



PHYSICS

BOOKS - SARAS PUBLICATION

MODEL QUESTION PAPER 4

Exercise

1. The p-type semiconductor is

- A. positively charged
- B. negatively charged

C. electrically neutral

D. uncharged at 0 K or- $273^{\circ}C$ but charged at temperature higher than 0 K.

Answer:



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2. Use Moseley's law with $b = 1$ to find the frequency of the K_{α} X-ray of $La(Z = 57)$ if the frequency of the K_{α} X-ray of $Cu(Z = 29)$ is known to be 1.88×10^{18} Hz.

$$A. V_{K_{\beta}} = V_{K_{\alpha}} + V_{L_{\alpha}}$$

B. $V_{K\beta} = V_{K\alpha} - V_{L\alpha}$

C. $V_{K\beta} = V_{K\alpha} / V_{L\alpha}$

D. $V^2 - (K_\beta) = V_{K\alpha} \cdot V_{L\alpha}$

Answer:



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3. A particle moving in a circular path of certain radius, with uniform angular velocity ω has an angular acceleration equal to :

A. $\lambda\omega^2 / 2 - \mu_0$

B. $\mu_0\lambda^2\omega / \sqrt{2}$

C. $\mu_0 \lambda \omega / 2$

D. $\mu_0 \lambda / 2\omega^2$

Answer:



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4. The de- Broglie wavelength of neutrons in thermal equilibrium at temperature T is:

A. 275K

B. 193k

C. 305 K

D. 360k

Answer:



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5. A spider of mass 50 g is hanging on a string of a cob web as what is the tension in the string

A. 101N

B. 12.5N

C. 5N

D. 15 N

Answer:



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6. A boy of mass 25 kg stands on a board of mass 10 kg which in turn is kept on a frictionless horizontal ice surface. The boy makes a jump with a velocity component 5m/s in a horizontal direction with respect to the ice. With what velocity does the board recoil? With what rate are the boy and the board separate from each other?

A. $2\text{m} / \text{s}$

B. $\sqrt{5}\text{m} / \text{s}$

C. $0.5\sqrt{2}m / s$

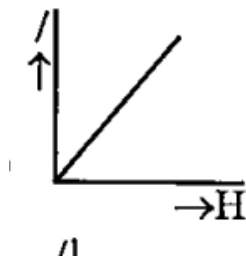
D. $10\sqrt{2}m / s$

Answer:

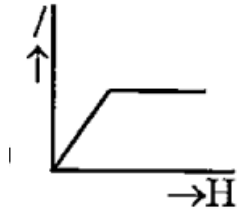
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7. Draw the magnetic field lines for a bar magnet.

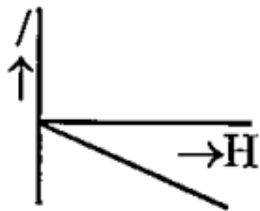
A.



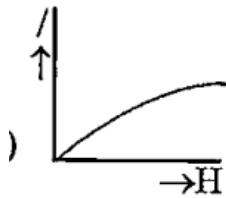
B.



C.



D.



Answer:



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8. A capacitor of capacitance $100\mu F$ is charged by connecting it to a battery of voltage 12 V with internal resistance 2Ω . The time after which 99% of the maximum charge is stored on the capacitor is

A. 0.92 ms

B. 0.72 ms

C. 0.34 ms

D. 0.54 ms

Answer:



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9. Three particles of masses $m_1 = 1kg$, $m_2 = 2kg$ and $m_2 = 3kg$ are placed at the corners of an equilateral triangle of side 1m as shown in Figure. Find the position of center of mass.

A. (15, 35)

B. (13,15)

C. (35, 15)

D. (30, 15)

Answer:



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10. A body is projected upwards with a velocity of 30m s^{-1} at an angle of 30° with the horizontal .
Determine .

the maximum height attained by the body .

A. 120 m

B. 260 m

C. 300 m

D. 240 m

Answer:



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11. A particle is moving with a constant velocity along a line parallel to positive X-axis. The magnitude of its angular momentum with respect of the origin is

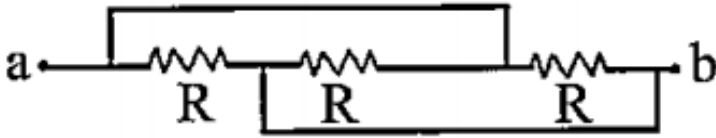
- A. is zero
- B. remains constant
- C. goes on increasing
- D. goes on decreasing

Answer:



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12. Consider the combination of resistor



The

equivalent resistance between a and b is

- A. $R/6$
- B. $2R/3$
- C. $R/3$
- D. $3R$

Answer:



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13. Match the following:

- | | | |
|-----------------|---|---|
| 1. Carbohydrate | - | a) Carrying out various biochemical reactions |
| 2. Proteins | - | b) Regulation of normal body function |
| 3. Vitamins | - | c) energy giving component |
| 4. Minerals | - | d) Body building food |

A. $\epsilon_0 t V^2 / 2dL$

B. $\epsilon_0 t V^2 / 2dL [X + 1]$

C. $\epsilon_0 t V^2 / 2d [L + X(k - 1)]$

D. $\epsilon_0^2 t^2 V^2 / 2d^2 [L^2 + x + 1]$

Answer:



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14. If the electric field lines is flowing along axis of a cylinder, then the flux of this field through the cylindrical surface with the axis parallel to the field is
[r = radius of cylinder]

A. $\sigma / 2\pi r \epsilon_0$

B. σ / ϵ_0

C. zero

D. $\sigma / 2\epsilon_0$

Answer:



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15. The electric field vector through a region is given

by $E = \frac{D}{X^4} \hat{i}$ where, $x = \text{length}$ and $D = \text{constant}$. The

unit (SI) of D is

A. Nm^4C^{-1}

B. Nm^3C^{-1}

C. $Nm^{-4}C^{-1}$

D. Vm^{-2}

Answer:



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16. When a dielectric slab is gradually inserted between the plates of an isolated parallel-plate capacitor, the energy of the system decreases. What can you conclude about the force on the slab exerted by the electric field?

A. eEV_0/m_e

B. $eEL/m_e \cdot V_0$

C. zero

D. $eEL/\sqrt{m_e V_0}$

Answer:



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17. A black body with surface area 0.001m^2 is heated upto a temperature 400 K and is suspended in a room temperature 300 K. The initial rate of loss of heat from the body to room is

A. 10 W

B. 1W

C. 0.1 W

D. 0.5W

Answer:



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18. A gas with $\gamma = 1.4$ undergoes the adiabatic process of compression, if the pressure is increased by 0.5%, then the volume decreases by (about)

- A. 0.36%
- B. 0.001%
- C. 0.01%
- D. 0.005%

Answer:



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19. Identify the reducing sugar.

- A. temperature of the surface of a body
- B. The heat of a body
- C. the calorific value of fuel
- D. the heat transferred to a body

Answer:



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20. The deviation of a real gas from the ideal one is minimum at

- A. low pressure and high temperature
- B. low temperature and low pressure
- C. high pressure and low temperature
- D. high pressure and high temperature

Answer:

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21. A parallel plate capacitor is charge upto a magnitude Q in time t while the current supplied by power source is 1 . If the plates area is A and if a plane surface having area $A/2$ is constructed parallel to

the plates and symmetrically between the plates, then the displacement current through this area is

A. $Q/2\epsilon_0$

B. $2I$

C. $I/2$

D. $2I/3$

Answer:



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22. The electric vector vibration of an electromagnetic wave is given by

$E = (50NC^{-1})\sin \omega, (t - x/c)$ The intensity of the wave is

A. $2.3Wm^{-2}$

B. $4.3Wm^{-2}$

C. $3.3Wm^{-2}$

D. $1.8Wm^{-2}$

Answer:

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23. Paschen found that the sparking potential of a gas in a discharge tube is the function of the product

of

A. pressure of the gas and separation between the plates

B. squared pressure and plate distance

C. squared pressure and squared plate distance

D. pressure of the gas and reciprocal of distance between the plates

Answer:



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24. An inductor coil is connected to a 12 V battery and drawing a current 24 A, This coil is connected to capacitor and an AC source of rms voltage rating 24 V in the series connection. The phase difference between current and emf is zero. Therms current through the circuit would found to be

A. 48A

B. 36A

C. 12A

D. 24A

Answer:



25. A galvanometer of resistance 50Ω gives a full scale deflection for a current $5 \times 10^{-4} A$. The resistance that should be connected in series with the galvanometer to read 3 V is:

- A. 0.15 ohm
- B. 25 ohm
- C. 0.55 ohm
- D. 0.25 ohm

Answer:



26. A bar magnet with magnetic moment $2.5 \times 10^3 \text{ JT}^{-1}$ is rotating in horizontal plane in the space containing magnetic induction $B = 4 \times 10^{-5} \text{ T}$. The work done in rotating the magnet slowly from a direction parallel to the field to a direction 45° from the field, is (in joule)

A. 0.07

B. 0.2

C. 0.03

D. 0.02

Answer:



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27. A beam of protons with a velocity of $4 \times 10^5 \text{ m s}^{-1}$ enters a uniform magnetic field of 0.3 T. The velocity makes an angle of 60° with the magnetic field. Find the radius of the helical path taken by the proton beam.

