PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 20

Paper 1 Physics Chemistry

1. A roller coaster is designed such that riders experience "weightlessness" as they go round the top of a hill whose radius of curvature is $20m$. The speed of the car at the top of the hill is between

A. 14 m/s and 15m/s

B. 15 m/s and 16 m/s

C. 16 m/s and 17 m/s

D. 13 m/s and 14 m/s

Answer: A

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2. The angle between the Z-axis and the vector $\left(\hat{i} + \hat{j} + \sqrt{2}\hat{k}\right)$ is

A. $30°$

B. $45°$

C. $60°$

D. $90°$

Answer: B

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3. A train is moving slowly on a straightly track with a constant speed of $2ms^{-1}$. A passenger in the train starts walking at a steady speed of $2ms^{-1}$ to the back of the train in the opposite direction of the motion of the train . So, to an observer standing on the platform directly in the front of that passenger appears to be

A. $4ms^{-1}$

B. $2ms^{-1}$

C. $2ms^{-1}$ in the opposite of the train

D. zero

Answer: D

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4. A point performs simple harmonic oscillation of period T and the equation of motion is given by $x = a\sin\left(\omega t + \dfrac{\pi}{6}\right)$. After the elapse of

what fraction of the time period, the velocity of the point will be equal to half of its maximum velocity ?

A. $\dfrac{T}{8}$

B. $\dfrac{T}{6}$

C. $\dfrac{T}{3}$

D. $\dfrac{T}{12}$

Answer: D

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5. A tranverse wave propagating on a stretched string of linear density 3×10^{-4} kg per m is represented by the equation

$$y = 0.2 \sin(1.5x + 60t)$$

Where , x is in metre and t is in second. The tension in the string (in newton) is

A. 0.24

B. 0.48

C. 1.2

D. 1.8

Answer: B

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6. A player caught a criket ball of mass 150 g moving at the rate of $20ms^{-1}$. If the catching process the completed in 0.1s , the force of the blow exerted by the ball on the hands of the player is

A. 0.3N

B. 30N

C. 300 N

D. 3000 N

Answer: B

7. At $10°C$, the value of the density of a fixed mass of an ideal gas divided by its pressure is x. at $110°C$, this ratio is

A. x

B. $\dfrac{383}{283}$ x

C. $\dfrac{10}{110}$x

D. $\dfrac{283}{383}x$

Answer: D

8. In steel, the Young's modulus and the strain at the breaking point are $2 \times 10^{11} Nm^{-2}$ and 0.15 respectively the stress at the break point for steel is

A. $1.33 \times 10^{11} N/m^2$

B. $1.33 \times 10^{12} N/m^2$

C. $7.5 \times 10^{-13} N/m^2$

D. $3 \times 10^{10} N/m^2$

Answer: D

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9. A mass M is suspended by a weightless string The horizontal force required to hold the mass $60°$ with the vertical is .

A. Mg

B. $Mg\sqrt{3}$

C. $Mg(\sqrt{3}+1)$

D. $\dfrac{Mg}{\sqrt{3}}$

Answer: B

10. Two points are located at a distance of $10m$ and $15m$ from the source of oscillation. The period of oscillation is $0.05s$ and the velocity of the wave is $300m/s$. What is the phase difference between the oscillation of two points?

A. $\dfrac{\pi}{3}$

B. $\dfrac{2\pi}{3}$

C. π

D. $\dfrac{\pi}{6}$

Answer: B

11. A cube is subjected to a uniform volume compression. If the side of the cube decrease by 2% , the bulk strain is

A. 0.02

B. 0.03

C. 0.04

D. 0.06

Answer: D

12. The energy required to charge a parallel plate condenser of plate separtion d and plate area of cross-section A such that the unifom field between the plates is E is

A. $\dfrac{1}{2}\varepsilon_0 E^2 / Ad$

B. $\varepsilon_0 E^2 / Ad$

C. $\varepsilon_0 E^2 Ad$

D. $\dfrac{1}{2}\varepsilon_0 E^2 Ad$

Answer: D

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13. The pressure inside a small air bubble of radius $0.1mm$ situated just below the surface of water will be equal to $\left(\text{Take surface tension of water} 70 \times 10^{-3}1^J m^{-1}\text{and atmospheric pressure} =\right.$

A. $2.054 \times 10^3 Pa$

B. $1.027 \times 10^3 Pa$

C. $1.027 \times 10^5 Pa$

D. $2.054 \times 10^5 Pa$

Answer: C

14. The top surface of an incompressible liquid is open to the atmosphere. The pressure at a depth h_1 below the surface is p_1. What is the pressure p_2 at depth $h_2 = 2h_1$ compare with p_1 ?

