ગુજરાત માધ્યમિક અને ઉચ્ચતર માધ્યમિક શિક્ષણ બોર્ડ, ગાંધીનગર

શૈક્ષણિક વર્ષ 2020-21 માટે

STD.-12 (SCIENCE STREAM) PHYSICS (054)

ANNUAL EXAM

SCHEME OF QUESTION PAPER

TIME : 3 Hours **Total Marks - 100**

NOTE : This blueprint is for the guidance of students, Teachers, Examiners, Moderators etc. The moderators, Teachers and experts in higher secondary of the respective subject may do essential changes keeping the objectives in mind.

Weightage as per objective :

Objectives	Knowledge (K)	Understanding (U)	Application (A)	Higher order thinking skill		Total Marks
Part-A Mark	06	15	16	13	-	50
Part-B Mark	06	15	16	08	05	50
Total Mark	**12**	**30**	**32**	**21**	**05**	**100**

Weightage as per type of question : PART-A

No.	Type of Question	No. of Question	Total Marks
1.	Multiple choice questions (MCQs)	50	50

Weightage as per type of question : PART-B

No.	Type of Question	No. of Question		Total Marks
		Without General Option	With General Option	Without Option
1.	Short Answer Type (SA-I)	08	12	16
2.	Short Answer Type (SA-II)	06	09	18
3.	Long Answer Type (LA)	04	06	16
	કુલ	**18**	**27**	**50**

Weightage as per Chapter :

No.	Name of Chapter	Chapterwise Weightage			Unitwise Weightage Without Option
		PART-A Mark	PART-B General Optional	PART-B General with Option	
1.	Electric charges and fields	5	2	5	Unit-1
2.	Electrostatic potential and capacitance	4	4	6	24 Mark
3.	Current Electricity	4	2	9	
4.	Moving charges and magnetism	3	2	5	
5.	Magnetism and matter	3	2	2	Unit-2
6.	Electromagnetic induction	3	2	5	26 Mark
7.	Alternating current	4	4	6	
8.	Electromagnetic waves	3	2	2	Unit-3
9.	Ray optics and optical instruments	5	7	7	25 Mark
10.	Wave optics	5	3	5	
11.	Dual nature of Radiation and matters	3	3	9	Unit-4
12.	Atoms	3	4	4	18 Mark
13.	Nuclei	3	2	5	
14.	Semiconductor Electronics : Materials, Devices and Simple circuits	2	5	5	Unit-5 7 Mark
	Total Marks	**50**	**50**	**75**	**100**

Note : Chapter weightage may be change for different question paper. But unit weightage can not be change.

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STD.-12 (SCIENCE STREAM) PHYSICS (054)
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TIME : 3 Hours **Total Marks - 100**

Que. No.	Question Detail	Marks
1 to 50	**PART - A** 50 Question of one Mark MCQ type	50
	PART - B	
1 to 12	**SECTION - A** • Short answer type 12 questions of 2 marks. • Write the answer of any 8 questions.	16
13 to 21	**SECTION - B** • Short answer type 9 questions of 3 marks. • Write the answer of any 6 questions.	18
22 to 27	**SECTION - C** • Long answer type 6 questions of 4 marks. • Write the answer of any 4 questions.	16
	Total Marks	**100**

Note :
- Time one hour for Part-A
- Time two hour for Part-B

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શૈક્ષણિક વર્ષ 2020-21 માટે

STD.-12 (SCIENCE STREAM) PHYSICS (054)

ANNUAL EXAM

SCHEME OF QUESTION PAPER

TIME : 3 Hours **Total Marks - 100**

Time :1 Hour **PART - A** **Marks : 50**

Instructions : (1) There are 50 objective type (M.C.Q.) questions in part-A and all questions are Compulsory.

(2) The questions are serially numbered from 1 to 50 and each carries 1 mark.

(3) Read each question carefully, select proper alternative and naswer in the O.M.R. Sheet.

