1101. Physical World and measurement

1. A physical quantity of the dimensions of length that can be formed out of *c*, *G* and $\frac{e^2}{4\pi\varepsilon_0}$ is [*c* is velocity of light, *G* is universal constant of gravitation and *e* is charge] **(2017)**

(1) $\frac{1}{c}\ G\ \frac{e^2}{4\pi\varepsilon_0}$ (2) $\frac{1}{c^2}\left[G\ \frac{e^2}{4\pi\varepsilon_0}\right]^{\frac{1}{2}}$

(3) $c^2\left[G\ \frac{e^2}{4\pi\varepsilon_0}\right]^{\frac{1}{2}}$ (4) $\frac{1}{c^2}\left[\frac{e^2}{G4\pi\varepsilon_0}\right]^{\frac{1}{2}}$

Answer (2)

2. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 *cm*. The main scale reading is 5 *cm* and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of 0.004 *cm* the correct diameter of the ball is **(2018)**

(1) 0.053 *cm* (2) 0.525 *cm*

(3) 0.521 *cm* **(4) 0.529 *cm***

Answer (4)

3. The unit of thermal conductivity is: **(2019)**

(1) J m K $^{-1}$ (2) J m $^{-1}$ K $^{-1}$

(3) W m K $^{-1}$ **(4) W m $^{-1}$ K $^{-1}$**

Answer (4)

4. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where X = $\frac{A^2\,B^{1/2}}{C^{1/3}D^3}$ will be: **(2019)**

(1) $\left(\frac{3}{13}\right)$% **(2) 16%**

(3) -10% (4) 10%

Answer: (2)

5. Time intervals measured by a clock give the following readings : **(2020)**

1.25s, 1.24 s, 1.27 s, 1.21 s and 1.28 s

What is the percentage relative error of the observations?

(1) 1.6% (2) 2%

(3) 4% (4) 16%

Answer (1)

6. A barometer is constructed using a liquid (density = 760 kg/m^3). What would be the height of the liquid column, when a mercury barometer reads 76 cm? **(2020)**

(Density of mercury = 13600 kg/m^3)

(1) 0.76 m (2) 1.36 m

(3) 13.6 m (4) 136 m

Answer (3)

7. The angle of 1' (minute of arc) in radian is nearly equal to **(2020)**

(1) 1.75 × 10^{-2} rad (2) 2.91 × 10^{-4} rad

(3) 4.85 × 10^{-4} rad (4) 4.80 × 10^{-6} rad

Answer (2)

8. If force [*F*], acceleration [*A*] and time [*T*] are chosen as the fundamental physical quantities. Find the dimensions of energy. **(2021)**

(1) [*F*][*A*$^{-1}$][*T*] (2) [*F*][*A*][*T*]

(3) [*F*][*A*][*T*^{2}] (4) [*F*][*A*][*T*$^{-1}$]

விசை [*F*], முடுக்கம் [*A*] மற்றும் நேரம் [*T*] ஆகியன அடிப்படை இயற்பியல் அளவீடுகள் எனத் தெரிவு செய்யப்பட்டால், ஆற்றலின் பரிமாணங்களைக் கண்டுபிடி.

(1) [*F*][*A*$^{-1}$][*T*] (2) [*F*][*A*][*T*]

(3) [*F*][*A*][*T*^{2}] (4) [*F*][*A*][*T*$^{-1}$]

Answer (3)

9. If E and G respectively denote energy and gravitational constant, then $\frac{E}{G}$ has the dimensions of **(2021)**

(1) [M^2] [L^{-2}] [T^{-1}] (2) [M^2] [L^{-1}] [T^0]

(3) [M] [L^{-1}] [T^{-1}] (4) [M] [L^0] [T^0]

E மற்றும் G ஆகியன ஆற்றல் மற்றும் புவியீர்ப்பு மாறிலி ஆகியவற்றை முறையாக குறித்தால், $\frac{E}{G}$ என்பது பெற்றிருக்கும் பரிமாணங்களாவன:

(1) $[M^2]\ [L^{-2}]\ [T^{-1}]$ (2) $[M^2]\ [L^{-1}]\ [T^0]$
(3) $[M]\ [L^{-1}]\ [T^{-1}]$ (4) $[M]\ [L^0]\ [T^0]$

Answer (2)

10. A screw gauge gives the following readings when used to measure the diameter of a wire
Main scale reading: 0 mm
Circular scale reading: 52 divisions
Given that 1 mm on main scale corresponds to 100 divisions on the circular scale. The diameter of the wire from the above data is

(1) 0.052 cm (2) 0.52 cm
(3) 0.026 cm (4) 0.26 cm

ஒரு மின்கம்பியின் விட்டத்தினை அளவிட, ஒரு திருகு அளவி பயன்படுத்தப்படும் போது, பின்வரும் அளவீடுகளைத் தருகிறது.
முதன்மை அளவுகோல் அளவீடு: 0 மி.மீ.
வட்ட அளவுகோல் அளவீடு: 52 பிரிவுகள்
முதன்மை அளவுகோலின் 1 மி.மீ. வட்ட அளவு கோலது 100 பிரிவுகளைக் குறிக்கும் எனக் கொடுக்கப்பட்டுள்ளது. மேற்கூறிய தரவுகளிலிருந்து, மின்கம்பியின் விட்டம் என்பது:

(1) 0.052 செ.மீ. (2) 0.52 செ.மீ.
(3) 0.026 செ.மீ. (4) 0.26 செ.மீ.

Answer (1)

11. The dimensions $[MLT^{-2}A^{-2}]$ belong to the **(2022)**
(1) Magnetic permeability
(2) Electric permittivity
(3) Magnetic flux
(4) Self inductance

Answer (1)

12. Plane angle and solid angle have **(2022)**
(1) No units and no dimensions
(2) Both units and dimensions
(3) Units but no dimensions
(4) Dimensions but no units

Answer (3)

13. Match List-I with List-II **(2022)**

	List-I		List-II
(a)	Gravitational constant (G)	(i)	$[L^2T^{-2}]$
(b)	Gravitational potential energy	(ii)	$[M^{-1}\ L^3T^{-2}]$
(c)	Gravitational potential	(iii)	$[LT^{-1}]$
(d)	Gravitational intensity	(iv)	$[ML^2\ T^{-2}]$

Choose the correct answer from the options given below
(1) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(2) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)
(3) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
(4) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

Answer (4)

14. The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is **(2022)**
(1) 1382.5 **(2) 14×10^2**
(3) 138×10^1 (4) 1382

Answer (2)

1102. Kinematics deals with moton

15. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at $t = 2$ s is **(2017)**
(1) $-8\ m/s^2$ (2) 0
(3) $5\ m/s^2$ (4) $-4\ m/s^2$

Answer (4)

16. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be **(2017)**
(1) $t_1 - t_2$ (2) $\frac{t_1+t_2}{2}$
(3) $\frac{t_1t_2}{t_2-t_1}$ (4) $\frac{t_1t_2}{t_2+t_1}$

Answer (4)

17. A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N? **(2017)**

(1) 5 m/s^2 (2) 25 m/s^2

(3) 0.25 rad/s^2 (4) 25 rad/s^2

Answer (4)

18. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\vec{E}$. Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively **(2018)**

(1) 121 m/s, 3.5 m/s (2) 1 m/s, 3 m/s

(3) 2 m/s, 4 m/s (4) 1.5 m/s, 3 m/s

Answer (2)

19. The moment of the force, $\vec{F} = 4\,\hat{\imath} + 5\,\hat{\jmath} - 6\,\hat{k}$ at (2, 0, – 3), about the point (2, – 2, – 2), is given by **(2018)**

(1) $-7\,\hat{\imath} - 8\,\hat{\jmath} - 4\,\hat{k}$ (2) $-4\,\hat{\imath} - \hat{\jmath} - 8\,\hat{k}$

(3) $-8\,\hat{\imath} - 4\,\hat{\jmath} - 7\,\hat{k}$ (4) $-7\,\hat{\imath} - 4\,\hat{\jmath} - 8\,\hat{k}$

Answer (4)

20. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at $t = 2$ s is **(2019)**

(1) –8 m/s^2 (2) 0

(3) 5 m/s^2 (4) –4 m/s^2

Answer (4)

21. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be **(2019)**

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

(3) $\frac{t_1 t_2}{t_2 - t_1}$ (4) $\frac{t_1 t_2}{t_2 + t_1}$

Answer (4)

22. A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N? **(2019)**

(1) 5 m/s^2 (2) 25 m/s^2

(3) 0.25 rad/s^2 (4) 25 rad/s^2

Answer (4)

23. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wished to cross the river along the shorter path, the angle at which he should make his strokes w.r.t. north is given by: **(2019)**

(1) 30° west (2) 0°

(3) 60° west (4) 45° west

Answer (1)

24. The angular speed of the wheel of a vehicle is increased from 360 rpm to 1200 rpm in 14 second. Its angular acceleration is, **(2020)**

(1) 1 rad/s^2 (2) 2π rad/s^2

(3) 28π rad/s^2 (4) 120π rad/s^2

Answer (2)

25. A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window? (g–10 m/s^2) **(2020)**

(1) 20 m/s (2) 15.5 m/s
(3) 14.5 m/s (4) 4.5 m/s

Answer (3)

26. A small block slides down on a smooth inclined plane, starting from rest at time $t = 0$. Let S_n be the distance travelled by the block in the interval $t = n - 1$ to $t = n$. Then, the ratio $\frac{S_n}{S_{n+1}}$ is **(2021)**

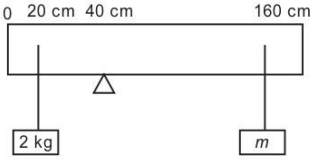
(1) $\frac{2n}{2n-1}$ (2) $\frac{2n-1}{2n}$
(3) $\frac{2n-1}{2n+1}$ (4) $\frac{2n+1}{2n-1}$

$t = 0$ எனும் நேரத்தில், தொடக்கத்தில் ஓய்வு நிலையிலிருந்த ஒரு சிறிய கட்டை, வழவழப்பான சாய்தளத்தில் கீழே சரிகிறது. t=n–1 யிலிருந்து $t = n$ என்ற இடைவெளியில், கட்டையால் பயணிக்கப்படும் தொலைவு, S_n என்க. $\frac{S_n}{S_{n+1}}$ எனும் தகவு என்பது:

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

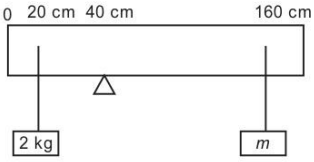
Answer (3)

27. A uniform rod of length 200 cm and mass 500 g is balanced on a wedge placed at 40 cm mark. A mass of 2 kg is suspended from the rod at 20 cm and another unknown mass 'm' is suspended from the rod at 160 cm mark as shown in the figure. Find the value of 'm' such that the rod is in equilibrium. (g = 10 m/s^2) **(2021)**



(1) $\frac{1}{12}$ kg (2) $\frac{1}{2}$ kg
(3) $\frac{1}{3}$ kg (4) $\frac{1}{6}$ kg

200 செ.மீ. நீளமும் 500 கி நிறையும் கொண்டதொரு சீரான தண்டு, அதன் 40 செ.மீ. குறியீட்டில் வைக்கப்பட்டுள்ள கூர்முனையில் சமநிலையில் அமைகிறது. படத்தில் காட்டப்பட்டுள்ளவாறு, 20 செ.மீ. தொலைவில் 2 கி.கி. நிறை ஒன்றும், 'm' நிறை கொண்ட மற்றொரு நிறை, 160 செ.மீ. குறியீட்டிலும் தண்டிலிருந்து தொங்கவிடப்பட்டுள்ளன. தண்டானது சமநிலையில் அமைவதற்கான 'm' அது மதிப்பினைக் கண்டறிக. (g = 10 மீ/வி^{2})



(1) $\frac{1}{12}$ கி.கி. (2) $\frac{1}{2}$ கி.கி.
(3) $\frac{1}{3}$ கி.கி. (4) $\frac{1}{6}$ கி.கி.

Answer (1)

28. A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution. If this particle were projected with the same speed at an angle 'θ' to the horizontal, the maximum height attained by it equals $4R$. The angle of projection, θ, is then given by: **(2021)**

(1) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{\frac{1}{2}}$ (2) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{\frac{1}{2}}$
(3) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{\frac{1}{2}}$ (4) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{\frac{1}{2}}$

R ஆரம் கொண்ட வட்டத்தில் சீரான வேகத்தோடு நகரும் ஒரு துகள், ஒரு சுழற்சியினை முடிக்க T நேரம் எடுத்துக் கொள்கிறது. இத்தகு துகள், கிடைமட்டத்தோடு 'θ' எனும் கோணத்தில் சமமான வேகத்தோடு எறியப்படின், அது அடையும் பெரும உயரம் $4R$ க்குச் சமமாகும். அதன் எறிவுக் கோணம் 'θ' வழங்கப்படுவது என்பது:

(1) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{\frac{1}{2}}$ (2) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{\frac{1}{2}}$
(3) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{\frac{1}{2}}$ (4) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{\frac{1}{2}}$

Answer (1)

29. A car starts from rest and accelerates at 5 m/s^2. At t = 4 s, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at t = 6 s? **(2021)**

(1) 20 $\sqrt{2}$ m/s, 10 m/s^2

(2) 20 m/s, 5 m/s^2

(3) 20 m/s, 0

(4) 20 $\sqrt{2}$ m/s, 0

ஒரு கார் ஓய்வு நிலையிலிருந்து துவங்கி, 5 மீ/வி^{2} என்ற வீதத்தில் முடுக்கமடைகிறது. காரில் அமர்ந்துள்ள ஒரு நபர், ஜன்னல் வழியாக, t = 4 வி. என்ற நேரத்தில் ஒரு பந்தினை கீழே போடுகிறார். t=6 வி. எனும் நேரத்தில் அப்பந்தினது திசைவேகம் மற்றும் முடுக்கம் ஆகியவற்றின் முறையான மதிப்புகள் யாவை? (g = 10 மீ/வி^{2} எனக் கொள்க).

(1) 20 $\sqrt{2}$ மீ/வி, 10 மீ/வி^{2}

(2) 20 மீ/வி, 5 மீ/வி^{2}

(3) 20 மீ/வி, சுழி

(4) 20$\sqrt{2}$ மீ/வி, சுழி

Answer (1)

30. The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is **(2022)**

(1) 12π (2) 104π

(3) 2π (4) 4π

Answer (4)

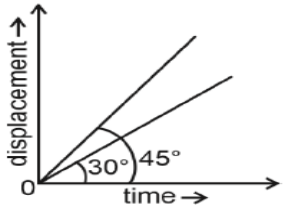
31. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second **(2022)**

(1) 1 : 3 : 5 : 7 (2) 1 : 1 : 1 : 1

(3) 1 : 2 : 3 : 4 (4) 1 : 4 : 9 : 16

Answer (1)

32. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is **(2022)**



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

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

Answer (2)

33. A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be **(2022)**

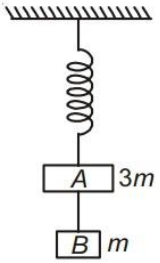
(1) 5 ms^{-1} (2) 10 ms^{-1}

(3) Zero (4) 5$\sqrt{3}$ ms^{-1}

Answer (4)

1103. Laws of Motion

34. Two blocks A and B of masses $3m$ and m respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively **(2017)**



(1) $\frac{g}{3}$, $\frac{g}{3}$ (2) g, $\frac{g}{3}$

(3) $\frac{g}{3}$, g (4) g, g

Answer (3)

35. Two discs of same moment of inertia rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocities ω_1 and ω_2. They are brought into contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is **(2017)**

(1) $\frac{I}{8}(\omega_1 - \omega_2)^2$ (2) $\frac{1}{2}I(\omega_1 + \omega_2)^2$

(3) $\frac{1}{4}I(\omega_1 - \omega_2)^2$ (4) $I(\omega_1 - \omega_2)^2$

Answer (3)

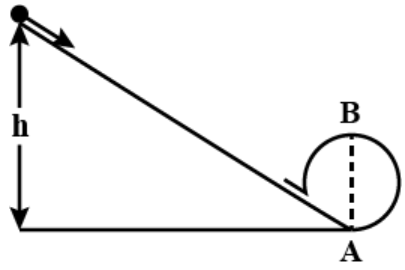
36. One end of string of length *l* is connected to a particle of mass '*m*' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed '*v*', the net force on the particle (directed towards center) will be (*T* represents the tension in the string) **(2017)**

(1) Zero (2) T

(3) $T + \frac{mv^2}{l}$ (4) $T - \frac{mv^2}{l}$

Answer (2)

37. A body initially at rest and sliding along a frictionless track from a height *h* (as shown in the figure) just completes a vertical circle of diameter *AB = D*. The height h is equal to **(2018)**



(1) $\frac{7}{5}D$ (2) D

(3) $\frac{3}{2}D$ (4) $\frac{5}{4}D$

Answer (4)

38. Which one of the following statements is incorrect? **(2018)**

(1) Frictional force opposes the relative motion.