A. $p_2 > 2p_1$

B. $p_2 = 2p_1$

C. $p_2 < 2p_1$

D. $p_2 = p_1$

Answer: C

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15. Curie temperature is the temperature above which

A. Ferromagnetic material becomes paramagnetic

B. paramagnetic material becomes diamagnetic material

C. paramagnetic material becomes ferromagnetic

D. ferromagnetic material becomes diamagnetic material

Answer: A

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16. Water from a tap emerges vertically downwards with initial velocity $4ms^{-1}$. The cross-sectional area of the tap is A. The flow is steady and pressure is constant throughout the stream of water. The distance h vertically below the tap, where the cross-sectional area of the stream becomes $\left(\dfrac{2}{3}\right) A$ is $\left(g = 10m/s^2\right)$

A. 0.5m

B. 1 m

C. 1.5 m

D. 2.2 m

Answer: B

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17. A long solenoid has 500 turns. When a current of $2A$ is passed through it, the resulting magnetic flux linked with each turn of the solenoid is $4 \times 10^{-3} Wb$. The self-inductance of the solenoid is

A. 2.5 H

B. 2.0 H

C. 1.0 H

D. 4.0 H

Answer: C

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18. In any AC circuit the emf (e) and the current (i) at any instant are given respectively by $e = E_0 \sin \omega t$

$$i = I_0 \sin(\omega t - \phi)$$

The average power in the circuit over one cycle of AC is

A. $\dfrac{E_0 I_0}{2}$

B. $\dfrac{E_0 I_0}{2} \sin \phi$

C. $\dfrac{E_0 I_0}{2} \cos \phi$

D. $E_0 I_0$

Answer: C

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19. A circular disc of radius $0.2m$ is placed in a uniform magnetic fied of induction $\dfrac{1}{\pi} \left(\dfrac{Wb}{m^2} \right)$ in such a way that its axis makes an angle of $60°$ with The magnetic flux linked with the disc is

A. 0.02 Wb

B. 0.06 Wb

C. 0.08 Wb

D. 0.01 Wb

Answer: A

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20. A transformer is used to light a 140 W, 24 V lamp from 240 V AC mains.

The current in mains cable is 0.7 A, find the efficiency of transformer.

A. 63.8 %

B. 74 %

C. 83.3 %

D. 48 %

Answer: C

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21. The groud state energy of hydrogen atom is $-13.6eV$. When its electron is in first excited state, its exciation energy is

A. 3.4 eV

B. 6.8 eV

C. 10.2 eV

D. zero

Answer: C

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22. If the surface tension of water is 0.06 Nm, then the capillary rise in a tube of diameter 1mm is $(\theta = 0°)$
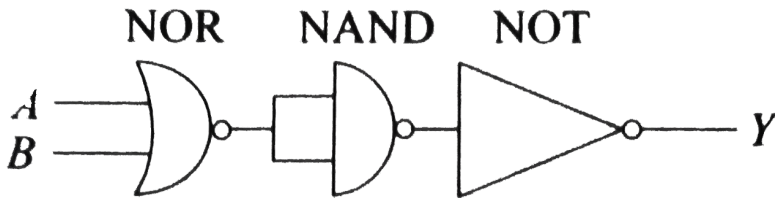
A. 1.22 cm

B. 2.44 cm

C. 3.12 cm

D. 3.86 cm

Answer: B

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23. The circuit is equivalent to

A. AND gate

B. NAND gate

C. NOR gate

D. OR gate

Answer: C

24. The ionisation potential of hydrogen atom is 13.6 volt. The energy required to remove an electron in the $n = 2$ state of the hydrogen atom is

    A. 27.4 eV

    B. 13.6 eV

    C. 3.4 eV

    D. None of these

Answer: C

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25. If the radius of the earth were to shrink by 1% its mass remaining the same, the acceleration due to gravity on the earth's surface would

    A. decrease by 2%

    B. remain unchanged

C. increase by 2%

D. increase by 1%

Answer: C

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26. Two particles of mass m and M are initially at rest and infinitely separated from each other. Due to mutual interaction, they approach each other.

