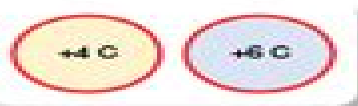


## The electrostatic charge

- The charge on the electron – the most common magnitude charge for chemical ions and accelerated charged particles in physics, is too small to be a practical unit, especially in electricity.
  - The unit we therefore use is the coulomb (C) for measuring electrostatic charge, named after Charles Augustin de Coulomb, a French physicist who did many of the early experiments on electrostatics.
- One coulomb (C) is the charge equal to the total charge on  $6.25 \times 10^{18}$  electrons.
  - So, 1 coulomb = the charge on 6 250 000 000 000 000 electrons
  - Therefore the charge on 1 electron =  $\frac{1}{6.25 \times 10^{18}} = -1.6 \times 10^{-19}$  C.
  - The charge on a proton is  $+1.6 \times 10^{-19}$  C.

## Sample Questions

1. How many electrons are involved in producing the following charged objects?
  - (a) Object A with a charge of  $+4.0$  mC.
  - (b) Object B with a charge of  $-2.5$   $\mu$ C.
  - (c) Object C with charge  $+6 \times 10^{-6}$  C.
  - (d) Object D with charge  $-7.2$  nC.
2. What is the charge on each of the following?
  - (a) Object which has a deficiency of  $6.0 \times 10^{18}$  electrons.
  - (b) Object which has an excess of  $7.5 \times 10^{18}$  electrons.
  - (c) Object which has a deficiency of  $4.8 \times 10^{18}$  electrons.
  - (d) Object which has an excess of  $5 \times 10^{17}$  electrons.
3. Two charged spheres of identical size carry charges of  $+4$  C and  $+6$  C as shown.



- (a) What happens if these spheres are touched together?
- (b) What will be the charges on each when they are separated again?
- (c) How many electrons move from which sphere to which sphere?

4. Two charged spheres of identical size carry charges of  $+3$  C and  $-5$  C as shown.



- (a) What happens if these spheres are touched together?
- (b) What will be the charges on each when they are separated again?
- (c) How many electrons move from which sphere to which sphere?

5. Two charged spheres of identical size carry charges of  $-1.6$  C and  $-3.2$  C as shown.



- (a) What happens if these spheres are touched together?
- (b) What will be the charges on each when they are separated again?
- (c) How many electrons move from which sphere to which sphere?

6. Three charged spheres of identical size carry charges of  $-2.0$  C,  $+6.0$  C and  $-1.0$  C as shown.



Describe what happens if these spheres are all touched together?

# Mastering Physics Solution Chapter

**Richard Bailey**



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