

# 11.8 RC Circuits

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**Total: 9 marks****KEY WORDS** capacitor 电容器 • time constant 时间常数 • rc circuit RC 电路 • resistance 电阻

## Objective

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Build the skills to answer exam questions on **RC circuits**.**You must be able to:**

- describe how a **capacitor** 电容器 charges and discharges through a resistor over time
- relate the **time constant** 时间常数  $\tau = RC$  to how quickly the circuit responds
- describe the current and voltage at the start and after a long time

## 1 Worked examples

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Study these first. Each one shows the method for a question type used later.

### ■ Charging and discharging

A capacitor charges up through a resistor, its voltage rising toward the supply value; it discharges the same way in reverse.

### ■ Time constant

$\tau = RC$  (seconds) sets the pace: a bigger  $R$  or  $C$  means slower charging.

### ■ Start and steady state

At  $t = 0$  the uncharged capacitor acts like a **wire** (maximum current); after a long time it is **fully charged** and the current is **zero**.

## 2 Practice

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**2.1** Find the time constant of a  $2000\ \Omega$  resistor and a  $50\ \mu\text{F}$  capacitor. [2]

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**2.2** State the current through the capacitor a long time after charging begins. [1]

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**2.3** State what happens to the charging rate if the resistance is increased. [1]

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### 3 Exam-style questions

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**3.1** The time constant of an RC circuit is [1]

|   |   |
|---|---|
| A | B |
| C | D |

- A**  $R/C$
- B**  $RC$
- C**  $R + C$
- D**  $C/R$

**3.2** A long time after charging begins, the current in an RC circuit is [1]

|   |   |
|---|---|
| A | B |
| C | D |

- A** at its maximum
- B** zero
- C** constant and large
- D** negative

**3.3** A  $10\text{ k}\Omega$  resistor charges a  $100\text{ }\mu\text{F}$  capacitor from a  $9.0\text{ V}$  supply.

(a) Find the time constant. [2]

(b) State the final voltage across the capacitor. [1]