2023

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

32 पृष्ठीय

परीक्षार्थी द्वारा भरा जावे ↓

परीक्षा का विषय	विषय कोड	परीक्षा का माध्यम
Physics	210	English

दिए गए ↓ से मिलाकर लगायें

पुस्तिका का क्रमांक **B-23** **0470683**

अंकों में परीक्षार्थी का रोल नम्बर

2	3	3	1	3	9	2	0	5	/

शब्दों में

Two	Three	Three	One	Three	Nine	Two	Zero	Five	/

नीचे दिये गये उदाहरण अनुसार रोल नम्बर भरें।

प्रश्न पत्र का सेट D

क :– परीक्षार्थी का कक्ष क्रमांक 05

ख :– परीक्षा का दिनांक 06 03 2023

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

SCH-Code
311219

पर्यवेक्षक का नाम एवं हस्ताक्षर	केन्द्राध्यक्ष / सहायक केन्द्राध्यक्ष के हस्ताक्षर
Prabha Tarnalkar	

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

प्रमाणित किया जाता है कि होलो ग्राफ्ट स्टीकर क्षतिग्रस्त नहीं पाया गया तथा अन्दर के पृष्ठों के अनुरूप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अकों का योग सही है।

निर्धारित मुद्रा : नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदांकित संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा	परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा
	Brijesh Shant V.N. 911095

Ganpat ... V.No. 9110195

A.K. SH ... GOVT. H.S. ...

केवल परीक्षक द्वारा भरा जावे।
प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्टी करें।

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		

परीक्षार्थी द्वारा भरा जावे ↓

केन्द्राध्यक्ष / सहायक केन्द्राध्यक्ष एवं पर्यवेक्षक द्वारा भरा जावे ↓

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

कुल अंक

प्र. क्र.

Ans of Q1

(a) 1.67×10^{-27} Kg

(b) Ampere / meter^2

(c) $\pi/2$

(d) Kolkata

(e) 0.75 eV

(f) Junction diode

(g) is less than

Ans of Q.2

(i) 10^{14} Hz

(ii) decreases

(iii) vector quantity

(iv) resistance

(v) zero

(vi) zero

(vii) Gamma rays

Ans of Q.3

(i) False

(ii) False

(iii) True

(iv) False

(v) False

(vi) True

(vii) False

प्रश्न

Ans of Q.4

(i) The direction of magnetic dipole moment of a magnet is from south pole to north pole

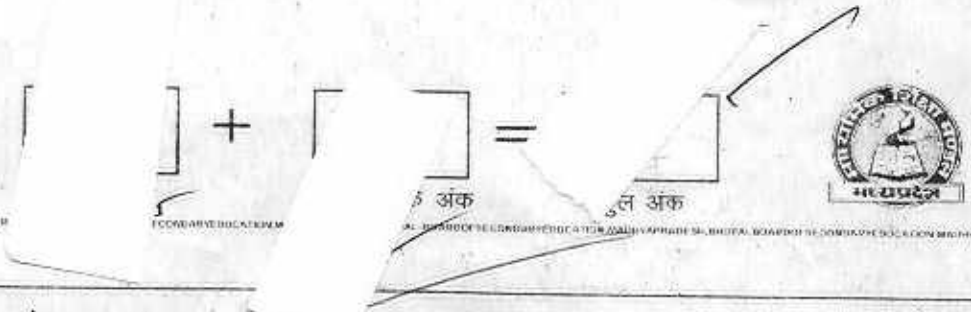
(ii) Galvanometer is converted into a voltmeter by joing a conductor of high resistance in series with it.

(iii) On increasing the temperature, the drift velocity decreases

(iv) Energy is directly proportional to frequency as $E \propto \nu$ i.e $E = h\nu$ where h is plank's constant.

(v) The minimum frequency of incident light rays (photons) required to cause the photoelectric effect is known as threshold frequency

(vi) When an obstacle comes in the path of light ray then the ray of light bent around the corners of the obstacle and enters into the shadow region, this phenomenon is known as diffraction, size of obstacle must be of order of wavelength of length.



