JEE-Main-22-01-2026 (Memory Based)
[EVENING SHIFT]
Physics

Question: Find the dimensions of the expression $\frac{\varepsilon_0 E}{T}$, where ε_0, E and T are permittivity, electric field and time.

Options:

(a) MLA^2

(b) $MA^{-1}L$

(c) AL^{-2}

(d) AL

Answer: (c)

Solution:

$$\left[\frac{\epsilon_0 E}{T}\right] = \frac{C^2}{Nm^2} \times \frac{N}{C \times T} = \frac{C}{m^2 T} = IL^{-2} = AL^{-2}$$

Question: In an open organ pipe 3rd and 6th harmonic frequency differ by 3200 Hz. Find the length of organ pipe (speed of sound = 320 m/s)

Options:

(a) 5 cm

(b) 10 cm

(c) 15 cm

(d) 20 cm

Answer: (c)

Solution:

$$f_0 = \frac{nV}{2L_0}$$

$$f_6 - f_3 = 3200\ Hz$$

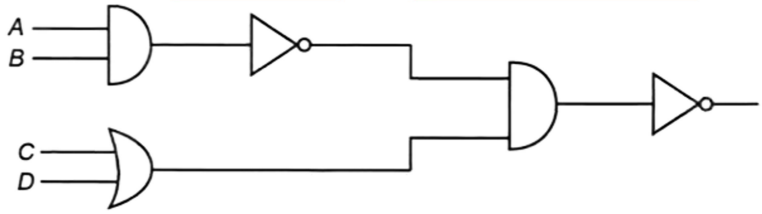
$$\Rightarrow \frac{6V}{2L_0} - \frac{3V}{2L_0} = 3200$$

$$\Rightarrow \frac{3V}{2L_0} = 3200$$

$$\Rightarrow L_0 = \frac{1.5 \times 320}{3200} = 0.15m = 15cm$$

$$10$$

Question: For the given logic gate find output function.



Options:

(a) $\overline{A}.\overline{B} + C + D$

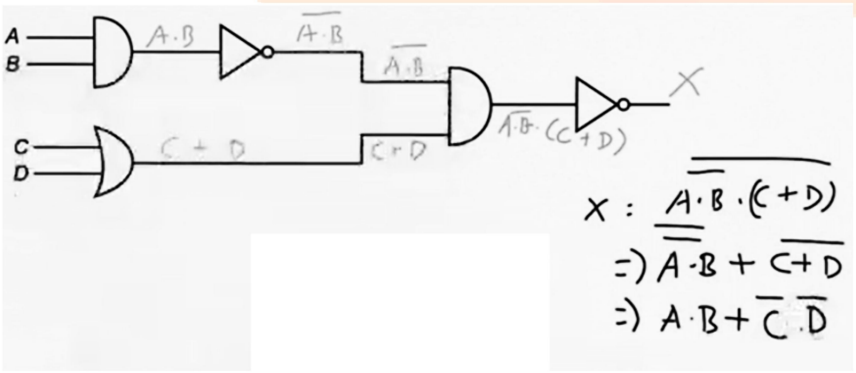
(b) $\overline{A} + \overline{B} + \overline{C}.\overline{D}$

(c) AB + CD

(d) $AB + \overline{C}.\overline{D}$

Answer: (d)

Solution:



Question: 3 small identical bubbles of water having same charge on each coalesce to form bigger bubble, Then the ratio of the potentials on one initial bubble & that on the resultant bigger bubble is:

Options:

(a) $1 : 3^{2/3}$
(b) $3^{2/3} : 1$
(c) $1 : 2^{2/3}$
(d) $1 : 3^{1/3}$

Answer: (a)

Solution:

$$V = \frac{Kq}{r}$$

$$V_{new} = \frac{K\,3q}{r\sqrt{3}}$$

$$= \frac{Kq}{r} \cdot \sqrt{3}$$

$$= V \cdot \sqrt{3}$$

$$\frac{V}{V_{new}} = \frac{1}{\sqrt{3}}$$

$$q + q + q = 3q$$

$$n + n + n \Rightarrow N \text{ ... moles.}$$

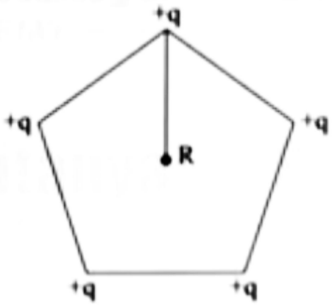
$$\frac{P \cdot V}{RT} \times 3 = \frac{P_{new} V_{new}}{RT}$$