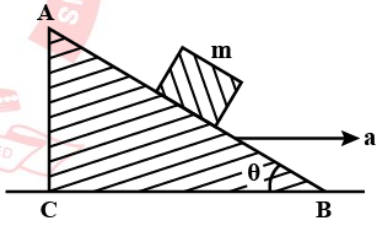
(2) Limiting value of static friction is directly proportional to normal reaction.

(3) Rolling friction is smaller than sliding friction.

(4) Coefficient of sliding friction has dimensions of length.

Answer (4)

39. A block of mass *m* is placed on a smooth inclined wedge *ABC* of inclination θ as shown in the figure. The wedge is given an acceleration *'a'* towards the right. The relation between *a* and θ for the block to remain stationary on the wedge is (**2018**)



(1) $a = g\cos\theta$ (2) $a = \frac{g}{\sin\theta}$

(3) $a = \frac{g}{\text{cosec}\,\theta}$ (4) $a = g\tan\theta$

Answer (4)

40. A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when: **(2019)**

(1) the mass is at the highest point

(2) the wire is horizontal

(3) the mass is at the lowest point

(4) inclined at an angle of 60° from vertical

Answer (3)

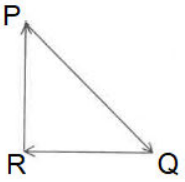
41. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object is shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be: **(2019)**

(1) $1 : \sqrt{2}$ (2) $\sqrt{2} : 1$

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

Answer (3)

42. A particle moving with velocity $\vec{V}$ is acted by three forces shown by the vector triangle PQR. The velocity of the particle will : **(2019)**



(1) increase

(2) decrease

(3) remain constant

(4) change according to the smallest force $\overrightarrow{QR}$

Answer (3)

43. Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed v_A and v_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be: **(2019)**

(1) $r_A : r_B$ (2) $v_A : v_B$

(3) $r_B : r_A$ (4) 1 : 1

Answer (4)

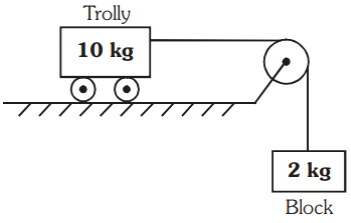
44. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be: (g = 10 m/s^2)

(1) $\sqrt{10}$ rad/s (2) $\frac{10}{2\pi}$ rad/s

(3) 10 rad/s (4) 10 πrad/s

Answer (3)

45. Calculate the acceleration of the block and trolly system shown in the figure. The coefficient of kinetic friction between the trolly and the surface is 0.05. (g = 10 m/s^2, mass of the string is negligible and no other friction exists). **(2020)**



(1) 1.00 m/s^2 (2) 1.25 m/s^2

(3) 1.50 m/s^2 (4) 1.66 m/s^2

Answer (2)

46. A ball of mass 0.15 kg is dropped from a height 10 m, strikes the ground and rebounds to the same height. The magnitude of impulse imparted to the ball is (g = 10 m/s^2) nearly **(2021)**

(1) 1.4 kg m/s (2) 0 kg m/s

(3) 4.2 kg m/s (4) 2.1 kg m/s

10 மீட்டர் உயரத்திலிருந்து கீழே போடப்படும் 0.15 கி.கி. நிறை கொண்டதொரு பந்து, தரையைத் தொட்டு சம உயரத்திற்கு மீளத் திரும்புகிறது. அப்பந்துக்கு அளிக்கப்படும் கணத்தாக்கத்திற்கான எண் மதிப்பு என்பது ஏறத்தாழ (g = 10 மீ/வி^{2}):

(1) 1.4 கி.கி. மீ/வி (2) 0 கி.கி. மீ/வி

(3) 4.2 கி.கி. மீ/வி (4) 2.1 கி.கி. மீ/வி

Answer (3)

1104. Work, Energy and Power

47. Consider a drop of rain water having mass 1 g falling from a height of 1 km. It hits the ground with a speed of 50 m/s. Take g constant with a value 10 m/s^2. The work done by the (i) gravitational force and the (ii) resistive force of air is **(2017)**

(1) (i) 10 J (ii) -8.75 J

(2) (i) -10 J (ii) -8.25 J

(3) (i) 1.25 J (ii) -8.25 J

(4) (i) 100 J (ii) 8.75 J

Answer (1)

48. A moving block having mass *m*, collides with another stationary block having mass 4*m*. The lighter block comes to rest after collision. When the initial velocity of the lighter block is *v*, then the value of coefficient of restitution (*e*) will be **(2018)**

(1) 0.8 (2) 0.25
(3) 0.5 (4) 0.4

Answer (4)

49. Body A of mass 4m moving with speed *u* collides with another body B of mass 2m, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is: **(2019)**

(1) $\frac{1}{9}$ (2) $\frac{8}{9}$
(3) $\frac{4}{9}$ (4) $\frac{5}{9}$

Answer (2)

50. A point mass 'm' is moved in a vertical circle of radius 'r' with the help of a string. The velocity of the mass is $\sqrt{7\,gr}$ at the lowest point. The tension in the string at the lowest point is **(2020)**

(1) 1 mg (2) 6 mg
(3) 7 mg (4) 8 mg

Answer (4)

51. A particle is released from height '*S*' from the surface of the Earth. At a certain height its kinetic energy is three times its potential energy. The height from the surface of earth and the speed of the particle at that instant are respectively **(2021)**

(1) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$ (2) $\frac{S}{4}, \frac{3gS}{2}$
(3) $\frac{S}{4}, \frac{3gS}{2}$ (4) $\frac{S}{2}, \sqrt{\frac{3gS}{2}}$

புவிபரப்பின் '*S*' உயரத்திலிருந்து ஒரு துகள் விடுவிக்கப்படுகிறது. குறிப்பிட்டதொரு உயரத்தில், அதன் இயக்க ஆற்றல், அதன் நிலையாற்றலின் மும்மடங்காகும். அந்த கணத்தில், துகளது உயரம் மற்றும் வேகம் ஆகியவை முறையே:

(1) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$ (2) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$
(3) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$ (4) $\frac{S}{2}, \sqrt{\frac{3gS}{2}}$

Answer (1)

52. Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of the input energy. How much power is generated by the turbine? (g = 10 m/s^2) **(2021)**

(1) 7.0 kW (2) 10.2 kW
(3) 8.1 kW (4) 12.3 kW

ஒரு சுழல்சக்கரத்தினை (டர்பைன்) செயலாக்க, நீரானது 15 கிகி/வி என்ற வீதத்தில், 60 மீ. உயரத்திலிருந்து நீர் விழுகிறது. உராய்வு விசையினால் ஏற்படும் இழப்புகளாவன, உள்ளீட்டு ஆற்றலின் 10% ஆகும். அந்த சுழல் சக்கரத்தால் (டர்பைன்) உருவாக்கப்படும் திறனது அளவு யாது? (g = 10 மீ/வி^{2})

(1) 7.0 kW (2) 10.2 kW
(3) 8.1 kW (4) 12.3 kW

Answer (3)

53. A shell of mass *m* is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2 : 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed *v*, the speed of the third (lighter) fragment is **(2022)**

(1) $\sqrt[2]{2v}$ (2) $\sqrt[3]{2v}$
(3) v (4) $\sqrt{2v}$

Answer (1)

54. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1}. The frictional force opposing the motion is 3000 N. The minimum power delivered by the motor to the lift in watts is : (g = 10 ms^{-2}) **(2022)**

(1) 34500 (2) 23500
(3) 23000 (4) 20000

Answer (1)

55. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is **(2022)**

(1) 36×10^5 J (2) 1×10^5 J
(3) 36×10^7 J (4) 36×10^4 J

Answer (3)

1105. Motion of System of Particles and rigid body

56. Which of the following statements are correct? **(2017)**

(a) Centre of mass of a body always coincides with the centre of gravity of the body.
(b) Centre of mass of a body is the point at which the total gravitational torque on the body is zero
(c) A couple on a body produce both translational and rotational motion in a body.
(d) Mechanical advantage greater than one means that small effort can be used to lift a large load.

(1) (c) and (d) (2) (b) and (d)
(3) (a) and (b) (4) (b) and (c)

Answer (2)

57. Three objects, *A*: (a solid sphere), *B*: (a thin circular disk) and *C*: (a circular ring), each have the same mass *M* and radius *R*. They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation **(2018)**

(1) $W_B > W_A > W_C$ (2) $W_A > W_B > W_C$
(3) $W_C > W_B > W_A$ (4) $W_A > W_C > W_B$

Answer (3)

58. A solid sphere is, rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere?

(1) Rotational kinetic energy **(2018)**
(2) Moment of inertia
(3) Angular velocity
(4) Angular momentum

Answer (1)

59. A solid sphere is in rolling motion. in rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is **(2018)**

(1) 10 : 7 (2) 5 : 7
(3) 7 : 10 (4) 2 : 5

Answer (2)

60. A disc of radius 2m and mass 100 kg rolls on a horizontal floor. Its centre of mass has speed of 20 cm/s. How much work is needed to stop it? **(2019)**

(1) 3 J (2) 30 kJ
(3) 2 J (4) 1 J

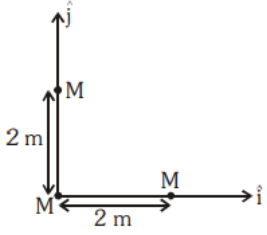
Answer (1)

61. A solid cylinder of mass 2 kg and radius 4 cm is rotating about its axis at the rate of 3 rpm. The torque required to stop after 2π revolutions is : **(2019)**

(1) 2×10^{-6} N m (2) 2×10^{-3} N m
(3) 12×10^{-4} N m (4) 2×10^{6} N m

Answer(1)

62. Three identical spheres, each of mass M, are placed at the corners of a right angle triangle with mutually perpendicular sides equal to 2 m (see figure). Taking the point of intersection of the two mutually perpendicular sides as the origin, find the position vector of centre of mass. **(2020)**



(1) $\frac{4}{3}(\hat{i}+\hat{j})$ (2) $2(\hat{i}+\hat{j})$

(3) $(\hat{i}+\hat{j})$ (4) $\frac{2}{3}(\hat{i}+\hat{j})$

Answer (4)

63. From a circular ring of mass '*M*' and radius '*R*' an arc corresponding to a 90° sector is removed. The moment of inertia of the remaining part of the ring about an axis passing through the centre of the ring and perpendicular to the plane of the ring is '*K*' times 'MR^2'. Then the value of '*K*' is **(2021)**

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

(3) $\frac{7}{8}$ (4) $\frac{1}{4}$

'M' நிறையும் 'R' ஆரமும் கொண்டதொரு வட்ட வடிவ வளையத்தின் 90° வட்டப்பகுதியினது வட்டவில் ஒன்று நீக்கப்படுகிறது. வளையத்தின் மையம் வழியே செல்லும் அச்சினைப் பொருத்தும், வளையத்தின் தளத்திற்கு செங்குத்தாகவும், எஞ்சியிருக்கும் வளையப் பகுதியினது நிலைமத் திருப்புத் திறன், 'MR^2' யினது 'K' மடங்கு எனில், 'K' யினது மதிப்பு என்பது:

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

(3) $\frac{7}{8}$ (4) $\frac{1}{4}$

Answer (2)

64. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is **(2022)**

(1) 10 m (2) 5 m

(3) $\frac{10}{3}$ m (4) $\frac{20}{3}$ m

Answer (4)

65. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is **(2022)**

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

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

Answer (4)

1106. Gravitation

66. The acceleration due to gravity at a height 1 km above the earth is the same as at a depth *d* below the surface of earth. Then **(2017)**

(1) $d = 2$ km (2) $d = \frac{1}{2}$ km

(3) $d = 1$ km (4) $d = \frac{3}{2}$ km

Answer (1)

67. Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will: **(2017)**

(1) Will become stationary

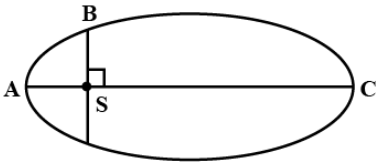
(2) Keep floating at the same distance between them

(3) Move towards each other

(4) Move away from each other

Answer (3)

68. The kinetic energies of a planet in an elliptical orhit about the Sun, at positions *A, B* and C are K_A, K_B and K_C, respectively. *AC* is the major axis and *SB* is perpendicular to *AC* at the position of the Sun *S* as shown in the figure. Then **(2018)**



(1) $K_B < K_A < K_C$ *(2)* $K_A > K_B > K_C$

(3) $K_A < K_B < K_C$ *(4)* $K_B > K_A > K_C$

Answer (2)

69. If the mass of the Sun were ten times smaller and the universal gravitational constant were *t* ten times larger in magnitude, which of the following is *not* correct? **(2018)**

(1) Time period of a simple pendulum on the Earth would decrease.

(2) Walking on the ground would become more difficult.

(3) Raindrops will fall faster.

(4) *'g'* on the Earth will not change.

Answer (4)

70. A body weighs 200 N on the surface of the earth. How much will it weigh half way down to the centre of the earth? **(2019)**

(1) 150 N (2) 200 N

(3) 250 N (4) 100 N

Answer (4)

71. The work done to raise a mass m from the surface of the earth to a height h, which is equal to the radius of the earth is: **(2019)**

(1) mgR (2) 2 mgR

(3) $\frac{1}{2}\,mgR$ (4) $\frac{3}{2}\,mgR$

Answer (3)

72. What is the depth at which the value of acceleration due to gravity becomes $\frac{1}{n}$ times the value that at the surface of earth? (radius of earth = R) **(2020)**

(1) $\frac{R}{n}$ (2) $\frac{R}{n^2}$

(3) $\frac{R(n-1)}{n}$ (4) $\frac{Rn}{(n-1)}$

Answer (3)

73. The escape velocity from the Earth's surface is *v*. The escape velocity from the surface of another planet having a radius, four times that of Earth and same mass density is **(2021)**

(1) 4*v* (2) *v*

(3) 2*v* (4) 3*v*

புவிப்பரப்பிலிருந்து, விடுபடு திசைவேகம் என்பது, *v* ஆகும். பூமியினது ஆரத்தின் நான்கு மடங்கு ஆரமும் சமமான நிறை அடர்த்தியும் கொண்ட மற்றொரு கோளது பரப்பிலிருந்து, விடுபடு திசைவேகமானது:

(1) 4v *(2) v*

(3) 2v *(4) 3v*

Answer (1)

74. A particle of mass '*m*' is projected with a velocity $v = kV_e$ ($k < 1$) from the surface of the earth.

(V_e = escape velocity) The maximum height above the surface reached by the particle is **2021**

(1) $\frac{Rk^2}{1-k^2}$ (2) $R\left(\frac{k}{1-k}\right)^2$

(3) $R\left(\frac{k}{1+k}\right)^2$ (4) $\frac{R^2k}{1+k}$

புவி மேற்பரப்பிலிருந்து $v = kV_e$ ($k < 1$) என்ற திசைவேகத்தோடு 'm' நிறை கொண்டதொரு துகள் எறியப்படுகிறது. (V_e = விடுபடு திசைவேகம்) மேற்பரப்பிற்கு மேலே, துகள் சென்று சேரும் பெரும உயரம் என்பது:

(1) $\frac{Rk^2}{1-k^2}$ (2) $R\left(\frac{k}{1-k}\right)^2$

(3) $R\left(\frac{k}{1+k}\right)^2$ (4) $\frac{R^2k}{1+k}$

Answer (1)

