

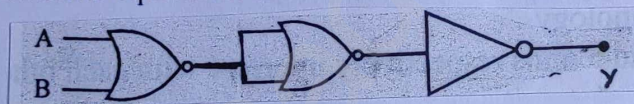
MODEL QUESTION PAPER

STANDARD XII

PART - I

 $15 \times 1 = 15$

- When the current changes from +2A to -2A in 0.05 s, an emf of 8 V is induced in a coil. The co-efficient of self-induction of the coil is
 (a) 0.2 H (b) 0.4 H (c) 0.8 H (d) 0.1 H
- If λ_v , λ_x and λ_m represent the wavelengths of visible light, X-rays and microwaves respectively, then
 a) $\lambda_m > \lambda_x > \lambda_v$ b) $\lambda_v > \lambda_m > \lambda_x$ c) $\lambda_m > \lambda_v > \lambda_x$ d) $\lambda_v > \lambda_x > \lambda_m$
- The materials used in Robotics are
 a) aluminium and silver b) silver and gold c) copper and gold d) steel and aluminium
- Two wires of A and B with circular cross section are made of the same material with equal lengths. If $R_A = 3 R_B$ then what is the ratio of radius of wire A to that of B?
 a) 3 b) $\sqrt{3}$ c) $\frac{1}{\sqrt{3}}$ d) $\frac{1}{3}$
- The frequency range of 3MHz to 30 MHz is used for
 a) Ground wave propagation b) space wave propagation
 c) sky wave propagation d) satellite communication
- A ray of light strikes a glass plate at an angle 60° . If the reflected and refracted rays are perpendicular to each other, the refractive index of the glass is
 a) $\sqrt{3}$ b) $\frac{3}{2}$ c) $\frac{1}{\sqrt{3}}$ d) $\frac{1}{3}$
- If voltage applied on a capacitor is increased from V to 2 V
 a) Q remains the same, C is doubled b) Q is doubled, C doubled
 c) C remains same, Q doubled d) Both Q and C remain same
- The nucleus is approximately spherical shape. Then the surface area of the nucleus having mass number A varies as
 a) $A^{\frac{2}{3}}$ b) $A^{\frac{4}{3}}$ c) $A^{\frac{1}{3}}$ d) $A^{\frac{5}{3}}$
- The given electrical network is equivalent to:



- a) AND gate b) OR gate c) NOR gate d) NOT gate
- A wire of length l carries a current I along the Y direction and magnetic field is given by $\vec{B} = \frac{\beta}{\sqrt{3}} (\hat{i} + \hat{j} + \hat{k})$. The magnitude of Lorentz force acting on the wire is
 a) $\sqrt{\frac{2}{3}} \beta I l$ b) $\sqrt{\frac{1}{3}} \beta I l$ c) $\sqrt{2} \beta I l$ d) $\sqrt{\frac{1}{2}} \beta I l$
- When a point charge of $6\mu\text{C}$ is moved between two points in an electric field, the work done is $1.8 \times 10^{-5} \text{ J}$. The potential difference between the two points is
 a) 1.08 V b) 1.08 μV c) 3 V d) 30V
- The wavelength of an electron λ_e and that of photon λ_p of same energy E are related by
 a) $\lambda_p = \lambda_e$ b) $\lambda_p \propto \sqrt{\lambda_e}$ c) $\lambda_p = \frac{1}{\sqrt{\lambda_e}}$ d) $\lambda_p \propto \lambda_e^2$
- For a myopic eye, the defect is cured by using a
 a) convex lens b) concave lens c) cylindrical lens d) plane glass
- In tangent galvanometer experiment, for two different value of current if the deflections are 45° and 30° respectively, then the ratio of the current is
 a) 2:3 b) 3:2 c) $\sqrt{3}:1$ d) $1:\sqrt{3}$
- If the current gain of the transistor α of a transistor is 0.98, what is the value of β of the transistor?
 a) 0.49 b) 49 c) 4.9 d) 5

PART - II

Answer any six questions . Question number 24 compulsory.

$6 \times 2 = 12$

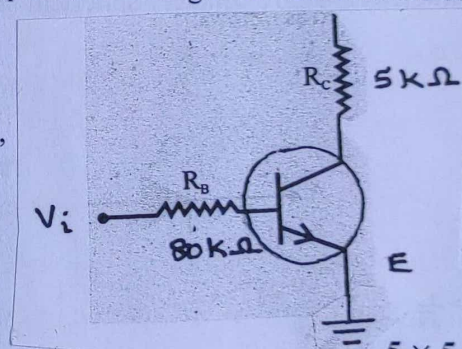
16. What is meant by Fraunhofer lines?
17. Why steel is preferred in making robots?
18. State Lenz's law.
19. Why do clouds appear white?
20. Calculate the radius of $^{197}_{97}\text{Au}$
21. What is the need for feedback circuit in transistor oscillator?
22. Show graphically the variation of electric field E (Y – axis) due to a charged infinite plane sheet with distance r (X – axis) from the plate.
23. Give any two applications of internet.
24. Calculate the magnetic field inside a solenoid when the number of turns is halved and the length of the solenoid and the area remain the same.