$$\frac{4S}{r} \times \frac{4}{3}\pi r^3 \times 3 = \frac{4S}{R} \cdot \frac{4}{3}\pi R^3$$

$$3r^2 = R^2$$

$$R = r\sqrt{3}$$

Question: Five positive charges each having charge q are placed at the vertices of a pentagon as shown in the figure. The electric potential (V) & the electric field $\left(\vec{E}\right)$ at the center O of the pentagon due to the 5 positive charges are:-



Options:

(a) V = 0, E = 0

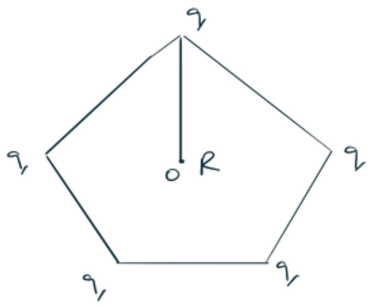
(b)

(c) $V = \frac{5a}{4\pi\varepsilon_0 r}, \vec{E} = 0$

(d)

Answer: (c)

Solution:



Electric potential :-

Due to each charge is $\frac{q}{4\pi\epsilon_0 a}$

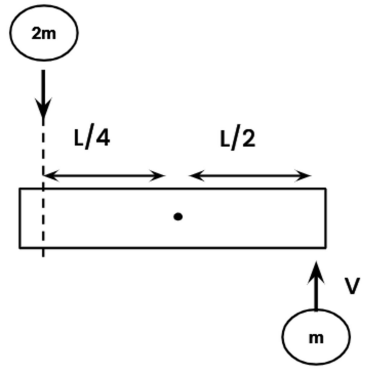
Due to 5 charges $V_0 = \frac{5q}{4\pi\epsilon_0 a}$

Electric field :-

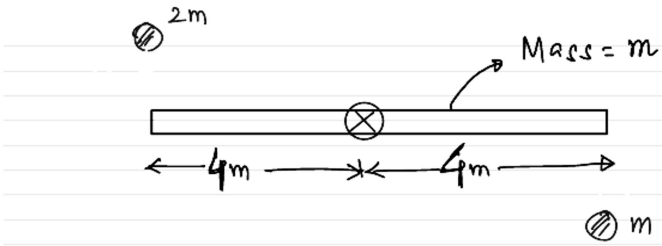
As electric field is vector quantity.

$E_0 = \vec{E_1} + \vec{E_2} + \vec{E_3} + \vec{E_4} + \vec{E_5} = 0$ //

Question: Two balls of mass 2 m and m collides with rod of mass m and length L as shown balls stick to the rod after collision. Find $\frac{V}{\omega}$ if rod is hinged at centre. (L = 8 m)



Options:
(a) 11/2
(b) 11/3
(c) 40/9
(d) 9/4
Answer: (c)
Solution:



Angular momentum of balls:-

$$L_i = (2mV \times 4) + (mV \times 4) = 12mV$$

Angular momentum of rod + balls after collision:-

$$L_f = \left[(2m \times 16) + (m \times 16) + \frac{1}{12} \times m \times 64\right]\omega$$

$$= \left[48 + \frac{16}{3}\right] \omega m$$

$$= \frac{160\,\omega m}{3}$$

Angular momentum Conservation:-

$$L_i = L_f$$

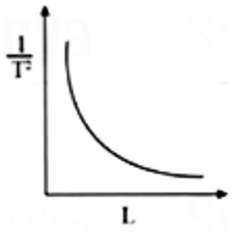
$$\Rightarrow \quad 12mV = \frac{160\,\omega m}{3}$$

$$\Rightarrow \quad \frac{V}{\omega} = \frac{160}{12 \times 3} = \frac{40}{9}$$

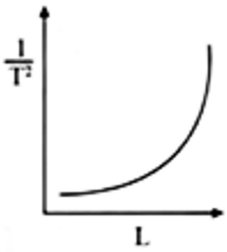
Question: Using a simple pendulum experiment g is determined by measuring its time period T. Which of the following plots represent correct relation b/w the pendulum length l & time period T.