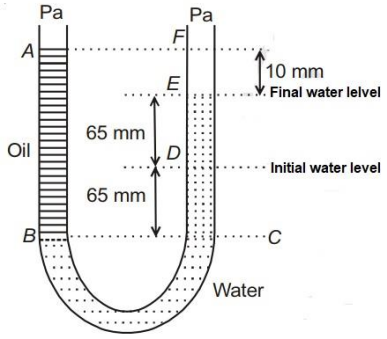
75. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is **(2022)**

(1) 20 N/kg (2) 180 N/kg
(3) 0.05 N/kg (4) 50 N/kg

Answer (4)

1107. Properties of Bulk Matter

76. A U tube with both ends open to the atmosphere, is partially filled with water. Oil, which is immiscible with water, is poured into one side until it stands at a distance of 10 mm above the water level on the other side. Meanwhile the water rises by 65 mm from its original level (see diagram). The density of the oil is **(2017)**



(1) 928 kg m^{-3} (2) 650 kg m^{-3}
(3) 425 kg m^{-3} (4) 800 kg m^{-3}

Answer (1)

77. The bulk modulus of spherical object is '*B*'. If it is subjected to uniform pressure '*p*', the fractional decrease in radius is **(2017)**

(1) $\frac{p}{3B}$ (2) $\frac{p}{B}$
(3) $\frac{B}{3p}$ (4) $\frac{3p}{B}$

Answer (1)

78. A small sphere of radius '*r*' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to **(2018)**

(1) r^5 (2) r^2
(3) r^3 (4) r^4

Answer (1)

79. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area *A* and the second wire has cross-sectional area *3A*. If the length of the first wire is increased by Δl on applying a force *F*, how much force is needed to stretch the second wire by the same amount? **(2018)**

(1) 4F (2) 6F
(3) 9F (4) F

Answer (3)

80. When a block of mass M is suspended by a long wire of length L, the length of the wire becomes (L+*l*). The elastic potential energy stored in the extended wire is: **(2019)**

(1) Mg*l* (2) MgL
(3) $\frac{1}{2}Mgl$ (4) $\frac{1}{2}$ MgL

Answer (3)

81. A soap bubble, having radius of 1 mm, is blown from a detergent solution having a surface tension of 2.5 × 10 $^{-2}$N/m. The pressure inside the bubble equals at a point Z_0 below the free surface of water in a container. Taking g = 10 m/s^2, density of water = 10^3 kg/m^3, the value of Z_0 below the free surface of water in a container. Taking g=10 m/s^2, density of water = 10^3 kg/m^3, the value of Z_0 is: **(2019)**

(1) 100 cm (2) 10 cm
(3) 1 cm (4) 0.5 cm

Answer (3)

82. A copper rod of 88 cm and an aluminum rod of unknown length have their increase in length independent of increase in temperature. The length of aluminum rod is : ($\alpha_{Cu} = 1.7 \times 10^{-5}\ K^{-1}$ and $\alpha_{Al} = 2.2 \times 10^{-5}\ K^{-1}$) **(2019)**

(1) 6.8 cm (2) 113.9 cm
(3) 88 cm (4) 68 cm

Answer (4)

83. A small hole of area of cross-section 2 mm^2 is present near the bottom of a fully filled open tank of height 2 m. Taking g = 10 m/s^2, the rate of flow of water through the open hole would be nearly **(2019)**

(1) 12.6 x 10^{-6} $m^{3/s}$ (B) 8.9 x 10^{-6} $m^{3/s}$
(3) 2.23 x 10^{-6} $m^{3/s}$ (C) 6.4 x 10^{-6} $m^{3/s}$

Answer (1)

84. A liquid does not wet the solid surface if angle of contact is **(2020)**

(1) zero (2) equal to 45^0
(3) equal to 60^0 (4) greater than 90^0

Answer (4)

85. The velocity of a small ball of mass *M* and density *d*, when dropped in a container filled with glycerine becomes constant after some time. If the density of glycerine is $\frac{d}{2}$, then the vscous force acting on the ball will be **(2021)**

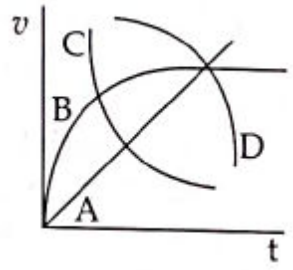
(1) 2*Mg* (2) $\frac{Mg}{2}$
(3) *Mg* (4) $\frac{3}{2}$ *Mg*

M நிறை மற்றும் d அடர்த்தி கொண்டதொரு சிறிய பந்தினை, கிளிசரினினால் நிரப்பப்பட்ட கொள்கலத்தில் விழச் செய்யும் பொழுது, சிறிது நேரத்தில் அதன் திசைவேகம் மாறாது அமைகிறது. கிளிசரினின் அடர்த்தி $\frac{d}{2}$ எனில், பந்தின் மீது செயல்படும் பாகியல் விசை என்பது:

(1) 2*Mg* (2) $\frac{Mg}{2}$
(3) *Mg* (4) $\frac{3}{2}$ *Mg*

Answer (2)

86. A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (*v*) as a function of time (*t*) is **(2022)**



(1) C (2) D (3) A (4) B

Answer (4)

87. If a soap bubble expands, the pressure inside the bubble **(2022)**

(1) Remains the same
(2) Is equal to the atmospheric pressure
(3) Decreases
(4) Increases

Answer (3)

88. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A): The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R): A coil spring of copper has more tensile strength than a steel spring of same dimensions.

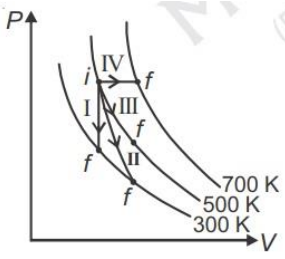
In the light of the above statements, choose the most appropriate answer from the options given below **(2022)**

(1) (A) is true but (R) is false
(2) (A) is false but (R) is true
(3) Both (A) and (R) are true and (R) is the correct explanation of (A)
(4) Both (A) and (R) are true and (R) is not the correct explanation of (A)

Answer (1)

1108. Thermodynamics

89. Thermodynamic processes are indicated in the following diagram. **(2017)**



Match the following:

Column – I	**Column – II**
(P) Process I	(a) Adiabatic
(Q) Process II	(b) Isobaric
(R) Process III	(c) Isochoric
(S) Process IV	(d) Isothermal

(1) P → d, Q → b, R → a, S → c
(2) P → a, Q → c, R → d, S → b
(3) P → c, Q → a, R → d, S → b
(4) P → c, Q → d, R → b, S → a

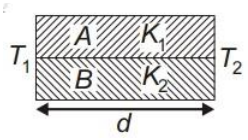
Ans: (3)

90. A Carnot engine having an efficiency of $\frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is

(1) 100 J (2) 1 J
(3) 90 J (4) 99 J

Ans: (3)

91. Two rods *A* and *B* of different materials are welded together as shown in figure. Their thermal conductivities are K_1 and K_2. The thermal conductivity of the composite rod will be



(1) $2(K_1 + K_2)$ (2) $\frac{K_1 + K_2}{2}$
(3) $\frac{3(K1 + K2)}{2}$ (4) $K_1 + K_2$

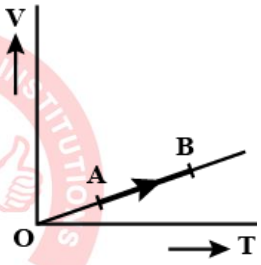
Ans: (2)

92. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be **(2017)**

(1) 1800 (2) 225
(3) 450 (4) 1000

Ans: (1)

93. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the beat absorbed by it, when it undergoes a change from state A to state B, is **(2018)**



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

Answer (3)

94. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is **(2017)**

(1) 6.25% (2) 20%
(3) 26.8% (4) 12.5%

Answer (3)

95. A sample of 0.1 *g* of water at 100°C and normal pressure (1.013×10^5 Nm^{-2}) requires 54 cal of heat energy to convert to steam at 100°C. If the volume of the steam produced is 167.1 *cc*, the change in internal energy of the sample, is **(2017)**

(1) 42.2 J (2) 208.7 J
(3) 104.3 J (4) 84.5 J

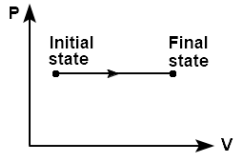
Answer (2)

96. In which of the following processes, heat is neither absorbed nor released by a system? (2019)

(1) isothermal (2) adiabatic
(3) isobaric (4) isochoric

Answer (2)

97. The P-V diagram for an ideal gas in a piston cylinder assembly undergoing a thermodynamic process is shown in the figure. The process is **(2022)**



(1) isothermal (2) adiabatic
(3) isochoric (4) isobaric

Answer (4)

98. The efficiency of a Carnot engine depends upon **(2020)**

(1) the temperature of the source only
(2) the temperature of the sink only
(3) the temperatures of the sources and sink
(4) the volume of the cylinder of the engine

Answer (3)

99. Three stars A, B, C have surface temperatures T_A, T_B, T_C respectively. Star A appears bluish, star B appears reddish and star C yellowish. Hence, **(2020)**

(1) $T_A > T_C > T_B$ (2) $T_A > T_B > T_C$
(3) $T_B > T_C > T_A$ (4) $T_C > T_B > T_A$

Answer (1)

100. A cup coffee cools from 90°C to 80°C in *t* minutes, when the room temperature is 20°C. The time taken by a similar cup of coffee to cool from 80°C to 60°C at a room temperature same at 20°C is (2021)

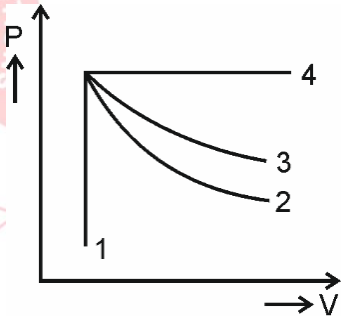
(1) $\frac{5}{13}t$ (2) $\frac{13}{10}t$
(3) $\frac{13}{5}t$ (4) $\frac{10}{13}t$

அறை வெப்பநிலை, 20°C என்றமையும் போது, ஒரு கோப்பைக் காபி, 90°C யிலிருந்து 80°C க்கு *t* நிமிடத்தில் குளிர்வடைகிறது. அறை வெப்பநிலை, அதே 20°C என்றமையும் போது, ஒத்ததொரு கோப்பைக் காபி 80°C யிலிருந்து 60°C க்கு குளிர்வடைவதற்கான கால அளவு என்பது:

(1) $\frac{5}{13}t$ (2) $\frac{13}{10}t$
(3) $\frac{13}{5}t$ (4) $\frac{10}{13}t$

Answer (1)

101. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is (2022)



(1) 3 (2) 4
(3) 1 (4) 2

Answer (4)

1109. Behaviour of Perfect Gas and Kinetic Theory

102. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature *T*. Neglecting all vibrational modes, the total internal energy of the system is **(2017)**

(1) 11 *RT* (2) 4 *RT*
(3) 15 *RT* (4) 9 *RT*

Answer (1)

103. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere? (2018)
(Given:
Mass of oxygen molecule (m) = 2.76 x 10 $^{-26}$) kg
Boltzmann's constant kg = 1.38 x 10 $^{-23}$ JK $^{-1}$)
(1) 5.016 x 10^4 K (2) 8.360 x 10^4 K
(3) 2.508 x 10^4 K (4) 1.254 x 10^4 K
Answer (2)

104. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature *T*. Neglecting all vibrational modes, the total internal energy of the system is (2019)
(1) 11 *RT* (2) 4 *RT*
(3) 15 *RT* (4) 9 *RT*
Answer (1)

105. Increase in temperature of a gas filled in a container would lead to: **(2019)**
(1) increase in its mass
(2) increase in its kinetic energy
(3) decrease in its pressure
(4) decrease in intermolecular distance
Answer (2)

106. The Mean Free Path / for a gas molecule depends upon diameter, d of the molecule as **(2020)**
(1) $l \propto \frac{1}{d}$ (2) $l \propto \frac{1}{d^2}$
(3) $l \propto d$ (4) $l \propto d^2$
Answer (2)

107. An ideal gas equation can be written as P = $\frac{\rho RT}{M_0}$
where ρ and M_0 are respectively,
(1) Number density, mass of the gas
(2) Mass density, mass of the gas
(3) Number density, molar mass
(4) Mass density, molar mass
Answer (4)

108. Match **Column – I** and **Column – II** and choose the correct match from the given choices. **(2021)**

Column – I	**Column – II**
(A) Root mean square speed of gas molecules	(P) $\frac{1}{3} nmv^2$
(B) Pressure exerted by ideal gas	(Q) $\sqrt{\frac{3RT}{M}}$
(C) Average kinetic energy of a molecule	(R) $\frac{5}{2} RT$
(D) Total internal energy of 1 mole Of a diatomic gas	(S) $\frac{3}{2} k_B T$

(1) (A) – (R), (B) – (Q), (C) – (P), (D) – (S)
(2) (A) – (R), (B) – (P), (C) – (S), (D) – (Q)
(3) (A) – (Q), (B) – (R), (C) – (S), (D) – (P)
(4) (A) – (Q), (B) – (P), (C) – (S), (D) – (R)

நிரல் – I மற்றும் நிரல் – II ஆகியவற்றைப் பொருத்தி, கொடுக்கப்பட்ட தெரிவுகளிலிருந்து, சரியான பொருத்தத்தினை தெரிவு செய்க.

நிரல் – I	நிரல் – II
(A) வாயு மூலக்கூறுகளது இருமடி சராசரியின் வர்க்க மூலம்	(P) $\frac{1}{3} nmv^2$
(B) நல்லியல்பு வாயுவினால் செலுத்தப்படும் அழுத்தம்	(Q) $\sqrt{\frac{3RT}{M}}$
(C) ஒரு மூலக்கூறினது சராசரி இயக்க ஆற்றல்	(R) $\frac{5}{2} RT$
(D) ஓர் ஈரணு வாயுவின் மோலுக்கான மொத்த உள்ளார்ந்த ஆற்றல்	(S) $\frac{3}{2} k_B T$

(1) (A) – (R), (B) – (Q), (C) – (P), (D) – (S)
(2) (A) – (R), (B) – (P), (C) – (S), (D) – (Q)
(3) (A) – (Q), (B) – (R), (C) – (S), (D) – (P)
(4) (A) – (Q), (B) – (P), (C) – (S), (D) – (R)
Answer (4)

109. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is **(2022)**
(1) 5.6 × 10^{-3} m^3 (2) 5.6 m^3
(3) 5.6 × 10^6 m^3 (4) 5.6 × 10^3 m^3
Answer (2)

1110. Oscillations and Waves

110. A spring of force constant *k* is cut into lengths of ratio 1 : 2 : 3. They are connected in series and the new force constant is *k*'. Then they are connected in parallel and force constant is *k*''. Then *k*' : *k*'' is **(2017)**

(1) 1 : 14 (2) 1 : 6
(3) 1 : 9 (4) 1 : 11

Ans: (4)

111. The two nearest harmonics of a tube closed at one end and open at other end are 220 Hz and 260 Hz. What is the fundamental frequency of the system?