PART - III

Answer any six questions . Question number 33 compulsory.

$6 \times 3 = 18$

25. Two cells each of 5V are connected in series across a $8\ \Omega$ resistor and three parallel resistors of $4\ \Omega$, $6\ \Omega$ and $12\ \Omega$. Draw the circuit diagram for the above arrangement and find the current through each resistor.
26. Explain the various losses in a transformer
27. Discuss the alpha – decay process with example.
28. Obtain the expression for the energy stored in a parallel plate capacitor
29. Explain the three advantages in medical technology
30. Two light sources with amplitudes 5 units and 3 units respectively interfere with each other. Calculate the ratio of maximum and minimum intensities.
31. An electron moves in a circular orbit with uniform speed v . It produces a magnetic field B at the centre of the circle. Prove the radius of the circle is proportional to $\sqrt{\frac{v}{B}}$
32. Give the construction and working of photo – emissive cell
33. In the circuit shown in the figure . The input voltage $V_i = +5\text{V}$, $V_{BE} = +0.8\text{V}$ and $V_{CE} = +0.12\text{V}$. Find the values of I_B , I_C and β



PART - IV

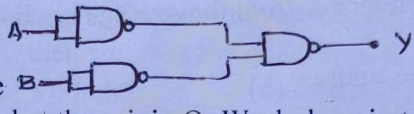
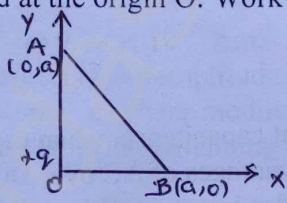
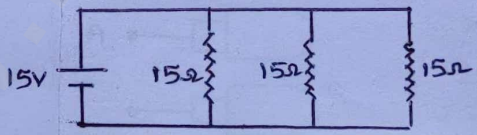
Answer all the questions

34. (a) Obtain the expression for electric field due to uniformly charge spherical shell at a distance r from its centre (OR)
- (b) Write any five properties of electromagnetic waves
35. (a) What is modulation? Explain the types of modulation with necessary diagram. (OR)
- (b) Find the expression for the mutual inductance between a pair of coils and show that $M_{12} = M_{21}$
36. (a) Derive the expression for the radius of the orbit of the electron and its velocity using Bohr atom model. (OR)
- (b) Discuss the theory and working of a Cyclotron in detail
37. (a) Obtain lens – maker's formula and mention its significance. (OR)
- (b) Explain the construction and working of full - wave rectifier.
38. (a) (i) Derive the expression for de Broglie wavelength of an electron
- (ii) An electron is accelerated through a potential difference of 81 V. What is the de Broglie wavelength associated with it? To which part of the electromagnetic spectrum does this wavelength correspond? (OR)
- (b) (i) Explain the determination of the internal resistance of a cell using potentiometer.
- (ii) A cell supplies a current of 0.9 A through a $1\ \Omega$ resistor and a current of 0.3 A through a $2\ \Omega$ resistor. Calculate the internal resistance of the cell.

XII -STD - PHYSICS - MARCH-2020

PART - II

15 × 1 = 15

- The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number A varies as
 - $A^{5/3}$
 - $A^{2/3}$
 - $A^{4/3}$
 - $A^{1/3}$
- The radius of curvature of curved surface at a thin planoconvex lens is 10 cm and the refractive index is 1.5. If the plane surface is silvered then the focal length will be:
 - 20 cm
 - 5 cm
 - 10 cm
 - 15 cm
- In Bohr Atom Model when the principal quantum number (n) increases the velocity of electron:
 - increases and then decreases
 - increases
 - decreases
 - remains constant
- Charging current for a capacitor is 0.2 A, find the displacement current.
 - zero
 - 0.2 A
 - 0.4 A
 - 0.1 A
- A light of wavelength 500 nm is incident on a sensitive plate of photoelectric work function 1.235 eV. The kinetic energy of the photo electrons emitted is : (Take $h = 6.6 \times 10^{-34}$ Js)
 - 1.16 eV
 - 0.58 eV
 - 2.48 eV
 - 1.24 eV
- Magnetic field at any point at a distance R due to a long straight conductor carrying current varies as:
 - R^2
 - R
 - $\frac{1}{R^2}$
 - $\frac{1}{R}$
- Type of material which emits white light in LED:
 - GaInN
 - SiC
 - AlGaP
 - GaAsP
- The frequency range of 30 MHz to 400 MHz is used for
 - Satellite communication
 - Ground wave propagation
 - Space wave propagation
 - Sky wave propagation
- The given electric network is equivalent to :
 - NAND gate
 - OR gate
 - NOT gate
 - Ex-OR gate
- In the given diagram a point charge $+q$ is placed at the origin O. Work done in taking another point charge Q from point A to point B is:
 - $\frac{qQ}{4\pi\epsilon_0 a^2} \left(\frac{a}{\sqrt{2}}\right)$
 - zero
 - $\left[\frac{-qQ}{4\pi\epsilon_0} \frac{1}{a^2}\right] \sqrt{2}a$
 - $\left[\frac{qQ}{4\pi\epsilon_0} \frac{1}{a^2}\right] \sqrt{2}a$
- In an oscillating LC circuit, the maximum charge on the capacitor is Q . The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is
 - Q
 - $\frac{Q}{2}$
 - $\frac{Q}{\sqrt{3}}$
 - $\frac{Q}{\sqrt{2}}$
- The current in the circuit is
 - 4 A
 - 1 A
 - 2 A
 - 3 A
- Two light waves from slits S_1 and S_2 on reaching points P and Q on a screen in Young's double slit experiment have a path difference zero and $\frac{\lambda}{4}$ respectively. The ratio of light intensities at P and Q will be
 - 4 : 1
 - 3 : 2
 - $\sqrt{2} : 1$
 - 2 : 1
- A particle of mass m , carrying charge q accelerated through a potential difference V (volt). When this accelerated charge comes under the influence of perpendicular magnetic field, the force acting on it is
 - $\sqrt{\frac{2q^3BV}{m^3}}$
 - $\sqrt{\frac{2q^3BV}{m}}$
 - $\sqrt{\frac{q^3B^2V}{2m}}$
 - $\sqrt{\frac{2q^3B^2V}{m}}$
- If voltage applied on a capacitor is increased from V to $2V$, choose the correct conclusion.
 - Both Q and C remain same
 - Q remains the same, C is doubled
 - Q is doubled, C doubled
 - C remains same, Q doubled

