DESIGN OF QUESTION PAPER
SUMMATIVE ASSESSMENT - I
CLASS XII
PHYSICS

Time: 3 Hours **Maximum Marks: 70**

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

A. Weightage to the contents/subject units

Sl. No.	Unit	Marks
1	Electrostatics	10
2	Current Electricity	09
3	Magnetic Effect of Current and Magnetism	10
4	Electromagnetic Induction and Alternating Current	10
5	Electromagnetic Waves	05
6	Optics	16
	Total	**70**

B. Weightage to form of questions

Sl. No.	Form of Questions	Marks for each Question	No. of Questions	Total Marks
1	Long Answer (LA)	5	03	15
2	Short Answer (SA-I)	3	08	24
3	Value Based	3	01	03
4	Short Answer (SA-II)	2	10	20
5	Very Short Answer (VSA)	1	08	08
	Total	**-**	**30**	**70**

C. Scheme of options

1. There will be no overall option.
2. Internal choices (either or type) on a very selective basis has been given in some questions.

D. A weightage of around 15 marks, has been assigned to numericals.

E. Weightage to difficulty level of questions

Sl. No.	Estimated difficulty level	Marks Alloted
1	Easy	15%
2	Average	70%
3	Difficult	15%

BLUE PRINT

	Unit	VSA (1 Mark)	SA-I (2 Marks)	SA-II (3 Marks)	Value Based (3 Mark)	LA (5 Marks)	Total
1	Electrostatics	-	4(2)	3(1)	-	5(1)	12(4)
2	Current Electricity	2(2)	2(1)	6(2)	-	-	10(5)
3	Magnetic Effect of Current and Magnetism	2(2)	2(1)	3(1)	-	5(1)	12(5)
4	Electromagnetic Induction and Alternating Current	2(2)	4(2)	6(2)	-	-	12(6)
5	Electromagnetic Waves	1(1)	4(2)	-	3(1)	-	08(4)
6	Optics	1(1)	4(2)	6(2)	-	5(1)	16(6)
	Total	**8(8)**	**20(10)**	**24(8)**	**3(1)**	**15(3)**	**70(30)**

PHYSICS (Theory)

Time allowed: 3 hours] *[Maximum Marks: 70*

General Instructions:

(i) ***All*** *questions are compulsory.*

(ii) *There are* ***30*** *questions in total. Question Nos.* ***1*** *to* ***8*** *are very short answer type questions and carry* ***one*** *mark each.*

(iii) *Question Nos.* ***9*** *to* ***18*** *carry* ***two*** *marks each. Question Nos.* ***19*** *to* ***27*** *carry* ***three*** *marks each and question nos.* ***28*** *to* ***30*** *carry* ***five*** *marks each.*

(iv) ***One*** *of the questions carrying* ***three*** *marks weightage is a value based question.*

(v) *There is no overall choice. However, an internal choice has been provided in* ***one*** *question of* ***two*** *marks,* ***one*** *question of* ***three*** *marks and all* ***three*** *questions of* ***five*** *marks each weightage. You have to attempt only* ***one*** *of the choices in such questions.*

(vi) *Use of calculators is* ***not*** *permitted. However, you may use log tables if necessary.*

(vii) *You may use the following values of physical constants wherever necessary:*

$c = 3 \times 10^{8}$ m/s

$h = 6.63 \times 10^{-34}$ J/s

$e = 1.6 \times 10^{-19}$ C

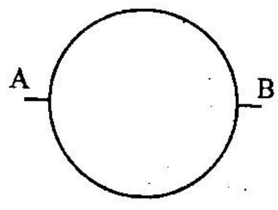
$\mu_o = 4\pi \times 10^{-7}$ Tm A^{-1}

$\frac{1}{4\pi\varepsilon_o} = 9 \times 10^{9}$ Nm^2C^{-2}

$m_e = 9.1 \times 10^{-31}$ kg

1. How does the relaxation time of electron in the conductor change when the temperature of the conductor decreases? (1)

2. A wire of resistance 8R is bent in the form of a circle. What is the effective resistance between the ends of a diameter AB? (1)



