CBSE Class 12 Physics Exam 2025-26

Sample Practice Test - 6

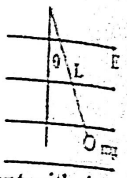
SECTION-A

1. Considering the Bohr model of hydrogen like atoms, the ratio of the ratio of the radius 5th orbit of the electron in Li^{2+} and He^{+} is

(A) $\frac{3}{2}$ (B) $\frac{4}{9}$ (C) $\frac{9}{4}$ (D) $\frac{2}{3}$

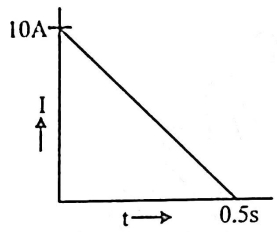
2. A small object with charge q and weight mg is attached to one end of a string of length 'L' attached to a stationary support. The system is placed in a uniform horizontal electric field 'E', as shown in the accompanying figure. In the presence of the field, the string makes a constant angle

θ with the vertical. The sign and magnitude of q-



(A) positive with magnitude mg/E (B) positive with magnitude (mg/E) tanθ
(C) negative with magnitude mg/E tanθ (D) positive with magnitude E tanθ/mg

3. In a coil of resistance 100 Ω a current is induced by changing the magnetic flux through it. The variation of current with time is as shown in the figure. The magnitude of change in flux through coil is

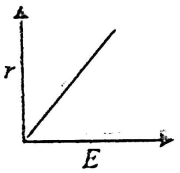


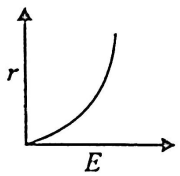
(A) 200 Wb (B) 275 Wb (C) 225 Wb (D) 250 Wb

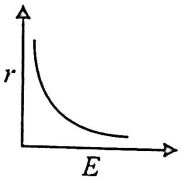
4. An electric charge 10^{-6} μC is placed at origin (0, 0) m of X – Y co-ordinate system. Two points P and Q are situated at $(\sqrt{3}, \sqrt{3})$ m and $(\sqrt{6}, 0)$ m respectively. The potential difference between the points P and Q will be :

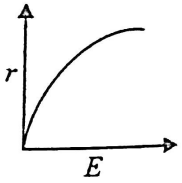
(A) $\sqrt{3}$V (B) $\sqrt{6}$V (C) 0 V (D) 3V

5. A particle of charge q, mass m and kinetic energy *E* enters in magnetic field perpendicular to its velocity and undergoes a circular arc of radius(r). Which of the following curves represents the variation of r with *E*?

(A) 

(B) 

(C) 

(D) 

6. The relative permeability of a substance X is slightly less than unity and that of substance Y is slightly more than unity, then
(A) X is paramagnetic and Y is ferromagnetic
(B) X is diamagnetic and Y is ferromagnetic
(C) X and Y both are paramagnetic
(D) X is diamagnetic and Y is paramagnetic

7. Let B_1 be the magnitude of magnetic field at center of a circular coil of radius R carrying current I. Let B_2 be the magnitude of magnetic field at an axial distance 'x' from the center. For x : R = 3 : 4, $\frac{B_2}{B_1}$ is :

(A) 4 : 5 (B) 16 : 25 (C) 64 : 125 (D) 25 : 16

8. A galvanometer has a coil of resistance 200 Ω with a full scale deflection at 20 μA. The value of resistance to be added to use it as an ammeter of range (0 – 20) mA is:

(A) 0.40Ω (B) 0.20Ω (C) 0.50Ω (D) 0.10Ω

9. Match List-I with List-II

List-I	List-II

(R) Transformer (III) Works on the principle of resonance in AC circuit

(S) Metal detector (IV) Changes an alternating voltage for smaller or greater value

Choose the correct answer from the options given below :-

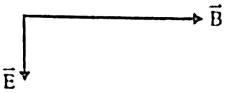
(A) (P) – (II), (Q) – (I), (R) – (IV), (S) – (III)

(B) (P) – (II), (Q) – (I), (R) – (III), (S) – (IV)

(C) (P) – (III), (Q) – (IV), (R) – (II), (S) – (I)

(D) (P) – (III), (Q) – (I), (R) – (II), (S) – (IV)

10. The diagram below shows the electric field (E) and magnetic field (B) components of an electromagnetic wave at a certain time and location.



