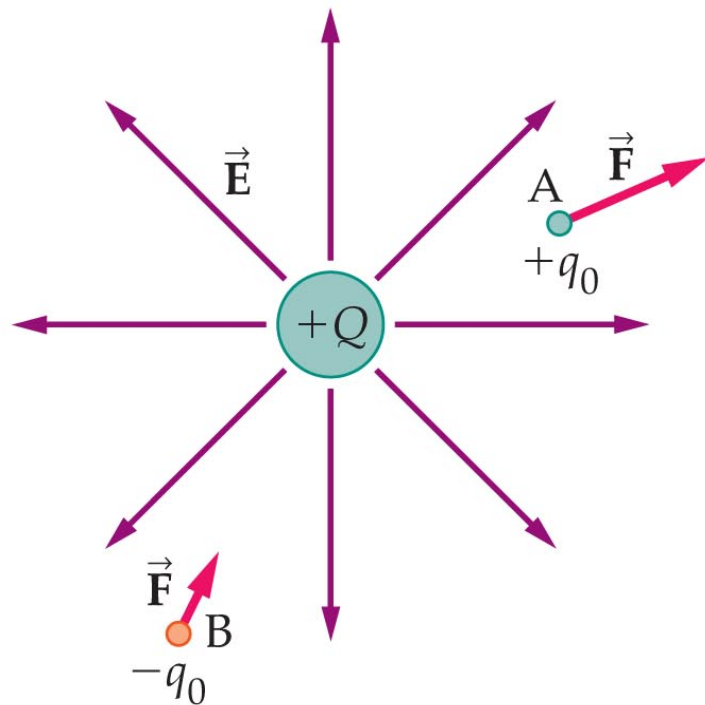


Chapter 20

Electric Field:

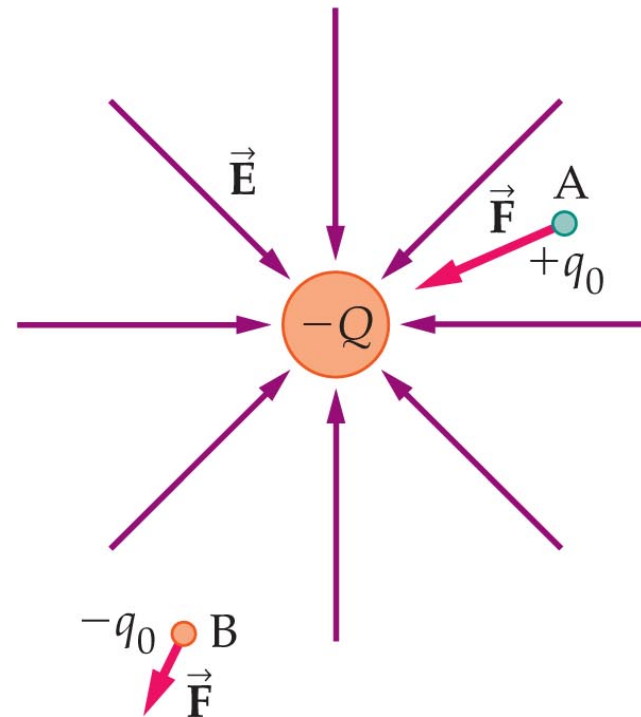
Direction: Direction of force on a positive charge

Magnitude $E = F/q$



(a)

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(b)

Revised 7.23.2020 Some diagrams from Pearson Physics by Walker. Used with permission

Play with this demonstration of electric fields (PHET):

Copy this link and paste it into your browser.

https://phet.colorado.edu/sims/html/charges-and-fields/latest/charges-and-fields_en.html

In order to see how a problem is solved, copy and paste this link and watch the movie:

https://www.youtube.com/watch?v=lpb94QF0_mM

Then do the problems on the following pages.

1. A positive test charge of $5.0 \times 10^{-6} \text{C}$ is in an electric field that exerts a force of $2.0 \times 10^{-4} \text{N}$. What is the field's magnitude?

