

Motion in a Straight Line

KCET Physics - Formula Sheet, Key Points and PYQP Traps

Must-Know Ideas

- Distance is total path length; displacement is change in position with direction.
- Speed uses distance; velocity uses displacement.
- Acceleration is change in velocity per unit time.
- Retardation means acceleration is opposite to velocity.
- Slope of position-time graph gives velocity.
- Slope of velocity-time graph gives acceleration.
- Area under velocity-time graph gives displacement.
- For KCET, first list given values and identify the missing quantity.

Formula Map

Need to find	Use	Watch out
Average velocity	$v_{\text{avg}} = \text{displacement} / \text{time}$	Use displacement, not total distance.
Acceleration	$a = (v - u) / t$	Final minus initial velocity.
Final velocity	$v = u + at$	Use sign of acceleration.
Displacement with time	$s = ut + 1/2 at^2$	Do not forget 1/2.
When time is absent	$v^2 = u^2 + 2as$	Find v after finding v squared.
Velocity-time graph	$s = \text{area under v-t graph}$	Use rectangle, triangle or trapezium area.

KCET PYQP-Style Patterns

Pattern	What to do quickly
Delayed start motion	Write separate times: first body t_0 , second body $(t_0 - \Delta t)$.
Graph questions	Ask: Is the question about slope or area?
Retardation	Keep acceleration negative if velocity decreases.
Equation selection	If time is not given, try $v^2 = u^2 + 2as$.

One Important Derivation Pattern

Two bodies fall from rest. The second starts Δt seconds later. If separation is H after t_0 seconds from the first start:

$$s_1 = \frac{1}{2}gt_0^2, s_2 = \frac{1}{2}g(t_0 - \Delta t)^2, H = s_1 - s_2$$

$$\text{After simplification: } t_0 = H / (g \Delta t) + \Delta t / 2$$

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