केवल मूल्यांकनकर्ता के उपयोग हेतु!

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

32 पृष्ठीय

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

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)	प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)
1			17		
2			18		
3			19		
4			20		
5			21		
6			22		
7			23		
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परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

→ परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे

प्रमाणित किया जाता है कि [illegible] पर के पृष्ठों के अनुरूप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अंकों का योग सही है।

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

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा

M. K. Nagar
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परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा

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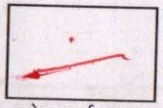

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Question - 1

i) Intensity of light - Number of photons

ii) Frequency of light - Frequency of photon

iii) Work function - Minimum energy to emit electoons from surface

iv) Matter waves - Moving particle

v) Threshold frequency - Minimum frequency to emit electoons from surface

vi) Particle nature of light - Einstein

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Question - 2

i) 6.25×10^{18}

ii) Tangent

iii) Transversal

iv) Interference

v) 90°

vi) small

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Question - 3

i) True

ii) True

iii) False

iv) False

v) True

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Question - 4

i) Electrons

ii) One

iii) Magnetic and electric field both

iv) Law of charge conservation

v) Photo electric effect

vi) Henrich Hertz

Question - 5

i) $q = n.e$

where, e is electronic charge

ii) 10^{14}

iii) 2 D

iv) Henry

v) $I_{rms} = \frac{I_0}{\sqrt{2}}$

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Question - 6

Capacity of a capacitor can be defined as its capability to store charge when unit potential difference is applied across it.

SI unit → Farad (F)

Question - 7

Intrinsic semiconductor	Extrinsic semiconductor
i) Intrinsic semiconductor are pure semiconductor, made up of only one kind of atom.	Extrinsic semiconductor are impure semiconductor, doped with trivalent or pentavalent impurity.
ii) In intrinsic semiconductor, no. of electrons is equal to no. of holes.	In extrinsic semiconductor, no. of electrons and no. of holes are not equal.

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Question - 8

Ionisation energy is the amount of energy required to be given to an isolated gaseous atom to eject out an electron from its orbit.

Question - 9

Malus law states that ~~the~~ intensity of polarised light when passed through a polaroid, varies as square of cosine of angle between plane of polaroid and direction of light wave ~~displacement.~~ propagation.

$$I_{new} = I_0 \cos^2(\phi)$$

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Question-10 - OR

In a transformer, core is laminated to reduce the eddy currents induced in core due to alternating voltage, and prevent the energy from being wasted in form of heat.

Question-11

Lenz's law states that, whenever magnetic flux through a loop changes, an EMF is induced in it in such a way that it opposes the cause of change.

$$E = -\frac{d\phi}{dt}$$

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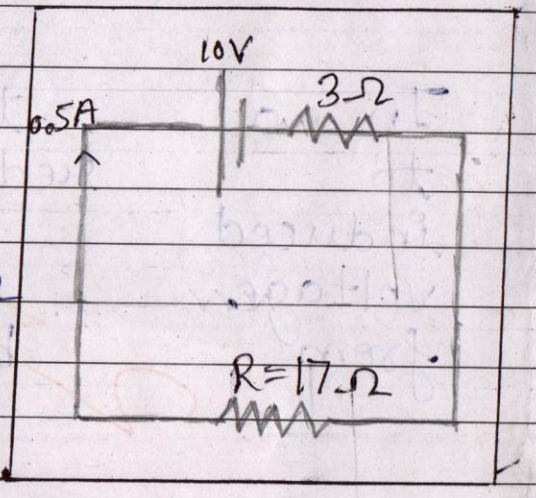
Question-12 - OR



Given,

EMF (V) = 10V

Current (i) = 0.5 A

Internal resistance(r) = 3Ω

To find,

Resistance of resistor (R).

Solution,

By ohm's law,

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

$\Rightarrow 0.5 = \frac{10}{R_{eq}}$

$\Rightarrow R_{eq} = \frac{10}{0.5}$

$\Rightarrow \boxed{R_{eq} = 20\,\Omega}$

Also, for series combination

$\Rightarrow \boxed{R_{eq} = r + R}$

$\Rightarrow 20 = 3 + R$

$\Rightarrow \boxed{R = 17\,\Omega}$

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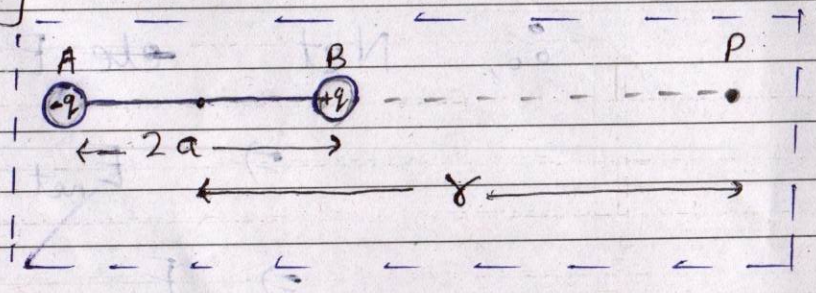
Question-14



