[REF]

Whitefield International College

Town Planning, Nayabazar, Kathmandu

ASSIGNMENT

Class: XII F.M-100
Subject: Physics P.M.-40

Group "A"

1. Answer in brief any four questions: (4×2=8)

a) What do you mean by resistivity of a material? What is its unit?
b) Can the terminal p.d. be greater than the emf of a cell?
c) You are asked to measure the emf of a cell, which instrument will you use to measure emf, voltmeter or a potentiometer and why?
d) Why is the cylindrical core of soft iron used in moving coil galvanometer?
e) A current carrying solenoid tends to contract. why?
f) A slowly –moving electron beam gradually diverges but a fast –moving beam gradually converges. Why?

2. Answer, in brief, any four questions: (4×2=8)

a) Electrical conductivity of a semiconductor increases with the rise in temperature. Explain
b) Can a hole be created in metal? Explain
c) What is PN junction? How is it formed?
d) Cathode ray cannot be regarded as electromagnetic waves. Why?
e) The electric discharge stops at low pressure. Why?
f) What are renewable and non-renewable resources? Give example

3. Attempt any one questions: (2)

a) Does the sound of an explosion travel faster than the sound produced by a humming bird?
b) Is the velocity of sound more in damped air or in dry air?

4. Attempt any one questions: (2)

a) How can a plane wavefront be converted into spherical and a spherical wavefront into a plane.
b) When light travels from denser to rare medium it loses speed. Does the reduction in speed imply a reduction in energy carried by the light wave?

Group "B"

5. Attempt any four questions: (3×4=12)

a) What do you mean by drift velocity of electrons? Derive the relation between current and drift velocity.
b) State and explain Kirchhoff's laws. Apply it to obtain the balance condition of whetstone's bridge.
c) Using Biot and Savart law, determine magnetic field strength due to infinitely long straight current carrying conductor.
d) using Ampere's circular law, derive an expression for the magnetic field at the centre of the current carrying solenoid.

6. Attempt any three questions: (3×4=12)

a) What are extrinsic semiconductors? Explain, how P-type and N-type semiconductors are formed?
b) Explain the characteristics of PN junction diode in the forward biased condition.
c) Describe with a neat diagram the phenomenon of electric discharge through gases.
d) State the principle of Millikan's oil drop experiment. Also describe in brief the construction and working of the apparatus used.

7. Attempt any one questions: (1×4=4)

a) Discuss Newton's formula for the velocity of sound in a gas with Laplace's correction.
b) What is the standing wave? Show the two waves of same amplitude and frequency traveling in opposite direction have an equation of the type $y = 2a\sin\omega t\cos kx$

8. Attempt any one questions: (1×4=4)

a) Using Huygens's principle verify the laws of reflection of light on the basis of wave nature.
b) Explain the Foucault's method for the velocity of light.

9. Attempt any two questions: (2×4=8)

a) The driver cell of a potentiometer has an emf 2V and negligible internal resistance. The potentiometer wire has a resistance of 3Ω. Calculate the resistance needed in series with the wire if a p.d. of 5mV is required across the whole wire.
b) A galvanometer has an internal resistance of 1Ω. It gives maximum deflection for a current of 50 mA. Show how this instrument can be converted into (i) an ammeter with a maximum range of 2A (ii) a voltmeter with a maximum range of 2V
c) The plane of a 5.0 cm×8.0 cm rectangular loop of wire is parallel to a 0.19 T magnetic field. The loop carries a current of 6.2 A. (a)what torque acts on the loop? (b) what is the magnetic moment of the loop. (c) what is the maximum torque that can e obtained with the same total length of wire carrying the same current in this magnetic field?

10. Attempt any two questions: (2×4=8)

a) An electron having 500eV of energy moves at right angles to a uniform magnetic field of flux density of $20\times10^{-1}T$. Find the radius of its circular orbit $\left(e/m = 1.76\times10^{11}C/kg\right).$

b) Calculate the vertical deflection of electron beam as it emerges from the plates of two plane metal plates of 5 cm long and 3 cm apart in a vacuum, one being vertically above. Electrons having a velocity $1.0\times10^{7}\ ms^{-1}$ are injected horizontally midway between the plates and in a direction parallel to the 5 cm edge. The upper plate is at of 400 V and lower is earthed $\left(e/m = 1.76\times10^{11}C/Kg\right).$

c) An oil drop of mass 3.25×10^{-15} falls vertically with the uniform velocity, through the air between vertical parallel plates which are 3.5 cm apart. Calculate the charge on the drop, when a potential of 1500 V is applied to the plates the drop moves towards the negatively charged plate, its path being inclined at 45^{0} to the vertical.

