PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 18

Paper 1 Physics Chemistry

1. A solid sphere of mass 1 kg, redius 10 cm rolls down an inclined plane of height 7m. The

velocity of its centre as it reaches the ground

level is

A. 7 m/s

B. 10m/s

C. 15 m/s

D. 20 m/s

Answer: B

2. An open organ pipe is closed suddenly with

the result

that the second overtone of the closed pipe is

found

to be higher in frequency by 100 than the first

overtone of the original pipe. Then, the

fundamental

frequency of the open pipe is

   A. 200 per sec

   B. 100 per sec

   C. 300 per sec

D. 250 per sec

Answer: A

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3. A faorce $F = 5\hat{i} + 2\hat{j} - 5\hat{k}$ acts on particles whose position vector is $r = \vec{j} - 2\vec{j} + \vec{k}$.

What is the torque about the origin ?

A. $8\hat{i} + 10\hat{j} + 12\hat{k}$

B. $8\hat{i} + 10htj - 12\hat{k}$

C. $8\hat{i} - 10\hat{j} - 8\hat{k}$

D. $10\hat{i} - 10\hat{j} - \hat{k}$

Answer: A

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4. A black body emits radiations of maximum intensity at a wavelength of Å 5000 , when the temperature of the body is $1227°C$. If the temperature of the body is increased by

$1000°C$, the maximum intensity of emitted radiation would be observed at

A. 2754.8Å

B. 3000Å

C. 3500Å

D. 4000Å

Answer: B

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5. A force is inclined at $60°$ to the horozontal. If its rectangular component in the horizontal direction is $50N$, then magnitude of the verticle components of force is approximately

A. 25 N

B. 75 N

C. 87 N

D. 100 N

Answer: C

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6. The disc of siren has n holes and the frequency of its rotation is 300 rpm. It produces a notes of wavelength 2.4 m. If the velocity of sound in air is 360 m/s, then the value of n will be

A. 30

B. 34

C. 12

D. 15

Answer: A

7. A mass of 100 gm is tied to one end of a string 2 m long. The body is revolving in a horizontal circle making a maximum of 200 revolutions per min. The other end of the string is fixed at the centre of the circle of revolution. The maximum tension that the string can bear is (approximately)

A. 87.6 N

B. 89.42 N

C. 8.76 N

D. 8.94 N

Answer: A

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8. The plates of a parallel plate capacitor with air as medium are separated by a distance of $8mm$. A medium of dielectric constant 2 and

thickness $4mm$ having the same area is introduced between the plates. For the capacitance to remain the same, the distance between the plates is

A. 8 mm

B. 6 mm

C. 4 mm

D. 10 mm

Answer: D

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9. Ataking the earth revolves round the sun in a circular orbit of 15×10^{10} m, with a time period of 1 yr, the time taken by another planet, which is at distance of 540×10^{10} m to revolve round the sun in circular orbit once, will be

A. 216 yr

B. 144 yr

C. 72 yr

D. 36 yr

Answer: A

10. A liquid takes 5 minutes to cool from $80°C$ to $50°C$. How much time will it take to cool from $60°C$ to $30°C$? The temperature of surroundings is $20°C$.

    A. 40 min

    B. 9 min

    C. 30 min

D. 20 min

Answer: B

11. A sphere of mass 0.5 kg and diameter 1 m rolls without sliding with a constant velocity of 5 m/s. What is the ratio of rotational KE to the total kinetic energy of the sphere ?

A. $\dfrac{7}{10}$

B. $\dfrac{5}{7}$

C. $\dfrac{2}{7}$

D. $\dfrac{1}{2}$

Answer: C

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12. A potentiometer wire 10 long has a resistance of 40Ω. It is connected in series with a resistances box and a 2 v storage cell. If

the potential gradient along the wire is $0.01\dfrac{V}{m}$ the resistance unplugged in the box is

A. 260 Ω

B. 760Omega

C. 960Omega

D. 1060Omega

Answer: B

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13. This time period of a particle undergoing SHM is 16 s. It starts motion from the mean position. After 2 s, its velocity is 0.4 ms^{-1}. The amplitude is

A. 0.36 m

B. 0.88 m

C. 0.72 m

D. 1.44 m

Answer: D

14. A uniform electric field and a uniform magneitc field exist in a region in the same direction An electron is projected with velocity pointed in the same direction the electron will