Let's assume that, 2 point charges $+q$ & $-q$ are placed on points A & B at small separation $2a$.

We have to find, Electric field at point P on its axis at a distance r.

such that, $\boxed{r >> 2a}$

Now,

E.F. at P due to $-q$,

$$\Rightarrow E_{-q} = \frac{Kq}{(r+a)^2} \quad (\hat{BA})$$

and, E.F. at P due to $+q$,

$$\Rightarrow E_{+q} = \frac{Kq}{(r-a)^2} \quad (\hat{AB})$$

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$\therefore$ Net ~~ele~~ E.F. at P,

$$\Rightarrow E_{net} = E_{-q} + E_{+q}$$

$$\Rightarrow E = \frac{Kq}{(r+a)^2}(\hat{BA}) + \frac{Kq}{(r-a)^2}(\hat{AB})$$

$$\Rightarrow E = -\frac{Kq}{(r+a)^2} + \frac{Kq}{(r-a)^2}(\hat{AB})$$

$$\Rightarrow E = \frac{Kq(r+a)^2 - Kq(r-a)^2}{(r+a)^2\,(r-a)^2}$$

$$\Rightarrow E = \frac{Kq(r^2+a^2+2ar) - Kq(r^2+a^2-2ar)}{(r^2-a^2)^2}$$

$$\Rightarrow E = \frac{2Kqar - (-2Kqar)}{(r^2-a^2)^2}$$

$$\Rightarrow E = \frac{4Kqqr}{(r^2-a^2)^2}$$

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$\therefore$ $\boxed{a^2 << r^2}$

$\therefore$ we can neglect a^2.

$\Rightarrow E = \frac{4Kq\,ar}{(r^2)^2}$

$\Rightarrow E = \frac{4Kq\,a}{r^3}$

$\Rightarrow E = \frac{(q \cdot 2a) \cdot (2K)}{r^3}$ $\quad [q \cdot 2a = P \text{ (Dipole moment)}]$

$\Rightarrow \boxed{E = \frac{2KP}{r^3} \quad (\hat{AB})}$

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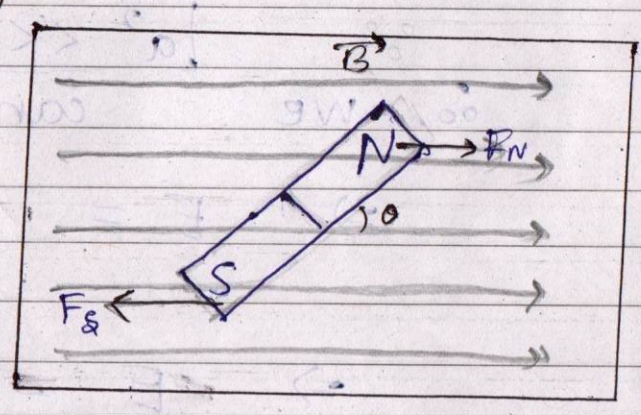
Question - 15



Let's assume that, A bar magnet of pole stength m and length l is placed in uniform magnetic field B making an angle θ with it.

We have to calculate torque on it.

now, Force on North pole,

$$\Rightarrow F_N = m \cdot B \sin\theta \, (\hat{B})$$

and, Force on South pole,

$$\Rightarrow F_S = m \cdot B \sin\theta \, (-\hat{B})$$

∵, Forces are equal and opposite,
∴ they will cancel out each other.

