No. of pages - 11 **(M)**

MARKING SCHEME
COMMON ANNUAL SCHOOL EXAMINATION (2024-25)
CLASS : XI
SUBJECT: PHYSICS (042)

समय : 3 घंटे **अधिकतम अंक - 70**

Time Allowed : 3 hours **Maximum Marks : 70**

SECTION-A

1. (a) $\left[ML^2T^{-2}K^{-1}mol^{-1}\right]$ 1

2. (c) $\frac{1}{2}MR^2\omega^2$ 1

3. (a) Law of oribts 1

4. (b) four times 1

5. (a) 0°C and 37°C 1

6. (b) periodic with a period, $T = \pi/\omega$ 1

7. (a) 7.85 cm 1

8. (b) $(6\hat{i} - 5\hat{j})m$ 1

9. (c) 6 m/s 1

10. (b) 44% 1

11. (d) 9F 1

12. (d) 20% 1

13. (d) Assertion (A) is false and Reason (R) is also false. 1

14. (c) Assertion (A) is true and Reason (R) is false. 1

15. (b) Both Assertion (A) and Reason (R) are true but (R) is the not correct explanation of Assertion (A). 1

16. (a) Both Assertion (A) and Reason (R) are true but (R) is the correct explanation of Assertion (A). 1

SECTION-B

17. $n_2 = n_1\left[\frac{M_1}{M_2}\right]^1\left[\frac{L_1}{L_2}\right]^2\left[\frac{T_1}{T_2}\right]^{-2}$ ½

$= 4.2\left[\frac{1\text{kg}}{10\text{kg}}\right]^1\left[\frac{1\text{M}}{10\text{M}}\right]^2\left[\frac{1\text{s}}{10\text{s}}\right]^{-2}$ 1

$n_2 = 0.42$ ½

18. $\frac{1}{2}m_e V_e^2 = 10\text{keV}$ ½

$\frac{1}{2}m_p V_p^2 = 100\text{keV}$ ½

$\frac{V_e}{V_p} = \sqrt{\frac{1}{10}\frac{m_p}{m_e}}$ ½

≈ 13.6 ½

19. $x_P = 50 + 15t$ ½

$x_Q = 150 + 105$

When bus P overtakes bus Q

$x_P = x_Q$ ½

$t = 20$ s ½

$x_P\,(20) = 50 + 15 \times 20$

$= 350$ m ½

OR

$t_1 = \frac{\frac{d}{2}}{x} = \frac{d}{2x}$ ½

$t_2 = \frac{d}{2y}$ ½

$v_{av} = \frac{d}{t_1 + t_2}$ ½

$v_{av} = \frac{2xy}{x + y}$ ½

20. Correct derivation 2

21. $\vec{v} = \frac{d\vec{r}}{dt}$

$\vec{v} = (3\hat{i} - 4t\hat{j})\,m/s$ ½

$\vec{a} = \frac{d\vec{v}}{dt}$ ½

$= -4\vec{j}\ m/s^2$ ½

Magnitude of acceleration = 4 m/s^2 ½

Direction of acceleration = negative y-axis ½

SECTION-C

22. Finding correct expression 3

23. (a) Correct definition 1

(b) (i) $\frac{1}{12}m\ell^2 = mk^2$ ½

$k = \frac{\ell}{\sqrt{12}}$ or $\frac{\ell}{2\sqrt{3}}$ ½

(ii) $\frac{1}{4}mr^2 = mk^2$ ½

$k = \frac{r}{2}$ ½

24. (a) $a = \frac{dv}{dt}$ ½

$= 1\ m/s^2$ ½

It is uniform ½

(b) $u = -1\ m/s,\ \text{at } t = 0$ ½

$s = ut + \frac{1}{2}at^2$ ½

$= (-1) \times 4 + \frac{1}{2} \times 1 \times 16$ ½

$= 4\ m$ ½

25. (a) $v_x = \frac{dx}{dt} = 8\cos 4t$ ½

$v_y = \frac{dy}{dt} = 8\sin 4t$ ½

$|\bar{v}| = \sqrt{v_x^2 + v_y^2}$

$= 8\ m/s$ ½

(b) Since velocity of the particle is constant ½

$\therefore$ displacement = vT ½

$= 8 \times 4$ ½

$= 32\ m$ ½

OR

Finding correct expression for

(i) horizontal range 1½

(ii) velocity of projectile at instant 't' 1½

$$v_x = 4\cos\theta,\ v_y = 4\sin\theta - gt,\ |\bar{v}| = \sqrt{v_x + v_y^2},\ \tan\theta = \frac{v_y}{v_x}$$ 1

26. (a) Correct statement 1

(b) $\Delta W = -320$ J ½

$\Delta Q = -70 \times 4.2 = -294$ J ½

From first law of thermodynamics

$\Delta Q = \Delta U + \Delta W$

$\Delta U = \Delta Q - \Delta W$

$= -294 + 320$

$= 26$ J ½

Increase in internal energy of the system ½

27. (a) $v_1 = \frac{(m_1 - m_2)u_1 + 2m_2u_2}{m_1 + m_2}$ ½

$= \frac{2mu_2}{2m} = u_2$ ½

$v_2 = \frac{(m_2 - m_1)u_2 + 2m_1u_1}{m_1 + m_2}$ ½

$= u_1$ ½

(b) Completely inelastic collision ½

Yes, momentum is conserved ½

28. (a) Derivation of the expression for orbital speed 2

(b) $v_0 = \sqrt{Rg}$

$v_0 = \sqrt{1.6 \times 10^6 \times 6.4}$ ½

$= 3.2 \times 10^3 \, m/s$

$= 3.2 km/s$ ½

SECTION-D

29. (i) α T 1

(ii) increases 1

OR

(c) remains same

(iii) (c) 0K 1

(iv) (a) temperature only 1

30. (i) (c) v/4 1

(ii) (b) doubled 1

(iii) (a) move with constant velocity downwards 1

(iv) (b) 4:9 1

OR

(c) $n^{2/3}V$

SECTION-E

31. (a) Statement 1

Proof 3

(b) $P_1 + Pgh_1 = P_2 + Pgh_2$ 1

OR

(a) Defining angle of contact 1

Two factors on which angle of contact depends 1

(b) Derivation of expression 3

32. Explanation (mathematical) 3

Discussion of normal modes of vibration in stretched string 2

OR

(a) $\frac{2\pi}{\lambda} = 0.01\pi$

$\lambda = 200\text{m}$ 1

$2\pi\nu = 3\pi$ ½

$\nu = 1.5\text{Hz}$ ½

(b) $v = \frac{\omega}{k} = \frac{3\pi}{0.01\pi}$ ½

$= 300 m/s$ ½

(c) $v = \frac{dy}{dt}$ ½

$v = 0.5 \times 3\pi \cos \pi(0.01x - 3t)$ ½

$= 1.5\pi \cos \frac{\pi}{2}$ ½

$= 0$ 1

33. (a) On applying brakes

$F \times d = \frac{1}{2} mv^2$

$F = \frac{mv^2}{2d}$ 1

In taking circular term of radius d

$F^1 = \frac{mv^2}{d}$ 1

$\frac{F}{F^1} = \frac{1}{2}$ ½

$F < F^1$

It is better to apply brakes ½

(b) F = Rate of change of momentum of bullets

= nmv 1

= $200 \times 20 \times 10^{-3} \times 300$

= 1200 N 1

OR

(a) Correct statement 1

(b) Finding expression of potential energy of spring 2

To show spring force is conservative 1

(c) Correct explanation 1