A. $3.7 \times 10^{-3} \text{ m}$

B. $5.4 \times 10^{-3} \text{ m}$

C. $7.6 \times 10^{-2} \text{ m}$

$$D. 6.9 \times 10^{-2}m$$

Answer:



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28. By sucking through a straw, a student can reduce the pressure in his lungs to 750 mm of Hg (density = $13.6gcm^{-2}$). Using the straw, he can drink water from a glass upto a maximum depth of.

A. 10 .2 cm

B. 75.3cm

C. 13.6 cm

D. 1. 96cm

Answer:



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29. A substance having coefficient of critical expansion $4.9 \times 10^{-40} C^{-1}$. The fractional change in the density for the rise in temperature 30 K is

A. 0.0012

B. 0.128

C. 0.0235

D. 0.0145

Answer:



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30. Water is boiled in flat bottom kettle placed in a stove. The area of the bottom is 3000cm^2 and the thickness is 2 mm. If the amount of steam produced is 1g min^{-1} . Then, the difference of temperature between inner and outer surfaces of the bottom is $[K, f \text{ or } \text{thematerialofke} \leq \text{is} 0.5\text{cal}^0\text{C}^{-1}\text{s}^{-1}\text{1cm}^{-1}]$

A. $0.12 \times 10^{-5} K$

B. $1.9 \times 10^{-3} K$

C. $1.3 \times 10^{-40} C$

D. $1.2 \times 10^{-3} K$

Answer:



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31. If 1000 drops are combined to form a larger drop, then the ratio of surface energy of smaller drop to the larger drop will be

A. 1 : 100

B. 1 : 1000

C. 1 : 10

D. 1:1

Answer:



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32. A solid floats such that its $1/4$ part is above the water surface. Then, the density of solid is

A. 750kgm^{-3}

B. $1000 / 3 \text{kgm}^{-3}$

C. $2000 / 3 \text{kgm}^{-3}$

D. 910kgm^{-3}

Answer:



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33. A potentiometer wire of length 100 cm has a resistance of 10Ω . It is connected in series with a resistance and a cell of emf 2V having negligible internal resistance. A source of emf 10 mV is balanced against a length of 40 cm of the potentiometer wire. The value of external resistance is

A. 760Ω

B. 640Ω

C. 790Ω

D. 840Ω

Answer:



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34. A hollow sphere is filled with water . It is hung by a long thread . As the water flows out of a hole at the bottom , the period of oscillation will

- A. It will go on increasing till the sphere is empty
- B. It will go on decreasing till the sphere is empty
- C. It will not be affected at all
- D. It will firstly increase, then decrease till the sphere is empty

Answer:



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35. A ray enters a glass sphere of refractive index $\mu = \sqrt{3}$ at an angle of incidence of 60° , a ray is reflected and refracted at the farther surface of the sphere. The angle between the reflected and refracted rays at this surface is

A. 50°

B. 60°

C. 90°

D. 40°

Answer:



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36. A wire having linear mass density $9 \times 10^{-3} \text{ kg/m}$ is stretched between two clamps 1 m apart and is subjected to an extension of $4.9 \times 10^{-4} \text{ m}$. The lowest frequency of wave produced in the wire is

$$\left(Y = 9 \times 10^{10} \frac{\text{N}}{\text{m}^2} \right)$$

A. 47 Hz

B. 42 Hz

C. 35 Hz

D. 37 Hz

Answer:



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37. A sound source is approaching the listener. The frequency of sound is 100 cps while passing through the listener, it is 50 cps. The frequency when the observer moves with the source is

A. 77.3 Hz

B. 66.67 Hz

C. 63.33 Hz

D. 133.3 Hz

Answer:



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38. The parallel beams of monochromatic light of wavelength $4.5 \times 10^{-7} m$ passes through a long slit with width $0.2 \times 10^{-3} m$. The angular divergence in which most of the light is

A. $4.5 \times 10^{-3} rad$

B. 45 rad

C. $2.25 \times 10^{-3} \text{ rad}$

D. $9.0 \times 10^{-3} \text{ rad}$

Answer:



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39. When sound wave is refracted from air to water, which of following will remain unchanged ?

A. Wave number

B. Wave length

C. Frequency

D. Wave velocity

Answer:



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40. The velocity of image when object and mirror both are moving towards each other with velocities 4m s^{-1} and 5m s^{-1} respectively, is

A. -14m s^{-1}

B. -15m s^{-1}

C. -9m s^{-1}

D. 14m s^{-1}

Answer:



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41. It $\mu_v = 1.5230$ and $\mu_R = 1.5145$, then dispersive power of a crown glass is

A. 0.0164

B. 0.00701

C. 0.0132

D. 0.032

Answer:



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42. The kinetic energy of α -particle emitted in the α -decay of ${}_{88}\text{Ra}^{226}$ is [Given, mass number Ra = 222u]

A. 5.201 MeV

B. 3,301 MeV

C. 6.023 MeV

D. 4.871 MeV

Answer:

