

JEE Main April 2024
Question Paper With Text Solution
09 April | Shift-2

PHYSICS

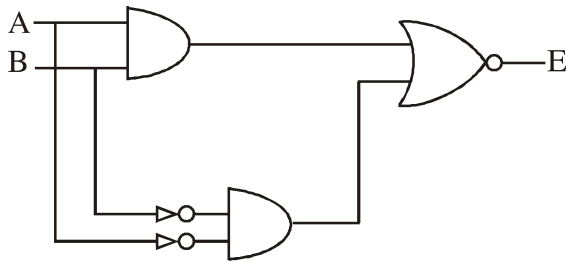


JEE Main & Advanced | XI-XII Foundation | VI-X Pre-Foundation

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31. In the truth table of the above circuit the value of X and Y are :



A	B	E
0	0	0
0	1	X
1	0	Y
1	1	0

(1) 0, 1

(2) 1, 0

(3) 1, 1

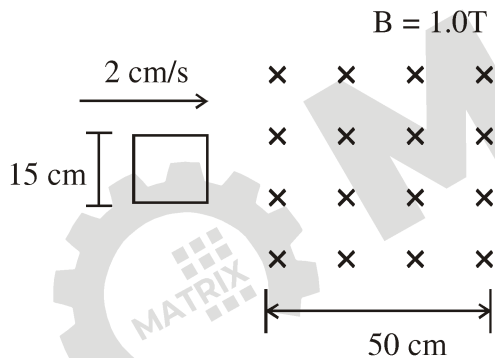
(4) 0, 0

Question ID: 68019114651

Ans. Official Answer NTA(3)

Sol.

32. A square loop of side 15 cm being moved towards right at a constant speed of 2 cm/s as shown in figure. The front edge enters the 50 cm wide magnetic field at $t = 0$. The value of induced emf in the loop at $t = 10$ s will be:



(1) zero

(2) 3 mV

(3) 4.5 mV

(4) 0.3 mV

Question ID: 68019114648

Ans. Official Answer NTA(1)

Sol.

33. The temperature of a gas is -78°C and the average translational kinetic energy of its molecules is K . The temperature at which the average translational kinetic energy of the molecules of the same gas becomes $2K$ is:

(1) -39°C (2) 117°C (3) -78°C (4) 127°C

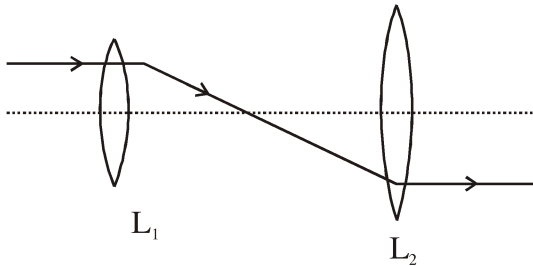
Question ID: 68019114644



Ans. Official Answer NTA (2)

Sol.

34. The following figure represents two biconvex lenses L_1 and L_2 having focal length 10 cm and 15 cm respectively. The distance between L_1 and L_2 is :



- (1) 25 cm (2) 15 cm (3) 10 cm (4) 35 cm

Question ID: 68019114649

Ans. Official Answer NTA (1)

Sol.

35. A spherical ball of radius 1×10^{-4} m and density 10^5 kg / m³ falls freely under gravity through a distance h before entering a tank of water, If after entering in water the velocity of the ball does not change, then the value of h is approximately :

(The coefficient of viscosity of water is 9.8×10^{-6} N s / m²)

