CBSE Class 12 Physics Exam 2025-26

Sample Practice Test - 3

SECTION-A

1. The force between two small charged spheres having charges of 1×10^{-7} C and 2×10^{-7} C placed 20 cm apart in air is

(A) 4.5×10^{-2} N
(B) 4.5×10^{-3} N
(C) 5.4×10^{-2} N
(D) 5.4×10^{-3} N

2. The coil of a moving coil galvanometer is wound over a metal frame in order to

(A) reduce hysteresis
(B) increase sensitivity
(C) increase moment of inertia
(D) provide electromagnetic damping

3. Two point charges +8q and – 2q are located at x = 0 and x = L respectively. The point on x axis at which net electric field is zero due to these charges is

(A) 8L
(B) 4L
(C) 2L
(D) L

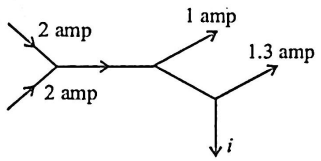
4. The total charge on the system of capacitors $C_1 = 1\ \mu F$, $C_2 = 2\ \mu F$, $C_3 = 4\ \mu F$ and $C_4 = 3\ \mu F$ connected in parallel is : (Assume a battery of 20 V is connected to the combination)

(A) 200 μC
(B) 200 C
(C) 10 μC
(D) 10 C

5. Two wires A and B of the same material, having radii in the ratio 1 : 2 and carry currents in the ratio 4 : 1. The ratio of drift speed of electrons in A and B is

(A) 16 : 1
(B) 1 : 16
(C) 1 : 4
(D) 4 : 1

6. The figure below shows currents in a part of electric circuit. The current *i* is

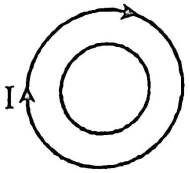


(A) 1.7 amp
(B) 3.7 amp
(C) 1.3 amp
(D) 1 amp

7. Magnetic permeability is maximum for

(A) diamagnetic substance
(B) paramagnetic substance
(C) ferromagnetic substance
(D) All of the above

8. Two different wire loops are concentric and lie in the same plane. The current in the outer loop (I) is clockwise and increases with time. The induced current in the inner loop



(A) is clockwise
(B) is zero
(D) has a direction that depends on the ratio of the loop radii.

9. When the current in a coil changes from 2 amp. to 4 amp. in 0.05 sec., an e.m.f. of 8 volt is induced in the coil. The coefficient of self inductance of the coil is

(A) 0.1 henry
(B) 0.2 henry
(C) 0.4 henry
(D) 0.8 henry

10. Match the Column I and Column II.

Column I	**Column II**
Electromagnetic wave	**Use**
(P) Ultraviolet rays	(1) In satellite signals
(Q) Infrared rays	(2) night vison and security cameras
(R) Microwave	(3) Television and cellular phones
(S) Radio wave	(4) detecting forged bank notes

(A) (P) → (4); (Q) → (2); (R) → (1); (S) → (3)
(B) (P) → (2); (Q) → (2); (R) → (4); (S) → (3)
(C) (P) → (4); (Q) → (3); (R) → (2); (S) → (1)
(D) (P) → (2); (Q) → (1); (R) → (4); (S) → (3)

11. When the number of nucleons in nuclei increases, the binding energy per nucleon

(A) increases continuously with mass number
(B) decreases continuously with mass number
(C) remains constant with mass number
(D) first increases and then decreases with increase of mass number

12. In _____ semiconductor, the fermi level lies in the energy gap, very close to conduction band.

(A) *p*-type
(B) *n*-type
(C) intrinsie
(D) None of these

For question numbers 13 to 16, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) If both A and R are true and R is the correct explanation of A
(B) If both A and R are true but R is NOT the correct explanation of A
(C) If A is true but R is false
(D) If both A and R are false

13. **Assertion (A) :** When a conductor is placed in an external electrostatic field, the net electric field inside the conductor becomes zero after a small instant of time.

Reason (R) : It is not possible to set up an electric field inside a conductor.

14. **Assertion (A) :** Density of all the nuclei is same.

Reason (R) : Radius of nucleus is directly proportional to the cube root of mass numbers.

15. **Assertion (A) :** Critical angle is minimum for violet colour.

Reason (R) : Because critical angle $\theta_c = \sin^{-1}\left(\frac{1}{\mu}\right)$ and $\mu \propto \frac{1}{\lambda}$.

16. **Assertion (A) :** The basic difference between various types of electromagnetic waves lies in their wavelength or frequencies.

