

JEE Main April 2024
Question Paper With Text Solution
06 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. In photoelectric experiment energy of 2.48 eV irradiates a photo sensitive material. The stopping potential was measured to be 0.5 V. Work function of the photo sensitive material is:

- (1) 0.5 eV (2) 2.48 eV (3) 1.68 eV (4) 1.98 eV

Question ID : 68019114110

Ans. Official answer NTA (4)

Sol.

32. The specific heat at constant pressure of a real gas obeying $PV^2 = RT$ equation is:

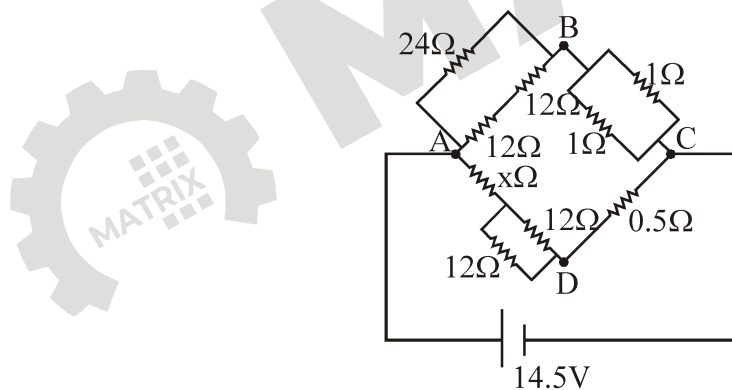
- (1) $C_v + \frac{R}{2V}$ (2) $\frac{R}{3} + C_v$ (3) R (4) $C_v + R$

Question ID : 68019114099

Ans. Official answer NTA (1)

Sol.

33. The value of unknown resistance (x) for which the potential difference between B and D will be zero in the arrangement shown, is:



- (1) 6 Ω (2) 42 Ω (3) 9 Ω (4) 3 Ω

Question ID : 68019114103

Ans. Official answer NTA (1)

Sol.

34. Given below are two statements:

Statement I: In an LCR series circuit, current is maximum at resonance.

Statement II: Current in a purely resistive circuit can never be less than that in a series LCR circuit when



connected to same voltage source.

In the light of the above statements, choose the correct from the options given below:

- (1) Both Statement I and Statement II are false
- (2) Statement I is false but Statement II is true
- (3) Both statement I and Statement II are true
- (4) Statement I is true but Statement II is false

Question ID : 68019114107

Ans. Official answer NTA(3)

Sol.

35. σ is the uniform surface charge density of a thin spherical shell of radius R . The electric field at any point on the surface of the spherical shell is:

- (1) $\sigma/2\epsilon_0$
- (2) $\sigma/4\epsilon_0$
- (3) σ/ϵ_0
- (4) $\sigma/\epsilon_0 R$

Question ID : 68019114101

Ans. Official answer NTA(3)

Sol.

36. While measuring diameter of wire using screw gauge the following readings were noted. Main scale reading is 1 mm and circular scale reading is equal to 42 divisions. Pitch of screw gauge is 1 mm and it has 100 divisions on circular scale. The diameter of the wire is $\frac{x}{50}$ mm. The value of x is:

- (1) 142
- (2) 42
- (3) 21
- (4) 71

Question ID : 68019114104

Ans. Official answer NTA(4)

Sol.

37. A sample contains mixture of helium and oxygen gas. The ratio of root mean square speed of helium and oxygen in the sample, is:

- (1) $\frac{1}{32}$
- (2) $\frac{1}{2\sqrt{2}}$
- (3) $\frac{1}{4}$
- (4) $\frac{2\sqrt{2}}{1}$

Question ID : 68019114100

Ans. Official answer NTA(4)

Sol.



38. A train starting from rest first accelerates uniformly up to a speed of 80 km/h for time t , then it moves with a constant speed for time $3t$. The average speed of the train for this duration of journey will be (in km/h):

- (1) 30 (2) 80 (3) 70 (4) 40

Question ID : 68019114097

Ans. Official answer NTA (3)

Sol.

39. To project a body of mass m from earth's surface to infinity, the required kinetic energy is (assume, the radius of earth is R_E , g = acceleration due to gravity on the surface of earth) :

- (1) $4 mgR_E$ (2) $2 mgR_E$ (3) mgR_E (4) $1/2 mgR_E$

Question ID : 68019114096

Ans. Official answer NTA (3)

Sol.