11. If a detonator is exploded on a rail way line, an observer standing on the rail 3 km away hears two reports. What is the time interval between the reporters? The young's modulus for steel is $2.0\times10^{11}\ Nm^{-2}$, density of steel $8\times10^{2}\ Kgm^{-2}$, density of air

$1.4 Kgm^{-2}$, ratio of molar heat capacities of air 1.4 and atmospheric pressure $10^5 Nm^{-2}$.

12. A beam of light after reflection at a plane mirror rotating 2000 times per minute passes to a distant reflector. It returns to the rotating mirror from which it is reflected to make an angle of 10 with the original direction. Assuming that the velocity of light is $3\times10^8 m/s$, Calculate the distance between the mirrors? (3)

"The End"

[REF]

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ASSIGNMENT

Class: XII F.M-100

Subject: Physics P.M.-40

Group -A

1. Answer in brief any **four** questions. (4×2=8)
   a) Current carrying solenoid tends to contract. Explain.
   b) The element of heater is very hot while the wire carrying current are cold. Why?
   c) What is superconductivity?
   d) What is the unit and dimensional equation of magnetic field?
   e) How is magnetic field made radial in a moving coil galvanometer?
   f) What is shunt?
2. Answer in brief any **four** questions. (4×2=8)
   a) Why does electric discharge not take place at very low pressure in gases?
   b) The value of $\frac{e}{m}$ is constant for cathode rays but not for positive rays. Why?
   c) Bigger drops cannot be used in milikan's oil drop experiment. Explain.
   d) Explain why the spectrum of hydrogen atom has many lines although a hydrogen atom contains only one electron?
   e) A proton and an electron has same de-Broglie wavelengths, which of the two has greater kinetic energy? Justify your answer.
   f) Can aluminum be used as a target in X-ray tube?
3. Answer in brief any **one** question. (1×2=2)
   a) Longitudinal waves are also called pressure waves. Why?
   b) Sound at a distance can be heard distinctly at night than in the day time. Why?
4. Answer in brief any **one** question. (1×2=2)
   a) When light enters from rarer to denser medium, its velocity changes. Does it implies change in energy? .
   b) State Huygen's principle.

Group-B

5. Answer any **three** questions. (3×4=12)
   a) State and verify ohm's law in electricity
   b) State Amper's law using the law find the magnetic field due to solenoid.
   c) Find an expression for the force per unit length between two long parallel conductors carrying current in same direction.
   d) State Biot and Savart law. Use it to find the magnetic field at the center of circular coil.
6. Answer any **three** questions. (3×4=12)
   a) Describe with necessary theory of Millikan's oil drop experiment to determine the value of the charge associated with an electron.
   b) What are Bohr's postulate? Derive an expression for the total energy of electron in n^{th} orbit of hydrogen atom.
   c) What is laser? Describe the construction and working of a He-Ne laser.
   d) What is stopping potential? Explain the Einstein's photoelectric equation.
7. Answer any **one** question. (1×4=4)
   a) Describe the Newton's formula for velocity of sound in air with Laplace's correction.
   b) Use the principle of super position of waves to find the position of displacement of nodes and antinodes in a standing wave.
8. Answer any **one** question. (1×4=4)
   a) Using wave theory, verify the laws of reflection of light.
   b) By using Michelson's method calculate the velocity of light.

