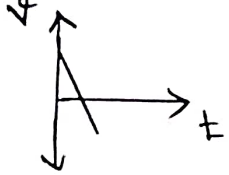
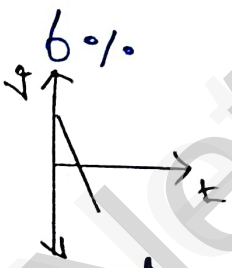
HIGHER SECONDARY - FIRST YEAR - Mar-2024

KEY ANSWERS FOR PHYSICS

PART-I

1) b) increases
2) c) 6%
3) d) 

4) d) $2\ ms^{-2}$
5) b) Pure rotation
6) d) $\sqrt{K_B/8KA}$
7) a) 1.0 m
8) a) increase 4 times
9) d) Zero
10) a) decrease and increase
11) c) Carbon-di-oxide
12) c) 100Hz and 6m
13) d) adiabatic
14) b) $(250 \pm 5)\ \Omega$
15) a) $J\ kg^{-1}\ K^{-1}$

4) b) மாறாமல்
5) d) 6%
6) 

7) d) $2\ ms^{-2}$
8) b) தூய சுழற்சி
9) d) $\sqrt{K_B/8KA}$
10) a) 1.0 m
11) a) 4 மடங்கு அதிகரிக்கும்
12) d) சுழி
13) a) அழுத்தம் மற்றும் அதிகரிக்கும்
14) d) ஆடை வெப்பமாற்றம்
15) b) $(250 \pm 5)\ \Omega$
16) a) $J\ kg^{-1}\ K^{-1}$

PART-II

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

$F = 15000\,N$

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) $V_{CM} = 5\,ms^{-1}$; $R = 1.5\,m$, $\omega = 3\,rads^{-1}$

$V = r\omega$

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

$V_{CM} > V\omega \rightarrow$ 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 F. 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 $\frac{1}{2}, 2, \ldots \pi, e$ etc.,

ii) This methode cannot decide whether the given quantity is vector (or) Scalar.

24) $W = -30kJ = -30,000J$; $Q = -5kcal = -5 \times 4.18kJ$

$\boxed{Q = -20920J}$

T.D:- I-law

$$\Delta U = Q - W$$

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

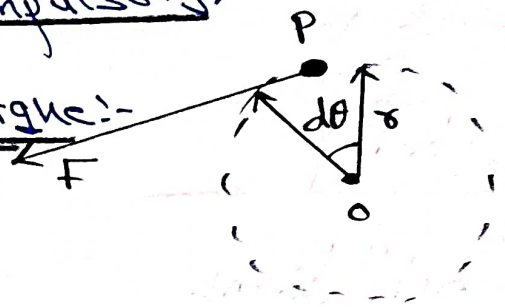
$$\Delta U = -20920 + 30,000$$

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

PART-III

Qn: No: 33 is Compulsory:

25) Work done by a torque:-



$dW = F \cdot ds$

$ds = r \cdot d\theta$

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

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

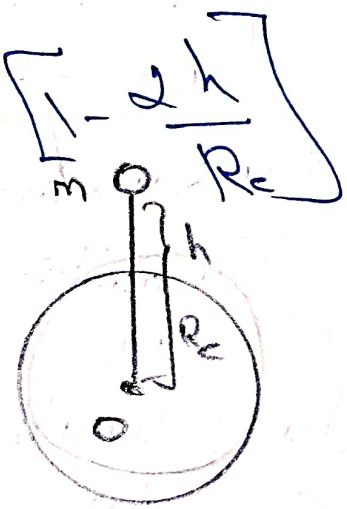
$dW = F \cdot ds$

26) Variation of g with altitude:

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

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

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



27) Factors effecting Surface tension:-

i) Presence of any Contamination (or) impurities

ii) Presence of dissolved Substance

iii) Electrification

iv) Temperature.

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

$P = \frac{2}{3} \cdot \frac{e}{2} \overline{v^2}$

$\boxed{P = \frac{2}{3} K.E}$

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

$f_1 = 120 Hz$; $f_2 = 122 Hz$

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

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

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

$\boxed{h_{max} = 0.318\,m}$

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

$\boxed{R = 2.21\,m}$

$P = \frac{nRT - V}{V}$

34) a) $\nu \propto F^a l^b m^c$; $\nu = k = F^a l^b m^c$

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

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

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

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

$\nu = k F^{1/2} l^{-1} m^{-1/2}$

$\nu = k \frac{1}{l} \sqrt{\frac{F}{m}}$

$\nu \propto \frac{1}{l} \sqrt{F/m}$

b) Statement

diagram + Explanation

$P_A = \frac{P_A V}{V}$; $\frac{P_A}{\rho} = \frac{P_A}{m/V}$

$P.E_{EA} = mgh$; $K.E_A = \frac{1}{2} m v_A^2$; $P.E_A = mgh_A$

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

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

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

35) a) Statement:-

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

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

$W = \frac{1}{2}mv^2 - \frac{1}{2}mu^2 = \Delta K.E$

$\boxed{W = \Delta K.E}$ 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

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

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

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

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) $V = u + at$ - 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.

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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:-

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

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

$$\boxed{d = \frac{KT}{\sqrt{2}\pi d^2 p}}$$

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38) a) **Moment of inertia of Uniform ring**

Diagram

Explanation

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

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

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

$$\boxed{I = MR^2}$$

b) Closed organ Pipe:-

Formation of node and antinode -

Explantion

Diagram

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

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

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