Reason (R) : Electromagnetic waves travel through vacuum with the same speed.

SECTION-B

17. In an ideal transformer, the number of turns in the primary and secondary are 200 and 1000 respectively. If the power input to the primary is 10 kW at 200 V, calculate (I) output voltage and (II) current in primary.

OR

A resistance R and a capacitor C are connected in series to a source $V = V_0 \sin \omega t$.

Find :

(A) The peak value of the voltage across the (I) resistance and (II) capacitor.

(B) The phase difference between the applied voltage and current. Which of them is ahead?

18. How will the interference pattern in Young's double slit experiment get affected, when

(I) distance between the slits S_1 and S_2 reduced and

(II) the entire setup is immersed in water? Justify your answer in each case.

19. (I) Depict the equipotential surfaces for a system of two identical positive point charges placed a distance d apart.

(II) Write the expression for the potential energy of a system of two point charges q_1 and q_2 brought from infinity to the points with positions r_1 and r_2 respectively in presence of external electric field E.

20. (I) Define mutual induction.

(II) A pair of adjacent coils has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 20 A in 0.5 s, what is the change of flux linkage with the other coil?

21. A telescope consists of an objective of focal length 75 cm and an eyepiece of focal length 5 cm. Calculate the minimum and maximum magnifying power of the telescope.

OR

A container is filled with two different liquids which do not mix. The liquid of refractive index 1.6 is 40 cm deep and the liquid of refractive index 1.5 is 30 cm deep. What is the apparent depth of the vessel when viewed normally?

SECTION-C

22. (A) State two distinguish features of nuclear force.

(B) Draw a plot showing the variation of potential energy of a pair of nucleons as a function of their separation. Mark the regions on the graph where the force is (i) attractive and (ii) repulsive.

23. Compare n-type and p-type semiconductors.

24. A cell of emf 'E' and internal resistance 'r' is connected across a variable resistor 'R'. Plot a graph showing variation of terminal voltage 'V' of the cell versus the current 'I'. Using the plot, show how the emf of the cell and its internal resistance can be determined.

5. A deuteron and an alpha particle are accelerated with the same accelerating potential.

Which one of the two has

(A) greater value of de-Broglie wavelength, associated with it and

(B) less kinetic energy? Explain.

OR

(I) Monochromatic light of frequency 5.0×10^{14} Hz is produced by a laser. The power emitted is 3.0×10^{-3} W. Estimate the number of photons emitted per second on an average by the source.

(II) Draw a plot showing the variation of photoelectric current versus the intensity of incident rediation on a given photosensitive surface.

26. An equiconvex lens of refractive index μ_1 focal length 'f' and radius of curvature 'R' is immersed in a liquid of refractive index μ_2. For (i) $\mu_2 > \mu_1$, and (ii) $\mu_2 < \mu_1$, draw the ray diagrams in the two cases when a beam of light coming parallel to the principal axis is incident on the lens. Also find the focal length of the lens in terms of the original focal length and the refractive index of the glass of the lens and that of the medium.

27. Describe full wave rectification by diode.

28. Draw the intensity pattern of single slit diffraction and double slit interference. Hence, state two differences between interference and diffraction patterns.

SECTION-D

29. **Read the following paragraph and answer the questions.**

When the magnet with its N-pole facing the coil is moved towards the coil, the galvanometer shows some deflection while the magnet is in motion showing that an electric current is produced in the coil even though no conventional source of e.m.f. is in the circuit. The current is called the induced current and the e.m.f. responsible for it is called the **induced e.m.f.**

Faraday stated experimental observations in the form of a law called *Faraday's law of electromagnetic induction*. The law is stated below.

The magnitude of the induced emf in a circuit is equal to the time rate of change of magnetic flux through the circuit.

Mathematically, the induced emf is given by

$$\varepsilon = -\frac{d\Phi_B}{dt}$$

The negative sign indicates the direction of ε and hence the direction of current in a closed loop.

(I) Whenever the magnetic flux linked with an electric circuit changes, an emf is induced in the circuit. This is called

(A) electromagnetic induction

(B) lenz's law

(C) hysteresis loss

(D) kirchhoff's laws

(II) According to Faraday's law of electromagnetic induction

(A) electric field is produced by time varying magnetic flux.

(B) magnetic field is produced by time varying electric flux.

(C) magnetic field is associated with a moving charge.

