


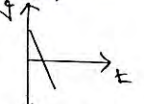
HIGHER SECONDARY - FIRST YEAR - Mar-2024

KEY ANSWERS FOR PHYSICS

PART-I

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)
- 11)
- 12)
- 13)
- 14)
- 15)

- b) increases
- c) 6%
- d) 
- d) 2 ms^{-2}
- b) Pure rotation
- d) $\sqrt{K_0/8KA}$
- a) 1.0 m
- a) increase 4 times
- a) Zero
- a) decrease and increase
- c) Carbon-di-oxide
- c) 100Hz and 6m
- d) adiabatic
- b) $(250 \pm 5) \Omega$
- a) $1 \text{ kg}^{-1} \text{ K}^{-1}$

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Qn: No: 24 is Compulsory:

16) Steel is more elastic than rubber. If an equal stress is applied to both steel and rubber, steel produces less strain. So Young's modulus is higher for steel than rubber. The object which has higher Young's modulus is more elastic.

17) Vector:- It can be described by both magnitude and direction.
Ex:- Force, Velocity

18) $F = \frac{mv^2}{r} = \frac{60 \times 50 \times 50}{10}$

$F = 15000N$

19) Factors affecting Brownian Motion:-

- i) Brownian Motion increases with increase temp.
- ii) Brownian Motion decreases with bigger Particle size, high viscosity and density of liquid or gas.

20) $v_{cm} = 5ms^{-1}$; $R = 1.5m$; $\omega = 3rad/s$ Net

$v_{rot} = 1.5 \times 3 = 4.5ms^{-1}$

$v_{cm} > v_{rot} \rightarrow$ Sliding.

21) Free Oscillation:-

When the oscillator is allowed to oscillate by displacing its position from equilibrium position it oscillates with ν which is equal to natural ν of the oscillator.

- Ex:-
- i) Vibration of tuning fork
 - ii) Vibration in stretched string.

22) Co-efficient of restitution:-
$$e = \frac{\text{Velocity of Separation}}{\text{Velocity of approach.}}$$

23) Limitations of Dimensional Analysis:-

- i) It gives no information about the dimensionless constants in formula like ν , α , \dots , π , e etc.
- ii) This method cannot decide whether the given quantity is vector (or) scalar.

24) $W = -30 \text{ kJ} = -30,000 \text{ J}$; $Q = -5 \text{ kcal} = -5 \times 4184 \text{ J}$

T.D.: 1-law

$$Q = -20920 \text{ J}$$

$$\Delta U = Q - W$$

$$\Delta U = -20920 - (-30,000)$$

$$\Delta U = -20920 + 30,000$$

$$\Delta U = 9080 \text{ J}$$

Q) n: No: 33 is Compulsory:

Q5) Work done by a torque:-

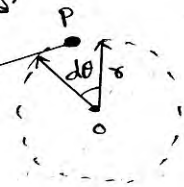
$$dW = F \cdot ds$$

$$ds = r \cdot d\theta$$

$$dW = F \cdot ds; dW = Fr d\theta$$

$$\boxed{dW = \tau \cdot d\theta}$$

$$dW = F \cdot ds$$

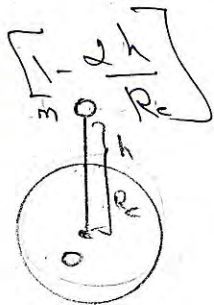


Q6) Variation of g with altitude:

$$g' = \frac{GM}{(R+h)^2}; g = \frac{GM}{R_e^2 [1+h/R_e]^2}$$

$$g' = \frac{GM}{R_e^2} (1+h/R_e)^{-2}; g' = \frac{GM}{R_e^2} \left[1 - \frac{2h}{R_e} \right]$$

$$\boxed{g' = g \left[1 - \frac{2h}{R_e} \right]}$$



Q7) Factors affecting Surface Tension:-

- i) Presence of any Contamination (or) impurities
- ii) Presence of dissolved Substance
- iii) Electrification
- iv) Temperature.

$$28) P = \frac{1}{2} n m \bar{v}^2 = \frac{1}{3} \rho v^2$$

$$P = \frac{\rho}{2} \cdot \frac{v}{\rho} \bar{v}^2$$

$$P = \frac{\rho}{2} K \cdot \vec{E}$$

29) Forced Oscillation:-

Any oscillator driven by an external periodic agency to overcome the damping is known as forced oscillation. Ex: Sound boards of stringed instruments

$$30) 2\pi f_1 = 240\pi ; 2\pi f_2 = 244\pi$$

$$f_1 = 120 \text{ Hz} ; f_2 = 122 \text{ Hz}$$

$$n = |f_1 - f_2| = |120 - 122| = 2$$

$$n = 2 \text{ beats per second}$$

31) Fundamental and derived Quantities:-

Quantities which cannot be expressed in terms of any other physical quantities.

Ex: length, Mass, time.

Quantities that can be expressed in terms of fundamental quantities.

