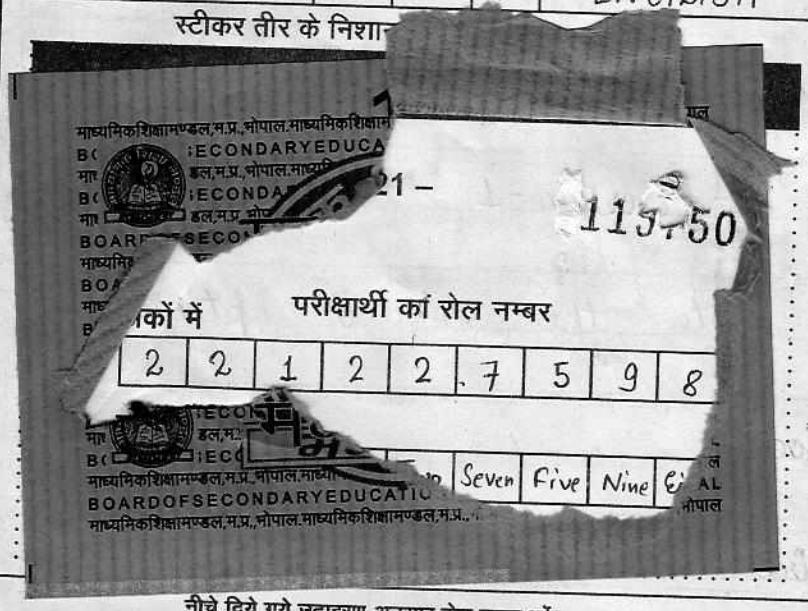
माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

परीक्षार्थी द्वारा भरा जायें ↓

24 पृष्ठीय मार्च 2022

परीक्षा का विषय	विषय कोड			परीक्षा का माध्यम
PHYSICS	2	1	0	ENGLISH

स्टीकर तीर के निशा...



नीचे दिये गये उदाहरण अनुसार रोल नम्बर भरें।

उदाहरणार्थ

1	1	2	4	3	9	5	6	8
एक	एक	दो	चार	तीन	नौ	पाँच	छः	आठ

क – पूरक उत्तर पुस्तिकाओं की संख्या अंको में 2 शब्दों में Two

ख – परीक्षार्थी का कक्ष क्रमांक 12

ग – परीक्षा की दिनांक 21 | 02 | 22

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकेण्डरी परीक्षा केन्द्र क्रमांक–122014

पर्यवेक्षक का नाम एवं हस्ताक्षर	केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर
अम्बर शर्मा अम्बर शर्मा	केन्द्राध्यक्ष अशा0 सरस्वती विद्या मन्दिर हायर सेकेण्डरी स्कूल रूपेपुर

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जायें ↓

प्रमाणित किया जाता है कि मूल्यांकन के समय पूरक उत्तर पुस्तिकाओं की संख्या उपरोक्तनुसार सही पाई होलो क्राफ्ट स्टीकर क्षतिग्रस्त नहीं पाया गया अन्दर के पृष्ठों के अनुरुप मुख्य पृष्ठ पर अंकों की प्रविष्टी अंकों का योग सही है। निर्धारित मुद्रा : नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदाकिंत संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा	परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा
	परीक्षक क्रमांक-34065 शिवशरण [illegible] (सिवनी) [illegible] ज्योति अक्षर उ.मा.वि. मानपुर

नोट :– ''हायर सेकेन्डरी परीक्षा में केवल वाणिज्य संकाय के विषयों तथा हाईस्कूल परीक्षा में प्रायोगिक विषय को छोड़कर शेष विषयों हेतु नियमित एवं स्वाध्यायी छात्रों के लिये प्रश्न पत्र 100 अंकों का होगा किन्तु नियमित छात्रों को 100 अंक के प्राप्तांक का 80% अधिमार एवं स्वाध्यायी छात्रों को 100 अंक के प्राप्तांक ही अंकसूची में प्रदर्शित किये जायेंगे।''

केवल परीक्षक द्वारा भरा जायें

प्रश्न क्रमांक के सम्मुख प्राप्ताकों की प्रविष्ठी करें

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्ताक (अंको में)
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28		
कुल प्राप्तांक शब्दों में		

सुरे... (सिवनी)
पंजी.क्र.-34194

विशेष नोट :– सिलाई खुली हुई अथवा क्षतिग्रस्त उत्तर पुस्तिका को न तो पर्यवेक्षक वितरण करे और न ही छात्र उपयोग में लें। ऐसी उत्तर पुस्तिका में लिखें उत्तरों का मूल्यांकन नहीं किया जायेगा। परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जायें → केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष एवं पर्यवेक्षक द्वारा भरा जायें → परीक्षार्थी द्वारा भरा जायें →

प्रश्न क्र.