The unit of power of lens is dioptre

Ans of Q.5

Isotopes - Isotopes are the atoms of the same element which has the same atomic number i.e number of protons but different mass number i.e different number of neutrons. For example

Hydrogen, $_{1}^{1}H$ (protium) has two isotopes which are as follows -

Deuterium - $_{1}^{2}H$
It contains 1 proton and 1 neutron

Tritium - $_{1}^{3}H$, It contains 2 neutron and 1 proton

Ans of Q6

Fundamental charge - It is defined as the basic charged i.e the smallest charge which is capable of independent existence. It is equal to the charge one one electron Its value is -1.6×10^{-19} C. All other

Charges exist as an integral multiple of this fundamental charge

i.e. $Q = \pm ne$

Ans of Q. 7 OR

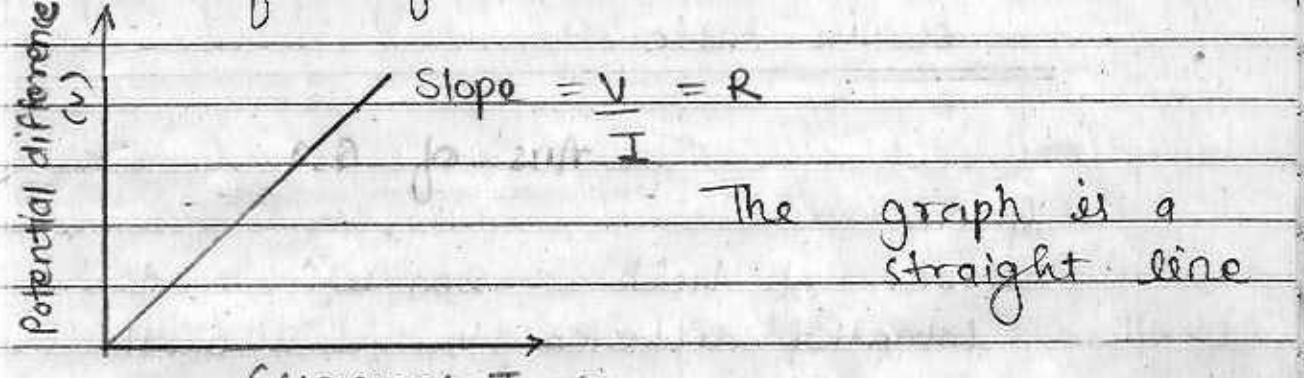
Ohm's law :- According to the Ohm's law, keeping all the physical conditions like temperature, pressure, dimensions of the wire, etc same, the potential difference V applied across the ends of a metallic conductor is directly proportional to the current flowing through it.

i.e.

$$V \propto I$$

$$\Rightarrow V = IR$$

where R is a constant of proportionality. On drawing graph between V and I, the slope of denotes R. It is the obstruction to the flow of current.



The graph is a straight line

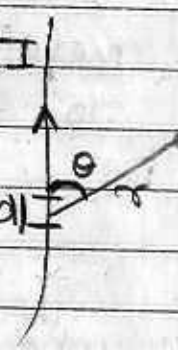
Ans of Q.8

Bio-Savaart law :- Bio Savaart law is used to find the magnitude and direction of magnetic field at a point due to elemental part of a current carrying conductor.

Let there be a current carrying conductor carry I current and $\vec{dl}$ be the elemental part. P is the point where magnetic field is to be determined at a distance $\vec{r}$ making an angle θ with $\vec{dl}$.

So

According to Biot Savaart law



$$\vec{dB} = \frac{\mu_0}{4\pi} \frac{I(\vec{dl} \times \vec{r})}{r^3}$$

where μ_0 = permeability of free space

The direction of magnetic field is ⊥ to both $\vec{dl}$ and $\vec{r}$ and is given by right hand screw rule

Ans of Q.9

Given,

Power of bulb = 200 W = P

Potential difference V = 220 V

We know that,

क्र.