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now,

Torque $(\tau) = F \cdot r \cdot \sin\theta$

$\Rightarrow \tau = m \cdot B \cdot l \cdot \sin\theta$

$\Rightarrow \tau = (m \cdot l) \cdot B \sin\theta$ [$m \cdot l = M$ magnetic moment]

$\Rightarrow \boxed{\tau = M \cdot B \sin\theta}$

or, $\boxed{\tau = (M \times B)}$

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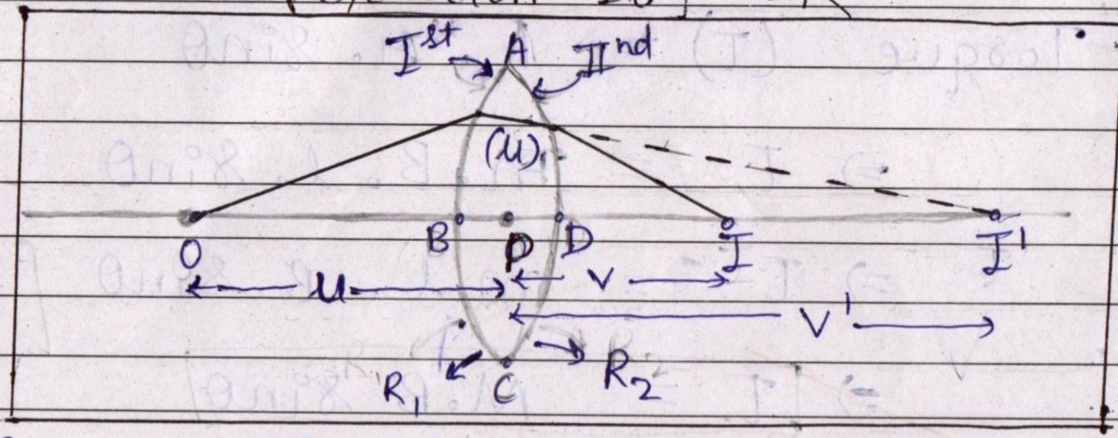
Question - 16 - OR



Let's assume,
A convex lens made of 2 spherical surfaces :-
i) ABC (Ist) of Radius R_1
ii) ADC (IInd) of Radius R_2

Now, a ~~point~~ object is placed at point (O) at distance u.
and, its image is formed at I' by Ist surface.

$$\Rightarrow \boxed{\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}}$$ [Formula for refraction by spherical surface]

$$\Rightarrow \boxed{\frac{\mu}{v'} - \frac{1}{u} = \frac{\mu - 1}{R_1}} \quad \text{--- (i)}$$

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For IInd surface,

I' will act as object and its image is formed at I.

$$\Rightarrow \boxed{\frac{1}{V} - \frac{\mu}{V'} = \frac{1-\mu}{R_2}} \quad \text{(ii)}$$

On adding (i) & (ii)

$$\Rightarrow \frac{\mu}{V'} - \frac{1}{U} + \frac{1}{V} - \frac{\mu}{V'} = \frac{\mu-1}{R_1} + \frac{1-\mu}{R_2}$$

$$\Rightarrow \frac{1}{V} - \frac{1}{U} = \frac{\mu-1}{R_1} - \frac{\mu-1}{R_2}$$

$$\Rightarrow \boxed{\frac{1}{f} = (\mu-1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)} \quad \left[\frac{1}{V} - \frac{1}{U} = \frac{1}{f}\right]$$

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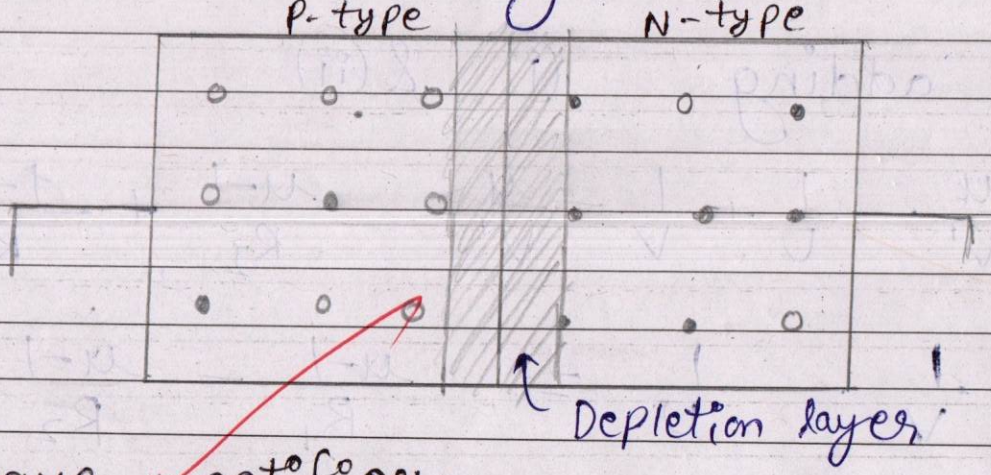
Question - 17

P-N junction diode is an unilateral device made up by joining a P-type and an N-type semiconductor, which allows flow current in one direction only (in forward biasing)



Full wave rectifier-

Rectifier is an application device of P-N diode used to convert Alternating EMF into Direct EMF.

