PHYS 1030
Tutorial 1

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What is physics?

From Ancient Creek, ‘knowledge of nature‘.

Physics is one of the most fundamental scientific disciplines,

and its main goal is to understand how the universe behaves.

Basis for most modern technology

Internet

Big data

Computer

- Challenging
- Interesting

When engineers has a bad background in physics:

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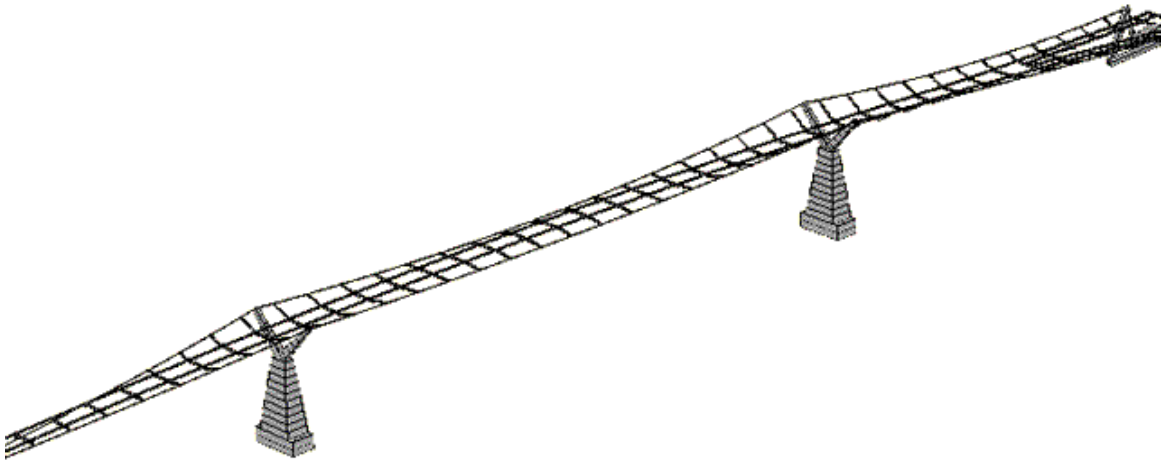
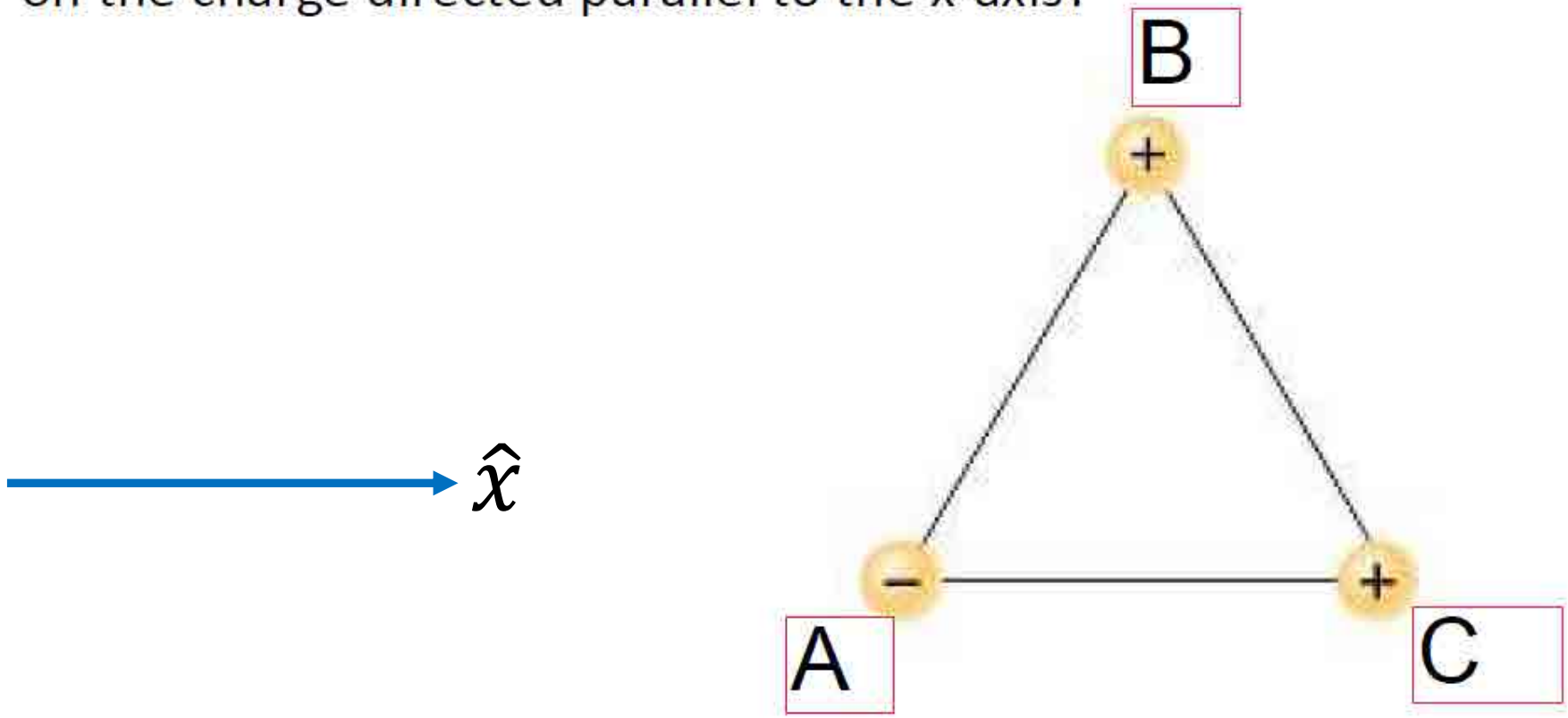