(4) The OMR Sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (C) O , (D) O. Darken the circle (●) of the correct answer with ball-pen.

(5) Rough work is to be done in the Spare provided for this purpose in the Test Booklet only.

(6) Set No. of Question Paper Printed on the upper most right side of the question paper is to be written in the column provided in the OMR Sheet.

(7) Students may use a Simple Calculator and log-table, if necessary.

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(1) The dimension formula of Electric flux is.....

(A) $M^1L^1T^{-2}A^{-2}$ (B) $M^2L^1T^{-3}A^{-1}$ (C) $M^1L^1T^{-3}A^{-1}$ (D) $M^1L^3T^{-3}A^{-1}$

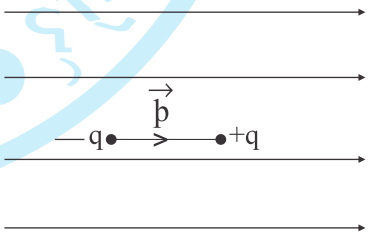
(2) Figure shows electric field lines in which an electric dipole $\vec{p}$ is placed as shown. Which of following statements is correct ?

(A) The dipole will not experience only force

(B) The dipole will not experience a firce towards right

(C) The dipole will experience a force towards left.

(D) The dipole will experience a force upwards.



(3) A system has two change $q_A = 2.5 \times 10^{-2}$ C and $q_B = 2.5 \times 10^{-7}$ C located at points A : (0, 0, -15) cm and B : (0, 0, 15) cm suggestively what is electric dipole wasent of the system is _____ cm.

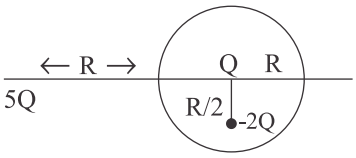
(A) 7.5×10^{-8} (B) 3.75×10^{-8}

(C) 1.25×10^{-8} (D) 2.5×10^{-8}

(4) A point change q is placed at the centre of a cube of side L. The electric flux emerging from the cube is _____.

(A) $q \backslash \in_0$ (B) Zero (C) $\frac{62\,L^2}{\in_0}$ (D) $\frac{q}{6L^2 \in_0}$

(5) Refer to the arrangement of charge in fig and a gaussian surface of radius R with Q at the Centre. Then



(A) Flux through the surface of sphere due to 5Q is $5Q/\in_0$

(B) Total flux through the surfare of the sphere is $-Q/\in_0$

(C) Field on the surface of the sphere is $\frac{-Q}{4\pi \in_0 R^2}$

(D) Field on the surface of sphera due to -2Q is same every where fog.

(6) The potential at a point due to a change of 4×10^{-7} C located 9 cm away is _____ V.

(A) 0.36×10^{-7} (B) 2.25×10^{4} (C) 4×10^{4} (D) 3.6×10^{-9}

(7) Equi potentials at a great distance from a collected of change. Whose total sum is not Zero are approrinsately.

(A) Spheres (B) Planes (C) Parabaloids (D) Ellipsoids

(8) For a separation between conductor of the order of 1 cm and electric field strength 3×10^{6} Vm^{-1} then potential difference is _____ V.

(A) 4×10^{3} (B) 3×10^{8} (C) 0 (D) 3×10^{4}

(9) If have energy of a 100 µF capacitor changes to 6 KV could all the used to lift a 50 Kg mass, than the greatest vertical heigh through which mass could be raised is _____m.

(A) 3.6 (B) 0.6 (C) 1.2 (D) 12

(10) The SI unit of the current density is _____

(A) CS^{-1} (B) Am^{-2} (C) Cm^{-2} (D) $A5^{1}$

(11) The storage battery of a car has an emf of 12 V. If the internal resistance of the battery is 0.3 Ω. What is the maximum current that can be drawn from the battery ?

