Chapter 3

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Project 1

T/F
1) T 2) F 3) T 4) T 5) F 6) F 7) F 8) F 9) F 10) T
11) F 12) T 13) F 14) F 15) T

FIB
1) 300,000 2) wavelength 3) frequency 4) diffraction
5) electric, magnetic 6) 400, 700 nm 7) red
8) radio, infrared, visible 9) temperature 10) 0
11) 273 12) 6000 K 13) the 1200 K 14) high
15) shorter or more blue

Review
1) Period - the time for one wave (cycle). Wavelength – the distance between two corresponding points on a wave. Amplitude – the maximum displacement from the rest position. Frequency – the number of waves (cycles) per unit time.

2) $v=f\lambda$ velocity = frequency times wavelength

3) Diffraction is the bending of a wave around a barrier. Light bends around barriers to produce a diffuse shadow.

4) *c* is the symbol for the speed of light in a vacuum. It is the speed limit – nothing ever measured has traveled faster. It is the same speed for any electromagnetic wave in a vacuum.

5) Both are inverse square laws. Gravitational force only attracts. Electrical forces attract and repel.

6) Moving charged particles generate an electromagnetic wave. The electromagnetic wave travels through space, spreading out in all directions. When the wave hits the retina of a person's eye charged particles move, causing an electrical signal in the brain.

7) ROYGBIV – is typically cited. Red, Orange, Yellow, Green, Blue, Indigo, Violet. The colors of light are different because they have different wavelengths and frequencies.

8) All of them are electromagnetic waves. They all have different frequencies and wavelengths.

9) The earth's atmosphere is transparent to visible, infrared and some radiowaves.

10) A black body is an idealized substance that absorbs and then re emits all radiation it receives. The peak wavelength of the emitted radiation depends on the temperature.

11) Wien's law states that the wavelength emitted is inversely proportional to the temperature. This means that hotter objects emit shorter wavelength light.

12) Stefan's law states that the amount of radiation emitted is proportional to T^4.

13) The peak radiation wavelength increases and it becomes dimmer. The object gets redder and dimmer as it cools off.

14) The frequency of a wave is greater when the object producing the wave is moving toward the observer and the frequency is less when moving away.

15) We could use infrared and radio waves to "see" the stars and planets.

Problems:

1) 1480 m/s 2) wavelength = 3 m 3) frequency = 23.5 Hz

4) 3.25 times hotter, 112 times as much energy 5) 310 K, about 9.3×10^{-6} m, infrared

6) 2.9 μm 7) 625 times more energy 8) 3.85×10^{26} watts

Projects 1) Rigel is hotter: the color is more blue so the wavelength is shorter, the frequency is greater, so the temperature is greater.