

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

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. A total of 48 J heat is given to one mole of helium kept in a cylinder. The temperature of helium increases by 2°C . The work done by the gas is :

Given, $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$.

- (1) 23.1 J
- (2) 24.9 J
- (3) 72.9 J
- (4) 48 J

Question ID : 87827055916

Ans. Official Answer NTA (1)

Sol.

32. When kinetic energy of a body becomes 36 times of its original value, the percentage increase in the momentum of the body will be :

- (1) 6%
- (2) 600%
- (3) 60%
- (4) 500%

Question ID : 87827055913

Ans. Official Answer NTA (4)

Sol.

33. The acceptor level of a p-type semiconductor is 6 eV. The maximum wavelength of light which can create a hole would be : Given $hc = 1242 \text{ eV nm}$.

- (1) 414 nm
- (2) 407 nm
- (3) 103.5 nm
- (4) 207 nm

Question ID : 87827055926

Ans. Official Answer NTA (4)

Sol.



34. Energy of 10 non rigid diatomic molecules at temperature T is :

- (1) $35 K_B T$
- (2) $35 RT$
- (3) $70 K_B T$
- (4) $\frac{7}{2} RT$

Question ID : 87827055918

Ans. Official Answer NTA (1)

Sol.

35. Given below are two statements :

Statement I : Dimensions of specific is $[L^2 T^{-2} K^{-1}]$.

Statement II : Dimensions of gas constant is $[M L^2 T^{-1} K^{-1}]$.

In the light of the above statements, choose the most appropriate answer from the options given below.

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

Question ID : 87827055909

Ans. Official Answer NTA (2)

Sol.

36. In a vernier calliper, when both jaws touch each other, zero of the vernier scale shifts towards left and its 4th division coincides exactly with a certain division on main scale. If 50 vernier scale divisions equal to 49 main scale divisions and zero error in the instrument is 0.04 mm then how many main scale divisions are there in 1 cm ?

- (1) 10
- (2) 5
- (3) 40
- (4) 20

Question ID : 87827055917

Ans. Official Answer NTA (4)



Sol.

37. The number of electrons flowing per second in the filament of a 110 W bulb operating at 220 V is :

(Given $e = 1.6 \times 10^{-19}$ C)

- (1) 1.25×10^{19}
- (2) 6.25×10^{18}
- (3) 31.25×10^{17}
- (4) 6.25×10^{17}

Question ID : 87827055920

Ans. Official Answer NTA (3)

Sol.

38. When UV light of wavelength 300 nm is incident on the metal surface having work function 2.13 eV, electron emission takes place. The stopping potential is :

(Given $hc = 1240$ eV nm)

- (1) 4.1 V
- (2) 2 V
- (3) 4 V
- (4) 1.5 V

Question ID : 87827055924

Ans. Official Answer NTA (2)

Sol.

39. A body of weight 200 N is suspended from a tree branch through a chain of mass 10 kg. The branch pulls the chain by a force equal to (if $g = 10$ m/s²) :

- (1) 100 N
- (2) 150 N
- (3) 200 N
- (4) 300 N

Question ID : 87827055911

Ans. Official Answer NTA (4)

Sol.



40. In the given electromagnetic wave $E_y = 600 \sin(\omega t - kx) \text{Vm}^{-1}$, intensity of the associated light beam is (in W/m^2): (Given $\epsilon_0 = 9 \times 10^{-12} \text{C}^2\text{N}^{-1}\text{m}^{-2}$)

- (1) 972
- (2) 729
- (3) 243
- (4) 486

Question ID : 87827055922

Ans. Official Answer NTA (4)

Sol.

41. Two identical conducting spheres P and S with charge Q on each, repel each other with a force 16 N. A third identical uncharged conducting sphere R is successively brought in contact with the two spheres. The new force of repulsion between P and S is :

- (1) 12 N
- (2) 6 N
- (3) 1 N
- (4) 4 N

Question ID : 87827055919

Ans. Official Answer NTA (2)

Sol.

