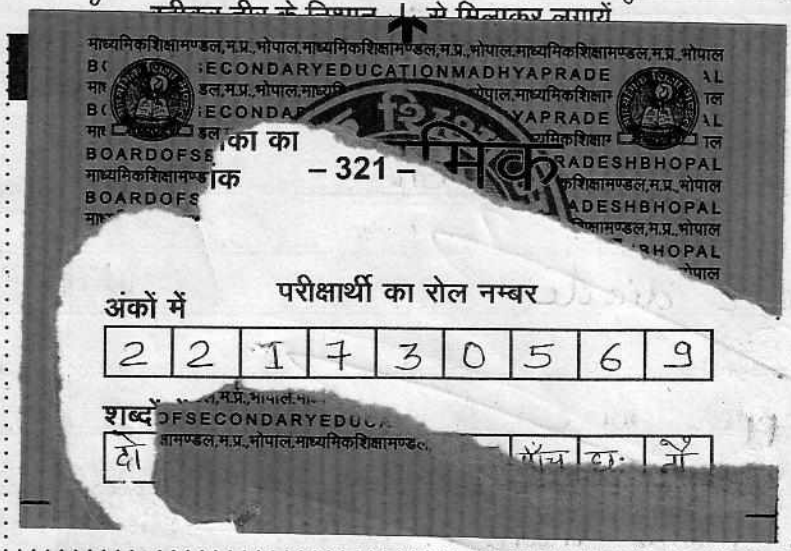
माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

परीक्षार्थी द्वारा भरा जायें ↓

24 पृष्ठीय

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

परीक्षार्थी द्वारा भरा जायें ↓



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 01 शब्दों में एक

ख – परीक्षार्थी का कक्ष क्रमांक 30

ग – परीक्षा की दिनांक 21 02 2022

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकण्डरी परीक्षा केन्द्र क्रमांक-172003

पर्यवेक्षक का नाम एवं हस्ताक्षर	केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर
21/2/22	

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
D.K. JAIN (Principal) Govt. H.S.S. Rewas Dewara	B.L. TORECHA Lecturer in Physics Rajeswari H.S.S. Pipliya Mandi

नोट : हायर सेकण्डरी 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।''

मार्च 2022

प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्टी करें

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्ताक (अंको में)
1		
2		
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28		

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

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Answer of Q.1

choose the correct option -

(a) (iii) Zener diode

(b) (ii) Copper wire

(c) (ii) is more than

(d) (iii) 1.6×10^{-19} C

(e) (ii) the current on the coil

(f) (ii) Mutual Induction

(g) (i) an accelerated charge

Answer of Q.2

Fill in the blanks:

(i) Gamma rays (Y-rays)

(ii) Bar magnet.

प्रश्न क्र.

(iii) Wheatstone bridge.

(iv) Concave.

(v) $Y = \overline{A.B}$

(vi) Scattering of light.

(vii) Parallel.

Answer of Q. 3

Column A	Answers
(i) Magnifying power of compound microscope	– (d) $-\frac{V_o}{u_o}\left(1 + \frac{D}{f_e}\right)$
(ii) Brewester's law	– (i) Polarisation of light.
(iii) Infrared Radiations	– (f) Hershel
(iv) Electron - Volt	– (j) Unit of energy.
(v) Dynamo	– (c) Electromagnetic induction
(vi) Ammeter	– (g) Instrument of measuring current.
(vii) Electrical Power	– (e) V. I.

प्रश्न क्र.

Answer of Q. 4

Answer in one sentence –

(i) Focal length of lens is inversely proportional to the power of lens.

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

(ii) NOT gate is known as inversion gate.

(iii) Lenz's law is based on the law of conservation of energy.

(iv) Threshold frequency is that minimum frequency of incident light below which electrons can't be emitted by any substance. It is represented by ν_0.

(v) Magnification power of Astronomical telescope can be increased by increasing the diameter of objective lens and decreasing the focal length of eye lens.

(vi) Insulated medium decreases the potential of a conductor when placed near the charged conductor.

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(vii) Displacement current is produced due to time varing electric field. Because on changing electric field, electric flux also changes.

Displacement current, $I_d = \varepsilon_0 \frac{d\phi_E}{dt}$

Answer of Q.5 (OR)

Kirchoff's Voltage law -

In a closed mesh (or loop), the algebraic sum of product of current and correspondi resistances is equal to the total emf of the closed loop. This law is also known as Kirchoff's Loop Rule.

