CBSE Class 12 Physics Exam 2025-26

Sample Practice Test - 2

SECTION-A

1. Which of the following is NOT the property of equipotential surface?
   (A) They do not cross each other.
   (B) The rate of change of potential with distance on them is zero.
   (C) For a uniform electric field they are concentric spheres.
   (D) They can be imaginary spheres.

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. A current of 10 A is flowing in a wire of length 1.5 m. A force of 15 N acts on it when it is placed in a uniform magneti field of 2 T. The angle between the magnetic field and the direction of the current is
   (A) 30°
   (B) 45°
   (C) 60°
   (D) 90°

4. The magnetic field due to a current carrying circular loop of radius 3 cm at a point on the axis at a distance of 4 cm from the centre is 54 μT. What will be its value at the centre of loop?
   (A) 125 μT
   (B) 150 μT
   (C) 250 μT
   (D) 75 μT

5. In normal adjustment, for a refracting telescope, the distance between objective and eye piece is 30 cm. The focal length of the objective, when the angular magnification of the telescope is 2, will be:
   (A) 20 cm
   (B) 30 cm
   (C) 10 cm
   (D) 15 cm

6. An object is placed 40 cm from a concave mirror of focal length 20 cm. The image formed is
   (A) real, inverted and same in size
   (B) real, inverted and smaller
   (C) virtual, erect and larger
   (D) virtual, erect and smaller

7. Match the physical quantities in Column I and their mathematical expressions in Column II.

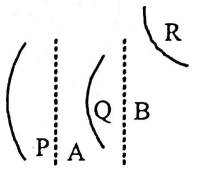
Column I	Column II
(P) Current	(1) $\frac{ne^2\tau}{m}$
(Q) Conductivity	(2) $\frac{1}{\rho}\left(\frac{d\rho}{dT}\right)$
(R) Current density	(3) $\vec{j}\cdot\overrightarrow{\Delta S}$
(S) Temperature coefficient of resistivity	(4) $nq\,\vec{v}_d$

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

8. By increasing the temperature, the specific resistance of a conductor and a semiconductor–
   (A) increases for both.
   (B) decreases for both.
   (C) increases for a conductor and decreases for a semiconductor.
   (D) decreases for a conductor and increases for a semiconductor.

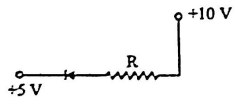
9. Two sources of light are said to be coherent, when they give light waves of same
   (A) amplitude and phase
   (B) wavelength and constant phase difference
   (C) intensity and wavelength
   (D) phase and speed

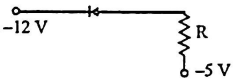
10. Figure shows wavefront P passing through two systems A and B and emerging as Q and then as R. The system A and B could, respectively, be
   (A) a prism and a convergent lens
   (B) a convergent lens and a prism
   (C) a divergent lens and a prism
   (D) a convergent lens and a divergent lens

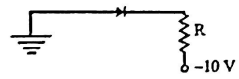


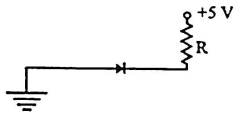
11. In a plane electromagnetic wave propagating in space has an electric field of amplitude 9×10^3 V/m, then the amplitude of the magnetic field is
   (A) 2.7×10^{12} T (B) 9.0×10^{-3} T (C) 3.0×10^{-4} T (D) 3.0×10^{-5} T

12. Of the diodes shown in the following diagrams, which one is reverse biased?

(A) 

(B) 

(C) 

(D) 

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) :** The force of repulsion between atomic nucleus and α-particle varies with distance according to inverse square law.

   Reason (R) : Rutherford did α-particle scattering experiment.

14. **Assertion (A) :** The property that the force with which two charges attract or repel each other are not affected by the presence of a third charge, is known as superposition of charges.

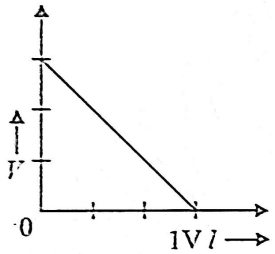
   Reason (R) : Force on any charge due to a number of other charge is the vector sum of all the forces on that charge [illegible] other charges, taken one at a time.

