PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 17

Physics Chemistry

1. We have two spheres, one of which is hollow and the other solid. They have identical

masses and moment of intertia about their respective diameters. The ratio of their radius is given by.

A. $5 : 7$

B. $3 : 5$

C. $\sqrt{3} : \sqrt{5}$

D. $\sqrt{3} : \sqrt{7}$

Answer: C

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2. Light travels with a speed of $2 \times 10^8 ms^{-1}$ in crown glass of refractive index 1.5. What is the speed of light in dense flint glass of refractive index 1.8 ?

A. $1.33 \times 10^8 ms^{-1}$

B. $1.67 \times 10^8 ms^{-1}$

C. $2.0 \times 10^8 ms^{-1}$

D. $3.0 \times 10^8 ms^{-1}$

Answer: B

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3. If g is the acceleration due to gravity on earth's surface, the gain of the potential energy of an object of mass m raised from the surface of the earth to a height equal to the radius R of the earth is

A. 2mgR

B. mgR

C. $\frac{1}{2}mgR$

D. $\frac{1}{4}mgR$

Answer: C

4. The resistance of the four arms P, Q, R and S in a Wheatstone's bridge are $10ohm$ $30ohm$ and $90ohm$ rerspectively. The e.m.f. and internal resistance of the cell are $7vo <$ and $5ohm$ respectively. If the galvanometer resistance is $50ohm$, the current drawn for the cell will be

A. 0.1 A

B. 2.0 A

C. 1. 0 A

D. 0.2 A

Answer: D

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5. The plane faces fo two identical plano-convex lenses each having a focal length of 50 cm are placed against each other to form a

usual biconvex lens. The distance from this lens combination at which an object must be placed to obtain a real, inverted image which has the same size as the object is

A. 50 cm

B. 25 cm

C. 100 cm

D. 40 cm

Answer: A

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6. The maximum particle velocity in a wave motion is half the wave velocity. Then, the amplitude of the wave is equal to

A. $\dfrac{\lambda}{4\pi}$

B. $\dfrac{2\lambda}{\pi}$
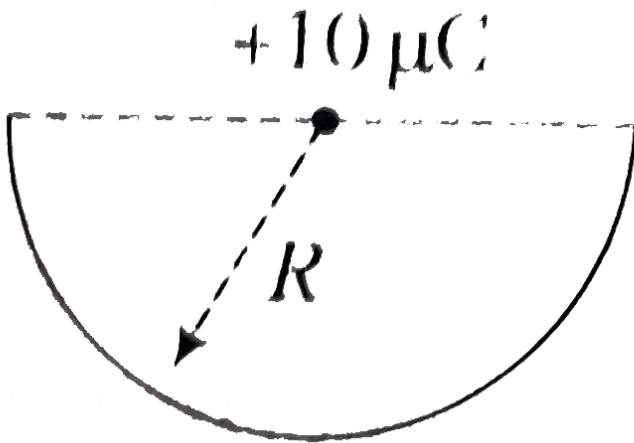
C. $\dfrac{\lambda}{2\pi}$

D. λ

Answer: A

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7. A charge $10\mu C$ is placed at the centre of a hemisphere of radius $R = 10cm$ as shown. The electric flux through the hemisphere (in MKS units)is

$$+10\,\mu C$$

A. 20×10^5

B. 10×10^8

C. 6×10^5

D. 2×10^5

Answer: C

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8. The graph between time period (T) and length (l) of a simple pendulum is

A. straight line

B. curve

C. ellipse

D. parabola

Answer: D

9. A body crosses the topmost point of a vertical circle with a critical speed. Its centripetal acceleration, when the string is horizontal will be

A. 6 g

B. 3 g

C. 2 g

D. g

Answer: C

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10. The terminal speed of a sphere of gold (density $= 19.5$ kg m^{-3}) is 0.2 ms^{-1} in a viscous liquid (density $= 1.5$ kg m^{-3}). Then, the

terminal speed of a sphere of silver (density = 10.5 kg m^{-3}) of the same size in the same liquid is

A. $0.1ms^{-1}$

B. $1.133ms^{-1}$

C. $0.4ms^{-1}$

D. $0.2ms^{-1}$

Answer: A

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11. A 20 μF capacitor is connected to 45 V battery through a circuit whose resistance is 2000 Ω. What is the final charge on the capacitor ?

