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CLASS 12

Physics

Sample Paper 4 - Questions

33 questions | 70 marks | 2026-27

Time: 3 hours. Answer all questions and subparts unless a choice is stated. Marks are shown on the right. Write answers on separate sheets. Independently prepared practice paper.

Section A - Objective questions

1. Which concept is illustrated in this example? Mass defect corresponds to energy through the mass-energy relation. **1**

(A) Magnetic force
(B) de Broglie wavelength
(C) Binding energy
(D) Lenz's law

2. Which statement correctly describes Electric field? **1**

(A) Inductive and capacitive reactances balance at a resonant frequency in a series RLC model.
(B) Changing magnetic flux induces an emf.
(C) Force per unit positive test charge defines the field.
(D) Stored charge divided by potential difference defines capacitance.

3. Which concept is illustrated in this example? Frequency affects maximum photoelectron kinetic energy. **1**

(A) Photoelectric effect
(B) Resonance in an AC circuit
(C) Coulomb's law
(D) Electric field

4. Which statement correctly describes Electromagnetic induction? **1**

(A) Changing magnetic flux induces an emf.

(B) Light reflects internally beyond the critical angle when travelling toward a lower-index medium.

(C) Coherent waves superpose to form a sustained intensity pattern.

(D) A p-n junction conducts asymmetrically under forward and reverse bias.

5. Which statement correctly describes Electric potential? **1**

(A) Coherent waves superpose to form a sustained intensity pattern.

(B) A p-n junction conducts asymmetrically under forward and reverse bias.

(C) Charge carriers have a small average velocity associated with current.

(D) Potential energy per unit charge is a scalar quantity.

6. Which statement correctly describes de Broglie wavelength? **1**

(A) Changing magnetic flux induces an emf.

(B) Coherent waves superpose to form a sustained intensity pattern.

(C) A particle's associated wavelength equals Planck's constant divided by momentum.

(D) Potential energy per unit charge is a scalar quantity.

7. Which concept is illustrated in this example? The circuit's impedance is then purely resistive under ideal assumptions. **1**

(A) Kirchhoff's junction rule

(B) Resonance in an AC circuit

(C) Binding energy

(D) Electric potential

8. Which statement correctly describes Lenz's law? **1**

(A) Inductive and capacitive reactances balance at a resonant frequency in a series RLC model.

(B) The induced response opposes the flux change responsible for it.

(C) Electrostatic force varies inversely with separation squared for point charges.

(D) Potential energy per unit charge is a scalar quantity.

9. Which concept is illustrated in this example? A capacitor stores charge when connected across a source. 1

(A) Total internal reflection
(B) Lenz's law
(C) Magnetic force
(D) Capacitance

10. Which concept is illustrated in this example? Electrons drift while also undergoing random thermal motion. 1

(A) Drift velocity
(B) Photoelectric effect
(C) Binding energy
(D) Coulomb's law

11. Which concept is illustrated in this example? Doubling the separation reduces force magnitude to one quarter. 1

(A) Coulomb's law
(B) Capacitance
(C) Resonance in an AC circuit
(D) Kirchhoff's junction rule

12. Which statement correctly describes Magnetic force? 1

(A) A p-n junction conducts asymmetrically under forward and reverse bias.
(B) Changing magnetic flux induces an emf.
(C) Conservation of charge balances current at a junction.
(D) A moving charge experiences a force related to velocity and magnetic-field orientation.

13. Which statement correctly describes Semiconductor diode? 1

(A) A p-n junction conducts asymmetrically under forward and reverse bias.
(B) A moving charge experiences a force related to velocity and magnetic-field orientation.
(C) Energy is required to separate a nucleus into its constituent nucleons.
(D) Potential energy per unit charge is a scalar quantity.

14. Which statement correctly describes Total internal reflection? **1**

(A) Force per unit positive test charge defines the field.

(B) Coherent waves superpose to form a sustained intensity pattern.

(C) Stored charge divided by potential difference defines capacitance.

(D) Light reflects internally beyond the critical angle when travelling toward a lower-index medium.

15. Which concept is illustrated in this example? Total incoming current equals total outgoing current in steady operation. **1**

(A) Binding energy

(B) Kirchhoff's junction rule

(C) Semiconductor diode

(D) Coulomb's law

16. Which statement correctly describes Interference? **1**

(A) Coherent waves superpose to form a sustained intensity pattern.

(B) Conservation of charge balances current at a junction.

(C) A moving charge experiences a force related to velocity and magnetic-field orientation.

(D) Stored charge divided by potential difference defines capacitance.

Section B - Short responses

17. An object is placed at twice the focal length of a convex lens with f = 38 cm. Calculate the image distance in cm using Cartesian signs. **2**

18. State the meaning of Electric field. Identify a relevant feature in this situation: A positive test charge experiences force along the field direction. **2**

19. An ideal transformer has primary voltage 200 V and turns ratio Ns/Np = 34/10. Calculate secondary voltage. **2**

20. Compare Resonance in an AC circuit and Coulomb's law. Give the meaning and an appropriate application of each. **2**

21. Light has frequency 29×10^{14} Hz. Use $h = 6.6 \times 10^{-34}$ J s. Give photon energy as a coefficient of 10^{-20} J. **2**

Section C - Short responses

22. Compare Lenz's law and Electromagnetic induction. Give the meaning and an appropriate application of each. **3**

23. A resistor of 33 ohms carries 3 A. Calculate power dissipated. **3**

24. Compare Semiconductor diode and Kirchhoff's junction rule. Give the meaning and an appropriate application of each. **3**

25. An object is placed at twice the focal length of a convex lens with f = 40 cm. Calculate the image distance in cm using Cartesian signs. **3**

26. State the meaning of Drift velocity. Identify a relevant feature in this situation: Electrons drift while also undergoing random thermal motion. **3**

27. An ideal transformer has primary voltage 200 V and turns ratio Ns/Np = 28/10. Calculate secondary voltage. **3**

28. State the meaning of Capacitance. Identify a relevant feature in this situation: A capacitor stores charge when connected across a source. **3**

Section D - Case and application questions

29. Consider this situation: An equipotential displacement involves no electrostatic work.

(a) Name the concept demonstrated in the case. **1**

(b) Explain the connection between the situation and that concept. **1**

(c) Distinguish that concept from Capacitance, giving an appropriate feature of each. **2**

30. Consider this situation: An optical fibre can guide light through repeated internal reflection.

(a) Name the concept demonstrated in the case. **1**

(b) Explain the connection between the situation and that concept. **1**

(c) Distinguish that concept from Photoelectric effect, giving an appropriate feature of each. **2**

Section E - Extended responses

31. (a) Explain Interference and analyse this application: Two suitable slits produce alternating bright and dark fringes. **5**
(b) Explain Semiconductor diode and show how this second application fits it: A diode can be used for rectification under suitable circuit conditions.

32. (a) Explain Magnetic force and analyse this application: A charge moving parallel to a magnetic field has zero magnetic force. **5**
(b) Explain Coulomb's law and show how this second application fits it: Doubling the separation reduces force magnitude to one quarter.

33. (a) Explain Coulomb's law and analyse this application: Doubling the separation reduces force magnitude to one quarter. **5**
(b) Explain Electric field and show how this second application fits it: A positive test charge experiences force along the field direction.

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