A. be deflected to the left without increase in speed

B. be deflected to the right without increase in speed

C. not be diflected but its speed will

decrease

D. not be deflected but its speed will

increase

Answer: C

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15. A galvenomenter of resistance 20Ω shows a

deflection of 10 divisions when a currect of 1

mA is passed through it. If a shunt of 4Ω is

concented and there are 50 divisions on the scale. The range of the gallvanometer is

A. $1A$

B. $3A$

C. $10mA$

D. $30mA$

Answer: D

16. A particle performs simple hormonic motion with a period of 2 seconds. The time taken by it to cover a displacement equal to half of its amplitude from the mea n position is

    A. $1/2$ s

    B. $1/3$ s

    C. $1/4$ s

    D. $1/6$ s

Answer: D

17. A circular coil of radius 10 cm, 500 turns and resistance 2 Omega is placed with its plane prependicular to the horizontal component of the earth's magnetic field. It is rotated about its vertical diameter through $180°$ in 0.25 s. Estimate the magnitude of the e.m.f and current induced in the coil. Horizotal component of earth's magnetic field at the place is $3 \times 10^{-5}T$.

A. 6 V, plance of the coil normal to magnetic meridian

B. 2 V, plance of the coil normal to magnetic meridian

C. 6 V, plance of the coil normal to magnetic meridian

D. 2 V, plance of the coil normal to magnetic meridian

Answer: A

18. Ampere- hour is the unit of

    A. quantity of charge

    B. potential

    C. energy

    D. current

Answer: A

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19. Given : force $= \dfrac{\alpha}{\text{density}+\beta^3}$. What are

the dimensions of α, β?

A. $\left[ML^2T^{-2}\right], \left[ML^{-1/3}\right]$

B. $\left[M^2L^4T^{-2}\right], \left[M^{1/3}L^{-1}\right]$

C. $\left[M^{1/3}L^{-1}\right], \left[M^2L^{-2}T^{-2}\right]$

D. $\left[M^2L^{-2}T^{-2}, \left[M^2L^{-1}\right]\right.$

Answer: D

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20. A transormer has an efficiency of 80%. It is connectes to a power input of 5 kW at 200 V. It the secondary voltage is 250 V, the primary and secondary currents are respectively

A. 25 A, 20A

B. 20 A, 16 A

C. 25 A, 16 A

D. 40 A, 25 A

Answer: C

21. A ball falls from 20 m height on floor and rebounds to 5 m. Time of contact is 0.02 s. Find acceleration during impact.

    A. $1200ms^{-2}$

    B. $1000ms^{-2}$

    C. $2000ms^{-2}$

    D. $1500ms^{-2}$

Answer: D

22. In a given directin, the intensities of the scattered light by a scattering substance for two beams of light are in the ratio of 250:81. The ratio of the frequency of the first beam to the frequency of the second beam is

A. $64 : 127$

B. $1 : 2$

C. $64 : 27$

D. None of these

Answer: D

23. A slit of width a illuminated by red light of wavelength 6500Å. The first minimum will fall at $\theta = 30°$ if a is

    A. $6.5 \times 10^{-4} mm$

    B. 1.3 micron

    C. 3250Å

    D. $2.6 \times 10^{-4} cm$

Answer: B

24. Two beams of light of intensity l_1 and l_2 interfere to given an interference pattern. If ratio of maximum intensity to that of minimum intersity is $\dfrac{25}{9}$, then $\dfrac{l_1}{l_2}$ is

A. $\dfrac{5}{3}$

B. 4

C. $\dfrac{81}{625}$

D. 16

Answer: D

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25. When the forwward bias voltage of a diode

is changed from 0.6 V to 0.7 V the current

changes from 5 mA to 15 mA. Then its forward

bias resistance is

A. 0.01Ω

B. 0.1Ω

C. 10Ω

D. 100Ω

Answer: C

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26. An object is gently placed on a long converges belt moving with $11ms^{-1}$. If the coefficient of friction is 0.4, then the block will side in the belt upto a distance of

A. 10.21 m

B. 15.125 m

C. 20.3 m

D. 25.6 m

Answer: B

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27. What is the minimum thickness of thin film required for constructive interference in the reflected light through it ?

(Given, the refractive index of the film $= 1.5$, wavelength of the lilght incident on the film $= 600$ nm.