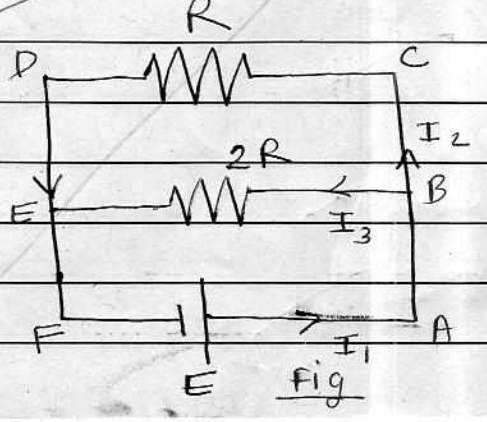
Sign Convention :

The potential drop through a resistance in the direction of current is taken as ~~negative~~ positive and in the opposite direction as negative.

In a cell, when we move from low potential to high potential, the emf is taken as positive.

In closed loop FABEF,

$I_3 \times 2R = E$



Fig

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Answer of Q.6

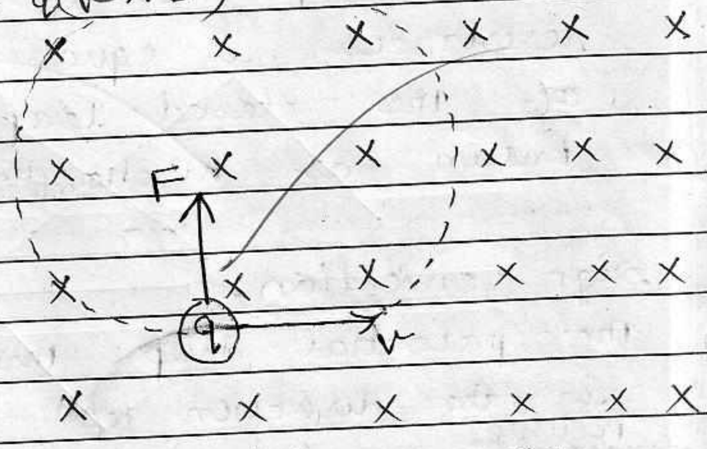
<u>Lorentz Force</u>

The Force acting on a charged particle (charge q) with a velocity in uniform magnetic field is known as Lorentz Force.

$$F = qvB\sin\theta$$

In vector form,

$$\vec{F} = q(\vec{v} \times \vec{B})$$



This force is responsible for the circular motion of a charged particle in uniform magnetic Field.

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Answer of Q.7

Given, the polarising angle of a transparent medium, $i_p = 30°$

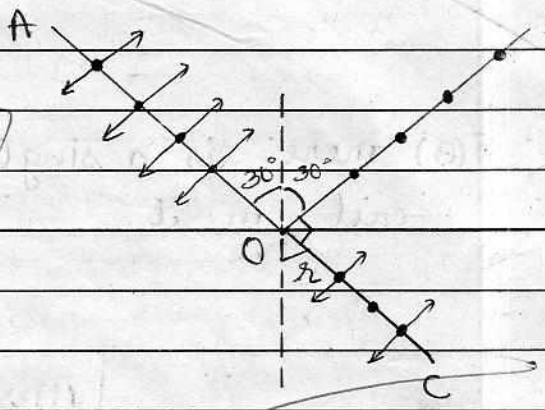
We know that,

$\angle BOC = 90°$

$\therefore i_p + r = 90°$

$r = 90° - i_p$

$\boxed{r = 90° - 30° = 60°}$



Angle of refraction $= 60°$.

Answer of Q.8 (OR)

Self Induction	Mutual Induction
(1) When the current flowing through a coil changes, an induced is produced in the coil itself. This phenomenon is known as self Induction.	(1) When the current flowi through a coil changes an induced current in other coil, this phenomenon is known as Mutual Induction

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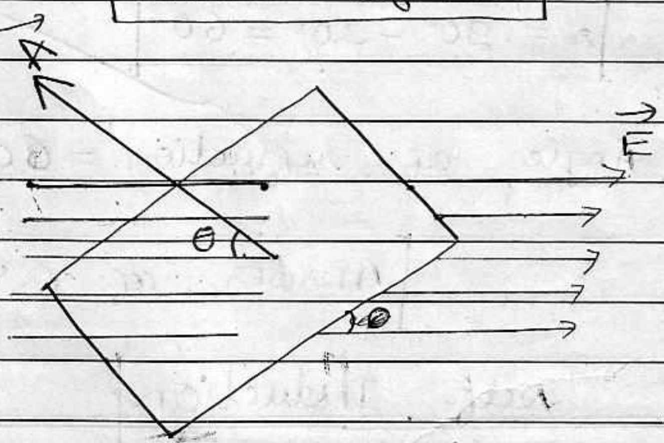
Self Induction	Mutual Induction
(2) The induced current directly affects the main current.	(2) The induced current is produced in other coil, therefore, It does not affect the main current.
(3) There is a single coil in it.	(3) There are two coils in it.