15. **Assertion (A) :** In semiconductors, thermal collisions are respossible for taking a valence electron to the conduction band.
Reason (R) : The number of conduction electrons go on increasing with time as thermal collisions continuously take place.

16. **Assertion (A) :** The kinetic energy of photoelectrons emitted from metal surface does not depend on the intensity of incident photon.
Reason (R) : The ejection of electrons from metallic surface is possible with frequency of incident photons below the threshold frequency.

SECTION-B

17. The plot of the variation of potential difference across a combination of three identical cells in series, versus current is shown below. What is the emf and internal resistance of each cell ?



18. Two narrow slits are illuminated by a single monochromatic source. Name the pattern obtained on the screen. One of the slits is now completely covered, what is the name of the pattern obtained now on the screen?

19. Two point charges 3 μ C and – 3 μ C are located 20 cm apart in vacuum.
(A) Calculate the electric field at the mid point O of the line AB, joining the charges.
(B) What is the force experienced by a negative test charge of magnitude 1.5×10^{-9} C placed at this point?

20. An equiconvex lens of focal length 15 cm is cut into two equal halves in thickness. What is the focal length of each half?

OR

A convex lens of focal length 30 cm is placed coaxially in contact with a concave lens of focal length 40 cm. Determine the power of the combination. Will the system be converging or diverging in nature?

21. Compare the magnetic field of a bar magnet and a solenoid.

OR

Out of the two magnetic materials, 'A' has relative permeability slightly greater than unity while 'B' has less than unity. Identify the nature of the materials 'A' and 'B'. Will their susceptibilities be positive or negative?

SECTION-C

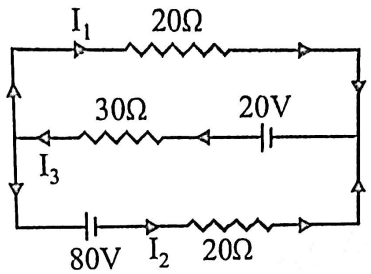
22. An inductor L of inductance X_L is connected in series with a bulb B and an ac source. How would brightness of the bulb change when (i) number of turn in the inductor is reduced, (ii) an iron rod is inserted in the inductor and (iii) a [illegible] is inserted in series in the circuit. Justify your answer in each case.

23. Two heating elements of resistances R_1 and R_2 when operated at a constant supply of voltage V, consume powers P_1 and P_2, respectively. Deduce the expressions for the power of their combination when they are, in turn, connected in

(i) series and (ii) parallel across their same voltage supply.

OR

Use Kirchhoff's rules to determine the value of the current I_1 flowing in the circuit shown in the figure.



24. (A) Write the necessary conditions for the phenomenon of total internal reflection to occur.

(B) Write the relation between the refractive index and critical angle for a given pair of optical media.

25. Define wavefront. Use Huygen's principle to verify the laws of refraction.

26. Draw a plot of α-particle scattering by a thin fail of gold to show the variation of the number of scattered particles with scattering angle. Describe briefly how the large angle scattering explains the existence of the nucleus inside the atom. Explain with the help of impact parameter picture, how Rutherford scattering serves a powerful way to determine an upper limit on the size of the nucleus.

27. If both the no. of p^+ and no. of n^0 s are conserved in each nuclear reaction, in what way is mass converted into energy or vice versa?

28. How are em waves produced by oscillating charges?

Draw a sketch of linearly polarized em waves propagating in *z*-direction. Indicate the directions of the oscillating electric and magnetic fields.

SECTION-D

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

A rectangular loop carrying a steady current I and placed in a uniform magnetic field experiences a torque. It does not experience a net force.

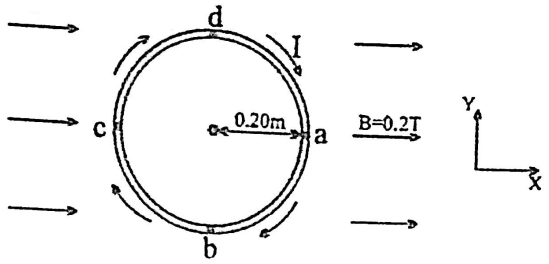
In a uniform magnetic field, torque is given by

$$\tau = \mathbf{m} \times \mathbf{B}$$

If the loop has N closely wound turns, the expression for torque, still holds, with

$$\mathbf{m} = NI\mathbf{A}$$

(I) A rigid circular loop has a radius of 0.20 m and is in the x-y plane. A clockwise current I is carried by the loop, as shown. T he magnitude of the magnetic moment of the loop is 0.75 A-m^2. A uniform external magnetic field, B = 0.20 T in the positive x-direction, is present



The magnitude of the magnetic torque exerted on the loop

(A) 0.15Nm

(B) 0.30Nm

(C) 0.45Nm

(D) 0.60Nm

(II) In figure, an external torque changes the orientation of loop from one of lowest potential energy to one of highest potential energy. Find the work done by the external torque.

