1. A uniform electric field \( E = 91 \times 10^3 \, \text{V/m} \) is created between two parallel, charged plates as shown in figure. An electron enters the field symmetrical to the plates with a speed \( v = 4 \times 10^7 \, \text{m/s} \). The length of each plate is \( l = 1 \, \text{m} \). Find the angle of deviation of the path of the electron as it comes out of the field. (Mass of the electron is \( m = 9.1 \times 10^{-31} \, \text{kg} \) and its charge is \( e = -1.6 \times 10^{-19} \, \text{C} \).)
2. The optical power of a double convex lens is 1.25 m⁻¹. Refractive index of lens is 1.5. Radius of curvatures are 20 cm and 30 cm find refractive index of surrounding:

\( \frac{1}{P} = \frac{n_{lens} - 1}{R_1} = \frac{n_{lens} - 1}{R_2} \)

\( P = 1.25 \text{ m}^{-1} \)

\( n_{lens} = 1.5 \)

\( R_1 = 20 \text{ cm} \)

\( R_2 = 30 \text{ cm} \)

\( \frac{1}{1.25} = \frac{1.5 - 1}{20} = \frac{1.5 - 1}{30} \)

\( \frac{1.5}{20} = 1.5 \times \frac{1}{20} = 1.5 \times \frac{1}{30} \)

\( \frac{1.5}{1.5} = \frac{600}{50} = 12 = 12 \times 1.25 = 1500 \)

\( \frac{1.5}{1.15} = \frac{50}{30} = 1.67 \approx 1.5 \)

\( \frac{1.5}{1.15} = \frac{1.5}{1.15} - \frac{15}{15} = \frac{15}{15} - \frac{15}{15} = \frac{30}{23} \)

Ans. (3)

3. Linear mass density of rod varies as \( \lambda = \lambda_0 \left( 1 - \frac{x^2}{a^2} \right) \). Find COM of rod.

\( dm = \lambda dx = \lambda_0 \left( 1 - \frac{x^2}{a^2} \right) dx \)

\( \int x dm = \int x \lambda_0 \left( 1 - \frac{x^2}{a^2} \right) dx \)

\( \int x \lambda_0 \left( 1 - \frac{x^2}{a^2} \right) dx = \int x^2 \lambda_0 \left( 1 - \frac{x^2}{a^2} \right) dx / 2 = 4 \int \frac{x^3}{3} - \frac{x^5}{5} dx \)

\( \int x dx = \frac{x^2}{2} \)

\( \int x^3 dx = \frac{x^4}{4} \)

\( \int x^5 dx = \frac{x^6}{6} \)

\( \frac{x^2}{2} - \frac{x^4}{4} + \frac{x^6}{6} \)

\( X_{COM} = \frac{3}{8} \)

Ans. (3)

4. Potential energy of a particle varies with \( x \) as \( U = 4(1 - \cos 4x) \). Find time period for small displacement (mass = 1kg)

\( \frac{\pi}{2} \)

\( \frac{\pi}{3} \)

\( \frac{\pi}{4} \)

\( \frac{\pi}{5} \)

Ans. (3)
5. An object is moving at 2 cm/s along principle axis as shown in figure. Find position of image after 10 sec.

\[
\frac{1}{v} = \frac{1}{80} + \frac{1}{100} \Rightarrow \frac{1}{v} = \frac{5}{400} \Rightarrow v = 400 \text{ cm}
\]

(1) 100 cm  (2) 200 cm  (3) 400 cm  (4) 500 cm

6. Two photons are incident on a metal if energy of first photon is 10 times of work function of metal and energy second photon is 5 times of work function then ratio of speed of emitted electrons will be:

\[
\begin{align*}
E_1 &= K_1 + \phi \\
10\phi &= K_1 + \phi \\
K_1 &= 9\phi \\
E_2 &= K_2 + \phi \\
5\phi &= K_2 + \phi \\
K_2 &= 4\phi \\
V_1^2 &= \frac{9}{4} \\
V_2^2 &= \frac{4}{2} \\
\frac{V_1}{V_2} &= \frac{3}{2}
\end{align*}
\]