PART - II

Note : Answer any six questions . Question number 24 is compulsory.

$6 \times 2 = 12$

16. What do you mean by doping?
17. What are the uses of X- rays?
18. An ideal transformer has 460 and 40,000 turns in the primary and secondary coils respectively. Find the voltage developed per turn of the secondary coil if the transformer is connected to a 230 V AC main.
19. Distinguish between Fresnel and Fraunhofer types of diffraction.
20. What is corona discharge?
21. What is skip area?
22. What are the properties of neutrino?
23. Two materials X and Y are magnetized whose intensity of magnetization are 500 Am^{-1} and 2000 Am^{-1} respectively. The magnetizing field is 1000 Am^{-1} . What is the ratio between the susceptibilities of the two material?
24. Why electron is preferred over X-ray in microscope?

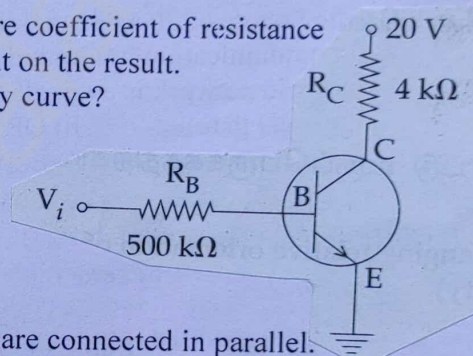
PART - III

Note : Answer any six questions . Question number 33 is compulsory.

$6 \times 3 = 18$

25. Explain the conversion of galvanometer into voltmeter
26. The resistance of a nichrome wire at 0°C is 10Ω . If the temperature coefficient of resistance is $0.004/^\circ\text{C}$, find its resistance at boiling point of water. Comment on the result.
27. What are the important inferences from the average binding energy curve?

28. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0 \text{ V}$ and $V_{CE} = 0 \text{ V}$, what are the values of I_B , I_C and β ?



29. Derive the expression for equivalent capacitance, when capacitors are connected in parallel.
30. What are the advantages and disadvantages of AC over DC?
31. Two light sources of equal amplitudes interfere with each other. Calculate the ratio of maximum and minimum intensities.
32. Derive an expression for De-Broglie wavelength of electrons.
33. Modulation helps to reduce the antenna size in wireless communication – Explain.

PART - IV

Note : Answer all the questions

$5 \times 5 = 25$

34. (a) Obtain the expression for the induced emf by changing relative orientation of the coil with the magnetic field (Graph not necessary). (OR)
- (b) Derive the mirror equation and the equation for lateral magnification.
35. (a) Deduce the expression for the force between two long parallel current carrying conductors. (OR)
- (b) Write down Maxwell equations in integral form.
36. (a) Describe Davisson – Germer experiment which demonstrated the wave nature of electrons. (OR)
- (b) (i) Derive an expression for the orbital energy of an electron in hydrogen atom using Bohr theory.
- (ii) An electron in Bohr's hydrogen atom has an energy of -3.4 eV . What is the angular momentum of the electron?
37. (a) Explain the working of the transistor as an oscillator. (OR)
- (b) Find out the phase relationship between the voltage and current in a pure inductive circuit.
38. (a) State Gauss Law in electrostatics. Obtain an expression for electric field due to an infinitely long charged wire. (OR)
- (b) How the emf of two cells are compared using potentiometer?