A. 100 nm

B. 50 nm

C. 200 nm

D. 25 nm

Answer: A

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28. Let there be a spherically symmetric charge distribution with charge density varying as

$$\rho(r) = \rho\left(\frac{5}{4} - \frac{r}{R}\right) \quad \text{upto} \quad r = R, \quad \text{and}$$

$\rho(r) = 0$ for $r > R$, where r is the distance from the origin. The electric field at a distance r(rltR) from the origin is given by

A. $\dfrac{4\pi\rho_0 r}{3\varepsilon_0}\left(\dfrac{5}{3} - \dfrac{r}{R}\right)$

B. $\dfrac{\rho_0 r}{4\varepsilon_0}\left(\dfrac{5}{3} - \dfrac{r}{R}\right)$

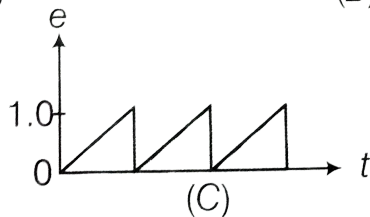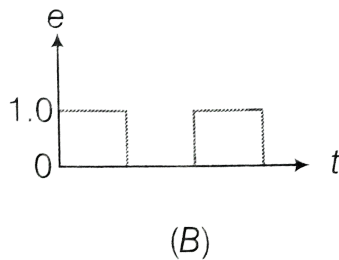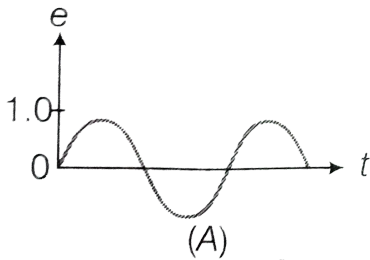C. $\dfrac{4\pi\rho_0 r}{3\varepsilon_0}\left(\dfrac{5}{4} - \dfrac{r}{R}\right)$

D. $\dfrac{\rho_0 r}{4\varepsilon_0}\left(\dfrac{5}{4} - \dfrac{r}{R}\right)$

Answer: B

29. The time variations of signals are given as in A, B and C. Point out the true statement from the following.

(A)

(B)

(C)

A. A ,B and C are analougte signals

B. A and B are analogue, but C iws

   angalogue signal

C. A and C are digitals, but B is analogue

   signal

D. A and C are analogue but B is digital

   signal

Answer: D

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30. A square surface of side L metre in the plane of papeer is placed in uniform electric field E (V/m) acting in the same plane at an angle θ with the horizontal side surface as shown in figure. The electric flux linked to the surface is

A. El^2

B. $El^2 \cos \theta$

C. $El^2 \sin \theta$

D. zero.

Answer: B

31. Three voltmeters A , B and C having resistances R, 1.5 R and 3R respectively are used in a cirrcuit as shown. When a potential difference is applied between X and Y,the readings of the voltmeters are V_1, V_2 and V_3 respectively. Then,

A. $V_1 = V_2 = V_3$

B. $V_1 < V_2 = V_3$

C. $V_1 > V_2 > V_3$

D. $V_1 > V_2 = V_3$

Answer: A

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32. A rectangular loop of sides $10cm$ and $5cm$ with a cut is stationary between the pole pieces of an electromagnet. The magnetic field

of the magnet is normal to the loop. The current feeding the electromagnet is reduced so that the field decreases from its initial value of $3.0T$ at the rate of $0.02Ts^{-1}$. If the cut is joined and the loop has a resistance of 2.0Ω, the power dissipated by the loop as heat is

A. 5 nW

B. 4 nW

C. 3 nW

D. 2 nW

Answer: A

33. A moving coil galvanometer has a resistance of 990Ω. in order to send only 10% of the main currect through this galvanometer, the resistance of the required shunt is

A. 0.9Ω

B. 110Ω

C. 405Ω

D. 90Ω

Answer: B

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34. A particle is moving in circular path with constant acceleration. In time t after the beginning of motion the direction of net acceleration is at $30°$ to the radius vector at that instant. The angular acceleration of the particle at that time t is

A. $\dfrac{3}{t^2}$

B. $\dfrac{1}{t^2}$

C. $\dfrac{\sqrt{3}}{t}$

D. $\dfrac{\sqrt{3}}{t^2}$

Answer: D

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35. A body floats in water with 40% of its volume outside water. When the same body

floats in an oil. 60% of its volume remians outside oil. The relative density of oil is

A. 0.9

B. 1.0

C. 1.2

D. 1.5

Answer: D

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36. A large open tank has two holes in its wall. Ine is a square hole of side a at a depath of x from the top and the other is a cirular hle of radius r at a depth 4x from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then r is equal to