(1) \(\frac{2}{5}\)  (2) \(\frac{3}{2}\)  (3) \(\frac{2}{3}\)  (4) \(\frac{2}{7}\)

7. Position of particle at any instant is given by

\[
x = 3t \\
y = 5t^3
\]

Find acceleration of particle at \(t = 1\) sec

(1) \(30 \text{ m/s}^2\)  (2) \(40 \text{ m/s}^2\)  (3) \(50 \text{ m/s}^2\)  (4) \(60 \text{ m/s}^2\)

(1)
8. Capacitance of a parallel plate capacitor having plate separation $d$ is $C$. A dielectric having width $3d/4$ dielectric constant $k$ is filled between plates. Find the new capacitance.

\[ \frac{1}{C_{\text{new}}} = \frac{C}{1+k} \]

\[ \frac{4C_{\text{old}}}{1+3/k} \]

\[ \frac{3C_{\text{old}}}{1-2/3} \]

\[ \frac{7C_{\text{old}}}{1+2k} \]

An. (2)

9. A radioactive substance decays by 7/8 in 15 min. What is its half-life time?

\[ N_0 = \frac{1}{(2)^{1/2}} \]

\[ \frac{1}{1} = \frac{1}{8} \]

\[ (2)^{2/3} = 2 \]

\[ \frac{t}{1} = 3 \]

\[ T = \frac{15}{3} = 5 \text{ min.} \]

An. (1)

10. An object is thrown up with 19.6 m/s from the top of a building. It reaches ground after 6s. Find maximum height of ball w.r.t. ground.

\[ v = \frac{u}{g} \]

\[ t = 2s \]

\[ h_{\text{max}} = \frac{u^2}{2g} \]

\[ h_{\text{max}} = 16 \times 9.8 \]

\[ = 78.4 \text{ m} \]

An. (3)
11. A simple pendulum has time period 4 second at the earth surface. An another simple pendulum of same length at height h from earth surface has time period 6 second. If radius of earth is 6400 km then find the value of h.
(1) 1600 km  (2) 3200 km  (3) 6400 km  (4) 12800 km

Ans. (2)

Sol. \( T_1 = 2\sqrt{\frac{L}{g_1}} \) \( \cdots \cdots \) (1)

\( T_2 = 2\sqrt{\frac{L}{g_2}} \)

\( \frac{T_1}{T_2} = \sqrt{\frac{g_2}{g_1}} \)

But \( g_1 = \frac{GM}{R^2} \)

\( g_2 = \frac{GM}{(R + h)^2} \)

So, \( \frac{T_1}{T_2} = \frac{R}{R + h} \)

\( \frac{4}{6} = \frac{R}{R + h} \)

\( \frac{2}{3} \)

\( h = \frac{R}{2} = 3200 \text{ km} \)

12. Statement-1 : A wire of resistance 8Ω is divided in four equal parts & these parts are connected in parallel. The effective resistance now is 2Ω.

Statement-2 : Two resistances 2Ω & 3Ω are connected in parallel in a circuit. The ratio of heat produced in these resistances is 2:3

(1) Statement 1 is true, Statement 2 is false
(2) Statement 1 is false, Statement 2 is true
(3) Both statements are true
(4) Both statements are false

Ans. (1)

13. Find ratio of magnetic field at centre of circular current carrying loop to magnetic field at a point at height \( \sqrt{3}R \) on axis of loop where R is radius of loop:

(1) 2 : 1  (2) 4 : 1  (3) 8 : 1  (4) 16 : 1

Ans. (3)

Sol. \( B_c = \frac{\mu_0 I}{2\pi R} \)

\( B_0 = \frac{\mu_0 I}{\frac{1 + R^2}{4\pi}} \)

