MODEL PRACTICE PAPERS FOR REVISION

MBD MODEL PRACTICE PAPER—1

PHYSICS
CLASS—XII

Time Allowed : 3 Hours   *Max. Marks : 70*

General Instructions :
- (*i*) *All questions are compulsory.*
- (*ii*) *Internal choices have been provided in some questions. You have to attempt only one of the choices in such questions.*
- (*iii*) *Question numbers **1** to **8** are very short answer questions, carrying **one** mark each. These questions are to be answered in one word or a sentence.*
- (*iv*) *Question numbers **9** to **16** are short answer type questions, carrying **Two** marks each. Their answers may not normally exceed **40** words each.*
- (*v*) *Question numbers **17** to **25** are also short answer type questions, carrying **three** marks each. Their answers may not normally exceed **60** words each.*
  *Question number **26** is a value based question and carries 4 marks.*
- (*vi*) *Question numbers **27** to **29** are long answer type questions, carrying **five** marks each. Their answers may not normally exceed **100** words each.*
- (*vii*) *Use of calculators is not permitted. However, you may use log tables, if necessary.*

1. Two point charges q_1 and q_2 are placed close to each other in air. What is the nature of the force between them when
- (*i*) $q_1q_2 > 0$
- (*ii*) $q_1q_2 < 0$. (1)

2. State two properties of electromagnetic waves. (1)

3. A wire of resistivity 'ρ' is stretched to twice its length. What will be its new resistivity ? (1)

4. Write the SI unit of potential gradient. (1)

6. What is the necessary condition to observe a rainbow ? (1)

7. What is the source of solar energy ? (1)

8. Work function of a photo surface is 2 eV. What is the threshold wavelength for this surface ? (1)

9. Two protons are placed 1.6 m apart. If one of them is free to move, what would be its kinetic energy in electron volt ?

Or

A transistor is being used as a common emitter amplifier. What is the value of phase difference if any between collector emitter voltage and input signal ? Draw circuit diagram. (2)

10. Write colour-coding scheme for a carbon resistor whose resistance is $2.4 \times 10^6 \, \Omega$. (2)

11. Refractive index of diamond is 2.4. What should be the critical angle of light ray moving from diamond to air ? (2)

12. Plot a graph between kinetic energy of emitted electron and the frequency of the incident radiation. Why this graph does not start with the origin ? (2)

13. Why does a paramagnetic sample displays greater magnetism when cooled ? (2)

14. What is the advantage of a.c. over d.c. ? (2)

15. Half life of a radioactive substance is 12 days. In how many days 1 g of this substance will become $\dfrac{1}{16}$ g ? (2)

16. How does the width of depletion region of a *p-n* junction vary if the reverse bias applied to it decreases ? (2)

17. What should be minimum height of a T.V. antenna to broadcast its programme in the range of 100 km ?

Or

A wire of resistance 8R is bent in the form of a circle. What is the effective resistance between ends of the diameter ? (3)

18. Calculate the current drawn by the primary of a transformer which step down 200 V to 20 V to operate a device of resistance 20 Ω. Assume the efficiency of the transformer to be 80%. (3)

19. Draw a ray diagram showing how the final image of a distant object is formed using an astronomical telescope in the near point position. (3)

20. Define angle of dip. Derive a relation between angle of dip and the resultant magnetic field of earth at a place. (3)

21. Define conductivity of a conductor and state its SI unit. State and explain the variation of ionic conductor with temperature. (3)

22. Define relaxation time of electron in a conductor. Explain how it varies with increase in temperature of a conductor. State the relationship between resistivity and relaxation time. (3)

23. Draw a diagram to show the variation of binding energy per nucleon with mass number for different nuclei. State the reason why light nuclei usually undergo nuclear fusion. (3)

24. What is meant by the term doping of an intrinsic semiconductor ? How does it affect conductivity of a semiconductor ? (3)

25. How do we make choice of communication channel ? A message signal has a bandwidth of 5 MHz. Suggest a possible communication channel for its transmission. (3)

26. Sangeeta was in fifth standard. One day, she found that if a comb is run through her dry hair, the comb attracted small bits of paper. She repeated the same procedure and again found the same result. She was surprised to observe this phenomenon. In the evening when her elder brother Sumeet came to the house she asked him about this phenomenon. Sumeet explained her the reason and convinced her. She succeed in forming a science group in her school.

(*a*) Why the comb run through one's hair attracts small bits of paper ?

