

JEE Main April 2024
Question Paper With Text Solution
04 April | Shift-1

PHYSICS



JEE Main & Advanced | XI-XII Foundation | VI-X Pre-Foundation

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911
Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in



31. To measure the internal resistance of a battery, potentiometer is used, For $R = 10\Omega$, the balance point is observed at $l = 500$ cm and for $R = 1\Omega$ the balance point is observed at $l = 400$ cm. The internal resistance of the battery is approximately :

- (1) 0.1Ω (2) 0.3Ω (3) 0.4Ω (4) 0.2Ω

Question ID: 87827055477

Ans. Official Answer NTA(2)

Sol.

32. On celcius scale the temperature of body increases by 40°C . The increase in temperature on Fahrenheit scale is :

- (1) 70°F (2) 75°F (3) 68°F (4) 72°F

Question ID: 87827055465

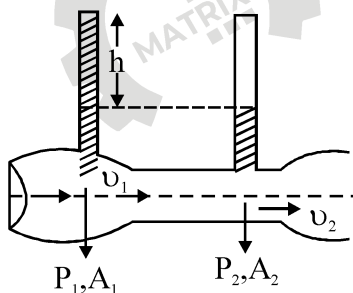
Ans. Official Answer NTA(4)

Sol.

33. Given below are two statements :

Statement I : When speed of liquid is zero everywhere, pressure difference at any two points depends on equation $P_1 - P_2 = \rho g (h_2 - h_1)$.

Statement II : In ventury tube shown $2gh = v_1^2 - v_2^2$



In the light of the above statments, choose the **most appropriate** answer from the options given below :

- (1) Both Statement I and Statement II are correct.
(2) Statement I is correct but Statement II in incorrect.
(3) Both Statement I and Statement II are incorrect.
(4) Statement I is incorrect but Statement II is correct.

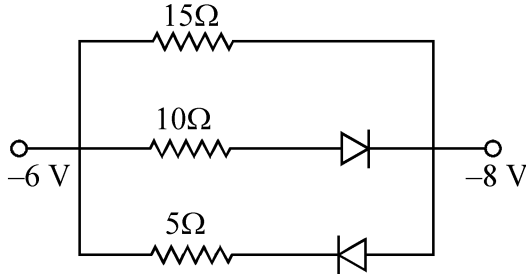
Question ID: 87827055464



Ans. Official Answer NTA (2)

Sol.

34. The value of net resistance of the network as shown in the given figure is :



- (1) 6Ω (2) $(5/2)\Omega$ (3) $(15/4)\Omega$ (4) $(30/11)\Omega$

Question ID: 87827055475

Ans. Official Answer NTA (1)

Sol.

35. The resistances of the platinum wire of a platinum resistance thermometer at the ice point and steam point are 8Ω and 10Ω respectively. After inserting in a hot bath of temperature 400°C , the resistance of platinum wire is:

- (1) 10Ω (2) 16Ω (3) 8Ω (4) 2Ω

Question ID: 87827055468

Ans. Official Answer NTA (2)

Sol.

36. An electron is projected with uniform velocity along the axis inside a current carrying long solenoid.

- (1) the electron will be accelerated along the axis.
(2) the electron will continue to move with uniform velocity along the axis of the solenoid.
(3) the electron will experience a force at 45° to the axis and execute a helical path.
(4) the electron path will be circular about the axis.

Question ID: 87827055469

Ans. Official Answer NTA (2)

Sol.

37. A body travels 102.5 m in n^{th} second and 115.0 m in $(n+2)^{\text{th}}$ second. The acceleration is :

- (1) 9 m/s^2 (2) 6.25 m/s^2 (3) 5 m/s^2 (4) 12.5 m/s^2



Question ID: 87827055461

Ans. Official Answer NTA (2)

Sol.

