

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

STD- XII
DATE-
SESSION:I

MM-70
TIME - 3HRS

Attempt *all the* questions from Part-I & any two out of three questions from each of the sections of
Part –II. The intended marks for questions or parts of questions are given in brackets [].

Part-I (20 marks)

All the questions are compulsory.

Question 1

[20 x 1 =20]

(A) Choose the alternative A,B,C or D for each of the questions given below:

- i) If hot junction is made cold and the cold junction is made hot, the
(a) direction of e.m.f. does not change. (b) direction of current gets reversed.
(c) direction of current does not change. (d) current is not obtained.
- ii) Focal length of a thin lens made of the material of refractive index 1.5 is 10 cm. Its focal length, when it is kept in a medium of refractive index $\frac{4}{3}$ would be cm.
(a) 30 (b) 40 (c) 50 (d) 60
- iii). Which of the following phenomenon is not possible for sound ?
(a) interference (b) diffraction (c) polarization (d) reflection

iv) ${}_7\text{N}^{14} + {}_2\text{He}^4 \dots + \rightarrow {}_1\text{H}^1 + \text{Q}$

(a) ${}_0\text{n}^1$ (b) ${}_6\text{C}^{12}$ (c) ${}_8\text{O}^{17}$ (d) ${}_{-1}\text{e}^0$

v). The Boolean equation of NOT gate is

(a) $Y = A$ (b) $Y = A \cdot B$ (c) $Y = A$ (d) $Y = B$

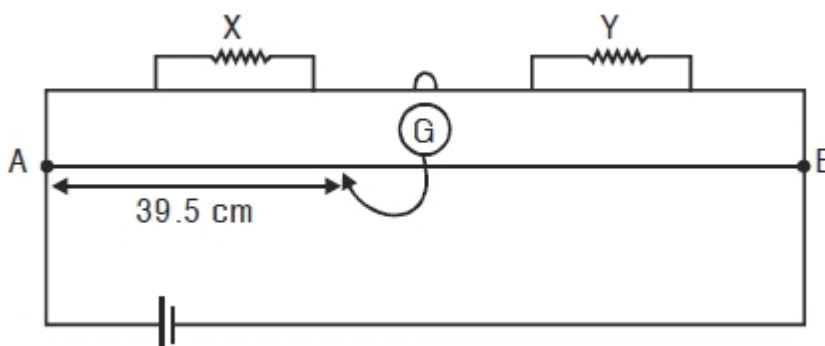
(B) Answer all questions briefly:

- a) Sketch graph to show how charge Q given to a capacitor of capacitance C varies with the potential difference.
- b) Write the unit of electric potential in terms of base unit of SI.
- c) A charge q is placed inside a closed surface . what is the electric flux through the surface?
- d) Write the relation between the efficiency of a cell and its internal resistance.
- e) Give any two factors on which thermo emf produced in a thermocouple depends?
- f) What is SI unit of magnetic dipole?
- g) What will be the path of charged particle moving along the direction of a uniform magnetic field ?
- h) Show that capacitor blocks d.c. but bypasses a.c.
- i) State the path difference between two waves for i) constructive and ii) destructive interference.
- j) What happens when a convex lens of refractive index 1.2 is immersed in a liquid of refractive index 1.3 ?
- k) A convex lens of focal length f is cut into two halves such that one surface is plane , what is the focal length of each half?
- l) Write de Broglie wave equation.
- m) What is the momentum of a photon of uv light of wavelength 332 nm?
- n) If the intensity of radiation in a photocell is increased how does the stopping potential vary?
- o) How is penetrating power of X ray is related to its wavelength?
- p) What is meant by activity of a radioactive material?

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Part-II (50 marks)**Section A**Answer any two out of three questions**Question 2**

a) In a meter bridge, the balance point is found to be 39.5 cm from end A. The known resistance Y is 12.5 . Determine unknown resistance X.

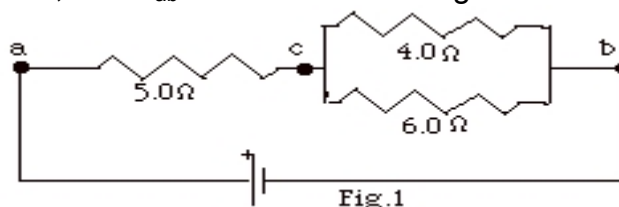


- b) Derive expression of electric field for an infinitely long distribution of charge using Gauss's law. [3]
 c) Derive an expression for the impedance of an a.c. circuit consisting of an inductor and a resistor.