(*b*) What values were displayed by Sumeet ? (4)

27. Derive lens formula relating object distance, image distance and focal length of a thin concave lens. Also explain the terms : centre of curvature, focal length and optical centre of a concave lens.

Or

Explain the construction and working of a compound microscope. Find an expression for its magnifying power. (5)

28. What is mutual induction ? Define coefficient of mutual induction and its SI unit. Also, derive an expression for coefficient of mutual induction of two long solenoid.

Or

Give the principle, construction and working of an a.c. generator. (5)

29. Draw the circuit diagram to study the input and output characteristics of a *n-p-n* transistor in CE configuration. Show these characteristics graphically. Explain how current amplification factor of a transistor is calculated using output characteristics.

Or

What is an oscillator ? With the help of a circuit diagram explain the working of a transistor as an oscillator in common-emitter configuration. (5)

MBD MODEL PRACTICE PAPER—2

PHYSICS
CLASS—XII

*Time Allowed : 3 Hours*   *Max. Marks : 70*

General Instructions : Same as MBD Model Practice Paper–1.

1. Two nuclei has mass numbers in the ratio of 1 : 3. What is the ratio of their nuclear densities ? (1)

2. How does the force between two point charges change if dielectric constant of medium in which they are kept increases. (1)

3. Why do magnetic lines of force prefer to pass through iron than through air ? (1)

4. A metallic rod moves parallel to a magnetic field, will an induced *e.m.f.* be set up in the rod ? (1)

5. Give the ratio of velocity of light and velocity of rays of wavelength 4000Å in vacuum. (1)

6. Which of the two colours red or blue travels slowly in a glass prism ? (1)

7. Draw energy-band diagram for a *p*-type extrinsic semiconductor. (1)

8. Why are short wave bands used for long distance radio broadcast ? (1)

9. An electric dipole of length 10 cm have charges $\pm\, 6 \times 10^{-3}$ C, placed at 30° w.r.t. a uniform electric field, experiences a torque of magnitude $6\sqrt{3}$ Nm. Calculate (*i*) the magnitude of the electric field (*ii*) the potential energy of the dipole.

Or

Explain with the help of diagram the terms (*i*) magnetic declination and (*ii*) angle of dip at a given place. (2)

10. Two circular coils, one of radius *r* and the other of radius R are placed coaxially with their centres coinciding. For R >> *r*, obtain an expression for the mutual inductance of the arrangement. (2)

11. When free electrons are present in abundance, how is that there is no current unless a potential difference or electric field is applied to the conductor ? (2)

12. Cyclotron is not suitable for accelerating electron. Why ? (2)

13. An astronomical telescope, in normal adjustment position had magnifying power 5. The distance between the objective and the eye piece is 120 cm. Calculate the focal lengths of the objective and of the eye piece. (2)

14. A T.V. Tower has a height of 400 m at a given place. Calculate its coverage range, if the radius of the earth is 64400 km. (2)

15. Give the logic symbol for an OR gate. Draw the output waveform for input waveform A and B for this gate. (2)
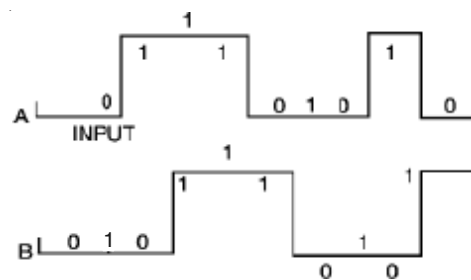
16. Explain, with the help of graph, the variation for conductivity with temperature for a metallic conductor. (2)

17. Using Gauss's theorem, derive an expression for the electric field intensity due to infinite plane sheet of charge density σ C m^{-2}.

Or

State the principle of working of van de Graaff generator. Give its one main application. (3)

18. Two identical cells each of e.m.f. 2 V and unknown internal resistance are connected in parallel. This combination is connected to a 5 Ω resistor. If the terminal voltage across the cells is 1.5 V. What is the internal resistance of each cell ? (3)

19. Half life of a radioactive sample is 30 s. Calculate (*i*) decay constant (*ii*) time taken for the sample to decay to $\frac{3}{4}$th of its original value. (3)

20. Sketch the wavefront corresponding to converging rays. Verify Snell's law of refraction using Huygens' wave theory. (3)

21. Explain with the help of circuit diagram, the use of potentiometer for determination of internal resistance of a primary cell. Derive the necessary expression. (3)

