

18 Electric fields — 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)		
electric field	电场	_____	_____	_____
electric field strength	电场强度	_____	_____	_____
test charge	检验电荷	_____	_____	_____
Field lines	场线	_____	_____	_____

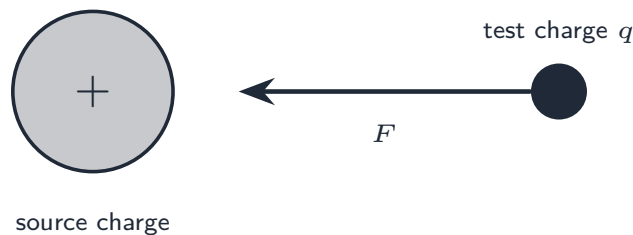
Recall

An **electric field** 电场 is a region where a charge feels a force from other charges — the electric version of the gravitational field you met earlier.

New ideas

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

■ 1 Field strength

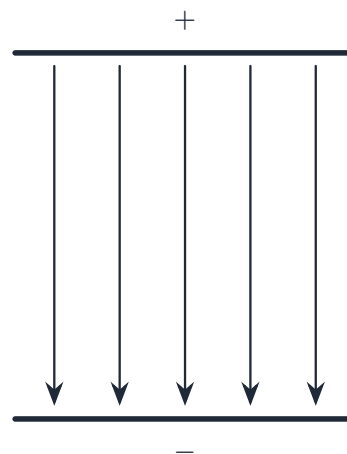
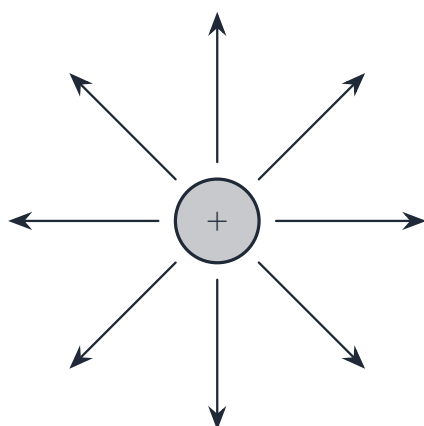


$$E = F/q \quad (\text{N C}^{-1})$$

The **electric field strength** 电场强度 $E = F/q$ is the force per unit positive charge on a small **test charge** 检验电荷. Its unit is N C^{-1} .

Worked example. A charge $q = 2.0 \times 10^{-6} \text{ C}$ feels a force of $3.0 \times 10^{-3} \text{ N}$. The field strength is $E = F/q = (3.0 \times 10^{-3})/(2.0 \times 10^{-6}) = 1.5 \times 10^3 \text{ N C}^{-1}$.

■ 2 Field lines



Field lines 场线 point the way the force acts on a positive charge — outward from a positive charge, and evenly spaced (uniform) between parallel plates.

Worked example. Around a lone positive charge the lines spread straight outwards in all directions. Between two parallel charged plates they run straight across, evenly spaced — a uniform field.

Watch out: field lines show the force on a *positive* charge. A negative charge in the same field feels a force the *opposite* way.

Practice

Try these in order.

18.1 What is an *electric field*? [1]

18.2 Write the formula for *electric field strength*. [1]

18.3 What is the unit of E ? [1]

18.4 A charge of 3.0×10^{-6} C feels a force of 0.012 N. Find the field strength. [2]

18.5 Which way do field lines point around a positive point charge? [1]

18.6 A positive charge and a negative charge are placed at the same point in a field. Compare the directions of the forces on them. Explain. [2]

18.7 Challenge. Compare the electric field ($E = F/q$) with the gravitational field ($g = F/m$). Give one way they are alike and one way they differ. [2]
