Physics (C)   **L.K.No. 1307**   **Paper Code No. 8475**

Paper II	(Objective Type)	Inter – A – 2022	(Group Ist)
Time :	20 Minutes	Inter (Part - II)	
Marks :	17	Session (2018 -20) to (2020 – 22)	BIAR-G1-22

Note : Four possible choices A , B , C ,D to each question are given. Which choice is correct fill that circle in front of that Question No. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

Q.No.1	
(1)	The heat produced by the passage of current through a resistor is : (A) I^2Rt (B) IR^2t (C) I^2R (D) IRt^2
(2)	A particle having a charge of **2e** falls through a potential difference of 3 . 0 Volts. The change in its K.E. is equal to : (A) 6 . 0 eV (B) 5 . 0 eV (C) 4 . 0 eV (D) 8 . 0 eV
(3)	Photocopier and Inkjet Printers are the applications of : (A) Electricity (B) Magnetism (C) Electrostatics (D) Electromagnetism
(4)	A Voltmeter is always connected in : (A) Series (B) Parallel (C) Place of Battery (D) All these
(5)	A device which converts Electrical Energy into Mechanical Energy is : (A) Transformer (B) D.C. Motor (C) A.C. Generator (D) D.C. Generator
(6)	If Magnetic Field is doubled , then the Magnetic Energy density becomes : (A) Two Times (B) Three Times (C) Half Time (D) Four Times
(7)	In Cathode Ray Oscilloscope, grid controls : (A) Temperature of Filament (B) Charge of Electrons (C) Number of Electrons (D) Energy of Electrons
(8)	Root Mean Square Value of Alternating Voltage with $V_o = 100$ V , is equal to : (A) 0 . 7 V (B) 7 V (C) 700 V (D) 70 V
(9)	In case of Silicon , the value of Potential Barrier is : (A) 0 . 6 V (B) 0 . 7 V (C) 0 . 1 V (D) 0 . 3 V
(10)	Example of a Ductile Material is : (A) Glass (B) Wood (C) Lead (D) Diamond
(11)	In RLC Series Circuit , the condition for resonance is (A) $X_L = X_C$ (B) $X_L > X_C$ (C) $X_L < X_C$ (D) $X_L = X_C + R$
(12)	In Full Wave Rectification, number of Diodes required are : (A) 3 (B) 5 (C) 1 (D) 4
(13)	Photons emitted in the inner Shell Transition are : (A) Continuous X - rays (B) Gamma Rays (C) Characteristic X - rays (D) Energetic X – rays
(14)	Absorbed Dose is defined as : (A) M x E (B) $\frac{M}{E}$ (C) $\frac{E}{M}$ (D) $\frac{E}{C}$
(15)	0 . 1 Kg mass will be equivalent to the energy (A) 5×10^8 Joules (B) 6×10^{19} Joules (C) 9×10^{15} Joules (D) 9×10^{19} Joules
(16)	Slow Neutrons can cause Fission in : (A) Uranium – 235 (B) Uranium – 238 (C) Plutonium – 239 (D) Thorium – 234
(17)	The Velocity at which relativistic length of a body reduces to half of its original length is : (A) $\frac{1}{2}C$ (B) $\frac{\sqrt{3}}{2}C$ (C) $\frac{3}{4}C$ (D) $\frac{1}{\sqrt{2}}C$

Note : It is compulsory to attempt any (8 – 8) Parts each from Q.No. 2 and Q.No.3 and attempt any (6) Parts from Q.No.4. Attempt any (3) Questions from Part – II .Write same Question No. and its Part No. as given in the Question Paper.