(III) A magnet is moved towards a coil (i) quickly (ii) slowly, then the induced e.m.f. is

(A) larger in case (i)

(B) smaller in case (i)

(C) equal in both the cases

(D) larger or smaller depending upon the radius of the coil

(IV) An induced e.m.f. is produced when a magnet is plunged into a coil. The strength of the induced e.m.f. is independent of

(A) the strength of the magnet

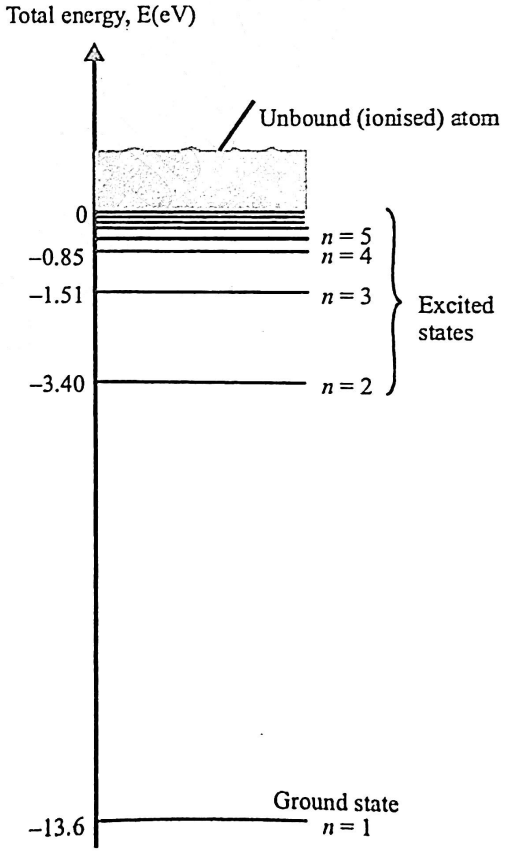
(B) number of turns of coil

(C) the resistivity of the wire of the coil

(D) speed with which the magnet is moved

30. Read the following paragraph and answer the questions.

The energy levels for hydrogen atom is shown below.



The energy of electron in n^{th} orbit of hydrogen atom is $E_n = \frac{-13.6}{n^2}$ eV

(I) The energy of a hydrogen atom in the ground state is – 13.6 *eV*. Find the energy of a He^+ ion in the first excited state

(II) Find the energy required for the electron excitation in Li^{++} from the first to the third Bohr orbit.

(III) Find the ratio of the energies of the hydrogen atom in its first to second excited states.

SECTION-E

31. (A) "The outward electric flux due to charge + Q is independent of the shape and size of the surface which encloses it." Give two reasons to justify this statement.

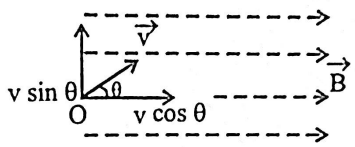
(B) Two large parallel plane sheets have uniform charge densities $+\sigma$ and $-\sigma$. Determine the electric field (i) between the sheets, and (ii) outside the sheets.

OR

(A) Define electric dipole moment. Is it a scalar or a vector? Derive the expression for the electric field of a dipole at a point on the equatorial plane of the dipole.

(B) Draw the equipotential surfaces due to an electric dipole. Locate the points where the potential due to the dipole is zero.

32. Describe the motion of a charged particle in a uniform magnetic field. Obtain an expression for the radius of the path of the charged particle moving perpendicular to uniform magnetic field. Show that the time taken to complete one revolution by the particle is independent of its speed.



OR

Two infinitely long straight parallel wires, '1' and '2', carrying steady currents I_1 and I_2 in the same direction are separated by a distance d. Obtain the expression for the magnetic field $\vec{B}$ due to the wire '1' acting on wire '2'. Hence find out, with the help of a suitable diagram, the magnitude and direction of this force per unit length on wire '2' due to wire '1'. How does the nature of this force changes if the currents are in opposite direction? Use this expression to define the S.I. unit of current.

33. (A) Draw a ray diagram to show image formation when the concave mirror produces a real, inverted and magnified image of the object.

(B) Obtain the mirror formula and write the expression for the linear magnification.

OR

(I) Derive the mathematical relation between refractive indices n_1 and n_2 of two radii and radius of curvature R for refraction at a convex spherical surface. Consider the object to be a point since lying on the principal axis in rarer medium of refractive index n_1 and a real image formed in the denser medium of refractive index n_2. Hence, derive lens maker's formula.

(II) Light from a point source in air falls on a convex spherical glass surface of refractive index 1.5 and radius of curvature 20 cm. The distance of light source from the glass surface is 100 cm. At what position is the image formed?