Options:

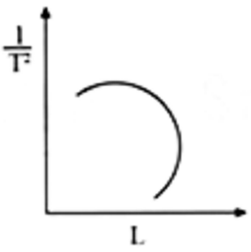
(a)

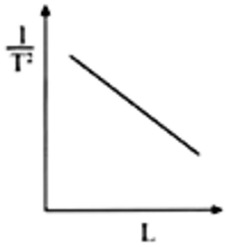


(b)



(c)

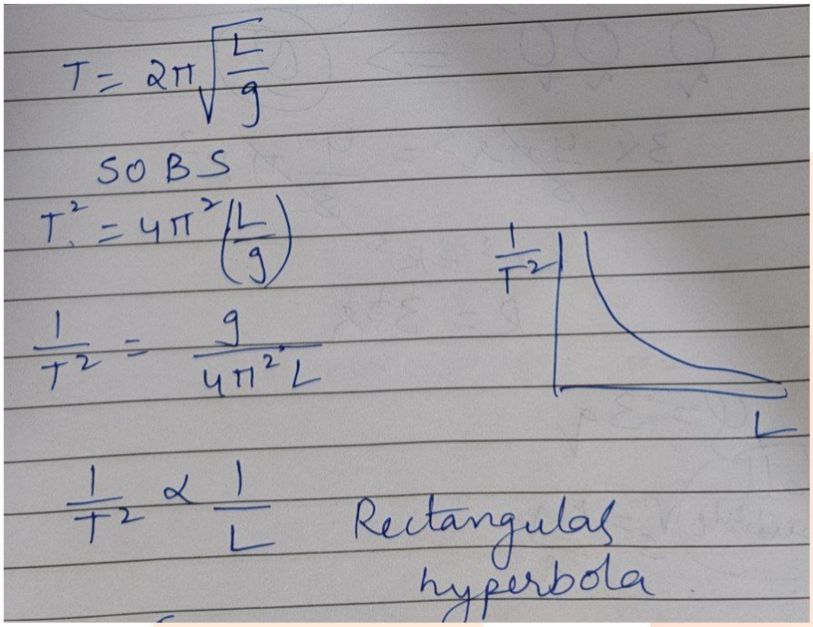




(d)

Answer: (a)

Solution:



Question: A gas undergoes a process in which state variable changes from (1 atm, 60 ml, 27℃) to (P atm, 30 ml, 77℃) then P is

Options:

(a) 3 atm

(b) 5/4 atm

(c) 7/3 atm

(d) 4/3 atm

Answer: (c)

Solution:

Initial state

$P_1 = 1$ atm

$V_1 = 60$ ml

$T_1 = 27^\circ C$

Final state

$P_2 = P$ atm

$V_2 = 30$ ml

$T_2 = 77^\circ C$

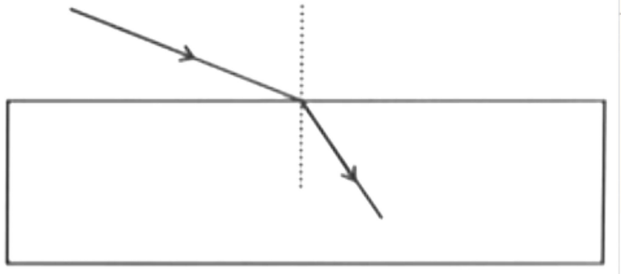
From ideal gas eqn

$PV = nRT$

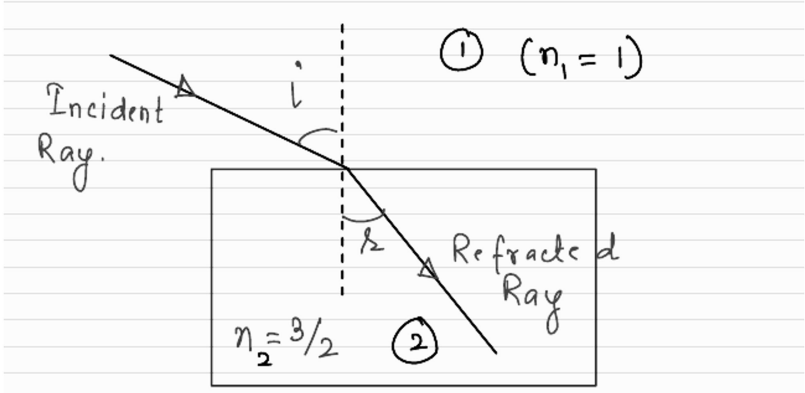
$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{1 \times 60}{300} = \frac{P \times 30}{350} \Rightarrow P = 7/3 \text{ atm}$$

Question: A light ray incident on a slab of refractive index $\frac{3}{2}$. If 2 wavelength of refracted ray is 520 nm. Find wavelength of incident ray.