(A) 30 A (B) 20 A (C) 40 A (D) 0.4 A

(12) Kir chhoff's junction rule is a reflection of

(A) Conservation of charge (B) Conservation of energy

(C) Conservation of current density vector (D) Conservation of momentum

(13) A metal rod length 10 cm and a rectangular cross - section of 1 cm x $\frac{1}{2}$ cm is connected to a battery across opposite faces. The resistance will be

(A) Maximum when the battery is connnected across 1 cm x $\frac{1}{2}$ cm faces.

(B) Maximum when the battery is connected accross 10 cm x 1 cm

(C) Maximum when the battery is connected accross 10 cm x $\frac{1}{2}$ cm faces.

(D) Same irrespective of the three faces.

(14) A permanent magnet in the shape of a thin cylinder of length 10 cm has $M=10^6$ A/m. Calculate the magnetization current Im_____.

(A) 10^2 A (B) 10^4 A (C) 10^5 A (D) 10^6 A

(15) The relation between $\in_0$ the permittivity of free space μ_0, the permeability of free space and C, the speed of light in vacuum is _____.

(A) C^2 (B) $\sqrt{C}$ (C) C^{-2} (D) C^1

(16) What is the radius of the path of an electron (mass 9×10^{-3} kg and charge 1.6×10^{-17} C) moving at a speed of 3×10^8 m/s in a magnetic field of 6×10^{-4} T perpendicular in it ?

(A) 1.28×10^{-2} *m* (B) 28.12 *cm* (C) 12.8×10^{-4} *m* (D) 2.812×10^{-3} *m*

(17) What is the magnitude of the equatorial fields due to a bar magnet of length 5 cm at a distance of 50 cm from its mid-point ? The magnetic moment of the bar magnet is 0. 40 Am^2.

(A) 1.6×10^{-7} T (B) 6.4×10^{-7} T (C) 3.2×10^{-7} T (D) Zero

(18) In the magnetic meridian of a certain place, the horizontal component of the earth's magnetic field is 0.40 G and the dip angle is 60^0. What is the magnetic field of the earth at this location ?

(A) 0.26 G (B) 0.52 G (C) 0.13 G (D) 0.114 G

(19) The dimensions of Permeability of free space is

(A) $MLT^{-2}A^{-2}$ (B) MT^2A^{-1} (C) $L^{-2}A$ (D) $L^{-1}A$

(20) A closed loop moves in a constant electric field between the plates of a large capacitor, a current induced in the loop.

(A) When it is wholly inside the region between the capacitor plates

(B) When it is partially outside the plates of the capacitor

(C) The electric field is normal to the plane of the loop

(D) Current can niot be induced by changing the electric flux.

(21) A 1 m long metal wire moving per pandicular with speed 5 ms^{-1} in a magnetic field of 0.1 T. Then the induce emf between two ends of wire is _____V.

(A) 1 (B) 2 (C) 0.5 (D) 0.25

(22) Which of the following is not the unit of inductance ?

(A) ΩS^{-1} (B) VSA^{-1} (C) $Wb\ A^{-1}$ (D) $WbC^{-1}S^{-1}$

(23) A light bulb is rated at 100W for a 220 V supply. The resistance of the bulb is _____.

(A) 022 (B) 484 (C) 022,000 (D) 311

(24) A capacitor of 250 µF is connected paralled with a inductor 0.16 mH. If the effective resistance is 20 Ω then resonant frequenct _____ Hz.

(A) 9×10^4 (B) 16×10^7 (C) 8×10^5 (D) 9×10^3

(25) The output of a step-down transformer is measured to be 24 V. When connected to a 12 W light bulb. The value of the peak current is _____A.

(A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{2}$ (C) 2 (D) $2\sqrt{2}$

(26) The mechanical quantities force constant K analogy to the electrical quantities_____.

