# IMPORTANT 3 MARKS QUESTIONS

## ELECTROSTATICS

**1. State Coulomb's law in electrostatics.**

The force of attraction or repulsion between two point charges is directly proportional to the product of the charges and inversely proportional to the square of the distance between them.

$$F \sim \frac{q_1 q_2}{r^2}$$

**2. Define Coulomb on the basis of coulomb's law.**

One coulomb is defined as the quantity of charge, which when placed at a distance of 1 metre in air or vacuum from an equal and similar charge, experiences a repulsive force of $9 \times 10^9$N.

**3. Define electric dipole and electric dipole moment. Give its unit.**

i) Two equal and opposite charges separated by a very small distance constitute an electric dipole.

ii) The magnitude of the dipole moment is the product of the magnitude of the one of the charges and the distance between them. ( p = q x 2d )

iii) Unit : Cm

**4. State Gauss' law in electrostatics.**

The total flux of the electric field E over any closed surface is equal to $\frac{1}{\varepsilon_0}$ times the net charge enclosed by the surface.

$$(\text{¤} = \frac{q}{£_0})$$

**5. Why is it safer to be inside a car than standing under a tree during lightning?**

i) The metal body of the car provides electrostatic shielding, where the electric field is zero.

ii) During lightning the electric discharge passes through the body of the car.

**6. Define electric potential at a point.**

It is defined as the amount of work done in moving a unit positive charge from infinity to that point against the electric forces.

**7. What is equipotential surface?**

If all the points of a surface are at same electric potential, then the surface is called an equipotential surface.

**8. What is electrostatic shielding?**

i) It is the process of isolating a certain region of space from external field.

ii) It is based on the fact that electric field inside a conductor is zero.

**9. What is capacitor? Define capacitance of a capacitor.**

i) Capacitor is a charge storing device.

ii) Capacitance of a capacitor is defined as the ratio of charge given to the conductor to the potential developed in the conductor. (C = q/V )

**10. What is a polar molecule . Give any two examples.**

i) A polar molecule is one in which the centre of gravity of the positive charges is separated from the centre of gravity of negative charges by a finite distance.

ii) Examples : $N_2O$ , $H_2O$

**11. What is a non polar molecule? Give any two examples.**

i) A non polar molecule is one in which the centre of gravity of the positive charges coincides with the centre of gravity of negative charges by a finite distance.

ii) Examples : $N_2$ , $H_2$

**12. What is meant by electric polarisation?**

The alignment of the dipole moments of the permanent or induced dipoles in the direction of applied electric field is called polarisation or electric polarisation.

**13. Mention some applications of capacitors.**

i) They are used in the ignition system of automobile engines to eliminate sparking.

ii) They are used to reduce voltage fluctuations in power supplies and to increase the efficiency of power transmission.

iii) They are used to generate electromagnetic oscillations and in tuning the radio circuits.

**14. What is meant by action of points or corona discharge?**

i) The leakage of electric charges from the sharp points of the charged conductor.

ii) They are in used in electrostatic machines to collect charges and in lightning arresters.

**15. Define electric flux. Give its unit.**

i) The total number of electric lines of force, crossing through the given area. ($\phi = \oint \vec{E}.\vec{ds}$)

ii) Unit : $Nm^2C^{-1}$

## CURRENT ELECTRICITY

**16. Define drift velocity.**

The velocity with which free electrons get drifted towards the positive terminal, when an electric field is applied.

**17. Define mobility of electrons. Give its unit.**

i) The drift velocity acquired per unit electric field.

ii) Unit : $m^2V^{-1}s^{-1}$

**18. State ohm's law.**

At constant temperature the steady current flowing through the conductor is directly proportional to the potential difference between the two end of the conductor. ( V = IR )

**19. What is called superconductivity?**

The ability of certain metals, their compounds and alloys to conduct electricity with zero resistance at very low temperatures is called superconductivity.

**20. Define electrical resistivity.**

The resistance offered to current flow by a conductor of unit length having unit area of cross section.

**21. State kirchoff's laws.**

**First law:** The algebric sum of currents meeting at any junction is zero.

**Second law:** The algebric sum of the products of resistance and current in each part of any closed circuit is equal to the algebric sum of the emf's in the closed circuit.