A. $9 \times 10^{-4} C$

B. $9\ 154 \times 10^{-4} C$

C. $98 \times 10^{-4} C$

D. None of these

Answer: A

12. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringes on either side of the central bright fringe is

A. 1.2 cm

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer: D

13. The fundamental of a closed pipe is 220 Hz. If $\dfrac{1}{4}$ of the pipe is filled with water, the frequency of the first overtone of the pipe now is

   A. 220 Hz

   B. 440 Hz

   C. 880 Hz

D. 1760 Hz

Answer: C

14. A long elastic spring is stretched by $2cm$ and its potential energy is U. If the spring is stretched by $10cm$, the PE will be

A. U/5

B. U/25

C. 5 U

D. 25 U

Answer: D

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15. A charge of 8.0 mA in the emitter current

brings a charge of 7.9 mA in the collector

current. The values of α and β are

A. 0.99, 90

B. 0.96, 79

C. 0.97, 99

D. 0.99, 79

Answer: D

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16. The intensity of radiation emitted by the sun has its maximum value at a wavelength of 510 nm and that emitted by the North star has the maximum value at 350 nm. If these stars

behave like black bodies, then the ratio of the surface temperatures of the sun and the north star is

A. 1.46

B. 0.69

C. 1.21

D. 0.83

Answer: B

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17. The PE of a harmonic oscillator of mass 2 kg in its mean position is 4 J. If the total energy is 8 J and its amplitude is 0.01 m, its time period in second will be

A. $\dfrac{\pi}{10}$

B. $\dfrac{\pi}{20}$

C. $\dfrac{\pi}{50}$

D. $\dfrac{\pi}{100}$

Answer: D

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18. When the angle of incidence is $60°$ on the surface of a glass slab, it is found that the reflected ray is completely polarised. The velocity of light in glass is

A. $\sqrt{3} \times 10^8$ m/s

B. 2×10^8 m/s

C. 3×10^8 m/s

D. $\sqrt{2} \times 10^8$ m/s

Answer: A

19. In a surface tension experiment with a capillary tube water rises upto $0.1m$. If the same experiment is repeated in an artificial satellite, which is revolving around the earth, water will rise in the capillary tube upto a height of

    A. 0. 1m

    B. 9.8 m

    C. 0.98 m

D. full length of capillary tube

Answer: D

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20. In a travelling wave, $y = 01 \sin \pi \left[x - 330t + \frac{2}{3} \right]$. The phase difference between $x_1 = 3$ and $x_2 = 35$ m is

A. $\pi / 2$

B. π

C. $3\pi/2$

D. 2π

Answer: A

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21. In an interference experiment, the spacing between successive maxima or minima is (Where the symbols have their usual meanings)

A. $\mu d / D$

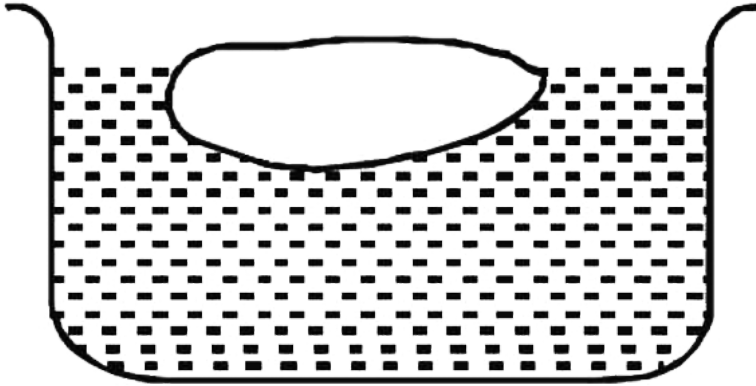B. $\lambda D / d$

C. $dD / \lambda\mu$

D. $\mu\lambda d / 4D$

Answer: B

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22. A body floats in a liquid contained in a beaker. The whole system as shown in Figure falls freely under gravity. The upthrust on the

body is

A. equal to the weight of the body in air

B. equal to the weight of the body in air

C. zero

D. equal to the weight of the immeresed

part of the body

Answer: A

23. A lossless coaxial cable has a capacitance of $7 \times 10^{-11} F$ and inductance of 0.39 μH. The characteristic impedance of the cable is

A. 750 Ω

B. .7 5Ω

C. 75 Ω

D. 7.5 Ω

Answer: C

24. A hollow sphere filled with water through a small body in it is then hung by a long theard and made to oscilation As the water slowly force end of the hole at the bottom the period of oscilation will

A. continuously decrease

B. continuously increase

C. first decrease then increase

D. first increase then decrease

Answer: D

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25. A coil with air inside it has a self inductance of 0.05 H. A soft iron rod of relative permeabiilty 100 is introduced inside the coil. The value of self inductance is

A. $5 \times 10^2 H$

B. 0.05 H

C. $0.05 \times 10^{-2} H$

D. 5 H

Answer: D

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26. A telescope, whose objective lens has an

apertune of 1 mm for the wavelength of light

500 A, then limiting resolving power of the telescope is

A. 2.1×10^{-5} rad

B. 4.1×10^{-5} rad

C. 5.1×10^{-5} rad

D. 6.1×10^{-5} rad

Answer: D

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27. A solid sphere is rotating in free space. If the radius of the sphere is increased keeping mass same which one of the following with not be affected ?