Options:
(a) 460 nm
(b) 780 nm
(c) 360 nm
(d) 560 nm
Answer: (b)
Solution:



$\lambda_r = 520\,nm$; $\lambda_i = ?$

Snell's law:–

$$\frac{\sin i}{\sin r} = \frac{n_2}{n_1} = \frac{V_1}{V_2} = \frac{\lambda_i}{\lambda_r}$$

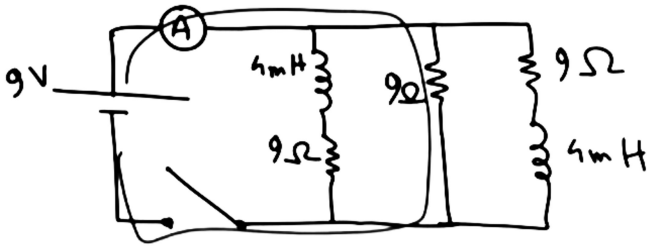
$$\therefore \quad \frac{3/2}{1} = \frac{\lambda_i}{520}$$

$$\Rightarrow \quad \lambda_i = 1.5 \times 520 = 780\,nm$$

Correct option (2)

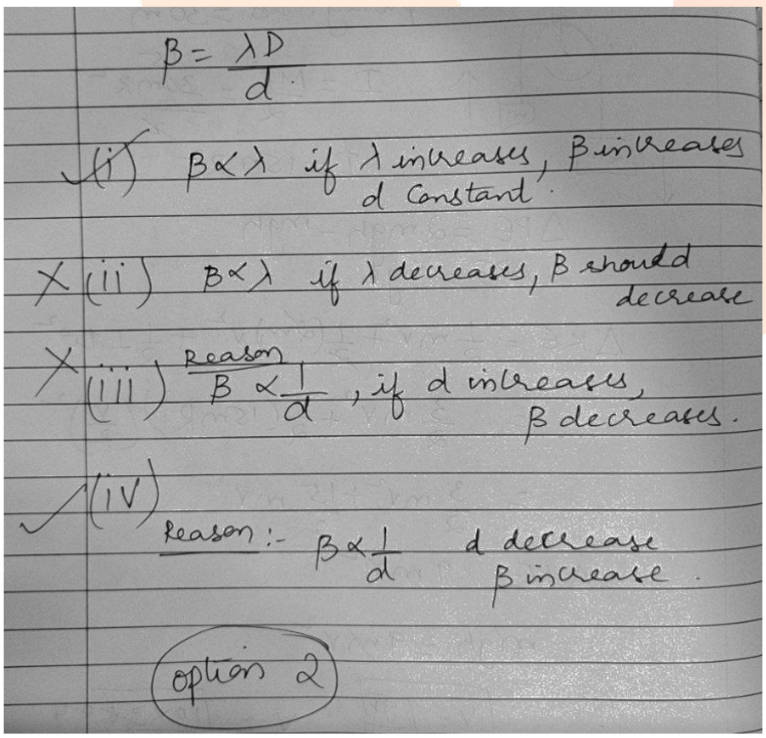
Question: Fig shows a circuit that contains 3 resistances (9 Ω each) & two inductors (4 mH). The reading of ammeter at the moment switch K is turned ON, is _____ A.

Options:
(a) 3
(b) 0
(c) 2
(d) 1
Answer: (d)
Solution:



9/9 = 1

Question: Which of the following is/are true for YDSE experiment?
i. Fringe width increases if distance between slits width is constant & wavelength increased.
ii. Fringe width increases if distance between slits is constant & wavelength decreased.
iii. Fringe width increases if distance between slits is increased & wavelength constant.
iv. Fringe width increases if distance between slits is decreased & wavelength constant.
Options:
(a) i, iii
(b) i, iv
(c) ii, iii
(d) ii, iv
Answer: (b)
Solution:



Question: A pulley has mass 3 cm there are two blocks of masses m & 2 M. Find speed of 2 m when it descends by distance 3.6 meter.