PHYSICS

Question - 1

Select and write the correct option :-

Ans (a) Zener diode.

Ans (b) Copper wire.

Ans (c) is more than.

Ans (d) 1.6×10^{-19} C.

Ans (e) The current on the coil.

Ans (f) Mutual Induction.

(g) an accelerated charge.

Question - 2

Fill in the blanks :-

मध्यप्रदेश

11 कुल अंक 18

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Ans 2) (i) Gamma Rays.

Ans 2) (ii) Bar magnet.

Ans 2) (iii) Wheatstone Bridge.

Ans 2) (iv) concave.

Ans 2) v) $Y = \overline{A \cdot B}$

Ans 2) vi) scattering of light.

Ans 2) vii) parallel.

Question - 3

Match the following :-

(i) Magnifying power of compound microscope → $-\frac{v_o}{u_o}\left(1 + \frac{D}{f_e}\right)$

(ii) Brewster's Law → Polarisation of light.

iii) Infrared Radiations → Hershel

iv) Electron - Volt → Unit of energy

प्रश्न क्र.

(v) Dynamo → Electromagnetic Induction

Ammeter → Instrument of measuring current.

Electrical power → V.I.

Question - 4

M P B

Write the answers in one sentence →

Ans 4)(i) Focal length of lens is inversely proportional to power of lens. It increases on decreasing power

$$P = \frac{1}{f(\text{in } m)}$$

A 'NOT' gate is known as inversion gate.

Lenz's law is based on law of conservation of energy.

The minimum frequency of light below which electrons are not emitted from metal surface what so ever be the intensity is called threshold frequency.

ification power of astronomical telescope can be eased by increasing aperture of object lens.

presence of insulated medium, the potential crease.

splacement current is produced due to ne varying electric field.

Answer - 5

Two limitations of Ohm's Law are :-

(i) The physical conditions like temperature, area of cross section of conductor, length of conductor and its material should remain constant.

Ohm's Law is true only for mital conductors. No strain should be produced inside the conductor.

प्रश्न क्र.

Answer - 6

Lorentz Force :- When a charge particle moves in a magnetic field (B) then it experiences force in direction perpendicular to its direction of motion (v). This force is called Lorentz Force.

It is given by,

$$F = qvB \sin\theta$$

where,

'q' is charge on moving particle
'v' is velocity of particle
'B' is the intensity of magnetic field
'θ' is the angle between $\vec{v}$ and $\vec{B}$.

Answer - 7

Given :- polarisation angle $= i_p = 30^\circ$ of a transparent medium.

प्रश्न क्र.

To find : angle of refraction = γ = ?

Solution :- We know that,

$$i_p + r = 90^\circ$$

$$\Rightarrow 30^\circ + \gamma = 90^\circ$$

$$\Rightarrow \gamma = 90^\circ - 30^\circ = 60^\circ$$

angle of refraction 'γ' is $\underline{60^\circ}$

Answer- 8

Faraday's second law of electromagnetic induction :- According to Faraday's second law of electromagnetic induction, the e.m.f. induced inside the coil is directly proportional to the rate of change of magnetic flux.

If initial flux linked with the coil is ϕ_1 and after time Δt it changes to ϕ_2 then,

$$e \propto \frac{\phi_2 - \phi_1}{\Delta t}$$

$$e \propto \frac{d\phi}{dt}$$

$$e = -\frac{d\phi}{dt}.$$

Here, the negative sign shows that e.m.f. induced opposes change in magnetic flux.

Answer - 9

Electric field inside charged conductor :-

Electric field inside a charged conductor is zero. It is because the net charge inside the conductor is zero and is uniformly distributed on its surface.

$$E = 0 \text{ (zero)}$$

Electric potential inside charged conductor :-

Electric potential inside the charged conductor is equal to the potential on its surface. It is because the potential inside the conductor is affected by the charge on surface.

$$V = \frac{1}{4\pi\epsilon_0} \times \frac{q}{r}$$ where, r is radius

प्रश्न क्र.

Answer - 10

The danger signals are always of red colour. It is because the wavelength of red colour is maximum. Due to its high wavelength, it is scattered least by the atmospheric particles like smoke, fog, mist, dust etc. Therefore, it can viewed over a large distance. So, the danger signals are red.

Answer - 11

STOPPING POTENTIAL :- Stopping potential is defined as the negative potential applied on the anode of photoelectric cell such that the photoelectric current becomes zero. It is known as the stopping potential. At stopping potential no current flows.

