terimal voltage of battery be zero?

Ans: When a battery is short circuited, the existence of negligibly small resistance in the circuit makes terminal voltage zero but current to a maximum value.

[Since $R = 0$, $V = 0$ and $I = E / r$]

Q.14. Why is internal resistance of a cell not constant?

Ans: The internal resistance of a cell depends upon the resistance of electrolyte, terminals and electrons (and also on their area and separation) of the cell. Due to chemical changes (e.g. absorption of hydrogen and sulphate ions) in the electrolyte during the process of discharging the resistance of the electrolyte increase. Thus the internal resistance of cell does not remain constant.

Q.15. What is resistance? What is its mechanical analogue?

Ans: Resistance is a property of a given conductor which limits the current flow. It is due to the collisions of the drifted electrons with the crystal lattice which causes frequent scattering of the electrons under an electric field.

This property is analogous to mechanical friction for moving bodies.

Q.16. Often, you might have noticed crows sitting safely on high tension wires. Why are they not electrocuted, even when sitting on a part of the wire where the insulation has worn off?

Ans: For electrocution, the current should pass through the bodies of crows. When a crow sits on a signal wire, a p.d. is not developed for the flow of current because his both claws are the same potential. Hence they are not electrocuted.

Q.17. Why is it dangerous to touch a live wire standing on the earth barefooted?

Ans: We may be electrocuted if one touches a live wire while standing on barefooted; because we provide lower potential of the earth throughout barefoot (conductor). [The effective resistance of the body is 50 $k\Omega/cm^3$ which reduces to 0.7 $k\Omega/cm^3$ when it is wet].

Q.18. A heavy duty battery of a truck maintains a current for 3.0A for 24 hours. How charge flows from the battery during this time.

Ans: The charge, $q = I \times t = 3 \times 24 \times 60 \times 60 = 2.6 \times 10^5C$.

Q.19. What a short circuit and open circuit mean to you?

Ans: A short circuit is a closed when no load is present i.e. external resistance (R) is zero. But an open circuit implies an infinite resistance (or gap) along its conduction path (i.e. wires).

Q.20. Is it possible to have a situation in which the terminal voltage will be greater than the e.m.f. of a battery?

Ans: In general, $V = E - Ir$. $V>E$ in the case when a battery is being charged. [$V = E + Ir$]

Q.21. Why is resistance of a conductor inversely proportional to the area of cross sectional a conductor?

Ans: The larger the area of cross section of a conductor, the wider path is provided by it for the flow of charges through it (R proportional 1/A). Hence, the resistance decreases.

SHORT ANSWER QUESTIONS

Q.1. What is flux density and how is it related to the number of lines of induction expressed in ewers?

Ans: Magnetic flux density B is the magnetic flux per unit area (B = Ø/A). The unit of flux density is Weber per m^2 (or tesla, T). Magnetic flux is the total number of magnetic lines of induction passing perpendicularly through on area (Ø = B perpendicularly A). Its SI unit is 'Weber' (1Wb = 1T. m^2). Hence magnetic flux density refers to the number of lines of induction (in Webbers) per square meter. It gases (G) = 10^4 T & 1T = $1NA^{-1}\ m^{-1}$.

Q.2. Charge particles fired in a vacuum tube hit a fluorescent screen. Will it be possible to know whether they are positive or negative?

Ans: Yes, the charge no particles in motion can be found by applying magnetic field perpendicular to the motion of the charges and by observing the deflection. A positive charge in an inward perpendicular magnetic field is deflected upward. In an electric field, a positive charge will be deflected towards the negative side (plate).

Q.3. Beams of electrons and protons are made to move with the same velocity at right angles to a uniform magnetic field of induction. Which of them will suffer a greater deflection? What will be the effect on the beam of electrons if their velocity is doubled?

Ans: The radius of the circular path of particle moving in a magnetic field is r = mv/Bq. Thus r proportional m. but deflection proportional = 1/m. thus electron, being lighter, wily be deflected more than the proton.
Since radius r proportional v. Hence if velocity is doubled, radius will also be doubled; but deflection is halved.

Q.4. A circular lop of wire hangs by a thread in a vertical plane. An electric current is maintained in the loop anti-clock wise on looking at the front face. To what direction will the front face or the coil turn in the earth's magnetic field?

Ans: Toward the geographic north pole.