(A) 0.3 J

(B) 0.6 J

(C) 0.9 J

(D) 1.2 J

(III) Current I is flowing in a coil of area A and number of turns is N, then find the magnetic moment of the coil.

(A) NIA^2 (B) NIA^3 (C) NIA^4 (D) NIA

(IV) A circular loop of area 0.02 m^2 carrying a current of 10A, is held with its plane perpendicular to a magnetic field induction 0.2 T. Calculate the torque acting on the loop is.

(A) 0.02Nm (B) 0.04Nm (C) 0.08Nm (D) 0.12Nm

30. Read the following paragraph and answer the questions.

Radiation energy is built up of discrete units – the so called *quanta of energy of radiation*. Each quantum of radiant energy has energy $h\nu$, where h is Planck's constant and ν the frequency of light.

According to Einstein, energy $h\nu$ of each quanta of radiation (photon) of incident light is partially utilised by an electron to overcome work function ϕ_0 and rest provides the maximum kinetic energy K_{max} to photoelectron during the emission.

For a given photosensitive material and frequency of incident radiation (above the threshold frequency), the photoelectric current is directly proportional to the intensity of incident light.

For a given photosensitive material and frequency of incident radiation, saturation current is found to be proportional to the intensity of incident radiation whereas the stopping potential is independent of its intensity.

(I) A physicist wishes to eject electrons by shining light on a metal surface. The light source emits light of wavelength of 450 nm. The table lists the only available metals and their work functions.

Metal	W_0 (eV)
Barium	2.5
Lithium	2.3
Tantalum	4.2
Tungsten	4.5

In a photoelectric effect experiment, for radiation with frequency υ_0 with $h\upsilon_0 = 8eV$, electrons are emitted with energy 2 eV. What is the energy of the electrons emitted for incoming radiation of frequency 1.25 υ_0?

(II) Light of a particular frequency ν is incident on a metal surface. When the intensity of incident radiation is increased, the photoelectric current will change.

(III) Define work function of a metal

SECTION-E

31. Derive the relation $C = \frac{\varepsilon_0 A}{d}$ for the capacitance of a parallel plate capacitor, where symbols have their usual meanings. A parallel plate capacitor is charged to a potential difference 'V' and disconnected from the supply. If the distance between the plates is doubled, explain how does (i) electric field and (ii) energy stored in the capacitor change?

OR

A capacitor is charged to potential V_1. The power supply is then disconnected and the capacitor is then connected in parallel to another capacitor of potential V_2.

(A) Derive an expression for the common potential of the combination of capacitor.

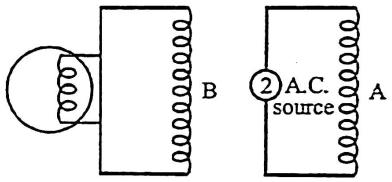
(B) Show that the total energy of combination is less than the sum of the energy stored in them before they are connected.

32. (I) State Faraday's law of electromagnetic induction.

(II) In the diagram given, a coil B is connected to low voltage bulb L and placed parallel to another coil 'A' as shown. Explain the following observations.

(A) Bulb lights and

(B) Bulb gets dimmer if the coil 'B' is moved upwards.



OR

(A) Describe a simple experiment (or activity) to show that the polarity of emf induced in a coil is always such that it tends to produce a current which opposes the change of magnetic flux that produces it.

(B) The current flowing through an inductor of self inductance L is continuously increasing. Plot a graph showing the variation of

(I) Magnetic flux versus the current

(II) Induced emf versus dI/dt

(III) Magnetic potential energy stored versus the current.

33. Explain the different types of materials on the basis of their energy gaps.

OR

Explain the effect of doping on energy bands of a semiconductor.