**22. Define temperature coefficient of resistance.**

The ratio of increase in resistance per degree rise in temperature to its resistance at $0^0$C.

$$\left( \sim = \frac{R_t - R_0}{R_0 t} \right)$$

**23. State Faraday's law of electrolysis.**

**First law**: The mass of the substance liberated at an electrode is directly proportional to the charge passing through the electrolyte.

$$( m \sim q )$$

**Second law**: The mass of the substance liberated at an electrode by a given amount of charge is proportional to the chemical equivalent of the substance.

$$(m \sim E)$$

**24. Distinguish between electromotive force and potential difference.**

| | Emf | Potential difference |
|---|---|---|
| **1.** | The difference of potential between the two terminals of a cell in an open circuit | The difference in potentials between any two points in a closed circuit. |
| **2.** | It is independent of external resistance | It is proportional to the resistance between any two points. |
| | | |

**25. What are the applications of secondary cells?**

i) The secondary cells are rechargeable.
ii) They are used in automobiles like cars, two wheelers, trucks etc.
iii) They have very low internal resistance.

**26. What are the changes observed at transition temperature?**

i) The electrical resistivity drops to zero.
ii) The conductivity becomes infinity.
iii) The magnetic flux lines are excluded from the material.

## EFFECTS OF ELECTRIC CURRENT

**27. Define ampere.**

It is defined as the constant current which when flowing through two parallel infinitely long straight conductors of negligible cross section and placed in air or vacuum at a distance of 1m apart experience a force of $2 \times 10^{-7}$ newton per unit length of the conductor.

**28. Why nichrome is used as heating element?**

i) It has high specific resistance.
ii) It has high melting point.
iii) It is not easily oxidized.

**29. State tangent law.**

A magnetic needle suspended at a point where there are two crossed fields at right angles to each other will come to rest in the direction of resultant of the two fields.

$$B = B_h \tan^{-}$$

**30. What is Ampere's circuital law?**

The line integral $\oint \vec{B}.\vec{dl}$ for a closed curve is equal to $\mu_0$ times the net current $I_0$ through the area bounded by the curve.

$$\oint \vec{B}.\vec{dl} = \mu_0 I_0$$

**31. Define peltier coefficient and give its unit.**

i) The amount of heat energy absorbed or evolved at one of the junctions of a thermocouple when one ampere current flows for one second.
ii) Unit : volt

**32. What are the limitations of cyclotron?**

i) Maintaining a uniform magnetic field over a large area of Dees is difficult.
ii) At high velocities relativistic variation of mass of the particle upsets the resonance condition.
iii) At high frequencies relativistic variation of mass of the electron is appreciable and hence electrons cannot be accelerated by cyclotron.

**33. In a galvanometer increasing the current sensitivity does not necessarily increase the voltage sensitivity. Explain?**

When the number of turns is doubled, current sensitivity is also doubled. But increasing the number of turns correspondingly increases the resistance G. hence voltage sensitivity remains unchanged.

**34. What is neutral temperature of a thermocouple?**

Keeping the temperature of cold junction constant, the temperature of hot junction is gradually increased. The thermo emf rises to a maximum at a temperature called neutral temperature.

**35. State Fleming's left hand rule.**

i) The forefinger, the middle finger and the thumb of the left hand are stretched in mutually perpendicular directions.
ii) If the fore finger points in the direction of magnetic field, the middle finger points in the direction of the current, then the thumb points in the direction of the force on the conductor.

**36. State Biot – savart law.**

The magnetic induction dB at a point P due to the current element of length dl is,

i) Directly proportional to the current I

ii) Directly proportional to the length of the element dl

iii) Directly proportional to the sine of the angle between dl and the line joining element dl and the point P.

iv) Inversely proportional to the square of the distance of the point from the element.

$$dB \sim \frac{Idl\sin^{-}}{r^2}$$

**ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT**

**37. What is electromagnetic induction?**

The phenomenon of producing induced emf due to the changes in the magnetic flux linked with the closed circuit.

**38. State Lenz"s law.**

The induced current produced in a circuit always flows in such a direction that it opposes the change or cause that produces it.

**39. Define quality factor.**

The ratio of the voltage across a coil or capacitor to the applied voltage.

$$Q = \frac{voltage\ across\ L\ or\ C}{applied\ voltage}$$

**40. State Fleming's right hand rule.**

i) The forefinger, the middle finger and the thumb of the right hand are held in three mutually perpendicular directions.

ii) If the fore finger points along the direction of magnetic field, the thumb is along the direction motion of the conductor, then the middle finger points in the direction of the induced current.