Q.5. Imagine that the room in which you are seated is filled with a uniform magnetic field pointing vertically upward. A loop of wire, which is free to rotate about horizontal axis is its plane through its centre parallel to its length, has its plane horizontal. For what

direction of current in the loop, as viewed from above, will the loop be in a stable equilibrium with respect to forces and torque of magnetic origin?

Ans: Anti-clock wise.

Q.6. Two identical loops, one of copper and the other of aluminum, are similarly rotated in a magnetic field of induction. Explain the reason for their different behaviour. Is electric generator a 'generator of electricity'? Where is the electricity before it is generated? What do such machines generate?

Ans: Since the conductivities of copper and aluminum are different, they show different behaviour with the induced e.m.f. As the conductive of copper is higher than that of aluminum, so a copper loop will have greater induced current than an identical aluminum loop moving with the same speed in the same magnetic field.

An electric generator is not a generator of electricity (i.e. quantity of charge). Electricity is present in the conducting coil of the generator before it was driven in an electoral circuit.

A generator provides e.m.f. to drift the haphazardly moving electrons in the conducting coil. In fact, a generator converts mechanical energy into energy of moving charges.

Q.7. A loosely wound helical spring of a stiff wire is mounted vertically with the lower just touching mercury in a dish. When a current is started in the spring, it excretes a vibratory motion with its lower and jumping out and into mercury, explains the resistance for its behaviour?

Ans: When a current is passed through a helical spring, whose one end is just above a mercury pool, a magnetic field is produced. The current through all the loops is the same direction. This produces attraction between them. So its length decreases. The dipping and moves out of the mercury. Consequently, the circuit is broken. The helix, due to elasticity, regains its original length. The electrical contact is established again. The process is repeated. So the helix will vibrate up and down.

Q.8. What is the mechanism of transfer of energy between the primary an secondary windings of a transformer. A certain amount of power is to be transferred over a long distance. If the voltage is stopped up 10 times, how is the transmission line loss reduced?

Ans: Electromagnetic induction is the phenomenon responsible for the transfer of energy between the primary windings (one circuit) to the secondary windings by means of a changing magnetic field which links the two coils. The mutual induction transformed the voltage or e.m.f. of large or similar value due to different number of turns in the primary and secondary coil.

Suppose a power a lines has input power P. the same power can be carried at low current if voltage is made high. Input current, $I_1 = PV_1$. if voltage is stopped up 10 times i.e.
$V_2 = 10V_1$ then $I_2 = P/V_2 = P/10V_1$, Thus $I_2/I_1 = P/10V_1 \,/\, P/V_1 = 1/10$.
When the current is 10 times smaller, the power loss as heat in the wires (I^2R) is $(10)^2$ i.e. 100 times smaller.

Q.9. What is the difference between magnetic find a.c. generators? What is meant by the frequency of alternating current?

Ans: An alternating current generator that uses a permanent magnet to provide the magnetic flux rather than an electromagnet is called 'magnetic'. It is used in the system of petrol engines, motor bikes and motor boats, etc. The a.c. generator that employs electromagnets is called "alternate". It has rotating field magnet (called rotor) and stationary armature (called stator) or the other way round.
Alternating current (a.c.) is produced by a voltages source whose terminal polarity reverses with time. The number of cycles per second made by an a.c. is called its frequency (f).its unit is hertz (Hz). We have $f = 1/T$. an a.c. reverse its polarity 2f times per second. An a.c. with frequency of 50 Hz has a time period of $1/50 = 0.02$ second. This a.c. reaches at zero value every 0.01 second.

Q.10. In what direction are the magnetic field lines surrounding a straight wire carrying current that is flowing directly towards you?

Ans: Anti-clock wire (using the right hand rule)

Q.11. What kind of field or fields does or do surround a moving electric charge?

Ans: When an electric charge is in motion, it is surrounded by an electrostatic field as well as a magnetic field.

Q.12. Can an electron at rest be set in motion with a magnet?

Ans: No. when an electron is at rest, it has no magnetic field ($F = qvB = o$ if $v = o$). So, in the absence of any magnetic field of its own, it cannot interact with a magnet.

Q.13. A beam of electron is directed towards a horizontal wire in which the current flows from left or right. In what direction is the beam deflected?

Ans: If the beam is parallel to the wire, it will follow a spiral path; and if it is perpendicular to the wire, it will adopt a circular path.

Q.14. A charged particle is moving in a circle under the influence of a uniform magnetic field. If an electric field is turned on that point along the same direction as the magnetic field, what path will the charged particle take?