3. Define gyromagnetic ratio. (1)

4. How does the angle of dip varies form equator to poles? (1)

5. Sketch the graph that shows change in reactance with frequency of a series LCR circuit. (1)

6. In an a.c. circuit, instantaneous voltage and current are $V = 200 \sin 300t$ V and $i = 8 \cos 300t$ A respectively. What is the average power dissipated in the circuit? (1)

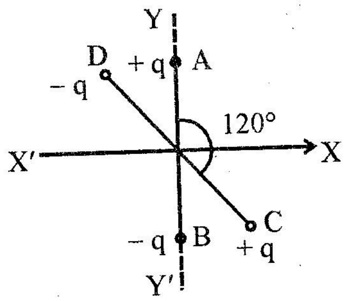
7. Which part of electromagnetic spectrum has highest penetrating power? (1)

8. When light travels from a rarer to a denser medium, the speed decreases. Does this (1)

decrease in speed imply a decrease in the energy carried by the light wave? Justify your answer.

9. Show that electric field intensity at a point can be given as negative of potential gradient. (2)

10. Two small identical electrical dipoles AB and CB, each of dipole moment 'p' are kept at angle of 120^{o} as shown in figure. What is the resultant dipole moment of this combination? If this system is subjected to electric field $\vec{E}$ directed along +X direction, what will be the magnitude and direction of torque acting on this? (2)



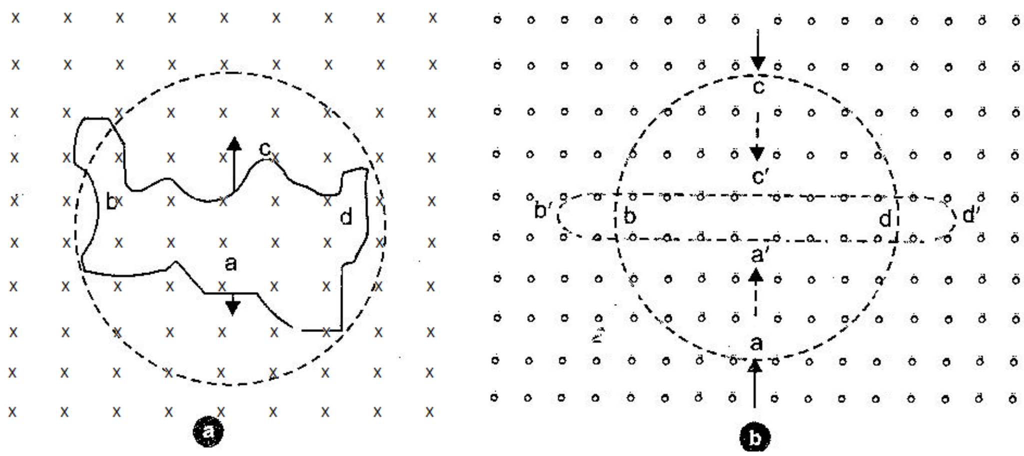
11. Derive the expression for the resistivity of a good conductor in terms of the relaxation time of electrons. (2)

12. Define relative permeability of a material. Out of two 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? (2)

13. Use Lenz's law to determine the direction of induced current in the situations described by the figure: (2)

(a) A wire of irregular shape turning into a circular shape;

(b) A circular loop being deformed into narrow straight wire.



14. A coil of inductance 0.50 H and resistance 100 Ω is connected to a 240 V, 50 Hz ac supply. (2)

(a) What is the maximum current in the coil?

(b) What is the time lag between the voltage maximum and current maximum?

OR

Prove that an ideal capacitor, in an a.c. circuit does not dissipate power. (2)

15. Answer the following questions: (2)

    (a) Long distance radio broadcasts use shortwave bands. Why?

    (b) If the earth did not have an atmosphere, would its average surface temperature be higher or lower than what it is now?