**41. Define rms value of alternating current.**

It is defined as the value of steady current, which when passed through a resistor for a given time, will generate the same amount of heat as generated by an alternating current when passed through the same resistor for the same time.

**42. What are the methods of producing the induced emf?**

The induced emf can be produced by changing

i) The magnetic induction (B)

ii) Area enclosed by the coil (A) and

iii) The orientation of the coil ( θ ) with respect to the magnetic field.

$$e = -\frac{d¤}{dt} = -\frac{d}{dt}(NBA\cos^{-})$$

**43. Differentiate AF choke and RF choke.**

| | AF choke | RF choke |
|---|---|---|
| **1.** | AF chokes used in low frequency a.c. circuits. | RF choke used in high frequency a.c. circuits. |
| **2.** | It has an iron core | It has an air core |
| **3.** | It has high inductance | It has low inductance |
| | | |

**44. State faraday's law of electromagnetic induction.**

**First law :** whenever the amount of magnetic flux linked with a closed circuit changes, an emf is induced in the circuit. The induced emf lasts so long as the change in magnetic flux continues.

**Second law :** The magnitude of emf induced in a closed circuit is directly proportional to the rate of change of magnetic flux linked with the circuit.

## ELECTROMAGNETIC WAVES AND WAVE OPTICS

**45. What is tyndall scattering ?**

The scattering of light by the colloidal particles is called tyndall scattering.

**46. Define specific rotation.**

It is defined as the rotation produced by one decimeter length of the liquid column containing 1 gram of the active material in 1cc of the solution.

**47. What are Fraunhofer lines?**

If the solar spectrum is closely examined, it is found that it consists of large number of dark lines. These dark lines in the solar spectrum are called Fraunhofer lines.

$$S = \frac{-}{l.c}$$

**48. State Huygens's principle on wavefront.**

Huygens's principle states that,

(i) Every point on a given wave front may be considered as a source of secondary wavelets which spread out with the speed of light in that medium and

(ii) The new wavefront is the forward envelope of the secondary wavelets at that instant.

**49. State Brewster's law.**

The tangent of the polarising angle is numerically equal to the refractive index of the medium.

$$\tan i_p = \mu$$

**50. Define optic axis.**

Inside the crystal there is a particular direction in which both the rays travel with same velocity. This direction is called optic axis.

**51. List the uses of infra red rays.**

(i) Infrared lamps are used in physiotherapy.

(ii) Infrared photographs are used in weather forecasting.

(iii) As infrared radiations are not absorbed by air, thick fog, mist etc, they are used to take photograph of long distance objects.

**52. List the uses of ultra-violet rays.**

i) They are used to destroy the bacteria and for sterilizing surgical instruments.

ii) These radiations are used in detection of forged documents, finger prints in forensic laboratories.

iii) They are used to preserve the food items.

**53. Compare Fresnel and Fraunhofer diffraction.**

| | Fresnel | Fraunhofer |
|---|---|---|
| **1.** | The source and the screen are at finite distances from the obstacle producing diffraction. | The source and the screen are at infinite distances from the obstacle producing diffraction. |
| **2.** | The wave front undergoing diffraction is either spherical or cylindrical. | The wavefront undergoing diffraction is plane. |

**54. On what factors does the amount of optical rotation depend?**

The amount of optical rotation depends on :

(i) thickness of crystal
(ii) density of the crystal or concentration in the case of solutions.
(iii) wavelength of light used
(iv) the temperature of the solutions.

**55. Write the conditions for total internal reflection to takes place.**

(i) light must travelfrom a denser medium to a rarer medium and
(ii) the angle of incidence inside the denser medium must be greater than the critical angle. i.e i > C.

## ATOMIC PHYSICS

**56. State Mosley's law.**

The frequency of the spectral line in the characteristic X-ray spectrum is directly proportional to the square of the atomic number (Z) of the element

$$\neg \sim Z^2 \ (or) \ \sqrt{\neg} = a(Z-b)$$

**57. What are the two important facts established by laue experiment.**

i) X–rays are electromagnetic waves of extremely short wave length.
ii) The atoms in a crystal are arranged in a regular three dimensional lattice.