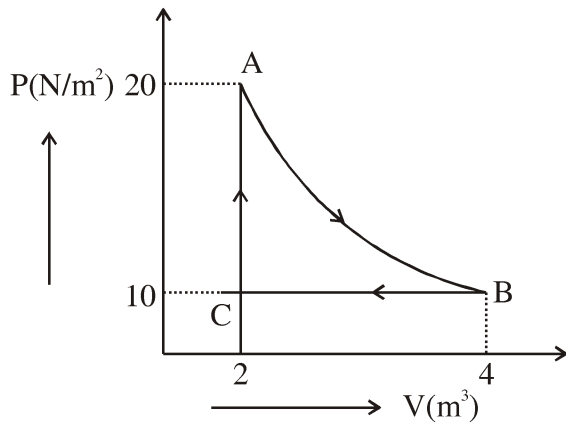
- (1) 2296 m (2) 2396 m (3) 2249 m (4) 2518 m

Question ID: 68019114643

Ans. Official Answer NTA (4)

Sol.

36. A real gas within a closed chamber at 27°C undergoes the cyclic process as shown in figure. The gas obeys $PV^3 = RT$ equation for the path A to B. The net work done in the complete cycle is (assuming $R = 8$ J/mol K):



- (1) 205 J (2) 20 J (3) 225 J (4) -20 J

Question ID: 68019114639

Ans. Official Answer NTA(1)

Matrix Answer (Bouns)

Sol.

37. A proton and a deuteron ($q = +e, m = 2.0u$) having same kinetic energies enter a region of uniform magnetic field \vec{B} , moving perpendicular to \vec{B} . The ratio of the radius r_d of deuteron path to the radius r_p of the proton path is :

- (1) 1 : 1 (2) 1 : 2 (3) $\sqrt{2} : 1$ (4) $1 : \sqrt{2}$

Question ID: 68019114647

Ans. Official Answer NTA(3)

Sol.

38. The de-Broglie wavelength associated with a particle of mass m and energy E is $h / \sqrt{2mE}$. The dimensional formula for Planck's constant is :

- (1) $[ML^2T^{-1}]$ (2) $[ML^{-1}T^{-2}]$ (3) $[M^2L^2T^{-2}]$ (4) $[MLT^{-2}]$

Question ID: 68019114634

Ans. Official Answer NTA(1)

Sol.

39. The magnetic field in a plane electromagnetic wave is $B_y = (3.5 \times 10^{-7}) \sin(1.5 \times 10^3 x + 0.5 \times 10^{11} t)$ T. The corresponding electric field will be :



$$(1) E_z = 105 \sin(1.5 \times 10^3 x + 0.5 \times 10^{11} t) \text{Vm}^{-1} \quad (2) E_y = 10.5 \sin(1.5 \times 10^3 x + 0.5 \times 10^{11} t) \text{Vm}^{-1}$$

$$(3) E_y = 1.17 \sin(1.5 \times 10^3 x + 0.5 \times 10^{11} t) \text{Vm}^{-1} \quad (4) E_z = 1.17 \sin(1.5 \times 10^3 x + 0.5 \times 10^{11} t) \text{Vm}^{-1}$$

Question ID: 68019114653

Ans. Official Answer NTA(1)

Sol.

40. A hydrogen atom in ground state is given an energy of 10.2 eV. How many spectral lines will be emitted due to transition of electrons ?

(1) 1

(2) 3

(3) 10

(4) 6

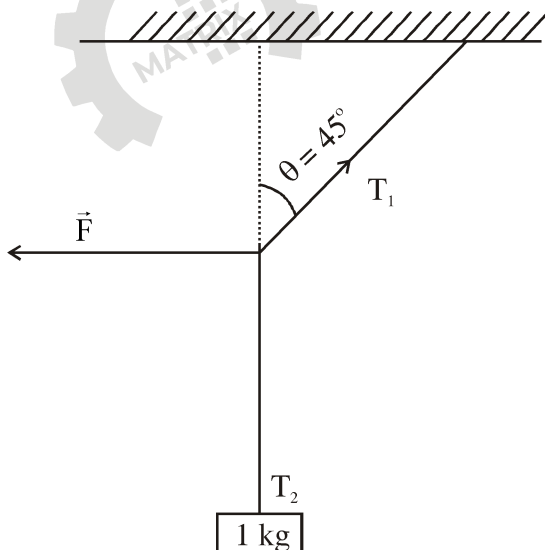
Question ID: 68019114638

Ans. Official Answer NTA(1)

Sol.

