# 2024 Ph H1 Q22

## Section: Electricity

## Topic: Capacitors (RC charging)

### Question Summary

A 12 V source, resistor and capacitor produce the shown I–t charging curve. The capacitor is replaced with an uncharged capacitor of greater capacitance and recharged under the same conditions. Which graph shows the new current–time behaviour?

### Worked Solution

Charging current in an RC circuit: $I(t) = (V/R)\, e^{-t/RC}$.

Increasing C increases the time constant $\tau = RC$. The initial current $I(0) = V/R$ is unchanged (same supply and series resistor), but the decay is slower (curve stretches horizontally).

Final Answer: C

## Revision Tips

- For larger C, $\tau = RC$ increases ⇒ slower decay of current/voltage changes.
- I(0) depends only on V and R, not on C (capacitor initially behaves like a short).
- New I–t curve starts at the same value and falls more slowly.