38. A metal wire of uniform mass density having length L and mass M is bent to form a semicircular arc and a particle of mass m is placed at the centre of the arc. The gravitational force on the particle by the wire is :

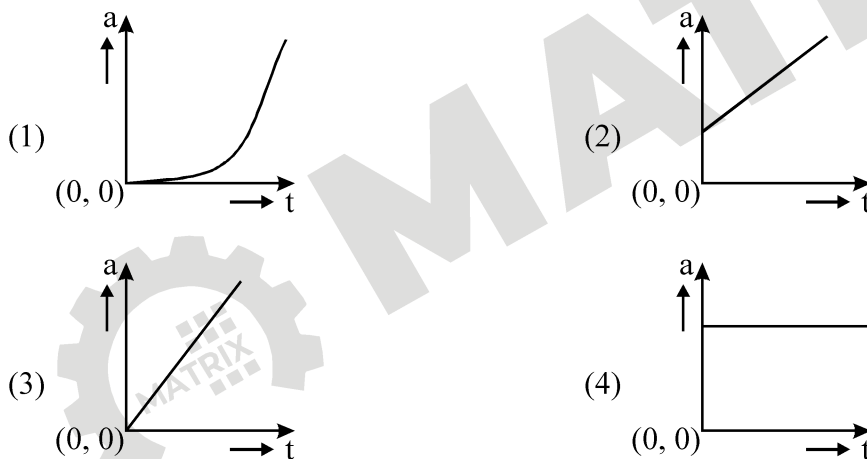
- (1) $\frac{GmM\pi^2}{L^2}$ (2) $\frac{GMm\pi^2}{2L^2}$ (3) $\frac{2GmM\pi}{L^2}$ (4) 0

Question ID: 87827055463

Ans. Official Answer NTA (3)

Sol.

39. A wooden block, initially at rest on the ground, is pushed by a force which increases linearly with time t . Which of the following curve best describes acceleration of the block with time :



Question ID: 87827055460

Ans. Official Answer NTA (3)

Sol.

40. The equation of stationary wave is :

$$y = 2a \sin\left(\frac{2\pi nt}{\lambda}\right) \cos\left(\frac{2\pi x}{\lambda}\right)$$

Which of the following is NOT correct :

- (1) The dimensions of n is $[LT^{-1}]$ (2) The dimensions of n/λ is $[T]$
 (3) The dimensions of x is $[L]$ (4) The dimensions of nt is $[L]$

Question ID: 87827055458

MATRIX JEE ACADEMY

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911

Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in



Ans. Official Answer NTA (2)

Sol.

41. The electric field in an electromagnetic wave is given by $\vec{E} = \hat{i} 40 \cos \omega \left(t - \frac{z}{c} \right) \text{N C}^{-1}$. The magnetic field induction of this wave is (in SI unit) :

(1) $\vec{B} = \hat{i} \frac{40}{c} \cos \omega \left(t - \frac{z}{c} \right)$

(2) $\vec{B} = \hat{j} 40 \cos \omega \left(t - \frac{z}{c} \right)$

(3) $\vec{B} = \hat{j} \frac{40}{c} \cos \omega \left(t - \frac{z}{c} \right)$

(4) $\vec{B} = \hat{k} \frac{40}{c} \cos \omega \left(t - \frac{z}{c} \right)$

Question ID: 87827055471

Ans. Official Answer NTA (3)

Sol.

42. Which of the following nuclear fragments corresponding to nuclear fission between neutron $\left(\begin{smallmatrix} 1 \\ 0 \end{smallmatrix} \text{n} \right)$ and uranium

isotope $\left(\begin{smallmatrix} 235 \\ 92 \end{smallmatrix} \text{U} \right)$ is correct :

(1) $\begin{smallmatrix} 140 \\ 56 \end{smallmatrix} \text{Xe} + \begin{smallmatrix} 94 \\ 38 \end{smallmatrix} \text{Sr} + 3 \begin{smallmatrix} 1 \\ 0 \end{smallmatrix} \text{n}$