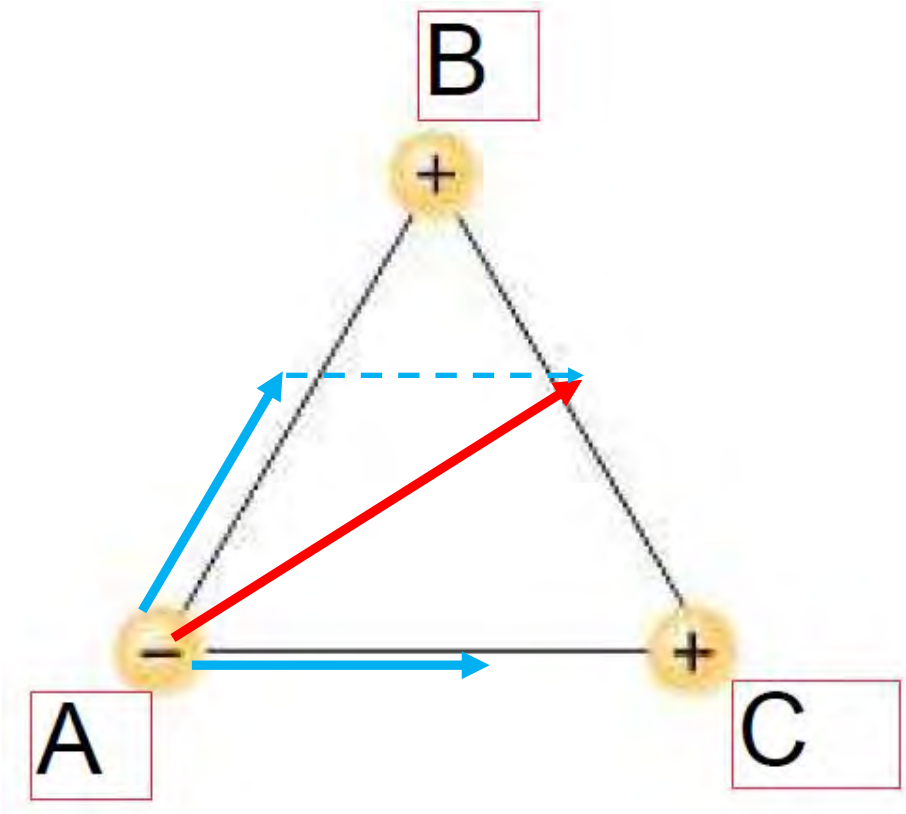
Quebec Bridge Disaster

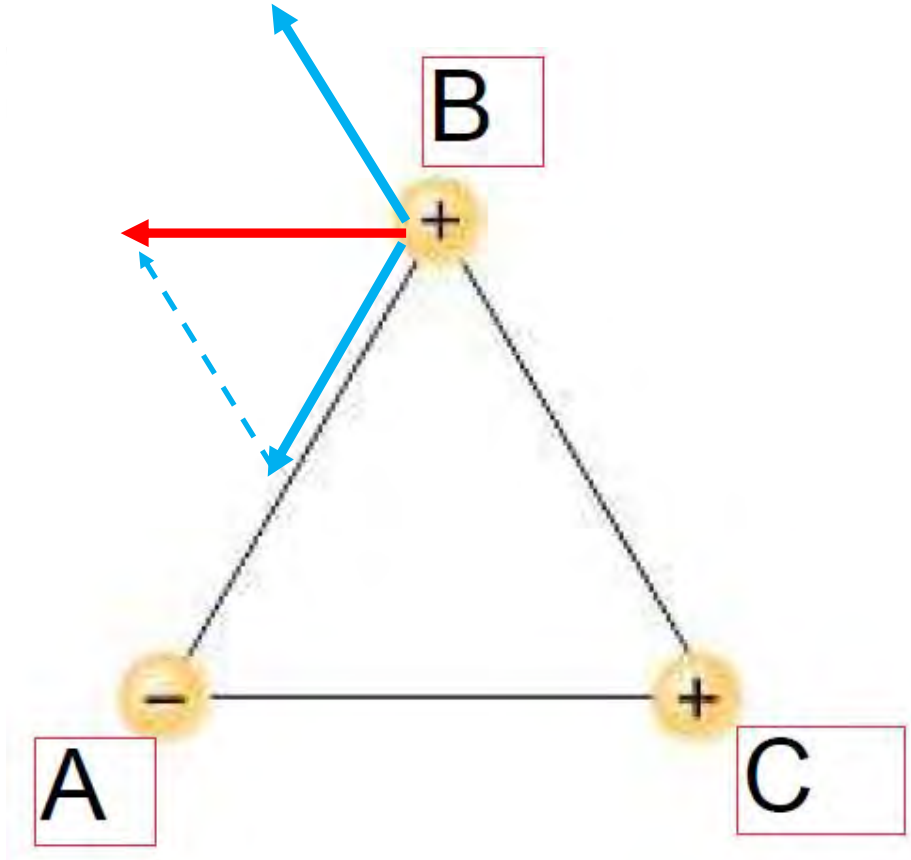
It kills !

Concept 18.9

Three point charges have equal magnitudes and are fixed to the corners of an equilateral triangle. Two of the charges are positive and one is negative, as the drawing shows. At which one of the corners is the net force acting on the charge directed parallel to the x-axis?




