LOYAL EDUCATION
Result Oriented

P H Y S I C S

(DAILY PRACTICE PAPER) **[CLASS - 12]**

CLASS - XII

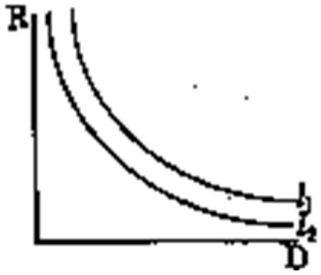
General Instructions

1. All the questions are compulsory there are 33 questions in all. Total 10 pages are there.
2. The question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains sixteen questions, twelve MCQ and four assertion reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.
4. There is no overall choice. However, an internal choice has been provided in Two question in Section B, one question in Section C and all three questions in Section E. You have to attempt only one of the choices in such questions.
5. Use of calculators is not allowed.
   You may use the following values of physical constants wherever necessary:
   $c = 3 \times 10^8$ m/s
   $h = 6.63 \times 10^{-34}$ Js
   $e = 1.6 \times 10^{-19}$ C
   $\mu_0 = 4\pi \times 10^{-7}$ Tm A^{-1}
   $\varepsilon_0 = 8.854 \times 10^{-12}$ C^{2}N^{-1} m^{-2}
   $1/4\pi\varepsilon_0 = 9 \times 10^9$ N m^{2}C^{-2}
   Mass of electron (m_e) $= 9.1 \times 10^{-31}$ kg
   Mass of neutron $= 1.675 \times 10^{-27}$ kg
   Mass of proton $= 1.673 \times 10^{-27}$ kg
   Avogadro's number $= 6.023 \times 10^{23}$ per gram mole
   Boltzmann constant $= 1.38 \times 10^{-23}$ JK^{-1}

SECTION - A

1. If a light ray of wavelength λ is incident on a prism of refractive index μ and small angle A, then the ray will be deviated with an angle proportional to:
   (a) refractive index of prism material.
   (b) wavelength of light.
   (c) frequency of light.
   (d) angle of incidence.

2. The graph shows the variation of resistance of a metal wire as a function of its diameter with lengths l_1 and l_2 then,



(a) Resistance of a wire is indirectly proportional to its length.
(b) For the same diameter, the wire with a greater length will have a lower resistance.
(c) We have sufficient information to conclude that $l_1 > l_2$
(d) All above statements are correct.

3. The magnetic field at a point 15 cm away from a straight wire carrying 6 A current will be:
(a) 4×10^{-6} T (b) 8×10^{-6} T
(c) 12×10^{-6} T (d) 2×10^{-6} T

4. Prism of angle 2º deviates an incident ray through an angle of 1º, then the refractive index of the prism's material will be:
(a) 1.5 (b) 3 (c) 2.5 (d) 1

5. Which of the following statement is true?
(a) Electrostatic force is a conservative force.
(b) Potential at a point is the work done per unit charge in bringing a charge from any point to infinity.
(c) Electrostatic force is non-conservative.
(d) Potential is the product of charge and work.

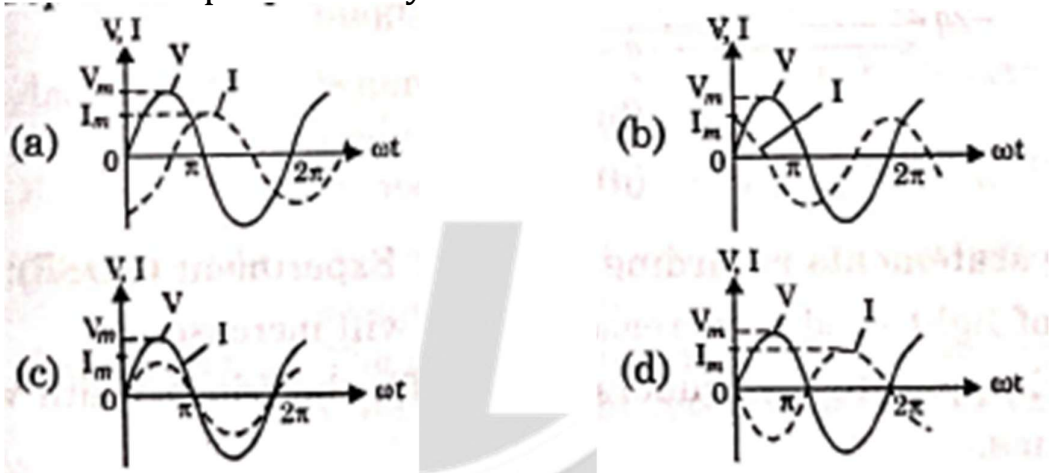
6. A dipole is placed in a uniform electric field directed from west to east. If the position of dipole is along the electric field then:
(a) the torque acting on the dipole is negative.
(b) no torque is acting on the dipole.
(c) the torque acting on the dipole is positive.
(d) the torque acting on the dipole is infinite.