Ex: Area, Volume, Velocity

32) Law of Conservation of Energy

Energy can neither be created nor destroyed. It may be transformed from one form to another but total energy of an isolated system remains constant.

$$33) \quad h_{\max} = \frac{u^2 \sin^2 \theta}{2g} = \frac{5 \times 5 \times (\sin 30) ^ 2}{2 \times 9.8}$$

$$h_{\max} = 0.318 \text{ m}$$

$$R = \frac{u^2 \sin 2\theta}{g} = \frac{5 \times 5 \times \sin 60}{9.8}$$

$$R = 2.21 \text{ m}$$

PART-W

34) a) $v \propto F^a m^b$; $v = k = F^a \rho^b m^c$

$$[M^0 L^0 T^{-1}] = [MLT^{-2}]^a [L]^b [ML^{-1}]^c$$

$$[M^0 L^0 T^{-1}] = [M]^{a+c} [L]^{a+b-c} [T^{-2a}]$$

$$a+c=0; a+b-c=0; -2a=-1$$

$a = 1/2$
$b = -1$
$c = -1/2$

$$v = k F^{1/2} \rho^{-1} m^{-1/2}$$

$$v = k \frac{1}{\rho} \sqrt{\frac{F}{m}}$$

$$v \propto \frac{1}{\rho} \sqrt{F/m}$$

b) Statement

Diagram + Explanation

$$P_A = \frac{P_A V}{v}; \frac{P_A}{R} = \frac{P_A}{m/v}$$

$$P_{EA} = mgh; k \cdot E_A = \frac{1}{2} m v_A^2; P \cdot E_A = mgh_A$$

$$E_A = m \frac{P_A}{R} + \frac{1}{2} m v_A^2 + mgh_A$$

$$E_B = m \frac{P_B}{R} + \frac{1}{2} m v_B^2 + mgh_B$$

$$\therefore \frac{P}{Rg} + \frac{v^2}{2g} + h = \text{Constant.}$$

35) a) Statement:-

$$W = Fs; F = ma; v^2 = u^2 + 2as; a = \frac{v^2 - u^2}{2s}$$

$$F = m \left(\frac{v^2 - u^2}{2s} \right); W = m \left(\frac{v^2 s}{2} \right) - m \left(\frac{u^2 s}{2} \right)$$

$$W = \frac{1}{2} m v^2 - \frac{1}{2} m u^2 = \Delta K.E$$

$$\boxed{W = \Delta K.E} \quad \text{THREE Special Cases-}$$

b) $COP = \frac{\text{Heat extracted from cold body}}{\text{External work done by Compressor}}$

$$\boxed{\beta = Q_L / W}$$

Refrigerator: Carnot engine Working in reverse order.

Schematic diagram of refrigerator.

Explanation

$$\boxed{Q_L + W = Q_H}$$

36) a) Diagram + Explanation

Free body diagram

$$\text{upto } a = \left(\frac{m_1 - m_2}{m_1 + m_2} \right) g$$

$$m_1 = m_2 = m; a = 0$$

$$\text{upto } T = \left(\frac{2m_1 m_2}{m_1 + m_2} \right) g$$

acceleration Vector form.

b) i) Law of orbit:- & Explanation

ii) Law of area & Explanation

iii) Law of Period & Explanation.

37) a) Kinematic Equation of Motion:-

i) $V = ut + at$ - derivation

ii) $S = ut + \frac{1}{2} at^2$ - derivation

iii) $V^2 = u^2 + 2as$ - derivation

iv) $S = \left(\frac{u+V}{2}\right) t$ - derivation.

b) Definition

Diagram + Explanation

$d = \frac{\text{distance travelled}}{\text{Number of Oscillations}}$

$d = \frac{vT}{n\pi d^2 vT} = \frac{1}{n\pi d^2}$

$d = \frac{1}{\sqrt{2} n\pi d^2}$

i) Cases:-

$d = \frac{kT}{\sqrt{2} n\pi d^2 p}$

$d = \frac{m}{\sqrt{2} n\pi d^2 \rho}$

$d = \frac{m}{\sqrt{2} n\pi d^2 \rho}$

38) a) Moment of inertia of Uniform Ring

Diagram

Explanation

$dI = dm \cdot R^2$; $d = \frac{M}{2\pi R}$; $dm = d \cdot dx = \frac{M}{2\pi R} \cdot dx$

$I = \int dI = \int (dm) \cdot R^2 = \int \left(\frac{M}{2\pi R} dx\right) R^2$; $I = \frac{MR}{2\pi} \int dx$

$I = \frac{MR}{2\pi} \int_0^{2\pi R} dx$; $I = \frac{MR}{2\pi} [x]_0^{2\pi R}$

$I = MR^2$

b) Closed Organ Pipe:-

Formation of node and antinode -

Explanation

Diagram

$$f_1 = \frac{v}{4L}; f_2 = 3f_1; f_3 = 5f_1$$

$$f_1 : f_2 : f_3 : f_4 \dots = 1 : 3 : 5 : 7$$


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