Options:

(a) 4

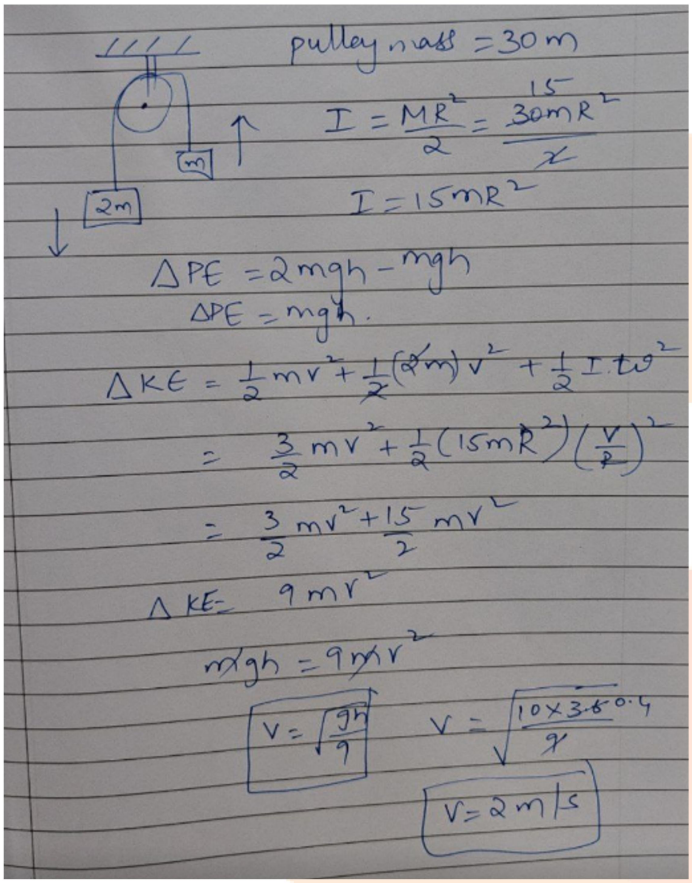
(b) 2

(c) 8

(d) 12

Answer: (b)

Solution:



Question: The smallest wavelength of Lyman series is λ_0. The difference between the largest wavelength of Paschen and Balmer series is nearly.

Options:

(a) $\frac{464\lambda_0}{5}$

(b) $\frac{566\lambda_0}{54}$

(c) $\frac{468\lambda_0}{35}$

(d) $534\lambda_0$

Answer: (c)

Solution:

Smallest wavelength of Lyman Series = λ_0

$n_L = 1; \quad n_H = \infty$

$$\frac{1}{\lambda_0} = R\left[\frac{1}{1^2} - \frac{1}{\infty^2}\right] = R$$

$$\lambda_0 = \frac{1}{R} \quad \text{---} \quad (1)$$

for largest wavelength of Paschen Series:-

$n_L = 3; \quad n_H = 4$

$$\frac{1}{\lambda_P} = R\left[\frac{1}{3^2} - \frac{1}{4^2}\right] = \frac{7R}{144}$$

for largest wavelength of Balmer Series:-

$$\frac{1}{\lambda_B} = R\left[\frac{1}{2^2} - \frac{1}{3^2}\right] = \frac{5R}{36}$$

$$\therefore \lambda_P - \lambda_B = \frac{144}{7R} - \frac{36}{5R} = \frac{468\lambda_0}{35}$$

Question: In case of capillary action if surface tension of liquid, radius of capillary and density of liquid decreases to 1% then percentage change in height of liquid level inside capillary:

Options:

(a) 1% increase

(b) 1% decrease

(c) 2% increase

(d) 2% increase

Answer: (a)

Solution:

Capillary rise "h" in a capillary Tube is:-

$$h_1 = \frac{2T_1\cos\theta}{\rho_1 g r_1}$$

$$T_2 = T_1 - 1\%\,T_1 = \frac{99}{100}T_1 = 0.99\,T_1$$

$$\rho_2 = 0.99\,\rho_1$$

$$r_2 = 0.99\,r_1$$

$$\therefore\ h_2 = \frac{2T_2\cos\theta}{\rho_2 g r_2} = \frac{2\times 0.99\,T_1\cos\theta}{0.99\rho_1 g(0.99 r_1)}$$

$$= \frac{1}{0.99}\times h_1$$

$$\frac{h_2}{h_1} = \frac{1}{0.99} = \frac{100}{99}$$

$$\%\ \text{Increase} = \left(\frac{h_2}{h_1} - 1\right)\times 100 = \frac{100}{99} = 1.01\%$$

Correct option (1).

