1. When clothes tumble-dry they become statically charged?

   a. Why?
   b.

As they tumble, they rub against the metal, which transfers electrons to the bed sheets.

   b. If the clothes are *not* allowed to dry completely, will they still be charged?

No. Water is great at removing static.

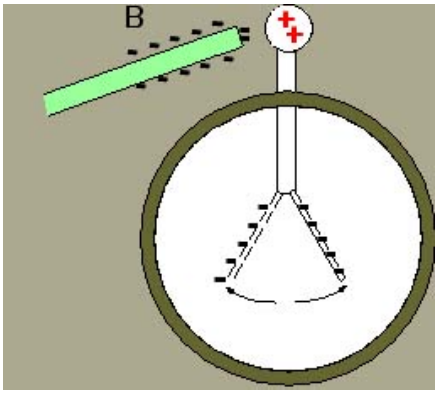
2. In the diagram below,
   a. explain why the leaves of the electroscope are moving apart.

Like charges repel. Both pieces are (-)

   b. explain how the leaves both became negative, and why the metal sphere is positive.

The negative charge from the rod repelled the electrons from teh sphere into the pieces at the bottom.

   c. explain what would happen if the rod actually touched or was placed extremely close to the sphere. The entire electroscope (knob and leaves) would become negative.



3. For each set, choose the one which offers the ***more*** resistance

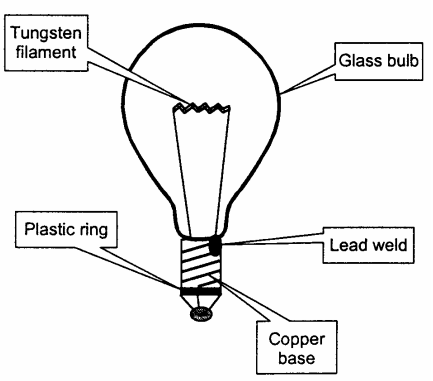
a. a wire 40 cm in length and 3 cm wide__X_
   a wire 40 cm in length and 8 cm wide___

b. a 20 cm wire made of Cu ____
   a 30 cm wire made of Cu__X__

c. a circuit operating at -3 ^{o}C___
   one operating at 2 ^{o}C__X

4.

The diagram on the right shows the main parts of an incandescent light bulb.



Which of the above substances used to make this light bulb are ***insulators***?

Plastic, glass

5. Two spheres are in contact with one another. The first sphere has twice the charge of the smaller sphere. The larger sphere has an area = 9 cm^2, and it loses 2 units of charge to the smaller sphere, which in spite of its size, is less crowded because it has so little charge.

   How many units of charge did the larger sphere begin with if the smaller sphere's area = 6.75 cm^2?

$$\frac{2x-2}{9} = \frac{x+2}{6.75}$$
$$6.75(2x-2) = 9(x+2)$$
$$x = 7$$
$$2x = 14 \; units\, of \; charge$$

6. Define grounding.
   Grounding is the process by which excess charge is removed from an object.

7. What happens to the force of attraction between two charges if the distance between is 1/3 of the original distance? **The force becomes 9 times stronger.**

$$\frac{F_{new}}{F_{old}} = \frac{\frac{-kq_1q_2}{(0.3333r)^2}}{\frac{-kq_1q_2}{r^2}}$$

$$\frac{F_{new}}{F_{old}} = \frac{-kq_1q_2}{0.111111r^2}\left(\frac{r^2}{-kq_1q_2}\right)$$

$$\frac{F_{new}}{F_{old}} = \frac{1}{0.111111} = 9$$

8. What is the conductance of a wire if its resistance is 30 Ω?

G = 1/R = 1/30 = 0.33 S

9. What forms of precipitation can be acidic?

All forms: rain, sleet, snow, hail etc.

10. How does SO_2 eventually become sulfuric acid?
It reacts with hydroxyl in the air:

$SO_2 + 2\ OH \rightarrow H_2SO_4$

11. How does acidic precipitation impact on…
a. people's health?

It aggravates respiratory diseases like asthma, pneumonia, and bronchitis.

b. our cities?

It attacks metal structures, cement, and marble.

c. our lakes?

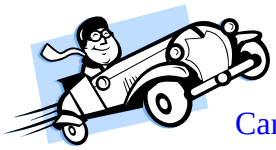
It kills acid-sensitive species like trout.

d. our forests?

It damages or kills trees, especially those at higher elevations.

12. If rain's pH goes down from 6 to 4, how much more acidic has it become?

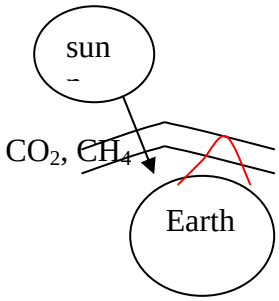
$10^{-4}/10^{-6}$ = 100 times more acidic.



13. What two gases are the main cause of global warming?

Carbon dioxide (CO_2) and methane (CH_4)

14. Use a diagram to explain what is meant by the greenhouse effect. Your explanation should be complete with a written explanation of what you've drawn.



The arrow represents visible light going right through the greenhouse gases, which are invisible, so they do not prevent the earth from receiving energy. But once the earth warms up, some of the infrared(see red curve) that tries to escape back into space is absorbed by CO_2 and CH_4.

15. Discuss the three deadly C's and how they contribute global warming. Then, propose solutions.

- Cars = burn gasoline which releases CO_2. We need to rely more on public transit and to develop fuel cells which emit water and not carbon dioxide.
- Cattle = our heavy reliance on dairy products and meat causes a huge number of cattle to be raised all over the world. These animals produce a large amount of methane(CH_4). We have to eat less meat
- Chainsaws = we consume too much paper and wood products. By cutting trees we eliminate a natural "sink" for CO_2. Recycling would help alleviate the problem.

16. You need to add indicator to the acidr, and then you slowly add base until you see the turning point colour.

17.

a. What is the colour of a solution with a pH of 6.5? orange
b. Turning pt. is 5.8 to 7.7, approximately.

18. What experiment was carried out to calculate the concentration of an acid? Also mention the equipment used and the formula that revealed C_2.

Use a buret to add base to an acid + indicator. When the turning point colour is seen, you record the base's volume and use $C_1V_1 = C_2V_2$.

19. What is the pH of a solution with $[H^+_{(aq}]$ = 0.0040 g/L?

0.0040g/mole(mole/1g) = 0.0040 mole/L

pH = -log(0.0040 mole/L) = 2.40

20. Compared to a pH of 2.5, a solution with a pH of 1.0 is how many times more acidic?

$10^{-1}/10^{-2.5}$ = 34.6 times stronger

21. (430 only: from June 2001 Exam) In the course of an experiment, you find that the pH of pure water is 7. Given that the equation for the ionization of water is:

$$H_2O_{(l)} \rightarrow H^+_{(aq)} + OH^-_{(aq)}$$

determine the molar concentrations of the $H^+_{(aq)}$ ion and the $OH^-_{(aq)}$ ion in pure water.

$[H^+_{(}aq][OH^-_{(aq)}] = 10^{-14}$

Since $[H^+_{(aq)}]$ and $[OH^-_{(aq)}]$ are equal, $x(x) = 10^{-14}$

$x^2 = 10^{-14}$

$x = 10^{-7}$ moles/L