

19 Capacitance – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
capacitor	电容器	_____
dielectric	电介质	_____
capacitance	电容	_____
farad	法拉	_____

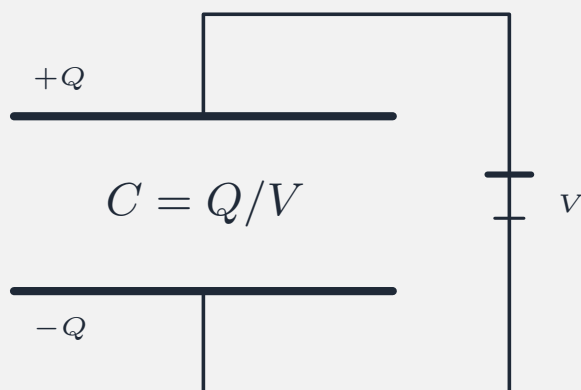
Recall

A **capacitor** 电容器 stores electric charge. The simplest is two parallel plates with an insulator between them — capacitors sit inside almost every phone, camera flash and computer.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice.

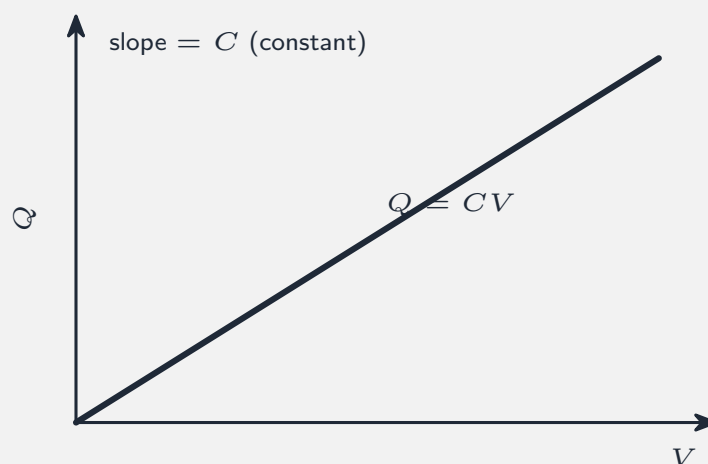
■ 1 The parallel-plate capacitor



A battery pushes charge $+Q$ onto one plate and $-Q$ onto the other, with a p.d. V across the gap. The insulator between is a **dielectric** 电介质.

Worked example. Connect the plates to a 9 V battery. Charge flows on until the p.d. across the plates reaches 9 V; then the flow stops. One plate is left with $+Q$, the other with an equal $-Q$.

■ 2 Capacitance



The **capacitance** 电容 $C = Q/V$ is the charge stored per volt. Its unit is the **farad** 法拉 (F). It is constant for a given capacitor.

Worked example. A $50 \mu\text{F}$ capacitor is charged to 9.0 V: $Q = CV = (50 \times 10^{-6})(9.0) = 4.5 \times 10^{-4} \text{ C}$.

Watch out: $1 \mu\text{F} = 10^{-6} \text{ F}$. The farad is a huge unit, so real capacitors are marked in μF , nF or pF . And C is fixed by the capacitor —doubling V doubles Q , but C does not change.

Practice

Try these in order.

19.1 What does a *capacitor* store? [1]

19.2 Write the formula for *capacitance*. [1]

19.3 What is the unit of capacitance? [1]

19.4 A $100\ \mu\text{F}$ capacitor is charged to $12\ \text{V}$. Find the charge it stores. [2]

19.5 A capacitor stores $6.0 \times 10^{-4}\ \text{C}$ at $20\ \text{V}$. Find its capacitance. [2]

19.6 If you double the voltage across a capacitor, what happens to the charge stored and to the capacitance? Explain. [2]

19.7 Challenge. Explain why the farad is rarely used as a practical unit, so that real capacitors are usually labelled in μF or nF . [2]
