PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 15

Paper 1 Physics Chemistry

1. A point mass of 2 kg tied to a string of 1 m length is rotated in a vertical circle with

uniform speed of 4m/s. The tension in the string is nearly 32 N when mass is at

A. botton

B. mid- way

C. highest point

D. between bottom and mid way

Answer: A

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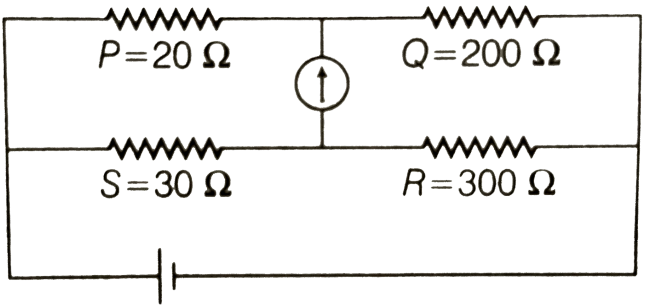
2. Figure below shows a balanced Wheat stone's network. If it is distributed by changing P to 22 Ω, then which of the following steps will bring the bridge to balance again ?



A. increasing S by 3Ω

B. increasing Q by 20 Ω

C. Both (a) and (b)

D. increasing R by 50Ω

Answer: C

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3. A breaker contains water, up to a height h_1 and kerosene of height h_2 above water, so that the total height of (water + kerosene) is $(h_1 + h_2)$. Refractive index of water is μ_1 and that of kerosene is μ_2. The apparent shift in

the position of the bottom of the beaker when viewed from above is

A. $\left(1-\frac{1}{\mu_1}\right)h_2+\left(1-\frac{1}{\mu_2}\right)h_1$

B. $\left(1+\frac{1}{\mu_1}\right)h_1+\left(1+\frac{1}{\mu_2}\right)h_2$

C. $\left(1-\frac{1}{\mu_1}\right)h_1+\left(1-\frac{1}{\mu_1}\right)h_2$

D. $\left(1+\frac{1}{\mu_1}\right)h_2-\left(1+\frac{1}{\mu_2}\right)h_1$

Answer: C

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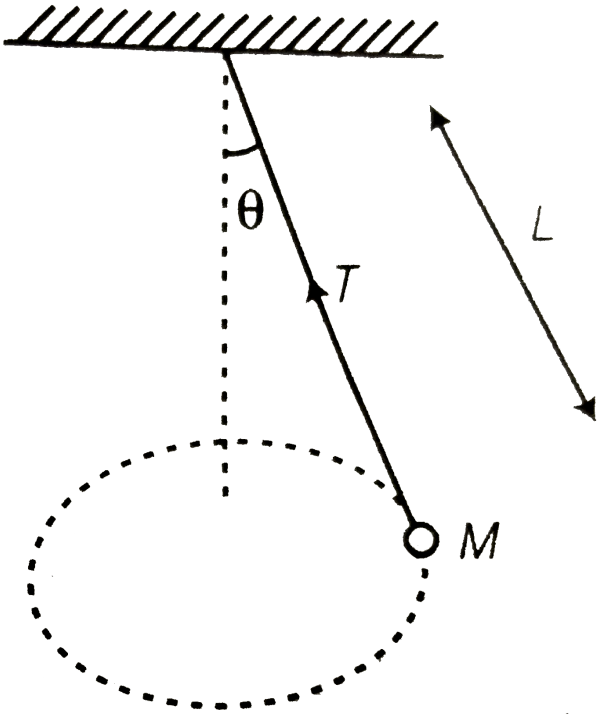
4. A string of length L is fixed at one end and carries a mass M at the other end. The string makes $\frac{2}{\pi}$ rev/s around the vertical axis through the fixed end as shown in figure, then

tension in string is



A. ML

B. 2 ML

C. 4 ML

D. 16 ML

Answer: D

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5. The distance between centre of the earth and moon is 384000 km . If the mass of the earth is $6 \times 10^{24} kg$ and $G = 6.66 \times 10^{-11} Nm^2 / kg^2$. The speed of the moon is nearly