(1) 40 Hz (2) 10 Hz
(3) 20 Hz (4) 30 Hz

Ans: (3)

112. A particle executes linear simple harmonic motion with an amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is (2017)

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

Ans: (4)

113. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is **(2018)**

(1) 2s (2) π s
(3) 2π s (4) 1 s

Answer (2)

114. The displacement of a particle executing simple harmonic motion is given by
$\Gamma = A_0 + A \sin\omega t + B \cos\omega t$
Then the amplitude of its oscillation is given by: (2019)

(1) $A_0 + \sqrt{A^2 + B^2}$ (2) $\sqrt{A^2 + B^2}$
(3) $\sqrt{A0^2 + (A+B)^2}$ (4) $A + B$

Answer (2)

115. Average velocity of a particle executing SHM in one complete vibration is: **(2019)**

(1) $\frac{A\omega}{2}$ (2) $A\omega$
(3) $\frac{A\omega^2}{2}$ (4) Zero

Answer (4)

116. A force F = 20 + 10*y* acts on a particle in *y*-direction where F is in newton and *y* in meter. Work done by this force to move the particle from *y = 0 to y = 1 m* is: **(2019)**

(1) 30 J (2) 5 J
(3) 25 J (4) 20 J

Answer (3)

117. Identify the function which represents a periodic motion. **(2020)**

(1) $e^{-\omega t}$ (2) $e^{\omega t}$
(3) $\log_e(\omega t)$ (4) $\sin\omega t + \cos\omega t$

Answer (4)

118. A spring is stretched by 5 cm by a force 10 N. The time period of the oscillations when a mass of 2 kg is suspended by it is **(2021)**

(1) 0.628 **s** (2) 0.0628 s
(3) 6.28 s (4) 3.14 s

ஒரு 10 நி விசையினால் ஒரு சுருள்வில் 5 செ.மீ. நீட்சியடைகிறது. அதிலிருந்து 2 கி.கி. நிறையொன்று தொங்கவிடப்படும் போது, அதன் அலைவுகளுக்கான கால நேரம் என்பது:

(1) 0.628 வி (2) 0.0628 வி
(3) 6.28 வி (4) 3.14 வி

Answer (1)

119. A body is executing simple harmonic motion with frequency '*n*', the frequency of its potential energy is **(2021)**

(1) 4*n* (2) *n*

(3) 2*n* (4) 3*n*

'*n*' எனும் அதிர்வெண் கொண்ட எளிய சீரிசை இயக்கத்தினை ஒரு பொருள் மேற்கொள்கிறது. அதன் நிலையாற்றலுக்கான அதிர்வெண் என்பது:

(1) 4*n* (2) *n*

(3) 2*n* (4) 3*n*

Answer (3)

120. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is: **(2022)**

(1) 10 (2) 8

(3) 11 (4) 9

Answer (3)

1211. Electrostatics

121. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system **(2017)**

(1) Increases by a factor of 2

(2) Increases by a factor of 4

(3) Decreases by a factor of 2

(4) Remains the same

Ans: (3)

122. The electrostatic force between the metal plates of an isolated parallel plate capacitor *C* having a charge *Q* and area *A*, is **(2018)**

(1) proportional to the square root of the distance between the plates,

(2) linearly proportional to the distance between the plates.

(3) independent of the distance between the plates.

(4) inversely proportional to the distance between the plates.

Answer (3)

123. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 *Hz*, the velocity of sound in air at 27°C is **(2018)**

(1) 350 m/s (2) 339 m/s

(3) 330 m/s (4) 300 m/s

Answer (2)

124. Two parallel infinite line charges with linear charge densities +λC/m and -λ C/m are placed at a distance of 2R in free space. What is the electric field mid-way between the two line charges? **(2019)**

(1) zero (2) $\frac{2\lambda}{\pi\epsilon_0 R}$ N/C

(3) $\frac{\lambda}{\pi\epsilon_0 R}$ N/C (4) $\frac{\lambda}{2\pi\epsilon_0 R}$ N/C

Answer (3)

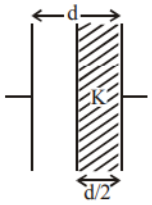
125. A parallel plate capacitor of capacitance 20 μF is being charged by a voltage source whose potential is changing at the rate of 3 V/s. The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively: **(2019)**

(1) zero, 60 μA (2) 60 μA, 60μA

(3) 60 μA, zero (4) zero, zero

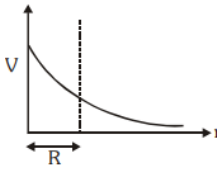
Answer (2)

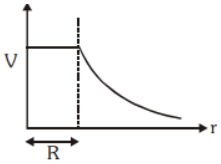
126. A parallel plate capacitor having cross-sectional area A and separation d has air in between the plates. Now an insulating slab of same area but thickness d/2 is inserted between the plates as shown in figure having dielectric constant K (= 4). The ratio of new capacitance to its original capacitance will be, **(2020)**

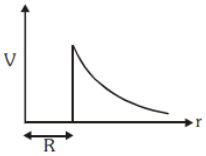


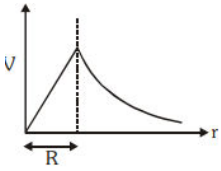
(1) 4 : 1 (2) 2 : 1
(3) 8 : 5 (4) 6 : 5
Answer (3)

127. The variation of electrostatic potential with radial distance r from the centre of a positively charged metallic thin shell of radius R is given by the graph **(2020)**

(1)


(2)


(3)


(4)


Answer (3)

128. A parallel plate capacitor has a uniform electric field '$\vec{E}$' in the space between the plates. If the distance between the plates is '*d*' and the area of each plate is '*A*', the energy stored in the capacitor is (ε_0 = permittivity of free space) **(2021)**

(1) $\frac{E^2Ad}{\varepsilon_0}$ (2) $\frac{1}{2}\varepsilon_0 E^2$
(3) $\varepsilon_0 EAd$ (4) $\frac{1}{2}\varepsilon_0 E^2 Ad$

ஓர் இணைத்தட்டு மின்தேக்கி, தனது தட்டுகளுக்கு இடைப்பட்ட வெளியில் சீரானதொரு '$\vec{E}$' மின்புலத்தினைப் பெற்றுள்ளது. தட்டுகளுக்கு இடையிலான தொலைவு, '*d*' மற்றும் ஒவ்வொரு தட்டினது பரப்பு, '*A*', எனில், மின்தேக்கியில் தேக்கி வைக்கப்படும் ஆற்றலானது, (ε_0 = கட்டற்ற வெளியினது மின் அனுமதிதிறன்)

(1) $\frac{E^2Ad}{\varepsilon_0}$ (2) $\frac{1}{2}\varepsilon_0 E^2$
(3) $\varepsilon_0 EAd$ (4) $\frac{1}{2}\varepsilon_0 E^2 Ad$
Answer (4)

129. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be **(2022)**

(1) 60 Hz (2) 120 Hz
(3) Zero (4) 30 Hz
Answer (1)

130. The angle between the electric lines of force and the equipotential surface is **(2022)**

(1) 90° (2) 180°
(3) 0° (4) 45°
Answer (1)

1212. Current Electricity

131. The resistance of a wire is '*R*' ohm. If it is melted and stretched to '*n*' times its original length, its new resistance will be **(2017)**

132. (1) $\frac{R}{n^2}$ (2) nR
(3) $\frac{R}{n}$ (4) n^2R
Ans: (4)

133. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F, because the method involves: **(2017)**

(1) A combination of cells, galvanometer and resistances
(2) Cells
(3) Potential gradients
(4) A condition of no current flow through the galvanometer

Ans: (4)

134. Suppose the charge of a proton and an electron differ slightly. One of them is -*e*, the other is ($e + \Delta e$). If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance *d* (much greater than atomic size) apart is zero, then Δe is of the order of [Given mass of hydrogen $m_h = 1.67 \times 10^{-27}$ kg] **(2017)**

(1) 10^{-47} C (2) 10^{-20} C
(3) 10^{-23} C (4) 10^{-37} C

Answer: (4)

135. A carbon resistor of (47 ± 4.7) kΩ is to be marked with rings of different colours for its identification. The colour code séquence will be **(2018)**

(1) Yellow – Green – Violet – Gold
(2) Yellow – Violet – Orange – Silver
(3) Violet – Yellow – Orange – Silver
(4) Green – Orange – Violet – Gold

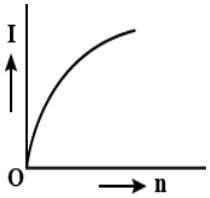
Answer (2)

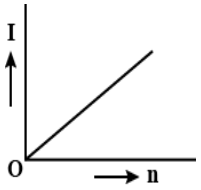
136. A set of '*n*' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the '*n*' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of '*n*' is **(2018)**

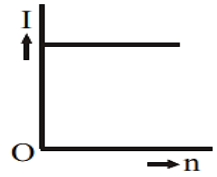
(1) 20 (2) 11
(3) 10 (4) 9

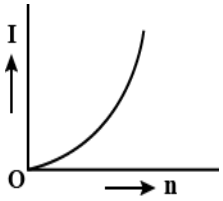
Answer (3)

137. A battery consists of a variable number '*n*' of identical cells (having internal resistance '*r*' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and *n*? **(2018)**

(1) 

(2) 

(3) 

(4) 

Answer (3)

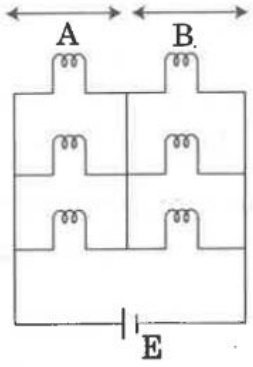
138. An electron falls from rest through a vertical distance *h* in a uniform and vertically upward directed electric field *E*. The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance *h*. The time of fall of the electron, in comparison to the time of fall of the proton is **(2018)**

(1) 10 times greater (2) 5 times greater
(3) Smaller (4) Equal

Answer (3)

139. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.

The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be: **(2019)**

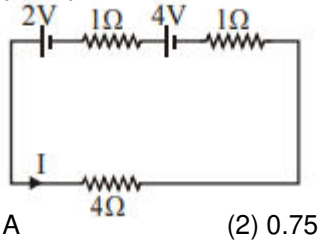


(1) 4 : 9 (2) 9 : 4
(3) 1 : 2 (4) 2 : 1
Answer (2)

140. Two point charges A and B, having charges +Q and – Q respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transferred to B, then force between the charges becomes: **(2019)**

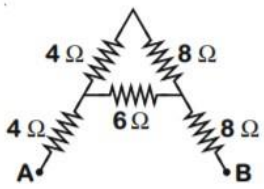
(1) F (2) $\frac{9F}{16}$
(3) $\frac{16F}{9}$ (4) $\frac{4F}{3}$
Answer (2)

141. For the circuit shown in the figure, the current I will be **(2020)**



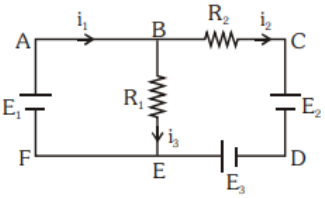
(1) 0.5 A (2) 0.75 A
(3) 1 A (4) 1.5 A
Answer (3)

142. The equivalent resistance between A and B for the mesh shown in the figure is **(2020)**



(1) 4.8 Ω (2) 7.2 Ω
(3)16 Ω (4) 30 Ω
Answer (3)

143. For the circuit given below, the Kirchoff's loop rule for the loop BCDEB is given by the equation **(2020)**



(1) $-i_2R_2 + E_2 + E_3 + i_3 R_1 = 0$
(2) $-i_2R_2 + E_2 - E_3 + i_3 R_1 = 0$
(3) $i_2R_2 + E_2 - E_3 - i_3R_1 = 0$
(4) $i_2R_2 + E_2 + E_3 + i_3R_1 = 0$
Answer (3)

144. The electric field at a point on the equatorial plane at a distance r from the centre of a dipole having dipole moment $\vec{p}$ is given by.

(r >> separation of two charges forming the dipole, ϵ_0^- permittivity of free space) **(2020)**

(1) $\vec{E} = -\frac{\vec{p}}{4\pi\epsilon_0 r^3}$ (2) $\vec{E} = \frac{\vec{p}}{4\pi\epsilon_0 r^3}$
(3) $\vec{E} = \frac{2\vec{p}}{4\pi\epsilon_0 r^3}$ (4) $\vec{E} = -\frac{\vec{p}}{4\pi\epsilon_0 r^2}$
Answer (1)

145. The acceleration of an electron due to the mutual attraction between the electron and a proton when they are 1.6 Å apart is,

($m_e \backsimeq 9 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C)

(Take $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ Nm^2 C^{-2}) **(2020)**

(1) 10^{25} m/s^2 (2) 10^{24} m/s^2
(3) 10^{23} m/s^2 (4) 10^{22} m/s^2
Answer (4)

146. Polar molecules are the molecules **(2021)**

(1) Having a permanent electric dipole moment.

(2) Having zero dipole moment.

(3) Acquire a dipole moment only in the presence of electric field due to displacement of charges.

(4) Acquire a dipole moment only when magnetic field is absent.

முனையமுறு மூலக்கூறுகள் எனும் மூலக் கூறுகள்:

(1) நிலையானதொரு மின் இருமுனை திருப்புத்திறனைக் கொண்டவை.

(2) சுழி மின் இருமுனை திருப்புத்திறன் கொண்டவை.

(3) ஒரு மின்புலம் அமைய பெறும் போது மட்டும், மின்னூட்டங்களின் இடப்பெயர்ச்சியால் ஒரு மின் இருமுனை திருப்புத் திறனைப் பெறக்கூடியவை.

(4) ஒரு காந்தப்புலம் அமைய்ப பெறாத போது மட்டும், ஒரு மின் இருமுனை திருப்புத் திறனைப் பெறக்கூடியவை.

Answer (1)

147. The effective resistance of a parallel connection that consists of four wires of equal length, equal area of cross-section and same material is 0.25 Ω. What will be the effective resistance if they are connected in series? **(2021)**

(1) 4 Ω (2) 0.25 Ω

(3) 0.5 Ω (4) 1 Ω

Answer (1)

சம நீளம், சம குறுக்கு வெட்டுப்பரப்பு மற்றும் ஒரே பொருளாலான நான்கு மின் கம்பிகளைப் பெற்றுள்ளதொரு பக்க இணைப்பினது நிகர் மின்தடை, 0.25 Ω ஆகும். அவை தொடர் சுற்றில் இணைக்கப்பட்டால், அவற்றின் நிகர் மின்தடை என்ன?

(1) 4 Ω (2) 0.25 Ω

(3) 0.5 Ω (4) 1 Ω

Answer (1)

148. Column-I gives certain physical terms associated with flow of current through a metallic conductor.

Column-II gives some mathematical relations involving electrical quantities. Match Column-I and Column-II with appropriate relations. **(2021)**

Column – I	Column – II
(A) Drift Velocity	(P) $\frac{m}{ne^2\rho}$
(B) Electrical Resistivity	(Q) nev_d
(C) Relaxation Period	(R) $\frac{eE}{m}\tau$
(D) Current Density	(S) $\frac{E}{J}$

(1) (A) – (R), (B) – (Q), (C) – (S), (D) – (P)
(2) (A) – (R), (B) – (S), (C) – (P), (D) – (Q)
(3) (A) – (R), (B) – (S), (C) – (Q), (D) – (P)
(4) (A) – (R), (B) – (P), (C) – (S), (D) – (Q)

நிரல் – I என்பது ஓர் உலோகக் கடத்தி வழியாகப் பாயும் மின்னோட்டத்தோடு தொடர்புடைய குறிப்பிட்ட இயற்பியல் பதங்களைத் தருகிறது. நிரல் – II என்பது, மின்னியல் அளவைகளை உள்ளடக்கிய சில கணக்கியல் தொடர்புகளாகும். நிரல் – I மற்றும் நிரல் – II ஆகியவற்றினை உரிய தொடர்புகளால் பொருத்துக.

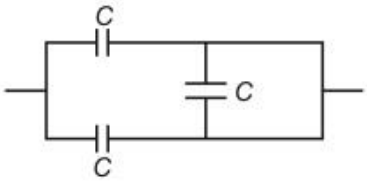
நிரல் – I	நிரல் – II
(A) நகர்வு திசைவேகம்	(P) $\frac{m}{ne^2\rho}$
(B) மின் தடையெண்	(Q) nev_d
(C) ஓய்வுக் காலம்	(R) $\frac{eE}{m}\tau$
(D) மின்னோட்ட அடர்த்தி	(S) $\frac{E}{J}$

(1) (A) – (R), (B) – (Q), (C) – (S), (D) – (P)
(2) (A) – (R), (B) – (S), (C) – (P), (D) – (Q)
(3) (A) – (R), (B) – (S), (C) – (Q), (D) – (P)
(4) (A) – (R), (B) – (P), (C) – (S), (D) – (Q)

Answer (2)

149. The equivalent capacitance of the combination shown in the figure is **(2021)**

படத்தில் காட்டப்பட்டுள்ள தொகுப்பினது மின்தேக்குத்திறனது சமன் என்பது:



(1) $\frac{3C}{2}$ (2) 3C

(3) 2C (4) $\frac{C}{2}$

Answer (3)

150. In a potentiometer circuit a cell of EMF 1.5 V gives balance point at 36 cm length of wire. If another cell of EMF 2.5 V replaces the first cell, then at what length of the wire, the balance point occurs? **(2021)**

(1) 62 cm (2) 60 cm

(3) 21.6 cm (4) 64 cm

1.5 V மி.இ.வி. கொண்டதொரு கலம், ஒரு மின்னழுத்தமானியின் சுற்றில், கம்பி நீளத்தின் 36 செ.மீட்டரில், சமன் புள்ளியைத் தருகிறது. இந்த முதல் கலத்தினை, 2.5 V. மி.இ.வி. கொண்ட மற்றொரு கலத்தைக் கொண்டு மாற்றி அமைத்தால், அதன் சமன் புள்ளி, கம்பியின் எந்த நீளத்தில் அமையப் பெறும்?