16. Suppose that the electric field amplitude of an electromagnetic wave is E_o = 120 N/C and that its frequency is v = 50.0 MHz. (a) Determine B_o, ω, k and λ. (b) Find expressions for $\vec{E}$ and $\vec{B}$. (2)

17. Answer the following questions: (2)

    (a) Does the apparent depth of a tank of water change if viewed obliquely? If so, does the apparent depth increase or decrease?

    (b) The refractive index of diamond than that of ordinary glass. Is this fact of some use to a diamond cutter?

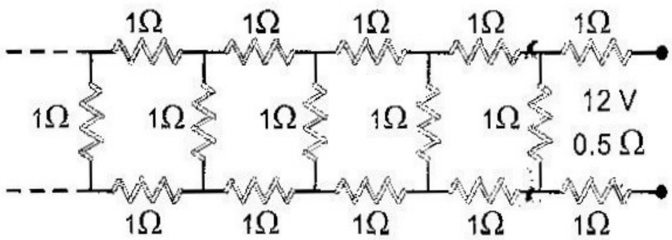
18. When a low flying aircraft passes overhead, we sometimes notice a slight shaking of the picture on our TV screen. Suggest a possible explanation. (2)

19. Define electric flux. Write its SI unit. (3)
    A uniformly charged conducting sphere of 2.4m diameter has a surface charge density of 80.0 μC/m.

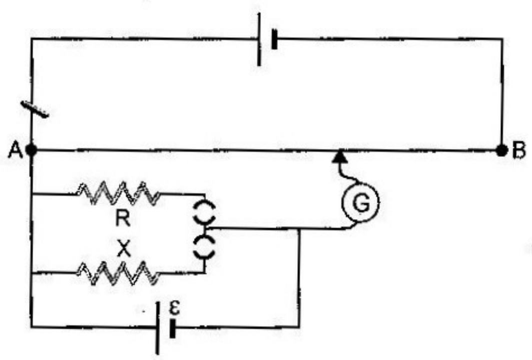
    (a) Find charge on sphere.

    (b) What is the total electric flux leaving the surface of the sphere?

20. Determine the current drawn from a 12V supply with internal resistance 0.5 Ω by the infinite network shown in figure. Each resistor has 1 Ω resistance. (3)



21. Figure shows a potentiometer circuit for comparison of two resistances. The balance point with a standard resistor R = 10.0 Ω is found to be 58.3 cm, while that with the unknown resistance X is 68.5 cm. Determine the value of X. What might you do if you failed to find the balance point with the given cell of emf ε? (3)



22. (a) State Ampere's circuital law, expressing it in the integral form. (3)

(b) A long straight wire of circular cross-section of radius 'a' carries a steady current 'I'. the current is uniformly distributed across the cross-section. Apply Ampere's circuital law to calculate the magnetic field at point 'r' in the region for (i) r < a and (ii) r > a.

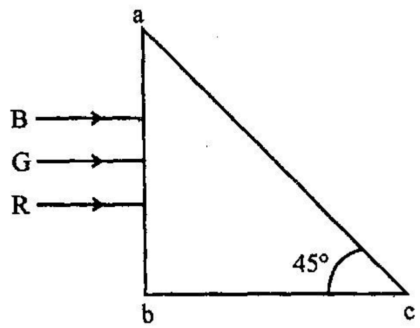
23. (a) Define self inductance. Write its SI unit. (3)

(b) Derive an expression for self inductance of long solenoid of length l, cross sectional area A and having N number of turns.

24. (a) Describe briefly, with the help of a labelled diagram, working of a step-up transformer. (3)

(b) A step-up transformer converts a low voltage into high voltage. Does it not violate the principle of conservation of energy? Explain.

25. Three light rays red (R), green (G) and blue (B) are incident on a right angled prism 'abc' at face 'ab'. The refractive indices of the material of the prism for red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. Out of the three which colour ray will emerge out of face 'ac'? Justify your answer. Trace the path of these rays after passing through face 'ab'. (3)



OR

(a) The far point of a myopic person is 80 cm in front of the eye. What is the power of the lens required to enable him to see very distant objects clearly? (3)

(b) In what way does the corrective lens help the above person? Does the lens magnify very distant objects? Explain carefully.

