ATUL VIDYALAYA
SECOND PRELIMINARY EXAMINATION-2012-13
PHYSICS
PAPER - 1 (THEORY)

STD- XII **MM-70**
DATE- 23-11-12 **TIME - 3HRS**
SESSION:I

(Candidates are allowed additional 15 minutes for only reading the paper. They must NOT start writing during this time. Answer* all *questions in Part I and six questions from Part* II, *choosing* two *questions from each of the Sections A, B and C).

Part I (Compulsory)

Question 1 **[20]**

Answer all questions briefly and to the point

(i) Write down the dimensional formula of permittivity.

(ii) Two straight conductors carrying currents i_1 & i_2 are oriented at right angles to each other. What will be the force between them if they are in the same plane?

(iii) Two equal & similar charges 0.03 m apart in air, repel each other with a force of 4.5 kgf. Find the charge in coulomb.

(iv) Vehicles carrying highly inflammable material have chains hanging to the ground. Explain why.

(v) Is there any place on the surface of the earth, where the horizontal component of earth's magnetic field is zero?

(vi) Calculate the capacity of earth in S.I. units. Radius of earth = 6400 km.

(vii) What is electrostatic shielding?

(viii) Light from a narrow slit passes through two parallel slits 0.4 mm apart & the fringes when measured at a distance of 40 cm from the slit are 0.5 mm apart. Find the wave length of light.

(ix) What is the wavelength of light of frequency 100 Hz?

(x) Radio telescopes are built on ground but X - ray astronomy is possible only from satellites orbiting the earth. Why?

(xi) Draw the symbol of the logic gate whose truth table is given below:

A	B	Y
0	0	1
1	0	0
0	1	0
1	1	0

(xii) What type of wave front is obtained by a refracted wave when a plane wave suffers refraction through a double convex lens.

(xiii) On moving the screen away from the source in Young's double slit experiment, does the fringe width increase or decrease?

(xiv) What is the power factor of the a.c. circuit while at resonance?

(xv) Can electrolysis proceed using an ac source?

(xvi) Radio waves diffract around buildings while light waves donot. Why?

(xvii) Show graphically the continuous spectrum of X - rays, labeling the axis & marking λ_m.

(xviii)What is meant by half life of radioactive substance?

(xix) What happens to the wavelength of a photon after it collides with an electron?

(xx) Draw the symbol for n-p-n transistor.

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Part-II

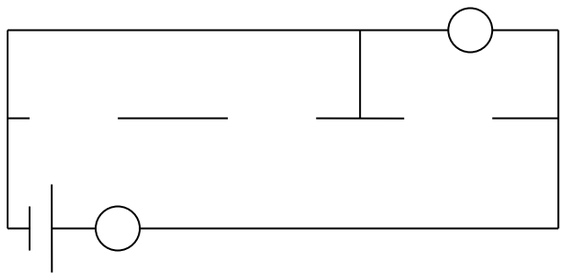
Answer six questions from this part, choosing two questions from each of the sections A, B and C.

Section A

(Answer any **two** questions)

Question 2

(a)Find the ammeter & voltmeter readings in the circuit shown below: [3]



(b) Obtain the expression for the magnetic field due to the circular coil carrying current at the centre of the coil. [3]

(c) The emf of a Cu-Fe thermocouple varies with the temperature of hot junction, cold junction at 0°C as E(□V) = 14□ – 0.02□^{2}. Determine neutral temperature. [3]

Question 3

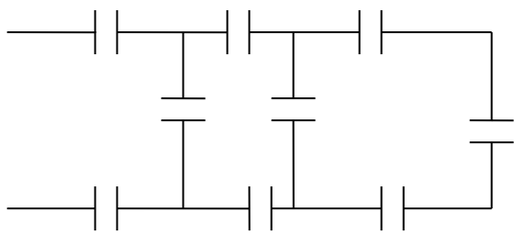
(a)Two spheres of charges +10 & +40 coulomb are placed 0.12 m apart. Find the position of the point between them where the intensity is zero. [3]