XII –STD - PHYSICS – SEPTEMBER – 2020

PART – I

15 × 1 = 15

- Two identical conducting balls having positive charges q_1 and q_2 are separated by a centre to centre distance r . If they are made to touch each other and then separated to the same distance, the force between them will be
(a) less than before (b) same as before (c) more than before (d) zero
- In an a.c. circuit voltage and current are given by $V = 50 \sin 50t$ volt and respectively and $i = 100 \sin(50t + \frac{\pi}{3})$ A. The power dissipated in the circuit will be (a) 2.5 kW (b) 1.25 kW (c) 5 kW (d) 500 kW
- The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number A varies as
(a) A (b) $A^{\frac{4}{3}}$ (c) $A^{\frac{1}{3}}$ (d) $A^{\frac{5}{3}}$
- The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by
a) $\lambda_p \propto \lambda_e$ b) $\lambda_p \propto \sqrt{\lambda_e}$ c) $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$ d) $\lambda_p \propto \lambda_e^2$
- The resistance of a uniform wire of length l and area of cross sectional area A , is R . The resistance of wire of the same material having length $2l$ and cross sectional area $2A$ is a) R b) $2R$ c) $\frac{R}{2}$ d) $\frac{R}{4}$
- Two polaroids P_1 and P_2 are placed with their optic axes perpendicular to each other. If the unpolarised light intensity I_0 is incident on the first Polaroid P_1 then the intensity of transmitted light through the second polaroid P_2 will be a) $\frac{I_0}{2}$ b) $\frac{I_0}{4}$ c) 0 d) $\frac{I_0}{8}$
- A parallel plate capacitor stores a charge Q at a voltage V . Suppose the area of the parallel plate capacitor and the distance between the plates are each doubled then which is the quantity that will change?
(a) Capacitance (b) Charge (c) Voltage (d) Energy density
- The value of the Bohr magneton μ_B is
a) $9.27 \times 10^{-24} \text{ Am}$ b) $9.27 \times 10^{24} \text{ Am}^{-1}$ c) $9.27 \times 10^{24} \text{ Am}^{-2}$ d) $9.27 \times 10^{-24} \text{ Am}^{-2}$
- The variation of frequency of carrier wave with respect to the amplitude of the modulating signal is called
a) Amplitude modulation b) Frequency modulation c) Phase modulation d) Pulse width modulation
- A system consists of N_0 nucleus at $t = 0$ the number of nuclei remaining after half of half – life (that is at time $t = \frac{1}{2} T_{\frac{1}{2}}$) a) $\frac{N_0}{2}$ b) $\frac{N_0}{\sqrt{2}}$ c) $\frac{N_0}{4}$ d) $\frac{N_0}{8}$
- When the current changes from $+2A$ to $-2A$ in $0.05s$, an emf of 8 V is induced in a coil. The coefficient of self-induction of the coil is (a) 0.2 H (b) 0.4 H (c) 0.8 H (d) 0.1 H
- The average energy density of the electromagnetic wave is
a) $\frac{1}{2} \epsilon_0 E$ b) $\frac{1}{2} \epsilon_0 E^2$ c) $\frac{1}{4} \epsilon_0 E^2$ d) $\frac{1}{4} \epsilon_0 E$
- The threshold wavelength for a metal surface whose photoelectric work function is 3.313 eV is
a) 4125 \AA b) 3750 \AA c) 6000 \AA d) 2062.5 \AA
- The dopant to be added with pure Germanium crystal to form n type semiconductor is
a) Boron b) Phosphorus c) Aluminium d) Indium
- If a unpolarised light is incident on a reflecting glass surface at an angle 57.5° , the angle between the reflected ray and the refracted beam will be a) 45° b) 60° c) 90° d) 30°

PART - II

Answer any six questions . Question number 24 is compulsory.

6 × 2 = 12

- What is skip distance?
- Calculate the cut off wavelength and cut off frequency of x-rays from an X – ray tube of accelerating potential $20,000 \text{ V}$
- State Lenz's law
- Potential in a given region is given as a function of distance x , $V = 5(x^2 + x)$ volt. Find the electric field when $x = 1 \text{ cm}$

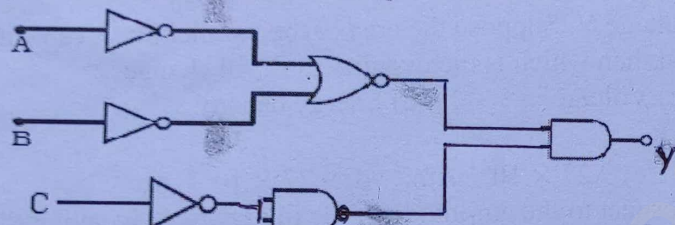
20. What is photovoltaic cell?
21. What are paraxial rays and marginal rays?
22. What are the constituents of Neutron and proton?
23. What are the uses of X-rays?
24. If an electric field of magnitude 570 NC^{-1} is applied in the copper wire. Find the acceleration experienced by the electron

PART - III

Note : Answer any six questions . Question number 33 is compulsory.