40. A bullet of mass 50 g is fired with a speed 100 m/s on a plywood and emerges with 40 m/s. The percentage loss of kinetic energy is:

- (1) 16% (2) 84% (3) 44% (4) 32%

Question ID : 68019114113

Ans. Official answer NTA (2)

Sol.

41. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (where $m_2 > m_1$). If

the acceleration of the system is $\frac{g}{\sqrt{2}}$, then the ratio of the masses $\frac{m_1}{m_2}$ is:

- (1) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ (2) $\frac{\sqrt{3}+1}{\sqrt{2}-1}$ (3) $\frac{1+\sqrt{5}}{\sqrt{2}-1}$ (4) $\frac{1+\sqrt{5}}{\sqrt{5}-1}$

Question ID : 68019114095

Ans. Official answer NTA (1)

Sol.

42. A small ball of mass m and density ρ is dropped in a viscous liquid of density ρ_0 . After sometime, the ball falls with constant velocity. The viscous force on the ball is:

- (1) $mg \left(\frac{\rho_0}{\rho} - 1 \right)$ (2) $mg \left(1 - \frac{\rho_0}{\rho} \right)$ (3) $mg (1 - \rho\rho_0)$ (4) $mg \left(1 + \frac{\rho}{\rho_0} \right)$



Question ID : 68019114098

Ans. Official answer NTA(2)

Sol.

43. The ratio of the shortest wavelength of Balmer series to the shortest wavelength of Lyman series for hydrogen atom is:

- (1) 1 : 4 (2) 4 : 1 (3) 2 : 1 (4) 1 : 2

Question ID : 68019114111

Ans. Official answer NTA(2)

Sol.

44. Electromagnetic waves travel in a medium with speed of $1.5 \times 10^8 \text{ m s}^{-1}$. The relative permeability of the medium is 2.0. The relative permittivity will be:

- (1) 4 (2) 2 (3) 5 (4) 1

Question ID : 68019114102

Ans. Official answer NTA(2)

Sol.

45. To find the spring constant (k) of a spring experimentally, a student commits 2% positive error in the measurement of time and 1% negative error in measurement of mass. The percentage error in determining value of k is:

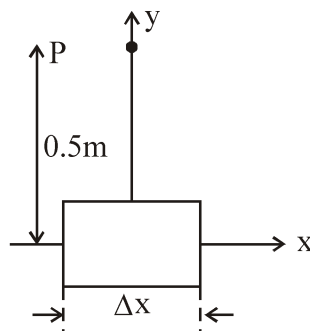
- (1) 1% (2) 5% (3) 3% (4) 4%

Question ID : 68019114108

Ans. Official answer NTA(2)

Sol.

46. An element $\Delta l = \Delta x \hat{i}$ is placed at the origin and carries a large current $I = 10 \text{ A}$. The magnetic field on the y -axis at a distance of 0.5 m from the elements Δx of 1 cm length is:

**MATRIX JEE ACADEMY**

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

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



(1) $4 \times 10^{-8} \text{ T}$

(2) $10 \times 10^{-8} \text{ T}$

(3) $8 \times 10^{-8} \text{ T}$

(4) $12 \times 10^{-8} \text{ T}$

Question ID : 68019114106

Ans. Official answer NTA (1)

Sol.

47. Match List I with List II

List I

A. Torque

B. Magnetic field

C. Magnetic moment

D. Permeability of free space

List II

I. $[M^1L^1T^{-2}A^{-2}]$ II. $[L^2A^1]$ III. $[M^1T^{-2}A^{-1}]$ IV. $[M^1L^2T^{-2}]$

Choose the correct answer from the options given below:

(1) A-I, B-III, C-II, D-IV

(2) A-IV, B-II, C-III, D-I

(3) A-III, B-I, C-II, D-IV

(4) A-IV, B-III, C-II, D-I

Question ID : 68019114105

Ans. Official answer NTA (4)

Sol.

48. Which of the following phenomena does not explain by wave nature of light.

A. Reflection

B. Diffraction

C. Photoelectric effect

D. Interference

E. Polarization

Choose the most appropriate answer from the options given below:

(1) A, C only

(2) B, D only

(3) C only

(4) E only

Question ID : 68019114109

Ans. Official answer NTA (3)

Sol.

