

Division Level Model Question Paper 2025**Class 12, Subject - Physics****Objective/Very Short Answer Questions (1 Mark Each)**

- One Coulomb of charge is equal to how many electrons?
- What is the quantization of charge?
- Name the physical quantity whose unit is Newton/Coulomb.
- What is the unit of the absolute permittivity of air or vacuum?
- What is the value of the dielectric constant for metals?
- What is an electric dipole?
- What is linear charge density? Write its SI unit.
- What is surface charge density? Write its SI unit.
- Write two limitations of Coulomb's inverse square law.
- What kind of electric lines of force are drawn in a uniform electric field?
- What will happen if a positively charged conductor is connected to the Earth?
- What is the value of the angle between an equipotential surface and electric lines of force?
- Write the SI unit of electric capacitance.
- What is the resistivity of a superconductor?
- Kirchhoff's laws for electrical distribution are based on which conservation laws?
- How many electrons form one ampere of current?
- Write the SI unit of potential gradient.
- Write Ohm's law.
- In what order are different electrical appliances connected in homes?
- Give one example of a non-ohmic resistance.
- Write the SI unit of magnetic flux.
- Which source does a current-carrying conductor produce?
- What is the resistance of an ideal ammeter?
- When do two current-carrying conductors attract each other?
- How much work is done by the Lorentz force?
- How is a galvanometer converted into an ammeter?
- How is a galvanometer converted into a voltmeter?
- How should an ammeter and voltmeter be connected in an electric circuit?
- Who discovered the magnetic effect of electric current?
- How is the magnetic field inside a current-carrying solenoid?
- What is mutual induction?
- Who discovered electromagnetic induction?
- Write Lenz's law.
- What is the unit of self-inductance?
- Write Faraday's second law of electromagnetic induction.
- What is the transformation ratio of a step-up transformer?
- On what principle does a transformer work?
- What is the phase difference between alternating voltage and alternating current in a purely resistive circuit?
- What is impedance? Write its SI unit.
- What is capacitive reactance? Write its SI unit.
- What do you understand by the peak value of alternating current?
- Who is the discoverer of electromagnetic waves?
- What is the basic source of electromagnetic waves?
- What are electromagnetic waves?
- What is the electromagnetic spectrum?
- Write the wavelength range of visible waves.
- Write two uses of infrared waves.
- Write two uses of X-rays.
- Write two uses of gamma rays.
- What is a conjugate focus?
- If the lower half of a concave mirror is painted black, what effect will it have on the image? ⁵¹
- Which mirror always forms a virtual and small image?
- Why do stars appear to twinkle?
- What would happen if there were no atmosphere?
- Write two conditions for total internal reflection.
- What is the critical angle?
- For which color is the refractive index of glass minimum?
- What is angular dispersion?
- What is the angle of minimum deviation?
- What is dispersive power?
- What happens to the magnifying power of a microscope when its length is increased?
- What are coherent sources?
- Write the conditions for two light sources to be coherent
- Why does light appear to propagate in a straight line?
- What is the photoelectric effect?
- What is thermionic emission?
- What is the work function in the photoelectric effect?
- What is field emission?
- What is threshold frequency?
- What is meant by stopping potential?
- Write the de Broglie wave equation.
- What is the dynamic mass of a photon?
- What is the rest mass of a photon?
- What effect will increasing the intensity of incident light have on the number of emitted photoelectrons?
- Who discovered the nuclear model of the atom?
- What is impact parameter?
- What is the charge of an atom?
- What is the mass of a neutron?
- Write the names of two isotopes of hydrogen.
- What is mass defect?
- What is nuclear fusion?
- Write two properties of the nuclear force.
- Where is a Zener diode used?
- What is the thickness of the depletion layer in a P-N junction diode?
- What is the energy gap for metals?
- Name the majority charge carriers in a P-type semiconductor.
- Name the majority charge carriers in an N-type semiconductor.
- What is the forbidden energy gap?
- What is doping?
- What is rectification?
- What is a P-N junction diode?

Short Answer Questions (2 Marks)

- Write the definition of electric current and state its unit. Is it a vector quantity or a scalar quantity?
- Define drift velocity and write the relation between drift velocity and electric current.
- Write the definition of specific resistance or resistivity and state its dimensional formula and unit.

Or

What is resistivity? Write its SI unit. On what factors does it depend?

4. You are given two wires of the same metal and equal length but different diameters. Which one will have higher resistance? Which wire will have higher specific resistance?
5. Write two differences between resistance and resistivity.
6. On what factors does the resistance of a conductor depend?

Or

What is resistance? On what factors does it depend?

Or

What is resistance? Write its SI unit.

