# 2022 Ph H1 Q23

## Section: Electricity

## Topic: Capacitors (RC charging)

### Question Summary

A series RC circuit is connected to a d.c. supply at t = 0. Which set of graphs correctly shows how the resistor voltage $V_R$, the capacitor voltage $V_C$, and the current I vary with time as the capacitor charges?

### Worked Solution

Charging behaviour for RC circuits:

- I starts maximum and decays exponentially to 0.
- $V_R$ = I R, so it also decays exponentially from its initial maximum to 0.
- $V_C$ rises exponentially from 0 to the supply voltage.

Select the option whose three graphs match these shapes (I↓ exp to 0, $V_R$↓ exp to 0, $V_C$↑ exp to V).

Final Answer: E

## Revision Tips

- At t = $0^+$, the uncharged capacitor behaves like a short: I is largest, V_R ≈ supply, V_C ≈ 0.
- As t → ∞, the capacitor is open-circuit: I → 0, V_R → 0, V_C → supply.
- Link V_R(t) to I(t) via Ohm’s law: V_R = I R.