

## Solution for Homework 4

### Chapter 18:

#### Questions:

18.1 The electric force depends on charge on one body, charge on the other, and the distance between them.

18.6 Rubbing processes between truck tires and the ground will make the truck charged. A conductive chain is used to avoid charge accumulation on the truck. Any accumulated charge on the truck will flow into the ground through the chain. Otherwise, excessive charge accumulation may induce discharging, which may lead to exploding.

18.8 You have acquired charges due to a rubbing process between your shoe and the rug.

18.17 The gravitational force on the leaves.

#### Exercises:

18.5 electric force =  $k Q_1 Q_2 / (r^2)$   
force =  $12N = k Q_1 Q_2 / (2cm)^2$

a) force =  $k Q_1 Q_2 / (6cm)^2 = 12N \times (2cm)^2 / (6cm)^2 = 12N/9 = 1.3N$

b) force =  $k Q_1 Q_2 / (1cm)^2 = 12N \times (2cm)^2 / (1cm)^2 = 48N$

c) force =  $k (3Q_1) Q_2 \times (2cm)^2 = 3 (k Q_1 Q_2 / (2cm)^2) = 3 \times 12N = 36N$

d) force =  $k (3Q_1) (3Q_2) \times (2cm)^2 = 9 (k Q_1 Q_2 / (2cm)^2) = 9 \times 12N = 108N$

### Chapter 19:

#### Questions:

19. 2 charge = current x time, e.g.,  $1A \cdot hr = (1C/sec. \cdot 3600sec.) = 3600C$

19.8 No. Current is continuous in a closed circuit.

19.21 With a bare feet, you can be directly in touch with the ground. If you touch a high-voltage wire, there will be current flowing through your body. It is dangerous.

When you wear shoes with good insulating sole and touch a high-voltage wire with only one hand, there is no current flow going through your body.

#### Exercises:

19.5 The voltage is  $2 \times 1.5V = 3V$

19.23 The power:  $p = \text{current} \times \text{voltage} = 150A \times 12V = 1800A \cdot V = 1800W$

19.25 The total energy is  $25W \times 24hr \times 365 = 219000W \cdot hr = 219kW \cdot hr$

The total cost will be  $219kW \cdot hr \times \$0.080/(kW \cdot hr) = \$17.52$