$6 \times 3 = 18$

25. Half lives of two radioactive elements A and B are 20 minutes and 40 minutes respectively. Initially, the samples have equal number of nuclei. Calculate the ratio of decayed numbers of A and B nuclei after 80 minutes.
26. State Kirchhoff's current rule and voltage rule.
27. An $500 \mu\text{H}$ inductor and 628Ω resistor are connected to form a series RLC circuit. Calculate the resonant frequency and Q factor of this circuit at resonance.
28. Obtain Gauss law of electrostatics from Coulomb's inverse square law
29. Compare the properties of dia, para and ferro magnetic materials
30. Fiber optic communication is gaining popularity among the various transmission media – Justify
31. What are the characteristics of photons?
32. Write the output (Y) Boolean expression for the following circuits with inputs A,B and C



33. What is total internal reflection? Give the conditions for total internal reflection takes place.

PART - IV

Note : Answer all the questions

$5 \times 5 = 25$

34. a) Explain the construction and working of transformer and define its efficiency (OR)
b) Derive the equation for angle of deviation produced by a prism and thus obtain the equation for refractive index of material of the prism
35. (a) Obtain the condition for bridge balance in Wheatstone's bridge. (OR)
(b) i) State Ampere's Circuital law
ii) Find the magnetic induction at a point due to an infinitely long straight conductor carrying current using Ampere's law
36. a) Derive an expression for the radius of the orbit of electron in an atom using Bohr atom model (OR)
(b) (i) Write down any six properties of electromagnetic waves.
(ii) Compute the speed of the electromagnetic wave in a medium if the amplitude of electric and magnetic fields are $3 \times 10^4 \text{ N C}^{-1}$ and $2 \times 10^{-4} \text{ T}$, respectively.
37. (a) Obtain lens maker's formula from that derive lens equation (OR)
(b) Describe the function of a transistor as an amplifier with the neat circuit diagram. Sketch the input and output wave form
38. (a) i) Obtain Einstein's photoelectric equation with necessary explanation
ii) What will happen to the stopping potential in the following cases, when A) work function of the material is increased B) Intensity of incident ray is increased (OR)
(b) Explain in detail the effect of a dielectric placed in a parallel plate Capacitor when the capacitor is disconnected from the battery

Time Allowed: 3.00 Hours

Maximum Marks : 70

PART - I

Note: i) Answer all the questions

15 × 1 = 15

(ii) Choose the most appropriate answer from four given alternatives and write the option code with the corresponding answer

- In an oscillating LC circuit, the maximum charge on the capacitor is Q . The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is
a) $\frac{Q}{\sqrt{2}}$ b) $\frac{Q}{2}$ c) Q d) $\frac{Q}{\sqrt{3}}$
- In a Young's double-slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance D must be changed to,
a) $\sqrt{2}D$ b) $2D$ c) $\frac{D}{\sqrt{2}}$ d) $\frac{D}{2}$
- Which charge configuration produces a uniform electric field?
a) Uniformly charged infinite plane b) point charge
c) Uniformly charged spherical shell d) Uniformly charged infinite line
- The ratio of magnetic length and geometrical length is
a) 0.833 b) 0.633 c) 0.933 d) 0.733
- The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is
a) 0.8Ω b) 0.2Ω c) 1.0Ω d) 0.5Ω
- If the nuclear radius of ^{27}Al is 3.6 fermi, the approximate nuclear radius of ^{64}Cu in Fermi is
a) 4.8 b) 2.4 c) 3.6 d) 1.2
- If the velocity and wavelength of light in air is V_a and λ_a and that in water is V_w and λ_w then the refractive index of water is
a) $\frac{\lambda_w}{\lambda_a}$ b) $\frac{V_w}{V_a}$ c) $\frac{V_a \lambda_a}{V_w \lambda_w}$ d) $\frac{V_a}{V_w}$
- The unit of electric flux
a) $\text{N m}^{-1} \text{C}^2$ b) $\text{Nm}^{-2} \text{C}^{-1}$ c) $\text{Nm}^2 \text{C}^{-1}$ d) $\text{N}^2 \text{mC}^{-1}$
- For healthy eye, the distance of the near point is
a) 30 cm b) 20 cm c) 35 cm d) 25 cm
- The blueprint for making ultra durable synthetic material is mimicked from
a) parrot fish b) Lotus leaf c) Peacock feather d) Morpho butterfly
- Emission of electrons by the absorption of heat energy is called _____ emission.
a) Thermionic b) Photoelectric c) Secondary d) Field
- The Zener diode is primarily used as
a) Oscillator b) Rectifier c) Voltage regulator d) Amplifier
- Which of the following is false for electromagnetic waves
a) longitudinal b) transverse
c) produced by accelerating charges d) non-mechanical waves
- A particle of mass m , carrying charge q accelerated through a potential difference V (volt). Find the force experienced when it is kept perpendicular magnetic field \vec{B}
a) $\sqrt{\frac{2q^3 B^2 V}{m}}$ b) $\sqrt{\frac{2q^3 B V}{m}}$ c) $\sqrt{\frac{2q^3 B V}{m^3}}$ d) $\sqrt{\frac{q^3 B^2 V}{2m}}$
- In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6A, then that in the secondary coil is
a) 12 A b) 2 A c) 1 A d) 18 A

PART - II

Note : Answer any six questions . Question number 24 is compulsory.