A. 1 km/s

B. 4 km/s

C. 8 km/s

D. 11.2 km/s

Answer: A

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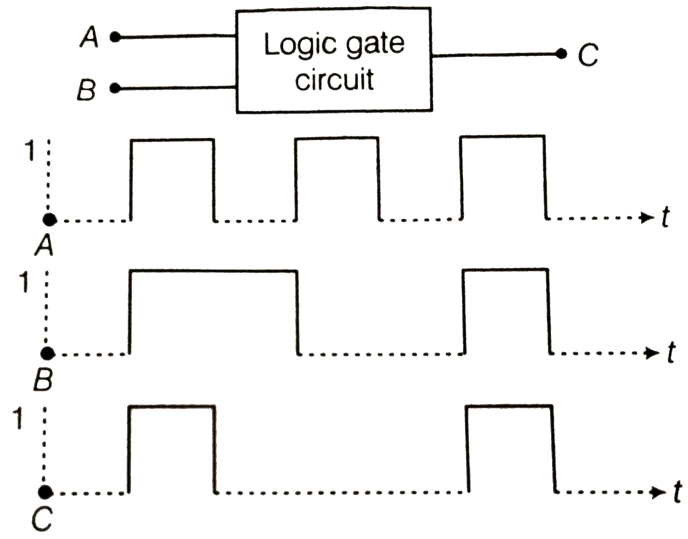
6. The following figure shows a logic gate circuit with two inputs A and B and the output C. The voltage waveforms of A, B and C are as shown below.



The logic circuit gate is

A. AND gate

B. NAND gate

C. NOR gate

D. OR gate

Answer: A

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7. Assuming the sun to have a spherical outer surface of radius r radiating like a black body at temperature $t^{\circ}C$. The power received by a unit surface (normal to the incident rays) at a distance R from the centre of the sun is where σ is the Stefan's constant.

A. $\frac{4\pi r^2 \sigma t^4}{R^2}$

B. $\frac{r^2\sigma(t+273)^4}{4\pi R^2}$

C. $\frac{16\pi^2 r^2\sigma t^4}{R^2}$

D. $\frac{r^2\sigma(t+273)^4}{R^2}$

Answer: D

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8. The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is

A. infinite

B. five

C. three

D. zero

Answer: B

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9. The period of a satellite in circcular orbit of radius 12000 km around a planet is 3h. What is

the period o a satellite in circular orbit of radius 48000 km around the same planet ?

A. 18 h

B. 14 h

C. 24 h

D. 32 h

Answer: C

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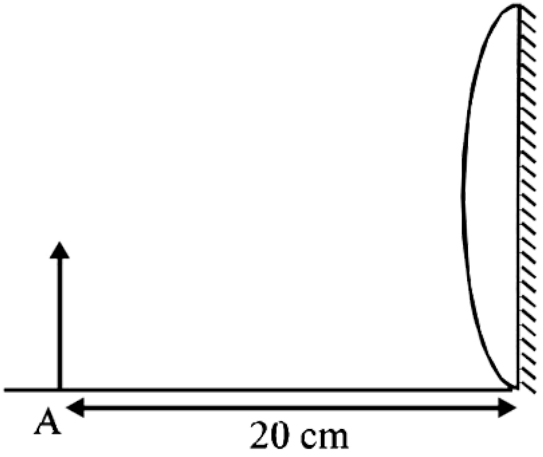
10. Focal length of the plano-convex lens is 15 cm. A small object is placed at A as shown in the figure. The plane surface is silvered. The image will form at `



A. 60 cm left of AB

B. 30 cm left from AB

C. 12 cm left of AB

D. 60 cm right of AB

Answer: C

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11. The resistance of an ammeter is 13Ω and its scale is graduated for a current upto $100A$. After an additional shunt has been connected to this ammeter it becomes possible to

measure currents upto $750A$ by this meter. The value of shunt resistance is

A. 20Ω

B. 2Ω

C. 0.2Ω

D. $2k\Omega$

Answer: B

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12. Under the influence of a unifrom magnetic field a charged particle is moving on a circle of radius R with Constnant speed v. The time period of the motion

A. depends on v and not on R

B. depends on both R and v

C. is independent of both R and v

D. depends on R and not on v

Answer: C

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13. A standing wave having 3 nodes and 2 antinodes is formed between two atoms having a distance 1.21Å between them. The wavelength of the standing wave is