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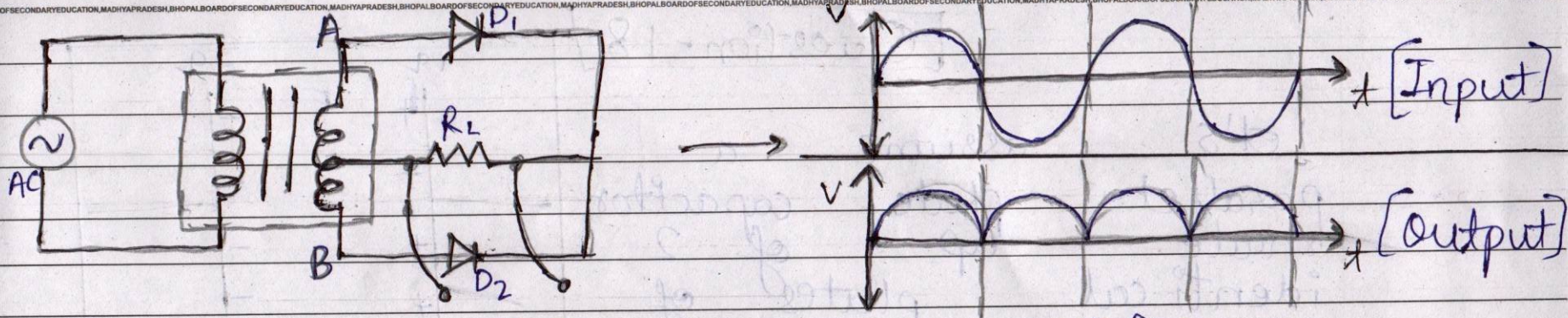

In a full wave rectifier, An AC source, 2 diodes D_1 & D_2 and load resistor (R_L) are connected as shown in diagram.

During I st half cycle of AC EMF. Terminal A will be (+ve) & B will be (-ve)
⇒ D_1 will be forward biased & allows current to flow & D_2 will resist.

During II nd half cycle of AC EMF, Ter A will be (-ve) & B will be (+ve)
⇒ D_2 will be forward biased and allow current to flow. & D_1 will resist.

In this way, DC EMF is obtained across R_L.

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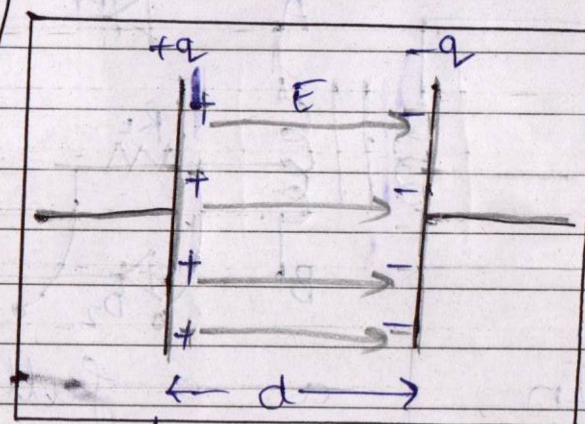
Question-18



Let's assume a parallel plate capacitor made up of 2 identical plates of Cross-sectional Area A placed at distance d. potential difference of V is applied across it and charge q is stored inside it.

Now, Net E.F. inside capacitor

$$\Rightarrow E = E_{+q} + E_{-q}$$

$$\Rightarrow E = \frac{-\sigma}{2\epsilon_0} + \frac{-\sigma}{2\epsilon_0}$$

$$\Rightarrow E = \frac{-\sigma}{\epsilon_0}$$

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$$\Rightarrow E = \frac{-Q}{A\epsilon_0}$$

$$\Rightarrow E.d = \frac{-Q.d}{A\epsilon_0}$$ [multiply d on both sides]

$$\Rightarrow \boxed{V = \frac{Qd}{A\epsilon_0}} \quad \text{①} \quad [\oint E.dr = -V]$$

On comparing ① with -

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

$$\Rightarrow \boxed{C = \frac{A\epsilon_0}{d}}$$

∴ 2 Factors affecting capacity are-

i) Area of plates - Capacity is directly proportional to cross sectional area of plates

ii) Distance b/w plates - Capacity is inversely proportional to separation b/w plates.