(1) 62 செ.மீ. (2) 60 **செ.மீ.**

(3) 21.6 செ.மீ. (4) 64 செ.மீ.

Answer (2)

151. Two charged spherical conductors of radius R_1 and R_2 and connected by a wire. Then the ratio of surface charge densities of the spheres (σ_1/σ_2) is **(2021)**

(1) $\frac{R_1^2}{R_2^2}$ (2) $\frac{R_1}{R_2}$

(3) $\frac{R_2}{R_1}$ (4) $\sqrt{\left(\frac{R_1}{R_2}\right)}$

R_1 மற்றும் R_2 ஆரம் கொண்ட இரு மின்னூட்டப்பட்ட கோள வடிவ கடத்திகள், கம்பியொன்றினால் இணைக்கப்பட்டு உள்ளன. (σ_1/σ_2) எனும் கோளங்களுக்கான மின்னூட்டப் பரப்பு அடர்த்திகளுக்கான விகிதம் என்பது:

(1) $\frac{R_1^2}{R_2^2}$ (2) $\frac{R_1}{R_2}$

(3) $\frac{R_2}{R_1}$ (4) $\sqrt{\left(\frac{R_1}{R_2}\right)}$

Answer (3)

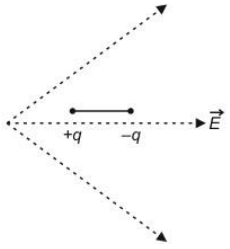
152. A dipole is placed in an electric field as shown. In which direction will it move? **(2021)**

(1) Towards the right as its potential energy will increase.

(2) Towards the left as its potential energy will increase.

(3) Towards the right as its potential energy will decrease.

(4) Towards the left as its potential energy will decrease.



படத்தில் காட்டப்பட்டவாறு ஒரு மின் இருமுனை, மின்புலம் ஒன்றில் வைக்கப்படுகிறது. அது எந்த திசையில் நகரும்?

(1) அதன் நிலையாற்றல் அதிகரிக்கும் போது, வலப்பக்கமாக நகரும்.

(2) அதன் நிலையாற்றல் அதிகரிக்கும் போது, இடப்பக்கமாக நகரும்.

(3) அதன் நிலையாற்றல் குறையும் போது, வலப்பக்கமாக நகரும்.

(4) அதன் நிலையாற்றல் குறையும் போது, இடப்பக்கமாக நகரும்.

Answer (3)

153. Twenty seven drops of same size are charged at 200 V each. They combine to form a bigger drop. Calculate the potential of the bigger drop. (2021)

(1) 1980 V (2) 660 V
(3) 1320 V (4) 1520 V

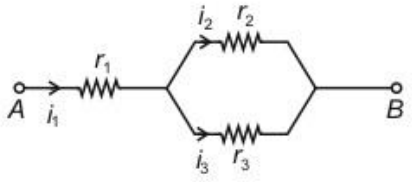
சம உருவளவு பெற்றுள்ள இருபத்தேழு துளிகள் ஒவ்வொன்றும் 220 V ற்கு மின்னூட்டப் படுகின்றன. அவை இணைந்து ஒருபெரிய துளியாக உருவாகிறது. பெரிய துளியினது மின்னழுத்தத்தினைக் கணக்கிடு.

(1) 1980 V (2) 660 V
(3) 1320 V (4) 1520V

Answer (1)

154. Three resistors having resistances r_1, r_2 and r_3 are connected as shown in the given circuit. The ratio $\frac{i_3}{i_1}$ of currents in terms of resistances used in the circuit is (2021)

கொடுக்கப்பட்டுள்ள மின்சுற்றில் காட்டப் பட்டுள்ளவாறு r_1, r_2 மற்றும் r_3 மின்தடைகளைப் பெற்றுள்ள மூன்று மின்தடைகள் இணைக்கப் பட்டுள்ளன. மின்சுற்றில் பயன்படுத்தப்படும் மின்தடைகளைப் பொருத்த, மின்னோட்டங்களது, விகிதம் $\frac{i_3}{i_1}$ என்பது:



(1) $\frac{r_2}{r_1+r_3}$ (2) $\frac{r_1}{r_2+r_3}$
(3) $\frac{r_2}{r_2+r_3}$ (4) $\frac{r_1}{r_1+r_2}$

Answer (3)

155. As the temperature increases, the electrical resistance **(2022)**

(1) Increases for conductors but decreases for semiconductors
(2) Decreases for conductors but increases for semiconductors
(3) Increases for both conductors and semiconductors
(4) Decreases for both conductors and semiconductors

Answer (1)

156. Two resistors of resistance, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100 Ω to that in 200 Ω in a given time is **(2022)**

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

Answer (4)

157. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be **(2022)**

(1) Equal on both the spheres
(2) Dependent on the material property of the sphere
(3) More on bigger sphere
(4) More on smaller sphere

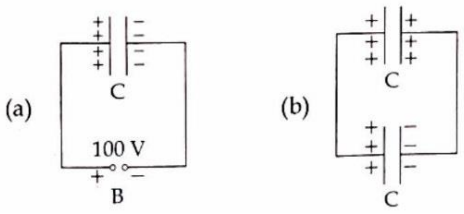
Answer (4)

158. A copper wire of length 10 m and radius $\langle\frac{10^{-2}}{\sqrt{\pi}}\rangle$ m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is **(2022)**

(1) 10^{-5} A/m^2 **(2) 10^5 A/m^2**
(3) 10^4 A/m^2 (4) 10^6 A/m^2

Answer (2)

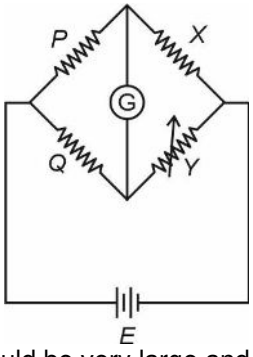
159. A capacitor of capacitance C = 900 pF is charges fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance C = 900 pF as shown in figure (b). The electrostatic energy stored by the system (b) is **(2022)**



(1) 2.25 × 10^{-6} J (2) 1.5 × 10^{-6} J
(3) 4.5 × 10^{-6} J (4) 3.25 × 10^{-6} J

Answer (1)

160. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q **(2022)**

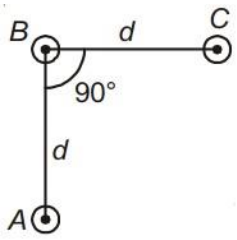


(1) should be very large and unequal
(2) do not play any significant role
(3) should be approximately equal to 2X
(4) should be approximately equal and are small

Answer (4)

1213. Magnetic Effects of current and Magnetism

161. An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I' along the same direction is shown in Fig. Magnitude of force per unit length on the middle wire 'B' is given by **2017**



(1) $\frac{\mu_0 I^2}{\sqrt{2}\pi d}$ (2) $\frac{\mu_0 I^2}{2\pi d}$
(3) $\frac{2\mu_0 I^2}{\pi d}$ (4) $\frac{\sqrt{2}\,\mu_0 I^2}{\pi d}$

Answer: (1)

162. A 250-Turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and subjected to a magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is **(2017)**

(1) 1.15 μJ (2) 9.1 μJ
(3) 4.55 μJ (4) 2.3 μJ

Answer: (2)

163. If θ_1 and θ_2 be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip θ is given by **(2017)**

(1) $\tan^2\theta = \tan^2\theta_1 - \tan^2\theta_2$
(2) $\cot^2\theta = \cot^2\theta_1 + \cot^2\theta_2$
(3) $\tan^2\theta = \tan^2\theta_1 + \tan^2\theta_2$
(4) $\cot^2\theta = \cot^2\theta_1 - \cot^2\theta_2$

Answer: (2)

164. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from **(2018)**

(1) the lattice structure of the material of the rod

(2) the magnetic field

(3) the current source

(4) the induced electric field due to the changing magnetic field

Answer (3)

165. Current sensitivity of a moving coil galvanometer is 5 *div/mA* and its voltage sensitivity (angular deflection per unit voltage applied) is 20 *div/V*. The resistance of the galvanometer is **(2018)**

(1) 250 Ω (2) 25 Ω

(3) 40 Ω (4) 500 Ω

Answer (1)

166. At a point A on the earth's surface the angle of dip, δ = +25°. At a point B on the earth's surface the angle of dip, δ = -25. We can interpret that: **(2019)**

(1) A and B are both located in the northern hemisphere.

(2) A is located in the southern hemisphere and B is located in the northern hemisphere

(3) A is located in the northern hemisphere and B is located in the southern hemisphere.

(4) A and B are both located in the southern hemisphere

Answer (3)

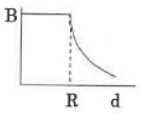
167. A 800 turn coil of effective area 0.05 m^2 is kept perpendicular to a magnetic field $5x10^{-5}$ T. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 a, the emf induced in the coil will be: **(2019)**

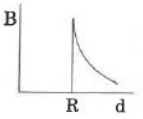
(1) 2V (2) 0.2V

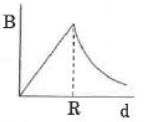
(3) 2×10^{-3} V (4) 0.02 V

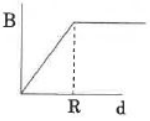
Answer (4)

168. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance, d, from the centre of the conductor, is correctly represented by the figure : **(2019)**

(1) 

(2) 

(3) 

(4) 

Answer (3)

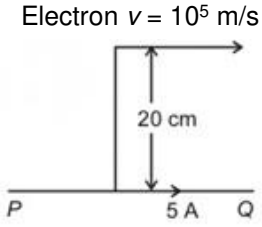
169. A wire of length L metre carrying a current of I ampere is bent in the form of circle. Its magnetic moment is **(2020)**

(1) $IL^2/4\pi$ A m^2 (2) $IL^2/4$ A m^2

(3) $I\pi L^2/4$ A m^2 (4) $2I L^2/\pi$ A m^2

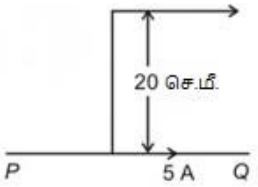
Answer (1)

170. An infinitely long straight conductor carries a current of 5 A as shown. An electron is moving with a speed of 10^5 m/s parallel to the conductor. The perpendicular distance between the electron and the conductor is 20 cm at an instant. Calculate the magnitude of the force experienced by the electron at that instant. **2021**



(1) 8×10^{-20} N (2) 4×10^{-20} N
(3) $8\pi \times 10^{-20}$ N (4) $4\pi \times 10^{-20}$ N

ஈறில்லா நீளம் கொண்ட நேர் கடத்தியொன்று, படத்தில் காட்டியுள்ளவாறு, 5A மின்னோடத்தினை தாங்குகிறது. ஓர் எலெக்டிரான் 10^5 மீ/வி என்ற வேகத்தில் கடத்திக்கு இணையாக நகர்கிறது. ஒரு கண நேரத்தில், எலெக்டிரானுக்கும் கடத்திக்கும் இடைப்பட்ட செங்குத்து தூரம் என்பது, 20 செ.மீ. ஆகும். அக்கணநேரத்தில், எலெக்டிரானால் உணரப்படும் விசையினது எண் மதிப்பினைக் கணக்கிடுக. எலெக்ரான் $v = 10^5$ மீ /வி

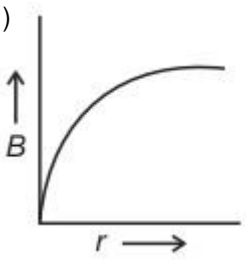


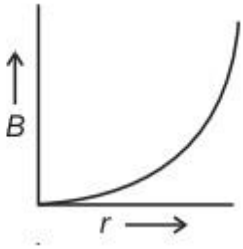
(1) 8×10^{-20} நி (2) 4×10^{-20} நி
(3) $8\pi \times 10^{-20}$ நி (4) $4\pi \times 10^{-20}$ நி

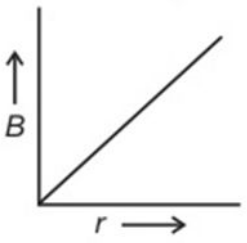
Answer (1)

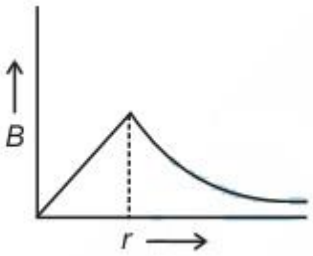
171. A thick current carrying cable of radius '*R*' carries current '*I*' uniformly distributed across its cross-section. The variation of magnetic field $B(r)$ due to the cable with the distance '*r*' from the axis of the cable is represented by **(2021)**

'*R*' எனும் ஆரம் கொண்டதொரு தடினமான, மின்னோட்டம் தாங்கிய கம்பிவடம் (கேபிள்) தனது குறுக்கு வெட்டுக்குக் குறுக்கே சீராக பரவலடைந்த 'I' எனும் மின்னோட்டத்தினை தாங்குகிறது. கம்பியின் அச்சிலிருந்து '*r*' தொலைவில், கம்பி வடத்தினால் (கேபிளினால்) ஏற்படும் காந்தப்புல மாற்றம் $B(r)$ யினை குறிக்கப்படுவதென்பது:

(1)


(2)


(3)


(4)


Answer (4)

172. A uniform conducting wire of length $12a$ and resistance '*R*' is wound up as a current carrying coil in the shape of, **(2021)**

(i) an equilateral triangle of side '*a*'.
(ii) a square of side '*a*'.

The magnetic dipole moments of the coil in each case respectively are

(1) 4 Ia^2 and 3 Ia^2
(2) $\sqrt{3}$ Ia^2 and 3 Ia^2
(3) 3 Ia^2 and Ia^2
(4) 3 Ia^2 and 4 Ia^2

Answer (2)

12*a* நீளம் மற்றும் '*R*' மின்தடை கொண்டதொரு சீராகக் கடத்தும் மின்கம்பி,

(1) '*a*' எனும் பக்கம் கொண்ட ஒரு சமகோண முக்கோணம்.

(2) '*a*' எனும் பக்கம் கொண்ட சதுர வடிவிலான மின்னோட்டம் தாங்கிய சுருள்களா க சுழற்றப்பட்டுள்ளது.

இவ்விரு நேர்வுகளில் சுருள்களது காந்த இருமுனை திருப்புத் திறன்கள் என்பன முறையே:

(1) 4 Ia^2 மற்றும் 3 Ia^2 (2) $\sqrt{3}$ Ia^2 மற்றும் 3 Ia^2

(3) 3 Ia^2 மற்றும் Ia^2 (4) 3 Ia^2 மற்றும் 4 Ia^2

Answer (2)

173. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is **(2022)**

(1) 12.56×10^{-4} T (2) 6.28×10^{-4} T

(3) 6.28×10^{-2} T (4) 12.56×10^{-2} T

Answer (4)

174. Given below are two statements

Statement I : Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

Statement II : Biot-Savart's law is analogous to Coulomb's inverse square law of charge *q*, with the former being related to the field produce by a scalar source, Idl while the latter being produced by a vector source, *q*. In light of above statements choose the most appropriate answer from the options given below **(2022)**

(1) Statement I is correct and Statement II is incorrect

(2) Statement I is incorrect and Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

Answer (1)

175. A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is **(2022)**

(1) 1 weber (2) Zero weber

(3) 2 weber (4) 0.5 weber

Answer (4)

176. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is **(2022)**

(1) A lineraly increasing function of distance *r* upto the boundary of the wire and then decreasing one with $\frac{1}{r}$ dependence for the outside region.

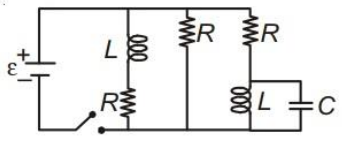
(2) A linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.

(3) Uniform the remains constant for both the regions.

(4) A linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.