A. 1.21Å

B. 1.40Å

C. 6.05Å

D. 3.63Å

Answer: B

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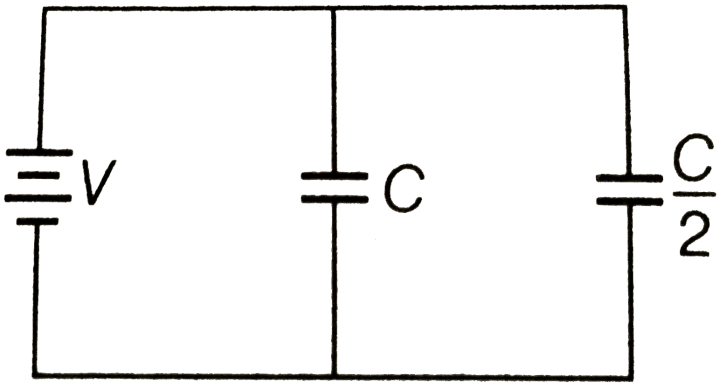
14. Two condenser, one of capacity C and the other of capacity $\frac{C}{2}$, are connected to a V volt battery, as shown in figure. The work done in charging fully both the condensers is



A. $2CV^2$

B. $\frac{1}{4}CV^2$

C. $\frac{3}{4}CV^2$

D. $\frac{1}{2}CV^2$

Answer: C

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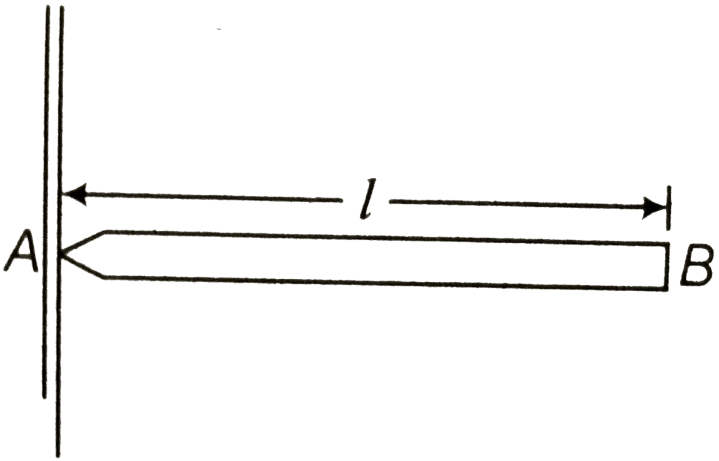
15. A uniform rod AB of length l and mass m is free to rotate about point A. The rod is released from rest in the horizontal position.

Given that the moment of inertia of the rod about A is $\frac{ml^2}{3}$, the initial angular acceleration of the rod will be



A. $\frac{2g}{3l}$

B. $mg\frac{l}{2}$

C. $\frac{3}{2}gl$

D. $\frac{3g}{2l}$

Answer: D

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16. At a given place where acceleration due to gravity is $g\,m/\sec^2$, a sphere of lead of density $d\ kg/m^3$ is gently released in a column of liquid of density $'\rho' kg/m^3$. If $d > \rho$, the sphere will

A. fall vertically with an acceleration gms^{-2}

B. fall vertically with no acceleration

C. fall vertically with an acceleration $g\left(\frac{d-\rho}{d}\right)$

D. fall vertically with an acceleration $g\left(\frac{\rho}{d}\right)$

Answer: C

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17. The ratio of the energies of the hydrogen atom in its first to second excited state is

A. $1/4$

B. $4/9$

C. $9/4$

D. 4

Answer: C

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18. A cylinder of height 20m is completely filled with water. The velocity of effux of water

$\left(\in ms^{-1} \right)$ through a small hole on the side wall of the cylinder near its bottom is

A. 10

B. 20

C. 25.5

D. 5

Answer: B

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19. A wire of density $9 \times 10^3 kg/m^3$ is stretched between two clamps 1 m apart and is subjected to an extension of $4.9 \times 10^{-4} m$. The lowest frequency of transverse vibration in the wire is $\left(Y = 9 \times 10^{10} N/m^2\right)$

A. 40 Hz

B. 35 Hz

C. 30 Hz

D. 25 Hz

Answer: B

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20. The molar specific heat at constant pressure of an ideal gas is $(7/2R)$. The ratio of specific heat at constant pressure to that at constant volume is

A. $7/5$

B. $8/7$

C. $5/7$

D. $9/7$

Answer: A

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21. A transformer is used to light a $100W$ and $110V$ lamp from a $220V$ mains. If the main current is $0.5A$, the Efficiency of the transformer is approximately:

A. $30\ \%$

B. $50\ \%$

C. $90\ \%$

D. $10\ \%$

Answer: C

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22. A charged particle (charge q) is moving in a circle of radius R with unifrom speed v. The associated magnetic moment μ is given by