7. Why are the wires used in electric circuits made of copper or aluminum?
8. Why are alloys used to make standard resistances?
9. Write 2 differences between ohmic and non-ohmic resistance.
10. Why is it easier to start a car engine on warm days compared to cold days?
11. On what factors does the electromotive force (EMF) of a cell depend?
12. A wire with resistivity ρ is stretched to triple its length. What effect will this have on its resistivity?
13. Find the equivalent resistance between A and B, given that three resistances of three ohms are connected in series.
14. What field does a moving charge produce? Write the SI unit of the magnetic field.
15. Name the force acting on a charged particle moving in a magnetic field and state when it is minimum.
16. Write Fleming's Left-Hand Rule.
17. Why do two parallel, straight, and long conductors repel each other when current flows in opposite directions?

Or

What will be the effect if current flows in the same direction in two long, straight, and parallel conductors?

Or

Do two parallel conductors, in which current flows in the same direction, attract each other?

18. Why is a soft iron core placed in the center of the coil of a moving coil galvanometer?
19. Write the names of two factors on which the sensitivity of a galvanometer depends.
20. Write Coulomb's law for magnetism and define unit pole.
21. Write two differences between an electromagnet and a permanent magnet.
22. Define the following:
 1. Magnetic dipole
 2. Magnetic field lines
23. Compare two properties of diamagnetic substances and paramagnetic substances.

Or

Compare two properties of ferromagnetic substances and paramagnetic substances.

Or

Write two differences between diamagnetic substances and ferromagnetic substances.

24. Write Faraday's first and second laws of electromagnetic induction.

25. Write two differences between self-induction and mutual induction.

26. Explain the self-inductance of a coil. Write its dimensional formula and unit.
27. Explain mutual inductance and write its SI unit.
28. Write two differences between alternating current (AC) and direct current (DC).
29. Why is alternating current more dangerous than direct current?
30. Define alternating current and write the relation between the root mean square (RMS) value and the peak value of alternating current.
31. An alternating current of $\sqrt{2}$ Ampere is flowing in a wire. What will be its maximum value?
32. The peak value of an alternating current is $2\sqrt{2}$ Ampere. What will be its root mean square (RMS) value?
33. The equation for alternating voltage is $V = 141 \sin 50 \pi t$. Find the RMS value of the voltage.
34. Explain that Lenz's law is in accordance with the law of conservation of energy.
35. Explain the following:
 1. Self-induction
 2. Mutual induction
36. What is total internal reflection?

Or

Write two conditions for total internal reflection.

37. What is the reason for the brilliance of a diamond?
38. Define angular dispersion.
39. Define dispersive power.
40. Why does light undergo dispersion after passing through a prism?
41. Why is the danger signal red?
42. How can the magnifying power of a compound microscope be increased?
43. What effect does immersing a lens in a liquid have on its focal length and nature?
44. Write two drawbacks of Huygens' wave theory.
45. What is the interference of light? Write its example.
46. What are coherent sources? Write the conditions for two sources to be coherent.
47. If Young's double-slit experiment setup is immersed in water, what effect will it have on the fringe width?
48. Why does a soap bubble appear colorful?
49. Write the names of the factors affecting the fringe width in Young's double-slit experiment.
50. Write two differences between Fresnel diffraction and Fraunhofer diffraction.
51. Write two differences between plane-polarized light and unpolarized light.
52. What effect will it have on the interference pattern in Young's double-slit experiment if one slit is closed? ¹⁵⁵
53. Write two differences between Rutherford's atomic model and Bohr's atomic model.
54. In the Balmer series of the hydrogen atom:
 1. Write the formula for finding the wavelength.
 2. In which region of the spectrum does this series fall?
55. In the Paschen series of the hydrogen atom:
 1. Write the formula for finding the wavelength.
 2. In which region of the spectrum does this series fall?
56. In the Lyman series of the hydrogen atom:
 1. Write the formula for finding the wavelength.
 2. In which region of the spectrum does this series fall?

57. Define the following:

1. Excitation energy
2. Ionization energy

58. Define mass defect and binding energy.

59. Write two differences between nuclear fission and nuclear fusion.

60. Which of the alpha, beta, or gamma rays are deflected by a magnetic field?

61. Why is only a neutron suitable for nuclear fission?

62. What is radioactivity? Write the names of the different rays emitted by a radioactive substance.

63. Explain that gamma rays have higher penetrating power while alpha rays have higher ionizing power.

64. Why do beta particles have higher penetrating power than alpha particles, but their ability to ionize a gas is lower?

65. What is doping? Why is it necessary?

Or

What is the meaning of doping a semiconductor? How does it affect the conductivity of the semiconductor?

