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			

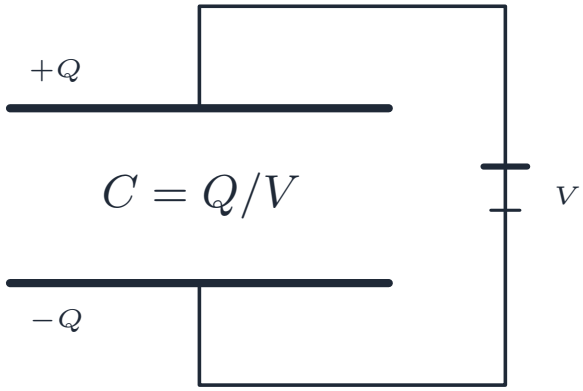
Recall

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.

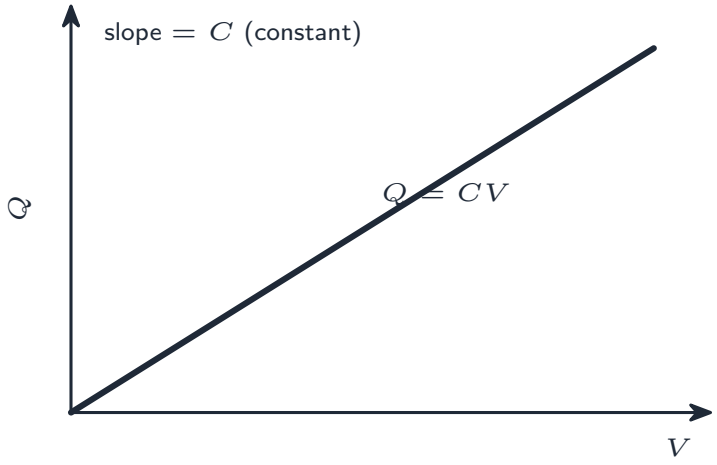
■ 1 The parallel-plate capacitor



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 μF capacitor is charged to 9.0 V: $Q = CV = (50\times10^{-6})(9.0) = 4.5 \times 10^{-4}$ C.

Watch out: 1 μF $= 10^{-6}$ 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 μF capacitor is charged to 12 V. Find the charge it stores. [2]

19.5 A capacitor stores 6.0×10^{-4} C at 20 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]