(A) inductance l (B) Reciprocal capacitance (1/C)

(C) Charge q (D) Current I d^2/dt

(27) The ratio of contribution made by the electric field and magnetic field components to the intensity of an EM waves is _____

(A) C : 1 (B) C^2 : 1 (C) 1:1 (D) $\sqrt{2}9\ C$:1

(28) The electric field intensity by the radiations consing from 100W bulb at a 3m distance is E. The electric field intensity produced by the radiations coming from 50W bulb at the same distance is _____.

(A) E/2 (B) 2E (C) $E/\sqrt{2}$ (D) $\sqrt{2}$ E

(29) In a plane electro magetic wave, the electric field oscillates sinusoidally at a frequency of 1.0×10^{10} Hz and amplitude 48 V/m. What is the wavelength of the Wave ?

($C = 3 \times 18^8\ ms^{-1}$)

(A) 1.6×10^{-7} m (B) 1.24×10^{-6} m (C) 1.5×10^{-2} m (D) 24×10^{-3} m

(30) If lower half of a concave mirror is blackned then,

(A) image distance increases (B) image distance decreases

(C) image intensity increases (D) image intensity decreases

(31) When a light wave travels from air to glass,

(A) Its wavelength decreases (B) Its wavelength increases

(C) There is no change in wavelength (D) Its frequency decreases

(32) A fish which is at a depth of 12 cm in water ($\mu = 4/3$) is viewed by an observer on the bank of a lake. Its apparent depth as observed by the observer is ..... cm.

(A) 3 (B) 9 (C) 12 (D) 16

(33) In an equilateral prism if incident angel is 45^0 then minimum deviation is .....

(A) 30^0 (B) 60^0 (C) 45^0 (D) 90^0

(34) Astigmatism for a human eye can be removed by using .....

(A) Concave lens (B) Convex lens (C) Cylindrical lens (D) Prismatic lens

(35) In young's double slit experiment, if the width of 4th bright fringe is 2×10^{-2} cm, then the width of 6th bright tringe will be ..... cm

(A) 10^{-2} (B) 3×10^{-2} (C) 2×10^{-2} (D) 1.5×10^{-2}

(36) The bending of beam of light around corners of obstancles is called .....

(A) Reflection (B) Refraction (C) Diffraction (D) Interference

(37) Two slits are made 1 mm a part and the screen is placed 1 m away. What is the fringe separation when blue green light of wave length 500 m i s used ?

(A) 0.5 mm (B) 5 cm (C) 50 mm (D) 0.05 mm

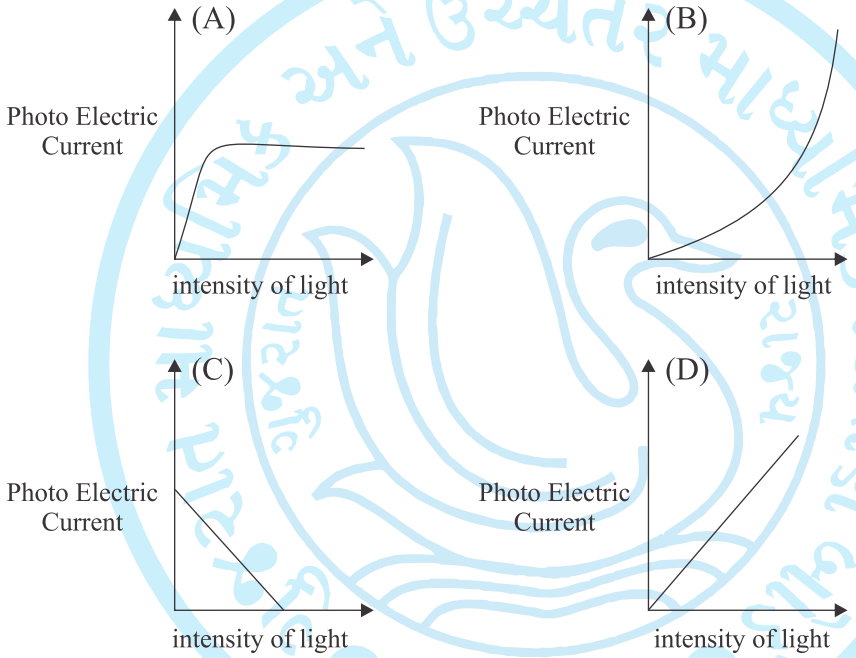
(38) For what distance is ray optics a good approximation when the aperture is 3mm wide and the wave length is 500 mm ?