1214. Electromagnetic Induction and Alternating currents

177. Figure shows a circuit contains three identical resistors with resistance R = 9.0 Ω each, two identical inductors with inductance L = 2.0 mH each, and an ideal battery with emf ε = 18V. The current '*i*' through the battery just after the switch closed is(2017)



(1) 0 ampere (2) 2 mA

(3) 0.2 A (4) 2 A

Answer (4)

178. A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the centre of the solenoid, a coil of 100 turns and radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate to 0 A from 4 A in 0.05 s. If the resistance of the coil is $10\pi^2\Omega$, the total charge flowing through the coil during this time is **(2017)**

(1) 16π μC (2) 32π μC
(3) 16 μC (4) 32 μC

Answer: (4)

179. The magnetic potential energy stored in a certain inductor is 25 *mJ*, when the current in the inductor is 60 *mA*. This inductor is of inductance (2018)

(1) 1.389 *H* (2) 138.88 *H*
(3) 0.138 *H* (4) 13.89 *H*

Answer (4)

180. A metallic rod of mass per unit length 0.5 $kg\ m^{-1}$ is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0.25 *T* is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is **(2018)**

(1) 14.76 *A* (2) 5.98 *A*
(3) 7.14 *A* (4) 11.32 *A*

Answer (4)

181. An inductor 20 *mH*, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, $V = 10 \sin 314\ t$. The power loss in the circuit is ***(2018)***

(1) 2.74 *W* (2) 0.43 *W*
(3) 0.79 *W* (4) 1.13 *W*

Answer (3)

182. In which of the following devices, the eddy current effect is not used? (2019)

(1) induction furnace
(2) magnetic braking in train
(3) electromagnet
(4) electric heater

Answer (4)

183. A hollow metal sphere of radius R is uniformly charged. The electric field due to the sphere at a distance r from the centre: **(2019)**

(1) increases as r increases for r<R and for r>R
(2) zero as r increases for r<R, decreases as r increases for r>R
(3) zero as r increases for r<R, increases as r increases for r>R
(4) decreases as r increases for r<R and for r>R

Answer (2)

184. A wheel with 20 metallic spokes each 1 m long is rotated with a speed of 120 rpm in a plane perpendicular to a magnetic field of 0.4 G. The induced emf between the axile and rim of the wheel will be (1 G = 10^4 T) (2020)

(1) 2.51 V (2) 2.51×10^{-4} V
(3) 2.51×10^{-5} V (4) 4.0×10^{-5} V

Answer (2)

185. The magnetic flux linked with a coil (in Wb) is given by the equation

$\phi = 5t^2 + 3t + 16$

The magnitude of induced emf in the coil at the fourth second will be **(2020)**

(1) 10V (2) 33 V
(3) 43 V (4) 108 V

Answer (3)

186. The magnetic field in a plane electromagnetic wave is given by,

$B_y = 2 \times 10^{-7} \sin (\pi \times 10^3 \times +3\pi \times 10^{11}t)$ T

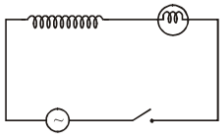
Calculate the wavelength **(2020)**

(1) $\pi \times 10^{-3}$ m (2) $\pi \times 10^3$ m

(3) 2×10^{-3} m (4) 2×10^3 m

Answer (3)

187. A light bulb and an inductor coil are connected to an ac source through a key as shown in the figure below. The key is closed and after sometime an iron rod is inserted into the interior of the inductor. The glow of the light bulb **(2020)**



(1) increases

(2) decreases

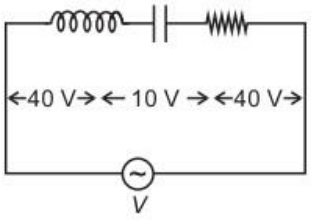
(3) remains unchanged

(4) will fluctuate

Answer (2)

188. An inductor of inductance *L*, a capacitor of capacitance *C* and a resistor of resistance '*R*' are connected in series to an ac source of potential difference '*V*' volts as shown in figure. Potential difference across *L*, *C* and *R* is 40 V, 10 V and 40 V, respectively. The amplitude of current flowing through *LCR* series circuit is $10\sqrt{2}$ A. The impedance of the circuit is **(2021)**

படத்தில் காட்டப்பட்டுள்ளவாறு, '*V*' எனும் மின்னழுத்த வேறுபாடு கொண்டதொரு ac மூலத்தோடு '*L*' எனும் மின்தூண்டல் எண் கொண்டதொரு மின் தூண்டி '*C*' எனும் மின்தேக்குத்திறன் கொண்டதொரு மின்தேக்கியும் மற்றும் '*R*' எனும் மின்தடை மதிப்பு கொண்டதொரு மின்தடையும் தொடர்சுற்றில் இணைக்கப்பட்டுள்ளது. *L*, *C* மற்றும் *R* க்கு குறுக்கிலான மின்னழுத்த வேறுபாடு 40 வோல்ட், 10 வோல்ட் மற்றும் 40 வோல்ட் என்று முறையாக அமைகிறது. *LCR* தொடர் மின்சுற்றின் வழியே பாயும் மின்னோட்டத்தின் வீச்சு, $10\sqrt{2}$A ஆம்பியர் ஆகும். மின்சுற்றிலுள்ள மின்மறுப்பு என்பது:



(1) 5 Ω (2) $4\sqrt{2}$ Ω

(3) $5\sqrt{2}$ Ω (4) 5 Ω

Answer (1)

189. A series LCR circuit containing 5.0 H inductor, 80 μF capacitor and 40 Ω resistor is connected to 230 V variable frequency ac source. The angular frequencies of the source at which power transferred to the circuit is half the power at the resonant angular frequency are likely to be **(2021)**

(1) 42 rad/s and 58 rad/s

(2) 25 rad/s and 75 rad/s

(3) 50 rad/s and 25 rad/s

(4) 46 rad/s and 54 rad/s

வேறுபடும் அதிர்வெண் கொண்ட 230 வோல்ட் ac மூலத்தோடு, 5.0 H மின்தூண்டி, 80 μF மின்தேக்கி மற்றும் 40 Ω மின்தடை கொண்டதொரு தொடர் LCR மின்சுற்று இணைக்கப் பட்டுள்ளது. ஒத்ததிர்வு கோண அதிர்வெண்ணில் அமையும் திறனில் பாதி மதிப்பாக திறனானது மின்சுற்றிற்கு மாற்றம் செய்யப் படும்போது மூலத்தினது கோண அதிர்வெண்கள் என்பன:

(1) 42 rad/s மற்றும் 58 rad/s

(2) 25 rad/s மற்றும் 75 rad/s

(3) 50 rad/s மற்றும் 25 rad/s

(4) 46 rad/s மற்றும் 54 rad/s

Answer (4)

190. A stepdown transformer connected to an ac mains supply of 220 V is made to operate at 11 V, 44 W lamp. Ignoring power losses in the transformer, what is the current in the primary circuit? **(2021)**

(1) 4 A (2) 0.2 A
(3) 0.4 A (4) 2 A

220 V a.c. முதன்மை மின்னளிப்பானோடு இணைக்கப்பட்டுள்ள ஓர் இறக்கு மின்மாற்றி 11 V, 44 W கொண்ட மின் விளக்கினை செயல் படுத்துகிறது. மின் மாற்றியில் உள்ள திறன் இழப்புக்களை ஒதுக்கிய பின் அதன் முதன்மை மின்சுற்றில் உள்ள மின்னோட்டம் யாது?

(1) 4 A (2) 0.2 A
(3) 0.4 A (4) 2 A

Answer (2)

191. Two conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coinciding. If $R_1 > > R_2$, the mutual inductance M between them will be directly proportional to **(2021)**

(1) $\frac{R_2^2}{R_1}$ (2) $\frac{R_1}{R_2}$
(3) $\frac{R_2}{R_1}$ (4) $\frac{R_1^2}{R_2}$

R_1 மற்றும் R_2 எனும் ஆரங்கள் கொண்ட இரு கடத்தும் வட்ட வடிவ கண்ணிகள், தங்களது மையங்கள் மேற்பொருந்தும்படி சமதளத்தில் அமைக்கப்பட்டுள்ளன. $R_1 >> R_2$ எனில், அவற்றிற்கிடையேயான பரிமாற்ற மின் தூண்டல் எண் M, நேர் விகிதத்தில் பொருந்தியிருப்பது என்பது:

(1) $\frac{R_2^2}{R_1}$ (2) $\frac{R_1}{R_2}$
(3) $\frac{R_2}{R_1}$ (4) $\frac{R_1^2}{R_2}$

Answer (1)

192. The peak voltage of the ac source is equal to **(2022)**

(1) $\sqrt{2}$ times the rms value of the ac source
(2) $1/\sqrt{2}$ times the rms value of the ac source
(3) The value of voltage supplied to the circuit
(4) The rms value of the ac source

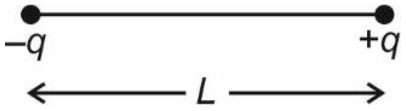
Answer (1)

193. A series LCR circuit with inductance 10 H, capacitance 10 μF, resistance 50 Ω is connected to an ac source of voltage, $V = 200\sin(100t)$ volt. If the resonant frequency of the LCR circuit is v_0 and the frequency of the ac source is v, then **(2022)**

(1) $v_0 = \frac{50}{\pi}$ Hz, $v = 50$ Hz
(2) $v = 100$ Hz; $v_0 = \frac{100}{\pi}$ Hz
(3) $v_0 = v = 50$ Hz
(4) $v_0 = v = \frac{50}{\pi}$ Hz

Answer (4)

194. Two point charges –q and +q are placed at a distance of L, as shown in the figure. **(2022)**



The magnitude of electric field intensity at a distance R(R>>L) varies as:

(1) $\frac{1}{R^4}$ (2) $\frac{1}{R^6}$
(3) $\frac{1}{R^2}$ (4) $\frac{1}{R^3}$

Answer (4)

195. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2×10^{-5} T and electrical resistance of the coil is 12.56 Ω, then the maximum induced current in the coil will be **(2022)**

(1) 1 A (2) 2 A
(3) 0.25 A (4) 1.5 A

Answer (1)

1215. Electromagnetic Waves

196. The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature *T* (Kelvin) and mass *m*, is **(2017)**

(1) $\frac{2h}{\sqrt{mkT}}$ (2) $\frac{h}{\sqrt{mkT}}$

(3) $\frac{h}{\sqrt{3mkT}}$ (4) $\frac{2h}{\sqrt{3mkT}}$

Answer: (3)

197. In an electromagnetic wave in free space the root mean square value of the electric field is E_{rms} = 6 V/m. The peak value of the magnetic field is **(2017)**

(1) 4.23×10^{-8} T (2) 1.41×10^{-8} T

(3) 2.83×10^{-8} T (4) 0.70×10^{-8} T

Answer: (3)

198. An em wave is propagating in a medium with a velocity $\vec{V} = V\,\hat{i}$. The instantaneous oscillating electric field of this em wave is along + y axis. Then the direction of oscillating magnetic field of the em wave will be along **(2018)**

(1) – *y* direction

(2) + *z* direction

(3) – *z* direction

(4) – *x* direction

Answer (2)

199. The E.M. wave with shortest wavelength among the following is,**(2020)**

(1) Microwaves (2) Ultraviolet rays

(3) X-rays (4) Gamma-rays

Answer (4)

200. The magnetic field in a plane electromagnetic wave is given by,

$B_y = 2 \times 10^{-7} \sin(\pi \times 10^3 \times +3\pi \times 10^{11}t)$ T

Calculate the wavelength **(2020)**

(1) $\pi \times 10^{-3}$ m (2) $\pi \times 10^3$ m

(2) 2×10^{-3} m (4) 2×10^3 m

Answer (2)

201. A capacitor of capacitance 'C', is connected across an ac source of voltage 'V', given by $V = V_0 \sin\omega t$. The displacement current between the plates of the capacitor, would then be given by **(2021)**

(1) $I_d = V_0\omega C\sin\omega t$ (2) $I_d = V_0\omega C\cos\omega t$

(3) $I_d = \frac{V_0}{\omega C}\cos\omega t$ (4) $I_d = \frac{V_0}{\omega C}\sin\omega t$

'V' மின்னழுத்தம் கொண்டதொரு ac மூலத்திற்கு குறுக்கே 'C' மின்தேக்குதிறன் கொண்டதொரு மின்தேக்கி இணைக்கப்பட்டுள்ளது. இங்கு $V = V_0 \sin\omega t$.

(1) $I_d = V_0\omega C\sin\omega t$ (2) $I_d = V_0\omega C\cos\omega t$

(3) $I_d = \frac{V_0}{\omega C}\cos\omega t$ (4) $I_d = \frac{V_0}{\omega C}\sin\omega t$

Answer (2)

202. For a plane electromagnetic wave propagating in *x*-direction, which one of the following combination gives the correct possible directions for electric field (*E*) and magnetic field (*B*) respectively? **(2021)**

(1) $-\hat{j} + \hat{k}, -\hat{j} + \hat{k}$ (2) $\hat{j} + \hat{k}, \hat{j} + \hat{k}$

(3) $-\hat{j} + \hat{k}, -\hat{j} - \hat{k}$ (4) $\hat{j} + \hat{k}, -\hat{j} - \hat{k}$

x – திசையில் பரவும் ஒரு தள மின்காந்த அலைக்கு, பின்வரும் தொகுப்புகளில், மின்புலம் (E) மற்றும் காந்தப்புலம் (B) ஆகியவை முறையே சரியாக இயலக்கூடிய முறையான திசைகளானவை எவை?

(1) $-\hat{j} + \hat{k}, -\hat{j} + \hat{k}$ (2) $\hat{j} + \hat{k}, \hat{j} + \hat{k}$

(3) $-\hat{j} + \hat{k}, -\hat{j} - \hat{k}$ (4) $\hat{j} + \hat{k}, -\hat{j} - \hat{k}$

Answer (3)

203. When light propagates through a material medium of relative permittivity ε_r and relative permeability μr, the velocity of light, *v* is given by (*c*-velocity of light in vacuum) **(2022)**

(1) $v = \sqrt{\frac{\varepsilon_r}{\mu_r}}$ (2) $v = \frac{c}{\sqrt{\varepsilon_r \mu_r}}$

(3) v = c (4) $v = \sqrt{\frac{\mu_r}{\varepsilon_r}}$

Answer (2)

1216. Optics

204. The ratio of resolving powers of an optical microscope for two wavelengths λ_1 = 4000 Å and λ_2 = 6000 Å **(2017)**

(1) 16 : 81 (2) 8 : 27
(3) 9 : 4 (4) 3 : 2

Answer: (4)

205. A thin prism having refracting angle 10° is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be **(2017)**

(1) 10° (2) 4°
(3) 6° (4) 8°

Answer: (3)

206. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is **(2017)**

(1) $\frac{I_0}{16}$ (2) $\frac{I_0}{2}$
(3) $\frac{I_0}{4}$ (4) $\frac{I_0}{8}$

Answer: (4)

207. A beam of light from a source *L* is incident normally on a plane mirror fixed at a certain distance *x* from the source. The beam is reflected back as a spot on a scale placed just above the source *L*. When the mirror is rotated through a small angle θ, the spot of the light is found to move through a distance *y* on the scale. The angle θ is given by **(2017)**

(1) $\frac{x}{y}$ (2) $\frac{y}{2x}$
(3) $\frac{y}{x}$ (4) $\frac{x}{2y}$

Answer: (2)

208. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly

(1) 1.78 (2) 1.25
(3) 1.59 (4) 1.69

Answer: (1)

209. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s respectively. The driver of the first car blows a horn having a frequency 400 Hz. The frequency heard by the driver of the second car is [velocity of sound 340 m/s] **(2017)**

(1) 448 Hz (2) 350 Hz
(3) 361 Hz (4) 411 Hz

Answer: (1)

210. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is **(2018)**

(1) 12.5 cm (2) 8 cm
(3) 13.2 cm (4) 16 cm

Answer (3)

211. Unpolarised light is incident from air on a plane surface of a material of refractive index 'μ'. At a particular angle of incidence 'i', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation? **(2018)**

(1) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$
(2) Reflected light is polarised with its electric vector perpendicular to the plane of incidence
(3) Reflected light is polarised with its electric vector parallel to the plane of incidence
(4) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

Answer (2)

212. In Young's double slit experiment the separation *d* between the slits is 2mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits 100 cm. It is found that the angular width of the fringes is 0.20°. To increase the fringe angular width to 0.21° (with same λ & D) the separation between the slits needs to be changed to **(2018)**

(1) 2.1 mm (2) 1.9 mm
(3) 1.8 mm (4) 1.7 mm

Answer (2)

213. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

(1) large focal length and large diameter
(2) large focal length and small diameter
(3) small focal length and large diameter
(4) small focal length and small diameter

Answer (1)

214. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30°. One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is **(2018)**

(1) 30° (2) 45°
(3) 60° (4) Zero

Answer (2)

215. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be **(2018)**

(1) 30 cm towards the mirror
(2) 36 cm away from the mirror
(3) 30 cm away from the mirror
(4) 36 cm towards the mirror

Answer (2)

216. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.2°. What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water? **(2019)**

($\mu_{water} = 4/3$)

(1) 0.266° (2) 0.15°
(3) 0.05° (4) 0.1°

Answer (2)

217. Which colour of the light has the longest wavelength? **(2019)**

(1) red (2) blue
(3) green (4) violet

Answer (1)

218. Two similar thin equi convex lenses, of focal length *f* each, are kept coaxially in contact with each other such that the focal length of the combination is F_1. When the space between the two lenses is filled with glycerin (which has the same refractive index (μ = 1.5) as that of glass) then the equivalent focal length is F_2. The ratio $F_1 : F^2$ will be : **(2019)**

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

Answer (2)

219. Pick the wrong answer in the context with rainbow.**(2019)**

(1) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.
(2) the order of colours is reversed in the secondary rainbow
(3) An observer can see a rainbow when his front is towards the sun.
(4) Rainbow is a combined effect of dispersion, refraction and reflection of sunlight.

