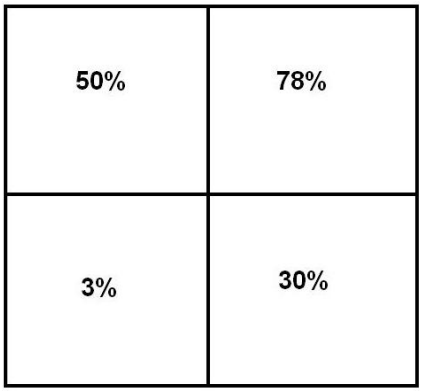


| Material | Reflectivity |
|---|---|
| Snow | 80% |
| White Concrete | 78% |
| Bare Aluminum | 74% |
| Vegetation | 50% |
| Bare Soil | 30% |
| Wood Shingle | 17% |
| Water | 5% |
| Black Asphalt | 3% |

When light falls on a material, some of the light energy is absorbed while the rest is reflected. The absorbed energy usually contributes to heating the body. The reflected energy is what we use to actually see the material! Scientists measure reflectivity and absorption in terms of the percentage of energy that falls on the body. The combination must add up to 100%.

The table above shows the reflectivity of various common materials. For example, snow reflects 80% of the light that falls on it, which means that it absorbs 20% and so 80% + 20% = 100%. This also means that if there are 100 watts of light energy falling on the snow, 80 watts will be reflected and 20 watts will be absorbed.

**Problem 1** - If 1000 watts falls on a body, and you measure 300 watts reflected, what is the reflectivity of the body, and from the Table, what might be its composition?

**Problem 2** - You are given the reflectivity map at the top of this page. What are the likely compositions of the areas in the map?

**Problem 3** - What is the average reflectivity of these four equal-area regions combined?

**Problem 4** - Solar radiation delivers 1300 watts per square meter to the surface of Earth. If the area in the map is 20 meters on a side; A) how much solar radiation, in watts, is reflected by each of the four materials covering this area? B) What is the total solar energy, in watts, reflected by this mapped area? C) What is the total solar energy, in watts, absorbed by this area?

**Problem 1** - If 1000 watts falls on a body, and you measure 300 watts reflected, what is the reflectivity of the body, and from the Table, what might be its composition?

Answer: The reflectivity is 100% x (300 watts/1000 watts) = 30%. From the table, Bare Soil has this same reflectivity and so is a likely composition.

**Problem 2** - You are given the reflectivity map at the top of this page. What are the likely compositions of the areas in the map?

Answer: 50% = Vegetation
78% = White Concrete
30% = Bare Soil
3% = Black Asphalt

**Problem 3** - What is the average reflectivity of these four equal-area regions combined? Answer: Because each of the four materials cover the same area, we just add up their reflectivities and divide by 4 to get (50% + 78% + 30% + 3%)/4 = 40%.

**Problem 4** - Solar radiation delivers 1300 watts per square meter to the surface of Earth. If the area in the map is 20 meters on a side; A) how much solar radiation, in watts, is reflected by each of the four materials covering this area? B) What is the total solar energy, in watts, reflected by this mapped area? C) What is the total solar energy, in watts, absorbed by this area?

Answer: Each material covers 10 meters x 10 meters = 100 square meters:

A) Vegetation: 0.50 x 1300 watts/$m^2$ x 100 $m^2$ = 65,000 watts.
Concrete: 0.78 x 1300 watts/$m^2$ x 100 $m^2$ = 101,400 watts.
Bare Soil: 0.30 x 1300 watts/$m^2$ x 100 $m^2$ = 39,000 watts.
Black Asphalt: 0.03 x 1300 watts/$m^2$ x 100 $m^2$ = 3,900 watts.

B) 65,000 + 101,400 + 39,000 + 3,900 = 209,300 watts.

C) The total wattage entering this area is 1,300 watts/$m^2$ x 100 $m^2$ x 4 = 520,000 watts. Since 209,300 watts are reflected, that means that 520,000 watts - 209,300 watts = 310,700 watts are being absorbed.

Note: If you work with significant figures the answers are to 2 SF: A) 65,000 ; 100,000; 39,000 and 3,900 B) = 210,000 C) 520,000-210,000 = 310,000 watts.