(A) 12 m (B) 18 m (C) 10 m (D) 8 m

(39) The condition for obtaining secondary maxima in the diffraction pattern due to single slit is .....

(A) $a \sin\theta = n\lambda$ (B) $a \sin\theta = (2n-1)\lambda/2$ (C) $a \sin\theta = (2n-1)\lambda$ (D) $a \sin\theta = n\lambda/2$

(40) Variation of photo electric current with intensity of light is shown by graph .....



(41) An X-ray tube is operated at 50 KV, the maximum wavelength produced is ..... $\mathring{A}$

(A) 0.75 (B) 0.25 (C) 1 (D) 2.5

(42) De-Broglie wavelength associated with an electron, accelerating through a potential

(A) Gamma rays (B) X-rays (C) Ultra voilet (D) Visible region

(43) If E_P and E_K represent potential energy and kinetic energy respectively of an orbital electron, then according to bohr's theory,

(A) $E_k = -E_p/2$ (B) $E_k = E_p$ (C) $E_k = 2E_p$ (D) $E_k = -2E_p$

(44) Highest energy level of an electron correcponds to $n = \infty$ and it has an energy of .....eV

(A) Zero (B) ∞ (C) 13.6 (D) -13.6

(45) A hydrogen atom in its ground state absorbs 10.2 eV of energy. The orbital angular momentum is increased by ..... Js. ($h=6.6 \times 10^{-34}$ J.S.)

(A) 1.05×10^{-34} (B) 3.16×10^{-34} (C) 2.11×10^{-34} (D) 4.22×10^{-34}

(46) Heavy stable nucle have more neutrons thau protons this is because of .....

(A) Neutrons are heavier than proton

(B) Electrostatic force between protons are repulsive

(C) Neutrons decay into protons through β decay

(D) Nuclear forces between neutrons are weaker than that between protons.

(47) A radioactive substance decays to 1/16 th of its initial mass in 40 days. The half - life of the substance is ..... day.

(A) 20 (B) 10 (C) 5 (D) 2.5

(48) If the mass of Al nucles is 26.84 u and A = 27 then the radius is _____ m.

(A) 3.6×10^{-15} (B) 2.7×10^{-15} (C) 2.29×10^{-15} (D) 4.05×10^{-15}

(49) In ideal junction diode as shown in figure, the current howing through AB is ..... A

(A) 10^{-2} (B) 10^{-1} (C) 10^{-3} (D) 0

(50) The Boolean expression of NOR gate is .....

(A) $y=\overline{A}$ (B) $y=A+B$ (C) $y=A \cdot B$ (D) $y=\overline{A+B}$

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TIME : 2 Hours | **PART - B** | **Total Marks - 50**

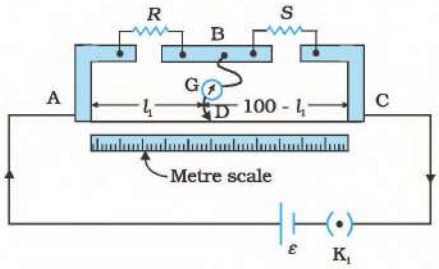
Instructions : (1) Write in a clear legible handwriting.
(2) There are THREE sections A, B and C in Part-B.
(3) All sections are compulsory and general options are given in each section.
(4) The number at the right side represent the marks of the section.
(5) Start new section on new page.
(6) Maintain sequence of questions in the section.
(7) Use of simple calculator and log table is allowed , if required.