Their relative velocity of approach at a separation d between them, is

A. $[2G(M + m)]^{1/2}$

B. $\sqrt{\dfrac{2G(M + m)}{d}}$

C. $\sqrt{\dfrac{2Gd}{M + m}}$

D. $2G\left(\dfrac{M + m}{d}\right)$

Answer: B

27. A round uniform body of radius R, mass M and moment of inertia 'I' rolls down (without slipping) and inclined plane making an angle θ with the horizontal. Then its acceleration is.

A. $\dfrac{g\sin\theta}{1+I/MR^2}$

B. $\dfrac{g\sin\theta}{\left(1+\frac{MR^2}{I}\right)}$

C. $\dfrac{g\sin\theta}{(1-I/MR^2)}$

D. None of these

Answer: A

28. A particle under the action of a force has a period of $3s$ and under the action of another force it has a period $4\sec$ in SHM. What will be its period under the combined action of both forces in the same direction?

A. 7 s

B. 5 s

C. 2.4 s

D. 0.4 s

Answer: C

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29. If mass is measured in unit of α kg, length in β m and time in γ s, then calorie would be

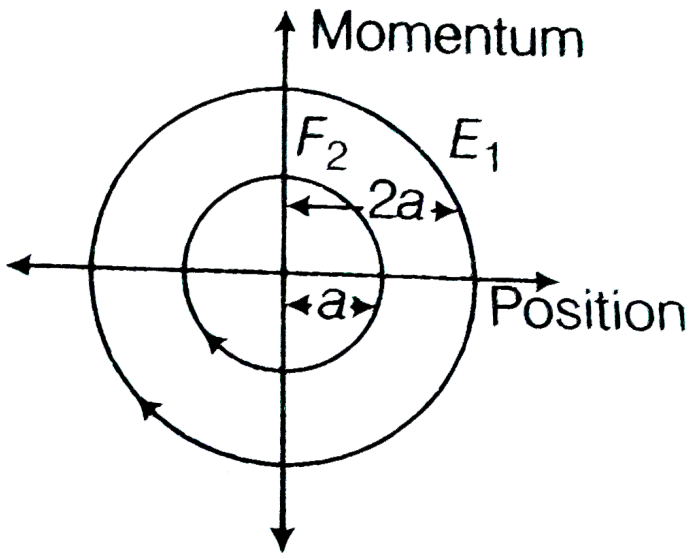A. $42\alpha\beta^2\gamma^{-2}$

B. $\left[MT^{-2}\right]$

C. $42\alpha^{-1}\beta^{-2}\gamma^{-2}$

D. $42\alpha^{-2}\beta^{-2}\gamma^{-2}$

Answer: B

30. The phase space diagram for harmonic motion is a circle centered at the origin as shown in figure. The to circles represent the same oscillator but for different initial conditions and E_1 and E_2 are the total mechanical energy, respectively . Then

A. $E_1 = \sqrt{2}E_2$

B. $E_1 = 2E_2$

C. $E_1 = 4E_2$

D. $E_1 = 16E_2$

Answer: C

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31. Capacity of a capacitor is $48\mu F$. When it is charged from 0.1 C to 0.5 C

, change in the energy stored is

    A. 2500 J

    B. 2.5×10^{-3} J

    C. 2.5×10^{6} J

    D. 2.42×10^{-2} J

Answer: A

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32. The dimension of $\dfrac{a}{b}$ in the equation $p = \dfrac{a - t^{-2}}{bx}$ where P is

pressure, x is distance and t is time are --------------?

A. $\left[M^2 LT^{-3}\right]$

B. $\left[MT^{-2}\right]$

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

D. $\left[ML^3T^{-1}\right]$

Answer: B

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33. Two identical wires have the same fundamental frequency of 400 Hz .

when kept under the same tension. If the tension in one wire is increased

by 2% the number of beats produced will be

A. 4

B. 2

C. 8

D. 1

Answer: A

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34. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipes so obtained will be

A. $v_1 + v_2$

B. $\dfrac{v_1 v_2}{v_1 + v_2}$

C. $\dfrac{v_1 v_2}{v_1 - v_2}$

D. $\sqrt{\left(v_1^2 + v_2^2\right)}$

Answer: B

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35. The optical path of a monochromatic light is same if it goes through 4.0 cm of glass or 4.5 cm of water. If the refractive index of glass is 1.53, the refractive index of the water is

A. 1.3

B. 1.36

C. 1.42

D. 1.46

Answer: B

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36. A body cool from $50.0°C$ to $39.9°C$ in 5 s . How long will it take to cool from $40.0°C$ to $39.9°C$? Assume the temperature of surroundings to be $30°C$ and Newton's law of cooling to be valid

A. 2.5 s

B. 0.07 s

C. 20 s

D. 5 s

Answer: B

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37. When a celling fan is switched off, its angular velocity falls to half while it makes 36 rotations. How many more rotations will it make before coming to rest ?