42. Match List - I with List - II :

List - I

Y vs X

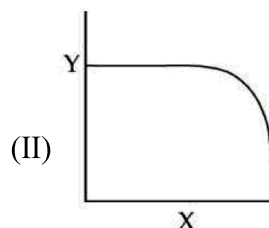
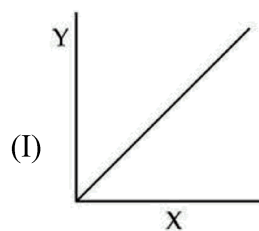
List- II

Shape of Graph

(A) Y = magnetic susceptibility

X = magnetising field

(B) Y = magnetic field



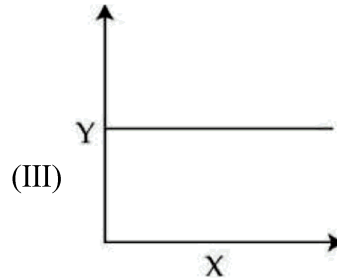


X = distance from centre of a current

carrying wire for $x < a$

(where a = radius of wire)

(C) Y = magnetic field



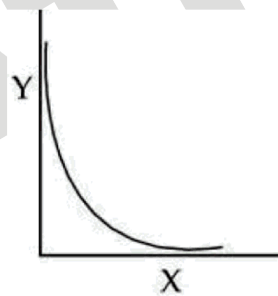
X = distance from centre of a current carrying

wire for $x > a$

(where a = radius of wire)

(D) Y = magnetic field inside solenoid

(IV)



X = distance from centre

Choose the correct answer from the options given below :

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

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

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

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

Question ID : 87827055912

Ans. Official Answer NTA(2)

Sol.

43. In finding out refractive index of glass slab the following observations were made through travelling microscope
50 vernier scale division = 49 MSD; 20 divisions on main scale in each cm for mark on paper



MSR = 8.45 cm, VC = 26

For mark on paper seen through slab

MSR = 7.12 cm, VC = 41

For powder particle on the top surface of the glass slab

MSR = 1.05 cm, VC = 1

(MSR = Main Scale Reading, VC = Vernier Coincidence)

Refractive index of the glass slab is :

- (1) 1.42
- (2) 1.52
- (3) 1.24
- (4) 1.35

Question ID : 87827055927

Ans. Official Answer NTA (1)

Sol.

44. Assuming the earth to be a sphere of uniform mass density, a body weighed 300 N on the surface of earth. How much it would weigh at $R/4$ depth under surface of earth ?

- (1) 75 N
- (2) 375 N
- (3) 225 N
- (4) 300 N

Question ID : 87827055914

Ans. Official Answer NTA (3)

Sol.

45. A body projected vertically upwards with a certain speed from the top of a tower reaches the ground in t_1 . If it is projected vertically downwards from the same point with the same speed, it reaches the ground in t_2 . Time required to reach the ground, if it is dropped from the top of the tower, is :

- (1) $\sqrt{t_1 - t_2}$
- (2) $\sqrt{t_1 + t_2}$
- (3) $\sqrt{t_1 t_2}$



$$(4) \sqrt{\frac{t_1}{t_2}}$$

Question ID : 87827055910

Ans. Official Answer NTA (3)

Sol.

46. In a coil, the current changes from $-2A$ to $+2A$ in 0.2 s and induces an emf of 0.1 V. The self inductance of the coil is :

- (1) 4 mH
- (2) 5 mH
- (3) 2.5 mH
- (4) 1 mH

Question ID : 87827055921

Ans. Official Answer NTA (2)

Sol.

47. The longest wavelength associated with Paschen series is : (Given $R_H = 1.097 \times 10^7$ SI unit)

- (1) 1.094×10^{-6} m
- (2) 2.973×10^{-6} m
- (3) 1.876×10^{-6} m
- (4) 3.646×10^{-6} m

Question ID : 87827055925

Ans. Official Answer NTA (3)

Sol.

48. A car of 800 kg is taking turn on a banked road of radius 300 m and angle of banking 30° . If coefficient of static friction is 0.2 then the maximum speed with which car can negotiate the turn safely : ($g = 10 \text{ m/s}^2$, $\sqrt{3} = 1.73$)

- (1) 102.8 m/s
- (2) 51.4 m/s
- (3) 70.4 m/s
- (4) 264 m/s

Question ID : 87827055908

Ans. Official Answer NTA (2)

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Sol.

49. For the thin convex lens, the radii of curvature are at 15 cm and 30 cm respectively. The focal length the lens is 20 cm. The refractive index of the material is :

- (1) 1.2
- (2) 1.8
- (3) 1.5
- (4) 1.4

Question ID : 87827055923

Ans. Official Answer NTA (3)

Sol.

50. Pressure inside a soap bubble is greater than the pressure outside by an amount :

(given : R = Radius of bubble, S = Surface tension of bubble)

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

Question ID : 87827055915

Ans. Official Answer NTA (2)

Sol.