प्रश्न क्र.

Answer – 12

	N-type semiconductor		P-type semiconductor
(i)	It is formed by mixing pentavalent impurities with pure semiconductor.	(i)	It is formed by mixing trivalent impurities with pure semiconductor.
(ii)	In this semiconductor electrons are in majority and holes are in minority.	(ii)	In this type of semiconductor holes are in majority and electrons are in minority
(iii)	Ex : Germanium doped with arsenic.	(iii)	Ex : Germanium doped with boron

Answer – 13

Given : In an electric circuit resistances 'R_1' and 'R_2'

are connected in parallel.

<u>To prove</u> : Equivalent resistance is given by,

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

<u>Proof</u> : Let two resistances 'R_1' and 'R_2' are connected in parallel.

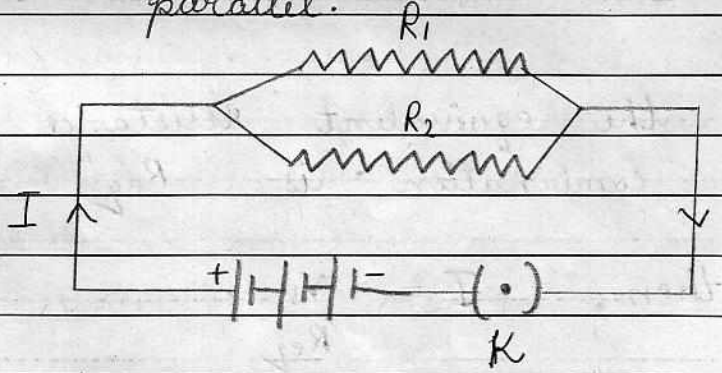

Fig : <u>Circuit Diagram</u>

Then, <u>voltage</u> across the resistances remain <u>same</u> but current gets distributed. So, total current 'I' is given by,

$$I = I_1 + I_2$$

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But we know that

$$I_1 = \frac{V}{R_1} \quad \text{---(I)}$$

and $$I_2 = \frac{V}{R_2} \quad \text{---(II)}$$

Substituting the values from (I) and (II)

$$I = \frac{V}{R_1} + \frac{V}{R_2}$$

If the equivalent resistance of the combination is R_{eq}

then, $$I = \frac{V}{R_{eq}}$$

So, $$\frac{V}{R_{eq}} = V\left\{\frac{1}{R_1} + \frac{1}{R_2}\right\}$$

$$\Rightarrow \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\Rightarrow \frac{1}{R_{eq}} = \frac{R_1 + R_2}{R_1 R_2}$$

प्रश्न क्र.

Taking reciprocal

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

Hence proved

Answer - 14

Construction of Meter Bridge :- The meter bridge consists of a one meter long wire made up of mixed material of constantan and manganine. A cell and key is connected with it. Also a resistance box and an unknown resistance is connected with it. It has a galvanometer with jockey.

Diagram :

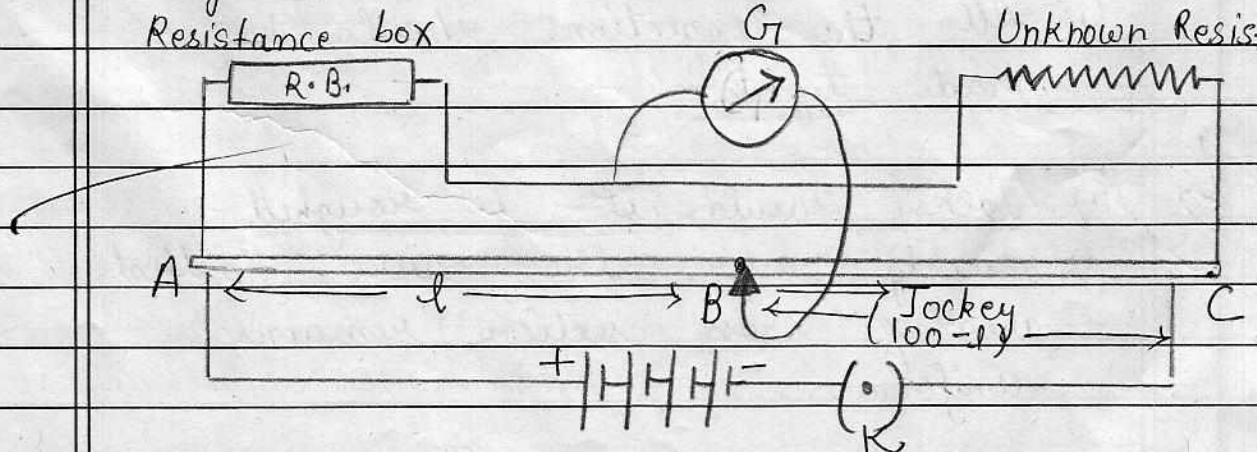

Fig : Labelled Diagram

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Principle : Meter Bridge works on the principle of Wheat Stone Bridge. It is that when the deflection on the galvanometer becomes zero, then this is called the balanced condition of Bridge and in this condition,

$$\frac{R}{lx} = \frac{X}{(100-l)x}$$

where, R is the resistance of resistance box.