22. Explain with the help of a labelled diagram, the underlying principle, construction and

working of a moving coil galvanometer. (3)

23. An electron beam of initial energy 18 keV moving horizontally is objected to horizontal magnetic field of 0.4 G normally to the initial direction. Calculate vertical deflection of the beam over a distance of 30 cm. (3)

24. State the postulates of Bohr's atomic model. Derive an expression for total energy of an electron in the nth orbit. (3)

25. With proper circuit diagram, show the biasing of a n-p-n transistor. Explain the movement of charge carriers through different parts of this transistor. Hence show that $I_e = I_c + I_b$. (3)

26. Ramesh while doing his physics practical in a class, he found that if a voltmeter, an ammeter and a resistance are connected in series to a lead accumulator, there is deflection in the voltmeter but the deflection in ammeter is negligible. He discussed his problem with all his class fellows but no one could explain the reason. Harshpreet was also studying in his class. When he discussed the problem with her, she explained the reason and then whole class was informed by both of them.

(*a*) What was the reason for deflection in voltmeter and negligible deflection in the ammeter ?

(*b*) What values were displayed by Ramesh and Harshpreet ? (4)

27. Define interference of light. Describe Young's double slit experiment and obtain an expression for the fringe width.

Or

(*a*) What do you mean by refraction of light ?

(*b*) Discuss refraction of light through a prism with the help of a ray diagram and derive an expression for the refraction and derive an expression for the refractive index of the prism. (5)

28. Mention important features of semiconductor. Explain the formation of potential barier and depletion region in a p–n junction.

Or

Explain the use of p-n junction diode as a rectifier. Draw the circuit diagram of a full wave rectifier and explain its working. Draw the input and output wave forms. (5)

29. Derive an expression for self- inductance of a long solenoid.

An inductor L, a capacitor 20 μF, a resistor 10 Ω connected in series with an a.c. source of frequency 50 Hz. If the current is in phase with the voltage, calculate the inductance of inductor.

Or

Define coefficient of mutual inductance and derive an expression for root mean square value of alternating current. (5)

MBD MODEL PRACTICE PAPER—3

PHYSICS
CLASS—XII

Time Allowed : 3 Hours   *Max. Marks : 70*

General Instructions : Same as MBD Model Practice Paper–1.

1. What is the advantage of radial magnetic field in a moving coil galvanometer ? (1)
2. Name the electromagnetic radiation used by any device for viewing objects through haze and fog. (1)
3. Why does the acceleration of a magnet falling through a long solenoid increase ? (1)
4. Ionising power of alpha particle is greater than that of protons. Give reason. (1)
5. Draw equipotential surface in a uniform electric field. (1)
6. State Rayleigh law of scattering. (1)
7. On what factors does the threshold frequency depend ? (1)
8. Is free neutron a stable particle ? (1)
9. Define mutual inductance. State two factors on which mutual inductance between pair of coils depend ? (2)
10. You are given two identical looking bars A and B. One of them is a bar magnet and the other is an ordinary piece of iron. Give an experiment to identify which one of the two is a bar magnet. You are not to use any additional material for the experiment ? (2)

Or

In a certain arrangement, a proton does not get deflected while passing through a magnetic field region. Under what condition is it possible ? (2)

11. State Lenz's law. Show that it is a consequence of the law of conservation of energy. (2)
12. The radius of curvature of each surface of a convex lens of refractive index 1.5 is 40 cm. Calculate its power. (2)
13. Find an expression for the force acting on a charge moving in a magnetic field. (2)
14. If 2.25×10^{20} electrons pass through a wire in one minute, find the magnitude of current through the wire. (2)
15. Explain greenhouse effect. (2)
16. Calculate the equivalent capacitance between points A and B in the following combination. (2)

$C_1 = 5\mu F$ $C_2 = 5\mu F$ $C_3 = 15\mu F$ $C_4 = 30\mu F$
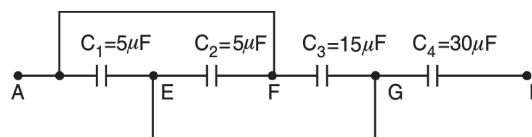
17. The wavelength of second line of the Balmer series in hydrogen spectrum is 4861 Å. Calculate the wavelength of the third line. (3)

Or

In a neon atom the energies of the 3s and 3p states are respectively 16.70 eV and 18.70 eV. What wavelength corresponds to 3p – 3s transition in neon atom ? In the helium neon laser why is this line not observed with the same intensity as the 632.8 nm laser line ? (3)