B
A
C


B
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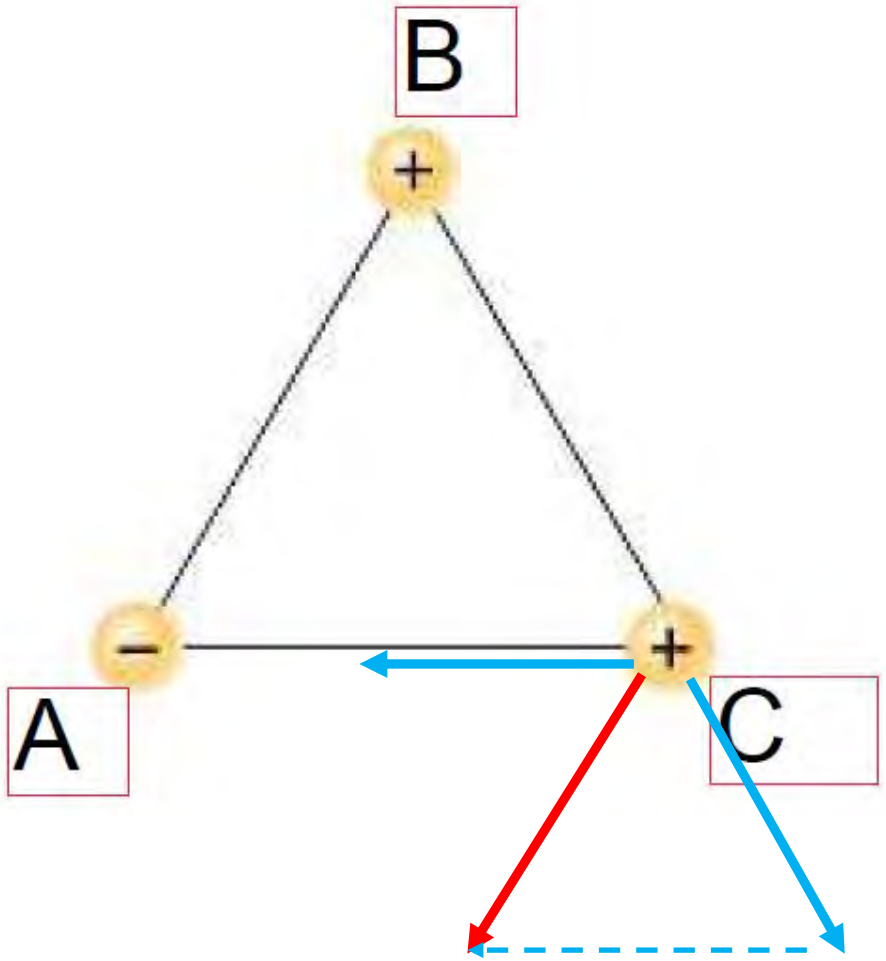
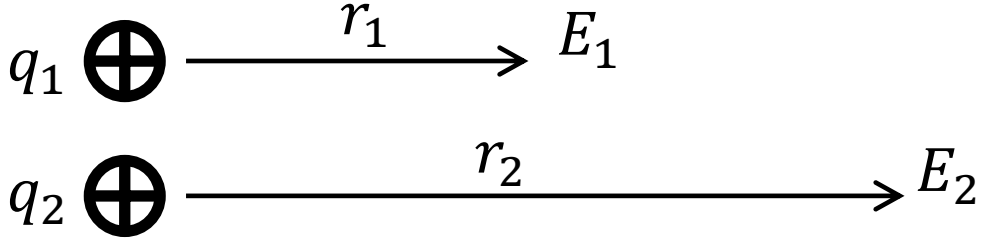

B
+
−
+
A
C

Concept 18.12

A positive point charge q_1 creates an electric field of magnitude E_1 at a spot located at a distance r_1 from the charge. The charge is replaced by another positive point charge q_2, which creates a field of magnitude $E_2=E_1$ at a distance of $r_2=2r_1$. How is q_2 related to q_1?

(a) $q_2=2q_1$
(b) $q_2=q_1/2$
(c) $q_2=4q_1$
(d) $q_2=q_1/4$
(e) $q_2=\sqrt{2}\,q_1$

$$E = \frac{kq}{r^2}$$



$$E_1 = \frac{kq_1}{r_1^2}$$

$$r_2 = 2r_1$$

$$E_2 = \frac{kq_2}{r_2^2}$$

$$E_2 = \frac{kq_2}{(2r_1)^2} = \frac{kq_2}{4r_1^2} = E_1 = \frac{kq_1}{r_1^2}$$

$$\frac{\cancel{k}q_2}{4\cancel{r_1^2}} = \frac{\cancel{k}q_1}{\cancel{r_1^2}} \qquad \frac{q_2}{4} = q_1 \qquad q_2 = 4 \times q_1$$