MPBSE

Answer of Q.9



The electric flux through a surface is given by

$$\phi_E = \vec{E}.\vec{A}$$

$$\phi_E = EA\cos\theta$$

where θ = Angle between electric field vector and area vector

प्रश्न क्र.

When the surface is parallel to the electric field, the area vector is perpendicular to the electric field.

i.e, $\theta = 90°$

$$\phi_E = EA \cos 90° = 0 \qquad (\because \cos 90° = 0)$$

Answer of Q.10

According to Rayleigh's law, the intensity of scattered light is inversely proportional to the fourth power of wavelength of light.

$$I \propto \frac{1}{\lambda^4}$$

Since, the wavelength of red colour is maximum of all the colours. Therefore, Red colour is scattered the least by atmosphere, dust particles etc. Red colour can be seen from far distances. Therefore, the danger signal is always red.

प्रश्न क्र.

Answer of Q. 11

Stopping Potential-
In Lenard's experiment, the negative potential of anode corresponding to which the photoelectric current becomes zero is known as stopping potential or cut off potential. This potential should stop even the most energetic photoelectron.

i.e., $KE_{max} = eV_0 = h\nu - \phi$

where ϕ = work function

Therefore, stopping potential

$$V_0 = \frac{h\nu}{e} - \frac{\phi}{e}$$

Answer of Q. 12 (OR)

P- type semiconductor	N - type semiconductor
(1) when trivalent impurity is dopped with pure tetravalent semiconductor, P- type semiconductor is formed.	(1) when Pentavalent impurity is dopped with pure tetravalent semiconductor, N-type semiconductor is formed.

प्रश्न क्र.

P- type semiconductor	N- type semiconductor
(2) Majority charge carriers are holes and minority charge carriers are electrons.	(2) Majority charge carriers are electrons and minority charge carriers are holes.
(3) The fermi level is towards valence band.	(3) The fermi level is towards conduction band.

Answer of Q.13

Parallel Combination of Resistances

let two resistors of resistances R_1 and R_2 are connected in parallel with a cell of emf E.

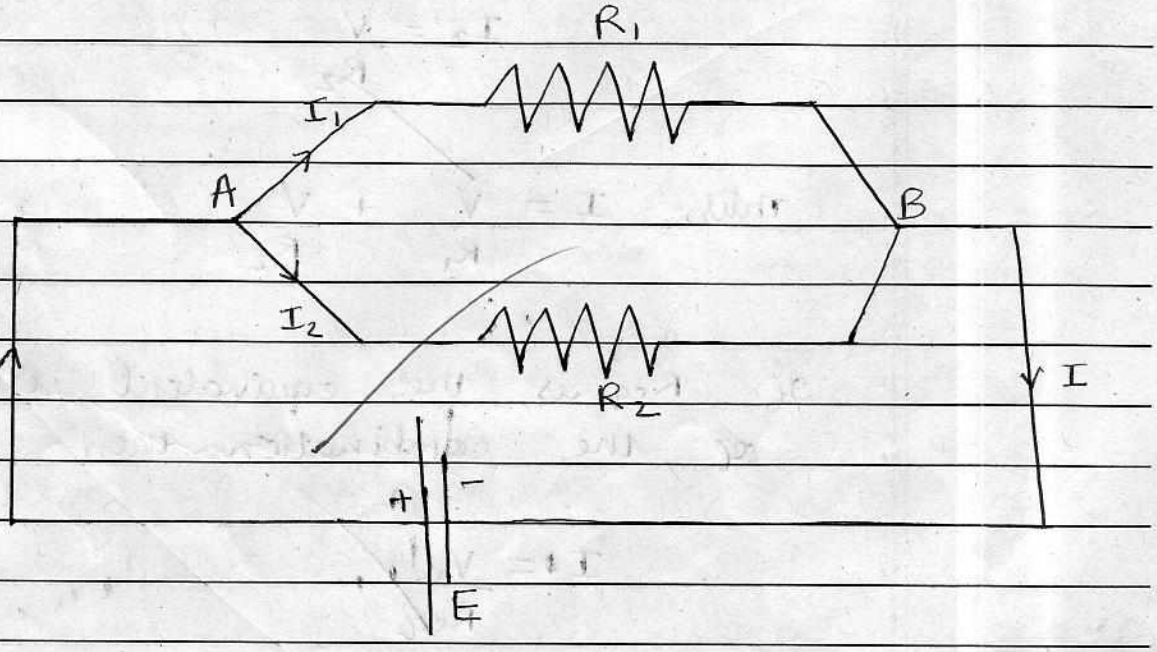


fig. Parallel combination of resistances

Let the current I is divided in two parts I_1 and I_2 through resistances R_1 and R_2, respectively.

