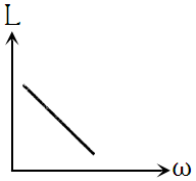
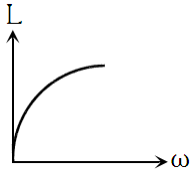
Studentpad

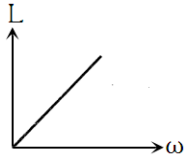
JEE-MAIN Physics 2022-23

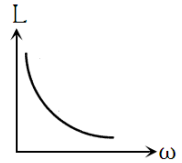
Time : 120 Min	Phy : Full Portion Paper	Marks : 120

01) Which of the following graph represents the graph between the angular momentum L and angular velocity ω?

A) 

B) 

C) 

D) 

02) The resistance of a 10 m long wire is 10Ω. Its length is increased by 25% by stretching the wire uniformly. The resistance of wire will changes to how much resistance? (approximately)

A) 14.5Ω
B) 12.5Ω
C) $15.6\,\Omega$
D) $16.6\,\Omega$

03) An inductive circuit contains resistance of $10\,\Omega$ and an inductance of 20 H. If an ac voltage of 120 V and frequency 60 Hz is applied to this circuit, the current would be nearly

A) 0.80 amp
B) 0.48 amp
C) 0.32 amp
D) 0.016 amp

04) Two particles of masses m_1 and m_2 in projectile motion have velocities $\vec{v}_1$ and $\vec{v}_2$ respectively at time t =0. They collide at time t_0. Their velocities become $\vec{v}_{1'}$ and $\vec{v}_{2'}$ at time $2t_0$ while still moving in air. The value of $|(m_1\vec{v_1}' + m_2\vec{v_2}') - (m_1\vec{v_1} + m_2\vec{v_2})|$ is

A) $\frac{1}{2}(m_1 + m_2)gt_0$
B) $(m_1 + m_2)gt_0$
C) $2(m_1 + m_2)gt_0$
D) Zero

05) An electron is moving along the positive X-axis. You want to apply a magnetic field for a short time so that the electron may reverse its direction and move parallel to the negative X-axis. This can be done by applying the magnetic field along

A) Y-axis only.
B) Y-axis.
C) X-axis.
D) None of these.

06) Choose the correct one: A body takes T minutes to cool from 62^0C to 61^0C when the surroundings temperature is 30^0C . The time taken by the body to cool from 46^0C to 45.5^0C is

A) less than T minutes
B) equal to T minutes
C) greater than T minutes
D) none of these

07) Energy needed in breaking a drop of radius R into n drops of radii r is given by

A) $\frac{4}{3}\pi(r^3n - R^2)$
B) $4\pi T(nr^2 + R^2)$
C) $4\pi T(R^2 - nr^2)$
D) $4\pi T(nr^2 - R^2)$

08) A ball is released from the top of tower of height h metre. It takes T second to reach the ground. The position of the ball at T/3 second is

A) (8h)/9 metre from the ground
B) (7h)/9 metre from the ground
C) (17h)/8 metre from the ground
D) h/9 metre from the ground

09) A body travels uniformly a distance of $(13.8 \pm 0.2)\,m$ in a time $(4.0 \pm 0.3)\,s$. The velocity of the body within error limits is

A) (3.45 ± 0.2) m/s
B) (3.45 ± 0.3) m/s
C) (3.45 ± 0.5) m/s
D) (3.45 ± 0.6) m/s

10) Two coaxial solenoids are made by winding a thin insulated wire over a pipe of cross- sectional area $A = 10\ cm^2$ and length 20 cm. If one of the solenoids has 300 turns and the other 400 turns, what is their mutual inductance?
$(\mu_0 = 4\pi \times 10^{-7}\ T\ m/A)$

A) $4.8\pi\times10^{-4}$H

B) $2.4\pi\times10^{-4}$H

C) $4.78\pi\times10^{-5}$H

D) $2.4\pi\times10^{-5}$H

11) A parallel plate capacitor has an electric field of 10^5 V/m between the plates. If the charge on the capacitor plate is $1\mu C$, the force on each capacitor plate is
A) 0.005 N
B) 0.05 N
C) 0.5 N
D) None of these

12) In Young's double slit experiment, the aperture screen distance is 2 m. The fringe width is 1 mm. Light of 600 nm is used. If a thin plate of glass (μ = 1.5) of thickness 0.06 mm is placed over one of the slits, then there will be a lateral displacement of the fringes by
(The symbol used for Fringe width is β as per NCERT and X as per HSC book.)
A) 15 cm
B) 10 cm
C) 5 cm
D) 0 cm

13) For a body moving in a circular path, a condition for no skidding, if μ is the coefficient of friction, is

A) $\frac{v}{r}=\mu g$

B) $\frac{mv^2}{r}=\mu mg$

C) $\frac{mv^2}{r}\le\mu mg$

D) $\frac{mv^2}{r}\ge\mu mg$

14) If a bullet of mass 5 gm moving with velocity 100 m /s, penetrates the wooden block upto 6 cm. Then the average force imposed by the bullet on the block is
A) Zero
B) 417 N
C) 830 N
D) 8300 N