The direction of the propagation of the electromagnetic wave is

(A) perpendicular to E and B and out of plane of the paper

(B) perpendicular to E and B and into the plane of the paper

(C) parallel and in the same direction as E

(D) parallel and in the same direction as B

11. A metallic plate exposed to white light emits electrons. For which of the following colours of light, the stopping potential will be maximum?

(A) Blue (B) Yellow (C) Red (D) Violet

12. The energy of an electron in n^{th} orbit of hydrogen atom is $E_n = -13.6/n^2$eV. The negative sign of energy indicates that

(A) electron is free to move.

(B) electron is bound to the nucleus.

(C) kinetic energy of electron is equal to potential energy of electron.

(D) atom is radiating energy.

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):** For the radiation of a frequency greater than the threshold frequency, photoelectric current is proportional to the intensity of the radiation.

Reason (R) : Greater the number of energy quanta available, greater is the number of electrons absorbing the energy quanta and greater is number of electrons coming out of the metal.

14. **Assertion (A) :** Putting p type semiconductor slab directly in physical contact with n type semiconductor slab cannot form the pn junction.

Reason (R) : The roughness at contact will be much more than inter atomic crystal spacing and continuous flow of charge carriers is not possible.

15. **Assertion (A) :** An electron has a higher potential energy when it is at a location associated with a negative value of potential and has a lower potential energy when at a location associated with a positive potential.

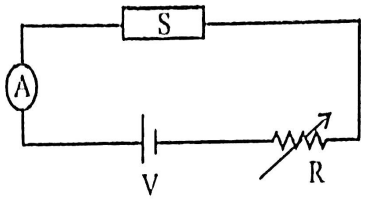
Reason (R) : Electrons move from a region of higher potential to a region of lower potential.

16. **Assertion (A) :** Propagation of light through an optical fibre is due to total internal reflection taking place at the core-cladding interface.

Reason (R): Refractive index of the material of the cladding of the optical fibre is greater than that of the core.

SECTION-B

17. The figure shows a piece of pure semiconductor S in series with a variable resistor R and a source of constant voltage V. Should the value of R be increased or decreased to keep the reading of the ammeter constant, when semiconductor S is heated? Justify your answer



18. Plot a graph showing variation of de Broglie wavelength (λ) associated with a charged particle of mass m, versus $1/\sqrt{V}$, where V is the potential difference through which the particle is accelerated. How does this graph give us the information regarding the magnitude of the charge of the particle ?

19. A ray of monochromatic light passes through an equilateral glass prism in such a way that the angle of incidence is equal to the angle of emergence and each of these angles is 3/4 times the angle of the prism. Determine the angle of deviation and the refractive index of the glass prism.

20. A heating element using nichrome connected to a 230 V supply draws an initial current of 3.2 A which settles after a few seconds to a steady value of 2.8 A. What is the steady temperature of the heating element if the room temperature is 27.0 °C and the temperature coefficient of resistance of nichrome is 1.70×10^{-4} °C^{-1} ?

OR

A current of 5 A passes through a copper conductor (resistivity) = $1.7\times10^{-8}\Omega$m) of radius of cross-section 5 mm. Find the mobility of the charges if their drift velocity is 1.1×10^{-3} m/s.

21. Show that the least possible distance between an object and its real image in a convex lens is 4f, where f is the focal length of the lens.

OR

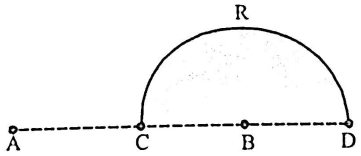
In an astronomical telescope in normal adjustment a straight black line of length L is drawn on the objective lens. The eyepiece forms a real image of this line whose length is ℓ What is the angular magnification of the telescope?

SECTION-C

22. A given coin has a mass of 3.0 g. Calculate the nuclear energy that would be required to separate all the neutrons and protons from each other. For simplicity assume that the coin is entirely made of $^{63}_{29}Cu$ atoms (of mass 62.92960 u).

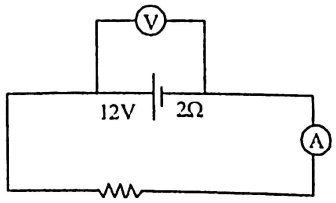
Given $m_p = 1.007825$u and $m_n = 1.008665$u.

23. Charges (+q) and (–q) are placed at the points A and B respectively which are a distance 2L apart. C is the midpoint between A and B. What is the work done in moving a charge +Q along the semicircle CRD.