Let the potential difference between A and B be V.

~~∴ Potential difference~~

We know that,

$$I = I_1 + I_2 \quad \text{— (1)}$$

Current through R_1,

$$I_1 = \frac{V}{R_1}$$

Current through R_2,

$$I_2 = \frac{V}{R_2}$$

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

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

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

प्रश्न क्र.

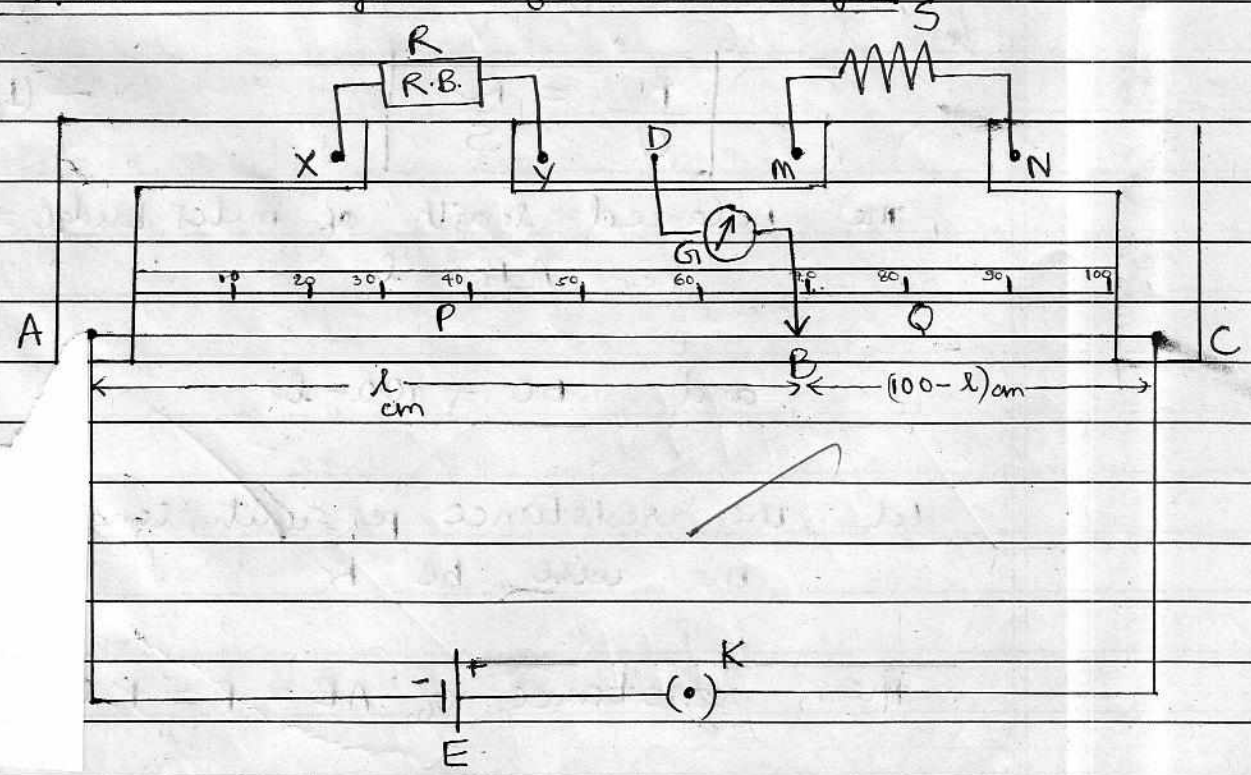
i.e., $\frac{V}{Req} = V\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

$$\boxed{\frac{1}{Req} = \frac{1}{R_1} + \frac{1}{R_2}}$$

i.e., $\boxed{Req. = \frac{R_1 R_2}{R_1 + R_2}}$ proved.

Answer of Q.14

Labelled diagram of Meter Bridge.



AC → Constantan wire

R → Resistance BOX

S → Unknown resistance

प्रश्न क्र.