15) An aluminum rod (Young's modulus $=7\times10^9\ N/m^2$) has a breaking strain of 0.2%. The minimum cross-sectional area of the rod in order to support a load of 10^4 Newton's is

A) $7.1\times10^{-4}\ m^2$

B) $3.5\times10^{-3}\ m^2$

C) $1.4\times10^{-3}\ m^2$

D) $1\times10^{-2}\ m^2$

16) The total power content of an AM wave is 900 W. The power transmitted by each side band for 100% modulation, is
A) 200 W
B) 150 W
C) 100 W
D) 50 W

17) If the pressure of an ideal gas contained in a closed vessel is increased by 0.5%, the increase in temperature is 2K. The initial temperature of the gas is
A) 400°C
B) 300°C
C) 127°C
D) 27°C

18) A scooter going due east at 10 ms^{-1} turns right through an angle of 90°. If the speed of the scooter remains unchanged in taking turn, the change in the velocity of the scooter is
A) zero.
B) 10.0 ms^{-1} in southern direction.
C) 14.14 ms^{-1} in south-west direction.
D) 20.0 ms^{-1} south eastern direction.

19) If c is the speed of electromagnetic waves in vacuum, its speed in a medium of dielectric constant K and relative permeability μ_r is

A) $v=\frac{K}{\sqrt{\mu_r C}}$

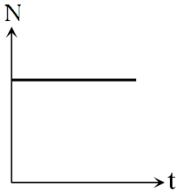
B) $v=\frac{c}{\sqrt{\mu_r K}}$

C) $v=c\sqrt{\mu_r K}$

D) $v=\frac{1}{\sqrt{\mu_r K}}$

20) Equal masses of water and a liquid of density 2 are mixed together, then the mixture has a density of
A) 4/3
B) 3/2
C) 2/3
D) 3

21) The graph between the instantaneous concentration (N) of a radioactive element and time (t) is

A)


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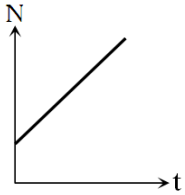
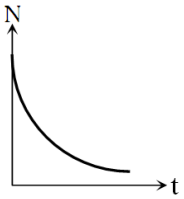
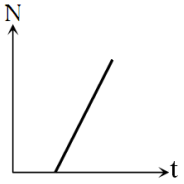


C) 

D) 

22) Four particles each of mass M, are located at the vertices of a square with side L. The gravitational potential due to this at the centre of the square is
A) Zero
B) $-\sqrt{32}\frac{GM}{L}$
C) $\sqrt{32}\frac{GM}{L}$
D) $-\sqrt{64}\frac{GM}{L^2}$

23) A steel rod 100 cm long is clamped at its middle. The fundamental frequency of longitudinal vibration of the rod are given to be 2.53 kHz. The speed of sound in steel is?
A) 5 km/s
B) 2 km/s
C) 7 km/s
D) 4 km/s

24) The potential energy of a particle with displacement X is U(X). The motion is simple harmonic, when (K is a positive constant)
A) $U = K$
B) $U = -\frac{KX^2}{2}$
C) $U = KX^2$
D) $U = KX$

25) Monochromatic light of wavelength 3000 Å is incident on a surface area 4 cm^2. If intensity of light is 150 mW/m^2, then the rate at which photons strike the target is
A) $9\times10^{13}/s$
B) $7\times10^{15}/s$
C) $6\times10^{19}/s$
D) $3\times10^{10}/s$

26) A uniform chain of length L changes partly from a table which is kept in equilibrium by friction. The maximum length that can withstand without slipping is l, then coefficient of friction between the table and the chain is
A) $\frac{l}{L}$
B) $\frac{l}{L-l}$
C) $\frac{l}{L+l}$
D) $\frac{L}{L+l}$

27) If 150 J of heat is added to a system and the work done by the system is 110 J, then change in internal energy will be
A) 260 J
B) 150 J
C) 110 J
D) 40 J

28) The amplification factor of a triode is 20. Its plate resistance is 10 kilo ohms. Mutual conductance is
A) 2×10^{-3} mho
B) 500 mho
C) 2×10^{4} mho
D) 2×10^{5} mho

29) A dip needle lies initially in the magnetic meridian, when it shows an angle of dip θ at a place. The dip circle is rotated through an angle x in the horizontal plane and then it shows an angle of dip θ'. Then $\frac{\tan\theta'}{\tan\theta}$ is
A) cos x
B) $\frac{1}{\sin x}$
C) $\frac{1}{\cos x}$
D) $\frac{1}{\tan x}$

30) A parallel beam of monochromatic light is incident at one surface of a equilateral prism. Angle of incidence is 55° and angle of emergence is 46°. The angle of minimum deviation will be
A) more than 41°.
B) less than 41°.
C) equal to 41°.
D) none of the above.