Group-C

9. Answer any **two** numerical problems. (2×4=8)
   a) A straight conductor of mass 50gm and length 0.5m is placed in uniform horizontal magnetic field of 0.2T perpendicularly. Calculate the current if the force just balances its weight.
   b) A wire carrying current of 10A and 2m in length is placed in a field of flux density 0.34T. What is the force on the wire if it is placed at 60^0 to the field?
   c) A slab of copper 2mm thick and 1.5cm wide is placed in a uniform magnetic field of flux density 0.4T so that maximum flux pass through the slab. When a current of 75A flows through it, a p.d of 0.81μv is developed between the edges of slab. Find the concentration of mobile electron in copper. $1.6\times10^{19}C$
10. Attempt any **two** numerical questions. (2×4=8)
    a) Find the radius of first Bohr orbit in hydrogen atom. Also calculate the velocity of the electron in this orbit. (E_0=8.85×$10^{-12}C^2N^{-1}M^{-2}$, h=6.62×10^{-34} JS, m=9.1×10^{-31}kg).
    b) A beam of protons is accelerated from rest through a potential difference of 2000V and then enters a uniform magnetic field which is perpendicular to the direction of the proton beam. If the flux density is 0.2T. Calculate the radius of the path which the beam describes. (proton mass = $1.7\times10^{-27}kg$ kg, electronic charge = $1.6\times10^{19}C$
    c) An x-ray tube, operated at a dc potential difference of 10KV produces heat at the target at the rate of 720w. Assuming 0.5% of the energy of incident electrons is converted into x-radiation, calculate the tube current and velocity of the incident electrons. $\left(e/m=1.8\times10^{11}Ckg^{-1}\right)$.
11. Calculate the velocity of sound in air at 27^0C, (density of air at STP=1.29kg/m^3,C_p=1.02J/KgK C_v=0.72J/KgK) (4)
12. A beam of light after reflection at a plane mirror rotating 2000 times per minute passes to a distant reflector. It returns to the rotating mirror from which it is reflected to make an angle of 1^0 with the original direction. Assuming that the velocity of light is $3\times10^8 m/s$, Calculate the distance between the mirrors? (3)

"The End"

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Town Planning, Nayabazar, Kathmandu

ASSIGNMENT

Class: XII F.M-100

Subject: Physics P.M.-40

Group -A

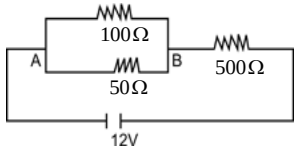
1. Answer in brief any **four** questions. (4×2=8)
   a) Is the emf of a cell always greater than its terminal p.d?
   b) How can a galvanometer be converted into voltmeter? Explain.
   c) Why do electrons acquire a steady drift velocity?
   d) Why is the cylindrical core of soft iron used in moving coil galvanometer?
   e) An electron is not deflected in passing through a certain region. Can we sure that there is no magnetic field in the region? Explain
   f) State Ampere's theorem.
2. Answer in brief any **four** questions. (4×2=8)
   a) The value of e/m is constant for cathode rays but nor for positive rays. Why?
   b) Explain why electric discharge through a gas takes place at low pressure.
   c) What are work function & threshold frequency in photo-electric effect?
   d) What do you mean by uncertainity principle?
   e) Which has more energy a photon in the infrared or one in ultraviolet? Give reason.
   f) What is optical pumping in the production of laser?
3. Answer in brief any **one** question. (1×2=2)
   a) Longitudinal waves are also called pressure wave. Why?
   b) Although the density of solid is high, the velocity of sound is greater in solids, why?
4. Answer in brief any **one** question. (1×2=2)
   a) What is wave front? Explain
   b) Differentiate between spherical & plane wave front?

Group-B

5. Answer any **Four** questions. (3×4=12)
   a) Describe the mechanism of metallic conduction & derive a relation between current density & drift velocity of the electrons.
   b) State & verify Joule's law of heating.
   c) State Bio-Savart law. Use this law, to find the magnetic field due to the current carrying circular coil at any point on the axis of the coil.
   d) Find the expression for torque on rectangular coil in a uniform magnetic field.
6. Answer any **three** questions. (3×4=12)
   a) Describe an experiment to determine the ratio of the charge to mass (e/m) for an electron. Show how the result is derived from the observation.
   b) Discuss a photoelectric effect & derive Einstein's photoelectric equation. What is stopping potential?
   c) State Bohr's postulate. Using these postulate obtain an expression for the total energy of an electron in north orbit of hydrogen atom.
   d) Describe the construction & working of He-Ne laser.
7. Answer any **one** question. (1×4=4)
   a) What are stationary wave? Prove that the distance between any two consecutive nodes in a stationary wave is $\lambda/2$.
   b) Describe Newton's assumption for the velocity of sound in a gas with Laplace correction.
8. Answer any **one** question. (1×4=4)
   a) State Huygen's principle. Use it to verify reflection of light.
   b) State Huygen's principle. Use it to verify refraction of light.