X = unknown resistance

lx = resistance of wire AB

$(100-l)x$ = resistance of wire BC

Precautions :-

(i) All the connections should be made tight.

(ii) Jockey should not be rouged roughly over the wire. So that, area of cross section remains uniform.

प्रश्न क्र.

Answer - 15

Given : Two thin convex lens L_1 and L_2 are kept with mutual contact.

To prove : Focal length of combine lens is given by,

$$F = \frac{f_1 f_2}{f_1 + f_2}$$

Proof : Let there be Two lens L_1 and L_2 both convex and having optical centre O_1 and O_2 are kept close to eachother.

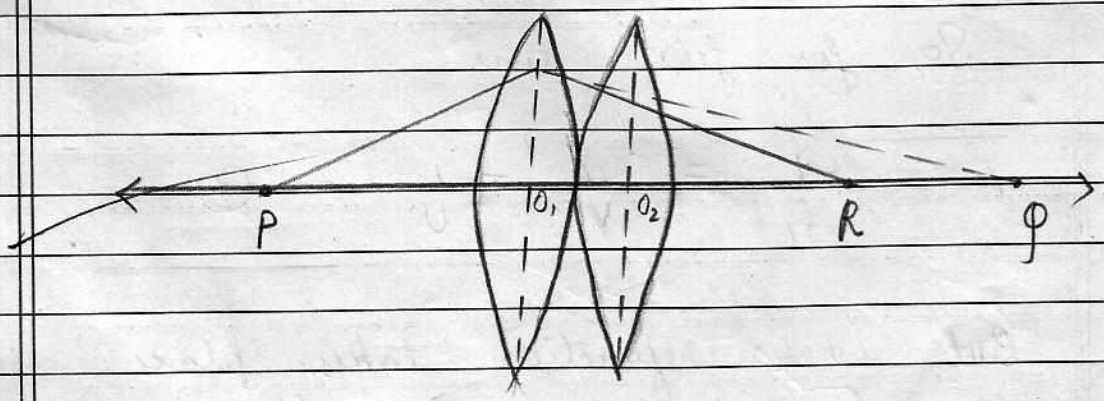

Fig : Combined Lens

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Let there be an object pin 'P'. When refraction takes place only through lens L_1 then image is formed at Q. But when refraction takes place through both the lens L_1, L_2 then image is formed at R.

For the first lens L_1 the object distance is $O_1P = u$ and the image distance is $O_1Q = v'$

Then by Lens formula, we know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

So, for first lens

$$\frac{1}{f_1} = \frac{1}{v'} - \frac{1}{u} \quad \text{—— (1)}$$

But when refraction takes place through both lenses then the image at Q acts as object for L_2 and it forms its final image at R

प्रश्न क्र.

So, when refraction takes place through L_2, by Lens formula

$$\frac{1}{f_2} = \frac{1}{v} - \frac{1}{v'} \quad \text{— (II)}$$

On adding (I) and (II)

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u}$$

If the combined focal length of the lens is F, then by Lens formula

$$\frac{1}{F} = \frac{1}{v} - \frac{1}{u}$$

So, $$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\Rightarrow \frac{1}{F} = \frac{f_1 + f_2}{f_1 f_2}$$

$$\Rightarrow \boxed{F = \frac{f_1 f_2}{f_1 + f_2}}$$ Hence Proved

प्रश्न क्र.

Answer-16

Given: In a step down transformer

V_p = primary voltage = 11000 V

V_s = secondary voltage = 440 V

N_p = number of turns in primary coil is = 8000

N_s = ?

To find: N_s = ? = number of turns in secondary coil

Solution: We know that,

in a step down transformer,

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = r$$

where 'r' is the transformer ratio.

Therefore,

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

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$$\Rightarrow \frac{440}{11000} = \frac{N_S}{8000}$$

$$\Rightarrow N_S = \frac{8000 \times 440}{11000}$$

$$\Rightarrow N_S = 8 \times 40$$

$$\Rightarrow \boxed{N_S = 320}$$

So, the number of turns in the step down transformers secondary coil is 320 which is less than the turns in primary coil.

