

18 Electric fields – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English

Write it 3 times (English)

electric field

electric field

strength

test charge

Field lines

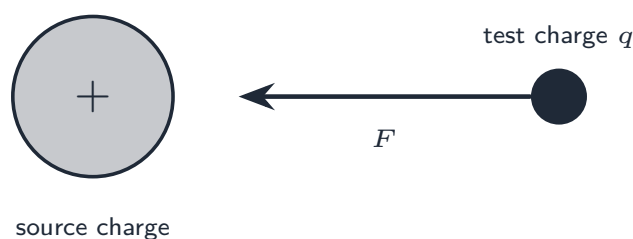
Recall

An **electric field** 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



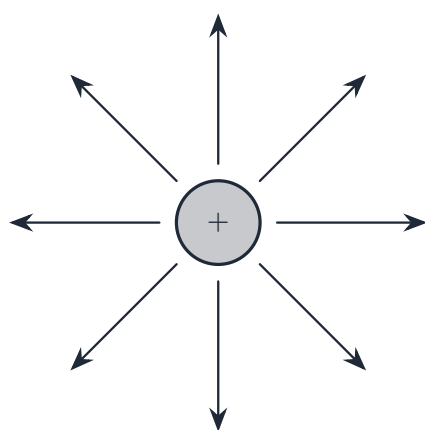
$$E = F/q \quad (\text{N C}^{-1})$$

The **electric field strength** on a small **test charge**

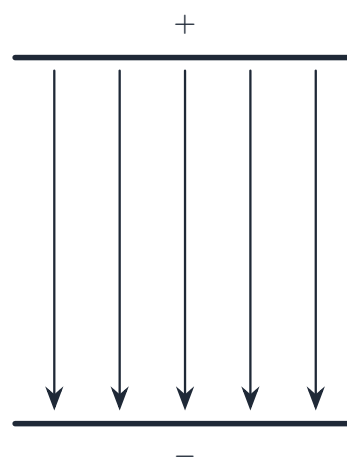
$E = F/q$ is the force per unit positive charge. Its unit is N C^{-1} .

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



point charge



parallel plates

Field lines 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]