**58. Define ionisation potential.**

The ionisation potential is that accelerating potential which makes the impinging electron acquire sufficient energy to knock out an electron from the atom and thereby ionise the atom.

**59. What is hologram?**

i) A three dimensional image of an object can be formed by holography.
ii) In holography, both the phase and amplitude of the light waves are recorded on the film.

**60. What are the conditions to achieve laser action.**

(i) There must be an inverted population i.e. more atoms in the excited state than in the ground state.
(ii) The excited state must be a metastable state.
(iii) The emitted photons must stimulate further emission.

**61. Distinguish between hard and soft x rays.**

| | Soft x rays | Hard x rays |
|---|---|---|
| **1.** | X–rays having wavelength of 4Å or above | X–rays having low wavelength of the order of 1Å |
| **2.** | Have lesser frequency and hence lesser energy. | Have high frequency and hence high energy. |
| **3.** | Their penetrating power is low | Their penetrating power is high |

**62. What are the characteristics of laser?**

The laser beam

(i) is monochromatic.

(ii) is coherent, with the waves, all exactly in phase with one another,

(iii) does not diverge at all and

(iv) is extremely intense

**63. Write the applications of laser in medical field**

(i) It can be used in the treatment of kidney stone, tumour, in cutting and sealing the small blood vessels in brain surgery and retina detachment.

(ii) The laser beams are used in endoscopy.

(iii) It can also be used for the treatment of human and animal cancer.

**64. Write any three industrial applications of laser.**

(i) The laser beam is used to drill extremely fine holes in diamonds, hard sheets etc.,

(ii) They are also used for cutting thick sheets of hard metals and welding.

**65. Write the applications of Mosley's law.**

(i) Any discrepancy in the order of the elements in the periodic table can be removed by Moseley's law by arranging the elements according to the atomic numbers and not according to the atomic weights.

(ii) Moseley's law has led to the discovery of new elements like hafnium (72), technetium (43), rhenium (75) etc.

(iii) This law has been helpful in determining the atomic number of rare earths, thereby fixing their position in the periodic table.

## DUAL NATURE OF RADIATION AND MATTER AND RELATIVITY

**66. Write any three uses of photo electric cells.**

i) Photoelectric cells are used for automatic switching on and off the street lights.

ii) These cells are used in opening and closing of door automatically.

iii) Photoelectric cells are used in burglar alarm and fire alarm.

**67. What are the limitations of electron microscope.**

i) An electron microscope is operated only in high vacuum.

ii) This prohibits the use of the microscope to study living organisms which would evaporate and disintegrate under such conditions.

**68. State the postulates of special theory of relativity.**

(i) The laws of Physics are the same in all inertial frames of reference.

(ii) The velocity of light in free space is a constant in all the frames of reference.

**69. Mention the uses of electron microscope.**

(i) It is used in the industry, to study the structure of textile fibres, surface of metals, composition of paints etc.

(ii) In medicine and biology, it is used to study virus, and bacteria.

(iii) In Physics, it has been used in the investigation of atomic structure and structure of crystals in detail.

**70. What are inertial and non inertial frames?**

**Inertial frames:**

i) A frame of reference is said to be inertial, when the bodies in this frame obey Newton's law of inertia and other laws of Newtonian mechanics.

ii) In this frame, a body remains at rest or in continuous motion unless acted upon by an external force.

**Non Inertial frames:**

i) A frame of reference is said to be a non-inertial frame, when a body not acted upon by an external force, is accelerated.

ii) In this frame, Newton's laws are not valid.

**71. Define threshold frequency.**

Threshold frequency is defined as the minimum frequency of incident radiation below which the photoelectric emission is not possible completely, however high the intensity of incident radiation may be.

**72. Define stopping potential.**

The minimum negative (retarding) potential given to the anode for which the photo electric current becomes zero is called the cut-off or stopping potential.

**73. What is photoelectric effect?**

Photoelectric emission is the phenomena by which a good number of substances, chiefly metals, emit electrons under the influence of radiation such as γ rays, X-rays, ultraviolet and even visible light.

**74. Define frame of reference.**

A system of co-ordinate axes which defines the position of a particle in two or three dimensional space is called a frame of reference.

