CBSE Class 12 Physics Exam 2025-26

Sample Practice Test - 5

SECTION-A

1. If E_a be the electric field strength of a short dipole at a point on its axial line and E_e that on the equatorial line at the same distance, then

(A) $E_e = 2E_a$
(B) $E_a = 2E_e$
(C) $E_a = E_e$
(D) None of these

2. A unit charge moves on an equipotential surface from a point A to point B, then

(A) $V_A - V_B = +ve$
(B) $V_A - V_B = 0$
(C) $V_A - V_B = -ve$
(D) it is stationary

3. A charged particle enters into a magnetic field with a velocity vector making an angle of 30° with respect to the direction of magnetic field. The path of the particle is

(A) circular
(B) helical
(C) elliptical
(D) straight line

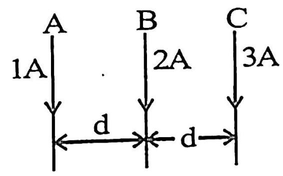
4. The ratio of intensity of magnetisation and magnetising field is called

(A) permeability
(B) magnetic intensity
(C) magnetic intensity
(D) magnetic susceptibility

5. The deflection in a moving coil galvanometer is

(A) directly proportional to the torsional constant
(B) directly proportional to the number of turns in the coil
(C) inversely proportional to the area of the coil
(D) inversely proportional to the current flowin g

6. Three wires A, B and C are situated at the same distance. A current of 1A, 2A, 3A flows through these wires in the same direction. Then the resultant force on B is directed



(A) Towards A
(B) Towards C
(C) Perpendicular to the plane of paper and outward
(D) Perpendicular to the plane of paper and inward

7. The focal length of the objective of a telescope is 60 cm. To obtain a magnification of 20, the focal length of the eye piece should be

(A) 2 cm
(B) 3 cm
(C) 4 cm
(D) 5 cm

8. **Column I** **Column II**

Column I		Column II
(P) Einstein Photoelectric equation	(1)	$\lambda = \frac{h}{p}$
(Q) de-Broglie relation	(2)	$K_{max} = h\nu - \phi_0$
(R) Threshold frequency	(3)	$\frac{p}{c}$
(S) Energy of photon	(4)	$\nu = \frac{\phi_0}{h}$

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

9. Nucleus of an atom whose atomic mass is 24 consists of
(A) 11 electrons, 11 protons and 13 neutrons
(B) 11 electrons, 13 protons and 11 neutrons
(C) 11 protons and 13 neutrons
(D) 11 protons and 13 electrons

10. A lens made of glass whose index of refraction is 1.60 has a focal length of + 20 cm in air. Its focal length in water, whose refractive index is 1.33, will be
(A) three times longer than in air
(B) two times longer than in air
(C) same as in air
(D) None of these

11. The radius of germanium (Ge) nuclide is measured to be twice the radius of $^{9}_{4}Be$. The number of nucleons in Ge are
(A) 74 (B) 75 (C) 72 (D) 73

12. Consider the diffraction pattern obtained from the sunlight incident on a pinhole of diameter 0.1 μm. If the diameter of the pinhole is slightly increased, it will affect the diffraction pattern such that
(A) Its size decreases, and intensity decreases
(B) Its size increases, and intensity increases
(C) Its size increases, but intensity decreases
(D) Its size decreases, but intensity increases

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 mass of a nucleus can be either less than or more than the sum of the masses of nucleons present.
Reason (R) : The half of total mass of the atom is concentrated in nucleus.

14. **Assertion (A) :** In photoelectric effect on increasing the intensity of light, kinetic energy of electrons increased but photoelectric current remains unchanged.

Reason (R) : The photoelectric current depends on frequency of light.

15. **Assertion (A) :** Bohr had to postulate that the electrons in stationary orbits around the nucleus do not radiate.

Reason (R) : According to classical physics all moving electrons radiate.

16. **Assertion (A):** Magnetic moment of an atom is due to both the orbital motion and spin motion of every electron.

Reason (R) : A charged particle produces magnetic field.

SECTION-B

17. A parallel plate capacitor with air between its plates having plate area of 6×10^{-3} m^2 and separation between them 3 mm is connected to a 100 V supply. Explain what would happen when a 3 mm thick mica sheet of dielectric constant 6 is inserted between the plates

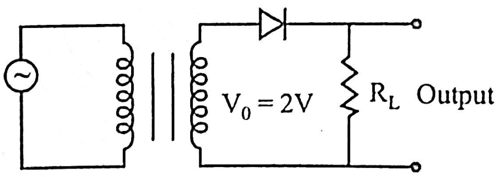
(A) while voltage supply remains constant and

(B) while voltage supply is disconnected.

