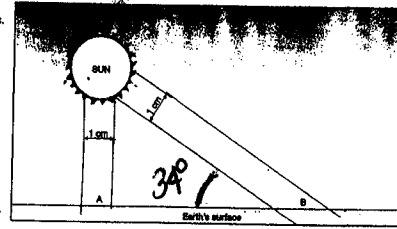


GS106
Key Lab 5

Activity 1

1) the angle of sun beam "B" and the earth is 34°

FIGURE 1
Vertical and oblique sun beams.



2-4) Segment A = 10 mm Segment B = 17 mm. This shows that the beam at segment B is more spread out than at A. The amount of radiation is the same for both segments but it is more concentrated at segment A and therefore there are more Langleys. Remember, a Langley is the equal to one calorie per cm². If you have the same number of calories but there are more cm's then the Langleys will go down. — THE MEASUREMENTS ARE BASED ON THE DIAGRAM IN THE LAB PACKET

5) The total width from x to y is 8 cm or 80 mm

6) To determine the % each mm is of the entirety we take

$$\frac{1\text{mm}}{80\text{mm}} \times 100 = 1.25\%$$

(remember a % is the portion divided by the whole x 100)

7) We can now use this information to calculate what is the % of total energy to reach any particular latitude by measuring these regions:

- 0-30 = 40 mm % radiation = 40mm x 1.25% = 50%
- 30-60 = 30 mm % radiation = 30 mm x 1.25% = 37.5%
- 60-90 = 11 mm % radiation = 11 mm x 1.25% = 13.75 %

- 8) Angle A is measuring the angle of the sun's rays at the equator: 90°
- Angle B is measuring the angle of the sun's rays at 30° : 63°
- Angle C measures the angle of the sun's rays at 60°: 26°
- Angle D measures the angle of the sun's rays at 90°: 0°

9) We can use the data from the two previous questions and see that as the angle of the sun's ray decreases so does the % of solar radiation. This corresponds to the % of radiation being lower at the poles and greater at the equator.

Activity 2:

June 21-22 in the N. Hemisphere is the summer solstice. This is the longest day of the year for the N. Hem. and is when the most intense radiation is hitting at 23.5°N latitude. Because of the way the earth is tilted on its axis, this is same time of the year that the S. Hemisphere experiences its winter solstice. This is when the S. Hemisphere has its shortest day of the year. During this time the Arctic Circle receives 24 hr. of daylight and the Antarctic receives 24 hours of darkness.

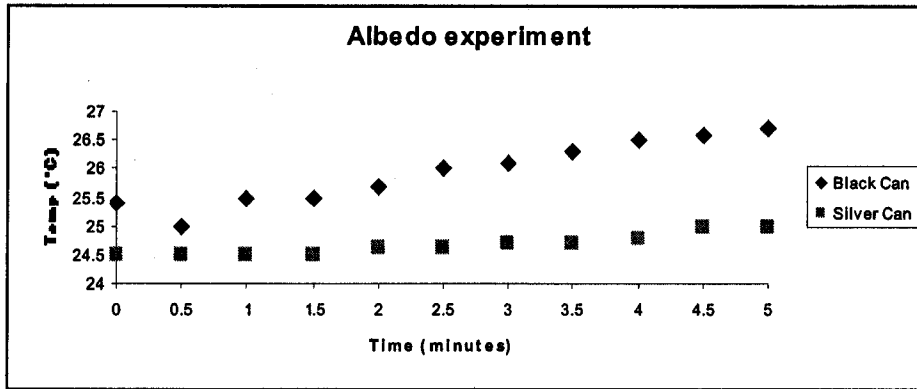
If we consider Dec 21-22 the opposite is true. It is the Winter solstice for the N. Hem and the Summer solstice for the S. Hem.

Knowing this information we can use table 1 on page 6 to determine how many hours of daylight are found at different latitudes on earth during Dec. 21-22. To do this, we must remember that for the N hemisphere this is the Winter solstice and for the S. Hem this is the summer solstice

90°N	0 hrs	0 min
40°N	9 hr	08 min
0°	12 hr	0 min
40°S	14 hr	52 min
90°S	24 hr	0 min

March 21 is known as the spring equinox in the N. Hemisphere and the fall equinox in the S. hemisphere. Likewise Sept. 21 is the Fall equinox in the N and Spring equinox in the S. The equinoxes represent the time when the day and night are equal in length at all latitudes on earth. The most intense radiation is received at the equator at this time of the year

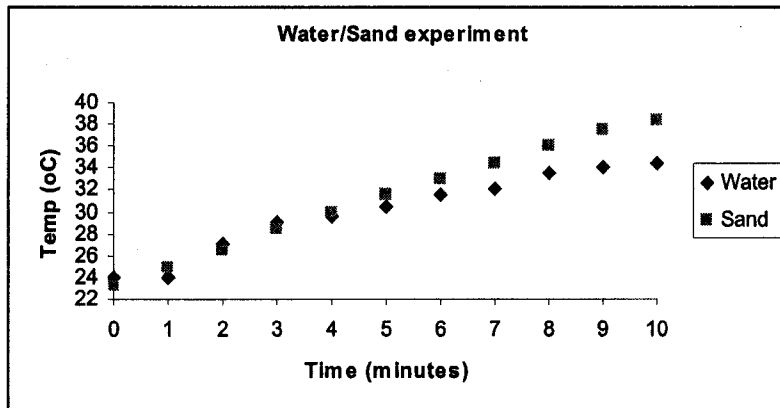
Part B



By looking at the above data we can see that the silver can reflected the most heat meaning that it has the highest albedo.

There are several surfaces on earth with high albedos (meaning they reflect solar energy). They should be anything light colored. This includes snow, white sand, white rock (granite for example), concrete etc. Examples of items with low albedos would be dark colored material such as asphalt, basalt, dirt or soil etc...

The energy given off by the sun is emitted as a short wavelengths of energy. Things on earth with low albedos absorb this short wavelength of energy and re-emit energy at a longer wavelength. It is this longer wavelength that we feel as heat. Therefore, if we think about things with a high albedo, they are reflecting this short wavelength energy and not producing the heat (i.e. the longer wavelengths) Therefore the air above snow or other light colored surfaces is cooler than the air above dark colored surfaces.



Based on the above graph we see that water heats more slowly than sand. One of the reasons for this is that water has a high specific heat (remember?) This means that it takes a lot of energy to raise the temperature of water. Another reason is that water does reflect some of the energy while the sand will absorb a lot of it.

Questions For further Thought:

Based on the diagrams provided, City B has the highest temperature, the lowest temperature, the greatest temperature range and it reaches it's max temperature at an earlier date. City A has a much more uniform temperature. The temperature profile for City A is like what would be found along a coastal region where the water (which heats up slowly but also releases heat slowly) moderates the surrounding climate. City B is more like an inland city.

The coolest part of the day occurs around 6 am and the hottest is around 5 pm. The reason for this is as follows: As the sun comes up in the morning, the earth begins to absorb the radiation. The thing that heats the atmosphere is when the earth re-radiates this absorbed energy at a longer wavelength. This re-radiation starts occurring in the early afternoon and by 5 pm the effects are strongly felt. The coolest part of the day at 6 am is because all night the earth is re-radiating out this stored energy and by 6 am it has exhausted the previous days supply.

Clouds act like a blanket. They hold any re-radiated heat in but also keep a lot of the incoming radiation out. Therefore on a cloudy day the temperature is more moderate. The range of temperature from high to low is closer together.