66. What effect does heating a semiconductor have on its conductivity?

67. Write two differences between forward bias and reverse bias.

68. Write two differences between a half-wave rectifier and a full-wave rectifier.

69. What is a P-N junction diode? Draw its V-I characteristic curve by drawing its electric circuit in forward bias.

70. Draw the electric circuit of a P-N junction diode in reverse bias and draw its V-I characteristic curve.

71. State the difference between energy levels and energy bands.

72. Write two differences between N-type and P-type semiconductors.

73. Why is electrical conduction not possible in an intrinsic semiconductor? Why is electrical conduction possible on increasing the temperature?

Short Answer Questions (3 Marks)

1. Write the expression for the intensity of the electric field at a point in the axial position due to an electric dipole. Also state its direction.
2. Establish the expression for the intensity of the electric field at a point in the equatorial position (broadside-on position) due to an electric dipole at a point located at the midpoint. Also state the direction.
3. An electric dipole is placed in a uniform electric field. Derive the expression for the torque acting on it.
4. Write and prove Gauss's theorem.
5. What do you understand by an equipotential surface? Write any four of its properties.
6. Find the expression for the capacitance of an isolated spherical conductor.
7. Calculate the electric potential at a point in the equatorial position due to an electric dipole.
8. Verify the formula for the potential energy of an electric dipole in an electric field.
9. Three capacitors of $3\mu F$, $4\mu F$, $5\mu F$ are connected in parallel. Find the equivalent capacitance.
10. Find the expression for the equivalent capacitance of three capacitors connected in series.

11. What is drift velocity? Establish the relation between drift velocity and electric current.

12. Write the difference between electromotive force (EMF) and potential difference.

13. Explain the meaning of the following:

- (1) Electromotive force (EMF)
- (2) Potential gradient
- (3) Resistance
- (4) Resistivity
- (5) Specific conductivity
- (6) Relaxation time
- (7) Potential difference

14. Define the internal resistance of a cell and state on what factors it depends.

15. Define the electromotive force (EMF) of a cell and establish its relation with the internal resistance.

16. Explain Kirchhoff's laws under current electricity with the help of a diagram.

17. What is the principle of a Wheatstone bridge? Establish its formula.

18. If the internal resistance of a cell is much greater than the external resistance, in which arrangement will the maximum current be obtained? Explain.

19. The potential difference across the terminals of a cell drops from 50 Volts to 30 Volts when connected to a 12 Ohm resistor. Calculate the internal resistance of the cell.

20. Derive the expression for displacement current.

21. What are electromagnetic waves? Write any four of their properties.

22. Write the difference between sound waves and electromagnetic waves.

23. Write the frequency range and one use for each of the following electromagnetic radiations:

- (I) Microwaves
- (II) Ultraviolet waves
- (III) Gamma rays

24. How are the following electromagnetic waves produced? Write two important uses of each.

- (I) Gamma rays
- (II) X-rays
- (III) Ultraviolet waves
- (IV) Infrared waves
- (V) Microwaves
- (VI) Radio waves

25. A radio can be tuned to any station in the 7.5 MHz to 12 MHz band. What will be the corresponding wavelength band?

26. Explain the meaning of the following:

- (I) Field emission
- (II) Thermionic emission
- (III) Work function

Or

- (I) Dual nature of radiation
- (II) Secondary emission
- (III) Threshold frequency
- (IV) Stopping potential

27. Write the laws of the photoelectric effect.

28. What is the photoelectric effect? Establish Einstein's photoelectric equation.

29. What are matter waves? Derive de Broglie's wave equation.

30. The energy of a photon corresponding to a wavelength of 600 nm 3.32×10^{-19} Joule. What will be the energy of the photon corresponding to a wavelength of 4000 Å?
31. The threshold frequency of a metal is 3.32×10^{14} Hz. If light with a frequency of 8.2×10^{14} Hz is incident on the metal, calculate the stopping voltage for photoelectric emission.
32. Prove that the ratio of the smallest wavelengths of the Lyman, Balmer, and Paschen series lines is 1:4:9.
33. The half-life of a radioactive substance is 30 seconds. Calculate the following:
 - (I) Decay constant
 - (II) The time required for $3/4$ of the initial amount of the substance sample to decay.
34. Write three postulates of Rutherford's atomic model.
35. Write two drawbacks of Rutherford's atomic model.
36. Write three postulates of Bohr's atomic model.
37. In the Balmer series of the Hydrogen atom:
 - (I) Formula for finding the wavelength.
 - (II) What is the range of the largest and smallest wavelengths?
 - (III) In which region of the spectrum does this series fall?
38. Explain Bohr's quantization postulate using de Broglie's hypothesis.
39. Calculate the maximum and minimum wavelengths for the Lyman series of the hydrogen atom.
($R=1.097 \times 10^7 \text{ meter}^{-1}$)
40. Write the difference between intrinsic and extrinsic semiconductors.
41. What is a P-N junction diode? Draw its V-I characteristic curve by drawing its electric circuit in forward bias.
42. What is a P-N junction diode? Draw its V-I characteristic curve by drawing its electric circuit in reverse bias.
43. What is rectification? Describe the P-N junction diode as a half-wave rectifier under the following headings:
 - (I) Labeled circuit diagram
 - (II) Working
44. Explain the working of a P-N junction diode as a full-wave rectifier by drawing the electric circuit.