18. Using Huygens' law, prove the laws of reflection of light. (3)
19. A cyclotron's oscillator frequency is 10 MHz. What should be the operating magnetic field for accelerating protons ? If the radius of its dee's is 60 cm, what is K.E. of protons beam produced by acceleration ? Express answer in MeV. (3)
20. State the conditions for diffraction of light to occur. In the diffraction at a single slit experiment, how would the width and intensity of central maxima change if (*i*) slit width is halved and (*ii*) visible light of longer wavelength is used ? (3)
21. Draw the circuit diagram of common-emitter amplifier with appropriate biasing. What is the phase difference between input and output signals ? State two reasons why common-emitter amplifier is preferred to a common-base amplifier. (3)
22. Define electric potential. Deduce an expression for the electric potential at a distance *r* from a point charge ($q > 0$). (3)
23. Define the term resistivity of a conductor. Give its S.I. unit. Show that the resistance R of a conductor is given by $\dfrac{ml}{ne^2\lambda}$, where the

symbol have their usual meanings. (3)

24. A certain *n-p-n* transistor has CE output characteristics as shown in the figure 14.105 (c)

(*a*) Find the emitter current V_{ce} = 10V and I_b = 50 μA.

(*b*) Find α at that point. (3)

25. Define electron volt and atomic mass unit and find relation between them. Express atomic mass unit in MeV (or eV). (3)

26. Harish was watching a programme on the topic wave optics on Discovery science channel. He came to know that parabolic mirrors and not concave spherical mirrors are used in search lights. He was surprised and wanted to know the reason behind it. He discussed it with his friends and they explained him the reason for using parabolic mirrors instead of concave spherical mirrors.

(*a*) What is the reason for using parabolic mirrors instead of concave spherical mirrors ?

(*b*) What values are displayed by Harish and his friends ? (4)

27. Derive a mathematical expression for the force acting on a current carrying straight conductor kept in a magnetic field. State the rules used to determine the direction of this force.

Or

Discuss the theory, principle, construction of a dead beat galvanometer. What do you mean by dead beat ? (5)

28. Derive an expression for the energy stored in a parallel plate capacitor. Explain how the energy stored in a parallel plate capacitor changes on the introduction of a dielectric medium of dielectric constant K between the plates.

Or

Define dipole moment of an electric dipole. Show mathematically that the electric field intensity due to a short dipole at a distance *d* along the axis is twice the intensity at the same distance along equatorial line.

29. Prove that an ideal inductor does not dissipate power in an a.c. circuit.

A bulb of resistance 10 Ω connected to an inductor L, in series with an a.c. source marked 100V, 50 Hz. If the phase angle between the voltage and current is $\pi/4$ radian, calculate the value of L.

Or

Derive a relation for the average power of an a.c. circuit. How will you differentiate between true power and virtual power ? (5)

MBD MODEL PRACTICE PAPER—4

PHYSICS
CLASS—XII

Time Allowed : 3 Hours   *Max. Marks : 70*

General Instructions : Same as MBD Model Practice Paper–1.

1. Is electrostatic force a central force ?   1
2. Do electrons tend to go regions of high positive potential or low potential ? Why ? 1
3. In what respect does a wire carrying a current different from a wire carrying no current ? 1
4. Name the wave phenomenon which is exhibited by light waves and not by sound waves.   1
5. How does conductance of a semiconducting material change with the rise of temperature ?   1
6. A wire of resistivity ρ is stretched to four times its length. What will be its new resistivity ? 1
7. An electron is moving with a velocity of 10^7 ms^{-1} enters a uniform magnetic field of 1 T along a direction parallel to the field. What would be its trajectory in the field ?   1
8. How does the resolving power of telescope change with aperture of its objective is increased ?   1
9. A Gaussian surface contains charges $-q$, $+2q$ and $-q$. Calculate the electric flux through the surface.   2
10. Prove that $E = -\dfrac{dV}{dr}$.   2
11. Derive the relation between *e.m.f.* and terminal potential difference of a cell.   2
12. Suppose there existed a planet that went around the sun twice as fast as the earth. Will its orbits radius be more or less than that of the earth ?