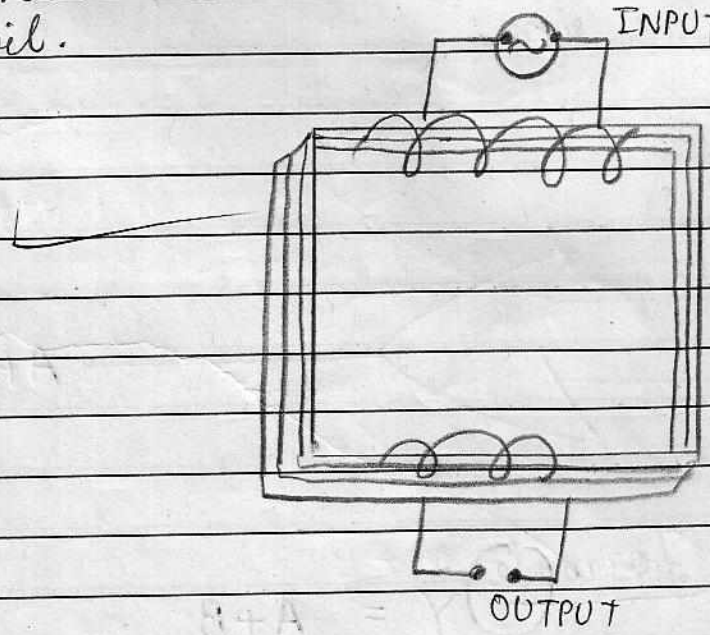

Fig: Step down transformer

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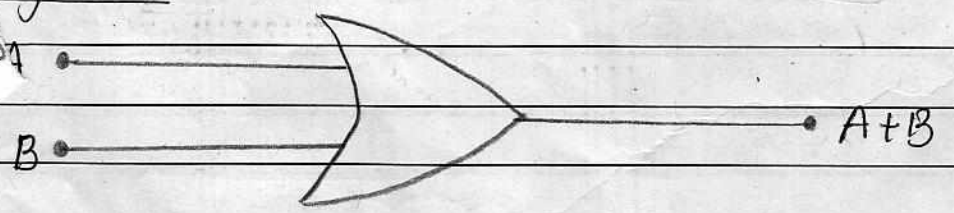
Answer - 17

Logic gates :- These are the logical gates which accept binary inputs and logical values and gives output. It may accept two or more inputs and gives one output.

There are various logic gates like NOT gate, OR gate, AND gate, NAND gate, NOR gate.

OR gate : It is the gate which accepts two inputs and gives one output. It is represented by '+' sign.

Symbol :



Boolean formula :

$$Y = A + B$$

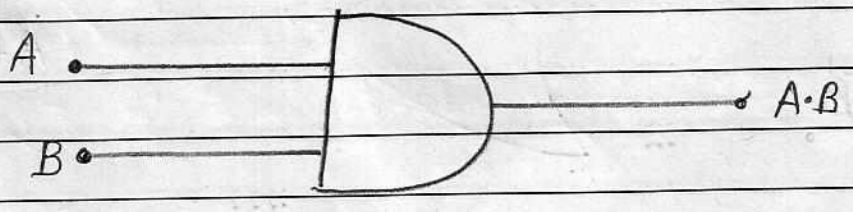
प्रश्न क्र.

Truth table :-

INPUT		OUTPUT
A	B	Y = A+B
0	0	0
0	1	1
1	0	1
1	1	1

AND gate → It is a type of logic gate which accepts two inputs and gives only one output. It is represented by (.) sign.

Symbol →



Boolean formula :- $Y = A \cdot B$

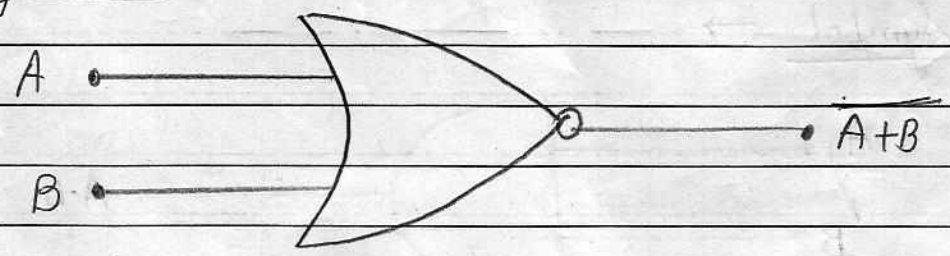
प्रश्न क्र.