    A. Agnular velocity

    B. Angular momentum

    C. Moment of inertia

    D. Rotational kinetic energy

Answer: B

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28. Given $F = (a/t) + bt^2$ where F denotes force and t time. The diamensions of a and b are respectively:

A. $[LT^{-4}]$ and $[LT^{-1}]$

B. $[LT^{-1}]$ and $[LT^{-4}]$

C. $[MLT^{-4}]$ and $[MLT^{-1}]$

D. $[MLT^{-1}]$ and $[MLT^{-4}]$

Answer: D

29. Two radioactive nuclei P and Q, in a given sample decay into a stable nucleus R. At time $t = 0$, number of P species are $4N_0$ and that of Q are N_0. Half-life of P (for conversation to R) is $1mm$ whereas that of Q is $2 \min$. Initially there are no nuclei of R present in the sample. When number of nuclei of P and Q are equal, the number of nuclei of R present in the sample would be :

A. $2N_0$

B. $3N_0$

C. $\dfrac{9N_0}{2}$

D. $\dfrac{5N_0}{2}$

Answer: C

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30. For a stationary wave, $t = 8\sin\left(\dfrac{\pi x}{20}\right)\cos(50\pi t).$ What is the distance between two successive antinode ?

A. 15 cm

B. 20 cm

C. 25 cm

D. 30 cm

Answer: B

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31. A long wire carries a current of $20A$ along the directed axis of a long solenoid. The field

due to a solenoid is $4mT$. Find the resultant field at a point $3mm$ from the solenoid axis.

A. 1.33 mT

B. 4.2 mT

C. 2.1 mT

D. 8.4 mT

Answer: B

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32. The frequency and intensity of a light source are both doubled. Consider the following statements

A. The saturation photocurrent remains almost the same

B. The maximum kinetic energy of the photoelectrons is double

    A. Both (I) and (II) are correct

    B. Both (I) and (II) are incorrect

    C. Only (I) is incorrect

D. None of the above

Answer: B

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33. The temperature at which the speed of sound in air becomes double of its value at $27^\circ C$ is

    A. $54^\circ C$

    B. $327^\circ C$

C. $927^\circ C$

D. None of these

Answer: C

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34. (a).Add $3.8 \times 10^{-6} \to 4.2 \times 10^{-5}$ with due regard to significant figures.

(b). Subtract 3.2×10^{-6} om 4.7×10^{-4} with regard to significant figures.

(c). Subtract 1.5×10^3 om 4.8×10^4 with due regard to significant figures.

A. 4.58×10^{-5}

B. 4.6×10^{-5}

C. 4.5×10^{-5}

D. None of these

Answer: B

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35. Two drops of equal radius coalesce to form a bigger drop. What is ratio of surface energy of bigger drop to smaller one?

A. $2^{1/2}:1$

B. $1:1$

C. $2^{2/3}:1$

D. None of these

Answer: C

36. A block of mass m is resting one a smooth horizontal surface. One end of a uniform rope of mass m/3 is fixed to the block, which is pulled in the horizontal direction by applying force F at the other end. The tension in the middle of the rope is

A. $\dfrac{8}{6}F$

B. $\dfrac{1}{7}F$

C. $\dfrac{1}{8}F$

D. $\dfrac{7}{8}F$

Answer: D

37. An object is kept on a smooth inclined plane of height 1 unit and length l units. The horizontal acceleration to be imparted to the inclined plane so that the object is stationary relative to the incline is

A. $g\sqrt{l^2 - 1}$

B. $g(l^2 - 1)$

C. $\dfrac{g}{\sqrt{l^2 - 1}}$
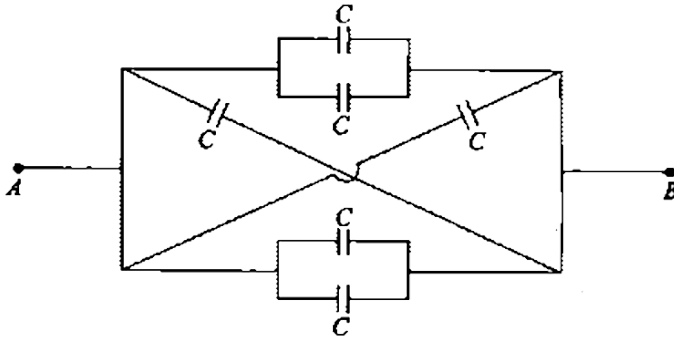
D. $\dfrac{g}{l^2 - 1}$

Answer: C

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38. Six capacitors each of capacitance of $2\mu F$

are connected as shown in the figure. The

effective capacitance between A and B is:

A. $12\mu F$

B. $8/3\mu F$

C. $3\mu F$

D. $6\mu F$

Answer: A

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39. When all the inputs of a NAND gate are connected together, the resulting circuit is :-