Group-C

9. Answer any **two** numerical problems. (2×4=8)
   a) What is the potential difference across 100Ω resistor in the circuit given below?



   b) A galvanometer can bear maximum of $25mA$ & resistance 5Ω. Find the suitable resistance to convert it into.
      i) a voltmeter of range 0-2v.
      ii) an ammeter of range 0-10A.
   c) A 60 cm long wire of mass 10gm is suspended horizontally in a transverse magnetic field of flux density 0.4 T through two spring at its two ends. Calculate the current required to pass through the wire so that there is zero tension in the spring.
10. Attempt any **two** numerical questions. (2×4=8)
   a) A beam of electron moving with velocity of $10^7\ {}^{m}/_{s}$ enters midway between two horizontal parallel plates in the direction parallel to the plates which are 5cm long & 2cm apart & have a p.d. of V volts between them. Calculate V if the beam is deflected so that if just grazes the edge of the plage. ${}^{e}/_{m} = 1.76\times10^{11}\ {}^{c}/_{kg}$.
   b) Sodium has a work function of $2ev$. Calculate the maximum $K.E.$ energy & speed of the emitted electrons when sodium is illuminated by radiation of wave length 150nm. $\left(me = 9.1\times10^{-31}kg\right)$.
   c) Calculate de Broglie wavelength of an electron which has been accelerated through a p.d of 200v. Given $m_e = 9.1\times10^{-31}kg$. $h = 6.6\times10^{-34}JS$.
11. The equation of a plane progressive wave is given the equation $y = 10Sin2\pi(t - 0.05x)$ where $y \& x$ are in cm & t in seconds. Calculate amplitude, frequency, wavelength & velocity of wave.
12. A source of sound of frequency 512Hz emits waves of wavelength 64.5cm in air at 20^0c. What would be the velocity of sound at 0^0C?

"The End"

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ASSIGNMENT

Class: XII F.M-100

Subject: Physics P.M.-40

Group -A

1. Attempt **all** questions: [4×2=8]
   a) State Ampere's theorem.
   b) Manganin wire is used instead of copper wire in potentiometer. Explain Why.
   d) Why do electrons acquire a steady drift velocity?
   e) Why is the cylindrical core of soft iron used in moving coil galvanometer?

2. Answer in brief. [4×2=8]
   a) Explain why a discharge through a gas take place at low pressure.
   b) What are work function and threshold frequency in photoelectric effect?
   c) How Paschen series is originated in Hydrogen spectra?
   d) A proton and an electron have same De-Broglie wavelengths, which of the two has greater kinetic energy? Explain.

3. Answer in brief any **one** question. [1×2=2]
   a) Sound at a distance can be heard distinctly at night than in the day time. Why?

4. Attempt the question. [2 x 1 = 2]
   a) Write is the differences between wavelet and wave front.

Group-B

5. Answer **all** questions. [3×4=12]
   a) State Biot-Savart law, find an expression for the magnetic field produced by a current carrying due to long straight conductor.
   b) Define drift velocity of electrons. Establish a relation between drift velocity of electrons and current density in the conductor.
   c) State and explain Kirchhoff's law of current and voltage. Apply them to obtain the balanced condition for Wheatstone's bridge.

6. Answer **all** questions. [3×4=12]
   a) Describe an experiment to determine the specific charge of an electron.
   b) What are Bohr's postulate? Derive an expression for the radius of n^{th} permissible orbit for hydrogen atom.
   c) Define binding energy. Draw the graph showing the relation between the binding energy per nucleus and mass number. Interpret the graph.

7. Answer the question. [1×4=4]
   a) What is end correction of a pipe? Describe the different modes of vibration of air column in an organ pipe closed at one end.

8. Attempt the question. (4 x 1 = 4)
   a) Explain Michelson's method for the velocity of light.

9. Solve the numerical problems. (2×4=8)
   a) Resistance of a wire of length 1m, diameter 1mm is 2.2 ohm. Calculate its resistivity and conductivity.
   b) A 60cm long wire of mass 10gm is suspended horizontally in a transverse magnetic field of flux density 0.4T through two springs at its two ends. Calculate the current required to pass through the wire so that there is zero tension in the spring.