Or

An electric lamp connected in series with a capacitor and an A.C. source is glowing with certain brightness. How does the brightness change on reducing the capacitance ?   2

13. An equiconvex lens of focal length 15 cm is cut into two halves as shown. What is the focal length of each half ?   2
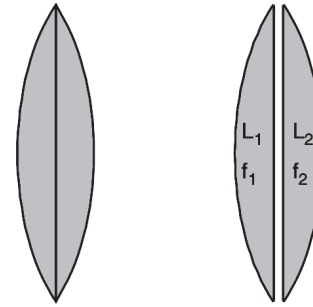

14. What is the name given to the curves, the tangent to which at any point gives the direction of magnetic field at that point ? Can two such curves intersect each other ? Justify your answer.   2
15. Calculate refractive index of material of an equivalent prism for which angle of minimum deviation is 60°.   2
16. If compass box and circle were to be taken to magnetic north pole of the earth, what would one observe with regard to deflections of respective needles and why ?   2
17. A circular brass needle of radius a and radius R is placed with its plane perpendicular to magnetic field which varies with time as $B = B_o \sin \omega t$. Obtain an expression for the induced current in the loop.

Or

How would the following be affected in absence of atmosphere around the earth ?
   (*a*) Surface temperature of the earth.
   (*b*) Range of radio wave transmission ?   3

18. Identify the logic gate 1 and 2 in the logic circuit given. Also with the truth table for the final output for all possible combination of the inputs A and B.
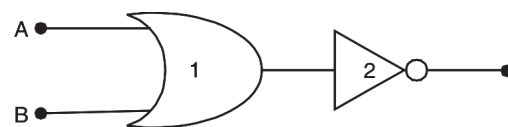
19. With the help of circuit diagram, explain how would you compare the e.m.f.'s of two primary cells using a potentiometer.   3
20. Two capacitors of capacitances $C_1 = 3\,\mu F$ and

$C_2 = 6 \mu F$ arranged in series are connected in parallel with third capacitor $C_3 = 4 \mu F$. The total arrangement is connected to a 6.0 V battery. Calculate the total energy in the capacitors. 3

21. A series battery of 10 lead accumulators each of e.m.f. 2 V and internal resistance 0.25 ohm is charged by a 220 V d.c. mains. To limit the charging current, a resistance of 47.5 ohm is used in series in the charging circuit. What is (a) the power supplied by the main and (b) power dissipated as heat ? Account for the difference in power (a) and (b). 3

22. Draw the curve showing the variation in binding energy per nucleon with mass number. Explain release of energy in the process of nuclear fission and fusion on the basis of this curve. 3

23. With proper circuit diagram, show the biasing of a *n-p-n* transistor. Explain the movement of charge carriers through different parts of this transistor. Hence show that $I_e = I_c + I_b$. 3

24. A galvanometer coil has a resistance of 30 ohm and meter shows full scale deflection for a current of 2.0 mA. Calculate the value of resistance required to convert it into an ammeter of range 0 to 1 A. Also calculate the resistance of an ammeter. 3

25. A thick copper wire carrying a current of 10 A is bent into semi- circular arc of radius 7.0 cm as shown in figure (a). State the direction and calculate the magnitude of magnetic field at the centre of the arc. How would your answer change if the same wire is bent into semicircular arc of the same radius but in opposite way as shown in fig. (b).

(a)   (b)
                                    3
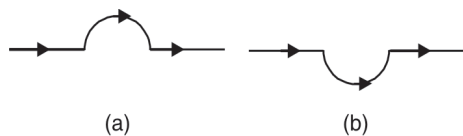
26. Neeta while doing her homework on sunday morning noticed that her grandfather was reading the newspaper by placing it at a distance of about 100 cm from his eyes. She advised him that he needs a spectacle and must consult an eye specialist.

(a) What is the nature and power of lens need if her grandfather wants to read the newspaper at 25 cm from his eye ?

(b) What are the valued displayed by Neeta ? 4

27. Derive the expression

$$-\frac{\mu_1}{u} + \frac{\mu_2}{v} = \frac{\mu_2 - \mu_1}{R}$$

When refraction occurs from rarer to denser medium at convex spherical refracting surface $(\mu_1 < \mu_2)$ and real image is formed.

Or

What is a telescope ? Describe astronomical telescope. Calculate magnifying power of the telescope in normal adjustment and for formation of image at least distance of distinct vision. 5

28. Explain through a labelled circuit diagram, the working of a transistor as an amplifier (common emitter configuration). Obtain an expression for the current gain, voltage gain and power gain.