Truth table :-

INPUT		OUTPUT
A	B	A·B
0	0	0
0	1	0
1	0	0
1	1	1

NOR gate :- It is a logic gate formed by the combination of OR gate and NOT gate. It is also called universal gate.

Symbol :



Boolean formula :-

$$Y = \overline{A+B}$$

प्रश्न क्र.

Truth Table :-

INPUT			OUTPUT
A	B	A+B	$\overline{A+B}$
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

Answer - 18

Electric Dipole :- When two equal and opposite charges are placed at a small separation, then the system is called electric Dipole.
The line joining the two charges is called Dipole axis.

Electric field intensity of an electric dipole for equitorial position :-

Let AB be an electric dipole consisting of charges $-q$ and $+q$

प्रश्न क्र.

separated at distance 2l and $-q$ is placed at A and $+q$ is placed at B.

Now, intensity of electric field is to be calculated at point P at distance 'r' from the mid point 'O' of the electric dipole on the perpendicular bisector of the dipole axis.

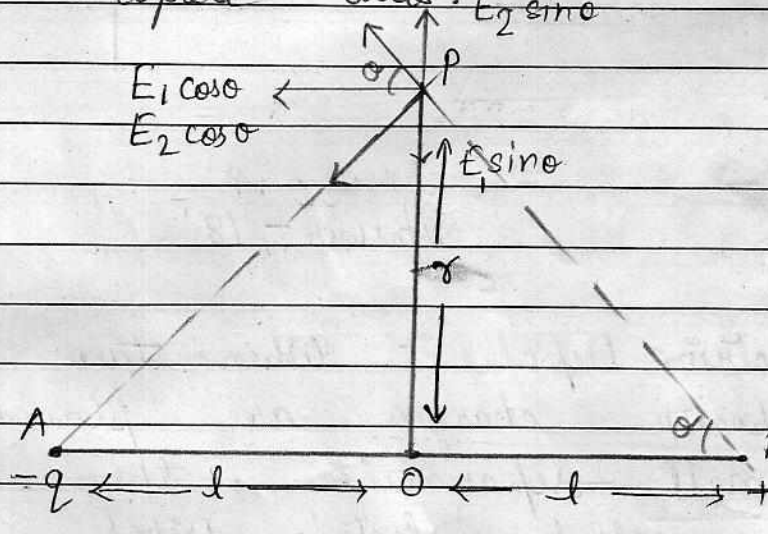


Fig: Electric Dipole at equitorial position

Electric field at P due to $-q$ charge is given by,

$$E_1 = \frac{1}{4\pi\epsilon_0 K} \times \frac{q}{(AP)^2} \quad \text{along } \overrightarrow{PA}$$

Now, Electric field at P due to $+q$ charge is given by,

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परीक्षार्थी द्वारा भरा जायें ↓

4 पृष्ठीय **वर्ष–2022**

परीक्षा का विषय	विषय कोड	परीक्षा का माध्यम
Physics	2 1 0	English

परीक्षा का दिनांक 21 | 2 | 22

स्टीकर तीर के निशान ↓ से मिलाकर लगायें

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

केन्द्र क्रमांक–122014

हायर सेकेण्डरी परीक्षा

पर्यवेक्षक का नाम एवं हस्ताक्षर

आचार शर्मा

आचार शर्मा

केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर

केन्द्राध्यक्ष

आशा० सरस्वती विद्या मन्दिर

हायर सैकेण्ड्री स्कूल श्योपुर

परीक्षार्थी द्वारा भरा जायें →

परीक्षार्थी का रोल नम्बर

अंकों में

2	2	1	2	2	7	5	9	8

शब्दों में

Two	Two		Two	Two	Seven	Five	Nine	Eight

मुख्य उत्तर पुस्तिका के अंतिम पृष्ठ क्रमांक 119150 तक कुल प्राप्तांक

प्रश्न क्र.

$$E_2 = \frac{1}{4\pi\epsilon_0 K} \times \frac{q}{(BP)^2} \quad \text{along } \vec{BP}$$

Now, in triangle AOP, by pythagorus theorem,

$$\Rightarrow (AP)^2 = (OA)^2 + (OP)^2$$

$$\Rightarrow AP^2 = d^2 + r^2$$

$$\Rightarrow AP = \sqrt{r^2 + d^2}$$

$$\Rightarrow AP = BP = \sqrt{r^2 + d^2}$$

पृष्ठ के अंकों का योग

MPBSE

प्रश्न क्र.