Answer (3)

220. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction? **(2019)**

(1) 180° (2) 0°

(3) equal to angle of incidence (4) 90°

Answer (4)

221. Two coherent sources of light interfere and produce fringe pattern on a screen. For central maximum, the phase difference between the two waves will be, **(2020)**

(1) $\pi/2$ (2) Zero

(3) π (4) $3\pi/2$

Answer (2)

222. The length of the string of a musical instrument is 90 cm and has a fundamental frequency of 120 Hz. Where should it be pressed to produce fundamental frequency of 180 Hz? **(2020)**

(1) 80 cm (2) 75 cm

(3) 60 cm (4) 45 cm

Answer (3)

223. An object is placed on the principal axis of a concave mirror at a distance of 1.5 f (f is the focal length). The image will be at, **(2020)**

(1) 3f **(2) –3f**

(3) 1.5 f (4) –1.5f

Answer (2)

224. If the critical angle for total internal reflection from a medium to vacuum is 45°, then velocity of light in the medium is,**(2020)**

(1) 3×10^8 m/s (2) 1.5×10^8 m/s

(3) $\frac{3}{\sqrt{2}} \times 10^8$ m/s (4) $\sqrt{2} \times 10^8$ m/s

Answer (3)

225. A plano-convex lens of unknown material and unknown focal length is given. With the help of a spherometer we can measure the,**(2020)**

(1) refractive index of the material

(2) focal length of the lens

(3) radius of curvature of the curved surface

(4) aperture of the lens

Answer (3)

226. The power of a biconvex lens is 10 dioptre and the radius of curvature of each surface is 10 cm. Then the refractive index of the material of the lens is, **(2020)**

(1) $\frac{3}{2}$ (2) $\frac{4}{3}$

(3) $\frac{9}{8}$ (4) $\frac{5}{3}$

Answer (1)

227. A lens of large focal length and large aperture is best suited as an objective of an astronomical telescope since **(2021)**

(1) A large aperture contributes to the quality and visibility of the images.

(2) A large area of the objective ensures better light gathering power.

(3) A large aperture provides a better resolution.

(4) All of the above

பெரிய ஒளித்திறப்பு மற்றும் நெடிய குவிதூரம் கொண்டதொரு வில்லை ஒரு வானியல் தொலைநோக்கியின் பொருளருகு வில்லையாக மிகச் சரியாக பொருந்தும் என்பதற்கான காரணமாக இருப்பது:

(1) பெரியதொரு ஒளித்திறப்பு என்பது, பிம்பங்களது தரம் மற்றும் புலப்படுதிறன் ஆகியவற்றிற்கு பங்களிக்கும்.

(2) அதிக பரப்பு கொண்ட பொருளருகு வில்லை என்பது, நல்லதொரு ஒளிச் சேர்க்கைக்கான திறனை உறுதி செய்யும்.

(3) பெரியதொரு ஒளித்திறப்பு நல்லதொரு பகுதிறன் அளிக்கும்.

(4) மேற்கூறிய அனைத்தும்.

Answer (4)

228. A convex lens '*A*' of focal length 20 cm and a concave lens '*B*' of focal length 5 cm are kept along the same axis with a distance '*d*' between them. If a parallel beam of light falling on '*A*' leaves '*B*' as a parallel beam, then the distance '*d*' in cm will be **(2021)**

(1) 30 (2) 25

(3) 15 (4) 50

20 செ.மீ. குவிதூரம் கொண்ட '*A*' எனும் ஒரு குவி வில்லை மற்றும் 5 செ.மீ. குவிதூரம் கொண்ட 'B' எனும் ஒரு குழிவில்லை ஆகியன 'd' எனும் இடைதூரத்தில் சம அச்சு திசையில் அமைக்கப் பட்டுள்ளன. 'A' மீது விழும் இணையானதொரு ஒளிக்கற்றறை 'B' வழியே இணைக்கற்றையாக வெளியேறுகிறது. எனில் 'd' எனும் தூரம் செ.மீட்டரில்:

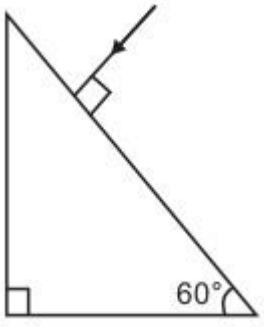
(1) 30 (2) 25

(3) 15 (4) 50

Answer (3)

229. Find the value of the angle of emergence from the prism. Refractive index of the glass is $\sqrt{3}$. **(2021)**

முப்பட்டகத்திலிருந்து வெளிப்படு கோணத்தினது மதிப்பினைக் கண்டறிக. கண்ணாடியது ஒளிவிலகல் எண் என்பது $\sqrt{3}$ ஆகும்.



(1) 90° (2) 60°

(3) 30° (4) 45°

Answer (2)

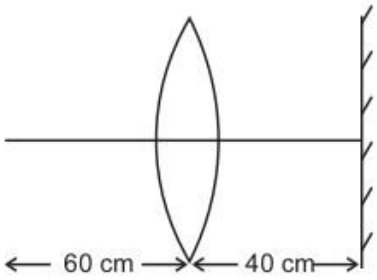
230. A point object is placed at a distance of 60 cm from a convex lens of focal length 30 cm. If a plane mirror were put perpendicular to the principal axis of the lens and at a distance of 40 cm from it, the final image would be formed at a distance of (2021)

(1) 20 cm from the plane mirror, it would be a virtual image

(2) 20 cm from the lens, it would be a real image

(3) 30 cm from the lens, it would be a real image

(4) 30 cm from the plane mirror, it would be a virtual image



(1) தள ஆடியிலிருந்து 20 செ.மீ. தூரத்தில் அது ஒரு மாய பிம்பமாக அமையும்.

(2) வில்லையிலிருந்து 20 செ.மீ. தூரத்தில் அது ஒரு மெய் பிம்பமாக அமையும்.

(3) வில்லையிலிருந்து 30 செ.மீ. தூரத்தில் அது ஒரு மெய் பிம்பமாக அமையும்.

(4) தள ஆடியிலிருந்து 30 செ.மீ. தூரத்தில் அது ஒரு மாய பிம்பமாக அமையும்.

Answer (1)

231. Match List-I with List-II

	List – I (Electromagnetic waves)		List – II (Wavelength)
(a)	AM radio waves	(i)	10^{-10} m
(b)	Microwaves	(ii)	10^{2} m
(c)	Infrared radiations	(iii)	10^{-2} m
(d)	X-rays	(iv)	10^{-4} m

Choose the correct answer from the options given below **(2022)**

(1) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(2) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(3) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
(4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

Answer (2)

232. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is **(2022)**

(1) +5D (2) Infinity
(3) +2D (4) +20D

Answer (1)

233. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is **(2022)**

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

Answer (1)

234. When two monochromatic lights of frequency, v and $\frac{v}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{V_2}{2}$ and V_2 respectively. The threshold frequency for this metal is **(2022)**

(1) $\frac{2}{3}$ v (2) $\frac{3}{2}$ v
(3) 2v (4) 3v

Answer (2)

235. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is **(2022)**

(1) 9 (2) 12
(3) 6 (4) 8

Answer (2)

236. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60°. The angle between the refracted and reflected rays would be **(2022)**

(1) 90° (2) 120°
(3) 30° (4) 60°

Answer (1)

237. Two transparent media *A* and *B* are separated by a plane boundary. The speed of light in those media are 1.5 × 10^8 m/s and 2.0 × 10^8 m/s, respectively. The critical angle for a ray of light for these two media is **(2022)**

(1) $\tan^{-1}$ (0.500) (2) $\tan^{-1}$ (0.750)
(3) $\sin^{-1}$ (0.500) (4) $\sin^{-1}$ (0.750)

Answer (4)

1217. Dual Nature of Matter and Radiation

238. The photoelectric threshold wavelength of silver is 3250 × 10^{-10} m. The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength 2536 × 10^{-10} m is (Given h = 4.14 × 10^{-15} eVs and c = 3 × 10^8 ms^{-1}) **(2017)**

(1) ≈ 0.3 × 10^6 ms^{-1} (2) ≈ 6 × 10^5 ms^{-1}
(3) ≈ 0.6 × 10^6 ms^{-1} (4) ≈ 61 × 10^3 ms^{-1}

Answer (2 & 3)* Both answers are correct.

239. When the light of frequency $2V_0$ (where V_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is V_1. When the frequency of the incident radiation is increased to $5V_0$, the maximum velocity of electrons emitted from the same plate is V_2. The ratio of V_1 to V_2 is **(2018)**

(1) 4 : 1 (2) 1 ; 4
(3) 1 : 2 (4) 2 : 1

Answer (3)

240. The power radiated by a black body is *P* and it radiates maximum energy at wavelength, λ_0. If the temperature of the black body is now changed so that it radiates maximum energy at 3 wavelength $\frac{3}{4}\lambda_0$, the power radiated by it 4 becomes *nP*. The value of *n* is **(2018)**

(1) $\frac{256}{81}$ (2) $\frac{4}{3}$

(3) $\frac{3}{4}$ (4) $\frac{81}{256}$

Answer (1)

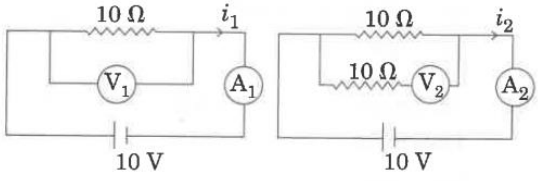
241. An electron is accelerated through a potential difference of 10,000 V. Its de Broglie wavelength is, (nearly) : ($m_e = 9 \times 10^{-31}$ kg) **(2019)**

(1) 12.2×10^{-13} m (2) 12.2×10^{-12} m

(3) 12.2×10^{-14} m (4) 12.2 nm

Answer (2)

242. In the circuits shown below , the readings of the voltmeters and the ammeters will be:



Circuit 1 Circuit 2

(1) $V_2 > V_1$ and $i_1 - i_2$ (2) $V_2 = V_1$ and $i_1 > i_2$

(3) $V_1 = V_2$ and $i_1 = i_2$ (4) $V_2 > V_1$ and $i_1 > i_2$

Answer (4)

243. The total energy of an electron in an atom in an orbit is -3.4 eV. Its kinetic and potential energies are respectively **(2019)**

(1) -3.4 eV, - 3.4 eV (2) -3.4 eV, -6.8 eV

(3) 3.4 eV, -6.8 eV (4) 3.4 eV, 3.4 eV

Answer (3)

244. The de Broglie wavelength of an electron moving with kinetic energy of 144 eV is nearly **(2020)**

(1) 102×10^{-2} nm (2) 102×10^{-3} nm

(3) 102×10^{-4} nm (4) 102×10^{-5} nm

Answer (2)

245. The number of photons per second on an average emitted by the source of monochromatic light of wavelength 600 nm, when it delivers the power of 3.3×10^{-3} what will be ($h = 6.6 \times 10^{-34}$ Js) **(2021)**

(1) 10^{15} (2) 10^{18}

(3) 10^{17} (4) 10^{16}

600 நா.மீ. அலைநீளம் கொண்ட ஒற்றை நிற ஒளி மூலத்திலிருந்து சராசரியாக ஒரு வினாடியில் உமிழப்படும் ஃபோட்டான் எண்ணிக்கை, அதன் உமிழும் திறன், 3.3×10^{-3} வாட் என்றமையும் போது: ($h = 6.6 \times 10^{-34}$ ஜூவி)

(1) 10^{15} (2) 10^{18}

(3) 10^{17} (4) 10^{16}

Answer (4)

246. An electromagnetic wave of wavelength 'λ' is incident on a photosensitive surface of negligible work function. If '*m*' mass is of photoelectron emitted from the surface has de-Broglie wavelength λ_d, then **(2021)**

(1) $\lambda = \left(\frac{2h}{mc}\right)\lambda_d^2$ (2) $\lambda = \left(\frac{2m}{hc}\right)\lambda_d^2$

(3) $\lambda_d = \left(\frac{2mc}{h}\right)\lambda^2$ (4) $\lambda = \left(\frac{2mc}{h}\right)\lambda_d^2$

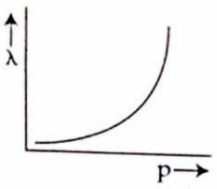
புறக்கணிக்கத்தக்க வேலைச் சார்பினைப் பெற்றுள்ளதொரு ஒளியுணர்வு பரப்பின் மீது 'λ' அலைநீளம் கொண்டதொரு மின்காந்த அலை விழுகிறது. பரப்பிலிருந்து உமிழப்படும் ஒளி எலக்டிரான், 'm' நிறையில் λ_d எனும் டீ-ப்ராக்லீ அலை நீளத்தினைப் பெற்றிருக்கிறது எனில்,

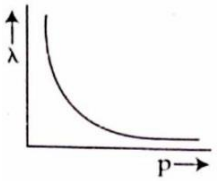
(1) $\lambda = \left(\frac{2h}{mc}\right)\lambda_d^2$ (2) $\lambda = \left(\frac{2m}{hc}\right)\lambda_d^2$

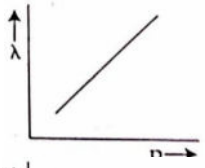
(3) $\lambda_d = \left(\frac{2mc}{h}\right)\lambda^2$ (4) $\lambda = \left(\frac{2mc}{h}\right)\lambda_d^2$

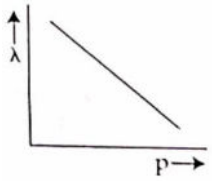
Answer (4)

247. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (*p*) is **(2022)**

(1) 

(2) 

(3) 

(4) 

Answer (2)

1218. Atoms And Nuclei

248. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is **(2017)**

(1) 0.5 (2) 2

(3) 1 (4) 4

Answer (4)

249. Radioactive material 'A' has decay constant '8λ' and material 'B' has decay constant 'λ'. Initially they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$? **(2017)**

(1) $\frac{1}{9\lambda}$ (2) $\frac{1}{\lambda}$

(3) $\frac{1}{7\lambda}$ (4) $\frac{1}{8\lambda}$

Answer (3)

250. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is **(2018)**

(1) 2 : – 1 **(2) 1 : – 1**

(3) 1 : 1 (4) 1 : – 2

Answer (2)

251. An electron of mass *m* with an initial velocity $\vec{V} = V_0\,\hat{\imath}\,(V_0 > 0)$ enters an electric field $\vec{E} = -E_0\,\hat{\imath}\,(E_0 = \text{constant} > 0)$ at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time *t* is **(2018)**

(1) $\lambda_0\, t$ (2) $\lambda_0\left(1 + \frac{eE_0}{mV_0}\,t\right)$

(3) $\frac{\lambda_0}{\left(1+\frac{eE_0}{mV_0}t\right)}$ (4) λ_0

Answer (3)

252. For radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is **(2018)**

(1) 30 (2) 10

(3) 20 (4) 16

Answer (3)

253. Ionized hydrogen atoms and α- particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_\alpha$ will be: **(2019)**

(1) 2 : 1 (2) 1 : 2

(3) 4 : 1 (4) 1 : 4

Answer (1)

254. α – particle consists of: **(2019)**

(1) 2 protons and 2 neutrons only

(2) 2 electrons, 2 protons and 2 neutrons

(3) 2 electrons and 4 protons only

(4) 2 protons only

Answer (1)

255. The half-life of a radioactive sample undergoing α - decay is 1.4×10^{17} s. If the number of nuclei in the sample is 2.0×10^{21}, the activity of the sample is nearly. **(2020)**

(1) 10^3 Bq (2) 10^4 Bq
(3) 10^5 Bq (4) 10^6 Bq

Answer (2)

256. What happens to the mass number and atomic number of an element when it emits γ-radiation? **(2020)**

(1) Mass number increases by four and atomic number increases by two.
(2) Mass number decreases by four and atomic number decreases by two.
(3) Mass number and atomic number remain unchanged.
(4) Mass number remains unchanged while atomic number decreases by one.