Section - A

- **Answer any 8 questions from given following question no. 1 to 12. [16]**
  (Each carry 2 marks)

(1) Define electric line of force and give its two important properties.

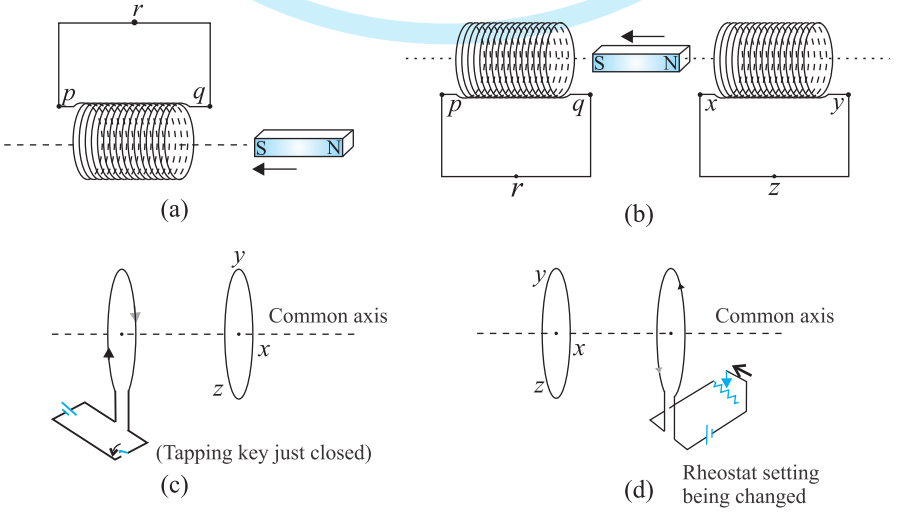
(2) In a meter bridge, the null point is found at a distance of 33.7 cm from A. If a resistance of 12 Ω is connected in parallel with S, the null point occurs at 51.9 cm. Determine the values of R and S.



(3) At room temperature (27° C) the resistance of a heating element is 100 Ω. What is the temperature of the element if the resistance is found to be 117 Ω. Given that the temperature coefficient of the material of the resistor is $1.70 \times 10^{-4} C^{-1}$

(4) A closely wound solenoid of 800 turns and area of cross section 2.5×10^{-4} m^2 carries a current of 3.0 A. is suspended through its centre alowing it to turn in a horizontal plane what is the magnetic moment of solenoid ?

(5) Predict the direction of induced current in the situations described by the following figs. (a) to (d).



(6) Give any four cheretristic of electro magnetic wawes.

(7) Explain the nuclear binding energy with example of $_{8}O^{16}$

(8) Write a shot not on P - type semi conductor.

(9) A system consisting of two charge 7 μc and -2 μc placed at (-9 cm, 0, 0) and (9 cm, 0, 0) respectively are placed in a rectorial electric fields $E = A(1/r^2)$, $A = 9 \times 10^5\ NC^{-1}\ m^2$, what would the electrostatic energy of the configuration be ?

(10) Two concentric, circular coil, one of small radius r_1 and the other of large radius r_2 such that $r_1 << r_2$ are placed, co-arially with centres coinciding. Obtain the mutual inductance of the arrangement.

(11) Show that the distance between two consecutive bright fingers $\beta = \frac{\lambda D}{d}$

(12) The work function of caesium is 2.14 eV. find the wavelength of the incident light if the photo current is brought to Zero by a stopping potential of 0.66 V.

Section - B

- **Asnwer any 6 questions from given following questions no. 13 to 21. [18] (Each carry 3 marks)**

(13) A room has AC run for 5 hours a day at a voltage of 220 V. The wiring of the room consists of Cu of 1 mm radius and a lenght of 10 m. Power consumption per day is 10 commercial units. What fraction of it goes in the joule heating in wires ? what would happen if the wiring is made of aluminium of the same dimensions ?