6 × 2 = 12

16. Mention the ways of producing induced emf?

17. Find the polarising angle for glass of refractive index 1.5?

Kindly send me your questions and answerkeys to us: Padasalai.Net@gmail.com

18. What is Peltier effect?
19. Define "Electrostatic potential"
20. How will you define threshold frequency?
21. State Ampere's circuital law
22. Why does sky appear blue?
23. Give two uses of IR radiations
24. Dielectric strength of air is $4 \times 10^6 \text{ V m}^{-1}$. Suppose the radius of a hollow sphere in the Van de Graff generator is $R = 0.4 \text{ m}$, calculate the maximum potential difference created by this Van de Graaff generator.

PART - III

Note : Answer any six questions . Question number 33 is compulsory.

$6 \times 3 = 18$

25. State Kirchhoff's current rule and voltage rule
26. What are critical angle and total internal reflection?
27. List out the characteristics of photons
28. Obtain the expression for energy stored in the parallel plate capacitor
29. Mention the differences between interference and diffraction
30. The repulsive force between two magnetic poles in air is $9 \times 10^{-3} \text{ N}$. If the two poles are equal in strength and are separated by a distance of 10 cm, calculate the pole strength of each pole.
31. Draw the circuit diagram of a full wave rectifier and draw its input and output waveforms
32. Mention the various energy losses in a transformer
33. ${}_{92}^{235}\text{U}$ nucleus emits 2α particles, 3β particles and 2γ particles. What is the resulting atomic number and mass number.

PART - IV

Note : Answer all the questions

$5 \times 5 = 25$

34. (a) Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current

OR

(b) Obtain the law of radioactivity.

35. (a) Calculate the electric field due to a dipole at a point on its axial line.

OR

(b) What is frequency modulation? List out the advantages and disadvantages of frequency modulation

36. (a) (i) Derive an expression for de Broglie wavelength of electrons
(ii) Calculate the momentum of an electron with kinetic energy 2eV

OR

(b) Write down Maxwell equations in integral form.

37. (a) Explain about Astronomical telescope and obtain the equation for magnification.

OR

(b) (i) Explain the equivalent resistance of a series resistor network

(ii) A copper wire of cross-sectional area 0.5 mm^2 carries a current of 0.2 A . If the free electron density of copper is $8.4 \times 10^{28} \text{ m}^{-3}$ then compute the drift velocity of free electrons.

38. (a) Obtain lens maker's formula

OR

(b) Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.

XII –STD – PHYSICS - MAY - 2022

Time Allowed: 3.00 Hours

Maximum Marks : 70

PART – I

Note: i) Answer all the questions

15 × 1 = 15

(ii) Choose the most appropriate answer from four given alternatives and write the option code with the corresponding answer

- The variation of frequency of carrier wave with respect to the amplitude of the modulating signal is called
a) Phase modulation b) Amplitude modulation c) Pulse width modulation d) Frequency modulation
- Emission of electrons by the absorption of heat energy is called.....emission.
a) thermionic b) photoelectric c) secondary d) field
- In an electron microscope, the electrons are accelerated by a voltage of 14 kV. If the voltage is changed to 224 kV, then the de Broglie wavelength associated with the electrons would
a) decrease by 4 times b) increase by 2 times c) increase by 4 times d) decrease by 2 times
- Which of the following is an electromagnetic wave?
(a) β - rays (b) γ - rays (c) α - rays (d) all of them
- An air bubble in glass slab of refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness of the slab is, (a) 12 cm (b) 8 cm (c) 16 cm (d) 10 cm
- Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is
(a) 1×10^{-2} C (b) 3×10^{-2} C (c) 2×10^{-2} C (d) 4×10^{-2} C
- Which one of the following is the natural nano material.
a) Grain of sand b) Peacock feather c) Skin of the Whale d) Peacock beak
- A wire of length l carries a current I along the Y direction is kept in a magnetic field given by $\vec{B} = \frac{\beta}{\sqrt{3}} (\hat{i} + \hat{j} + \hat{k})$. The magnitude of Lorentz force acting on the wire is
a) $\sqrt{2} \beta I l$ b) $\frac{\sqrt{2}}{3} \beta I l$ c) $\frac{\sqrt{1}}{2} \beta I l$ d) $\frac{\sqrt{1}}{3} \beta I l$
- Q factor is equal to a) $\frac{\omega_r L}{R}$ b) $\frac{1}{R} \sqrt{\frac{L}{C}}$ c) $\frac{X_L}{R}$ d) all are correct
- A step-down transformer reduces the supply voltage from 220 V to 11 V and increase the current from 6 A to 100 A. Then its efficiency is (a) 0.12 (b) 1.2 (c) 0.9 (d) 0.83
- The electric potential between a proton and an electron is given by $V = V_0 \ln\left(\frac{r}{r_0}\right)$, where r_0 is a constant. Assume that Bohr atom model is applicable to potential, then variation of radius of n^{th} orbit r_n with the principal quantum number n is
(a) $r_n \propto \frac{1}{n^2}$ (b) $r_n \propto \frac{1}{n}$ (c) $r_n \propto n^2$ (d) $r_n \propto n$
- The transverse nature of light is shown in,
(a) scattering (b) interference (c) polarization (d) diffraction
- The charge of cathode rays is (a) neutral (b) positive (c) not defined (d) negative
- In India electricity is supplied for domestic use at 220 V. It is supplied at 110 V in USA. If the Resistance of a 60W bulb for use in India is R , the resistance of a 60W bulb for use in USA will be
(a) $\frac{R}{4}$ (b) R (c) $\frac{R}{2}$ (d) $2R$
- If a current of 7.5 A is maintained in a wire for 45 seconds then the charge flowing through the wire is
(a) 6 C (b) 365.5 C (c) 3 C (d) 337.5 C