## NUCLEAR PHYSICS

**75. Define : curie**

Curie is defined as the quantity of a radioactive substance which gives $3.7 \times 10^{10}$ disintegrations per second (or) $3.7 \times 10^{10}$ becquerel.

**76. Write any three properties of neutron.**

(i) Neutrons are the constituent particles of all nuclei, except hydrogen.

(ii) Neutrons are neutral particles with no charge and mass slightly greater than that of protons

(iii) Neutrons are stable inside the nucleus. But outside the nucleus they are unstable.

**77. Define roentgen.**

One roentgen is defined as the quantity of radiation which produces $1.6 \times 10^{12}$ pairs of ions in 1 gram of air.

**78. What is α-decay?**

When a radioactive nucleus disintegrates by emitting an α-particle, the atomic number decreases by two and mass number decreases by four.

Example: $_{88}Ra^{226} \rightarrow {}_{86}Rn^{222} + {}_{2}He^{4}$

**79. Write the properties of nuclear force.**

(i) Nuclear force is charge independent. It is the same for all the three types of pairs of nucleons (n-n), (p-p) and (n-p).

(ii) Nuclear force is the strongest known force in nature.

(iii) Nuclear force is not a gravitational force. Nuclear force is about $10^{40}$ times stronger than gravitational force.

**80. What is pair production and annihilation of matter.**

The conversion of a photon into an electron–positron pair on its interaction with the strong electric field surrounding a nucleus is called pair production.

The converse of pair production in which an electron and positron combine to produce a photon is known as annihilation of matter.

**81. What is meant by breeder reactor?**

The process of producing more fissile material in a reactor in this manner than consumed during the operation of the reactor is called breeding. A fast reactor can be designed to serve as a good breeder reactor.

**82. What is mass defect?**

The difference in the total mass of the nucleons and the actual mass of the nucleus is known as the mass defect.

**83. What is binding energy?**

When the protons and neutrons combine to form a nucleus, the mass that disappears (mass defect, Δm) is converted into an equivalent amount of energy ($\Delta mc^2$). This energy is called binding energy of nucleus.

**84. State radio active law of disintegration.**

The rate of disintegration at any instant is directly proportional to the number of atoms of the element present at that instant. This is known as radioactive law of disintegration.

$$-\frac{dN}{dt} \sim N$$

**85. What is radioactivity?**

The phenomenon of spontaneous emission of highly penetrating radiations such as α, β and γ rays by heavy elements having atomic number greater than 82 is called radioactivity and the substances which emit these radiations are called radioactive elements.

**86. What are the uses of nuclear reactor?**

i) Nuclear reactors are mostly aimed at power production, because of the large amount of energy evolved with fission.

ii) Nuclear reactors are useful to produce radio-isotopes.

iii) Nuclear reactor acts as a source of neutrons, hence used in the scientific research.

**87. Write a short note on leptons.**

**i)** Leptons are lighter particles having mass equal to or less than about 207 times the mass of an electron except neutrino and antineutrino.

**ii)** This group contains particles such as electron, positron, neutrino, antineutrino, positive and negative muons.

**iii)** The electron and positron are the antiparticles. The neutrinos and antineutrinos are massless and chargeless particles.

**88. What is β−decay?**

When a radioactive nucleus disintegrates by emitting a β− particle, the atomic number increases by one and the mass number remains the same.

Example: $_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + {}_{-1}e^{0}$

## SEMICONDUCTOR DEVICES AND THEIR APPLICATIONS

**89. State de Morgan's theorem**

**First theorem**;

"The complement of a sum is equal to the product of the complements"

$$\overline{A+B} = \overline{A} \,.\, \overline{B}$$

**Second theorem:**

"The complement of a product is equal to the sum of the complements."

$$\overline{A.B} = \overline{A} + \overline{B}$$

**90. What is zener breakdown?**

i) When both sides of the PN junction are heavily doped, consequently the depletion layer is narrow.

ii) When a small reverse bias is applied, a very strong electric field is produced across the thin depletion layer.

iii) This field breaks the covalent bonds, extremely large number of electrons and holes are produced.

**91. What is rectification?**

The process in which alternating voltage or alternating current is converted into direct voltage or direct current is known as rectification. The device used for this process is called as rectifier.

**92. What is an intrinsic semiconductor?**

A semiconductor which is pure and contains no impurity is known as an intrinsic semiconductor.