Ans: When a charged particle is moving in a circle under the influence of a uniform magnetic field; and if an electric field is applied along the same direction, it will exert lateral force on the charged particle. Consequently, the charged particle will move in a cyclic path in the form of spiral (called helix).

Q.15. A loop of wire is suspended between the poles of a magnet with its plane parallel to the pole faces. What happens if direct current is passed through the coil? What will happen if an alternating current is passed instead?

Ans: When d.c. passes through the loop such that its magnetic field is: (i) opposite direction of the field of the magnet, the coil will turn round through 180° and then will stay in equilibrium. (ii) Along the field of the magnet, the coil will stay in equilibrium. However, when an a.c. is passed through the loop, it will remain in its initial position (with slight vibration).

Q.16. A current carting wire is placed in a magnetic field. How must it be oriented so that the force acting on it is zero or is maximum?

Ans: Force will be zero if theta is equal to zero (parallel to B);
Force will be maximum if theta is equal to 90° (perpendicular to B).

Q.17. Why is the magnetic field strength greater inside a current carrying loop of wire?

Ans: In a loop of wire, the direction of current in the opposite sides of the loop is opposite to each other. This is analogous to two parallel conductors carrying current in opposite direction. The directions of both the magnetic fields are along the same direction in the loop. This increase the strength of the field.

Q.18. What exactly does transformer transform?

Ans: A transformer transforms the magnitude of alternating voltage and current.

Q.19. Can an efficient transformer step up energy? Explain.

Ans: Transformers cannot charge energy. In an ideal transformer, the power remains constant i.e. power input = power output ($V_P I_P = V_S I_S$). Thus it cannot step up energy.

Q.20. In what three ways can a voltage be induced in a wire?

Ans:

- By moving a wire in a magnetic field.
- By moving magnet near it;
- By changing current through a circuit near it.

Q.21. Does the voltage output of generator change it its speed of rotation is increased?

Ans: Yes, because induced e.m.f. = BNA omega sin (omega time). Thus, an e.m.f. increases if speed of rotation "Omega" is increased.

Q.22. When a beam of electrons is shot into a certain region of space, the electrons travel a straight line through the region. Can we conclude that in the region there is no electric field? No magnetic field?

Ans: There are two possibilities:

- No electric or magnetic field is present.
- The electric and magnetic field are at right angle to each other and their strengths are exerting equal but opposite forces on the electron beam.

Q.23. A copper ring is placed above a solenoid with an iron core to increase its field. When the current is turned on in the solenoid, the copper ring moves upward? Why?

Ans: When current in a solenoid (with an iron core) increase, an induced current is produced in a copper ring (held above it) in opposite direction. This is analogous to opposite currents in two parallel wires. Thus they develop similar poles and repel each other. Consequently, the ring moves up

Q.24. A very long copper pipe is held vertically. Describe the motion of a bar magnet dropped length wise down the pipe?

Ans: Suppose a bar magnet falls through a very long copper pipe (under gravity). When the magnet is well inside the pipe, the configuration of the magnetic field remains the same. So it will fall freely with acceleration of gravity only.

Q.25. A solenoid is viewed in such a way that the solenoid current appears clockwise to the viewer. What is the direction of the filed within the solenoid?

Ans: The end viewed will develop south polarity. So the direction of the magnetic field will be away from the viewer inside the solenoid.

Q.26. A hollow copper tube carries. Why is B = 0 inside the tube? Is B non-zero outside the tube?

Ans: The charges always reside or move on the outer of a conductor. Since inside the tube, current is zero, hence B = 0 (according to Ampere's law). The outer surface of the tube behaves like a set of parallel wires carrying current down their length. The magnetic field, outside the tube, exists; and its direction is given by the right hand grip rule.

Q.27. Can a current carrying coil be used as compass?

Ans: A current carrying coil behaves like a bar magnet (magnet dipole). Thus when it is suspended freely, it can be used as a compass.

Q.28. When a charged particle enters magnetic field, it is deflected by the magnetic force? Can the magnetic force do work on the moving charged particle

Ans: No. magnetic force can do no work on a moving charged particle, because it is always perpendicularly to the velocity of the particle.

Q.29. If both electric field (E) and magnetic field (B) act on a charged particle, what is the total force on it?

Ans: The total force is $F = qE + q\,(v \times B)$. This force is called the Lorenz force.

Q.30. Can an isolated magnetic pole (monopole) exist? What is the source of the magnetic fields?

Ans: No, magnetic monopoles cannot exist. The only known source of magnetic field are magnetic dipoles (current loops), even in magnetic materials.