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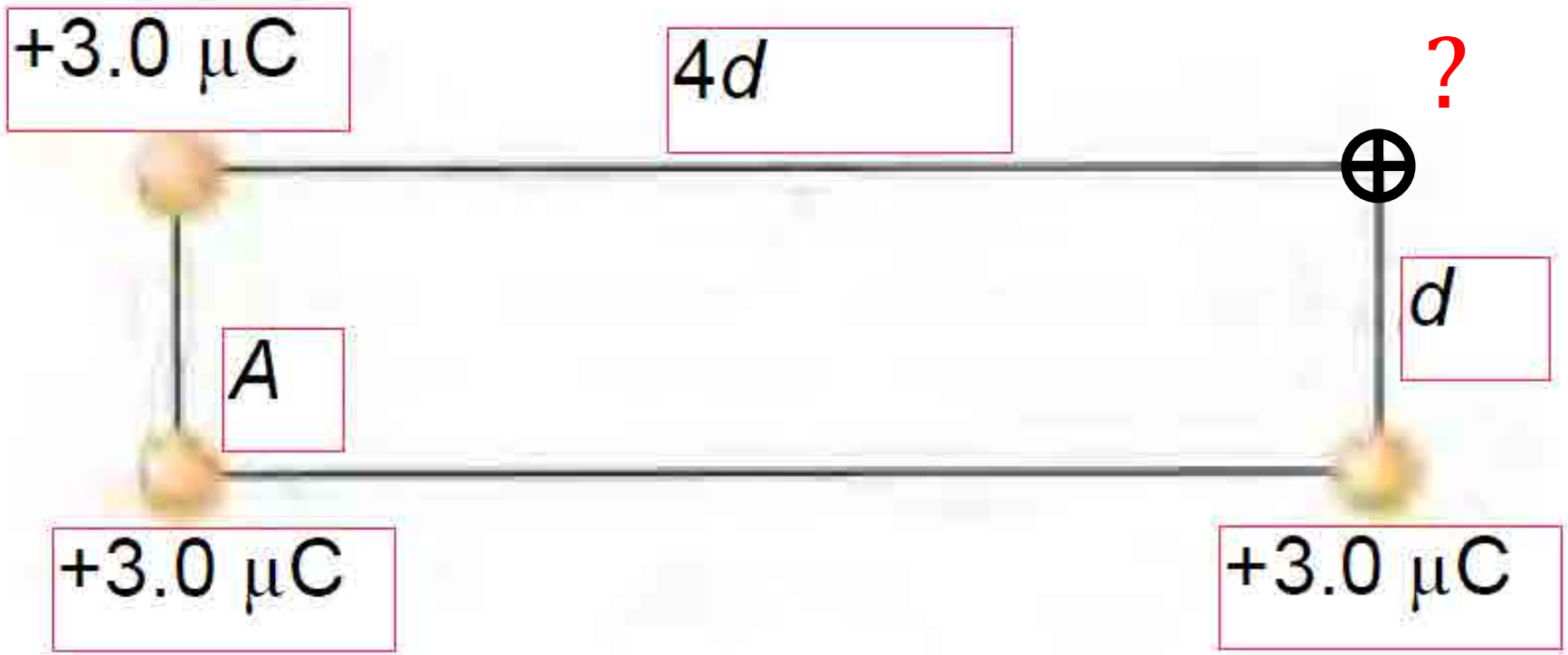