41. A 1 kg mass is suspended from the ceiling by a rope of length 4m. A horizontal force 'F' is applied at the mid point of the rope so that the rope makes an angle of 45° with respect to the vertical axis as shown in figure. The magnitude of F is :

(Assume that the system is in equilibrium and $g = 10 \text{ m/s}^2$)





(1) 10 N

(2) $\frac{10}{\sqrt{2}}$ N

(3) 1 N

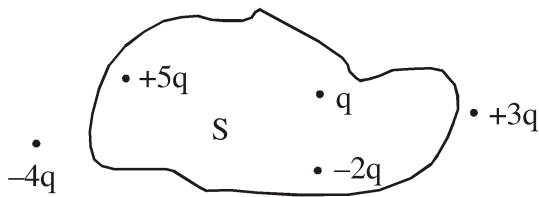
(4) $\frac{1}{10\sqrt{2}}$ N

Question ID: 68019114637

Ans. Official Answer NTA(1)

Sol.

42. Five charges $+q$, $+5q$, $-2q$, $+3q$ and $-4q$ are situated as shown in the figure. The electric flux due to this configuration through the surface S is :



(1) $\frac{4q}{\epsilon_0}$

(2) $\frac{3q}{\epsilon_0}$

(3) $\frac{q}{\epsilon_0}$

(4) $\frac{5q}{\epsilon_0}$

Question ID: 68019114645

Ans. Official Answer NTA(1)

43. Two cars are travelling towards each other at speed of 20 ms^{-1} each. When the cars are 300 m apart, both the drivers apply brakes and the cars retard at the rate of 2 ms^{-2} . The distance between them when they come to rest is :

(1) 25 m

(2) 50 m

(3) 200 m

(4) 100 m

Question ID: 68019114635

Ans. Official Answer NTA(4)

Sol.

44. The energy released in the fusion of 2 kg of hydrogen deep in the sun is E_H and the energy released in the fission of 2 kg of ^{235}U is E_U . The ratio $\frac{E_H}{E_U}$ is approximately :

(Consider the fusion reaction as $4_1^1\text{H} + 2e^- \rightarrow {}_2^4\text{He} + 2\nu + 6\gamma + 26.7\text{MeV}$, energy released in the fission reaction of ^{235}U is 200 MeV per fission nucleus and $N_A = 6.023 \times 10^{23}$)

(1) 25.6

(2) 15.04

(3) 7.62

(4) 9.13

Question ID: 68019114640



Ans. Official Answer NTA (3)

Sol.

45. A nucleus at rest disintegrates into two smaller nuclei with their masses in the ratio of 2 : 1. After disintegration they will move :

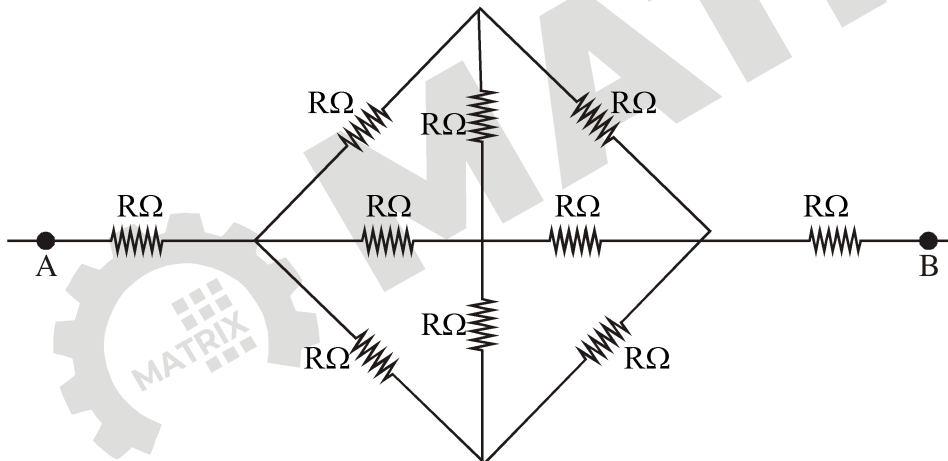
- (1) in opposite directions with the same speed.
- (2) in opposite directions with speed in the ratio of 2 : 1 respectively.
- (3) in the same direction with same speed.
- (4) in opposite directions with speed in the ratio of 1 : 2 respectively.