Or

Write the construction of p-n-p transistor. How is it represented symbolically ? Explain its operation. What type of emitter base and collector base biasing is required for the use of transistor as common-base amplifier ? 5

29. An L.C. circuit contains a 20 mH inductor and a 50 μF capacitor with an initial charge of 10 mC. The resistance of circuit is negligible. Assume the instant the circuit is closed to be $t = 0$. (a) What is the total energy stored initially ? (b) What is the frequency and time period of L.C. oscillations ? (c) At what time is the energy stored completely electrical (*i.e.* stored in the capacitor ? (*ii*) Completely magnetic (*i.e.,* stored in inductor) ?

Or

Derive the expression for impedance of LCR series circuit. Draw impedance triangle. 5

MBD MODEL PRACTICE PAPER—5

PHYSICS
CLASS—XII

Time Allowed : 3 Hours   *Max. Marks : 70*

General Instructions : Same as MBD Model Practice Paper–1.

1. Identify the physical quantity, which has as its unit coulomb-metre. Is it a scalar or a vector quantity ?   1

2. Who first assigned the positive and negative signs to charge ?   1

3. Define dielectric constant of a medium in the form of capacitance of a capacitor.   1

4. Why the light of a motor car becomes slightly dim when it is started ?   1

5. Why does the electric field inside dielectric decreases when it is placed in an external field ?   1

6. State any rule which relates the direction of electric current and direction of accompanying magnetic field.   1

7. What is the phase difference between voltage drop across L and C in a series LCR circuit connected to AC–source ?   1

8. Arrange the following radiation in descending order of wavelengths. Radio waves, X-rays, Ultraviolet rays and red light.   1

9. A transistor is being used as common emitter amplifier. What is the value of phase difference if any between the collected emitter voltage and input signal ? Draw circuit diagram.

Or

Two wires A and B of the same material and having same length have their cross-sectional areas in the ratio of 1 : 4. What would be the ratio of heat produced in these wires when same voltage is applied across each ?   2

10. Define the term critical angle for a pair of media ? Establish the relationship between their refractive index.   2

11. Observations on a given device yielded the following current voltage data :

Current (ampere)	Voltage (Volts)
0.1	19.7
2.0	39.4
3.0	59.1
4.0	78.8
5.0	98.5

Draw V–I graph using the above data. What conclusion can you draw from graph with regard to ohmic and non-ohmic nature of device ?   2

12. Suppose you have two bases of identical dimensions one made of paramagnetic substance and other of diamagnetic substance. If you place these bases along uniform magnetic field, show diagramatically, what modification in the field pattern would take place in each case.   2

13. Find the minimum speed required to produce a potential difference of 5 V across the wings of an aeroplane 40 m in length due to the earth's magnetic field (vertical component) of 5.0×10^{-5} Wb m^{-2}.   2

14. Derive the expression for the force on a charge moving in a magnetic field.   2

15. Calculate the equivalent capacitance between point A and B in the following combination.   2
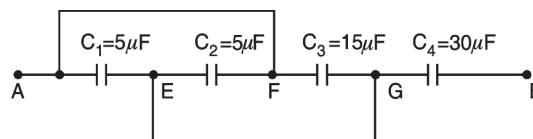
16. A wire of resistance 4R is bent in the form of a circle. What is the effective resistance between ends of the diameter ?   2

17. Fig. shows an inductor L, a resistor R connected in parallel to a battery through a switch. The resistance of R is the same as that of coil L. Two identical bulbs are put in each arm of the circuit.

    (*i*) Which of the bulb will light up earlier when S is closed.

    (*ii*) Will the bulbs be equally bright after some time ?   3
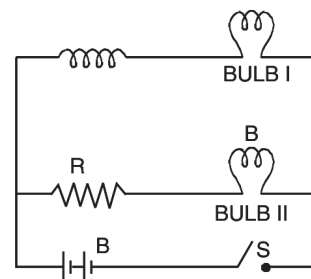
18. A convex lens made up of a material of refractive index M_1, is immersed in a medium of refractive index μ_2. Trace the path of parallel beam of light passing through the lens whose (i) $\mu_1 = \mu_2$; (ii) $\mu_1 < \mu_2$. Explain your answer.

