PHYSICS

BOOKS - GURUKUL BOOKS & PACKAGING PHYSICS (HINGLISH)

FEBRUARY 2016

Section I

1. In $U.C.M.$ (Uniform Circular Motion), prove the relation $\overrightarrow{v} = \overrightarrow{\omega} \times \overrightarrow{r}$, where

symbols have their usual meanings.

2. A satellite revolving around the earth is

3. Obtain an expression for total kinetic energy

of a rolling body in the form

$$\frac{1}{2}MV^2\left[1 + \frac{K^2}{R^2}\right].$$

4. Dimensions of emissive power are

5. A coin kept at a distance of 5 cm from the centre of a turntable of radius $1.5m$ just begins to slip when the turntable rotates at a speed of 90r.p.m. Calculate the coefficient of static friction between the coin and the turntable $\left[g = 9.8m/s^2\right]$

6. The frequency of third overtone of a pipe closed at one end , is in unison with the fifth overtone of a pipe open at both the ends. Then the ratio of length of the pipe closed at one end to the open at both the ends is

7. A particle performing linear S.H.M. has a period of 6.28 seconds and a path length of 20

cm. What is the velocity when its displacement is 6 cm from mean position ?

8. The energy of the free surface of a liquid drop is 5π times the surface tesion of the liqid. Find the diameter of the drop in C.G.S system .

9. A particle rotates in U.C.M with tengential velocity 'v' along a ghorizontal circle of diameter 'D' . Total angular displacement of the particle in time 't' is

   A. vt

   B. $\left(\dfrac{v}{D}\right) - 1$

   C. $\dfrac{vt}{2D}$

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

Answer: D

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10. Two spring of force constants K_1 and $K_2 (K_1 > K_2)$ are stretched by same force. If W_1 and W_2 be the work done stretching the spring then.........

A. $W_1 = W_2$

B. $W_1 < W_2$

C. $W_1 > W_2$

D. $W_1 = W_2 = 0$

Answer: B

11. A and B are two wire. The radius of A is twice that of B. If they are stretched by the same load, then the stress on B is

A. four times that of A.

B. two times that of A.

C. three times that of A.

D. same as that of A.

Answer: A

12. When sound waves are reflected from a denser medium

A. 0 rad

B. $\dfrac{\pi}{4}$ rad

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

D. π rad

Answer: D

13. A sonometer wire vibrates with frequency n_1 in air under suitable load of specific gravity σ . When the load is immersed in water , the frequency of vibration of wire n_2 will be .....

A. $n_1 \sqrt{\dfrac{\sigma + 1}{\sigma}}$

B. $n_1 \sqrt{\dfrac{\sigma - 1}{\sigma}}$

C. $n_1 \sqrt{\dfrac{\sigma}{\sigma + 1}}$

D. $n_1\sqrt{\dfrac{\sigma}{\sigma - 1}}$

Answer: B

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14. For polyatomic molecules having 'f' vibrational modes, the ratio of two specific heat, $\dfrac{C_P}{C_V}$ is

A. $\dfrac{1 + f}{2 + f}$

B. $\dfrac{2 + f}{3 + f}$

C. $\dfrac{4+f}{3+f}$

D. $\dfrac{5+f}{4+f}$

Answer: C

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15. A body of moment of inertia 5 kgm^2 rotating with an angular velocity 6 rad/s has the same kinetic energy as a mass of 20 kg moving with a velocity of ......

A. $5m/s$

B. $4m/s$

C. $3m/s$

D. $2m/s$

Answer: C

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16. Define linear S.H.M. Show that S.H.M. Is a projection of U.C.M. on any diameter.

A metal sphere cools at the rate of $4°$C/min.

when its temperature is $50°C$.Find its rate of cooling at $45°C$ if the temperature of surroundings is $25°C$.

17. Explain analytically how the stationary waves are formed. Hence show that the distance between node and adjacent antinode is $\frac{\lambda}{4}$.

A set of 48 tuning forks is arranged in a series of descending frequencies such that each fork

gives 4 beats per second with preceding one. The frequencies of first fork is 1.5 times the frequency of the last fork, fidn the frequency of the first and 42nd tuning fork.

18. What is the decrease in weight of a body of mass $600kg$ when it is taken in a mine of the depth $5000m$? [Radius of earth $= 6400$ km, $g = 9.8m/s^2$]

19. State and prove theorem of parallel axes.

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20. Derive Laplace's law for a spherical membrane.