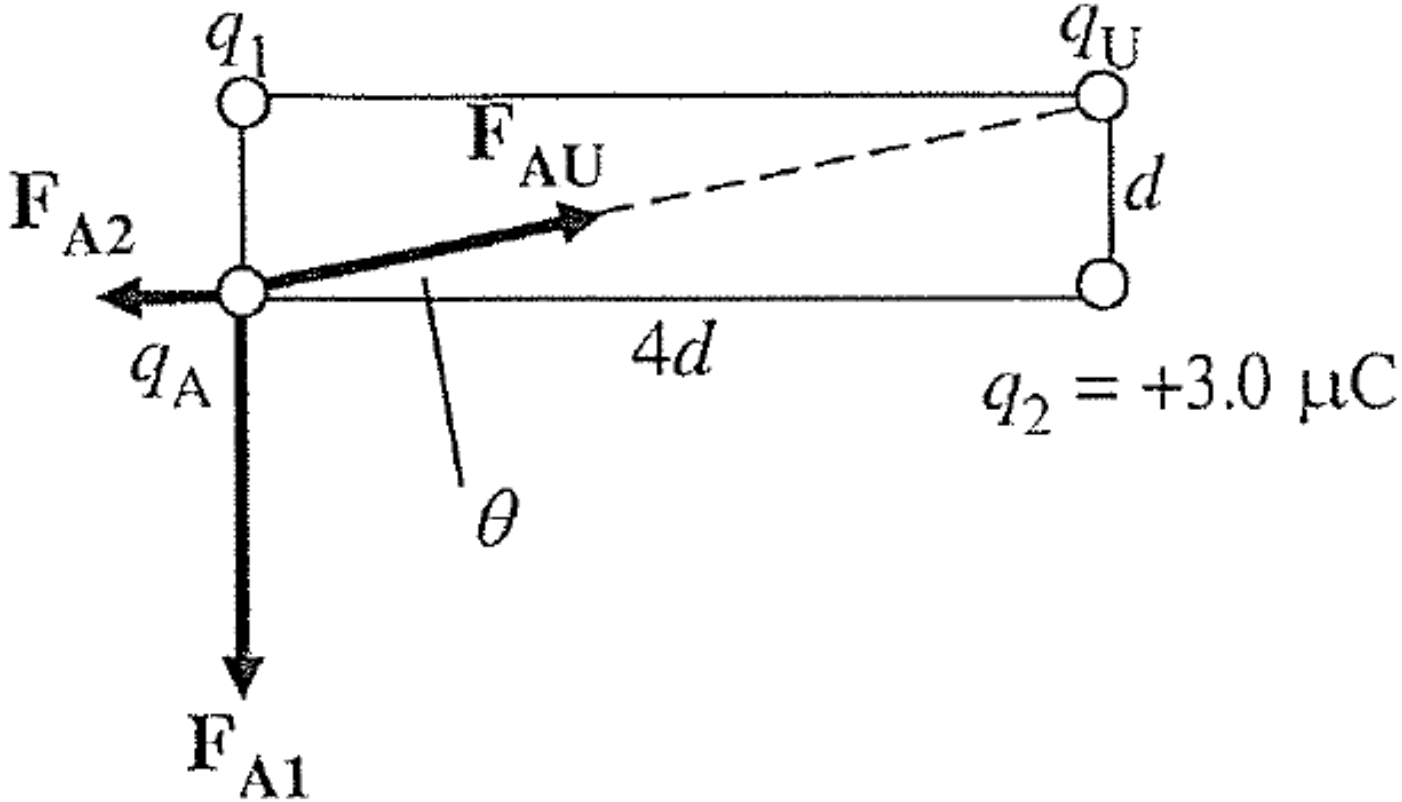
C & J 18.25

