Sethu Bhaskara Matriculation Higher Secondary School

Quarterly Examination - 2022 Std. : XI

Physics - Answer key

Part - I

II 1. a) ML^2T^{-1} → 1m

2. b) 5 % → 1m

3. c) momentum → 1m

4. a) $1\ ms^{-2}$ → 1m

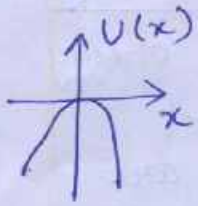
5. a) inertia of direction → 1m

6. b) need not be zero → 1m

7. d) $\mu_s mg\cos\theta$ → 1m

8. b) zero → 1m

9. c) $\sqrt{5gR}$ — 1m

10. c) 

→ 1m

11. d) $\frac{L}{\sqrt{2}}$ → 1m

12. c) $\sqrt{2}\,V_0$ → 1m

13. c) 746 W → 1m

14. c) 1.96 N → 1m

15. b) 486 J → 1m

Part - II

II 16. Any 2 limitations of dimensional analysis each one carries 1 mark

17. Any two differentiation of displacement (2) and distance.. — 2 mark
Each one carries one mark

18. $\omega = \omega_0 + \alpha t$ ⟶ ½ mark
$\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ ⟶ ½ mark
$\omega^2 = \omega_0^2 + 2\alpha\theta$ ⟶ ½ mark
$\theta = \frac{(\omega_0 + \omega)}{2} t$ ⟶ ½ mark
— 2 mark

19. $a = \frac{F}{m} = \frac{5}{2.5} = 2\ ms^{-2}$ ⟶ 1 mark
$a = \frac{F}{m} = \frac{5}{100} = 0.05\ ms^{-2}$ ⟶ 1 mark
— 2 mark

20. Correct definition ⟶ 2 mark — 2 mark

21.

Elastic collision	Inelastic collision
* Total kinetic energy is conserved	* Total kinetic energy is not conserved
* Forces involved are conservative forces	* Forces involved are non-conservative forces
* Mechanical energy is not dissipated	* Mechanical energy is dissipated into heat, light, sound etc.

Any two difference. Each carry one mark — 2 mark

22. Correct definition of power ⟶ 1½ mark
Unit : Watt (or) W ⟶ ½ mark
— 2 mark

23. $\vec{\tau} = \vec{r} \times \vec{F}$

$$\tau = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 7 & 4 & -2 \\ 4 & -3 & 5 \end{vmatrix}$$ ⟶ 1

$\vec{\tau} = \hat{i}(20-6) - \hat{j}(35+8) + \hat{k}(-21-16)$ (3) → ½ mark

$\vec{\tau} = 14\hat{i} - 43\hat{j} - 37\hat{k}$ Nm → ½ mark — 2 mark

24. Any two example of torque. — 2 mark
Each example carries one mark.

Part - III

III 25. Any 6 rules of determining significant figures. — 3 mark
Each one carries ½ mark.

26. Any 6 properties of vector product — 3 mark
Each property carries ½ mark

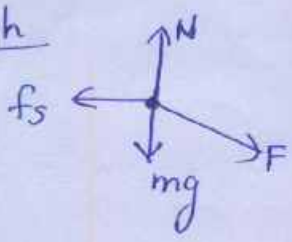
27. Explanation → ½ mark

$N_{push} = mg + F\cos\theta$ → ½ mark

$f_s^{max} = \mu_s N_{push}$

$= \mu_s (mg + F\cos\theta)$ → ½ mark

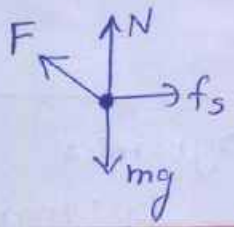
Push



→ ½ mark — 3 mark

$N_{pull} = mg - F\cos\theta$ → ½ mark

Pull



→ ½ mark

28. $a_x = \frac{F_x \cos\theta}{m}$

$= \frac{50 \cos 30^\circ}{20}$ → 1½ mark

$a_x = 2.165\ ms^{-2}$

$a_y = \frac{F_y \sin\theta}{m}$

$= \frac{50 \sin 30^\circ}{20}$ → 1½ mark

$a_y = 1.25\ ms^{-2}$

3 mark

29. Any 2 difference between conservative and non-conservative forces → 2 marks

Two examples for each → 1 mark

3 mark

30. Explanation → ½ mark

$KE = \frac{1}{2}mv^2 = \frac{1}{2}m(\vec{v}\cdot\vec{v})$

$KE = \frac{1}{2}\frac{m^2}{m}(\vec{v}\cdot\vec{v})$

upto $KE = \frac{p^2}{2m}$ → 2 mark

$|\vec{p}| = p = \sqrt{2m(KE)}$ → ½ mark

3 mark

31. $r = \frac{v^2}{\tan\theta\, g}$ → ½ mark

$r = \frac{(20)^2}{(\tan 30^\circ) \times 10}$

upto $r = \sqrt{3} \times 40$ → 1½ mark

$r = 69.28\ m$ → 1 mark

3 mark

32. Translational, Rotational, Static, Dynamic, Stable, Unstable and Neutral → 1 mark

Explanation → 2 mark

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33. i) Gravitational potential energy $U = mgh$ → 1 mark (5)

ii) Elastic potential energy $U = \frac{1}{2}k(x_f^2 - x_i^2)$ → 1 mark

iii) Electrostatic potential energy $U = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$ → mark