Long Answer Questions (4 Marks)

1. Ajay was walking with his friends when a truck passed by with the sign "Caution Explosive Material." A chain was attached to the truck and was touching the ground. Arun explained to his friends that the truck's axle cuts the magnetic field lines of the Earth's magnetic field during its motion. As a result, an electromotive force is induced across its ends. The induced charge leaks through the chain, which keeps the explosive material safe. Answer the following questions:
 1. What values did Ajay exhibit?
 2. When is induced electromotive force generated?
 3. Name the rule and state its principle for finding the direction of the induced current.
2. Ram, a class 10 student in a rural school, was gifted a bicycle with a dynamo fitted on it by his uncle. He was thrilled to receive it. He could see objects on the road at night by lighting the bulb while riding the bicycle. However, he did not know how this device worked. He asked this question to his teacher, and the teacher explained the answer to all the students. Answer the following questions:

1. On what principle does a dynamo work?
2. Explain electromagnetic induction.
3. Write two values exhibited by Ram and the teacher.
3. Pradeep's school teacher took the students on an educational tour to a power plant. The teacher explained that electric energy in the form of alternating current is transmitted over long distances to cities. The alternating current is stepped up to high voltage, and the voltage is reduced at receiving stations in cities for operating appliances. Consequently, very little energy is lost. Pradeep listened carefully to the teacher and asked questions. Answer the following questions:
 1. Name the device used to convert alternating voltage to a high or low value.
 2. Mention the reasons for power loss in this device.

Or

- 3. On what principle does a generator work?
- 4. Write the names of the main parts of an AC generator.
- 5. Write two values exhibited by Pradeep and the teacher.
- 4. A teacher was teaching Lenz's law in Physics. According to this law, the direction of the induced electromotive force always opposes the change in magnetic flux that caused it. This means that if the electromotive force is induced due to an increase in magnetic flux, the direction of the induced electromotive force will always oppose the increase in magnetic flux, and the opposite will also always be true. Answer the following questions:
 1. Does Lenz's law not follow the law of conservation of energy?
 2. By which other rule can the direction of the induced current be determined?
 3. How is Lenz's law useful in daily life?
 5. Ravi was watching a live cricket match with his friends. Suddenly, the picture on the TV screen started shaking. At that moment, they heard the sound of an airplane passing by. The shaking of the picture stopped after the airplane passed. A doubt arose in their minds whether the shaking of the pictures was related in any way to the airplane passing overhead. One of Ravi's friends was studying engineering. He resolved their doubt. Answer the following questions:²⁹⁸
 1. What values did Ravi's friend, who was studying engineering, exhibit?
 2. Is there any relation between the shaking of the pictures and the flying airplane? Justify your answer.

Long Answer Questions (5 Marks)

1. Write Gauss's theorem. With the help of this theorem, find the expression for the intensity of the electric field at a point due to a line charge.
 2. Write Gauss's theorem in electrostatics and find the expression for the intensity of the electric field near an infinite plane sheet of charge.
 3. What is a capacitor? Explain its principle. Derive the expression for a parallel plate capacitor and write one use of a capacitor.
 4. What is the potential energy of a capacitor? Derive its expression. In what form and where is this energy found?
- Unit 3: Moving Charges and Magnetism
5. Find the intensity of the magnetic field due to a straight, long, current-carrying conductor.

6. Find the intensity of the magnetic field on the axis of a current-carrying circular loop.
7. Write Ampere's circuital law. With its help, find the intensity of the magnetic field due to a long current-carrying solenoid.
8. Derive the expression for the force between two parallel current-carrying conductors. When will this force be attractive and when will it be repulsive? Define Ampere based on this force.

9. For a spherical surface, prove that:

$$\frac{\mu}{v} - \frac{1}{u} = \frac{\mu - 1}{R}$$

10. Write the lens maker's formula and prove it.
11. Find the formula for the refractive index of a prism.
12. Describe the compound microscope based on the following headings:
 1. Ray diagram for the formation of the image.
 2. Establishment of the formula for magnifying power when the image is formed:
 - (A) At the least distance of distinct vision.
 - (B) At infinity.
 3. Condition for high magnifying power.
13. Describe the astronomical telescope based on the following headings:
 1. Ray diagram for the formation of the image.
 2. Establishment of the formula for magnifying power when the image is formed:
 - (A) At the least distance of distinct vision.
 - (B) At infinity.
14. Find the expression for the fringe width in Young's double-slit experiment.