(2) $\begin{smallmatrix} 153 \\ 51 \end{smallmatrix} \text{Sb} + \begin{smallmatrix} 99 \\ 41 \end{smallmatrix} \text{Nb} + 3 \begin{smallmatrix} 1 \\ 0 \end{smallmatrix} \text{n}$

(3) $\begin{smallmatrix} 144 \\ 56 \end{smallmatrix} \text{Ba} + \begin{smallmatrix} 89 \\ 36 \end{smallmatrix} \text{Kr} + 3 \begin{smallmatrix} 1 \\ 0 \end{smallmatrix} \text{n}$

(4) $\begin{smallmatrix} 144 \\ 56 \end{smallmatrix} \text{Ba} + \begin{smallmatrix} 89 \\ 36 \end{smallmatrix} \text{Kr} + 4 \begin{smallmatrix} 1 \\ 0 \end{smallmatrix} \text{n}$

Question ID: 87827055474

Ans. Official Answer NTA (3)

Sol.

43. In an ac circuit, the instantaneous current is zero, when the instantaneous voltage is maximum. In this case, the source may be connected to :

A. pure inductor.

B. pure capacitor.

C. pure resistor.

D. combination of an inductor and capacitor.

Choose the correct answer from the options given below :

(1) A, B and C only (2) A and B only (3) B, C and D only (4) A, B and D only



Question ID: 87827055470

Ans. Official Answer NTA (4)

Sol.

44. If a rubber ball falls from a height h and rebounds upto the height of $h/2$. The percentage loss of total energy of the initial system as well as velocity ball before it strikes the ground, respectively are :

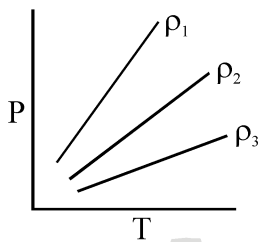
- (1) 50%, $\sqrt{2gh}$ (2) 50%, \sqrt{gh} (3) 50%, $\sqrt{\frac{gh}{2}}$ (4) 40%, $\sqrt{2gh}$

Question ID: 87827055462

Ans. Official Answer NTA (1)

Sol.

45. P-T diagram of an ideal gas having three different densities ρ_1, ρ_2, ρ_3 (in three different cases) is shown in the figure. Which of the following is correct :



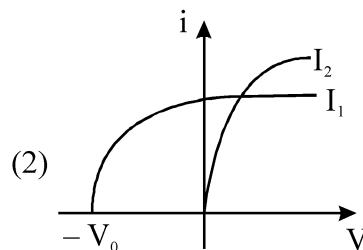
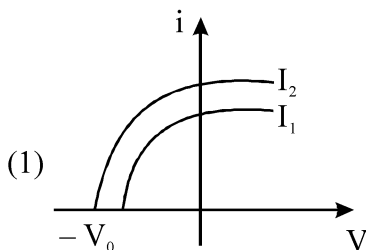
- (1) $\rho_2 < \rho_3$ (2) $\rho_1 > \rho_2$ (3) $\rho_1 = \rho_2 = \rho_3$ (4) $\rho_1 < \rho_2$

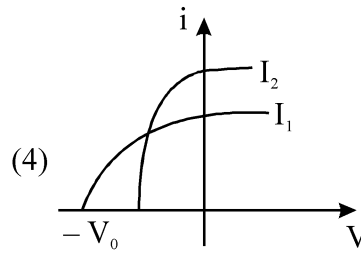
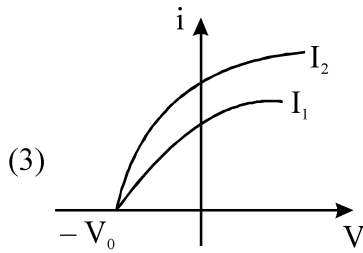
Question ID: 87827055466

Ans. Official Answer NTA (2)

Sol.