In the rectangle in the drawing, a charge is to be placed at the empty corner to make the net force on the charge at corner *A* point along the vertical direction. What charge (magnitude and algebraic sign)must be placed at the empty corner?



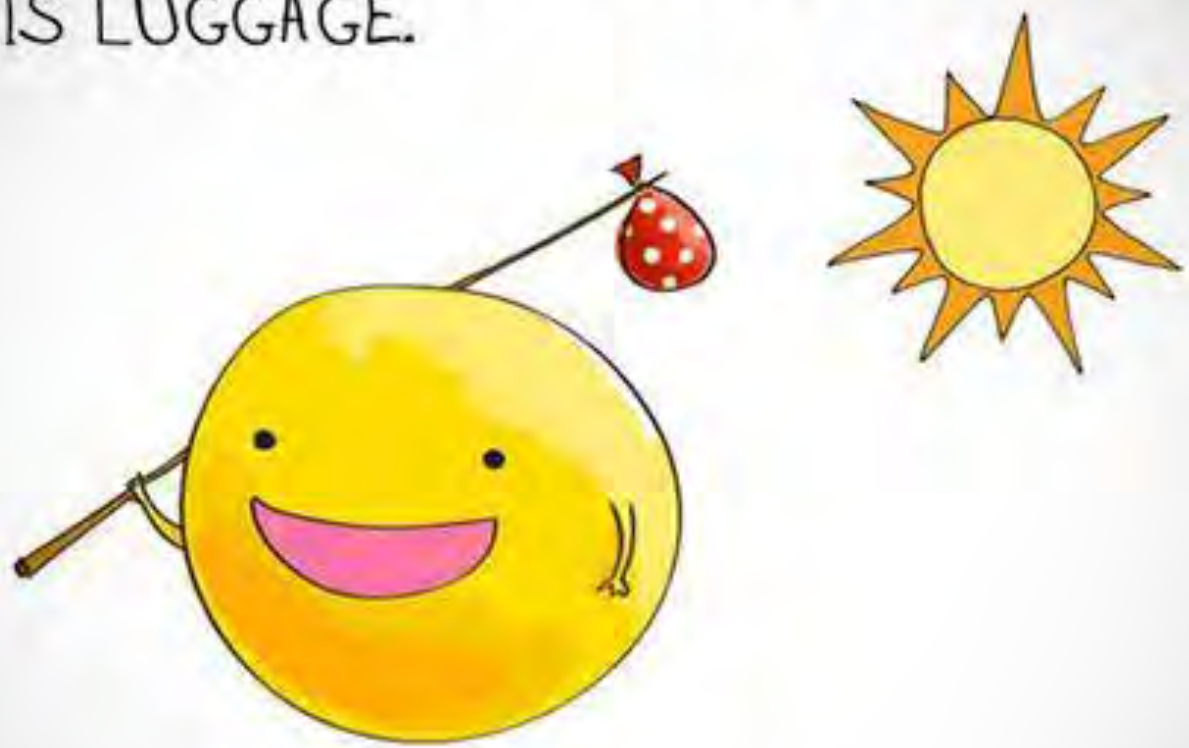

q_1
q_U
$\mathbf{F}_{AU}$
$\mathbf{F}_{A2}$
d
q_A
$4d$
$q_2 = +3.0\ \mu C$
θ
$\mathbf{F}_{A1}$

C&J 18.40. A proton and a electron are moving due east in a constant electric field that also points due east. The electric field has a magnitude of 8.0×10^4 N/C

(a) Determine the magnitude of the acceleration of the proton and the electron.

(b) Determine the magnitude of the acceleration of the proton and the electron if the field points due north. Also sketch the trajectories for both of the particles in this field.

A PHOTON CHECKS INTO A HOTEL AND IS ASKED IF HE NEEDS ANY HELP WITH HIS LUGGAGE.



"NO, I'M TRAVELLING LIGHT."

Problem 19.10

A moving particle encounters an external electric field that decreases its kinetic energy from 9520 eV to 7060 eV as the particle moves from position A to position B. The electric potential at A is -55.0 V and the electric potential at B is +27.0 V. Determine the charge (with sign) of the particle.

Problem 19.13

Two point charges, +3.40 μC and -6.10 μC are separated by a distance of 1.20 m. What is the electric potential midway between the two charges?

Problem 19.31

Two equipotential surfaces surround a $+1.5 \times 10^{-8}$ C point charge. How far is the 190.0 V surface from the 75.0 V surface?