Or

The wavelength of second line of the Balmer series in hydrogen spectrum is 4,861 Å, calculate the wavelength of the first line.   3

19. State and explain Huygen's principle. Name the type of wavefront that corresponds to a beam of light (i) coming from a far off source, (ii) diverging radially from a point source.   3

20. Draw logic symbol and truth table for OR gate. Describe its realisation with circuit diagram using semiconductor diode.   3

21. A student has two wires of iron and copper of equal length and diameter. He joins the two wires in series and passes the current through combination which increases gradually. After that he joins the two wires in parallel and repeats the process of passing current, which wire will glow first in each case and why ? 3

22. A sun shine recorder globe of 30 cm diameter is made of glass of refractive index $\mu = 1.5$. A ray enters the globe parallel to the axis. Find the position from the centre of the sphere when the ray crosses the axis.   3

23. Differentiate between n-type and p-type semiconductors on the basis of energy band diagrams. Explain the process of conduction in both type of materials.   3

24. The frequency of cyclotron is 10^7 Hz. What should be operating magnetic field for accelerating protons ? If the radius of the dee's of the cyclotrons is 6×10^{-1} m, calculate the energy of the proton beam produced by it in MeV. Given e = 1.6×10^{-19} C; M_p = 1.67×10^{-27} kg. 1 MeV = 1.602×10^{-13} J.

25. Draw circuit diagram for simple microscope and determine its magnifying power.   3

26. Sumeet, a science student, while studying the conversion of a galvanometer into an ammeter was curious to know the information required about the galvanometer before conversion it into an ammeter and voltmeter. He discussed it with his friends but no body took interest in his problem. He further discussed with his teacher about the requirement. His teacher gave him the required information to his satisfaction.

(a) What values did Sumeet have ?

(b) What were the information necessary before converting a galvanometer into an ammeter or voltmeter ? What are the formulae for conversion ?   4

27. With the help of labelled diagram, explain the principle, construction and working of an A.C. generator.

Or

With the labelled diagram, explain, construction and working of a step up transformer. Why is the core laminated ?   5

28. (a) Derive the mirror formula which gives the relation between f, v and u. What is the corresponding formula for a thin lens ?

(b) Calculate the distance d, so that a real image of an object at O, 15 cm in front of a convex lens of focal length 10 cm be formed at the same point O. The radius of curvature of the mirror is 20 cm. Will the image be inverted or erect ?

Or

(a) Using the relation for refraction.

(b) In the accompanying diagram, the direct image formed by the lens (f = 10 cm) of an object placed at O and that formed after reflection from the spherical mirror are formed at the same point. What is the radius of curvature of the mirror ?   5
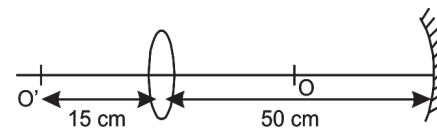
29. Explain the term induced e.m.f. List three different methods of producing this type of e.m.f. What are eddy currents ? How is their direction found ?

Or

(a) State Lenz's law of electromagnetic induction. Does it violate law of conservation of energy ?

(b) A magnet is dropped down a long vertical copper tube. What will happen to its ultimate motion?   5

PHYSICS
CLASS—XII

*Time Allowed : 3 Hours*   *Max. Marks : 70*

General Instructions : Same as MBD Model Practice Paper–1.

1. Is electric flux a scalar or vector quantity ? Write its SI unit.

2. Name the wave phenomenon which is exhibited by light waves and not by sound waves. **1**

3. Describe Davisson and Germer experiment to establish the wave nature of electrons. Draw a labelled diagram of apparatus used. **1**

4. Will the drift velocity of free electrons in a metallic conductor increases or decreases with the increase of its temperature ? **1**

5. How does the conductivity of a semiconductor vary with temperature ? **1**

6. Name the states of matter which normally don't show ferromagnetism. **1**

7. A magnetic needle, free to rotate in a vertical plane, orients itself with the axis vertical at a certain place on the earth. What are the values of (*a*) horizontal component of earth's magnetic field ? (*b*) angle of dip at this place ?

