PRE MID-TERM EXAMINATION

PHYSICS (042)

MARKING SCHEME

Class: XI **Time: 1hr**
Date: 06.08.25 **Max Marks: 25**

General Instructions:

(i) *There are three sections A, B, and C with 13 questions in total, Section A has 5 Multiple Choice Questions of one mark each, Section B has 4 questions of two marks each and Section C has 4 questions of three marks each.*

Section A

1. (c) $L^{-2} T^{2}$ 1
2. (c) 3 1
3. (b) 8m 1
4. (c) x>0, v<0, a>0 1
5. (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion. 1

Section-B

6. The area of the house on the slide is 1.75 cm^2.
   The area of the house on the screen is 1.55 m^2. Since 1 meter = 100 centimeters, 1.55 m^2 = 1.55 * (100 cm * 100 cm) = 15500 cm^2. 1
   Area magnification is the ratio of the image area to the object area: 15500 cm^2 / 1.75 cm^2 = 8857.14
   Linear magnification is the square root of the area magnification: $\sqrt{8857.14} \approx 94.11$ 1
7. 8 minutes and 20 seconds is equal to (8 * 60) + 20 = 500 seconds. 1
   In the new unit system, the speed of light (c) is defined as 1.
   Distance is calculated as speed * time. Therefore, the distance is 1 * 500 = 500 new units of length. 1

8.

Initial velocity of the car, $u = 126\ km/hr = 35\ m/s$

Final velocity of car, $v = 0$

Before coming to rest,

Distance covered by the car, $s = 200\ m$

Let, retardation produced in the car $= a$

Now, using the third equation of motion,

$$v^2 - u^2 = 2as$$

$$\Rightarrow (0)^2 - (35)^2 = 2 \times a \times 200$$

$$\Rightarrow a = -35 \times \frac{35}{2} \times 200 = -3.06\ m/s^2$$

Time taken by the car to stop is given by the first equation of motion.

That is,

$$v = u + at$$

$$\Rightarrow t = \frac{(v-u)}{a} = \frac{(-35)}{(-3.06)} = 11.44\ sec$$

2

9. The slope of a velocity-time graph represents the acceleration of a particle at any given time. This is because acceleration is defined as the rate of change of velocity with respect to time, and the slope of a velocity-time graph is calculated as the change in velocity divided by the change in time, which is the mathematical definition of acceleration. 2

Section-C

10. (i) $[M^0L^0T^{-1}]$ (ii) $[M^{-1}L^3T^{-2}]$ (iii) $[ML^{-1}T^{-2}]$ (iv) $[ML^2T^{-1}]$ (v) $[ML^{-1}T^{-2}]$ (vi) $[ML^2T^{-2}]$. 3

11. $v = k * r^a * \rho^b * S^c$, where a, b, and c are the powers to be determined.

Equate Dimensions:

$[T^{-1}] = [L]^a * [ML^{-3}]^b * [MT^{-2}]^c$

$[T^{-1}] = M^{(b+c)} * L^{(a-3b)} * T^{(-2c)}$

1

Solve for Exponents:

$b + c = 0 \Rightarrow b = -c$

$-2c = -1 \Rightarrow c = ½$

$b = -1/2$ 1

$a - 3b = 0 \Rightarrow a = 3b \Rightarrow a = -3/2$

$v = k * r^{-3/2} * \rho^{-1/2} * S^{1/2}$

$v = k * \sqrt{(S / (\rho * r^3))}$ 1

12.