49. Four particles A, B, C, D of mass $\frac{m}{2}$, m , $2m$, $4m$, have same momentum, respectively. The particle with maximum kinetic energy is:

(1) A

(2) D

(3) C

(4) B

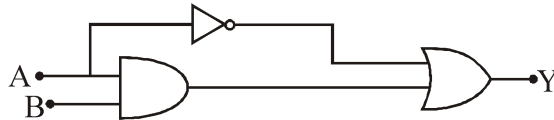
Question ID : 68019114094



Ans. Official answer NTA (1)

Sol.

50. The correct truth table for the following logic circuit is:



(1)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

(2)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(3)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	1

(4)

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1

Question ID : 68019114112

Ans. Official answer NTA (3)

Sol.

Section B

51. A big drop is formed by coalescing 1000 small droplets of water. The ratio of surface energy of 1000 droplets to that of energy of big drop is $\frac{10}{x}$. The value of x is _____.

Question ID : 68019114117

Ans. Official answer NTA (1)

Sol.

52. Radius of a certain orbit of hydrogen atom is 8.48 \AA . If energy of electron in this orbit is E/x . then $x = \text{_____}$.

(Given $a_0 = 0.529 \text{ \AA}$, $E =$ energy of electron in ground state).

Question ID : 68019114123

Ans. Official answer NTA (16)

Sol.

53. A wire of resistance R and radius r is stretched till its radius became $r/2$. If new resistance of the stretched wire is xR , then value of x is _____.

Question ID : 68019114121

MATRIX JEE ACADEMY

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

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



Status : Answered

Ans. Official answer NTA (16)

Sol.

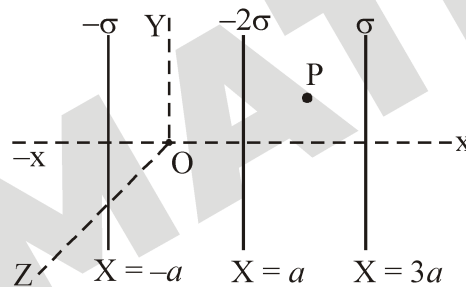
54. A particle is doing simple harmonic motion of amplitude 0.06 m and time period 3.14 s. The maximum velocity of the particle is _____ cm/s.

Question ID : 68019114115

Ans. Official answer NTA (12)

Sol.

55. Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is $\frac{x\sigma}{\epsilon_0}$. The value of x is _____ (all quantities are measured in SI units).



Question ID : 68019114122

Ans. Official answer NTA (2)

Sol.

56. When a dc voltage of 100 V is applied to an inductor, a dc current of 5 A flows through it. When an ac voltage of 200 V peak value is connected to inductor, its inductive reactance is found to be $20\sqrt{3}\Omega$. The power dissipated in the circuit is _____ W.

Question ID : 68019114118

Ans. Official answer NTA (250)

Sol.

57. The refractive index of prism is $\mu = \sqrt{3}$ and the ratio of the angle of minimum deviation to the angle of prism is



one. The value of angle of prism is _____°.

Question ID : 68019114114

Ans. Official answer NTA(60)

Sol.

58. For three vectors $\vec{A} = (-x\hat{i} - 6\hat{j} - 2\hat{k})$, $\vec{B} = (-\hat{i} + 4\hat{j} + 3\hat{k})$ and $\vec{C} = (-8\hat{i} - \hat{j} + 3\hat{k})$, if $\vec{A} \cdot (\vec{B} \times \vec{C}) = 0$, then value of x is _____.

Question ID : 68019114116

Ans. Official answer NTA(4)

Sol.

59. If the radius of earth is reduced to three-fourth of its present value without change in its mass then value of duration of the day of earth will be _____ hours 30 minutes.

Question ID : 68019114119

Ans. Official answer NTA(13)

Sol.

60. A circular coil having 200 turns, $2.5 \times 10^{-4} \text{ m}^2$ area and carrying 100 μA current is placed in a uniform magnetic field of 1 T. Initially the magnetic dipole moment (\vec{M}) was directed along \vec{B} . Amount of work, required to rotate the coil through 90° from its initial orientation such that \vec{M} becomes perpendicular to \vec{B} , is _____ μJ .

Question ID : 68019114120

Ans. Official answer NTA(5)

Sol.