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21. A steel wire having cross-sectional area $1.5mm^2$ when stretched by a load produces a lateral strain 1.5×10^{-5}. Calculate the mass attached to the wire.

$(Y_{\text{steel}} = 2 \times 10^{11} N/m^2,$ Poisson's ration $\sigma = 0.291, g = 9.8m/s^2$)

Section li

1. Explain what is meant by diffraction of light. Describe a simple experiment to demonstrate diffraction at a single slit.

2. Draw a neat labelled diagram for the construction of 'cyclotron '.

3. Give any 'two' points of differences between diamagnetic and ferromagnetic substances.

4. PROPAGATION OF ELECTROMAGNETIC WAVES

5. The combined resistance of a galvanometer of resistance 500Ω and its shunt is 21Ω

Calculated the value of shunt.

6. The susceptibility of magnesium at $200K$ is 1.8×10^{-5}. At what temperature will the susceptibility decreasey 6×10^6 ?

7. The co-efficient of mutual induction between primary and secondary coil is $2H$. Calculate

induced e.m.f. If current of 4 A is cut off in 2.5×10^{-4} seconds.

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8. The decay constant of radioactive substance is 4.33×10^{-4} per year. Calculate its half life period .

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9. If the polarising angle for a given medium is $60°$, then the refractive index of the medium is

A. $\dfrac{1}{\sqrt{3}}$

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

C. l

D. $\sqrt{3}$

Answer: d

10. The resolving power of a telescope depends on

    A. length of the telescope

    B. focal length of an objective

    C. diameter of an objective

    D. focal length of an eyepiece

Answer: c

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11. Electric field intensity due to a charged sphere at a point outside the sphere decreases with . . . .

A. increase in charge on sphere

B. increase in dielectric constant.

C. decrease in the distance of from the centre of sphere.

D. decrease in the square of distance from the centre of sphere.

Answer: b

12. In potentiometer experiment, if l_1 is the balancing length for e.m.f. of the cell of internal resistance r and l_2 is the balancing length for its terminal potential difference when shunted with resistance R then :

A. $l_1 = l_2 \left(\dfrac{R + R}{R} \right)$

B. $l_1 = l_2 \left(\dfrac{R}{R - r} \right)$

C. $l_1 = l_2 \left(\dfrac{R}{R + r} \right)$

D. $l_1 = l_2 \left(\dfrac{R - r}{R} \right)$

Answer: a

13. The energy of a photon of wavelength λ is

given by

A. $hc\lambda$

B. $\dfrac{h\lambda}{c}$

C. $\dfrac{\lambda}{hc}$

D. $\dfrac{hc}{\lambda}$

Answer: d

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14. Which of the following gates correspond to the truth table given below ?

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

A. AND

B. NOR

C. OR

D. NAND

Answer: b

15. The process of superimposing a low frequency signal on a high frequency wave is _____.

A. detection

B. mixing

C. modulution

D. attenuation

Answer: c

16. State the principle on which transformer works. Explain its working with construction. Derive an expression for ratio of e.m.f.s and currents in terms of number of turns in primary and secondary coil.

A conductor of any shape, having area $40cm^2$ placed in air is uniformaly charged with a charge $0.2\mu C$. Determine the electric intensity

at a point just outside its surface. Also, find mechanical force per unit area of the charged conductor.

$[\varepsilon_0 = 8.85 \times 10^{-12}$ S.I. units]

17. With the help of a neat labelled diagram, describe the Geiger-Marsden experiment.

What is mass defect ?

The photoelectric work function for a metal surface is $2 : 3eV$. If the light of wavelength

6800Å is incident on the surface of metal, find threshold frequency and incident frequency. will there be an emission of photoelectron or not ?

[Velocity of light $c = 3 \times 10^8 m/s$, Planck's constants, $h = 6.63 \times 10^{-34} Js$]

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18. Determine the change in wavelength of light during its passage from air to glass. If the refractive index of glass with respect to air

is 1.5 and the frequency of light is 3.5×10^{14} Hz, find the wave number of light in glass.

[Velocity of light in air (c) $= 3 \times 10^8 m / s$]

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19. In biprism experiment, 10th dark band is observed at $2.09mm$ from the central bright point on the screen with red light of wavelength 6400Å. By how much will fringe width change if blue light of wavelength 4800Å is used with the same setting ?

20. Describe Kelvin's method to determined the resistance of galvanometer by using meter bridge .

21. Explain the elementary idea of an oscillator with the help of block diagram .