Question ID: 68019114636

Ans. Official Answer NTA (4)

Sol.

46. The effective resistance between A and B, if resistance of each resistor is R, will be :



- (1) $\frac{2}{3}R$
- (2) $\frac{8R}{3}$
- (3) $\frac{4R}{3}$
- (4) $\frac{5R}{3}$

Question ID: 68019114646

Ans. Official Answer NTA (2)

Sol.

47. A satellite of 10^3 kg mass is revolving in circular orbit of radius $2R$. If $\frac{10^4 R}{6}$ J energy is supplied to the satellite, it would revolve in a new circular orbit of radius :

(use $g = 10 \text{ m/s}^2$, $R = \text{radius of earth}$)

- (1) $4R$
- (2) $3R$
- (3) $6R$
- (4) $2.5R$



Question ID: 68019114641

Ans. Official Answer NTA (3)

Sol.

48. The excess pressure inside a soap bubble is thrice the excess pressure inside a second soap bubble. The ratio between the volume of the first and the second bubble is :

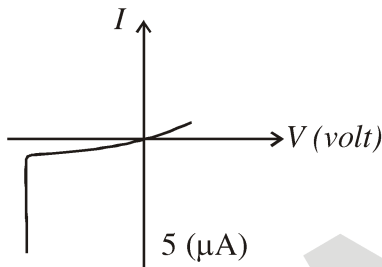
- (1) 1 : 81 (2) 1 : 9 (3) 1 : 3 (4) 1 : 27

Question ID: 68019114642

Ans. Official Answer NTA (4)

Sol.

49. The I-V characteristics of an electronic device shown in the figure. The device is :



- (1) a zener diode which can be used as a voltage regulator
(2) a solar cell
(3) a diode which can be used as a rectifier
(4) a transistor which can be used as an amplifier

Question ID: 68019114652

Ans. Official Answer NTA (1)

Sol.

50. UV light of 4.13 eV is incident on a photosensitive metal surface having work function 3.13 eV. The maximum kinetic energy of ejected photoelectrons will be :

- (1) 7.26 eV (2) 4.13 eV (3) 3.13 eV (4) 1 eV

Question ID: 68019114650

Ans. Official Answer NTA (4)

Sol.

51. A capacitor of reactance $4\sqrt{3} \Omega$ and a resistor of resistance 4Ω are connected in series with an ac source of



peak value $8\sqrt{2}$ V. The power dissipation in the circuit is _____ W.

Question ID: 68019114656

Ans. Official Answer NTA (4)

Sol.

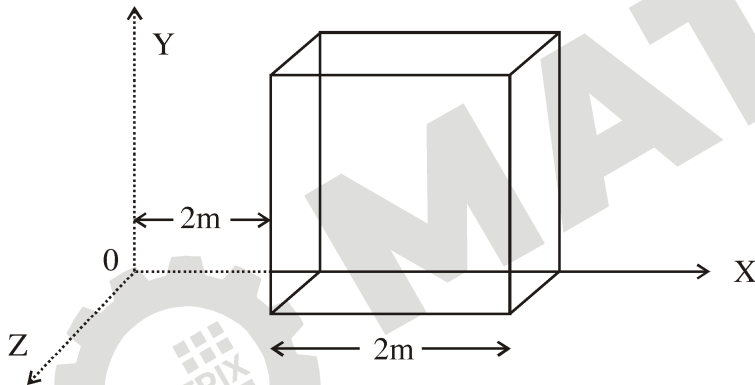
52. The resultant of two vectors \vec{A} and \vec{B} is perpendicular to \vec{A} and its magnitude is half that of \vec{B} . The angle between vectors \vec{A} and \vec{B} is _____ °.