18. What happens to the width of depletion layer of a p-n junction when it is

(I) forward biased? (II) reverse biased?

19. Consider the half wave rectifier in fig. Assume diode to be a silicon diode with a threshold voltage of 0.7 V. Draw the output if the input is a sine wave with an amplitude of 2 V.



20. Using lens maker's formula, derive the thin lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ for a biconvex lens.

OR

Calculate the speed of light in a medium whose critical angle is 45°. Does critical angle for a given pair of media depend on the wavelength of incident light? Give reason.

21. A plane electromagnetic wave travels along Z-direction. What can you say about directions of electric and magnetic field vector ? If the frequency of the wave is 30 MHz, what is its wavelength?

OR

Identify the electromagnetic radiation and write its wavelength range, which is used to kill germs in water purifier. Name the two sources of these radiations.

SECTION-C

22. (A) Calculate the distance of an object of height 'h' from a concave mirror of radius of curvature 20 cm, so as to obtain a real image of magnification 2. Find the location of image also.

(B) Using a mirror formula, explain why does a convex mirror always produce a virtual image.

23. Draw a labelled diagram of an ac generator. Obtain the expression for the emf induced in the rotating coil of N turns each of ... of a magnetic field $\vec{B}$.

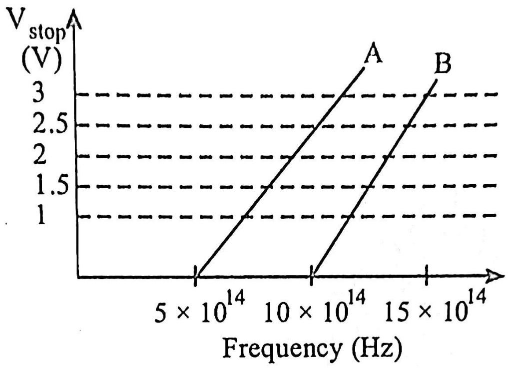
OR

(A) State lenz's law

(B) A vertical metallic pole falls down through the plane of the magnetic meridian. Will any e.m.f. be produced between its ends? Give reason for your answer.

24. Define relaxation time of the free electrons drifting in a conductor. How is it related to the drift velocity of free electrons? Use this relation to deduce the expression for the electrical resistivity of the material.

25. A student performs an experiment on photoelectric effect, using two materials A and B. A plot of V_{stop} vs ν is given in Fig.



(I) Which material A or B has a higher work function?

(II) Given the electric charge of an electron $= 1.6 \times 10^{-19}$ C, find the value of h obtained from the experiment for both A and B. Comment on whether it is consistent with Einstein's theory:

26. State the basic assumption of the Rutherford model of the atom. Explain in brief why this model cannot account for the stability of an atom?

27. Write any two distinguishing features between conductors, semiconductors and insulators on the basis of energy band diagrams.

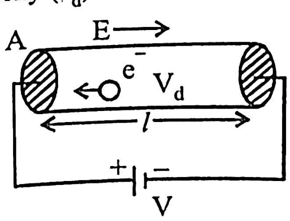
28. Two wavelengths of sodium light of 590 nm and 596 nm, are used in turn to study the diffraction taking place at a single slit of aperture 2×10^{-6} m. If the distance between slit and the screen is 1.5m, calculate the separation between the positions of the second maxima of diffraction pattern obtained in the two cases.

SECTION-D

29. Read the following paragraph and answer the questions.

The motion of free electrons in a conductor are continuous and random. They collide with positive metal ions and change direction during each collision. So thermal velocities are randomly distributed and average velocity is zero.

When a potential difference is applied across the ends of a conductor, electrons are drifted towards the positive terminal of the field, this velocity is called drift velocity (v_d).



Drift velocity is given by $V_d = \dfrac{e\tau E}{m}$

Here, τ is the average collision time for electrons

m = mass of electron

E= electric field

e = Charge on electron

Relation between drift velocity (V_d) and electric current (I) is given by $I = neAV_d$

(I) A metal wire is subjected to a constant potential difference. When the temperature of the metal wire increases, the drift velocity of the electron in it

(A) increases, thermal velocity of the electron increases

(B) decreases, thermal velocity of the electron increases

(C) increases, thermal velocity of the electron decreases

(D) decreases, thermal velocity of the electron decreases

(II) When a potential difference V is applied across a conductor at a temperature T, the drift velocity of electrons is proportional to

(A) $\sqrt{V}$ (B) V (C) $\sqrt{T}$ (D) T

(III) We are able to obtain fairly large currents in a conductor because

(A) the electron drift speed is usually very large

(B) the number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge

(C) the number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge

(D) the very small magnitude of the electron charge has to be divided by the still smaller product of the number density and drift speed to get the electric current

(IV) When a current I is set up in a wire of radius r, the drift velocity is v_d. If the same current is set up through a wire of radius 2 r, the drift velocity will be

(A) $4 v_d$ (B) $2 v_d$ (C) $v_d/2$ (D) $v_d/4$

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

Self Induction is a property of a coil due to which the coil opposes any change in the strength of current flowing through it by inducing an e.m.f. in itself. Whenever the key in the circuit is closed or opened, the current in the circuit increases or decreases. The variation of current causes a variation in magnetic flux linked with the circuit ($\therefore \phi \propto \beta \propto i$) hence, an induced emf is developed in the circuit.