Question 3

a) A rectangular loop of sides 25 cm and 10 cm carrying current of 15A is placed with its longer side parallel to a long straight conductor 2.0 cm apart carrying a current of 25A. What is the new force on the loop?

- b) In Fig. 1 below, find V_{ab} if the current through the 4.0-ohm resistor is 3.0 A. [3]



- c) Derive an expression for force acting on a current carrying conductor. [3]

Question 4

a) A circular coil having 20 turns, each of radius 8 cm, is rotating about its vertical diameter with an angular speed of 50 radian s⁻¹ in a uniform horizontal magnetic field of magnitude 30 mT. Obtain the maximum average and r. m. s. values of the emf induced in the coil.

If the coil forms a closed loop of resistance , how much power is dissipated as heat in it? [3]

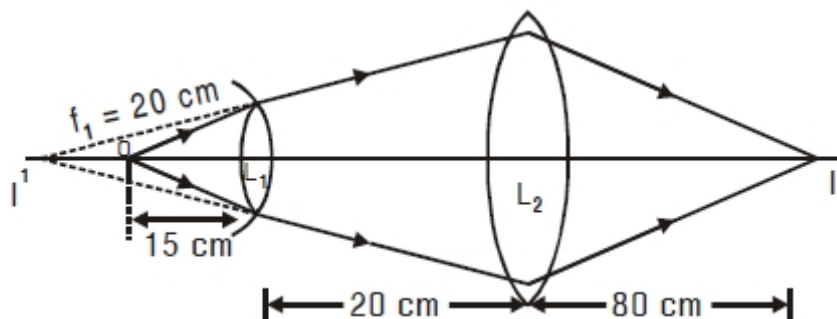
b) Explain diamagnetism and para magnetism on the basis of modern electron theory. [3]

c) Find the capacitance of a capacitor to run 30 V , 10 W lamp when connected in series to an alternating emf of 220 V and 50 Hz. [3]

Section BAnswer any two out of three questions**Question 5**

(a) Obtain the relation $e \sin \theta = \lambda$ for the first minimum of the diffraction pattern of a single slit of width e using light of wavelength λ . [3]

(b) In the following diagram, find the focal length of lens L₂



(c) A ray of light is refracted through a prism on the position of minimum deviation. The angle of prism is 60° and the refractive index of its material is 1.532. Find the angle of minimum deviation and the corresponding angles of incidence and refraction. [2]

Question 6

- a) What is Huygens principle? Use it to explain laws of refraction of light. [3]
- b) With help of ray diagram explain working of compound microscope. [3]
- c) What is Spherical aberration and how to reduce it. [2]

Question 7

- a) Discuss the case of refraction at spherical convex surface with real image using a suitable diagram. [3]
- b) What is polarization of light? Explain Brewster's law. [3]
- c) A convex lens of focal length 0.2 m and made of glass (RI = 1.5) is immersed in water (RI = 1.33) find the change in focal length. [2]

Section C

Answer any two out of three questions

Question 8

- a) explain transistors working as simple oscillator with circuit diagram and main parts working [4]
- b) In a hydrogen atom a transition takes places from n = 3 to n = 2 orbit. Calculate the wavelength of emitted photon. Will the photon be visible? To which spectral series will this photon belong? (R = 1.097 x 10⁷ m⁻¹) [4]

Question 9

- a) State the laws of radioactive decay . Deduce the relation $N = N_0 e^{-\lambda t}$. [4]
- b) The threshold wavelength of tungsten is 2,400 Å . When tungsten is illuminated with a light of wavelength 1600 Å, find i) work function ii) max kinetic energy of emitted electron iii) stopping potential. [4]

Question 10

- a) Describe J.J. Thompson method of to find e/m of electron, give necessary theory. [4]
- b) Derive Einstein's photoelectric equation and hence explain the laws of photoelectric effect . [4]

PHYSICAL CONSTANTS

Mass of electron (m _e)	= 9 x 10 ⁻³¹ kg
Charge of electron (e)	= 1.6 x 10 ⁻¹⁹ C
Plank's constant (h)	= 6.6 x 10 ⁻³⁴ Js
Permittivity of free space (ε ₀)	= 8.85 x 10 ¹² F/m
1 / 4πε ₀	= 9 x 10 ⁹ N m ² C ⁻²
Speed of light in vacuum (c)	= 3 x 10 ⁸ m/s
μ ₀ / 4π	= 10 ⁷ H/m.
1 eV	= 1.6 x 10 ⁻¹⁹ J

1 a.m.u. (u)

= 931 MeV