Speed of car P,

$$v_P = 36 \text{ kmh}^{-1}$$

$$= 36 \times \frac{5}{18} = 10 \text{ ms}^{-1} \qquad ½$$

Let v_Q and v_R be the speeds of cars Q and R

$\therefore$ $$v_Q = v_R = 54 \text{ kmh}^{-1}$$

$$= 54 \times \frac{5}{18}$$

$$= 15 \text{ ms}^{-1} \text{ (given)} \qquad ½$$

$\therefore$ Relative speed of car Q w.r.t. car P, *i.e.*, v_{QP} is given by

$$v_{QP} = v_Q - v_P = 15 - 10$$

$$= 5 \text{ ms}^{-1}$$

Also, Relative speed of car R w.r.t. car P, *i.e.*, V_{RP} is given by

$$v_{RP} = v_R - (-v_P) = v_R + v_P$$

$$= 15 + 10 = 25 \text{ ms}^{-1}$$

$$PQ = PR = 1 \text{ km (given)}$$

$$= 1000 \text{ m} \qquad 1$$

Let t = time taken by car PR to travel distance PR

$\therefore$ Using relation

$$s = ut$$

(∴ car R is in uniform motion)

We get, $$t = \frac{s}{u} = \frac{PR}{v_{RP}} = \frac{1000}{25} = 40 \text{ s}.$$

Suppose a = acceleration of car Q for $t = 40$ s; it will cover 1000 m in 40 s.

∴ Using the relation,

$$s = ut + \frac{1}{2}at^2,$$

we get $$PQ = u_{QP}\, t + \frac{1}{2}at^2$$

or $$1000 = 5 \times 40 + \frac{1}{2}a \times (40)^2$$

$$= 200 + a \times \frac{1600}{2}$$

or $$800a = 800$$

∴ $$a = 1 \text{ ms}^{-2}.$$ 1

13. (a)

Speed	Velocity
(*i*) Speed is defined as the rate of change of position of a body in any direction.	(*i*) Velocity is defined as the rate of change of position of a body in a particular direction
(*ii*) It is a scalar quantity.	(*ii*) It is a vector quantity.
(*iii*) The speed of a body can be zero or positive.	(*iii*) The speed of a body can be positive, negative or zero.

1

(b)

$u = 0, a = 10\ ms^{-2}, S = 90\ m, t = ?, v = ?$

Using $v^2 - u^2 = 2as$, $v^2 - (0)^2 = 2 \times 10 \times 90$

$\Rightarrow \quad v = 30\sqrt{2}\ m/s$

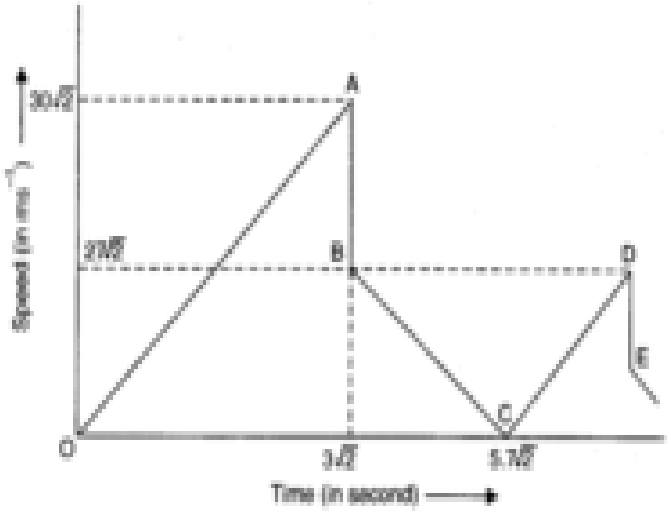
Again, using $\quad S = ut + \frac{1}{2}at^2, 90 = 0 \times t + \frac{1}{2} \times 10t^2$

$\Rightarrow \quad t = \sqrt{18}\ s = 3\sqrt{2}\ s$

Rebound velocity $= \frac{9}{10} \times 30\sqrt{2}\ ms^{-1} = \sqrt{2}\ ms^{-1}$

Time taken to reach highest point $= \frac{27\sqrt{2}}{10} s = 2.7\sqrt{2}\ s$

Total time $= (3\sqrt{2} + 2.7\sqrt{2})\ s = 5.7\sqrt{2}\ s$



OA represents the vertically downward motion after the ball has been dropped from a height of 90 m. The ball reaches the floor with a velocity of $30\sqrt{2}\ ms^{-1}$ after having been

2