A. $\frac{qvR}{2}$

B. qvR^2

C. $\frac{qvR^2}{2}$

D. qvR^2

Answer: D

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23. Two instruments having stretched strings are being played in unison . When the tension in one of the instruments is increases by 1% , 3 beats are produced in $2s$. The initial frequency of vibration of each wire is

A. 300 Hz

B. 500 Hz

C. 1000 Hz

D. 400 Hz

Answer: A

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24. A particle executing SHM according to the equation $x = 5\cos\left(2\pi t + \frac{\pi}{4}\right)$ in SI units. The

displacement and acceleration of the particle at t=1.5 s is

A. $-3m, 100m/s^2$

B. $+2.54m, 200m/s^2$

C. $-3.54, 140m/s^2$

D. $+3.55, 120m/s^2$

Answer: C

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25. The length of the wire increases 8 mm when a weight of 5 kg is hung. If all conditions are same, but the radius of the wire is doubled, what will be the decrease in its length ?

A. 2 mm

B. 1 mm

C. 0.5 mm

D. 1.5 mm

Answer: A

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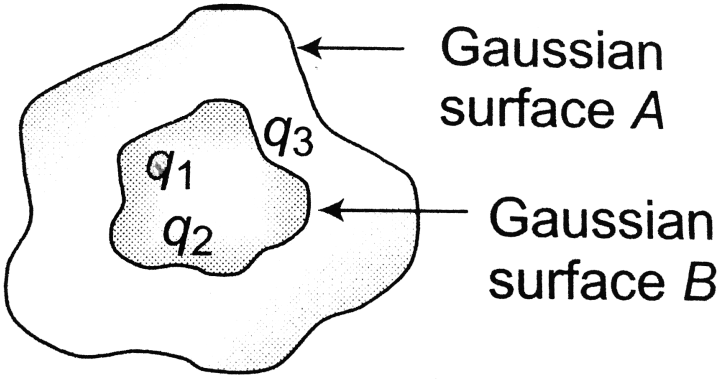
26. The electric flux for Gaussian surface A that enclose the charge particles in free space is (given $q_1 = -14nC, q_2 = 78.85nC, q_3 = -56nC$)



A. $10^3 Nm^2C^1$

B. $10^3 CN^{-1}C^2$

C. $6.32 \times 10^3 Nm^2 C^1$

D. $6.32 \times 10^3 CN^{-1}m^2$

Answer: A

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27. For ordinary terrestrial experimants, the observer is an inertial frame in the following cases is

A. a child revolving in a giant wheel

B. a driver in a sports car moving with a constant high speed of 200 kmh^{-1} on a straight rod

C. the pilot of an aeroplane which is taking off

D. a cyclist negotiating a sharp curve

Answer: B

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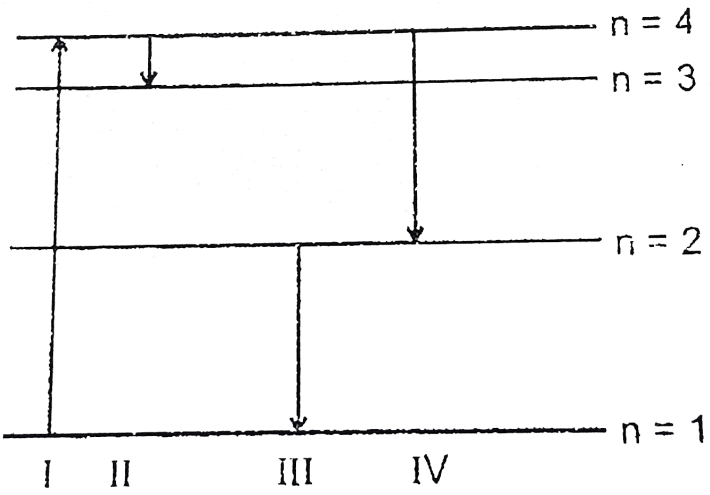
28. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of photon with the most enegy ?



