**Subject :** PCM

**Topic :** Physics

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**Q1 :** Unit used to represent nuclear diameter is

**A** nm

**B** Fermi

**C** $\mu$m

**D** Å

**Q2 :** By measuring a physical parameter in your experiment several times and then taking the average, you improve your result by reducing

**A** Random error

**B** Systematic error

**C** Least count error

**D** Constant error

**Q3 :** If $|\vec{A}| = 5$ , $|\vec{B}| = 2$ , and $\vec{A} \times \vec{B} = -3\hat{k} + 4\hat{\imath}$. The angle between $\vec{A}$ and $\vec{B}$ is

**A** $45^0$

**B** $60^0$

**C** $30^0$

**D** $90^0$

**Q4 :** A ball is dropped from a height of 125 m on a floor. At each collision with the floor, the ball loses one-tenth of its speed. The time taken by the ball to reach maximum height after first rebound is (given g=10 m/s$^2$)

| | |
|---|---|
| **A** | 5 s |

**B** 4.5 s

**C** 0.5 s

**D** 9.5 s

**Q5 :** A projectile is following $y = \frac{1}{\sqrt{3}}x - \frac{1}{375}x^2$ (take g = 10 m/s$^2$) The initial velocity of the projectile is

**A** 20 m/s

**B** 40 m/s

**C** 50 m/s

**D** 100 m/s

**Q6 :** An airplane takes off at sea level and climbs to a height of 500 m. The net outward force on a passenger's eardrum assuming the density of air is approximately constant at 1.3 kg/m$^3$ and that the inner ear pressure hasn't been equalized (take area of an eardrum as 1 square cm; g=10 m/s$^2$).

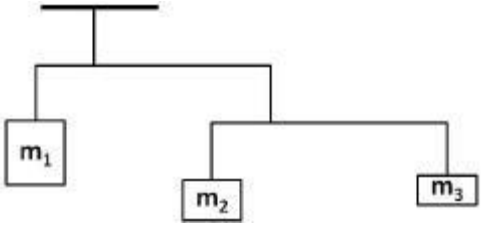
**A** 0.65 N

**B** 6.5 N

**C** 65 N

**D** 0.065 N

**Q7 :** Three masses are hanging from a ceiling shown in figure. Each crossbar is horizontal, has negligible
mass, and extends three times as far to the right of the wire supporting to it to the left. The mass of
$m_1$ = 12 kg. The mass of $m_2$ would be




| | |
|---|---|
| **A** | 1 kg |
| **B** | 2 kg |
| **C** | 3 kg |
| **D** | 4 kg |

**Q8 :** The inclined plane with inclination of $\theta = 30^0$ have first quarter from the top smooth surface and the
remaining is rough surface. A block starting from rest at the top and come to the rest at the bottom.
The coeffcient of friction for the rough would be

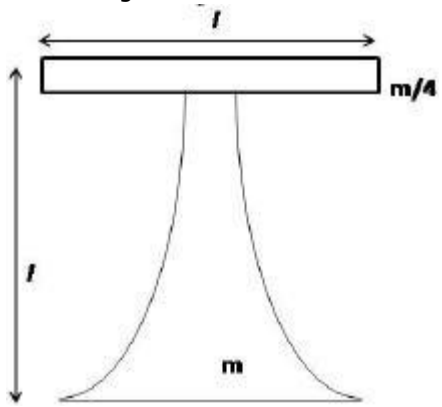
**A** $\frac{4}{3\sqrt{3}}$

**B** $\frac{3}{4}$

**C** $\frac{4}{3}$

**D** $\frac{\sqrt{3}}{4}$

**Q9 :** `T' shaped structure shown in figure with different mass and same length. The linear mass density of
top block is constant whereas of the base increases quadratically. Where would be the center of mass
from the ground level




**A** *3l/4*

**B** *l/4*

**C** *3l/5*

**D** *2l/5*

**Q10 :** A force F (in N)= $4\hat{\imath} + 3\hat{\jmath}$ is applied on a stationary object of mass 2 kg. The distance of the object after 2 s will be

| | |
|---|---|
| **A** | 3 m |

**B** 4 m

**C** 5 m

**D** 9 m

**Q11 :** The output of an AND gate with three inputs, A, B, and C, is HIGH when

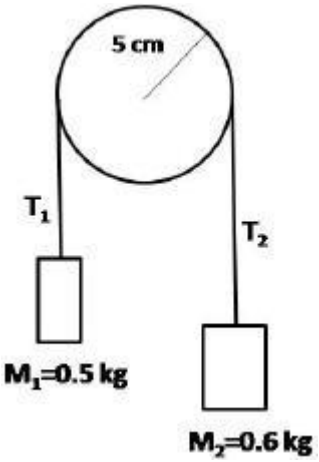
**A** A=1, B=0, C=0

**B** A=1, B=1, C=0

**C** A=1, B=1, C=1

**D** A=1, B=0, C=1

**Q12 :** Two different masses are attached with a string on a pulley (shown in the figure). The mass $m_2$ falls 75 cm in 5 s. What is the tension $T_1$ (take g=9.8 $m/s^2$)