10. Solve the numerical questions. (2×4=8)
   a) An electron accelerates through a potential difference of 2000V and then it enters a uniform magnetic field of 0.02T, is a direction perpendicular to it. Find the radius of path of the electron in the magnetic field. Mass of electron is 9.1×10^{-31}kg , charge of electron is 1.6×10^{-19}C.
   b) Sodium has a work function of 2 eV. Calculate the maximum energy and speed of the emitted electrons when sodium is illuminated by radiation of wavelength 150nm. Given mass of electron is 9.1×10^{-31}kg.

11. When a detonator is exploded in a railway line, an observer standing on the rail 2 km awayhears two sounds. What is the time interval between them? [Young's modulus of steel = 2×10^{11}N/m^2, density of steel = 8×10^3kg/m^3, atmospheric pressure = 10^5N/m^2, heat ratio for air=1.4] (4)

12. A beam of light is reflected by the mirror onto a fixed mirror which sends back to the rotating mirror from which it is again reflected and then makes an angle of $3.6^0$with the original direction. The distance between the two mirrors is 1 km and the rotating mirror is making 750 rev/s. Calculate the velocity of light. (3)

"The End"

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ASSIGNMENT

Class: XII F.M-100

Subject: Physics P.M.-40

Group ~ A

1. Attempt **all** questions: (4×2=8)
   a) What is tesla? Define it.
   b) Earth's magnetic field does not affect the working of a moving coil galvanometer? Explain.
   c) What are the factors on which resistance of a conductor depends?
   d) How a galvanometer can be converted into ammeter?
2. Attempt **all** questions. (4×2=8)
   a) How did Millikan's experiment lead to the quantum nature of the electric charge?
   b) Which has more energy a photon in infrared or one in the ultraviolet? Give reason.
   c) Why cannot we observe de-Broglie wave with moving macroscopic bodies like a bus, a ball etc. in our daily life?
   d) Differentiate between excitation potential and ionization potential.
3. Attempt **all** questions. (1×2=2)
   a) The speed of sound in humid air is more than that of dry air, why?
4. Attempt **all** questions (1×2=2)
   a) Distinguish between wave front and wavelets?

Group ~ B

5. Attempt **all** questions: (3×4=12)
   a) Using Ampere's circular law, derive an expression for the magnetic field due to a straight current carrying conductor.
   b) Using Biot-savart's law derive an expression for the magnetic field due at a point on the axis of current carrying circular coil.
   c) What is drift velocity? Derive an expression for the drift velocity of an electron in a conductor.
6. Attempt **all** questions. (3×4=12)
   a) Explain the motion of electron inside the electric field.
   b) Describe Millikan's experiment to determine the value of Plank's constant.
   c) Using Bohr's Postulate, Calculate the energy of electron in n^{th} orbit of hydrogen atom.
7. Attempt **all** questions. (1×4=4)
   a) Discuss Newton's formula for the velocity of sound in a gas medium with Laplace's correction.
8. Attempt **all** questions. (1×4=4)
   a) State Huygens's principle. Describe the laws of reflection by using this principle.

Group ~ C

9. Attempt **all** questions. (2×4=8)
   a) A long wire carrying a current of 10 A is placed perpendicular to magnetic field of flux 5 tesla. Calculate the force acting on 2meter of the wire?
   b) Resistance of a wire of length 1m, diameter 1 mm is 2.2Ω. Calculate its resistivity and conductivity.
10. Attempt **all** questions. (2×4=8)
    a) Obtain the de-Broglie wave length of the electron having the kinetic energy of 3600eV. (Mass of electron = 9.1×10^{-31}kg, Electronic charge=1.6×10^{-19}, Planck's constant=6.6×10^{-34}Js)
    b) An oil drop of density 960 kgm^{-3} and radius of 10^{-6} m is driven vertically upward through air by an electric field of 1.95×10^{5} V/m with a constant velocity of 3.5×10^{-4} m/s. if the viscosity of air is 1.8×10^{-5} $Nsm^{-2,}$ calculate the number of electronic charges on the drop. (Neglecting the up thrust due to air)
11. A source of sound of frequency 512 Hz emits wave of wave length 670 mm at 20^0C. What is the velocity of sound in air at this temperature? What would be the wavelength of sound from the source in air at 0^0C? (4)
12. The radius of curvature of the curved mirror is 20 meters and the plane mirror is rotated at 20 rev per sec. calculate the angle in degrees between a ray incident on the plane mirror and then reflected from it after the light has travelled to the curve mirror and back to the plane mirror. (Velocity of light = 3×10^8 m/s). (3)

"The End"