A. III

B. IV

C. I

D. II

Answer: A

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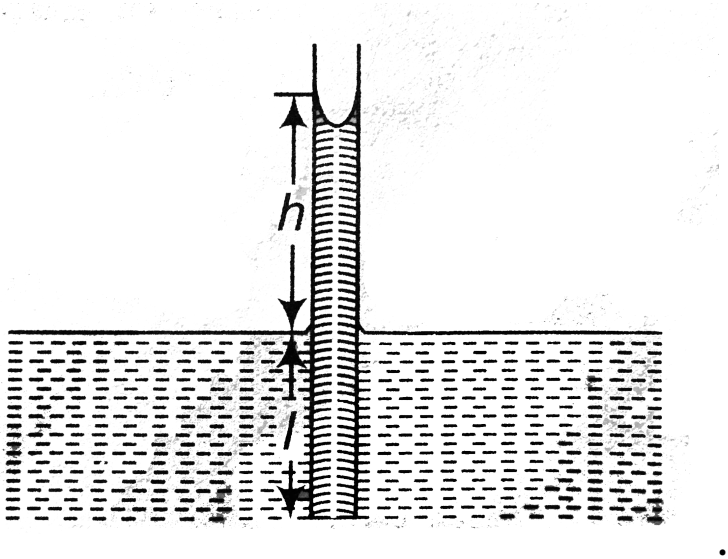
29. Water rises to a height h in a capillary tube lowered vertically into water to a depth l as shown in the figure. The lower end of the tube is now closed, the tube is the taken out of the water and opend again. The length of the

eater column remaining in the tube will be



A. zero

B. $l + h$

C. $2h$

D. h

Answer: B

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30. When an unpolarized light of intensity I_0 is incident on a polarizing sheet, the intensity of the light which does not get transmitted is

A. $\frac{1}{2}l_0$

B. $\frac{1}{4}l_0$

C. zero

D. l_0

Answer: A

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31. When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is $200Hz$, then what was the original frequency of fork 2 ?

A. 200 Hz

B. 202 Hz

C. 196 Hz

D. 204 Hz

Answer: C

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32. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

A. Zero

B. $0.5\ \%$

C. $5\ \%$

D. $20\ \%$

Answer: D

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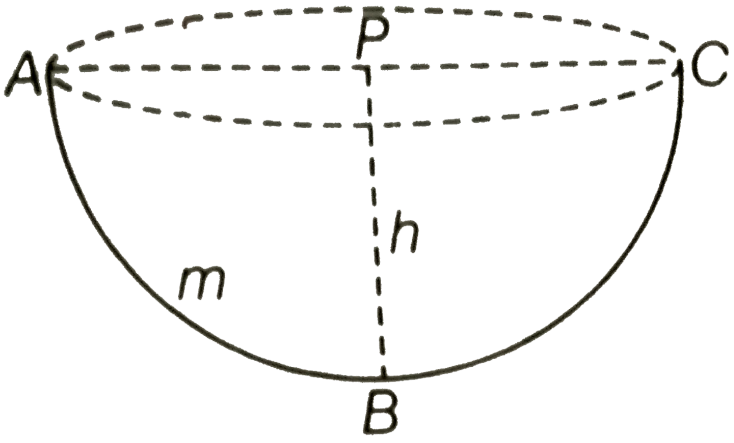
33. A sphere fo mass m makes SHM in a hemispherical bowl ABC and it moves from A to C and back to A via ABC, so that PB = h. If

acceleration due to gravity is g, the speed of the ball when it just crosses the point B is



A. $2gh$

B. gh

C. $\sqrt{2gh}$

D. $\sqrt{5gh}$

Answer: C

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34. The length of a wire of a potentiometer is 100 cm, and the e.m.f. of its standard cell is E volt. It is employed to measure the e.m.f. of a battery whose internal resistance is 0.5Ω. If the balance point is obtained at I = 30 cm from the positive end, the e.m.f. of the battery is . where i is the current in the potentiometer wire.

A. $\frac{30E}{100.5}$

B. $\frac{30E}{100-0.5}$

C. $\frac{30(E-0.5i)}{100}$

D. $\frac{30E}{100}$

Answer: D

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35. Two identical metal balls at temperature $200^\circ C$ and $400^\circ C$ kept in air at $27^\circ C$. The ratio of net heat loss by these bodies is

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\frac{1}{16}$

D. $\frac{(473)^4 - (300)^4}{(673)^4 - (300)^4}$

Answer: D

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36. The wavelength difference of light waves of the wave numbers 2×10^6 per m and 2

25×10^6 per m is

A. 0.556×10^{-6} m

B. 0.0556×10^6 m

C. 0.556×10^{-6} m

D. 0.556×10^6 m

Answer: C

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37. The work done in turning a magnet of magnetic moment 'M' by an angle of 90° from the meridian is 'n' times the corresponding work done to turn it through an angle of 60°, where 'n' is given by

A. $n = \frac{1}{2}$

B. $n = 2$

C. $n = \frac{1}{4}$

D. $n = 1$

Answer: B

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38. A common emitter amplifier has a voltage gain of 50, an input impedance of 200Ω and an output impedance of 400Ω. Calculate the power gain of the amplifier.