**A** 4.93 N

**B** 4.79 N

**C** 5.88 N

**D** 5.84 N

**Q13 :** The acceleration of a particle is given by $a_x(t)= -2 + 3t$ (in SI unit). What would be the initial velocity (m/s) such that the particle will be having same x-coordinate at $t$ = 4 s as it had at $t$ = 0 s.

| | |
|---|---|
| **A** | 0 |
| **B** | -2 |

| | |
|---|---|
| **C** | -4 |
| **D** | -8 |

**Q14 :** A pendulum having mass 2 kg stone swinging on 4.0 m long massless string. The speed at the lowest point is 7m/s. The speed at a height when the string is at $60^0$ to the vertical (g=10 $m/s^2$)

**A** 3

**B** 5

**C** 7

**D** 8

**Q15 :** Two living insects, each of mass 'm' rides on a horizontal disk of mass `5 m' and radius `R'. The disk rotates around its vertical symmetric axis at an angular speed 7 rad/s. The insects are initially at 'R/2' from the the center of the axis of rotation but one crawls to the center and other out to the rim of the disk. The final angular momentum (rad/s) will be

**A** 7

**B** 6

**C** 5

**D** 4

**Q16 :** The value of temperature co-efficient of a material which is used in precision wire-wound resistors

**A** -5Ω/°C

**B** 0Ω/°C

**C** 5 /°C

**D** 100Ω/°C

**Q17 :** The minimum voltage required for producing K-line in the Lead (Pb) is 90 kV and corresponding K-absorption edge is 0.15Å. The ratio *h/e* (in SI unit) will be

| | |
|---|---|
| **A** | 13.5 X $10^{-15}$ |

**B** $1.5 \times 10^{-15}$

**C** $4.5 \times 10^{-15}$

**D** $3.0 \times 10^{-15}$

**Q18 :** The Carnot engine operate between temperature 127 $^0$C and 27 $^0$C. The effciency of the engine is

**A** 75%

**B** 25%

**C** 79%

**D** 21%

**Q19 :** Water storage tank (radius of 0.25 m) is filled 2.1 m deep and sealed from top. The space above water surface contains air having pressure 1.5 times the atmospheric pressure. Water flows out from the bottom through a narrow pipe with radius 0.7 cm. The volume flow rate (l/s) will be (given g=10 m/s$^2$)

**A** 1.85

**B** 12

**C** 1.54

**D** 1.2

**Q20 :** The fringe width 0.3 mm is estimated using Sodium light ($\lambda$= 5890 $\text{Å}$) in biprism experiment. On introducing a thin glass of refractive index 1.5 in half of the beam the central fringe shifted by 2.1 mm. The thickness (in $\mu$m) of the glass sheet is

**A** 16.5

**B** 8.25

**C** 4.1

**D** 2.06

**Q21 :** A single slit of width 2 $\mu$m is illuminated by light of wavelength 600 nm. The approximate angular spread (in radian) of the central maxima of diffraction pattern will be

| | |
|---|---|
| **A** | 0.3 |

**B** 0.6

**C** 1.2

**D** 2.4

**Q22 :** The human eye is most sensitive to light of wavelength 600 nm. The separation between two points on the moon that can be resolved by a telescope of 1m objective lens aperture will be (the distance of the moon is 5 X $10^5$ km)

**A** 100 m

**B** 122 m

**C** 244 m

**D** 366 m

**Q23 :** The reflected light from a surface whose refractive index is 1.732 completely polarized. The angle of refraction would be

**A** $30^0$

**B** $60^0$

**C** $90^0$

**D** $45^0$

**Q24 :** A particle of mass 200 g is placed in a field of potential U(ergs)= $\alpha x^2 + 5$ , oscillates with angular frequency of 2 rad/s. The constant $\alpha$ (dyne/$cm^2$) is

**A** 100

**B** 200

**C** 300

**D** 400

**Q25 :** The electric field of an EM wave is given by $\vec{E}(z,t) = 15\sqrt{2}\sin[2\pi(1.67 \times 10^6 z - 5 \times 10^{14} t)]\,(\hat{i}+\hat{j})$ (N/C).
The maximum amplitude of the magnetic field (in T) is

| | |
|---|---|
| **A** | 1 X $10^{-7}$ |

**B** $5 \times 10^{-7}$

**C** $7.07 \times 10^{-7}$

**D** $5\sqrt{2} \times 10^{-7}$

**Q26 :** The speed of voltage wave in an electrical circuit containing inductance per unit length ($L_0$) and conductance per unit length ($C_0$)is

**A** $1/\sqrt{L_0 \cdot C_0}$

**B** $\sqrt{L_0/C_0}$

**C** $\sqrt{C_0/L_0}$

**D** $\sqrt{L_0 \cdot C_0}$

**Q27 :** A point charge of 53.5 $\mu$C is enclosed at the center of the cube of side 6 cm. The electric flux (in SI unit) through one face of the cube will be ($\varepsilon_0$ = 8.85 X $10^{-12}$ SI unit)