E → cell

K → Key

l → Balanced length

G → Galvanometer

P → resistance of AB

Q → resistance of BC

Principle -

Meter Bridge works on the principle of wheatstone bridge. In the balanced condition, galvanometer shows no deflection and in this situation

$$\boxed{\frac{P}{Q} = \frac{R}{S}} \quad \text{— (1)}$$

The Balanced length of meter bridge = l cm

i.e., $AB = l$

and $BC = 100 - l$

Let the resistance per unit length of the wire be K

Then, resistance of $AB = P = Kl$

and resistance of $BC = Q = K(100 - l)$

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From eqn (1),

$$\frac{K\ell}{K(100-\ell)} = \frac{R}{S}$$

$$\boxed{S = \frac{R(100-\ell)}{\ell}} \quad -(2)$$

Therefore, the unknown resistance can be calculated by eqn (2).

Precautions

(1) Jockey should not be rubbed with the wire.

(2) All the connections must be tight.

(3) Current should be drawn when the reading is to be taken.

Answer of Q.15 (OR)

Let L_1 and L_2 are two convex lens placed in contact of each other.

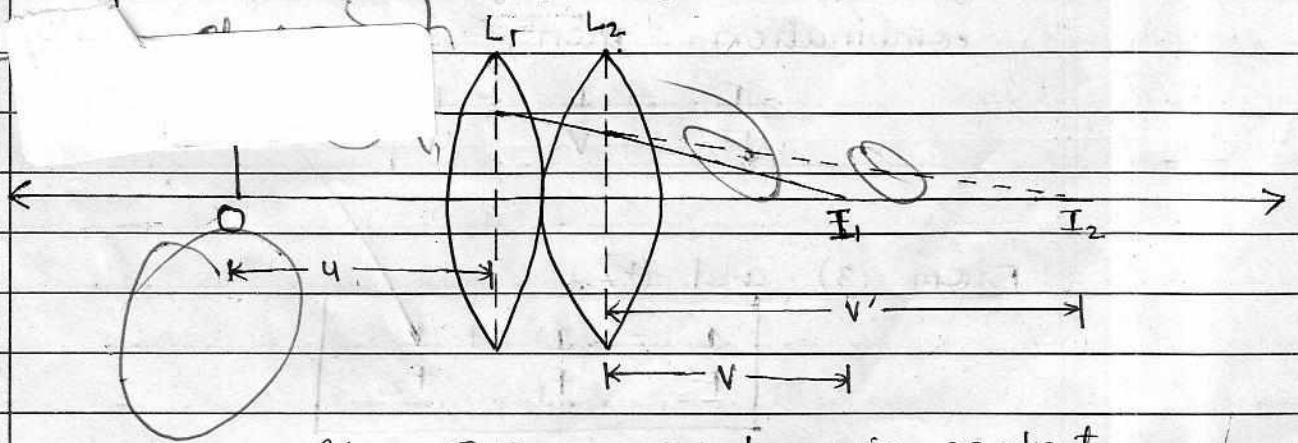

Fig. Two convex lens in contact

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Let the focal length of L_1 and L_2 are f_1 and f_2, respectively.

$O \rightarrow$ Object

$I_2 \rightarrow$ first image formed by L_1

$I_1 \rightarrow$ final image formed by L_2

By lens formula,

$$\frac{1}{f_2} = \frac{1}{V'} - \frac{1}{U} \quad \text{(Image by } L_1\text{)} \quad -(1)$$

And,

$$\frac{1}{f_2} = \frac{1}{V} - \frac{1}{V'} \quad \text{(Image by } L_2\text{)} \quad -(2)$$

Adding (1) and (2), we get

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{V} - \frac{1}{U} \quad -(3)$$

If F is the focal length of the combination then;

$$\frac{1}{F} = \frac{1}{V} - \frac{1}{U} \quad -(4)$$

From (3) and (4),

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

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i.e, $$F = \frac{f_1 f_2}{f_1 + f_2}$$

Answer of Q.16

Given:

Input a.c. Voltage in the primary coil

$V_p = 11000\ V$

Output a.c. voltage in the secondary coil

$V_s = 440\ V$

Number of turns in the primary coil

$N_p = 8000$

We know that,

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s} = \text{Transformer ratio}$$

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

i.e, $$\frac{440}{11000} = \frac{N_s}{8000}$$

$$N_s = \frac{440}{11000} \times 8000 = \frac{440 \times 8}{11}$$

$$N_s = 40 \times 8 = 320$$

Hence, the number of turns in the secondary coil are 320.

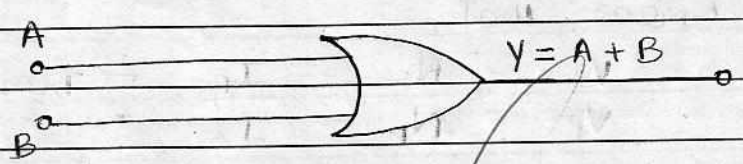
Answer of Q.17

Logic Gates-

A digital circuit, which either allows a signal to pass through or stop it, is called logic gate. A logic gate obeys a certain logic relation between input and output voltages.

☆ OR gate

Symbol:



Boolean Formula:

$$Y = A + B$$

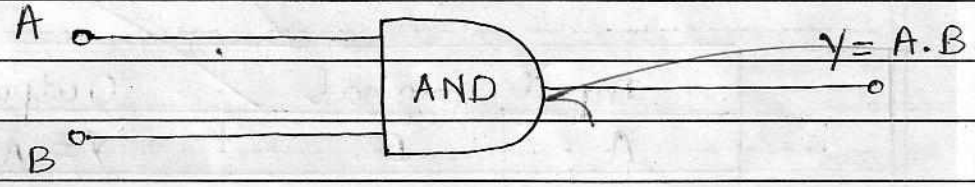
Truth Table

प्रश्न क्र.

Input signal		Output signal
A	B	Y = A + B
0	0	0
0	1	1
1	0	1
1	1	1

☆ AND gate

Symbol:



Boolean Formula:

$$Y = A.B$$

Truth Table:

Input signal		Output signal
A	B	Y = A.B
0	0	0
0	1	0
1	0	0
1	1	1

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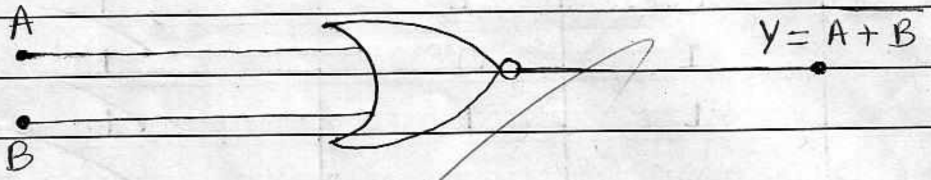
NOR gate

Symbol :



Boolean Formula:

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

Truth Table :

Input signal		Output signal
A	B	$Y = \overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0

प्रश्न क्र.

Answer of Q.18

Capacitor -

A device which can increase the capacity of a conductor without changing its shape or size is known as capacitor.

Symbol :

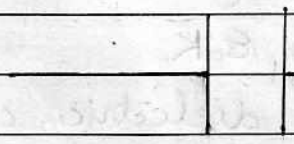


fig. capacitor

Parallel Plate Capacitor

Let X and Y be the two plates of a parallel plate capacitor.

When charge $+Q$ is given to plate X, $-Q$ charge is induced on plate Y. Distance between plates be d.

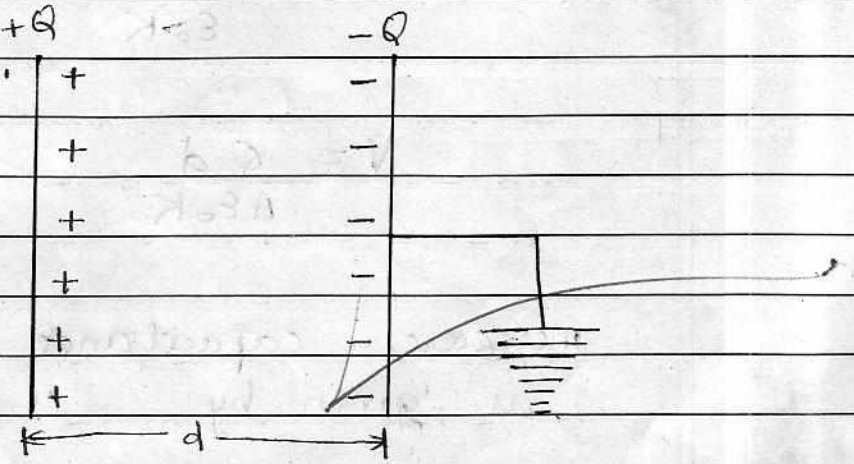


fig. Parallel Plate capacitor

प्रश्न क्र.

surface charge density on the plates

$$\sigma = \frac{Q}{A}$$

where A = area of each plate

Electric Field Intensity between the plates of the capacitor

$$E = \frac{\sigma}{\varepsilon_0 K}$$

where K = dielectric constant of medium between the plates.

Therefore, Potential difference across plates X and Y,

$$V = Ed$$

$$V = \frac{\sigma d}{\varepsilon_0 K}$$

$$V = \frac{Q d}{A \varepsilon_0 K} \quad \left(\because \sigma = \frac{Q}{A}\right)$$

Therefore, capacitance of the capacitor is given by

प्रश्न क्र.

$$C = \frac{Q}{V}$$

i.e, $$C = \frac{Q}{\frac{Qd}{\varepsilon_0 A K}}$$

$$\boxed{C = \frac{\varepsilon_0 A K}{d}}$$

If the medium between the plates is air / vacuum, then $K = 1$

capacitance of capacitor,

$$\boxed{C = \frac{\varepsilon_0 A}{d}}$$

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Answer of Q.19 (OR)

L-C-R circuit

(1) Electrical circuit

Let inductance L, capacitance C and resistance R are connected in series with an a.c. source of voltage $V = V_0 \sin\omega t$

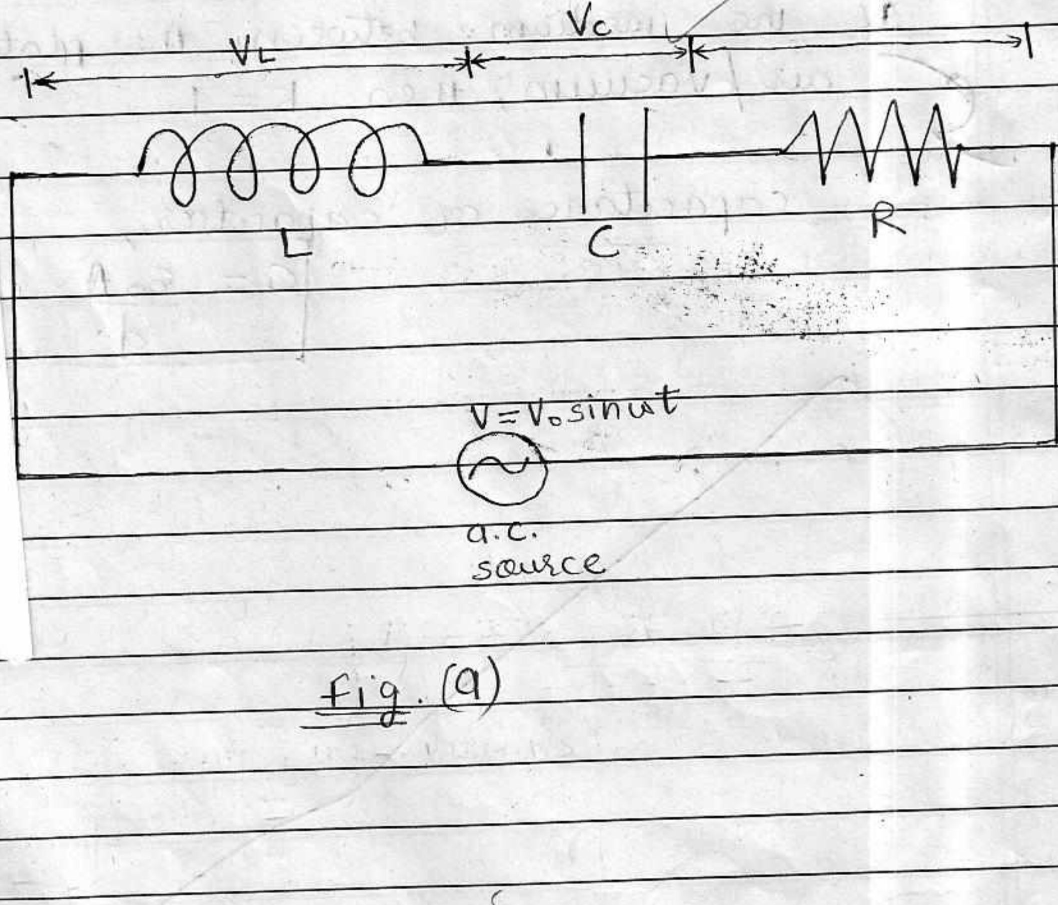


Fig. (9)

(1)