$P = \frac{V^2}{R \text{ (resistance)}} \Rightarrow R = \frac{V^2}{P}$

$R = \frac{220 \times 220}{200} = \frac{484 \text{ ohm}}{2} = 242 \text{ ohm}$

ie resistance of bulb is ~~484 ohm~~ 242 ohm

Ans of Q.10 OR

Refractive telescope	Reflective telescope
① Lense is used in the objective due to which the problem of Chromatic abberation occurs	① Mirrors are used in the objective so it removes the problem of chromatic abberation
② It is difficult to hold mechanically, is costly and has the problem of spherical abberation	② It is comparatively small in size, so is easy to hold, comparatively cheap and has no spherical abberation

Ans of Q.11

Photoelectric effect :- The phenomenon of ejection of electrons from the metal surface under the influence of radiations of high frequency is known as photoelectric effect.

प्रश्न क्र.

Einstein Photoelectric equation

$$K.E_{max} = \mathcal{E} - \phi$$

$$\Rightarrow \frac{1}{2}mv^2 = h\nu - h\nu_0$$

This is the photo electric equation where

$\mathcal{E}$ is the energy of incident radiation

h = planck's contant ϕ = work function

ν = frequency of incident radiation

ν_0 = threshold frequency

$K.E_{max}$ = energy of ejected electrons

m = mass of electron v = velocity of e^- ejected

B S E

Ans of Q.12

The two postulates of Bohr's model are as follows.

(1) The electrons revolve only in certain fixed orbitals. These orbits are known as energy levels or stable orbits designated as K, L, M, N, etc. The electrons have same energy as that of the energy of orbit. While revolving in these orbits, electron neither emits nor absorbs any energy. If it absorbs energy, it must move to different energy level

(c) Electrons revolve only in those orbits for which the orbital angular momentum of electron is an integral multiple of $\frac{h}{2\pi}$, It means angular momentum is quantised

Orbital angular momentum $= \vec{r} \times \vec{p}$

$= mvr$

so $mvr = \frac{nh}{2\pi}$

Ans of Q.13 OR

Resistance	Specific resistance
1. It is defined as the obstruction to the flow of current, it opposes the current flow in a conductor.	1. It is defined as the resistance of a wire of unit length and unit area of cross section.
2. Resistance depends upon the dimensions of wire like length, area, etc.	2. It doesn't depends upon the dimension of wire. It depends only on the material of wire.
3. Its SI unit is ohm	3. Its SI unit is ohm xmeter.

Ans of Q.14.

Given,

Bulb B_1 of power $P_1 = 100$ watt

Bulb B_2 of power $P_2 = 400$ watt

We know that

$$P = \frac{V^2}{R} \quad - (i)$$

Let the two bulbs' voltage be V

So, from equation (i)

$$\frac{P_1}{P_2} = \frac{R_2}{R_1} \Rightarrow \frac{100}{400} = \frac{R_2}{R_1}$$

$$\Rightarrow \frac{R_2}{R_1} = \frac{1}{4} \Rightarrow R_1 = 4R_2$$

So,

it means resistance of bulb B_1 is four times the resistance of bulb B_2 of power 400

Ans of Q.15

Applying Len's formula

we have

$$\frac{1}{f} = \left(\frac{n_l}{n_m} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right) \quad - (i)$$

where

n_l = refractive index of ~~length~~ lens (glass)

and n_m = refractive index of air = 1

Given

$R_1 = +10$ cm $\quad f = +12$ cm $\quad$ {By sign conventions}

$R_2 = -15$ cm

Putting these values in eqn - (1)

we get

$$\frac{1}{12} = (n_g - 1)\left\{\frac{1}{10} - \frac{1}{(-15)}\right\}$$

$$\Rightarrow \frac{1}{12} = (n_g - 1)\left\{\frac{1}{10} + \frac{1}{15}\right\}$$

$$\Rightarrow \frac{1}{12} = (n_g - 1)\left\{\frac{3+2}{30}\right\}$$

$$\Rightarrow \frac{1}{12} = (n_g - 1) \times \frac{5}{30} \Rightarrow n_g - 1 = \frac{30}{12 \times 5}$$

$$n_g - 1 = \frac{6}{12} = \frac{1}{2}$$

$$\Rightarrow n_g = 0.5 + 1 = 1.5$$

So the refractive index of glass is 1.5

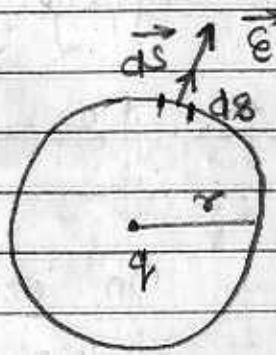
प्रश्न क्र.