A. 500

B. 1000

C. 1250

D. 100

Answer: C

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39. The phase difference between the instantaneous velocity and acceleration of a particle executing simple harmonic motion is

A. 0.5π

B. π

C. 0.707π

D. zero

Answer: A

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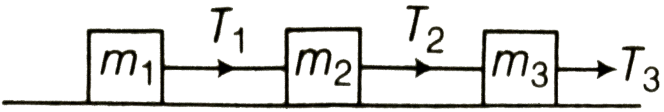
40. Three blocks of masses m_1, m_2 and m_3 are connected by mass less string as shown kept on a frictionless table.



They are pulled with a force $T_3 = 40N$. If $m_1 = 10kg, m_2 = 6kg$ and $m_3 = 4kg$, the tension T_2 will be

A. 20 N

B. 40 N

C. 10 N

D. 32 N

Answer: D

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41. Interference pattern is obtained with a source of red light of wavelength 6400 Å. The source is then replaced by another source of

wavelength 4000 Å. It is found that nth bright fringe of first source coincides with $(n+3)^{th}$ bright finge of second source. The order of finge is equal to

A. 6

B. 5

C. 4

D. 3

Answer: B

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42. A frame made of metalic wire enclosing a surface area A is covered with a soap film. If the area of the frame of metallic wire is reduced by $50\,\%$ the energy of the soap film will be changed by:

A. $100\,\%$

B. $25\,\%$

C. $90\,\%$

D. $75\,\%$

Answer: C

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43. Unit of electric flux is

A. Vm

B. Nm/c

C. V/m

D. CN/m

Answer: B

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44. The velocity of a paritcle (v) at an instant t is given by $v = at + bt^2$. The dimesion of b is

A. [L]

B. $\left[LT^{-1}\right]$

C. $\left[LT^{-2}\right]$

D. $\left[LT^{-3}\right]$

Answer: C

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45. A cylindrical tube, open at both ends, has a fundamental frequency f in air . The tube is dipped vertically in water so that half of its length is in water. The fundamental frequency of the air column is now

(a) $f/2$

(b) $3f/4$

(C) f

(d) $2f$

A. f/2

B. f

C. 3f/4

D. 2f

Answer: B

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46. A partical has the position vector $r = \hat{i} - 2\hat{j} + \hat{k}$ and the linear momentum $p = 2\hat{i} - \hat{j} + \hat{k}$ its angular momentum about the origin is

A. $-\hat{i}+\hat{j}-3\hat{k}$

B. $-\hat{i}+\hat{j}+3\hat{k}$

C. $\hat{i}+\hat{j}+3\hat{k}$

D. $\hat{i}-\hat{j}-5\hat{k}$

Answer: B

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47. A passenger train is moving at 5 ms^{-1} . An express train is travelling at 30 ms^{-1} , on the same track and rear side of the passenger

train at some distance. The driver in express

train at some distance. The driver in express

train applied brakes in 4 ms^{-2} , the time in which the accident is avoided after the application of brakes is

A. 4.25 s

B. 5.25 s

C. 6.25 s

D. 7.25 s

Answer: C

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48. Whatis the phase velocity of electromagneticwave having electron density and frequency for D-layer, N = 300 electron/cc, $\nu = 200kHz$?

A. 34×10^8 m/s

B. $48 \times 10^8 m/s$

C. $3 \times 10^7 m/s$

D. $3 \times 10^8 m/s$

Answer: B

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49. Light of wavelength 4000 Å is incident on a metal surface. The maximum kinetic energy of emitted photoelectron is 2 eV. What is the work function of the metal surface ?

A. 4 eV

B. 1 eV

C. 2 eV

D. 6 eV

Answer: B

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50. Neglecting and correction , the frequency of Ist overtone of the air column in a pipe of length 25 cm closed at one end (v = 350 m/s in air) is

A. 1050 Hz

B. 350 Hz

C. 525 Hz

D. 700 Hz

Answer: A

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