7. If an EM wave has B, Bo sin (100t-20πx) then we can deduce that:
(a) It is propagating along-ve x-axis with electric field oscillation in-ve y-axis.
(b) It is propagating along +ve x-axis with electric field oscillations along-ve y-axis.

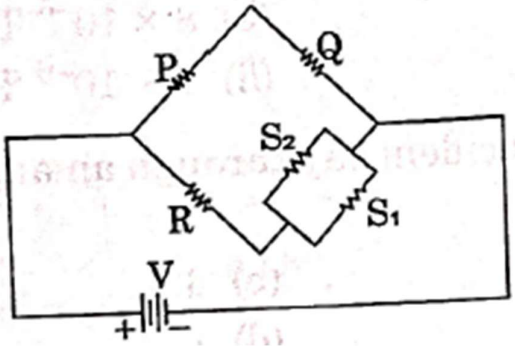
(c) It is propagating along-ve x-axis with electric field oscillation along +ve y-axis.

(d) It is propagating along +ve x-axis with electric field oscillation along +ve y-axis.

8. The phase relationship between current and voltage in a pure resistive circuit is best represented by:



9. In a Wheatstone bridge, three resistances P, Q and R are connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected as show figure.
Which of the following statement is NOT true for this circuit?



(I) No current will flow in the galvanometer arm of the Wheatstone bridge when $PS_1 S_2 = RQ (S_1 + S_2)$

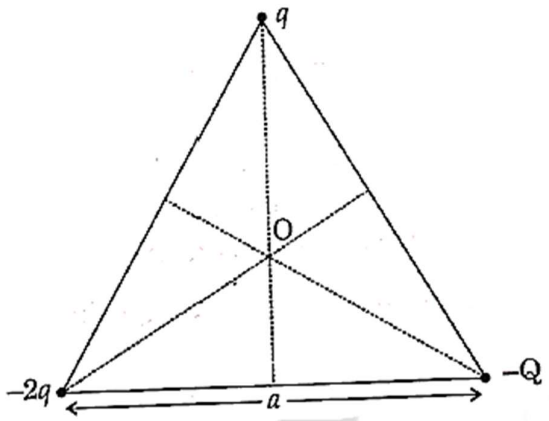
(II) The bridge will be balanced when $P/Q = R/S$ where S is $(S_1+S_2) / S_1S_2$

(III) If resistances S_1 and S_2 are connected in series instead of parallel, then Q should be decreased to maintain the balanced state.

(a) only (I) (b) both (II) and (III)

(c) only (III) (d) both (I) and (II)

10. Three point charges q, -2q and -Q are placed at corners of an equilateral triangle of a side 'a' as shown in figure. The relation between Q and q for which potential at the centre of the square is zero, is:



(a) Q = q (b) Q = -q
(c) Q = -2q (d) Q = 2q

11. Consider the following statements regarding Young's Double Slit Experiment (YDSE):
    1. If the wavelength of light used is increased, the fringe width will increase.
    2. If the whole YDSE apparatus is immersed in water ($\mu = 1.5$), the fringe width will decrease by 1.5 times.
    3. If the distance between the slits and the screen (D) is decreased, the fringe width will decrease.
    4. If one of the slits is blocked with an opaque object, the fringe pattern will disappear.

    Choose the correct option:
    (a) All statements are correct.
    (b) Only statements 1, 2, and 4 are correct.
    (c) Only statements 1 and 3 are correct.
    (d) Only statements 2 and 3 are correct.
12. Two identical objects are moving with constant speed towards two optical devices X and Y with following results.

Devices	Device type	Motion of object	Motion of light
X	Mirror	Uniform motion	Non- uniform motion away from X
Y	Lens	Uniform motion	Non- uniform motion away from Y

Identify X and Y.
(a) X: Concave mirror, Y: Concave lens
(b) X: Concave mirror, Y: Convex lens
(c) X: Convex mirror, Y: Concave lens
(d) X: Convex mirror, Y: Convex lens

For Questions 13 to 16, two statements are given one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

13. Assertion (A): For larger magnification, a simple microscope of magnification 10 can be used.
Reason (R): The second lens is used in simple microscope for enhancing the effect of other.

14. Assertion (A): When a rectangular coil is placed in magnetic field, it starts rotating.
Reason (R): The force on two perpendicular arms of a rectangular coil placed in a magnetic field is equal and opposite.

15. Assertion (A): When AC current is flowing through LCR circuit and $L = C$, current and emf are in phase with each other.
Reason (R): Impedance of the circuit becomes equal to the R.

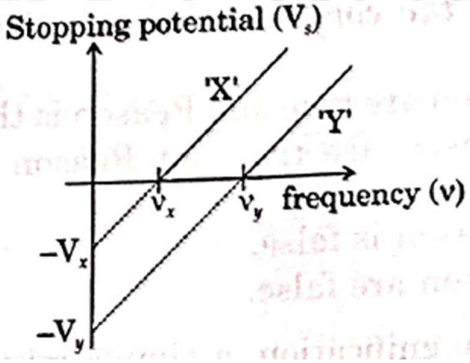
16. Assertion (A): When white light passes through a glass prism, the deviation produced is minimum for the red color.
Reason (R): The angle of deviation depends on the refractive index of the prism for the color of light, and red light has the lowest refractive index in glass.

SECTION - B

17. Show that the Gauss's law helds true for magnetic field of a point dipole moment M at the origin for the surface which is a sphere of radius r?
18. Two wires of aluminium and copper of radius 0.12 cm are connected in series carrying current of 20 A.
    (A) What will be the current density in aluminium wire?
    (B) Calculate the drift velocity of electrons in copper wire if number density of electrons is 8.4 x $10^2/m^3$.

    OR

    Rahul is trying to fix LED lights for diwali. He has only one wire and the cell he was using last year is being replaced by a cell with twice the emf. He thought of increasing the resistivity of his wire to compensate for that. To increase resistivity of a conductor what factors should Rahul change and how?
19. Draw the figures of p-n junction diode showing the difference in the widths of the depletion layer in forward and reversed biasing.
20. The graph below shows the variation of the stopping potential (V) vs the frequency (v) of incident light for two different materials 'X' and 'Y'.

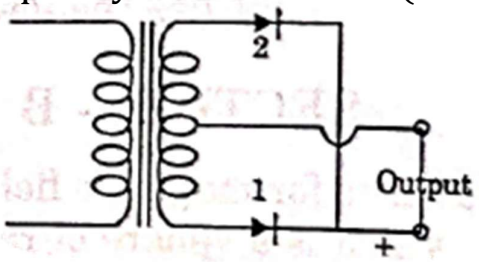


From the given graph, identify:
(A) Which material has the higher work function?
(B) Which material exhibits the photoelectric effect at a lower frequency?

OR

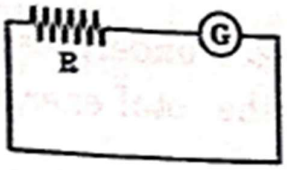
Plot a graph showing variation of maximum kinetic energy of photoelectrons with frequency for two different value of intensities I, and I_2 of incident radiation.

21. A full-wave rectifier is supplied with 220 V, 50 Hz AC. The transformer has a turns ratio of 10:1, and the diodes are ideal. Calculate:
    (A) the average DC output voltage.
    (B) the DC output current, if the load resistance $R_1 = 100\ \Omega$.
    (C) the output frequency of the rectifier. (Take n = 3.14)



SECTION - C

22. If R is a high value resistance then will the galvanometer behave as a voltmeter? If yes then derive the expression for required value of R in terms of required range of voltmeter.



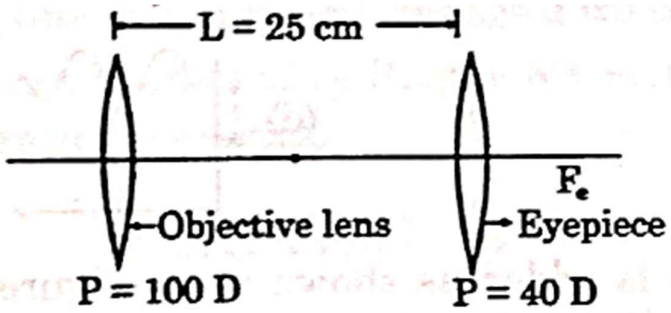
OR

(A) Draw a neat, labeled diagram showing two identical short bar magnets, each having a magnetic moment of 24 Am^2, placed perpendicular to each other as described: one along the X-axis and the other along the Y-axis. The center-to-center distance between their poles is such that point P lies at equal distances of 5 cm from the center of each magnet.
(B) Calculate the resultant magnetic field at point P (midpoint between the two magnets).

23. Neha uses a portable electric lamp to light up her keyboard when working on her computer at night. The lamp consists of two small bulbs each of resistance 2 Ω connected in series and is powered by a 20 V battery.
    (A) How much current is drawn by the portable lamp?
    (B) Each of the two bulbs in the portable lamp is rated for continuous use of 10 hours only before they burn out. If the battery can

supply a total energy of 4000 kJ, which of the two occurs first: the lamp burns out or the battery drains out? Show the working.

24. Mass number of a nucleus of an atom is A, by neglecting the mass of the orbital electrons. Find the nuclear density of the nucleus ?
25. An optical instrument is designed with following specifications.



Identify the instrument and calculate its angular magnification if image is formed at infinity.

26. For a p-n junction diode, following data is obtained:

Biasing	V	I
Forward	2 V	60 mA
	2.4 V	80 mA
Reverse	0 V	0 μA
	-2 V	-0.25 μA

Find the forward and reverse biased resistance of the given diode.

27. Draw labeled diagram of an AC circuit consisting of an inductor (L), a capacitor (C), and three resistors R1, R2, R3 arranged such that R1 is in series with a parallel combination of R2 and R3. This entire combination is in series with L and C. Derive an expression for impedance of this circuit.
28. (A) In a nuclear reactor, 1 g of U-235 undergoes complete fission. If each fission releases 200 MeV of energy, calculate the total energy produced. How long could this energy power a 100 W bulb.

(B) Calculate the energy released in fusion reaction:

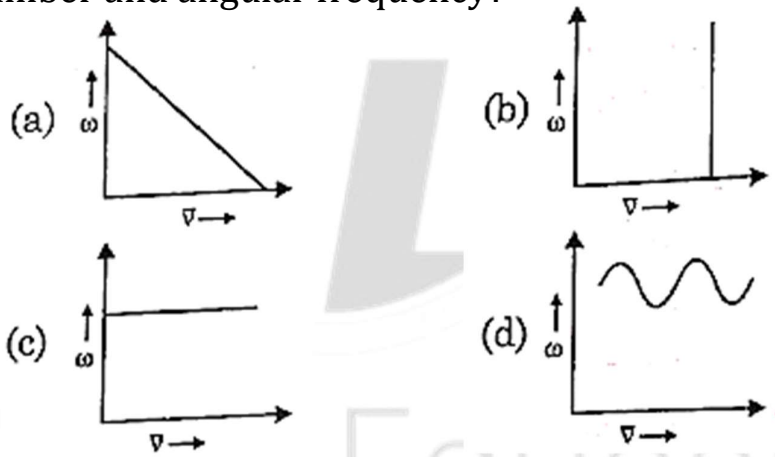
$$^{2}H_{1} + {}^{2}H_{1} \rightarrow {}^{3}He_{2} + n$$

Given, BE of $^{2}He_{1} = 2.23$ MeV and of $_{3}He = 7.73$ MeV.

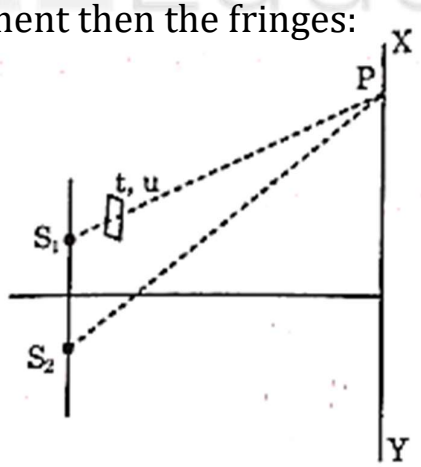
SECTION - D

29. When two tuning forks are struck simultaneously, they produce sound waves almost in the same phase. Their phase difference varies slowly with time. Such variations can be detected easily by human ear. The phase difference between two independent light bulb changes by 10 per second. Therefore, we can observe interference of sound using our senses but we cannot observe the interference pattern of light.

