

**Test (d)**

**GEPL 4490/5490 Remote Sensing of the Environment**

Name \_\_\_\_\_

10/04/04

1. Explain through comparison and contrasting these 2 laws. Stefan-Boltzmann Law and Wien's Displacement Law.

Stefan-Boltzmann essentially states that amount of EMR is directly proportional to the 4<sup>th</sup> power of the absolute temperature of a blackbody. In other words an object's temperature determines the amount of EMR is radiated. Wien's displacement describes the EMR that dominates the output. That dominant wavelength may be identified by Wien's Displacement. Stefan-Boltzmann describes the relationship of Temperature and EMR energy, whereas Wien's Displacement defines the dominant wavelength based on Temperature.

2. What is Scale?

It is the relationship of distant measurements on a map or image with the same measurements on the earth. It may be described in several ways RF, Verbal and Graphic.

3. What Unit values is RF on a 7.5 Min Topo sheet? Explain why.

None, scale is given as 1/24000 that is an RF and thus dimensionless.

4. Explain Emissivity and in doing so you will need to explain what is a black body.

Emissivity is the ratio of radiation that an object emits over that of a theoretical blackbody's emission as describe in Planck's law. The sun is probably the best example of a near perfect black body. Human skin has an emissivity of .97  
(Think also how that relates to Albedo if it does)

5. Explain the 3 ways EME may be scattered, and name them.

Scattering is a function of the size of the molecule

Rayleigh – Molecular scattering, particle size is a fraction of the wavelength. Upper atmosphere gives blue sky

Mie – Caused by pollen, dust, smoke, particle size is larger than wavelength of EMF however this type of scattering is wavelength dependent.

Non Selective scattering happens in the lower portion of the atmosphere and is not wavelength dependent and is the scattering we associate with haze.

6. Describe the difference between subtractive and additive colors.

Additive colors are RGB and they describe wavelength of energy in combination such that they may form any color and when all wavelengths are combined they form white.

Subtractive color describes the effect of absorbing or taking away some or all but a single wavelength, as seen with dyes and filters. These colors are CYM and the combination of these colors result in black.

7. What is an atmospheric window.

A range of EMF wavelengths that the earth's atmosphere appears

transparent. Absorption caused by elements in the atmosphere like C H and O cause certain wavelengths to be absorbed and re-radiated. At a lower wavelength

8. Hooke, Newton, Maxwell, Planck, and Einstein, were all used in class to explain the shifting understanding of EMR. Please recount that shifting argument. Give examples.

The shift in understanding EMR had to do with whether or not EMR was a wave or particle. Hooke said it was a wave. EMR acts as a wave this may be observed by noticing effect of light traveling outward from a central point and remains in constant phase as a wave in a pond would. He also said that white light was the purist form of light colors were subordinate to the purity of white light. Newton disagreed said EMR acts like a particle, he called a corpuscle. Newton stated white light is a heterogeneous combination of all wavelengths primarily RGB and that these primaries could not be broken down into further colors. Red was red only. Further that these colors could then be recombined into white light. Young later showed that indeed light acted very much like a wave with his experiment with 3 slots. Maxwell noted Electric and Magnetic energy seemed to travel at the same speed as Light causing him to propose that in fact Light was EMR. Planck noted that indeed the ability of light to do work was not a function of the amount of light but rather the wavelength determined the capability to do work he noticed this photo-electric effect when working with electricity in a vacuum. Finally Einstein called EMR a particular kind of energy that was at once both a particle and a wave.

9. Specular and Lambertian what are these words describing, explain the differences.

Reflection, Lambertian reflects light with equal intensity in all

direction, specular reflection describes a kind of reflection where the angle of incident equal the angle of reflected energy. No change in the color of the energy reflected.

10. What is f-stop why is it important.

It describes the relationship between the size of the hole (aperture) and the focal length. It describes the speed of the lens or how much light is reaching the focal plane. Works in combination with the type of film and the speed of the shutter.

11. How do you determine scale on an aerial photo.

Several ways. 1. know the altitude of the airplane and the focal length. Or measure a distance on the image with a known distance in the world, like a football field or baseball diamond.

12. Compare and contrast vector and raster.

Vector is a describing shapes in terms of nodes (points) and edges or vectors (lines). This results in small and discrete file sizes. Good for GIS as the regions have hard edges. Not good for continuous data representation.

Raster is a an array of cells where each cell is used to describe some feature. Unlike the vector file a every region in a raster is recorded, every cell must be accounted for, resulting in large file sizes. Rasters are good for images such as pictures and describe surfaces.

13. What is resolution in terms of remote sensing?

The ability to distinguish between features, to resolve the difference between things. Usually this is defined by a linear measure.

14. Name 3 types of resolution that concern remote sensing.

Spatial, spectral, and radiometric temporal

15. What is a focal plane?

In terms of a camera it is the place that the focused EMR results and where the film or the scanning device resides.

16. What is multi-spectral imagery referring to?

Recording specific regions of EMR at the same time and of the same place. For the purpose of increasing the ability to distinguish features in the image that reflect and emit and transmit in a predictable fashion.

17. Explain why a yellow filter will help reduce atmospheric haze.

Rayleigh scattering dominates in terms of scattering, Mie and non-selective are generally episodic. A yellow filter absorbs blue light and lets red and green pass through. By subtracting out the wavelength primarily associated with scattering the image will have less random EMF inputs thus reducing noise.

18. Compare and contrast Digital and analog.

Digital is discrete analog is continuous. A Digital value is generally an average, analog is not. Digital is the basis of electronic storage methods such as those found in computers. Analog is the storage medium we associate with photographs or phonographs. Digital holds its resolution between transfers generally with no loss of value, Analog storage suffers when transferring between media.

19. What happens to EMR when it passes from a less to a more dense media?

It refracts.

20. Draw a Raster over the 2 shapes below in rasterize the shape. In other words fill in each cell in which your target shape fills. You must decide how to fill the raster.