$$\Rightarrow \phi = \frac{1}{4\pi\varepsilon_0} \times \frac{q_0}{r^2} \int ds$$

$$= \frac{1}{4\pi\varepsilon_0} \frac{q_0}{r^2} \times 4\pi r^2 \quad \{\text{Area of sphere} = 4\pi r^2\}$$

$$= \frac{1}{\varepsilon_0} \times q_0$$

Ans of Q. 16



Let us take a point charge q
Let there be a spherical Gaussian surface of radius r such that the charge q is placed at its centre

Consider an elemental $\vec{ds}$ of the spherical surface
The electric field due to charge q at elemental part is E
The direction of electric field is radially outwards and is same as that of elemental area vector
i.e $\vec{E} \parallel \vec{ds}$ i.e angle between them is 0°

So
Small electric flux through elemental sphere

$$d\phi = E \cdot ds$$
$$= E ds \cos 0^\circ$$
$$= E ds$$

Electric flux through whole surface is

$$\int d\phi = \int \varepsilon \, ds$$

$$\Rightarrow \phi = \varepsilon \int ds$$

{ Electric field is constant at all points }

eqn. ① $\Rightarrow \phi = \varepsilon \times 4\pi r^2$ { Area of sphere $= 4\pi r^2$ }

Applying Gauss law

Net electric flux $\phi = \frac{q}{\varepsilon_0}$ — ②

On comparing eqn ① and ②

we get

$$\varepsilon \times 4\pi r^2 = \frac{q}{\varepsilon_0} \Rightarrow \varepsilon = \frac{1}{4\pi\varepsilon_0} \times \frac{q}{r^2}$$

So electric field at elemental spherical point is $\frac{1}{4\pi\varepsilon_0} \frac{q}{r^2}$

Force experienced by unit q_0 charged placed at this electric field will we

$$F = q_0 \times \varepsilon = q_0 \times q \times \frac{1}{4\pi\varepsilon_0} \times \frac{1}{r^2}$$

$$= \frac{1}{4\pi\varepsilon_0} \times \frac{q_0 q}{r^2}$$

This is Coulomb's law

Hence proved.

प्रश्न 7.

Ans of Q.17.

Differences between intrinsic and extrinsic semiconductor are as follows.

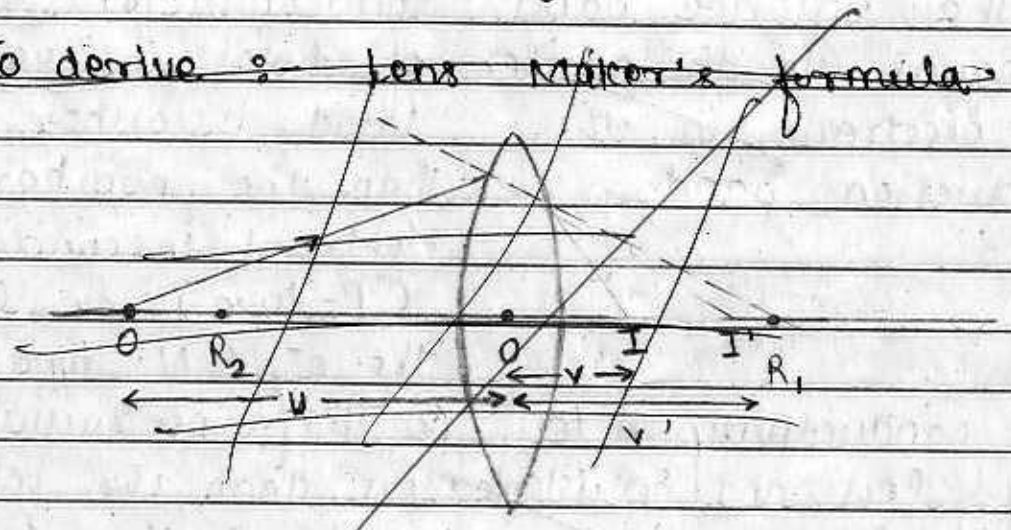
Intrinsic Semiconductor	Extrinsic Semiconductor
① These are the pure semiconductors. There are no impurities. These are group 14 elements like Silicon, Germanium, etc.	① These are impure semiconductor. In this we add impurities to the intrinsic semiconductor to obtain them. Impurities are the atoms of group 13 and 15 element
② The number of holes in the valence band is equal to the number of electrons in the conduction band	② In this type of semiconductor, the number of holes in valence band is either greater than the number of electrons in conductor band (P-type) or less than the e^- (N-type)
③ Their conductivity is very less and resistance is high. current developed is small	③ Their conductivity is more than the intrinsic semiconductor due to doping. large current develops