(A) Which of the given graph shows correct relation between wave number and angular frequency?



(B) If a thin film of mica is added as shown in the figure in Young's double experiment then the fringes:

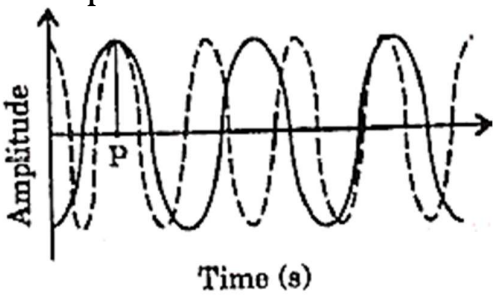


(a) shift towards P (b) shift towards Y
(c) become narrower (d) disappear entirely

(C) If the ratio of two intensities of two waves is 9:1, then the ratio of amplitude of two waves:

(a) 9:1 (b) 1:9 (c) 3:1 (d) 1:3

(D) The figure shows two waves travelling in a medium with same amplitude A but different frequencies. The resultant amplitude of these waves at point P is:



(a) A (b) 2 A (c) A/2 (d) zero

30. De-Broglie hypothesis show that wave particle duality was not only a behaviour of light but was a fundamental principle exhibited by both radiation and matter. It is possible to use wave equation to describe material behaviour as long as one properly applies the de-Broglie wavelength. Though the broglie hypothesis predicts wavelength of matter of any size, there are realistic limits only when it's useful. A cricket ball shot towards the boundary has de-Broglie wavelength smaller than the diameter of a proton by about 20 orders of magnitude.

(A) Two cars, A and B, are in motion. Car A has speed v and de-Broglie wavelength λ. Car B moves with twice the speed of car A and has double the kinetic energy. Determine 2 the de-Broglie wavelength of car B in terms of λ.

(B) A cricket ball of mass 60 g is moving with velocity 11 m/s. Calculate its de-Broglie wavelength. How does de-Broglie wavelength change if we double the velocity of ball? 1

(C) Draw a graph showing the variation of de Broglie wavelength of a particle of charge q and mass m with accelerating potential.

SECTION - E

31. With the help of a diagram, explain the construction and working of an astronomical telescope when it forms final image at the least distance of distinct vision and at infinity.

OR

(A) With the wavefront diagram, explain what should be the approximate size of the aperture to observe the diffraction of light.

(B) Distinguish between diffraction and interference.

32. (A) Using phasor diagram, derive an expression for the average value of power over a cycle when an AC voltage is applied to a resistor.

(B) If peak voltages are given to be 200 V and resistor has a what will be the average power dissipated?

OR

(A) If a source of emf is connected to an inductor L and current starts inducing an opposite emf in the inductor, derive an expression for energy spent by the source to send current through the circuit against the induced emf?

(B) What will be the energy stored in an inductor of 20 mH if current grows from zero to 5 A?

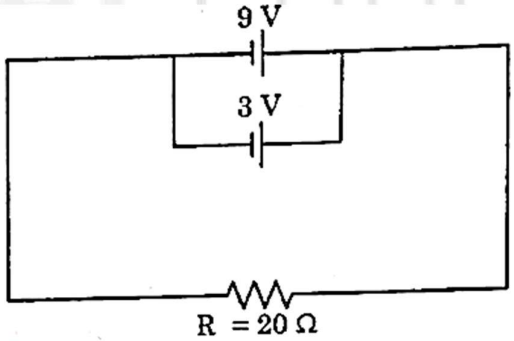
33. (A) Demonstrate that the heat produced is minimized when a current is split between two resistors in accordance with Kirchoff's laws.

(B) Plot a graph showing variation of current in a conductor with drift velocity of electrons.

OR

(A) Define emf of a cell? On what factors does it depend?

(B) Calculate the current flowing through resistor R if internal resistances of cell 9 V and 3 V is 2 Ω and 4 Ω respectively.



(C) A bulb is connected across diagonal of a square arrangement of four resistors such that it does not glow when the arrangement is connected to a battery. Identify the circuit. What will be the current in bulb if the P, Q, R and S are 2 Ω, 4 Ω, 3 Ω and 6 Ω respectively.

* * * * * * * * * * * * * * * * *