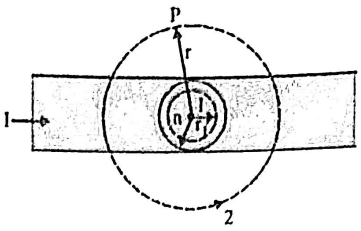


24. The total energy of an electron in the first excited state of the hydrogen atom is about –3.4 eV.
    (A) What is the kinetic energy of the electron in this state?
    (B) What is the potential energy of the electron in this state?
    (C) Which of the answers above would change if the choice of the zero of potential energy is changed?

25. (A) The potential difference applied across a given resistor is altered so that the heat produced per second increases by a factor of 9. By what factor does the applied potential difference change?
    (B) In the figure shown, an ammeter A and a resistor of 4 Ω are connected to the terminals of the source. The emf of the source is 12V having an internal resistance of 2Ω. Calculate the voltmeter and ammeter readings.



26. The given figure shows a long straight wire of a circular cross-section (radius a) carrying steady current I. The current I is uniformly distributed across this cross-section. Calculate the magnetic field in the region $r < a$ and $r > a$.



27. A capacitor, made of two parallel plates each of plate area A and separation d, is being charged by an external ac source. Show that the displacement current inside the capacitor is the same as the current charging the capacitor.

28. A long straight current carrying wire passes normally through the centre of circular loop. If the current through the wire increases, will there be an induced emf in the loop? Justify.

OR

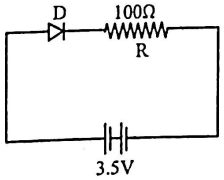
Describe a simple experiment (or activity) to show that the polarity of emf induced in a coil is always such that it tends to produce a current which opposes the change of magnetic flux that produces it.

SECTION-D

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

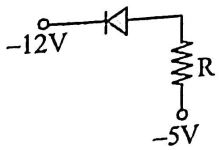
A semiconductor diode is basically a pn junction with metallic contacts provided at the ends for the application of an external voltage. It is a two terminal device. When an external voltage is applied across a semiconductor diode such that p-side is connected to the positive terminal of the battery and n-side to the negative terminal, it is said to be forward biased. When an external voltage is applied across the diode such that n-side is positive and p-side is negative, it is said to be reverse biased. An ideal diode is one whose resistance in forward biasing is zero and the resistance is infinite in reverse biasing. When the diode is forward biased, it is found that beyond forward voltage called knee voltage, the conductivity is very high. When the biasing voltage is more than the knee voltage the potential barrier is overcome and the current increases rapidly with increase in forward voltage. When the diode is reverse biased, the reverse bias voltage produces a very small current about a few microamperes which almost remains constant with bias. This small current is reverse saturation current.

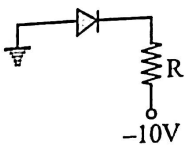
(I) In the given figure, a diode D is connected to an external resistance $R = 100\ \Omega$ and an emf of 3.5 V. If the barrier potential developed across the diode is 0.5 V, the current in the circuit will be:

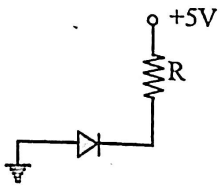


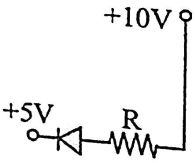
(A) 40 mA (B) 20 mA (C) 35 mA (D) 30 mA

(II) In which of the following figures, the pn diode is reverse biased?

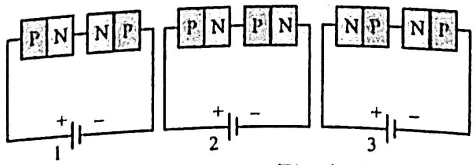
(A)


(B)


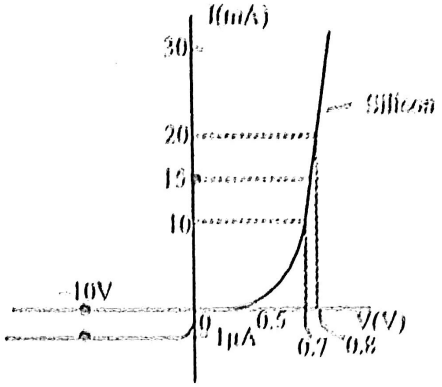
(C)


(D)


(III) Two identical PN junctions can be connected in series by three different methods as shown in the figure. If the potential difference in the junctions is the same, then the correct connections will be



(A) in the circuits (1) and (2) (B) in the circuits (2) and (3)
(C) in the circuits (1) and (3) (D) only in the circuit (1)



(IV) The V-I characteristic of a diode is shown in the figure. The ratio of the resistance of the diode at I = 15 mA to the resistance at V = -10 V is

(A) 100 (B) 10^6 (C) 10 (D) 10^4

Read the following paragraph and answer the questions.