51. In Franck- Hertz experiment, the first dip in the current-voltage graph for hydrogen is observed at 10.2 V. The wavelength of light emitted by hydrogen atom when excited to the first excitation level is _____ nm. (Given $hc = 1245 \text{ eV nm}$, $e = 1.6 \times 10^{-19} \text{ C}$).

Question ID : 87827055932

Ans. Official Answer NTA (122)

Sol.

52. Two coherent monochromatic light beams of intensities I and 4 I are superimposed. The difference between maximum and minimum possible intensities in the resulting beam is x I. The value of x is _____.

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Question ID : 87827055931

Ans. Official Answer NTA (8)

Sol.

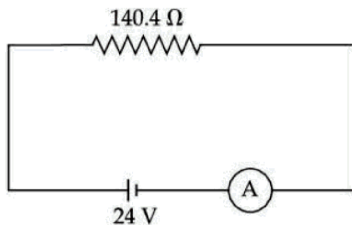
53. A coil having 100 turns, area of $5 \times 10^{-3} \text{ m}^2$, carrying current of 1 mA is placed in uniform magnetic field of 0.20 T such a way that plane of coil is perpendicular to the magnetic field. The work done in turning the coil through 90° is _____ μJ .

Question ID : 87827055935

Ans. Official Answer NTA (100)

Sol.

54. In the given figure an ammeter A consists of a 240Ω coil connected in parallel to a 10Ω shunt. The reading of the ammeter is _____ mA.

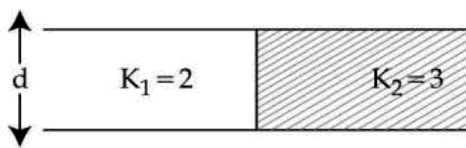


Question ID : 87827055930

Ans. Official Answer NTA (160)

Sol.

55. A capacitor of $10 \mu\text{F}$ capacitance whose plates are separated by 10 mm through air and each plate has area 4 cm^2 is now filled equally with two dielectric media of $K_1 = 2$, $K_2 = 3$ respectively as shown in figure. If new force between the plates is 8N. The supply voltage is _____ V.



Question ID : 87827055929

Ans. Official Answer NTA (80)

Sol.

56. Three balls of masses 2kg, 4kg and 6kg respectively are arranged at centre of the edges of an equilateral triangle of side 2 m. The moment of inertia of the system about an axis through the centroid and perpendicular



to the plane of triangle, will be _____ kg m^2 .

Question ID : 87827055933

Ans. Official Answer NTA (4)

Sol.

57. Two open organ pipes of lengths 60 cm and 90 cm resonate at 6th and 5th harmonics respectively. The difference of frequencies for the given modes is _____ Hz.

(Velocity of sound in air = 333 m/s)

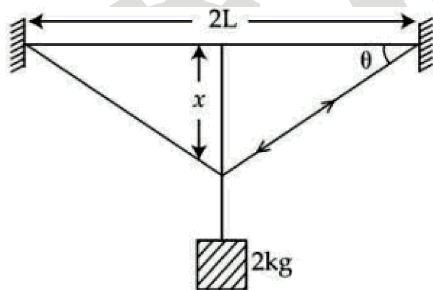
Question ID : 87827055928

Ans. Official Answer NTA (740)

Sol.

58. A wire of cross sectional area A , modulus of elasticity $2 \times 10^{11} \text{ Nm}^{-2}$ and length 2 m is stretched between two vertical rigid supports. When a mass of 2 kg is suspended at the middle it sags lower from its original position making angle $\theta = \frac{1}{100}$ radian on the points of support. The value of A is _____ $\times 10^{-4} \text{ m}^2$ (consider $x \ll L$).

(given : $g = 10 \text{ m/s}^2$)



Question ID : 87827055937

Ans. Official Answer NTA (1)

Sol.

59. A particle moves in a straight line so that its displacement x at any time t is given by $x^2 = 1 + t^2$. Its acceleration at any time t is x^{-n} where $n =$ _____.

Question ID : 87827055934

Ans. Official Answer NTA (3)

Sol.

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60. For a given series LCR circuit it is found that maximum current is drawn when value of variable capacitance is 2.5 nF. If resistance of $200\ \Omega$ and 100 mH inductor is being used in the given circuit. The frequency of ac source is _____ $\times 10^3$ Hz. (given $\pi^2 = 10$)

Question ID : 87827055936

Ans. Official Answer NTA (10)

Sol.