(b) Derive the expression for the electric intensity due to a charged infinitely long straight cylindrical rod. [3]

(c) An electric dipole consisting of charges 2 □C each separated by 10^{-2} m apart is placed in a uniform electric field of intensity 3 x 10^3 N/C. Calculate the torque acting upon it when it is inclined to the lines of force field at an angle of 45°. [3]

Question 4

(a)A number of capacitors are connected as shown in the figure. Calculate the equivalent capacity of the network between the points A & B when C_8 & C_9 have the capacity of 2□F whereas the rest have the capacity of 3□F. [4]



(b) Show that when two equal capacitors are connected in parallel, the system has four times the capacity as obtained when they are in series. [2]

(c) Obtain a relation connecting di-electric constant of the medium with its electric susceptibility. [3]

Section B

(Answer any **two** questions)

Question 5

(a) Dispersion is produced by a prism but not by a slab while both are made of glass. [2]

(b) Draw a ray diagram to show the working of a compound microscope. Define its magnifying power or angular magnification. [3]

(c) The focal length of an achromatic combination of two lenses separated by a distance is 0.05 m. If the focal length of one lens is 0.03 m, find the focal length of the other & the distance of separation.

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Question 6

(a) Two waves having intensities in the ratio of 9:1 produce interference. What will be the ratio of the intensity of maxima to that of minima? [3]

(b) How will you prove that when light gets reflected from a denser medium there is a phase difference of □ using Lloyd's mirror experiment. [3]

(c) A better diffraction pattern is obtained if the size of the slit is small. Why? [2]

Question 7

(a) An object is placed at a distance of 1.50 m from a screen & a convex lens placed in between produces an image magnified 4 times on the screen. Calculate the focal length & position of the lens. [3]

(b) Glass is transparent yet glass powder looks opaque. When water is poured over it, it again becomes transparent. Why? [2]

(c) Derive the lens maker's formula for a double convex lens. Mention the assumptions used. [3]

Section C

(Answer any **two** questions)

Question 8

(a) Draw a labeled circuit diagram of a simple oscillator using transistor (n-p-n or p-n-p) in common emitter configuration. On what factors does the frequency of the oscillator depend? [3]

(b) What is meant by doping a semiconductor? What are p-type semiconductors? Draw the circuit diagram of reverse biasing of a semiconductor diode. [3]

(c) What is rectification? Why is half-wave rectifier not preferred? [2]

Question 9

(a) What is photoelectric effect? With the help of a suitable graph show the variation of photo current with:
(i) The intensity of incident radiation (ii) Voltage applied between cathode & anode
(iii) Frequency of incident radiation. [4]

(b)Define stopping potential. How is it related to the kinetic energy of photo electrons? [2]

(c) Electrons move at right angles to a magnetic field of 0.03 T & enter it with a velocity of 2×10^7 m/s. Find the value of e/m, given radius of the circular path to be 0.01764 m. [2]

Question 10

(a) Draw energy band diagram of conductors, semiconductors and insulators. [3]

(b) Derive the expression for the velocity of electron in the 1st orbit of H_2 atom & for the radius in the ground state. [3]

(c) The half life period of a radioactive substance is 16 hrs. After how much time will 6.25% of the material remain undecayed? [2]

[PHYSICAL CONSTANTS]

Mass of electron (m_e)	$= 9 \times 10^{-31}$ kg
Charge of electron (e)	$= 1.6 \times 10^{-19}$ C
Plank's constant (h)	$= 6.6 \times 10^{-34}$ Js
Permittivity of free space (ε_o)	$= 8.85 \times 10^{12}$ F/m
$1 / 4\pi\varepsilon_o$	$= 9 \times 10^9$ N m^2 C^{-2}
Speed of light in vacuum (c)	$= 3 \times 10^8$ m/s

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