Make Diagram where necessary.		Part - I		22 x 2 = 44

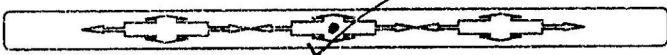| Q.No.2	(i)	Show that $E = -\dfrac{\Delta v}{\Delta r}$
	(ii)	Define Volt and Farad.
	(iii)	Describe the Force or Forces on a positive point charge when placed between Parallel Plates : (a) With similar and equal charges (b) With opposite and equal charges
	(iv)	If a point charge **q** of mass **m** is released in a non – uniform electric field with field lines pointing in the same direction , will it make a rectillinear motion ? Explain.
	(v)	What is meant by Zeroed of Ohm – Meter ?
	(vi)	Write down the main parts of C.R.O.
	(vii)	Why does the picture of a T.V. Screen become distorted when a magnet is brought near the screen?
	(viii)	How can you use a magnetic field to separate Isotopes of a Chemical Element ?
	(ix)	Differentiate between Baryons and Mesons.
	(x)	If $^{233}_{92}U$ decays twice by $\alpha - emission$, what is the resulting Isotope ?
	(xi)	What fraction of a Radioactive Sample Decays after two half lives have elapsed ?
	(xii)	If you swallowed an $\alpha - source$ and β source , which would be more dangerous to you ? Explain why ?
Q.No.3	(i)	Is the filament resistance lower or higher in a 500 W , 220 V light bulb than in a 100 W , 220 V bulb ?
	(ii)	Differentiate between Resistance and Resistivity.
	(iii)	Write two uses of Rheostat.
	(iv)	A choke coil placed in series with an electric lamp in A.C. Circuit causes the lamp to become dim , why is it so ?
	(v)	What do you mean by Root Mean Square Value of A.C. Voltage ?
	(vi)	How does doubling the frequency affect the reactance of : (a) An Inductor (b) A Capacitor
	(vii)	Distinguish between Intrinsic and Extrinsic Semi Conductors.
	(viii)	What are Super Conductors ? Give two uses of Super Conductors.
	(ix)	What is Crystal Lattice ? What is its significance ?
	(x)	How does the motion of an electron in a n – type substance differ from the motion of holes in a P – type substance ?
	(xi)	What are Sensors ? Give two examples.
	(xii)	What is the role of Potential Barrier in a Diode ? How is it formed in a Diode ?
Q.No.4	(i)	How would you position a flat loop of wire in a changing magnetic field so that there is no emf induced in the loop ?
	(ii)	Show that $emf\,(\mathcal{E})$ and $\dfrac{\Delta\emptyset}{\Delta t}$ have the same units .
	(iii)	When the primary of a transformer is connected to the A.C. mains, the current in it : (a) Is very small if the secondary circuit is open , but (b) Increases when the secondary circuit is closed. Explain these facts.
	(iv)	Describe practical use of Step Up Transformer.
	(v)	Compton's Shift $(\Delta\lambda)$ in a Wave is zero. Calculate the scattering angle of photon.
	(vi)	What happens to the total radiation from a black body if its absolute temperature is doubled ?
	(vii)	When light shines on a surface , is momentum transferred to the metal surface ? Explain.
	(viii)	Calculate the energy of electron in 4th orbit of Hydrogen Atom (in ev).
	(ix)	What are the advantages of Lasers over Ordinary Light ?

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		Part - II LHRGI-22	
Q.No.5	(a)	Define Electric Power. Derive an expression for power dissipated in a Resistor. $1 + 4 =$	(5)
	(b)	Find the Electric Field Strength required to hold a suspended particle of mass 1.0×10^{-6} Kg and charge $1.0 \, \mu C$ between two plates 10.0 cm apart.	(3)
Q.No.6	(a)	Explain how energy density is proportional to square of magnetic field in a current carrying inductor ?	(5)
	(b)	A coil of 0.1 m x 0.1 m and of 200 turns carrying a current of 1.0 mA is placed in a uniform magnetic field of 0.1 T. Calculate maximum torque that acts on the coil.	(3)
Q.No.7	(a)	Discuss the Parallel Resonance Circuit and also write down its properties.	(5)
	(b)	The current flowing into the base of a transistor is $100 \, \mu A$. Find its Collector Current I_C, its Emitter Current I_E and the ratio $\dfrac{I_C}{I_E}$.	(3)
Q.No.8	(a)	What was the de − Broglie's Hypothesis ? How this hypothesis was confirmed by Davisson and Germer ?	(5)
	(b)	A 1.25 cm Diameter Cylinder is subjected to a load of 2500 Kg. Calculate the stress on the bar in Mega Pascals.	(3)
Q.No.9	(a)	Explain Nuclear Fusion Reaction. What are Nuclear Reactions in the sun ?	(5)
	(b)	The Wavelength of K X − ray from copper is 1.377×10^{-10} m. What is the energy difference between two levels from which this transition results ?	(3)

