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**Physics behind Remote Sensing: Electromagnetic spectrum**

**Introduction to Electromagnetic radiation**

1. Draw a short wavelength wave and a long wavelength wave.

2. What is the relationship between wavelength and frequency?

3. For visible light (ROYGBIV), which has the shortest wavelength? Which has the longest?

4. Some insects can see light of shorter wavelengths than humans can see. What kind of radiation do you think they see? Explain your reasoning.

5. Which radiation do you think has more energy and why?

**Interacting with a model of the electromagnetic spectrum**

1. **What are the differences between the different types of electromagnetic radiation?**
   * Which has a longer wavelength - visible or infrared radiation?
   * Which contains more energy - visible or infrared radiation?
   * Which has a higher frequency - visible or infrared radiation?
2. About how fast do all EM waves move?
3. Do EM waves transmit energy or mass?
4. Explore the model and explain the relationship between wavelength, frequency and energy of electromagnetic radiation. Use data from the model to support your answer.

**Introduction to spectral remote sensing**

Watch the video and answer the questions

1. (00:44) Compare and contrast a camera and a remote sensing satellite.
2. (01:22) What are reflective spectrometers?

1. (01:32) What are bands?
2. (01:57) What is spectral resolution?

1. (02:51) What do pixels show us?
2. (03:20) What is a spectral signature?
3. (03:48) How do scientists use the spectral signatures?
4. (04:14) Why is near-infra red measurements used map vegetation on the ground?

1. (05:02) What are some applications of remote sensing data?

**Exploring Landsat imagery to analyze spectral signatures**

In this section you will explore Landsat data and graph spectral signatures of different features and evaluate the validity of the claims made in the video about the the use of remote sensing as a tool to capture and transmitt information absorbed, reflected or transmitted by matter.

***Click on the points in both the True Color and False Color images to get the Digital Numbers of different land cover features and record it in the chart below.***

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band Name** | **Vegetation** | | | **Average** | **Water** | | | **Average** | **Bare Ground** | | | **Average** |
| Blue |  |  |  |  |  |  |  |  |  |  |  |  |
| Green |  |  |  |  |  |  |  |  |  |  |  |  |
| Red |  |  |  |  |  |  |  |  |  |  |  |  |
| Near infra red\_1 |  |  |  |  |  |  |  |  |  |  |  |  |
| Near infra red\_2 |  |  |  |  |  |  |  |  |  |  |  |  |
| Mid infrared |  |  |  |  |  |  |  |  |  |  |  |  |

***Graph average Digital Number of each land cover feature (digital numbers on the y-axis and the bands on the x-axis) to analyze the spectral signature of the different land cover.***

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**Analysis and Evaluation**

1. What do the digital numbers represent?
2. Explain what the spectral signatures of vegetation, water and bare ground represent.
3. Why does the spectral signature of vegetation spike in the NearInfrared\_1 band?
4. **Based on the Landsat data that you graphed and analyzed write a paragraph evaluating the contents of this page and the video.**