Question: Statement-1: Work done by $\vec{F}$ from $\vec{r}_1$ to $\vec{r}_2$ is given as

$$W = -\int_{r_1}^{r_2} \vec{F}.d\vec{r},$$

if $\vec{F}$ is conservative.

Statement -1: There are ∞ ways through which we can go from $\vec{r}_1$ to $\vec{r}_2$ and work done for each are case will be different for conservative force.

Options:

(a) Statement-1 is True, Statement-2 is True; Statement-2 is correct explanation of Statement-1.

(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT correct explanation of Statement-1.

(c) Statement-1 is True, Statement-2 is False.

(d) Statement-1 and Statement-2 both are False.

Answer: (d)

Solution:

statement 1 :- false

work done is always $\int \vec{F} \cdot d\vec{r}$ always

statement 2 :- false

work done by a conservative force does not depends on path.

Question: A laser beam has intensity of 4.0×10^{14} w/m^2. The amplitude of magnetic field associated with beam is _____ T.

Options:

(a) 1.83

(b) 5.5

(c) 18.3

(d) 2.0

Answer: (a)

Solution:

$$I = \frac{1}{2}\frac{B_0^2}{\mu_0}c$$

$$B_0 = \sqrt{\frac{2\mu_0 I}{c}} = \sqrt{\frac{2\times 4\pi\times 10^{-7}\times 4\times 10^{14}}{3\times 10^8}}$$

Question: Statement-1: Kinetic energy of system

$$= \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 \ldots\ldots \frac{1}{2}m_nv_n^2.$$

Statement-2: Kinetic energy of system= Kinetic energy of centre of mass + Kinetic energy with respect to centre of mass.

Options:

(a) Statement I is true. Statement II is true

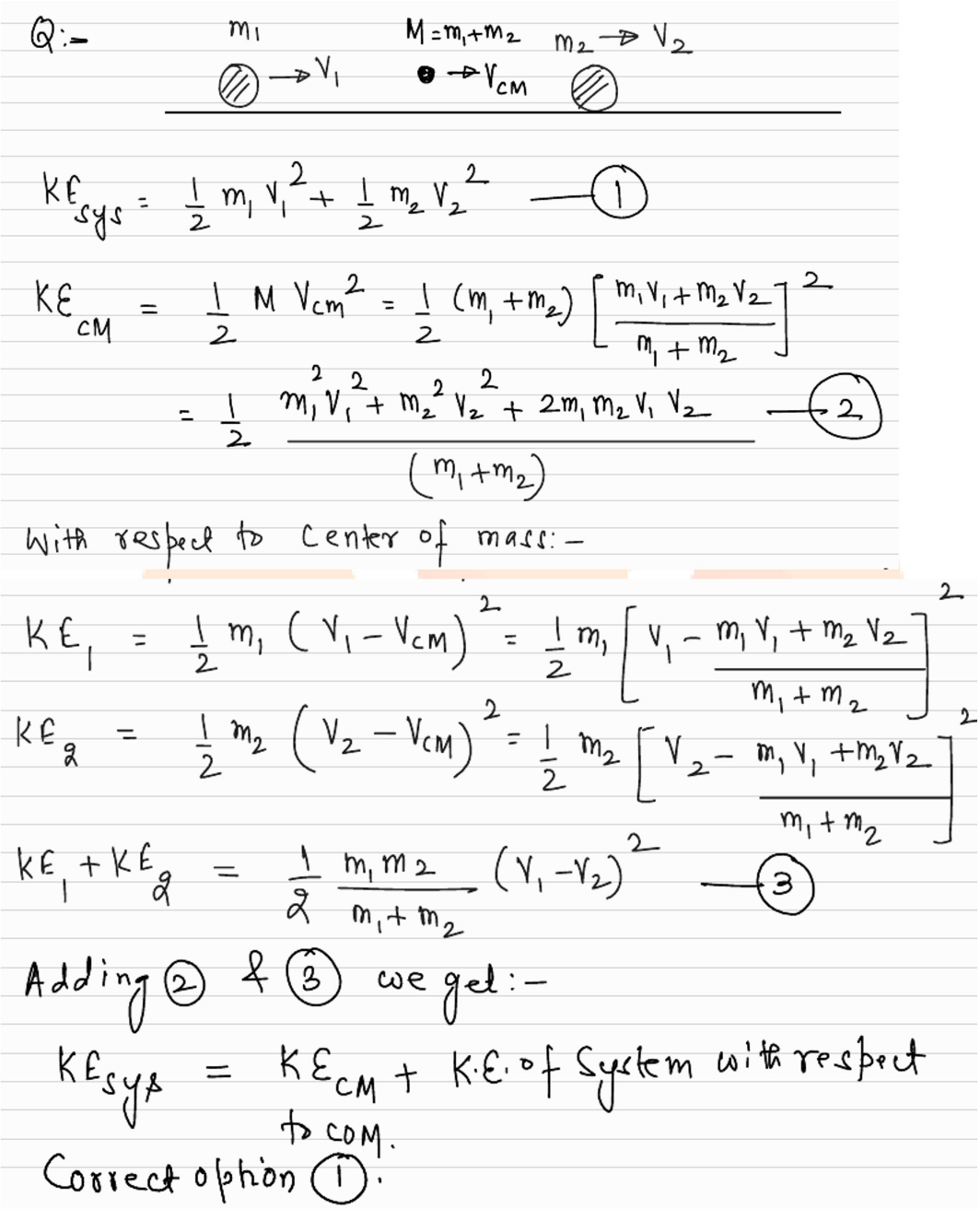
(b) Statement I is true. Statement II is false