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Q.No.1		
(1)	The absolute potential at a point distant 20 cm from a charge of $2\,\mu C$ is :	(A) 9×10^2 V (B) 9×10^3 V (C) 9×10^4 V (D) 9×10^5 V
(2)	$\frac{v}{m}$ is unit of :	(A) Magnetic Field Intensity (B) Electric Field Intensity (C) Electric Force (D) Gravitational Force
(3)	Three Resistors of Resistance $2\,\Omega$, $3\,\Omega$ and $6\,\Omega$ are connected in series. Their Equivalent Resistance is :	(A) $10\,\Omega$ (B) $11\,\Omega$ (C) $\frac{1}{10}\,\Omega$ (D) $\frac{1}{11}\,\Omega$
(4)	Which of the following Apparatus is used to measure Current, Voltage and Resistance :	(A) Ammeter (B) Voltmeter (C) Avometer (D) Galvanometer
(5)	To convert a Galvanometer into a Voltmeter, a high resistance connected in series with Galvanometer is given by :	(A) $R_h = \frac{V}{R_g} - I_g$ (B) $\frac{V}{R_g} + I_g = R_h$ (C) $R_h = \frac{V}{I_g} - R_g$ (D) $\frac{V}{I_g} + R_g = R_h$
(6)	The direction of the Induced Current is always so as to oppose the change which causes the current :	(A) Faraday's Law (B) Lenz's Law (C) Ohm's Law (D) Kirchhoff's Ist Rule
(7)	In D.C. Generator, Split Rings act as :	(A) Capacitor (B) Commutator (C) Inductor (D) Resistor
(8)	The basic circuit element in a D.C. Circuit which controlled the current and voltage is :	(A) Transformer (B) Resistor (C) Inductor (D) Transistor
(9)	The device which allows only the flow of D.C. is	(A) Generator (B) Transformer (C) Inductor (D) Capacitor
(10)	A Semi Conductor will behave as an Insulator at temperature :	(A) 0 K (B) 0°C (C) 10 K (D) 10°C
(11)	Which Diode works at Reverse Biasing :	(A) LED (B) Photo – Voltaic Cell (C) Photodiode (D) Silicon Diode
(12)	The Voltage Gain of an Amplifier having $r_{ie} = 1\,\Omega$, $\beta = 100$, $R_e = 20\,\Omega$ is :	(A) 1000 (B) 2000 (C) 500 (D) 5000
(13)	The Materialization of Energy take place in the process of :	(A) Photoelectric Effect (B) Compton Effect (C) Pair Production (D) Annihilation of Matter
(14)	The factor $\frac{h}{m_o c}$ has the unit of :	(A) Kilogram (B) Second (C) Meter (D) Joule
(15)	The equation of Rydberg's Constant is :	(A) $R_H = \frac{hc}{m_o}$ (B) $R_H = \frac{E_o}{hc}$ (C) $R_H = \frac{E_o}{\lambda}$ (D) $R_H = \frac{1}{hc}$
(16)	Binding Energy for deuteron nucleus is given by :	(A) 2.8 MeV (B) 2.23 MeV (C) 2.28 MeV (D) 2.25 MeV
(17)	Electrons are :	(A) Hadrons (B) Leptons (C) Quarks (D) Baryons

Note : It is compulsory to attempt any (8 – 8) Parts each from Q.No.2 and Q.No.3 and attempt any (6) Parts from Q.No.4. Attempt any (3) Questions from Part – II .Write same Question No. and its Part No. as given in the Question Paper.