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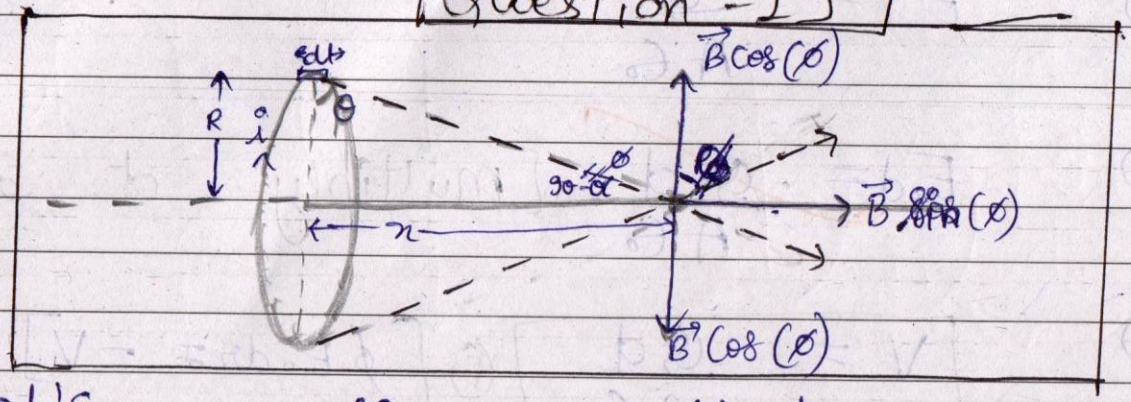
Question - 19



Let's assume that a circular ring is carrying current i

We have to find $\vec{B}$ on its axis at point P at distance x from ring.

θ is the angle made by element dl & line joining dl to P.

Now,

$d\vec{B}$ (due to dl) $= \frac{Ki\,dl\,\sin(90)}{x^2}$

$\Rightarrow d\vec{B} = \frac{Ki\,dl\,\sin(90^\circ)}{(R^2+x^2)}$

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$$\Rightarrow \int d\vec{B} = \int_0^{2\pi R} \frac{Ki\, dl}{(R^2+x^2)}$$

$$\Rightarrow \vec{B} = \frac{Ki\,(2\pi R)}{(R^2+x^2)}$$

On resolving $\vec{B}$ into components.
Vertical comp. ($\vec{B}\cos(\phi)$) will cancel out
&, Horizontal comp. ($\vec{B}\sin(\phi)$) will add up.

$$\Rightarrow \vec{B}_{net} = \frac{Ki\,2\pi R}{R^2+x^2} \cdot \sin(\phi)$$

$$\Rightarrow \vec{B}_{net} = \frac{Ki\,2\pi R}{R^2+x^2} \cdot \frac{R}{\sqrt{R^2+x^2}}$$

$$\Rightarrow \boxed{\vec{B}_{net} = \frac{Ki\,2\pi R^2}{(R^2+x^2)^{3/2}}}$$

Question-20 / OR

	Interference	Diffraction.
i)	Phenomenon of superposition of 2 wavefronts from coherent sources	Phenomenon of superposition of 2 secondary wavelets of same wavefront.
ii)	All fringes are of equal width	Width of fringes decrease on moving away from central maxima.
iii)	Spacing between fringes is uniform	Spacing between fringes is non-uniform
iv)	All bright fringes are completely bright & all dark fringes are completely dark throughout pattern.	Intensity of fringes starts fading on moving away from central maxima. ∴, Neither no fringes are completely bright or dark
Ex-	colour film inside water bubble	sunlight entering through windows.

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Question - 13 - OR

Given, $m\,N = 14.00307\ u$ & $^{14}_{7}N$

To find, (B.E.) Nitrogen nucleus

Solution,

We know that, $m\,(\text{nucleon}) = 1\,u$

$\therefore,\quad BE = (\Delta m) \cdot 931\ MeV$

$\Rightarrow\quad BE = (14.00307 - (14 \times 1)) \cdot 931\ MeV$

$\Rightarrow\quad BE = 0.00307 \times 931\ MeV$

$\Rightarrow\quad \boxed{BE = 2.86\ MeV}$