Examples: pure germanium and silicon.

**93. What is an extrinsic semiconductor?**

An extrinsic semiconductor is one in which an impurity with a valency higher or lower than the valency of the pure semiconductor is added, so as to increase the electrical conductivity of the semiconductor.

**94. What is a light emitting diode? Give any one of its uses.**

i) A light emitting diode (LED) is a forward biased PN junction diode, which emits visible light when energized.

ii) LEDs are used for instrument displays, calculators and digital watches.

**95. What is meant by doping?**

The process of addition of a very small amount of impurity into an intrinsic semiconductor is called doping.

**96. Define bandwidth of an amplifier.**

Bandwidth is defined as the frequency interval between lower cut off and upper cut off frequencies.

**97. What is an integrated circuit?**

An integrated circuit (IC) consists of a single – crystal chip of silicon, containing both active (diodes and transistors) and passive (resistors, capacitors) elements and their interconnections

**98. What are universal gates? Why are they called so?**

i) NAND and NOR gates are called Universal gates

ii) Because they can perform all the three basic logic functions.

**99. What are the advantages of negative feedback?**

(i) Highly stabilised gain.

(ii) Reduction in the noise level.

(iii) Increased bandwidth

**100. What are the essentials of an LC oscillator?**

(i) Tank circuit

(ii) Amplifier

(iii) Feedback circuit

**101. Give the Barkhausen criteria for oscillation.**

(i) The loop gain $A\beta = 1$

(ii) The net phase shift round the loop is $0^0$ or integral multiples of 2® .

**102. Mention any three advantages of Intergrated circuit (IC).**

**i)** Extremely small in size

**ii)** Very small weight

**iii)** Reduced cost

**103. What is zener diode ?**

Zener diode is a reverse biased heavily doped semiconductor (silicon or germanium) PN junction diode, which is operated exclusively in the breakdown region.

**104. Give the important parameters of an operational amplifier.**

(i) very high input impedance
(ii) very high gain
(iii) very low output impedance

**105. What are the different methods of doping?**

(i) The impurity atoms are added to the semiconductor in its molten state.
(ii) The pure semiconductor is bombarded by ions of impurity atoms.
(iii) When the semiconductor crystal containing the impurity atoms is heated, the impurity atoms diffuse into the hot crystal.

**106. What is input impedance of a transistor ?**

The input impedance of the transistor is defined as the ratio of small change in base – emitter voltage to the corresponding change in base current at a given $V_{CE}$.

**107. What is output impedance of a transistor?**

The output impedance is defined as the ratio of variation in the collector emitter voltage to the corresponding variation in the collector current at a constant base current .

**108. Mention the uses of cathode ray oscilloscope.**

(i) It is used to measure a.c and d.c voltage.
(ii) It is used to study the waveforms of a.c voltages.
(iii) It is used to find the frequency of a.c voltage.
(iv) It is used to study the beating of heart in cardiology.

## COMMUNICATION SYSTEM

**109. Define modulation factor.**

It is defined as the ratio of the change of amplitude in carrier wave after modulation to the amplitude of the unmodulated carrier wave.

**110. What is meant by skip distance.**

In the skywave propagation, for a fixed frequency, the shortest distance between the point of transmission and the point of reception along the surface is known as the skip distance.

**111. What is fax ?**

i) Fax (or) Facsimile, is an electronic system for transmitting graphical information by wire or radio.

ii) It is used to send printed material by scanning and converting it into electronic signals.

**112. Mention the advantages of frequency modulation.**

i) It gives noiseless reception.

ii) The operating range is quite large.

iii) The efficiency of transmission is very high

**113. Mention the advantages of digital communication.**

(i) The transmission quality is high and almost independent of the distance between the terminals.

(ii) The capacity of the transmission system can be increased.

(iii) The newer types of transmission media such as light beams in optical fibers and wave guides operating in the microwave frequency extensively use digital communication.

**114. What are the limitations of amplitude modulation.**

i) Noisy reception

ii) Low efficiency

iii) Small operating range

**115. Mention any three advantages of fibre optic communication system.**

(i) Transmission loss is low.

(ii) Fiber is lighter and less bulky than equivalent copper cable.

(iii) More information can be carried by each fiber than by equivalent copper cables.

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**THANK YOU**

**BEST OF LUCK**

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