Make Diagram where necessary.   **Part - I**   22 x 2 = 44

Q.No.2	(i)	How can you identify that which plate of a capacitor is positively charged ?
	(ii)	Electric Lines of Force never cross , why ?
	(iii)	Define Electron Volt . Give its numerical value in Joule.
	(iv)	Show that $1\dfrac{v}{m} = 1\dfrac{N}{C}$
	(v)	What is meant by Sensitivity of Galvanometer ? How can a Galvanometer be made more sensitive ?
	(vi)	What is the function of Grid in C.R.O. ?
	(vii)	How can you use a Magnetic Field to separate Isotopes of Chemical Element ?
	(viii)	Why does the picture of a T.V. Screen become distorted when a magnet is brought near the screen ?
	(ix)	Why are heavy nuclei unstable ?
	(x)	What do you understand by " Background Radiation " ? State two sources of this radiation.
	(xi)	What is the Mass Defect ?
	(xii)	Define the term Binding Energy.
Q.No.3	(i)	Is the filament resistance lower or higher in a 500 W , 220 V light bulb than in a 100 W , 220 V bulb ?
	(ii)	Distinguish between Resistivity and Conductivity.
	(iii)	What is the difference between emf and Terminal Potential Difference ?
	(iv)	What is meant by A.M. and F.M. ?
	(v)	When 10 V are applied to A.C. Circuit , the current flowing in it is 100 mA. Find its impedance.
	(vi)	What is Resonance Condition in R – L – C Series Circuit ?
	(vii)	Distinguish between Amorphous and Polymeric Solids.
	(viii)	Define Critical Temperature and Curie Temperature.
	(ix)	What is meant by Hysteresis Loss ? Explain.
	(x)	Why Ordinary Silicon Diodes do not emit light ?
	(xi)	What is the principle of Virtual Ground ? Apply it to find the gain of an inverting amplifier.
	(xii)	Write the basic characteristics of Operational Amplifier.
Q.No.4	(i)	A metal rod of 0.25 m is moving at a speed of $0.5\,ms^{-1}$ in a direction perpendicular to a 0.25 T magnetic field. Find emf produced in the rod.
	(ii)	When an Electric Motor such as an Electric Drill is being used , does it also act as a generator ? If so what is the consequence of this ?
	(iii)	A suspended magnet is oscillating freely in a horizontal plane. The oscillations are strongly damped when a metal plate is placed under the magnet . Explain why does this occur ?
	(iv)	Can a step – up transformer increase the power level ? Explain with equation.
	(v)	Rest and Motion are not absolute but relative. Explain this statement with example.
	(vi)	If an object moves with speed of light , then what will be its mass ? Explain with equation.
	(vii)	Which photon , red , green or blue carries the most : (a) Energy and (b) Momentum
	(viii)	Differentiate between Normal Population and Population Inversion of Atomic Energy. State with figures.
	(ix)	Can X – ray photon be reflected , refracted , diffracted and polarized just like any other wave ? Explain.

		Part - II	
Q.No.5	(a)	State Ohm's Law and derive its expression. Discuss why filament of a lighted bulb is non – Ohmic by graph. Also give any two examples of Non – Ohmic Devices.	(5)
	(b)	A particle carrying a charge of **2e** falls through a potential difference of **3 . 0 V**, calculate the energy acquired by it.	(3)
Q.No.6	(a)	Derive an expression for energy stored in an inductor.	(5)
	(b)	A coil of **0 . 1 m x 0 . 1 m** and of **200** turns carrying a current of **1 . 0 mA** is placed in a uniform magnetic field of **0 . 1 T**, calculate the maximum torque that acts on the coil.	(3)
Q.No.7	(a)	How can we use a Transistor as an Amplifier?	(5)
	(b)	A 10 mH , 20 Ω coil is connected across 240 V and $180/\pi$ Hz source. How much power does it dissipate?	(3)
Q.No.8	(a)	What is Energy Band Theory? Distinguish Conductors , Insulators and Semi Conductors on the basis of Band Theory.	(5)
	(b)	X – rays of Wavelength 22 pm are scattered from a Carbon Target. The scattered radiation being viewed at 85° to incident beam. What is Compton Shift?	(3)
Q.No.9	(a)	State Bohr's Model of the Hydrogen Atom. Give de – Broglie interpretation of Bohr's Orbit. Also derive a relation for emission spectrum of Hydrogen.	(5)
	(b)	If $^{233}_{92}U$ decays twice by α - emission, what is the resulting isotope?	(3)