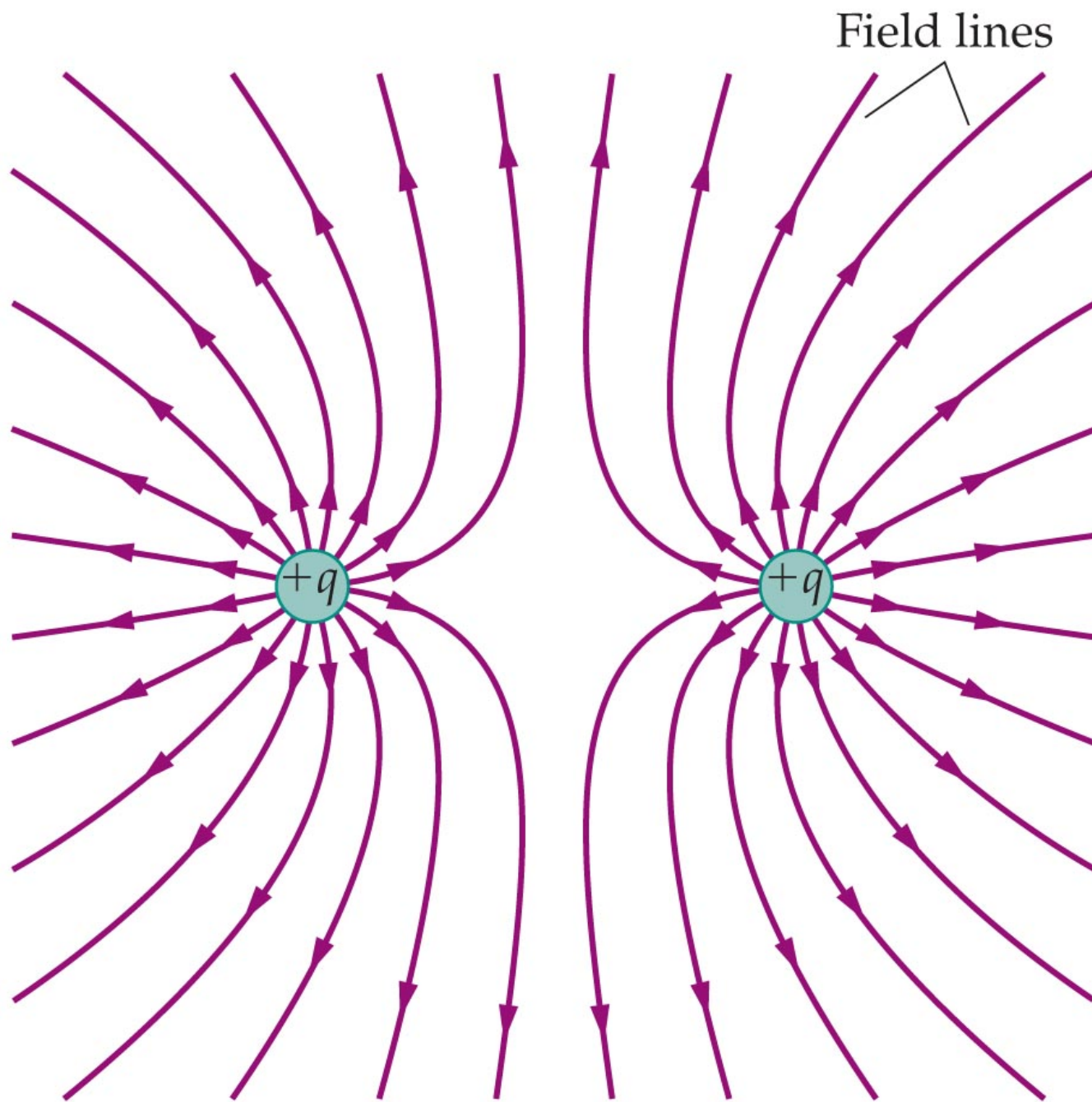
2. A negative charge of $2.0 \times 10^{-8} \text{C}$ experiences a force of 0.060 N to the right in an electric field. What is the magnitude and direction of the field? (p 565)

An electron is in an electric field having a magnitude of $1.2 \times 10^{-9} \text{ N/C}$ directed to the right.