46. Which figure shows the correct variation of applied potential difference (V) with photoelectric current (I) at two different intensities of light ($I_1 < I_2$) of same wavelengths :



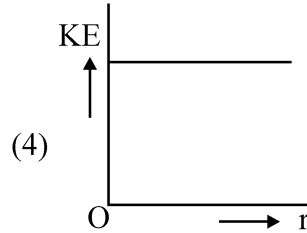
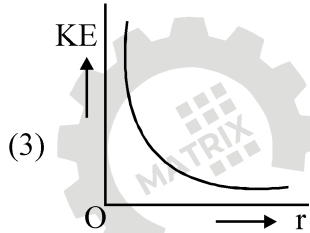
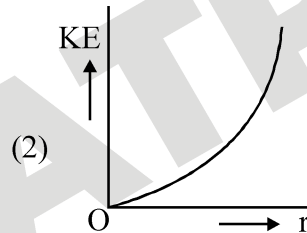
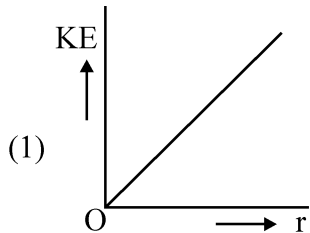


Question ID: 87827055473

Ans. Official Answer NTA (3)

Sol.

47. An infinitely long positively charged straight thread has a linear charge density $\lambda \text{ Cm}^{-1}$. An electron revolves along a circular path having axis along the length of the wire. The graph that correctly represents the variation of the kinetic energy of electron as a function of radius of circular path from the wire is :



Question ID: 87827055467

Ans. Official Answer NTA (4)

Sol.

48. In an experiment to measure focal length (f) of convex lens, the least counts of the measuring scales for the position of object (u) and for the position of image (v) are Δu and Δv , respectively. The error in the measurement of the focal length of the convex lens will be :

(1) $f^2 \left[\frac{\Delta u}{u^2} + \frac{\Delta v}{v^2} \right]$ (2) $2f \left[\frac{\Delta u}{u} + \frac{\Delta v}{v} \right]$ (3) $\frac{\Delta u}{u} + \frac{\Delta v}{v}$ (4) $f \left[\frac{\Delta u}{u} + \frac{\Delta v}{v} \right]$



Question ID: 87827055476

Ans. Official Answer NTA (1)

Sol.

49. An effective power of a combination of 5 identical convex lenses which are kept in contact along the principal axis is 25D. Focal length of each of the convex lens is :

- (1) 20 cm (2) 50 cm (3) 500 cm (4) 25 cm

Question ID: 87827055472

Ans. Official Answer NTA (1)

Sol.

50. The co-ordinates of a particle moving in x-y plane are given by :

$$x = 2 + 4t, y = 3t + 8t^2$$

The motion of the particle is :

- (1) uniformly accelerated having motion along a straight line.
(2) uniformly accelerated having motion along a parabolic path.
(3) uniform motion along a straight line.
(4) non-uniformly accelerated.

Question ID: 87827055459

Ans. Official Answer NTA (2)

Sol.

51. Two forces \vec{F}_1 and \vec{F}_2 are acting on a body. One force has magnitude thrice that of the other force and the resultant of the two forces is equal to the force of larger magnitude. The angle between \vec{F}_1 and \vec{F}_2 is $\cos^{-1}\left(\frac{1}{n}\right)$.

The value of $|n|$ is _____ .

Question ID: 87827055478

Ans. Official Answer NTA (6)

Sol.

52. A hydrogen atom changes its state from $n = 3$ to $n = 2$. Due to recoil, the percentage change in the wave length of emitted light is approximately 1×10^{-n} . The value of n is _____ .



[Given $Rhc = 13.6 \text{ eV}$, $hc = 1242 \text{ eV nm}$, $h = 6.6 \times 10^{-34} \text{ J s}$ mass of the hydrogen atom $= 1.6 \times 10^{-27} \text{ kg}$]

Question ID: 87827055487

Ans. Official Answer NTA (7)

Sol.