(c) Statement I is false. Statement II is true

(d) Statement I is false. Statement II is false

Answer: (a)

Solution:



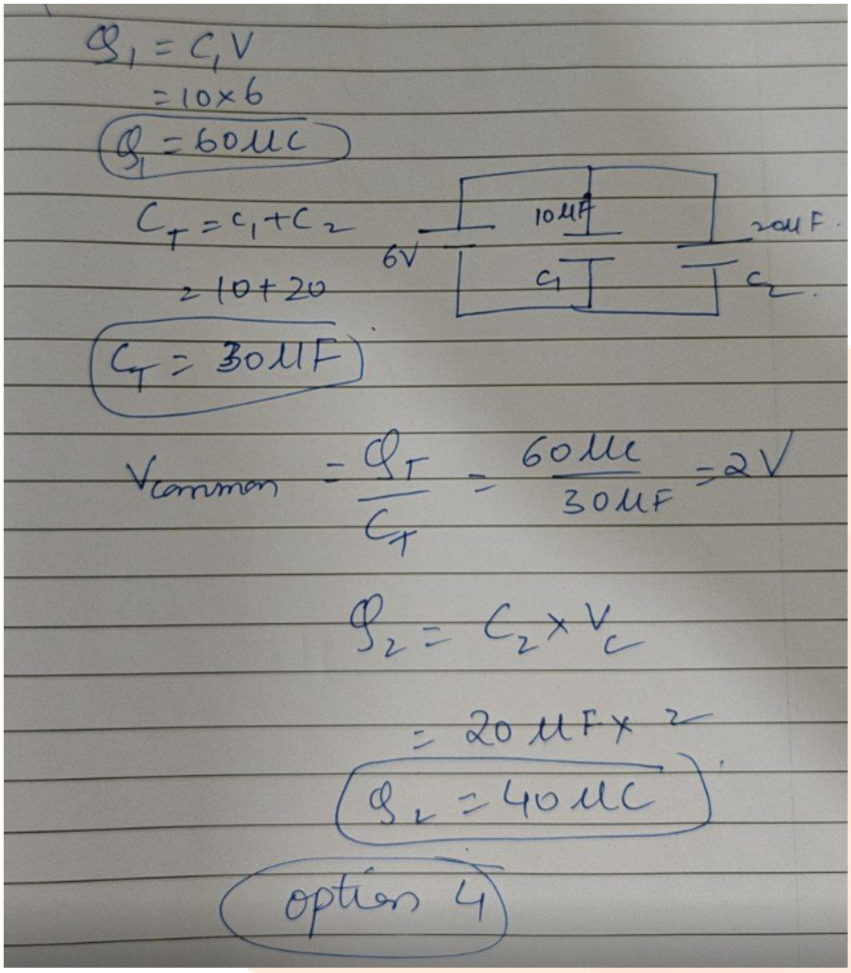
Question: A capacitor of capacitance 10 µF is connected with a battery 6 V. Now battery is disconnected and another uncharged capacitor of capacitance 20 µF is connected to the capacitor. Find charge on 20 µF capacitor.