(c) The above person prefers to remove his spectacles while reading a book. Explain why?

26. (a) How does an unpolarised light gets polarised when passed through a polaroid? (3)

(b) Two polaroids are set in crossed positions. A third polaroid is placed between the two making an angle θ with the pass axis of first polaroid. Write the expression for the intensity of light transmitted from the second polaroid. In what orientations will the transmitted intensity be (i) minimum and (ii) maximum?

27. Four persons went out for an excursion on a hill top where the temperature is quite low. One of them fell sick. The other persons put a blanket on him, collected the pieces of dry wood and ignited fire in his vicinity. After sometime the sick person felt better. (3)

Read the above passage and answer the following questions:

(a) What are the type of rays coming from fire?

(b) Why did the sick person feel better while sitting near the fire?

(c) What basic values do you learn from this study?

28. (a) Derive an expression for capacitance of parallel plate capacitor of thickness t ($t < d$) between the plates separated by the distance d. (5)

(b) If the dielectric slab is introduced with the battery connected, then how do the following quantities change (i) charge, (ii) potential, (iii) capacitance, and (iv) energy.

OR

State Gauss's law in electrostatics. Deduce an expression for electric field intensity due to a charged spherical shell at a point (i) inside (ii) on its surface (iii) outside it. Graphically show the variation of electric field intensity with distance from the centre of the shell. (5)

29. Draw a schematic sketch of a cyclotron. Explain briefly how it works and how it is used to accelerate charged particles. (5)

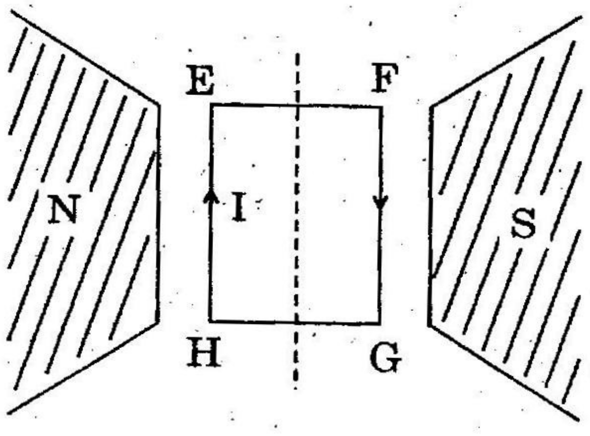
(i) Show that the time period of ions in a cyclotron is independent of both the speed and radius of circular path.

(ii) What is resonance condition? How is it used to accelerate the charged particles?

OR

(a) Two straight long parallel conductors carry currents I_1 and I_2 in the same direction. Deduce the expression for the force per unit length between them. Depict the pattern of magnetic field lines, around them. (5)

(b) A rectangular current carrying loop EFGH is kept in uniform magnetic field as shown in the figure.



(i) What is the direction of magnetic moment of the current loop?

(ii) When is the torque acting on the loop (A) maximum, (B) zero?

30. (a) For a ray of light travelling from denser medium of refractive index n_1 to a rarer medium of refractive index n_2, prove that $\frac{n_2}{n_1} = \sin i_c$, where i_c is the (5)

critical angle of incidence for the media.

(b) Explain with the help of a diagram, how the above principle is used for transmission of video signals using optical fibres.

OR

(a) State Huygen's principle. Using this principle explain how a diffraction pattern is obtained on a screen due to a narrow slit on which a narrow beam coming from a monochromatic source of light is incident normally. (5)

(b) Show that the angular width of the first diffraction fringe is half of that of the central fringe.

(c) If a monochromatic source of light is replaced by white light, what change would you observe in the diffraction pattern?

*****

Submitted by:
Dushyant Sharma
Contact (M): +91-7827978848
E-mail: writetodushyant@outlook.com