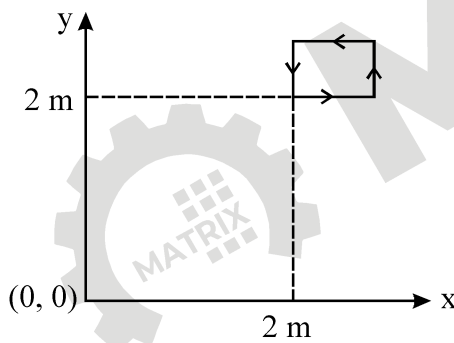
53. A solid sphere and a hollow cylinder roll up without slipping on same inclined plane with same initial speed v . The sphere and the cylinder reaches upto maximum heights h_1 and h_2 , respectively, above the initial level. The ratio $h_1 : h_2$ is $\frac{n}{10}$. The value of n is _____.

Question ID: 87827055479

Ans. Official Answer NTA (7)

Sol.

54. The magnetic field existing in a region is given by $\vec{B} = 0.2(1 + 2x)\hat{k} \text{ T}$. A square loop of edge 50 cm carrying 0.5 A current is placed in x-y plane with its edges parallel to the x-y axes, as shown in figure. The magnitude of the net magnetic force experienced by the loop is _____ mN.



Question ID: 87827055484

Ans. Official Answer NTA (50)

Sol.

55. An infinite plane sheet of charge having uniform surface charge density $+\sigma_s \text{ C/m}^2$ is placed on x-y plane. Another infinitely long line charge having uniform linear charge density $+\lambda_c \text{ C/m}$ is placed at $z = 4 \text{ m}$ plane and parallel to y-axis. If the magnitude values $|\sigma_s| = 2|\lambda_c|$ then at point $(0, 0, 2)$, the ratio of magnitudes of electric field values due to sheet charge to that of line charge is $\pi\sqrt{n} : 1$. The value of n is _____.

Question ID: 87827055482

Ans. Official Answer NTA (16)



Sol.

56. Two wavelengths λ_1 and λ_2 are used in Young's double slit experiment. $\lambda_1 = 450 \text{ nm}$ and $\lambda_2 = 650 \text{ nm}$. The minimum order of fringe produced by λ_2 which overlaps with the fringe produced by λ_1 is n . The value of n is _____.

Question ID: 87827055486

Ans. Official Answer NTA (9)

Sol.

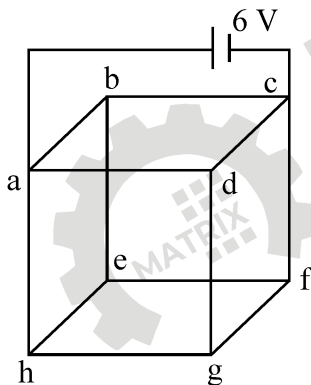
57. An elastic spring under tension of 3 N has a length a . Its length is b under tension 2 N. For its length $(3a - 2b)$, the value of tension will be _____ N.

Question ID: 87827055481

Ans. Official Answer NTA (5)

Sol.

58. Twelve wires each having resistance 2Ω are joined to form a cube. A battery of 6 V emf is joined across point a and c . The voltage difference between e and f is _____ V.



Question ID: 87827055483

Ans. Official Answer NTA (1)

Sol.

59. A soap bubble is blown to a diameter of 7 cm, 36960 erg of work is done in blowing it further. If surface tension of soap solution is 40 dyne/cm then the new radius is _____ cm Take $\left(\pi = \frac{22}{7}\right)$.

Question ID: 87827055480

Ans. Official Answer NTA (7)



Sol.

60. A alternating current at any instant is given by $i = [6 + \sqrt{56} \sin(100\pi t + \pi/3)]$ A . Then rms value of the current is _____ A.

Question ID: 87827055485

Ans. Official Answer NTA (8)

Sol.