\( = \frac{\mu_0 IR^2}{16\pi R^3} \)

\( = \frac{\mu_0 h}{16R} \)

\( B_0 = \frac{8}{1} \)

14. Find force in CD

(1) 10 N \times 10^{-4} N  (2) 11.5 \times 10^{-4} N  (3) 1.25\sqrt{3} \times 10^{-3} N  (4) 3.6 \times 10^{-3} N
15. A particle is attached with a string of length 0.5 m and cross sectional area 3 mm² is revolving in a circle in vertical plane. Mass of the particle is 2 kg and velocity of it at lowest position is 20 m/s. If Young's modulus of wire is 10⁹ N/m². Then find strain in the wire at lowest position.

\[ F = \frac{mgv^2}{2} \]

\[ \frac{F}{A} = \frac{mgv^2}{2A} \]

\[ \text{Strain} = \frac{F}{AY} \]

\[ \text{Strain} = \frac{20 \times 10^6}{3 \times 10^{-5} \times 10^4} = 54 \times 10^{-4} \]

16. A pipe with area of cross section 5 cm² is ejecting water with speed 2 m/s and striking on wall find force exerted by water stream on wall if density of water is 1000 kg/m³.

\[ F = \rho Av^2 \]

\[ = 1000 \times 5 \times 10^{-4} \times 2^2 \]

\[ = 20 \times 1 \times 10^{-1} \]

\[ = 2 \text{ N} \]
17. In the circuit shown below find current through battery just after closing the switch.

\[ \text{Ans.} \quad 1 \text{A} \]

\[ \text{Sol.} \quad \text{just after closing switch, inductor behaves as open circuit hence} \]

\[ I = \frac{6 \text{V}}{1 \text{A}} \]

18. Find power consumption in B1.

\[ \text{Ans.} \quad 14.06 \text{ W} \]

\[ \text{Sol.} \quad R_1 = \frac{V^2}{P} = \frac{220^2}{100} = 484 \]

\[ R_2 = \frac{V^2}{P} = \frac{220^2}{6} = 484 \]

\[ I = \frac{220}{484} \times \frac{6}{10} = \frac{484}{16} \]

\[ P_1 = IR_1 = \left( \frac{220}{484} \times \frac{6}{10} \right)^2 \times 484 = 14.06 \text{ W} \]

**Resonance Eduventures Ltd.**

Reg. Office & Corp. Office: CG Tower, A-45 & 52, IPIA, Near City Mall, Bhatwar Road, Kota (Raj.) - 324005

Ph. No.: +91-744 2777777, 2777700 | FAX No.: +91-222 3036322

To Know more : visit RESO at 56677 | Website: www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN: U86929 Rajasthan 2007 PCC24029

Tell Free : 18000 258 5555 | 7466099090

This solution was downloaded from Resonance JEE (MAIN) 2022 Solution portal PAGE # 8

19. A bullet enters in a water column with kinetic energy 90 Joule. After 1 second its kinetic energy is found 40 Joule. Find the minimum length of water column, so that bullet can be stopped. Mass of the bullet is 200 gram.

\[ m = 200 \text{ gm} \]

\[ \text{KE}_t = 90 \text{ J} \]

\[ \text{KE}_f = 40 \text{ J} \]

\[ \text{Ans.} \quad 1 \text{ sec} \]

\[ \text{Sol.} \quad \frac{1}{2} \text{mv}^2 = 90 \]

\[ v_i = 90 \times \frac{2}{0.2} = 900 \]

\[ v_f = 30 \]

\[ \frac{1}{2} \text{mv}^2 = 70 \]

\[ v_f = 40 \times \frac{2}{0.2} \]

\[ \text{KE} = 90 \text{ J} \]

\[ \text{KE}_f = 40 \text{ J} \]
20. If v and v' are image and object distance from focus of mirror and v.v' = 225. Then find focal length of mirror.