ESE

	(4) Its conductance depends only on the heat On increasing temperature condutivity ~~decrease~~ increases	(4) Its conductance depends upon the the concentration of the dopant atom and little on temperature
S E	(5) Fermi level is at the centre between the valence band and the Conduction band	(5) Fermi level is towards the valence band i.e. shifts downwards in P- type semiconductor and upwards i.e towards the conduction band in N- type semiconductor

~~Ans~~ of Q.18. OR

To derive :- Lens Maker's formula



क्र.

Ans of Q.19.

When a variable current flows through a conductor then the magnetic flux linked with the conductor changes as a result of which an emf is induced in it which caused an induced current. This phenomenon is known as self induction

The induced current opposes the growing current and supports the dying current

The total flux linked with a conductor is directly proportional to the current flowing through it i.e

$$\phi \propto I$$

$$\Rightarrow \phi = LI \quad \text{— eqn -(i)}$$

where L is a constant of proportionality known as self inductance. Its SI unit is Henry

Self inductance is defined as numerically equal to the magnetic flux induced in a conductor when current flowing through it is one ampere

Applying Faraday's law of electromagnetic induction, we have

प्रश्न क्र.

$$e = \frac{-d\phi}{dt} = -\frac{dLI}{dt} \quad \text{(from eqn-i)}$$

$$= -L\frac{dI}{dt}$$

So self inductance is numerically equal to the opposing emf induced in the conductor when the rate of change of current is one ampere per second.

B S E

Let there be a solenoid of length l carrying N turns. The radius of solenoid be r and its cross section area be A

Let number of turns per unit length be $n = \frac{N}{l}$

Let i current be flowing through it

Then the magnetic field induced inside it will be

$B = \mu_0 ni$ where μ_0 is permeability of free space

Magnetic flux through one coil will be $B \times A$

$= \mu_0 ni \times \pi r^2$

Magnetic flux through all coil will be

$$\phi_T = \mu_0 n i \times \pi r^2 \times n \times l \quad \{\because N = nl\}$$
$$= \mu_0 n^2 \pi r^2 l \times i$$

But from eqn (i) we have

$$\phi_T = Li$$

So comparing these two equations we have

$$Li = \mu_0 n^2 \pi r^2 l \times i$$

$$\Rightarrow L = \mu_0 n^2 \pi r^2 l$$

$$\Rightarrow L = \mu_0 \frac{N^2}{l^2} \times \pi r^2 l \quad \{\text{Putting } n = N/l\}$$

$$\Rightarrow L = \frac{\mu_0 N^2 \pi r^2}{l}$$

This is the self inductance for a solenoid If the solenoid is placed in a medium of relative permeability μ_r then