So, $E_1 = \frac{1}{4\pi\varepsilon_0 K} \times \frac{q}{(\sqrt{r^2+l^2})^2}$ along $\vec{PA}$

$E_1 = \frac{1}{4\pi\varepsilon_0 K} \times \frac{q}{(r^2+l^2)}$ along $\vec{PA}$

Similarly, $E_2 = \frac{1}{4\pi\varepsilon_0 K} \times \frac{q}{(r^2+l^2)}$ along $\vec{BP}$

Now taking components

Horizontal component : $E_1 \cos\theta$, $E_2 \cos\theta$
Vertical component : $E_1 \sin\theta$, $E_2 \sin\theta$

Since, the vertical components are equal in magnitude and opposite in direction. Therefore they cancle eachother and net electric field is given by Horizontal components.

$$E = E_1 \cos\theta + E_2 \cos\theta$$

$$E = 2E_1 \cos\theta$$

$$E = 2 \times \frac{1}{4\pi\varepsilon_0 K} \times \frac{q}{(r^2+l^2)} \cos\theta$$

प्रश्न क्र.

$$\cos\theta = \frac{l}{\sqrt{r^2+l^2}}$$

$$\Rightarrow E = 2 \times \frac{1}{4\pi\epsilon_0 K} \times \frac{q}{(r^2+l^2)^{3/2}} \times l$$

$$\because q \times 2l = p$$

$$\Rightarrow E = \frac{1}{4\pi\epsilon_0 K} \cdot \frac{\times p}{(r^2+l^2)^{3/2}}$$

For small dipoles,

$$l << r \Rightarrow l^2 << r^2$$

On eliminating l^2

$$\Rightarrow E = \frac{1}{4\pi\epsilon_0 K} \times \frac{p}{(r^2)^{3/2}}$$

$$\boxed{E = \frac{1}{4\pi\epsilon_0 K} \times \frac{p}{r^3}} \quad \text{along } \vec{BA}$$

$$\text{or, } \boxed{E = \frac{kp}{r^3}} \quad N/C$$

The direction of electric field is from $+q$ to $-q$ that is opposite to direction of dipole moment.

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Answer - 19

(i) L.C.R circuit :- In an L.C.R circuit inductance (L), capacitance (C) and resistance (R) are connected in series with alternating voltage source. Current flows through the circuit.

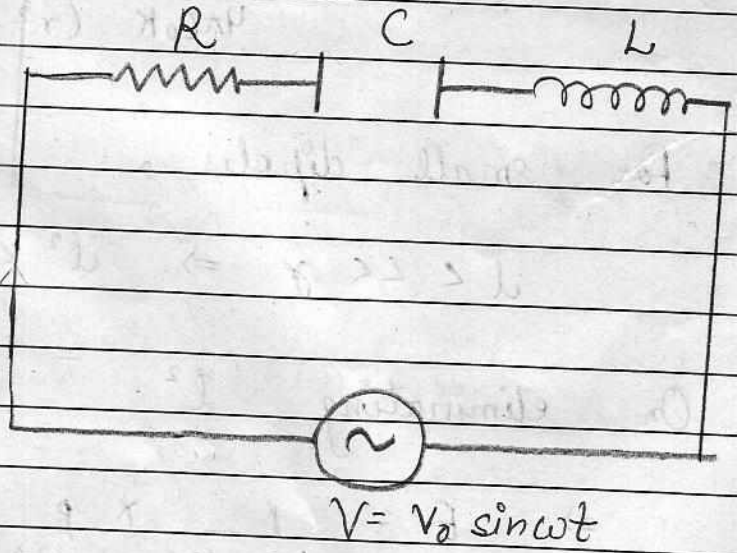


Fig: L.C.R. series circuit

Now, the current and voltage in inductance are in different phase. Voltage leads current in phase by $\frac{\pi}{2}$.

In capacitance, current leads voltage in phase by $\frac{\pi}{2}$.