PART - II**Note :** Answer any six questions . Question number 24 is compulsory. $6 \times 2 = 12$

16. What is corona discharge ?
17. How will you increase the current sensitivity?
18. Define work function of a metal. Mention its unit
19. Calculate the radius of $^{197}_{79}\text{Au}$ nucleus
20. State Fleming's left hand rule
21. What do you mean by doping?
22. What is displacement current?
23. Define electrical resistivity
24. The angle of minimum deviation for an equilateral prism is 37° . Find the refractive index of the material of the prism.

PART - III**Note :** Answer any six questions . Question number 33 is compulsory. $6 \times 3 = 18$

25. Derive the relation between f and R for a spherical mirror
26. Obtain the relation between current and drift velocity
27. List out the laws of photo electric effect
28. Draw the circuit diagram of NPN transistor in Common Emitter configuration
29. Give the uses of Polaroids.
30. Derive the expression for resultant capacitance, when capacitors are connected in series.
31. Find the (i) angular momentum (ii) velocity of the electron revolving in the 5th orbit of hydrogen atom. ($h = 6.6 \times 10^{-34} \text{ Js}$, $m = 9.1 \times 10^{-31} \text{ kg}$)
32. List out salient features of magnetic Lorentz force
33. Find the impedance of a series RLC circuit if the inductive reactance, capacitive reactance and resistance are 184Ω , 144Ω and 30Ω respectively. Also calculate the phase angle between voltage and current.

PART - IV**Note :** Answer all the questions $5 \times 5 = 25$

34. (a) Explain the construction and working of full - wave rectifier
(OR)
(b) Explain the construction and working of transformer
35. (a) Derive an expression for electrostatic potential due to an electric dipole
(OR)
(b) Obtain the equation for bandwidth in Young's double slit experiment
36. (a) Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current
(OR)
(b) Discuss the spectral series of hydrogen atom
37. (a) i) How will you obtain characteristics X - ray spectrum?
ii) Calculate the cut-off wavelength and cut-off frequency of x-rays from an x - ray tube of accelerating potential $20,000 \text{ V}$.
(OR)
(b) What is emission spectrum? Explain the types of emission spectrum.
38. (a) Obtain lens maker's formula
(OR)
(b) Explain the determination of the internal resistance of a cell using potentiometer.

XII -STD - PHYSICS - AUGUST - 2022

Time Allowed: 3.00 Hours

Maximum Marks : 70

PART - I

15 × 1 = 15

Note: i) Answer all the questions

(ii) Choose the most appropriate answer from four given alternatives and write the option code with the corresponding answer