$$L = \frac{\mu_0 \times \mu_r \times N^2 \pi r^2}{l}$$

Factors affecting the self inductance of a solenoid are as follows :-

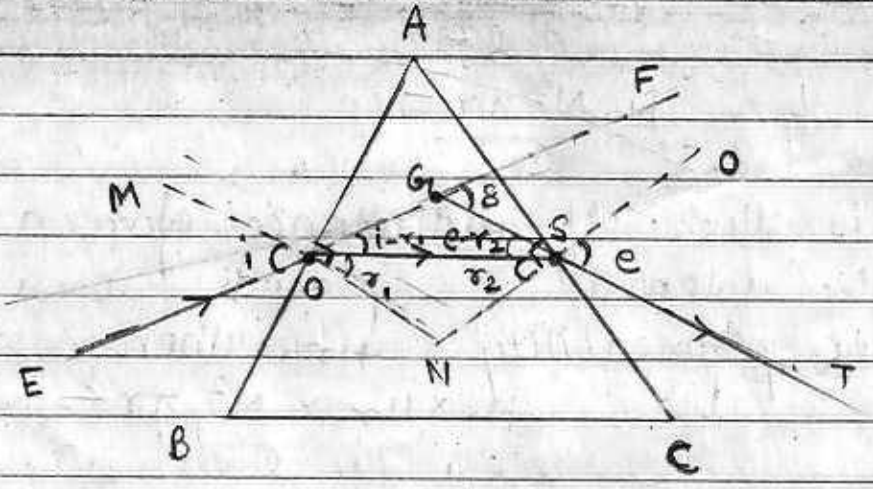
(1) permeability of medium - Self inductance is directly proportional to the permeability of medium

(2) Area of cross section - It is directly proportional to are of a cross section

③ Number of turns :- It is directly proportional to the square of number of turns of solenoid

Length of solenoid :- It is inversely proportional to the length of solenoid

Ans of Q.18.



Here
AB and AC are refracting surfaces of prism
OE is the incident ray and ST is emergent ray OS is refracted ray
∠A = Angle of prism
MN and ON are normal
∠EOM = i = incident angle
∠OST = e = emergent angle

प्र क्र.

$\angle SON = r_1$

$\angle OSN = r_2$

$\angle SGnF = \delta$ = angle of deviation

We have $\angle GnON = \angle EOM$ (vertically opposite angles)

So $\angle GnOS + \angle SON = i$

$\Rightarrow \angle GnOS + r_1 = i$

$\Rightarrow \angle GnOS = i - r_1$

Similarly $\angle OSGn = e - r_2$

B S E

Now we know that

exterior angle = Sum of interior opposite angles

So

$$\delta = i - r_1 + e - r_2$$

$$= i + e - (r_1 + r_2) \quad \text{— eqn (i)}$$

Now considering quadrilateral AONS

we know that

Sum of all angles of quadrilateral $= 360^\circ$

So

$$\angle A + 90 + 90 + \angle ONS = 360^\circ$$

$\Rightarrow \angle A + 180^\circ + 180 - r_1 - r_2 = 360$ ($r_1 + r_2 = 180 + \angle ONS$)

$\Rightarrow \angle A = r_1 + r_2$

Putting this value of ~~A~~ $r_1 + r_2$ in eqn (i) we get

$$\delta = i + e - A \quad - \text{eqn } (3)$$

Now we know that

at angle of minimum deviation δ_m

$r_1 = r_2$

$\Rightarrow A = r_1 + r_2 = 2r$ {let $r_1 = r_2 = r$}

$\Rightarrow r = \frac{A}{2}$ - eqn - (2)

Also

at δ_m $i = e$

So putting this value in eqn - (3) we get

$$\delta_m = 2i - A$$

$$\Rightarrow i = \frac{\delta_m + A}{2} \quad - \text{eqn} - (4)$$

Now applying snell's law we have

$$\frac{\sin i}{\sin r} = {}_1H_2 = \frac{H_2}{H_1} = \frac{H}{1} \quad - (5) \quad \{\because H_1 = 1 \text{ air is medium}\}$$

Here $H_2 = H$ = refractive index of glass prism

H_1 = air refractive index = 1

So

$$H = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

{from eqn (2) and (4) by putting the pa value in eqn 5}

Hence derived