SERIES: SIMPH31 **Q Code: 2/3**

ROLL NO:								

Candidate must write code on the title page of answer book

1. Please check this question paper contains 10 printed pages
2. Code number given in the right hand side of the question paper should be written on the title page of the answer book by the candidate.
3. Please check that this question paper contains 36 of questions
4. Please write down the serial number of question papers before attempting it
5. Fifteen minutes are allotted to read this question paper during this time student will read the question papers and will not write any answer during this time

PRE BOARD EXAMINATION 2021

PHYSICS (CLASS XII)

Time Allowed: 3.00Hrs. Maximum Marks: 70

General Instructions:

1. All questions are compulsory. There are 33 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains ten very short answer questions and four assertion reasoning MCQs of 1 mark each, Section B has two case based questions of 4 marks each, Section C contains nine short answer questions of 2 marks each, Section D contains five short answer question of 3 marks each and Section E contains three long answer questions of 5 marks each.
4. There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.

SECTION A

All questions are compulsory. In case of Internal choice, attempt any one of them.

1 Name the part of electromagnetic spectrum of wavelength 10^{-2}m and mention its one application. 1

2 A jet plane is travelling west at $450ms^{-1}$. If the horizontal component of earth's magnetic field at that place is 4×10^{-4} tesla and the angle of dip is 30°, find the emf induced between the ends of wings having a span of 30m. 1

(OR)

Two coils have mutual inductance of 1.5 H. If current in primary coil is raised to 5A in one millisecond after closing the circuit, what is the emf induced in the secondary coil

3 When light travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a decrease in the energy carried by the light wave? Justify your answer. 1

4 A charged rod P attracts rod R where as P repels another charged rod Q. What type of force is developed between Q and R? 1

(OR)

The distance of the field point on the equatorial plane of a small electric dipole is halved? By what factor will the electric field due to the dipole change?

5 We prefer a potentiometer with a longer bridge wire. Explain? Why? 1

6 An electron and alpha particle have the same kinetic energy. How are the de-Broglie wavelengths associated with them related? 1

7 The stopping potential in an experiment on photoelectric effect is 1.5 V. What is the maximum kinetic energy of the photoelectrons emitted? 1

(OR)

The energy of the electron in the ground state of hydrogen atom 1s – 13.6 ev. How much energy is required to take an electron in this atom from the ground state to the first excited state.

8 How does the fringe width, in young's double slit experiment, change when the distance of separation between the slits and screen is doubled. 1

(OR)

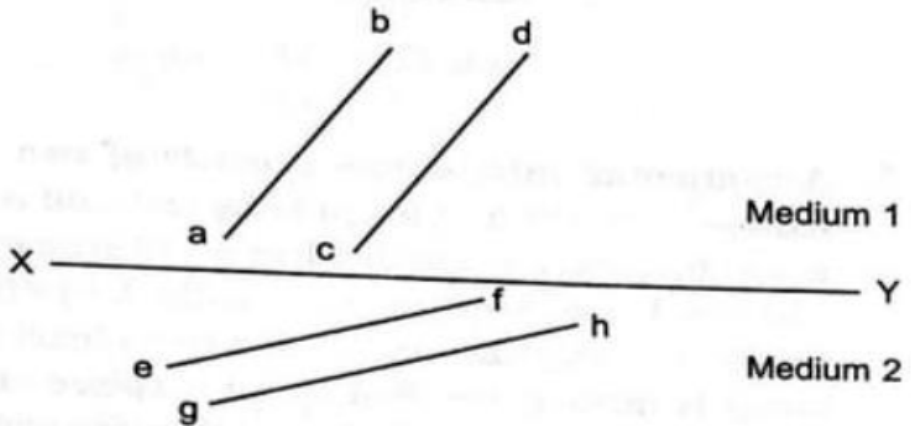
Write the necessary conditions for the phenomenon of total internal reflection to occur.