A. 18

B. 12

C. 36

D. 48

Answer: B

38. In an interference experiment , phase difference for points where the intensity is minimum is (n = 1,2,3,...)

A. $n\pi$

B. $(n+1)\pi$

C. $(2n-1)\pi$

D. zero

Answer: C

39. A TV tower has a height of $150m$. The area of the region covered by the TV broadcast is (Radius of earth $= 6.4 \times 10^6 m$)

A. $9.6\pi \times 10^8 m^2$

B. $19.2\pi \times 10^8 m^2$

C. $19.2\pi \times 10^7 m^2$

D. $1.92\pi \times 10^9 m^2$

Answer: D

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40. A voltmeter having resistance of 50×10^3 ohm is used to measure the voltage in a circuit. To increase the range of measurement 3 times the additional series resistance required is

A. $100 \times 10^3 \Omega$

B. $150 \times 10^3 \Omega$

C. $900 \times 10^3 \Omega$

D. $9 \times 10^6 \Omega$

Answer: A

41. Identify the correct statement from the following:

A. Cyclotron frequency is dependent on speed of the charged particle

B. Kinetic energy of charged particle in cyclotron does dependent on its mass

C. Cyclotron frequency does not depend on speed of charged particle

D. Kinetic energy of charged particle in yclotron is independent of its charge

Answer: C

42. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher by

$100Hz$ then the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is

A. 480 Hz

B. 300 Hz

C. 240 Hz

D. 200 Hz

Answer: D

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43. A slit of size $0.15m$ is placed at $2.1m$ from a screen. On illuminated it by a light of wavelength $5 \times 10^{-5}cm$. The width of central maxima will be

A. 70 mm

B. 0.14 mm

C. 1.4mm

D. 0.14 cm

Answer: C

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44. A thin mica sheet of thickness $2 \times 10^{-6}m$ and refractive index $(\mu = 1.5)$ is introduced in the path of the first wave. The wavelength of the wave used is 5000Å. The central bright maximum will shift

A. 2 fringes upwards

B. 2 fringes downwards

C. 10 fringes upwards

D. None of these

Answer: D

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45. The photoelectrons emitted from a given cathode , on the incidence of a given monochromatic beam of light have

    A. an energy spread with a lower limit

    B. an energy spread with an upper limit

    C. an energy with no sharp limit

    D. a definite energy only

Answer: B

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46. If the forward voltage in p-n junction is increased , the length of depletion layer will

    A. increase

    B. decrease

    C. remain unchanged

D. disappear

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47. The de-Broglie wavelength of proton $(\text{charge} = 1.6 \times 10^{-19} C, \text{mass} = 1.6 \times 10^{-27} Kg)$ accelerated through a potential difference of 1kV is

A. 600 Å

B. $0.9 \times 10^{-12} m$

C. 7 Å

D. 0.9 mm

48. A galvonometer of resistance 20Ω gives a full scale deflection with a current of 0.04A is passed through it. It is derised to convert it into an ammeter of range 20A . The only shunt available is 0.05Ω . The resistance that must be converted in series with the coil of the galvonometer is

A. 4.95 Ω

B. 5.94Ω

C. 9.45Ω

D. 12.62Ω

Answer: A

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49. The wavelength of light observed on the earth , from a moving star is found to decrease by 0.05% .Relative to earth , the star is

A. moving away with a velocity of $1.5 \times 10^5 m/s$

B. coming closer with a velocity of $1.5 \times 10^5 m/s$

C. moving away with a velocity of $1.5 \times 10^4 m/s$

D. coming closer with a velocity of $1.5 \times 10^4 m/s$

Answer: B

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50. Diameter of a plano-convex lens is 6 cm and thichness at the centre is 3 cm. If speed of light in material of lens is 2×10^8 m/s, the focal length of the lens is

A. 15 cm

B. 20 cm

C. 30 cm

D. 10 cm

Answer: C

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