Find the magnitude and direction of the force exerted on the electron by the field.

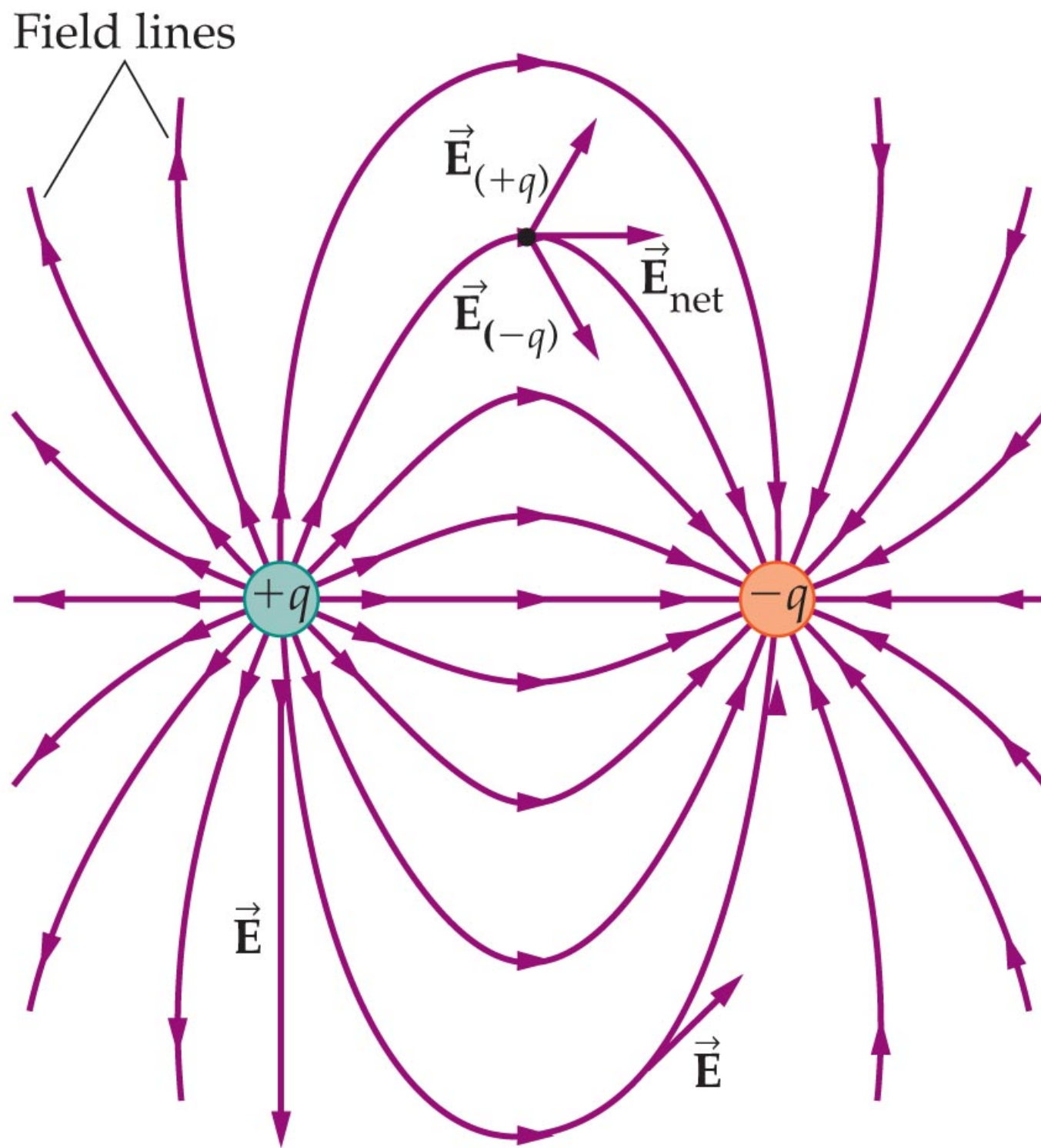
Electric Field Lines:

1. Point in the direction of the electric field at any point.
2. Start at a + charge (or infinity).
3. End on a - charge (or infinity).
4. Are closer together when E is stronger
5. Number of lines leaving or entering a charge are \propto proportional to the magnitude of the charge.
6. They never cross.