A. NOR

B. OR

C. NOT

D. AND

Answer: C

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40. The nature of the communication system used in the present time is

A. electrical only

B. optical onlyb

C. electronic only

D. All of these

Answer: C

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41. In moving coil galvnometer a current f 2A for radial magnetic field of $4 \times 10^{-3} W \dfrac{b}{m^2}$ produces some deflection. FI the field is doubled by keeping all other quantities same, the current for the same deflection will be
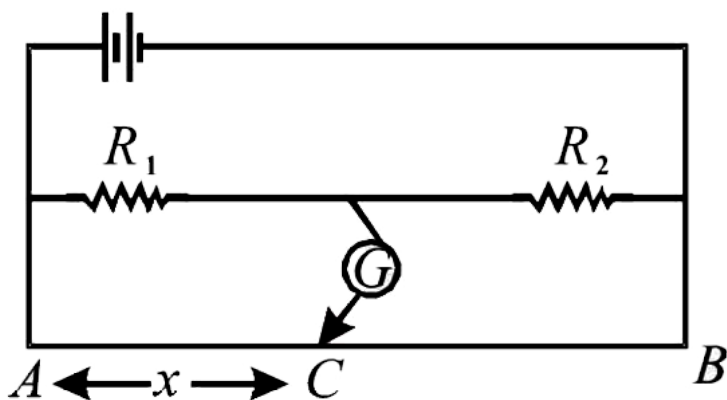
A. 0.5 A

B. 0.041666666666667

C. 0.125

D. 1 A

Answer: D

42. In the shown arrangement of the experiment of the meter bridge if AC corroesponding to null deflection of galvanometer is x, what would be its value if the radius of the wire AB is doubled?

A. $\dfrac{x}{2}$

B. $\dfrac{x}{4}$

C. 4x

D. x

Answer: D

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43. The angle subtended by vector $\overrightarrow{A} = 4\hat{i} + 3\hat{j} + 12\hat{k}$ with the x-axis is :

A. $\sin^{-1}\left(\dfrac{3}{13}\right)$

B. $\sin^{-1}\left(\dfrac{4}{13}\right)$

C. $\cos^{-1}\left(\dfrac{4}{13}\right)$

D. $\cos^{-1}\left(\dfrac{3}{13}\right)$

Answer: C

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44. If the de - Broglie wavelengths for a proton and for a α - particle are equal , then the ratio of their velocities will be

A. $4:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: A

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45. A cyslist is traveilling on a circular section of highway of radius 2500 ft at the speed of 60 mile/h. The cyclist suddenly applies the brakes

causing the bicycle to slow down at constant rate. Knowing that after 8 second,the speed has been reduced to 45 mile/h. The acceleration of the bicyle immediately after the breakes have been applied. is

A. $2 ft / s^2$

B. $4.14 ft / s^2$

C. $3.10 ft / s^2$

D. $2.75 ft / s^2$

Answer: B

46. An Ac circuit with f=1000 Hz consists of a cail of 200 mH and negligible resistance. Calculate the voltage across the coil, if the effective current of 5 mA is flowing.

A. $7.64V_{(rms)}$

B. $7.452V_{(rms)}$

C. $6.28V_{(rms)}$

D. $74.62_{(rms)}$

Answer: C

47. Two simple harmonic motions are represented by the equations $y_1 = 10\sin\left(3\pi t + \dfrac{\pi}{4}\right)$ and $y_2 = 5\left(3\sin 3\pi t + \sqrt{3}\cos 3\pi t\right)$. Their amplitudes are in the ratio of

A. $\sqrt{3}$

B. $1/\sqrt{3}$

C. 2

D. $1/6$

Answer: B

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48. A bar magnet has coercivity $4 \times 10^3 \, Am^{-1}$.

It is desired to demagnetise it by inserting it

inside a solenoid $12cm$ long and having 60

turns. The current that should be sent

through the solenoid is

A. 2A

B. 4A

C. 6A

D. 8A

Answer: D

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49. Surface temperature of the sun as

estimate is $6032.25K$. Find the wavelength at

which sun radiates maximum energy (Given, Wien's constant $= 0.2898cm - k$)

A. $\lambda_m = 5000\text{Å}$

B. $\lambda_m = 48042\text{Å}$

C. $\lambda_m = 38095\text{Å}$

D. $\lambda_m = 28916\text{Å}$

Answer: B

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50. Two trains, each of length 200 m are running on parallel tracks. One overtakes the other is 20 s and one crosses the other in 10 s. The velocities of the two trains are

A. $5ms^{-1}, 10ms^{-1}$

B. $10ms^{-1}, 30ms^{-1}$

C. $15ms^{-1}, 20ms^{-1}$

D. $20ms^{-1}, 21ms^{-1}$

Answer: B