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

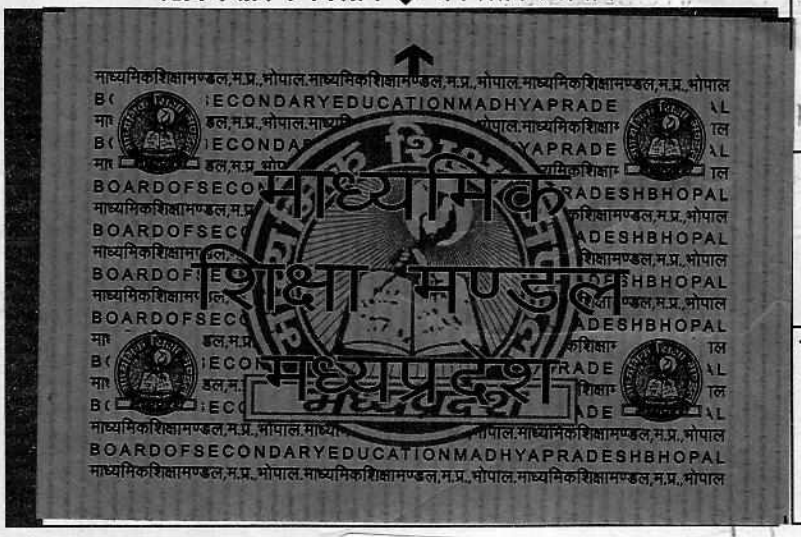
परीक्षार्थी द्वारा भरा जायें ↓

2022 फरवरी

परीक्षा का विषय	विषय कोड			परीक्षा का माध्यम	परीक्षा का दिनांक		
Physics	2	1	0	English	21	02	2022

स्टीकर तीर के निशान ↓ से मिलाकर लगायें

परीक्षार्थी द्वारा भरा जायें →



परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा	
पर्यवेक्षक का नाम एवं हस्ताक्षर	21/02/22
केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर	

मुख्य उत्तर पुस्तिका के अंतिम पृष्ठ क्रमां [ ] + [ ] = [ ]

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(2) Phasor diagram

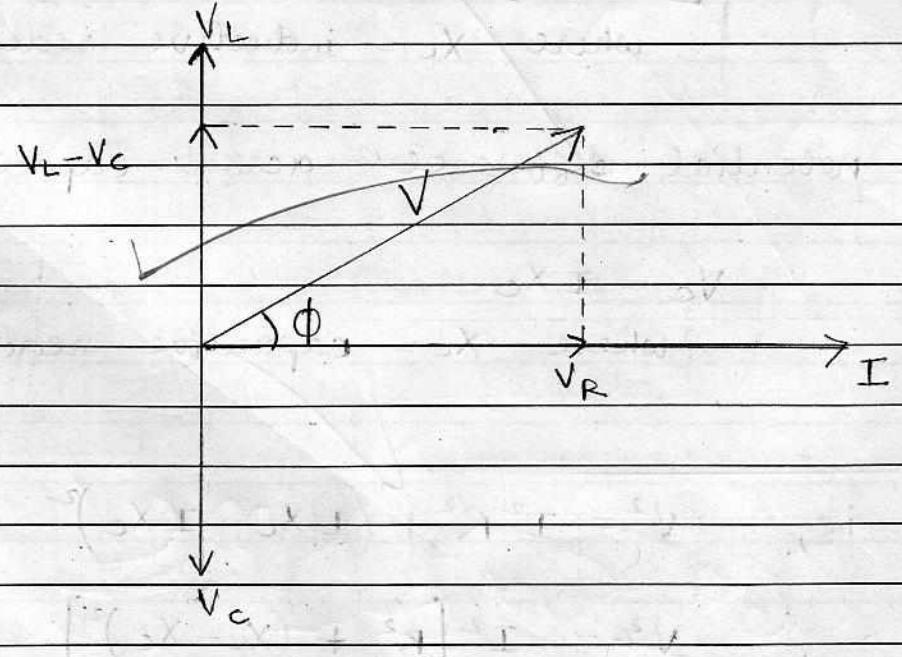

fig. (b)

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(3) Resultant Voltage

from fig (b)

$$V^2 = V_R^2 + (V_L - V_C)^2$$ (Pythagoras theorem)

Potential difference across resistance

$$V_R = IR$$

Potential difference across inductance

$$V_L = IX_L$$

where X_L = inductive reactance

Potential difference across capacitance

$$V_C = IX_C$$

where X_C = capacitive reactance

i.e., $$V^2 = I^2R^2 + (IX_L - IX_C)^2$$

$$V^2 = I^2\left[R^2 + (X_L - X_C)^2\right]$$

$$\boxed{V = I\sqrt{R^2 + (X_L - X_C)^2}} \quad \text{— (1)}$$

This is the required resultant voltage

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where

$X_L = \omega L$

and $X_C = \frac{1}{\omega C}$

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

(4) Impedance

Impedance is the effective resistance of the combination.

On comparing eqn (1) with Ohm's law, we get

Impedance of L-C-R circuit

$$Z_{LCR} = \sqrt{R^2 + (X_L - X_C)^2}$$

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

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(5) Phase difference

From Fig (b)

Phase difference between the resultant voltage V and current I

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

$$\tan\phi = \frac{IX_L - IX_C}{IR} = \frac{X_L - X_C}{R}$$

$$\phi = \tan^{-1}\left(\frac{X_L - X_C}{R}\right)$$

i.e.,

$$\boxed{\phi = \tan^{-1}\left(\frac{\omega L - \frac{1}{\omega C}}{R}\right)}$$