(b)

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(c) Electric dipole



Many aquatic animals can produce electric fields and detect changes in them. This assists them in locating obstacles and food. Sharks are well known for their sensitivity to weak electric fields in their surroundings. This has been used to repel them. (See page 713 in the textbook)



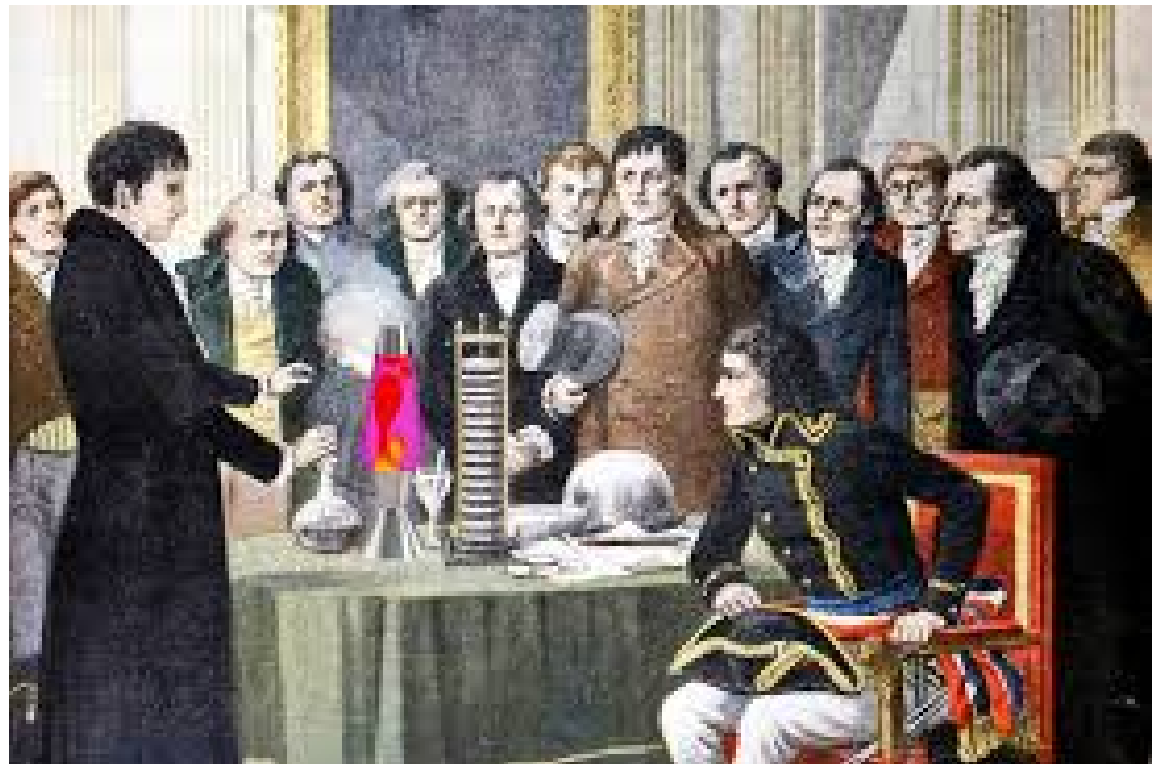
The electric eel is one of the few creatures able to generate, store, and discharge electricity. It can deliver a powerful series of high-voltage discharges reaching 560 volts. These are strong enough to topple a horse crossing a stream 20 feet away. It can also cause paralysis, cardiac arrhythmia and even death in humans.

Potential Difference = work/charge

$$V = w/q$$

A Volt = Joule/Coulomb

$$E = V/d$$



Alessandro Volta demonstrates the electric pile to Napoleon

1. How much work is done when 3.0 C is moved through an electrical potential difference of 1.5 Volts?

2. An electron in a television picture tube passes through a potential difference of 18000volts. How much work was done on the electron by the field?