A convex or converging lens is thicker at the centre than at the edges. It converges a beam of light on refraction through it. It has a real focus. Convex lens is of three types: Double convex lens, Plano convex lens and Concavo-convex lens.

Concave lens is thinner at the centre than at the edges. It diverges a beam of light on refraction through it. It has a virtual focus. Concave lenses are of three types: Double concave lens, Plano concave lens and Convexo-concave lens.

When two thin lenses of focal lengths f_1 and f_2 are placed in contact with each other along their common principal axis, then the two lens system is regarded as a single lens of focal length f and

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

If several thin lenses of focal length f_1, f_2, ... f_n are placed in contact, then the effective focal length of the combination is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + ... + \frac{1}{f_n}$$

and in terms of power, we can write

$$P = P_1 + P_2 + ... + P_n$$

The value of focal length and power of a lens must be used with proper sign consideration.

(I) Given is a thin convex lens of glass (refractive index μ) and each side having radius of curvature R. One side is polished for complete reflection. At what distance from the lens, an object be placed on the optic axis so that the image gets formed on the object itself.

(II) A lens having refractive index 1.6 has focal length of 12 cm, when it is in air. Find the focal length of the lens when it is placed in water. (Take refractive index of water as 1.28)

(III) What is the relative decrease in focal length of a lens for an increase in optical power by 0.1 D from 2.5 D? ['D' stands for dioptre]

SECTION-E

31. (I) Draw a ray diagram for the formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2. Hence derive lens maker's formula.

(II) A converging lens has a focal length of 10 cm in air. It is made of a material of refractive index 1.6. If it is immersed in a liquid of refractive index 1.3, find its new focal length.

OR

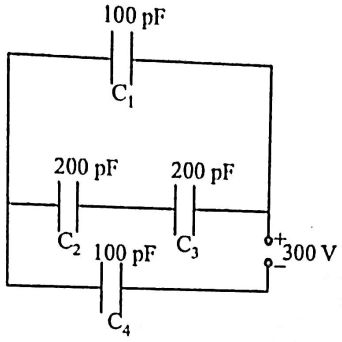
Define a wavefront. How is it different from a ray? ... secondary wavelets draw a diagram showing the passage of a plane wavefront from

(III) In a double slit experiment using light of wavelength 600nm and the angular width of the fringe formed on a distant screen is 0.1°. Find the spacing between the two slits.

(IV) Write two differences between interference pattern and diffraction pattern.

32. (I) Derive an expression for the capacitance of a parallel plate capacitor with air present between the two plates.

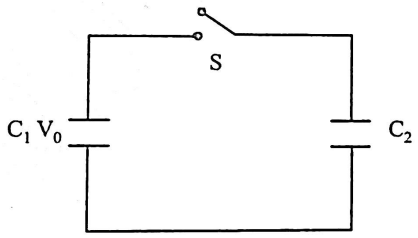
(II) Obtain the equivalent capacitance of the network shown in figure. For a 300 V supply, determine the charge on each capacitor.



OR

(I) A dielectric slab of thickness 't' is kept between the plates of a parallel plate capacitor with plate separation 'd' ($t < d$). Derive the expression for the capacitance of the capacitor.

(II) A capacitor of capacity C_1 is charged to the potential of V_0. On disconnecting with the battery, it is connected with an uncharged capacitor of capacity C_2 as shown in the adjoining figure. Find the ratio of energies before and after the connection of switch S.



33. (A) Draw graphs showing the variations of inductive reactance and capacitive reactance with frequency of applied ac source.

(B) Draw the phasor diagram for a series LRC circuit connected to an AC source.

(C) When an alternating voltage of 220V is applied across a device X, a current of 0.25A flows which lags behind the applied voltage in phase by $\pi/2$ radian. If the same voltage is applied across another device Y, the same current flows but now it is in phase with the applied voltage.

(I) Name the devices X and Y.

(II) Calculate the current flowing in the circuit when the same voltage is applied across the series combination of X and Y.

OR

(A) A series LCR circuit is connected to an ac source. Using the phasor diagram, derive the expression for the impedance of the circuit.

(B) Plot a graph to show the variation of current with frequency of the ac source, explaining the nature of its variation for two different resistances R_1 and R_2 ($R_1 < R_2$) at resonance.