8. What are the requirements of doping process ? **1**

9. Define disintegration constant and mean life of a radioactive substance. Give units for each.

Or

A steady current flows in a metallic conductor of non-uniform cross-section. Which of the following quantity is/are constant along the conductor, current/current density/drift velocity ? **2**

10. The variation of P.D. with length in case of two potentiometer wires A and B is given. Which of the two is more sensitive ? **2**
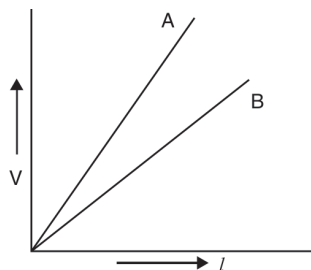
11. What is meant by the term interference of light ? Write any two conditions necessary for obtaining well defined and sustained interference pattern of light. **3**

12. Define the term angular dispersion. Draw the path of a ray of white light passing through prism and mark angular dispersion on it. **2**

13. The radius of curvature of each surface of a convex lens of refractive index 1.5 is 40 cm. Calculate its power. **2**

14. Prove that $\lambda = \dfrac{h}{mv}$ for matter waves. **2**

15. A radioactive nuclide decays to form a stable nuclide. Its half life time is 3 min. What fraction of its 1 g will remain radioactive after 9 minutes ? **2**

16. Explain the modes in which modems can be used. **2**

17. A sphere S_1 of radius r_1 encloses a total charge Q. If there is another concentric sphere S_2 of radius r_2 $(r_2 > r_1)$ and there is no additional charges between S_1 and S_2. Find the ratio of electric flux through S_1 and S_2.

Or

A simple voltaic cell has an e.m.f 1.0 V. Is there a net field inside the cell whom (*i*) Circuit is open, circuit is closed and a steady current is drawn through it ? Explain your answer in each case. **3**

18. Establish the relationship between object distance, image distance and radius of curvature of a convex lens. **3**

19. If emitter and base of npn transistor have same doping concentration. Explain how will collector and base current be affected. **3**

20. With the help of a circuit diagram, explain the working of a full wave rectifier. **3**

21. Draw the logic symbol and write down the truth table of AND gate. With the help of a circuit diagram, describe the realisation of AND gate using semiconductor diodes. **3**

22. An electron beam of initial energy 18 keV moving horizontally is subjected to horizontal

magnetic field of 0.4 G normally to the initial direction. Calculate vertical deflection of the beam over a distance of 30 cm.   3

23. When 100 V d.c. is applied across inductor, a current of 1 A flows through it. If the same inductor is connected to 100 V a.c. the current reduces to 0.5 A. Why is the current reduced in the latter case ? Calculate the value of reactance of the inductor.   3

24. A radio isotope decays in the following sequence

    $$A \xrightarrow{+1\beta} A_1 \xrightarrow{\alpha} A_2$$

    If mass number and atomic number of A_2 are 176 and 71 respectively, find the mass number and atomic number of A_1 and A. Which of the three elements are isobars ?   3

25. With the help of a circuit diagram explain the use of npn transistor as an amplifier in common emitter configuration. What is the phase relationship between the collector and base voltage ?   3

26. Adity noticed that her grandmother has an eyesight problem. She asked her grandmother to consult a doctor. Her grandmother told that she had already consulted a doctor who has advised her for cataract operation which she has developed but she was reluctant to go through the operation as she was quite old and was of opinion that the results may not be positive after operation, and the surgery is also expensive. Adity told her that age is not a factor in cataract surgery and cost is high due to the cost of eye lens which is to be planted in place of clouded lens. She explained the benefit of operation. Finally she convinced her for operation and the operation was successful and her grandmother was again able to see the world clearly and was happy and thankful to her granddaughter.

    (a) What is a cataract ?

    (b) What values were displayed by Adity ?   4

27. Explain the phenomenon of total internal reflection. What are conditions for this phenomenon ? Explain the meaning of critical angle. Calculate speed of light in a medium whose critical angle is 45°.

    Or

    (a) Discuss the phenomenon of refraction through a prism. Prove that $\delta = (\mu-1)$ A, where the symbols have their usual meaning.

    (b) Explain why white light is not dispersed while passing through a hollow prism ?   5

28. With the proper circuit diagram show the biasing of a *n-p-n* transistor. Explain the movement of charge carriers through different parts of the transistor. Hence show that $I_E = I_B + I_C$.

    Or

    What is an amplifier ? With the help of a circuit diagram, explain the function of a *p-n-p* transistor as an amplifier.   5

29. A small town with a demand of 800 kW of electric power at 220 V is situated 15 km away from an electric plant generating power at 440 V. The resistance of the cable carrying power is 15 ohm. The town gets power through a 4000 – 220 V down transformer at a sub-station in the town.

    (a) Calculate the line losses in form of heat.

    (b) How much power must plant supply, assuming there is a negligible power loss due to leakage ?

    (c) Calculate the voltage drop in the line.

    Or

    Define instantaneous power of an a.c. circuit and derive the expression for average power of an a.c. circuit.   5