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

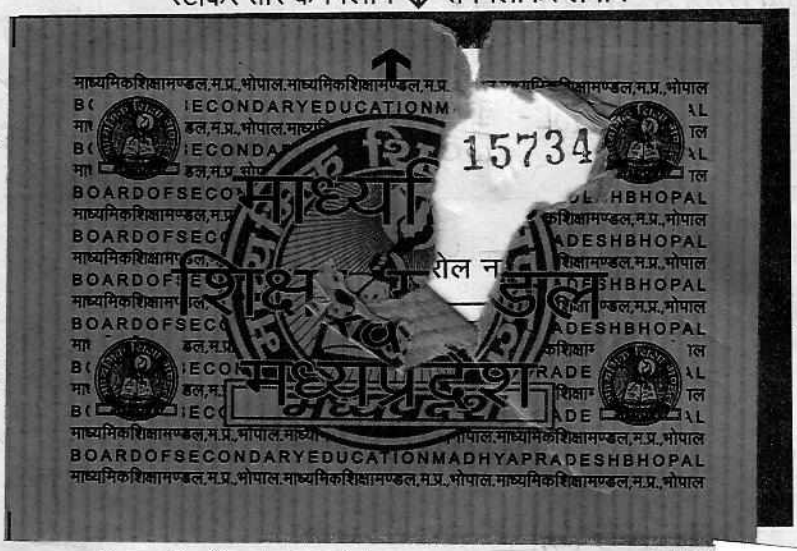
परीक्षार्थी द्वारा भरा जायें ↓

4 पृष्ठीय **वर्ष–2022**

परीक्षा का विषय	विषय कोड			परीक्षा का माध्यम
Physics	2	1	0	English

परीक्षा का दिनांक | 21 | 2 | 22 |

स्टीकर तीर के निशान ↓ से मिलाकर लगायें



परीक्षार्थी द्वारा भरा जायें →

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

केन्द्र क्रमांक–122014
हायर सेकेण्डरी परीक्षा

पर्यवेक्षक का नाम एवं हस्ताक्षर

आनर शर्मा
आनर शर्मा

केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर

केन्द्र क्रमांक 122014
केन्द्राध्यक्ष

आशा० सरस्वती विद्या मन्दिर
हायर सैकेण्ड्री स्कूल श्योपुर

मुख्य उत्तर पुस्तिका के अंतिम पृष्ठ क्रमांक ..... तक व

□ + □ = □

प्रश्न क्र.

But in resistance, current and voltage are in same phase.

Voltage across inductance is given by,

$$V_L = IX_L = I\omega L$$

Voltage across capacitance is given by,

$$V_C = IX_C = \frac{I}{\omega C}$$

Voltage across resistance is given by,

$$V_R = IR$$

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(ii) Phasor diagram :-

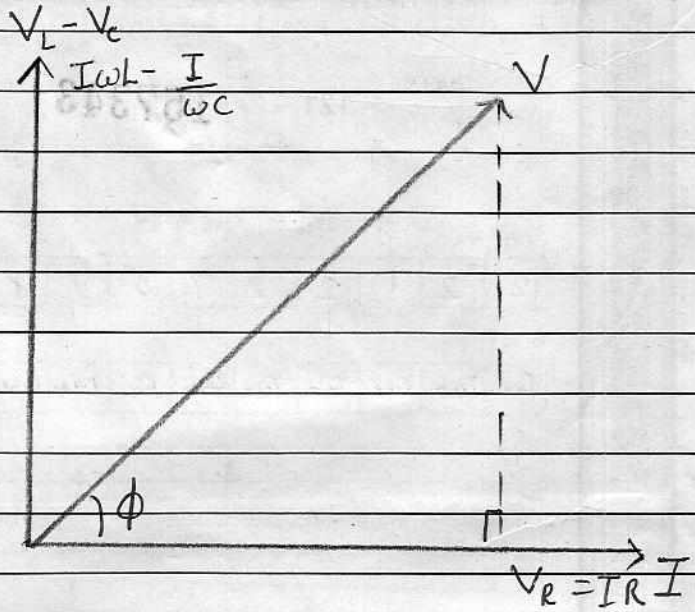

Fig : phasor diagram

(iii) Resultant voltage :-

If 'V' is the resultant voltage then

$$V^2 = V_R^2 + (V_L - V_c)^2$$

$$V = \sqrt{V_R^2 + (V_L - V_c)^2}$$

$$V = \sqrt{I^2R^2 + (I\omega L - \frac{I}{\omega C})^2}$$

$$V = I\sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}$$

So, the resultant voltage is given by,

$$V = I\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

(iv) Impedance :-

Now, $$\frac{V}{I} = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$$\Rightarrow Z_{LCR} = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

where Z_{LCR} is the impedance.

(v) Phase difference :-

If the phase difference is ϕ

Then,

$$\tan\phi = \frac{V_L - V_C}{V_R}$$

$$\tan\phi = \frac{I\omega L - \frac{I}{\omega C}}{IR}$$

$$\tan\phi = \frac{\omega L - \frac{1}{\omega C}}{R}$$

प्रश्न क्र.

So, $\phi = \tan^{-1}\left\{\frac{\omega L - \frac{1}{\omega C}}{R}\right\}$

ϕ is the phase difference