2021 Ph H1 Q5

Section: Our Dynamic Universe
Topic: Motion, Equations and Graphs

Question Summary

Two objects **P** and **Q** of the same mass are dropped from the same height.
The graph shows how their **vertical velocities** vary with time over 40 s.

Students make these statements:
I. The terminal velocity of object P is **50 m s^{-1}**.
II. Object Q reaches terminal velocity at **10 s**.
III. At **40 s**, both objects have fallen through the same distance.

Which statements are correct?

✅ Final Answer:

A. I only

Working

- **Statement I**: Correct.
For P, the velocity levels off (horizontal line) at **50 m s^{-1}**, so **50 m s^{-1} is its terminal velocity**.

- **Statement II**: Incorrect.
Q does **not** reach terminal velocity at 10 s — the graph still shows an increasing velocity at that point.

- **Statement III**: Incorrect.
Distance fallen = area under the velocity-time graph.
At 40 s, the area under Q's curve is **less** than that under P's curve, so they have not fallen the same distance.

Quick Tips

- **Terminal velocity** = when the v–t graph flattens (acceleration = 0).
- **Distance** = total area under the velocity-time curve.
- Compare shapes (area) of the graphs to decide relative distances.