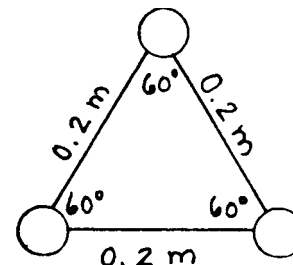


Challenge Exercises for Further Study

B-1: Three glass Christmas balls become electrically charged when Noel removes them from the packaging material in their box. Noel hangs the balls on the tree as shown. If each ornament has acquired a charge of $2.0 \times 10^{-10} \text{ C}$, what is the magnitude and direction of the force experienced by the ball at the top?



B-2: In a TV picture tube, electrons are accelerated from rest up to very high speeds through a potential difference of 22 000 V. At what speed will an electron be moving just as it strikes the TV screen? (In reality you would have to consider the effects of relativity in order to solve this exercise properly; however, ignore such relativistic effects here.)

B-3: A lightning bolt discharges into New Hampshire's Lake Winnepesaukee after passing through a potential difference of $9.00 \times 10^7 \text{ V}$. What is the minimum amount of charge the lightning bolt could be carrying, if it were to vaporize 1000. kg of water in the lake that was originally at a temperature of 20.0 °C?