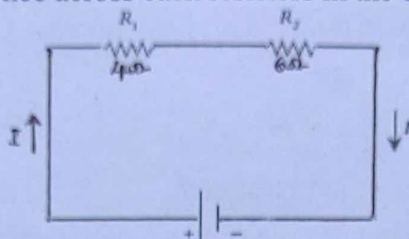
- The ratio between the first three orbits of hydrogen atom is
(a) 1:2:3 (b) 2:4:6 (c) 1:4:9 (d) 1:3:5
- Two coherent monochromatic light beams of intensities I and $4I$ are superposed. The maximum and minimum possible intensities in the resulting beam are
(a) $5I$ and I (b) $5I$ and $3I$ (c) $9I$ and I (d) $9I$ and $3I$
- A wire connected to a power supply of 230 V has power dissipation P_1 . Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is P_2 . The ratio $\frac{P_1}{P_2}$ is
(a) 1 (b) 2 (c) 3 (d) 4
- Stars twinkle due to
a) Reflection b) total internal reflection c) Refraction d) Polarisation
- The instantaneous values of alternating current and voltage in a circuit are $i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ and $v = \frac{1}{\sqrt{2}} \sin(100\pi t + \frac{\pi}{3})$ V. The average power in watts consumed in the circuit is
a) $\frac{1}{4}$ b) $\frac{\sqrt{3}}{4}$ c) $\frac{1}{2}$ d) $\frac{1}{8}$
- The mean wavelength of light from sun is taken to be 550 nm and its mean power is 3.8×10^{26} W. The number of photons received by the human eye per second on the average from sunlight is of the order of
a) 10^{45} b) 10^{42} c) 10^{54} d) 10^{51}
- An electric dipole is placed at an alignment angle of 30° with an electric field of $2 \times 10^5 \text{ N C}^{-1}$. It experiences a torque equal to 8 N m. The charge on the dipole if the dipole length is 1 cm is
(a) 4 mC (b) 8 mC (c) 5 mC (d) 7 mC
- Fraunhofer lines are an example of _____ spectrum.
a) line emission b) line absorption c) band emission d) band absorption
- The mass of a ${}^7_3\text{Li}$ nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of ${}^7_3\text{Li}$ nucleus is nearly
(a) 46 MeV (b) 5.6 MeV (c) 3.9 MeV (d) 23 MeV
- The temperature coefficient of resistance of a wire is 0.00125 per $^\circ\text{C}$. At 20°C , its resistance is 1Ω . The resistance of the wire will be 2Ω at
a) 800°C b) 700°C c) 850°C d) 820°C
- The particle size of ZnO material is 30 nm. Based on the dimension it is classified as
a) Bulk material b) Nano material c) Soft material d) Magnetic material
- The value of L, C and R of an AC circuit are 1 H, 9 F and 3Ω respectively. The quality factor for this circuit is
(a) 1 (b) 9 (c) $\frac{1}{9}$ (d) $\frac{1}{3}$
- A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipole moment of the coil is
(a) $1.0 \text{ amp} - \text{m}^2$ (b) $1.2 \text{ amp} - \text{m}^2$ (c) $0.5 \text{ amp} - \text{m}^2$ (d) $0.8 \text{ amp} - \text{m}^2$
- Two radiations with photon energies 0.9 eV and 3.3 eV respectively are falling on a metallic surface successively. If the work function of the metal is 0.6 eV, then the ratio of maximum speeds of emitted electrons will be
a) 1:4 b) 1:3 c) 1:1 d) 1:9
- If a positive half-wave rectified voltage is fed to a load resistor, for which part of a cycle of the input signal there will be current flow through the load?
a) $0^\circ - 90^\circ$ b) $90^\circ - 180^\circ$ c) $0^\circ - 180^\circ$ d) $0^\circ - 360^\circ$

PART - II

Answer **any six** questions . Question number 24 is **compulsory**.

$6 \times 2 = 12$

16. Mention the ways of producing induced emf.
17. Define Stopping potential
18. Give two uses of UV rays
19. Pure water has refractive index 1.33. What is the speed of light through it?
20. Define-Ampere in terms of force.
21. What is rectification?
22. State Gauss's law
23. Define atomic mass unit
24. Calculate the equivalent resistance for the circuit which is connected to 12 V battery and also find the potential difference across each resistors in the circuit.

**PART - III**

Note : Answer **any six** questions . Question number 33 is **compulsory**.

$6 \times 3 = 18$

25. Obtain the expression for capacitance for a parallel plate capacitor
26. An electron moving perpendicular to a uniform magnetic field 0.500 T undergoes circular motion of radius 2.50 mm. What is the speed of electron.
27. Give the construction and working of a photo emissive cell
28. Mention the difference between interference and diffraction
29. What is zener diode? Mention any uses of Zener diode
30. What is Seebeck effect? State the applications of Seebeck effect.
31. What are the properties of cathode rays?
32. AC is advantageous than DC. Explain
33. Light travels from air into a glass slab of thickness 50 cm and refractive index 1.5. What is the speed of light in the glass slab and what is the time taken by the light to travel through the glass slab?

PART - IV

Note : Answer **all** the questions

$5 \times 5 = 25$

34. a) Obtain the condition for bridge balance in Wheatstone's bridge

OR

- b) i) What is half-life and mean life of a radio active nucleus?
- ii) Calculate the number of nuclei of carbon - 14 undecayed after 22,920 years if the initial number of carbon - 14 atoms is 10,000. The half-life of carbon -14 is 5730 years.

35. (a) Describe the Fizeau's method to determine the speed of light

OR

- b) i) Write down the properties of electromagnetic waves
- ii) The relative magnetic permeability of the medium is 2.5 and the relative electrical permittivity of the medium is 2.25. Compute the refractive index of the medium.

36. a) Explain in detail the construction and working of a Van de Graff generator.

OR

- b) Explain the compound Microscope and obtain the equation for the magnification

37. a) Show that the mutual inductance between a pair of coils is same ($M_{12} = M_{21}$).

OR

- b) State and prove De Morgan's First and Second theorems

38. a) i) Obtain Einstein's photoelectric equation with necessary explanation

- ii) List out the characteristics of photons

OR

- b) Deduce an expression for the force on a current carrying conductor placed in a magnetic field