Anss. (3)
Sol. \[ v = \frac{f}{v'} \]
\[ 225 = f^2 \]
\[ f = 15 \]

21. In the given diagram pulley is ideal & small acceleration of chain at the given moment is g/2 then find ratio L/L:

Anss. (2)
Sol. \[ a = \frac{(L - \frac{L}{2}) - 0}{L} \cdot g \]
\[ g \cdot \frac{L - 2L}{2} \cdot g \]
\[ L = 2L = 4L \]
\[ L/4 = 4 \]

22. 5 x 10^6 N/m² Pressure is applied on the water surface as shown. If atmospheric pressure is 10^5 N/m² and density of water is 10^3 kg/m³ then find velocity v of ejecting water.

Anss. (3)
Sol. From Bernoulli equation
\[ \frac{1}{2}v^2 + 10^3 = 0 + gh = 5 \times 10^5 + 0 \]
Solving \[ v = 10\sqrt{10} \text{ m/s} \]
23. A gas of degree of freedom 8 at a certain temperature expands isobarically & does work 1500 Joule. Find absorbed heat.

   (1) 5500 Joule  (2) 6500 Joule  (3) 7500 Joule  (4) 8500 Joule

Ans. (3)

Sol. \[ Q = \Delta U + W = \frac{1}{2} nR \Delta T + nR \Delta T \]

\[ = \frac{1}{2} nR \Delta T + nR \Delta T \]

\[ = 5nR (\Delta T) \]

\[ = 5 \times 1500 \text{ Joule} \]

\[ = 7500 \text{ Joule} \]

24. Sun light falling on a perfectly absorbing plate for 20 min. Area of plate is 36 cm². If average force on the plate is 7.2 \times 10^3 N. Then find intensity in (watt/cm²).

   (1) 0.5  (2) 0.6  (3) 0.7  (4) 0.8

Ans. (2)

Sol. \[ P = IA \]

\[ F = \frac{P}{A} \]

\[ I = \frac{F \cdot C}{A} = \frac{7.2 \times 10^{-3} \times 3 \times 10^4}{36 \text{ cm}^2} \]

\[ = 0.6 \text{ watt/cm}^2 \]
लगातार दूसरे वर्ष, कोटा का श्रेष्ठ परिणाम, रेजोनेंस के नाम

JEE (Main) 2022
JUNE (Session-1)
OVERALL NTA SCORE 99.998%ile
NTA SCORE (S) 100 in CHEMISTRY
VARDAN VERMA Claussen Student
CHAITANYA AGGARWAL Claussen Student

"वर्दन वर्मा का %ile Score कोटा में रहकर JEE की तैयारी करने वाले सभी संस्थाओं के सभी वर्गों में हाई स्कोर है जिसका स्थान नहीं है।"

AIR 8
BEST RANK
बीस से अधिक कॉलेजों में के कॉलेज में सबसे अच्छे पासर्ट विद्यार्थी।

Admissions Open: 2022-23
For Class XII Passed Students

TARGET
JEE (Main+Advanced) 2023
COURSE
VIJAY (JR)
CLASS STARTS
1st & 16th Aug

TARGET
JEE (Main) 2023
COURSE
AJAY (ER)
CLASS STARTS
1st, 16th & 29th Aug

Scholarship upto 100% on the basis of JEE (Main) Percentile Score

अपनी स्कॉरलिष स्थापने के लिए अपनी मैट्रिक (मेन) परस्ताईल विद्यार्थी करें: 73400-10345

Resonance Eduventures Ltd.
Kota Study Centre & Registered Corporate Office: C6 Tower, A-46 & 52, IPIL, New City Mall, Jhalawar Road, Kota (Raj.) - 324005
Tel No.: 0744-277777, 277700 | CIN: U80302RJ2007PLC024029 | www.resonance.ac.in | contact@resonance.ac.in

© Resonance Eduventures Limited | Toll-Free: 1800-258-5550 | 0744-277777, 277700 | contact@resonance.ac.in | CIN: U80302RJ2007PLC024029