    A. $2\pi a$

    B. a

    C. $\dfrac{a}{2\pi}$

D. $\dfrac{a}{\sqrt{2\pi}}$

Answer: D

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37. A capillary tube of radius R is immersed in water and water rises in it to a height H . Mass of water in the capillary tube is . M If the radius of the tube is doubled, mass of water that will rise in the capillary tube will now be

A. M

B. 2M

C. M/2

D. 4 M

Answer: B

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38. In Melde's experiment, the string vibrates in 4 loops when a 50 gram weight is placed in the pan of weight 15 gram . To make the string

to vibrates in 6 loops the weight that has to be removed from the pan is

A. 0.0007 kg-wt

B. 0.0021 kg-wt

C. 0.036 kg-wt

D. 0.0029 kg-wt

Answer: C

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39. In Milikan's oil drop experiment, an oil drop of radius r and charge q is held in equilibrium between the plates of as charged parallell plate capacitor when the potential difference is V. To keep as drop of radius 2r and with a charge $2q$ in equilibrium between the plates the potential difference V required is

A. V

B. 2V

C. 4V

D. 8V

Answer: C

40. A conducting circular loop is placed in a uniform magnetic field $0.04T$ with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at $2mm/\sec$. The induced emf in the loop when the radius is $2cm$ is

A. $4.8\pi\mu V$

B. $0.8\pi\mu V$

C. $1.6\pi\mu V$

D. $3.2\pi\mu V$

Answer: D

41. A transistor is operated in common emitter configuration at $V_c = 2V$ such that a change in the base current from $100\mu A$ to $300\mu A$

produces a change in the collector current from $10mA$ to $20mA.$ The current gain is

A. 25

B. 50

C. 75

D. 100

Answer: B

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42. Particle nature and wave nature of electromagnetic waves and electrons can be shown by

A. electron has small mass, deflected by the metal sheet

B. X-ray is diffracted, reflcted by thick metal sheet

C. light is refracted and diffracted

D. photoelectricity and electron microscopy

Answer: D

43. A satellite is launched into a circular orbit of radius R around the earth. A second satellite is launched into an orbit of radius (1.01) R. The period of the second satellite is larger than the first one by approximately

A. 1.5%

B. 0.5%

C. 3 %

D. 1 %

Answer: A

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44. A ray of light falls on a transparent glass slab of refractive index 1.62. If the reflected ray and the refracted rays are mutually perpendicular, what is the angle of refraction ?

A. $\tan^{-1}(162)$

B. $\tan^{-1}\left(\dfrac{1}{1.62}\right)$

C. $\tan^{-1}(1.33)$

D. $\tan^{-1}\left(\dfrac{1}{1.33}\right)$

Answer: A

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45. A wire of natural length l, young's modulus Y and ares of cross-section A is extended by x. Then, the energy stored in the wire is given by

A. $\dfrac{1}{2}\dfrac{YA}{l}x^2$

B. $\dfrac{1}{3}\dfrac{YA}{l}x^2$

C. $\dfrac{1}{2}\dfrac{Yl}{A}x^2$

D. $\dfrac{1}{2}\dfrac{YA}{l^2}x^2$

Answer: A

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46. Two moles of oxygen are mixed with eight moles of helium. The effective specific heat of the mixture at constant volume is

A. 1.3 R

B. 1.4 R

C. 1.7 R

D. 1.9 R

Answer: A::C

47. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to the second orbit of hydrogen atom. For the

electron jump from the fourth to the second orbit of hydrogen atom, the wavelength of radiation emitted will be

A. $\dfrac{16}{25}\lambda_0$

B. $\dfrac{20}{27}\lambda_0$

C. $\dfrac{27}{20}\lambda_0$

D. $\dfrac{25}{16}\lambda_0$

Answer: B

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48. A particle executes simple harmonic motion with a period of $16s$. At time $t = 2s$, the particle crosses the mean position while at $t = 4s$, its velocity is $4ms^{-1}$ amplitude of motion in metre is

A. $\sqrt{2\pi}$

B. $16\sqrt{2\pi}$

C. $24\sqrt{2\pi}$

D. $\dfrac{32\sqrt{2}}{\pi}$

Answer: D

49. A transparent plastic bag filled with air forms a concave lens. Now, if this bag is completely immersed in water, then it behaves as

A. divergent lens

B. convergent lens

C. equilateral prism

D. rectangular slab

Answer: B

50. The kinetic energy of an electron with de - Broglie wavelength of $0.3 nanometre$ is

A. 0.168 ev

B. 16.8 ev

C. 1.68 ev

D. 2.5 ev

Answer: B

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