Answer (3)

257. The wave nature of electrons was experimentally verified by, **(2020)**

(1) Davisson and Germer (2) de Broglie
(3) Hertz (4) Einstein

Answer (1)

258. A radioactive nucleus ${}^{A}_{Z}X$ undergoes spontaneous decay in the sequence ${}^{A}_{Z}X \rightarrow_{z-1} B \rightarrow_{z-3} C \rightarrow_{z-2} D$, where Z is the atomic number of element *X*. The possible decay particles in the sequence are **(2021)**

(1) β^-, α, β^+ (2) α, β^-, β^+
(3) α, β^+, β^- (4) β^+, α, β^-

${}^{A}_{Z}X$ எனும் ஒரு கதிரியக்க அணுக்கரு அடையக்கூடிய தன்னியல்பு சிதைவின் வரிசை முறை, ${}^{A}_{Z}X \rightarrow_{z-1} B \rightarrow_{z-3} C \rightarrow_{z-2} D$, இங்கு Z என்பது X தனிமத்தின் அணு எண் ஆகும். இந்த வரிசை முறையில் நிகழக்கூடிய சிதைவு துகள்கள் என்பன முறையே:

(1) β^-, α, β^+ (2) α, β^-, β^+
(3) α, β^+, β^- (4) β^+, α, β^-

Answer (4)

259. A nucleus with mass number 240 breaks into two fragments each of mass number 120, the binding energy per nucleon of unfragmented nuclei is 7.6 MeV while that of fragments is 8.5 MeV. The total gain in the Binding Energy in the process is **(2021)**

(1) 216 MeV (2) 0.9 MeV
(3) 9.4 MeV (4) 804 MeV

240 நிறை எண் கொண்டதொரு அணுக்கரு, தனித்து 120 நிறை எண் கொண்ட இரு துண்டுகளாக உடைகிறது. பிளவடையாத அணுக்கருக்களின் ஓரலகு நியூக்ளியானது பிணைப்பாற்றல் 7.6 MeV மற்றும் துண்டுகளது மதிப்பு, 8.5 MeV ஆகும். இந்நிகழ்வில் பிணைப்பாற்றலின் மொத்தப் பெருக்கம் என்பது:

(1) 216 MeV (2) 0.9 MeV
(3) 9.4 MeV (4) 804 MeV

Answer (1)

260. The half-life of a radioactive nuclide is 100 hours. The fraction of original activity that will remain after 150 hours would be **(2021)**

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

ஒரு கதிரியக்க அணுக்கருவின் அரை-ஆயுட் காலம் 100 மணி நேரமாக உள்ளது. 150 மணி நேரத்திற்குப் பிறகு அதன் தொடக்கச் செயலாக்கத்தின் பின்னமென்பது:

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

Answer (3)

261. In the given nuclear reaction, the element *X* is ${}^{22}_{11}\text{Na} \rightarrow X + e^+ + \nu$ **(2022)**

(1) ${}^{22}_{10}\text{Ne}$ (2) ${}^{22}_{12}\text{Mg}$
(3) ${}^{23}_{11}\text{Na}$ (4) ${}^{23}_{10}\text{Ne}$

Answer (1)

262. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atoms, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is **(2022)**

(1) 4 : 9 (2) 9 : 4
(3) 1 : 4 (4) 4 : 1

Answer (2)

263. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is **(2022)**

(1) 5 : 4 (2) 25 : 16
(3) 1 : 1 (4) 4 : 5

Answer (1)

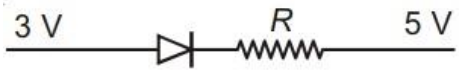
1219. Electronic Devices

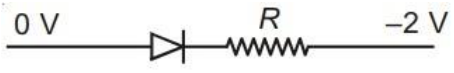
264. In a common emitter transistor amplifier the audio signal voltage across the collector is 3 V. The resistance of collector is 3 kΩ. If current gain is 100 and the base resistance is 2 kΩ, the voltage and power gain of the amplifier is **(2017)**

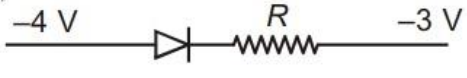
(1) 20 and 2000 (2) 200 and 1000
(3) 15 and 200 (4) 150 and 15000

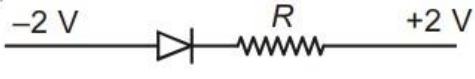
Answer (4)

265. Which one of the following represents forward bias diode? **(2017)**

(1) 

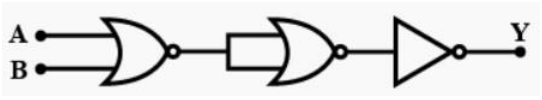
(2) 

(3) 

(4) 

Answer (2)

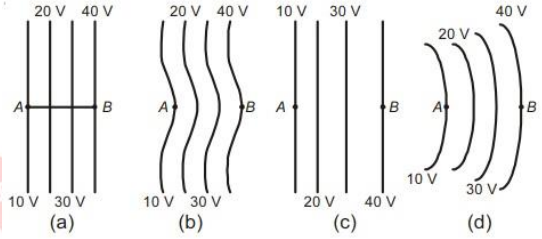
266. The given electrical network is equivalent to **(2017)**



(1) NOT gate (2) AND gate
(3) OR gate (4) NOR gate

Answer (4)

267. The diagrams below show regions of equipotentials. **(2017)**

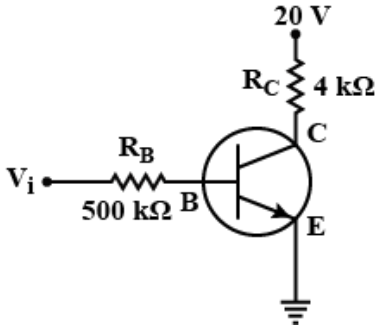


A positive charge is moved from A to B in each diagram.

(1) Maximum work is required to move q in figure (b).
(2) Maximum work is required to move q in figure (c).
(3) In all the four cases the work done is the same.
(4) Minimum work is required to move q in figure (a).

Answer (3)

268. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B, I_C, and β are given by **(2018)**



(1) I_B = 20 μA, I_C = 5 mA, β = 250

(2) I_B = 25 μA, I_C = 5 mA, β = 200

(3) I_B = 40 μA, I_C = 10 mA, β = 250

(4) I_B = 40 μA, I_C = 5 mA, β = 125

Answer (4)

269. In a p-n junction diode, change in temperature due to heating **(2018)**

(1) does not affect resistance of p-n junction

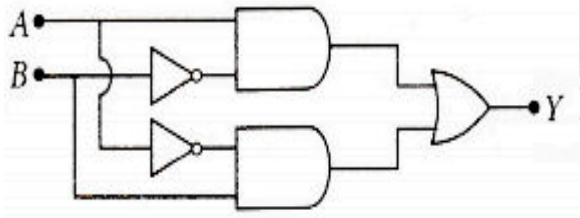
(2) affects only forward resistance

(3) affects only reverse resistance

(4) affects the overall V – I characteristics of p-n junction

Answer (4)

270. In the combination of the following gates the output Y can be written in terms of inputs A and B as **(2018)**



(1) $\overline{A.B} + A.B$ (2) $A.\bar{B} + \bar{A}.B$

(3) $\overline{A.B}$ (4) $\overline{A+B}$

Answer (2)

271. For a p-type semiconductor, which of the following statements is true? **(2019)**

(1) Electrons are the majority carriers and trivalent atoms are the dopants.

(2) Holes are the majority carriers and trivalent atoms are the dopants.

(3) Holes are the majority carriers and pentavalent atoms are the dopants.

(4) Electrons are the majority carriers and pentavalent atoms are the dopants.

Answer (2)

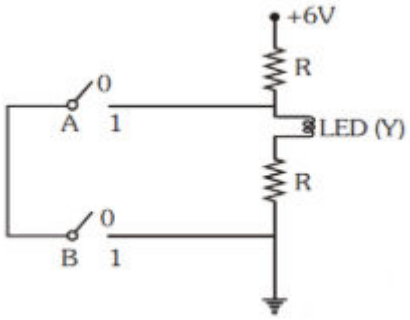
272. Which of the following acts as a circuit protection device? **(2019)**

(1) conductor (2) inductor

(3) switch (4) fuse

Answer (4)

273. The correct Boolean operation represented by the circuit diagram drawn in **(2019)**



(1) AND (2) OR

(3) NAND (4) NOR

Answer (3)

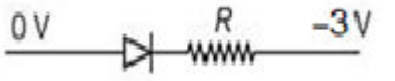
274. An intrinsic semiconductor is converted into n-type extrinsic semiconductor by doping it with **(2020)**

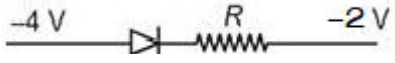
(1) Germanium (2) Phosphorous

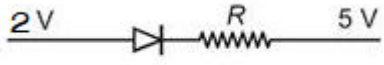
(3) Aluminium (4) Silver

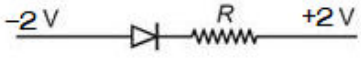
Answer (2)

275. Out of the following which one is a forward biased diode? **(2017)**

(1)


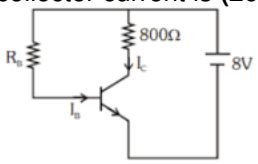
(2)


(3)


(4)


Answer (1)

276. A n-p-n transistor is connected in common emitter configuration (see figure) in which collector voltage drop across load resistance (800 Ω) connected to the collector circuit is 0.8V. The collector current is **(2020)**



(1) 0.2 mA (2) 2 mA
(3) 0.1 mA (4) 1 mA
Answer (4)

277. Which of the following gate is called universal gate? **(2020)**
(1) NOT gate (2) OR gate
(3) AND gate (4) NAND gate
Answer (4)

278. The electron concentration in an *n*-type semiconductor is the same as hole concentration in a *p*-type semiconductor. An external field (electric) is applied across each of them. Compare the currents in them. **(2021)**
(1) No current will flow in *p*-type, current will only flow in *n*-type
(2) Current in *n*-type = current in *p*-type
(3) Current in *p*-type > current in *n*-type
(4) Current in *n*-type > current in *p*-type.

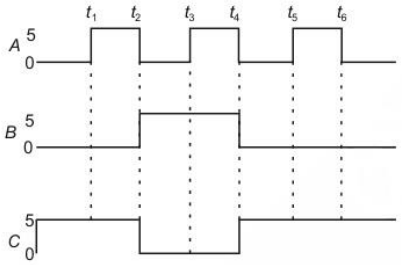
ஒரு *n*-வகை குறைகடத்தியினது எலெக்டிரான் செறிவு என்பது ஒரு *p*-வகை குறைகடத்தியினது துளை செறிவுக்குச் சமமாக உள்ளது. அவற்றின் ஒவ்வொன்றுக்குக் குறுக்கே, ஒரு புறப்பலம் (மின்) அளிக்கப்படுகிறது. அவற்றில் உள்ள மின்னோட்டங்களை ஒப்பிடுக.
(1) *p* – வகையில் மின்னோட்டம் பாயாது, *n*-வகையில் மட்டும் மின்னோட்டம் பாயும்.
(2) *n* – வகையில் உள்ள மின்னோட்டம் = *p*-வகையில் மட்டும் மின்னோட்டம்.
(3) *p* – வகையில் மின்னோட்டம் > *n*- வகையில் உள்ள மின்னோட்டம்.
(4) *n* – வகையில் உள்ள மின்னோட்டம் > *p*-வகையில் உள்ள மின்னோட்டம்.
Answer (4)

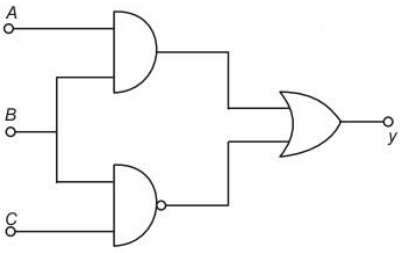
279. Consider the following **statements (A)** and **(B)** and identify the correct answer. **(2021)**
(A) : A zener diode is connected in reverse bias, when used as a voltage regulator.
(B) : The potential barrier of *p-n* junction lies between 0.1 V to 0.3 V.
(1) (A) is incorrect but (B) is correct.
(2) (A) and (B) both are correct.
(3) (A) and (B) both are incorrect.
(4) (A) is correct and (B) is incorrect.

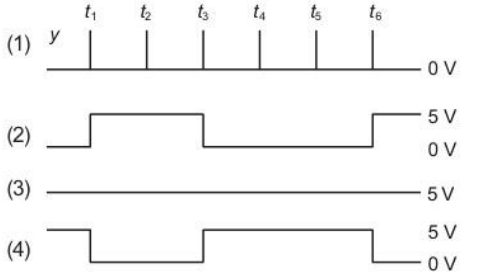
(A) மற்றும் (B) ஆகிய பின்வரும் கூற்றுகளைக் கருதி, சரியான விடையினை கண்டறிக.
(A):மின்னழுத்த ஒழுங்கிசைவு இயந்திரம் இயக்கப்படும் போது ஒரு ஜீனர் டயோடு பின்னோர்க்குச் சார்பில் இணைக்கப்படும்.
(B):p-n சந்தியினது மின்னழுத்த அரண் 0.1 V லிருந்து 0.3 V க்கு இடையில் அமையும்.
(1) (A) என்பது சரியற்றது ஆனால் (B) என்பது சரியானது.
(2) (A) மற்றும் (B) ஆகிய இரண்டும் சரியானவை.
(3) (A) மற்றும் (B) ஆகிய இரண்டும் சரியற்றவை.
(4) (A) என்பது சரியானது மற்றும் (B) என்பது சரியற்றது.
Answer (4)

280. For the given circuit, the input digital signals are applied at the terminals *A*, *B* and *C*. What would be the output at the terminal '*y*'? **(2021)**

கொடுக்கப்பட்டுள்ள மின்சுற்றிற்கு, A, B மற்றும் C ஆகிய மின்முனைகளில் எண்ணிலக்க உள்ளீட்டு சைகைகள் அளிக்கப்படுகின்றன. '*y*' மின் முனையில் அமையப் பெறும் வெளியீடு யாது?

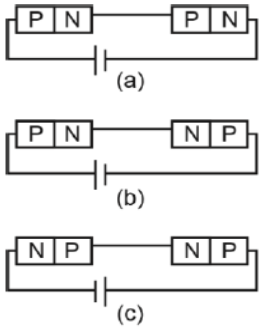






Answer (3)

281. In the given circuits (a), (b) and (c), the potential drop across the two *p-n* junctions are equal in **(2022)**



(1) Circuit (c) only

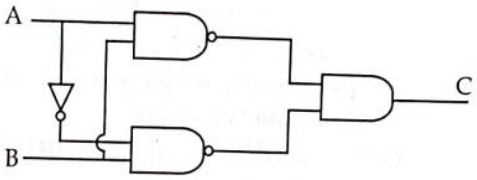
(2) Both circuits (a) and (c)

(3) Circuit (a) only

(4) Circuit (b) only

Answer (2)

282. The truth table for the given logic circuit is **(2022)**



(1)

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

(3)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(4)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

Answer (1)