Question ID: 68019114662

Ans. Official Answer NTA (150)

Sol.

53. An electric field $\vec{E} = (2x\hat{i})\text{NC}^{-1}$ exists in space. A cube of side 2m is placed in the space as per figure given below. The electric flux through the cube is _____ Nm^2/C .



Question ID: 68019114659

Ans. Official Answer NTA (16)

Sol.

54. A straight magnetic strip has a magnetic moment of 44 Am^2 . If the strip is bent in a semicircular shape, its magnetic moment will be _____ Am^2 .

(given $\pi = \frac{22}{7}$)

Question ID: 68019114657

Ans. Official Answer NTA (28)

Sol.



55. A force $(3x^2 + 2x - 5)$ N displaces a body from $x = 2$ m to $x = 4$ m. Work done by this force is _____ J.

Question ID: 68019114654

Ans. Official Answer NTA (58)

Sol.

56. Monochromatic light of wavelength 500 nm is used in Young's double slit experiment. An interference pattern is obtained on a screen. When one of the slits is covered with a very thin glass plate (refractive index = 1.5), the central maximum is shifted to a position previously occupied by the 4th bright fringe. The thickness of the glass-plate is _____ μ m.

Question ID: 68019114655

Ans. Official Answer NTA (4)

Sol.

57. A particle of mass 0.50 kg executes simple harmonic motion under force $F = -50 (\text{Nm}^{-1})x$. The time period of oscillation is $\frac{x}{35}$ s. The value of x is _____.

(given $\pi = \frac{22}{7}$)

Question ID: 68019114660

Ans. Official Answer NTA (22)

Sol.

58. A circular disc reaches from top to bottom of an inclined plane of length l . When it slips down the plane, it takes t s. When it rolls down the plane then it takes $\left(\frac{\alpha}{2}\right)^{1/2} t$ s, where $\left(\frac{\alpha}{2}\right)^{1/2} t$ s is _____.

Question ID: 68019114661

Ans. Official Answer NTA (3)

Sol.

59. At room temperature (27°C), the resistance of a heating element is 50Ω . The temperature coefficient of the material is $2.4 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$. The temperature of the element, when its resistance is 62Ω , is _____ $^\circ\text{C}$.

Question ID: 68019114658

Ans. Official Answer NTA (1027)

Sol.

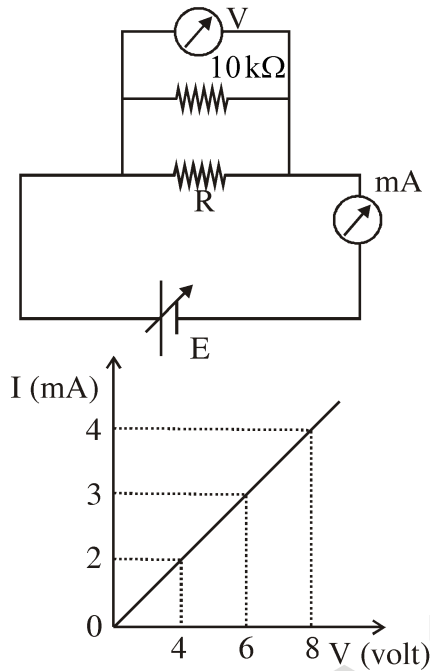
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60. To determine the resistance (R) of a wire, a circuit is designed below. The V-I characteristic curve for this circuit is plotted for the voltmeter and the ammeter readings as shown in figure. The value of R is _____ Ω .



Question ID: 68019114663

Ans. Official Answer NTA (2500)

Sol.