**A** $1 \times 10^{6}$

**B** $2 \times 10^{6}$

**C** $3 \times 10^{6}$

**D** $4 \times 10^{6}$

**Q28 :** Half-life of an element is 12 Hrs. How long does it take for 93.75% of this sample to decay

**A** 24 Hrs

**B** 36 Hrs

**C** 48 Hrs

**D** 72 Hrs

**Q29 :** Two closed organ pipe sounded simultaneously gives 5 beats/s between the fundamental. If shorter organ pipe is 1 m long , the length (in m) of the longer pipe will be (Take speed of sound = 340 m/s)

**A** 1.16

**B** 1.10

**C** 1.06

**D** 1.01

**Q30 :** The lattice constant 'a' of a substance having `fcc' lattice ($M_w$=60.23 and density 400 kg/$m^3$;$N_A$ = 6:023 X $10^{23}$)

**A** 5Å

**B** 10Å

**C** 20Å

**D** 40Å

**Q31 :** The packing fraction of diamond crystal which has double fcc structure is

**A** 74%

**B** 68%

**C** 52%

**D** 34%

**Q32 :** Two identical pith balls are charged by rubbing against each other. The charge on each ball has a magnitude 2.0X$10^{-8}$ C.They are suspended from a horizontal rod through two strings of length 10cm each, the separation between the suspension points being 15 cm. In equilibrium, the separation between the balls is 3 cm. The tension in the string will be ($1/4\pi\varepsilon_0$ = 9 X $10^9$SI unit)

**A** 0.67 X $10^{-2}$ N

**B** 0.33 X $10^{-2}$ N

**C** 0.9 X $10^{-2}$ N

**D** 0.1 X $10^{-2}$ N

**Q33 :** A wire is bent in the form of a regular hexagon of each side 2 m and a total charge q is distributed uniformly on it. The electric field at the centre is

**A** 0

**B** 6 $q/\varepsilon_0$

**C** 3 $q/\varepsilon_0$

**D** 0.25 $q/\varepsilon_0$

**Q34 :** A cylindrical capacitor is constructed using two coaxial cylinders of the same length 18ln 2 cm and of radii 2 mm and 4 mm. The capacitance.

**A** 10 p**F**

**B** 100 p**F**

**C** 1 p**F**

**D** 0.1 p**F**

**Q35 :** Protons of mass `m' having kinetic energy `K' emerge from an accelerator as a narrow beam. The beam is bent by a perpendicular magnetic field so that it just misses a plane target kept at a distance
`l' in front of the accelerator. The magnetic field will be

**A** $\sqrt{2mK}/ql$

**B** $2\sqrt{mK}/ql$

**C** $\sqrt{2K}/mql$

**D** $\sqrt{mK}/2ql$

**Q36 :** A planet is 2 times more massive than the Earth and its radius is 2 times smaller. The escape velocity
from the surface of the planet would be (given, escape velocity from the Earth surface is 11.2 km/s)

**A** 5.6

**B** 11.2

**C** 22.4

**D** 11.2 $\sqrt{2}$

**Q37 :** A transformer has 50 turns in the primary and 100 in the secondary. If the primary is connected to a 220 V DC supply. The voltage across the secondary will be

**A** 0 V

**B** 440 V

**C** 110 V

**D** 1100 V

**Q38** A coil has a resistance of 10$\Omega$ and an inductance of 0.4 Henry. It is connected to an AC source of

: 6.5V, $30/\pi$ Hz. Find the average power (in W) consumed in the circuit

**A** 1.625

**B** 2.82

**C** 1.82

**D** 0.625

**Q39 :** A student in Biology lab leaves the door open of the freezer which has 5 kg ice at -80$^0$C.After few hrs all ice melted to water and temperature reads 20 $^0$C.How much heat must be absorbed by the ice (Specific heat of ice=2200 J/kg-K; heat of fusion=350kJ/kg, and specific heat of liquid water=4200 J/kg-K)

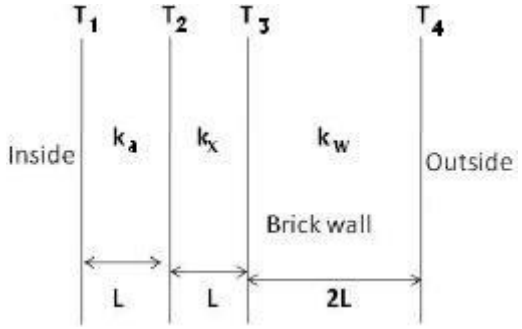
**A** 3050 kJ

**B** 1300 kJ

**C** 2170 kJ

**D** 2630 kJ

**Q40 :** The thermostat was set at 200C in a house in Canada where outside temperature is -400C.The wall of the house has three layers with different thickness and conductivity shown in figure.The conductivity of brick layer (kw) is five times the plywood layer (ka ).The thermal conduction through the wall has reached the steady state. If $T_2$ = 15$^0$C then temperature $T_3$ will be




**A** -38$^0$C

**B** -35$^0$C

**C** -30$^0$C

**D** -33$^0$C