9	How does the energy gap in an intrinsic semiconductor vary, when doped with a pentavalent impurity?	1
10	Mention the two characteristic, properties of the material suitable for making core of a transformer.	1
	For question number 11,12,13 and 14, 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) Both A and R are true and R is the correct explanation of A** **b) Both A and R are true but R is NOT the correct explanation of A** **c) A is true but R is false** d) **A is false and R is also false**	
11	**Assertion (A) :** If amount of charge is decreases, the number of field line is also decreases. **Reason(R)**: Number of field lines is directly proportioned to the amount of charge.	1
12	**Assertion (A) :** Refractive index of glass with respect to air is different for red light and violet light. **Reason (R):** Refractive index of a pair of media depends on the wavelength of light used.	1
13	**Assertion (A):** Nuclear forces are the strongest attractive forces. **Reason (R) :** Nuclear forces are central forces.	1
14	**Assertion (A):** Intrinsic semiconductors are called pure or undoped semiconductor **Reason (R):** In Intrinsic semiconductor number of electron is not equal to number of holes.	1

SECTION – B

Questions 15 and 16 are case study based questions and are compulsory. Attempt all the questions. Each question carries 1 marks.

15 Figure shows a surface XY separating two transparent media, medium 1 and medium 2. Lines ab and cd represent wavefronts of a light wave travelling in a medium 1 and incident on XY. Lines ef and gh represent wavefron of the light wave in medium 2 after refraction. 4



(i) How does light travels in each medium?

(ii) The phases of the light waves at c,d,e and f are ϕ_c, ϕ_d, ϕ_e and ϕ_f respectively. It is given that $\phi_c \neq \phi_f$. Then $(\phi_d - \phi_f)$ is equal to _____.

(iii) Is speed of light in two media same?

If ϑ_1 and ϑ_2 are speed of light in two media 1 and 2 respectively, then write the relationship between ϑ_1 and ϑ_2

(iv) Why there is no change in frequency? Show mathematically.

16 When a conductor does not have a current through it, its conduction electrons move randomly, with no net motion in any direction. When the conductor does have a current through it, these electrons actually still move randomly, but now they tend to drift with a drift speed V_a in the direction opposite to the applied electric field that causes current. The drift speed is very small as compared to the speeds in the random motion. For example, in the copper conductors of household wiring, electron drift speeds are perhaps 10^{-5} ms $^{-1}$ to 10^{-3} ms $^{-1}$ where as the random speed is around 10^{6} ms $^{-1}$. 4

(i) The electron drift speed is estimated to be only a few mm s^{-1} for currents in the range of a few amperes? How is current established almost the instant a circuit is closed?

(ii) The electron drift arises due to the force experienced by electrons in the electric field inside the conductor. But force should cause acceleration. Why do the electrons acquire a steady average drift speed?

(iii) If the electron drift speed is so small, and the electron's charge is small, how can we still obtain large amounts of current in a conductor?

(iv) When electrons drift in a metal from lower to higher potential, does it mean that all the 'free' electrons of the metal are moving in the same direction?

SECTION – C

17 Write Enistein's photoelectric equation. State clearly the three salient features observed in photoelectric effect, which can be explained on the basis of the equation. 2

18 (i) Define drift velocity. Write its relationship with relaxation time in terms of the electric field $\vec{E}$ applied to a conductor. 2

(ii) A Potential difference V is applied to a conductor of length L. How is the drift Velocity affected when V is double and L is halved?

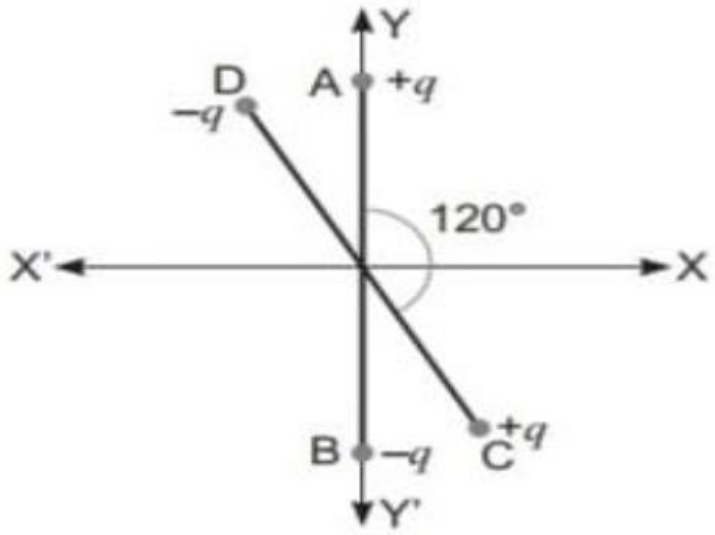
(OR)

Define ionic mobility. Write its relationship with relaxation time. How does one understand the temperature dependence of resistivity of a semiconductor?

19 Two uniformly large parallel plates having charge densities $+\sigma$ and $-\sigma$ are kept in the X- Z plane at a distance 'd' apart sketch an equipotential surface due to electric field between the plates. If a particle of mass 'm' and charge '-q' remains stationary between the plates. What is the magnitude and direction of this field? 2

(OR)

Two small identical electrical dipole AB and CD, each of dipole moment 'p' are kept at angle of 120° as shown in the 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 magnitude and direction of the torque acting on this?



20 Mention various energy loses in a transformer 2

21 State two points of difference between the interference pattern obtained in young's double slit experiment and the diffraction pattern due to single slit. 2

22 A convex lens of focal length 20cm is placed coaxially in contact with a concave lens of focal length 25cm. Determine the power of the combination. Will the system be converging or diverging in nature. 2

23 Using Bohr's postulates, obtain the expression for (i) Kinetic energy (ii) Potential energy of the electron in stationary state of hydrogen atom. 2

24 (i) How are eddy currents reduced in a metallic core? 2
(ii) Give two uses of eddy currents.

(OR)

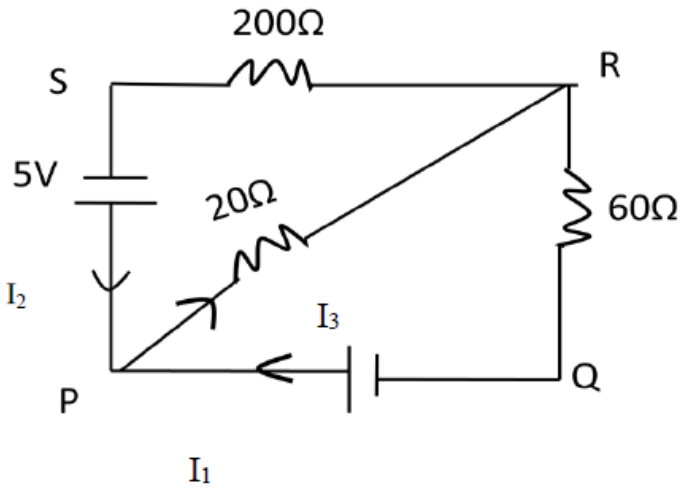
State the reason why the photociode is always operated under reverse bias? Write the working principle of a photodiode.

25 Plot a graph showing the variation of stopping potential with the frequency of incident radiation for two different photosensitive materials having work function W_1 and W_2 ($W_1 > W_2$). On what factor does the (i) slope and (ii) Intercept of the lines depend? 2

Section - D

All questions are compulsory. In case of internal choices, attempt anyone

26 State kirchhoff's rules. Apply these rules to the loops PRSP and PQRP to write the expressions for the currents I_1, I_2 and I_3 in the given circuit. 3



27 (i) Define the term "mutual inductance" between the two coils. 3

(ii) Obtain the expression for mutual inductance of a pair of a long co axial solenoids each of length l and radii r_1 and r_2 ($r_2 >> r_1$). Total number of turns in the two solenoids are N_1 and N_2 respectively

(OR)

Draw a labelled diagram of a full wave rectifier circuit. State its working principle show the input-output waveforms.

28 Light of wavelength 2000A° falls on a metal surface of work function 4.2 eV. What is the kinetic energy (in eV) of the fastest electrons emitted from the surface? 3

(i) What will be the change in the energy of the emitted electrons if the intensity of light with same wavelength is doubled?

(ii) If the same light falls on another surface of work function 6.5 eV, what will be the energy of emitted electrons?

(a) Use Huygen's principle to explain the formation of diffraction pattern due to a single slit illuminated by a monochromatic source of light.

(b) When width of slit is made double the original width, how this affect the size and intensity of central diffraction band?

29 An inductor L of inductance X_L is connected in series with a bulb B and an AC source How would brightness of the bulb change when (i) number of turns in the inductor is reduced? 3

(ii) an iron rod is inserted in the inductor?

(iii) a capacitor of reactance $X_C = X_L$ is inserted in series in the circuit? Justify your answer in each case.

30 Using Biot - Savart's law, derive an expression for the magnetic field at the centre of a circular coil of radius R, number of turns N, carrying current I. 3

SECTION - E

All questions are compulsory. In case of internal choices, attempt any one

31 Describe briefly, with the help of a labelled diagram, the basic elements of AC generator state its underlying principle show diagrammatically how an alternating emf is generated by a loop of wire rotating in a magnetic field, Write the expression for the instantaneous value of the emf induced in the rotating loop. 5

(OR)

(a) Sate the working principle of a potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emf's of two primary cells. Obtain the required expression used for comparing the emf's.
(b) Write two possible causes of one side deflection in potentio meter experiment.

32 (a) State briefly the processes involved in the formation of P-n junction explaining clearly how the depletion region is formed.
(b) using the necessary circuit diagrams, show the V- I characteristics of a p-n junction are obtained in
(i) Forward biasing
(ii) Reverse biasing

(OR)

(a) In young's double slit experiment, describe briefly how bright and dark fringes are obtained on the screen kept in front of a double slit. Hence obtain the expression for the fringe width
(b) The ratio of intensities at minima to the maxima in young's double slit experiment is 9:25. Find the ratio of the widths of the two slits.

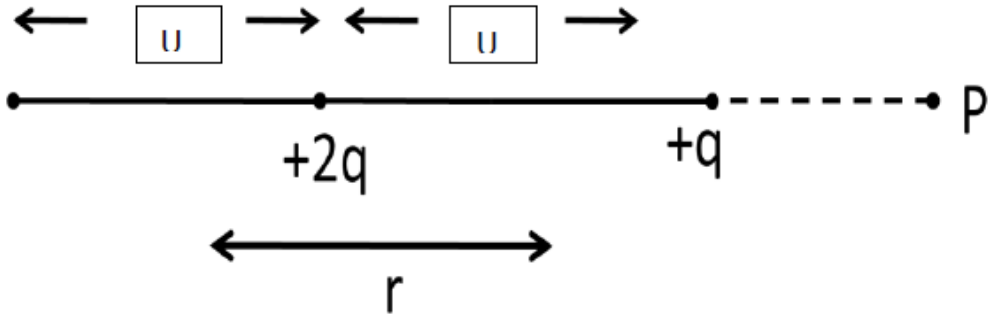
33 (a) Derive the expression of potential energy of an electric dipole of dipole moment $\vec{P}$ placed in a uniform electric field $\vec{E}$. 5

Find out the orientation of the dipole when it is in

(i) stable equilibrium

(ii) unstable equilibrium

(b) Figure shows a configuration of the charge array of two dipoles.



Obtain the expression for the dependence of potential on r for r>>a for a point P on the axis of this array of charges.

(OR)

State the underlying principle of working of a moving coil galvanometer. Write two reasons why a galvanometer can not be used to measure current in a given circuit. Name any two factors on which the current sensitivity of a galvanometer depends.