From Faraday's law the induced emf is given by

$$\varepsilon = -\frac{d(N\Phi_B)}{dt} = -L\frac{dI}{dt} \qquad [\text{Using } N\Phi_B = LI]$$

Thus, the self-induced emf always opposes any change (increase or decrease) of current in the coil.

The total flux linked with the solenoid is

$N\Phi_B = (nl)(\mu_0 n I)(A) = \mu_0 n^2 A l I$

Where nl is the total number of turns.

Thus, the self-inductance of solenoid is,

$$L = \frac{N\Phi_B}{I} = \mu_0 n^2 A l$$

(I) When current in a coil changes from 5 A to 2 A in 0.1 s, average voltage of 50 V is produced. Find the self-inductance of the coil.

(II) Two solenoids of same cross-sectional area have their lengths and number of turns in ratio of 1 : 2 both. Find the ratio of self-inductance of two solenoids.

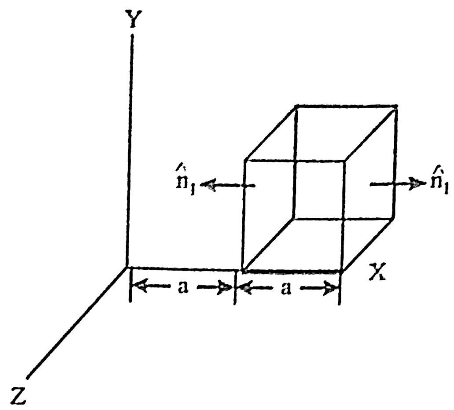
(III) Find the coefficient of self inductance of a solenoid is 0.18 mH. If a core of soft iron of relative permeability 900 is inserted, then find the coefficient of self inductance.

SECTION-E

31. (A) Two long charged plane sheets of charge densities σ and -2σ C/m² are arranged vertically with a separation of d between them. Deduce the expressions for the electric field at points (I) to the left of first sheet, (II) to the right of second sheet ... between two sheets.

(B) A cube which each side a is kept is an electric field. given by E = Cx. (as is shown in the figure where, C is a positive dimensional constant.

Find out :



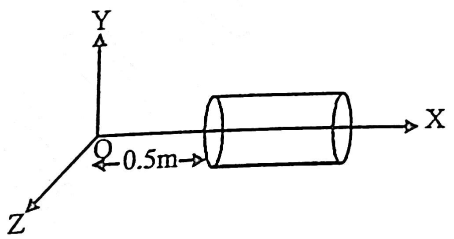
(I) The electric flux through the cube, and

(II) The net charge inside the cube.

OR

(A) State Gauss's law on electrostatics and derive an expression for the electric field due to a long straight thin uniformly charged wire (linear charge density λ) at a point lying at a distance r from the wire.

(B) A hollow cylindrical box of length 0.5 m and area of cross-section 20 cm^2 is placed in a three dimensional coordinate system as shown in the figure. The electric field in the region is given by $\bar{E} = 20x\,\hat{i}$, where E is NC^{-1} and x is in metres. Find :



(I) Net flux through the cylinder

(II) Charge enclosed in the cylinder

32. Derive an expression for the alternating current across a pure inductor L connected to an alternating source of e.m.f $E = E_0 \sin \omega t$. Explain the variation of e.m.f and current graphically and with a phasor diagram.

OR

Derive an expression for the alternating current across a pure capacitor C connected to an alternating ource of e.m.f. $E = E_0 \sin \omega t$. Explain the variation of e.m.f and current graphically and with a phasor diagram.

33. In Young's double slit experiment, the two slits 0.15 mm apart are illuminated by monochromatic light of wavelength 450 nm. The screen is 1.0 m away from the slits.

(I) Find the distance of the second

(A) bright fringe,

(B) dark fringe from the central maximum.

(II) How will the fringe pattern change if the screen is moved away from the slits?

OR

Use Huygens' principle to show the propagation of a plane wavefront from a denser medium to a rarer medium. Hence find the ratio of the speeds of wavefronts in the two media.