Options:

(a) $\frac{30}{4}\mu C$

(b) 10 µC

(c) $\frac{20}{3}\mu C$
(d) 40 μC
Answer: (d)
Solution:



Question: For the given statements below mark the correct option.

Statement-I: Work done by conservative force f, from $\overrightarrow{r_1}$ to $\overrightarrow{r_2}$ is given by

$$W = -\int_{r_1}^{r_2} \overrightarrow{F}.\overrightarrow{dr}$$

Statement-II: Work done by conservative force is path dependent.
Options:
(a) Statement-I and statement-II is true
(b) Statement-I is false and statement-II is true
(c) Statement-I is true and statement-II is false
(d) Statement-I and statement-II is false
Answer: (d)
Solution:

Question: Electromagnetic wave with intensity $I = 4 \times 10^{14}$ watt/m^2 is propagating in free space. Find the amplitude of magnetic field B_0.
(Use $c = 3 \times 10^8$ m/s, $\varepsilon_0 = 8.85 \times 10^{-12}$ c^2/N.m^2).

Options:
(a) 1.83 Tesla
(b) 0.5 Tesla
(c) 4.5 Tesla
(d) 1 Tesla

Answer: (a)

Solution:

$I = \frac{1}{2}\varepsilon_0 E_0^2 c$

$c = \frac{E_0}{B_0} \Rightarrow E_0 = cB_0$

$I = \frac{1}{2}\varepsilon_0 c^3 B_0^2$

$B_0^2 = \frac{2I}{\varepsilon_0 c^3}$

$B_0^2 = \frac{2 \times 4 \times 10^{14}}{8.85 \times 10^{-11} \times (3 \times 10^8)^3}$

$B_0 = 1.83\ T$

Question: A cylindrical conductor of Length 2 m and Area of cross section. 0.2 mm^2 carries an electric current of 1.6 A when its. ends are connected to 2V battery. Mobility of electrons in the conductor is $\alpha \times 10^{-3}$ m^2/v - s. The value. of α is.
[Electron concentration = 5×10^{28} /m^3 and Electron charge = 1.6×10^{-19} C].

Options:
(a) 1
(b) 4
(c) 5
(d) 10

Answer: (a)

Solution:

$E = \frac{V}{L}$

$i = neAv_d$

$\Rightarrow v_d = \frac{i}{neA}$

$\mu = \frac{v_d}{E}$

$\mu = \frac{iL}{neAV}$

$= 1 \times 10^{-3}$

$: \alpha \times 10^{-3}$

Question: The wavelength of light when it is passing through water is 540 nm. The refractive index of water is 4/3. The wavelength of the same light when it is passing through a transparent medium having refractive index of 3/2 is.

Options:

(a) 840 nm

(b) 480 nm

(c) 400 nm

(d) 356 nm

Answer: (b)

Solution:

$$\lambda = \frac{\lambda_0}{n} \Rightarrow \lambda_0 = n\lambda$$

$$\frac{4}{3} \times 540 = \frac{3}{2} \times \lambda'$$

$$\Rightarrow \lambda' = \frac{4 \times 2}{9} \times 540^{60} = 480$$

Question: S-I:- A satellite is moving around earth in the orbit very close to the earth's surface. The time period of the revolution depends on the density of the earth.

S-II:- The time period of the revolution of the satellite is $T = 2\pi\sqrt{\frac{R_e}{g}}$, **where R_e is the radius of the earth and g is the acceleration due to gravity.**

Options:

(a) S-I is true but S-II is false.

(b) Both S-I and S-II are true.

(c) S-I is false but S-II is true.

(d) Both S-I and S-II are false.

Answer: (b)

Solution:

$$T = \frac{2\pi R^{3/2}}{\sqrt{GM}}$$

$$g = \frac{GM}{R_e^2}$$