3 mark

Part - IV

IV

34. a) $v \propto F^x l^y \left(\frac{m}{l}\right)^z$ —— ½ mark

$T^{-1} \propto [MLT^{-2}]^x [L]^y [ML^{-1}]^z$ —— 1½ mark

Deriving upto $x = 1/2$ $z = -1/2$ $y = -1$ → 2 mark. 5 mark

→ $M^0 L^0 T^{-1} \propto M^{x+z} L^{x+y-z} T^{-2x}$ —— 1 mark

$v \propto F^{1/2} l^{-1} m^{-1/2}$ → ½ mark

b) Newton's 1st law → 1 mark

Newton's 2nd law → 1 mark

Newton's 3rd law → 1 mark 5 mark.

Significance → 2 mark

35. a) Statement → 1 mark

Diagram → ½ mark

Explanation → ½ mark

Magnitude derive $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$ —— 1½ mark 5 mark.

Direction derive $\alpha = \tan^{-1}\left(\frac{B\sin\theta}{A + B\cos\theta}\right)$ → 1½ mark

b) Derive upto $G_{cgs} = G_{SI}\left[\frac{M_1}{M_2}\right]^a \left[\frac{L_1}{L_2}\right]^b \left[\frac{T_1}{T_2}\right]^c$ → 1 mark

Dimensional formula for G is $M^{-1} L^3 T^{-2}$ → 1 mark.

5 mark

Derivation up to $G_{cgs} = 6.6 \times 10^{-11} \times 10^{-3} \times 10^6 \times 1$ → 2

$G_{cgs} = 6.6 \times 10^{-8}$ dyne cm^2 g^{-2} → 1 mark

(6)

36 a) Explanation ⟶ ½ mark
Diagram ⟶ ½ mark
Motion along horizontal direction :
$x = u_x t$ ⟶ ½ marks
Motion along downward direction :
upto $y = \frac{1}{2} g t^2$ ⟶ 1½ mark.
upto $y = \left(\frac{g}{2u_x^2}\right) x^2$ ⟶ 1½ mark
$y = kx^2$
where $k = \frac{g}{2u_x^2}$ is constant ⟶ ½ mark
5 mark

b) statement ⟶ 1 mark
Explanation ⟶ ½ mark
Diagram ⟶ ½ mark.
$I = I_c + Md^2$ ⟶ ½ mark
derivation upto $I = \Sigma mx^2 + \Sigma md^2 + 2d\Sigma mx$ ⟶ 2 mark
Remaing derivation. ⟶ ½ mark
5 mark

37.
a) Explanation ⟶ ½ mark
Diagram ⟶ ½ mark.
$dI = dm\, x^2$ ⟶ ½ mark
Derivation upto $I = \frac{M}{l} \int x^2 dx$ ⟶ 1½ mark
Derivation upto $I = \frac{1}{12} Ml^2$ ⟶ 2 mark
5 mark

b) Any 5 points
Each point carries 1 mark.
5 mark

38.

a) Statement ⟶ 1 mark

Explanation ⟶ 2 mark

$W = Fs$ ⟶ 1 mark

$F = ma$ ⟶ 1 mark

$a = \frac{v^2 - u^2}{2s}$ ⟶ 1 mark

Derivation upto $W = \Delta KE$ ⟶ 2 mark

5 mark

b) Explanation ⟶ 1 mark

Diagram ⟶ 1 mark

Conservation of linear momentum upto

$m_1(u_1 - v_1) = m_2(v_2 - u_2)$ ⟶ 1 mark

Upto $m_1(u_1^2 - v_1^2) = m_2(v_2^2 - u_2^2)$ ⟶ 1 mark

Upto $u_1 + v_1 = v_2 + u_2$ ⟶ 1 mark

Derivation upto v_1

$v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2}\right)u_1 + \frac{2m_2u_2}{m_1 + m_2}$ ⟶ 2 mark

Similarly

$v_2 = \left(\frac{2m_1}{m_1 + m_2}\right)u_1 + \left(\frac{m_2 - m_1}{m_1 + m_2}\right)u_2$ ⟶ 1 mark

5 mark

Handling Teachers

1. Jerome Joseph

2. (A. VICTORIA HELEN)

3. T. Brindha Zeby

4. G. S. SUGANYA

5. M. MANIKANDAN

6. – B. VIJAYALAKSHMI

29/9/22