$[\ \rho_{cu} = 1.7 \times 10^{-8}\ \Omega\ m,\ \rho_{al} = 2.7 \times 10^{-8}\ \Omega\ m]$

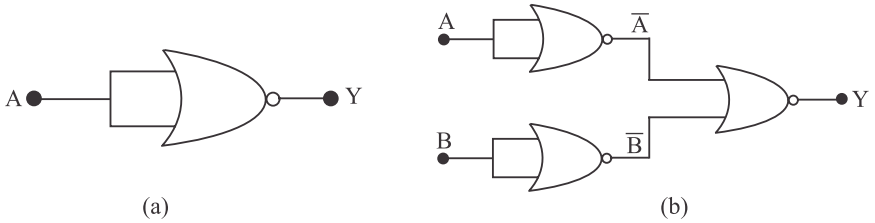
(14) For a circular coil of radius R and N turns carrying current I, Prove that the magnitude of the magnetic field at a point on its axis at a distance X from its centre is give by $B = \frac{\mu_0 I R^2 N}{2(x^2 + R^2)^{3/2}}$

(15) A small bulb is placed at the bottom of a tank containing water to a depth of 80 cm. What is the area of the surface of water through which light from the bulb can emerge out ? Refractive index of water is 1.33.

(16) In young's double slit experiment using monochromatic light of wavelenght λ , the intensity of light at a point on the screen where path difference is λ , is K units. What is the intensity of light at a point where path difference is λ /3 ?

(17) What is the de Broglie wavelength associated with (a) an electron moving with a speed of 5.4×10^6 m/s and (b) a ball of mass 150 g travelling at 30.0 m/s ?

(18) Write the truth table for the circuits given is Fig. consisting of NOR gates only. Identify the logic operations (OR, AND, NOT) performed by the two circuits.



(a) (b)

(19) Consider three charges q_1, q_2, q_3, each equal to q at the vertices of an equilateral triangle of side l. What is the force on a charge Q (with the same Sign as q) placed at the centroid of the triangle.

(20) A jet plane is travailing towards at a speed of 1800 km/h. What is the Voltage difference developed between the ends of the Wing having a span of 25 m, if the earth's magnetic field at the location has a magnitude of 5×10^{-4} T and the dip is 30.

(21) Derive the law of radioactive decay.

Section - C

- **Answer any 4 questions from given following question no. 22 to 27. [16] (Each Carry 4 marks)**

(22) A 600 þF Capacitor is charged by a 200 V Supply. It is then disconnected from the supply and is connected to another uncharged 600 þF capacitor. How much electrostatic energy is lost in the process ?

(23) A resister of 200 Ω and a capacitor of 15.0 μF are connected in series to a 220 V, 50 Hz ac source.

(a) Calculate the current in the circuit.

(b) Calculate the voltage (rms) across the resister and the capacitor. Is the algebraic sum of these voltages more than the source voltage ? If yes, resolve the paradox.

(24) Use the mirror equation to deduce that :

(a) An object placed between f and $2f$ of a concave mirror produces a real image beyond $2f$.

(b) A convex mirror always produces a virtual image independent of the location of the object.

(c) The virtual image produced by a convex mirror is always diminished in size and is located between the focus and the pole.

(25) A hydrogen atom initially in the ground level absorbs a photon, which excites it to the n = 4 level. Determine the wavelength and frequency of the photon.

(26) Explain drift of electrons and the origin of resistivity and derive $\sigma = \frac{ne^2}{m}\tau$

(27) The work function of caesium metal is 2.14 eV. When light of frequency 6×10^{14} Hz is incident on the metal surface, photo emission of electron occurs. What is the

(a) maximum kinefic energy of the emitted electrons

(b) stopping potential, and

(c) maximum speed of the emitted photo electrons.