

Problem Set #11 Light and Heat Transfer
Due Thursday March 5 A/B and Friday March 6 C/D

Name: _____

I worked with:

Equations:

Force:	$F = ma$
Force due to Gravity on Earth:	$F = mg$
Acceleration due to gravity on Earth:	$g = 9.8 \text{ m/s}^2$
Work	$W = F \cdot d$

Waves

Simplified Wave Equation	$x = A \sin(\omega t)$
Angular Velocity to Frequency	$\omega = 2\pi f$
Speed of a Light Wave	$c = \lambda f$
Speed of light in a vacuum	$c = 3 \times 10^8 \text{ m/s}$
Energy of Light per photon	$E = hf$
Planck's Constant	$h = 6.626 \times 10^{-34} \text{ Js}$

1. Platinum has a work function of $1.017 \times 10^{-18} \text{ J}$. If I exposed a piece of platinum to green light with a wavelength of 532 nm, would I see photoelectrons?

$$c = \lambda f \rightarrow f = \frac{c}{\lambda} = \frac{3 \times 10^8 \text{ m/s}}{532 \times 10^{-9} \text{ m}} = 5.64 \times 10^{14} \text{ s}^{-1}$$
$$E = hf = 6.626 \times 10^{-34} \text{ Js} \times 5.64 \times 10^{14} \text{ s}^{-1} = 3.74 \times 10^{-19} \text{ J}$$

$$1.017 \times 10^{-18} \text{ J} > 3.74 \times 10^{-19} \text{ J} \leftarrow \text{you will not see photo-electrons}$$

2. You were exposed to a large amount of Electromagnetic radiation with a frequency of 10^{15} Hertz. Should you be worried? Why or why not?

This is at the far end of blue, into the ultraviolet range.
So you might be concerned about your exposure

3. You and your project team should create a research document and share it with Ms. Caroline and Ms. Alicyn. In that document you should be researching the answers to the following questions.

- What is the immediate cause of your impact?
- How is that immediate cause connected to larger causes of climate change (increase of carbon in the atmosphere)?
- What are some ways we as humans and other forms of life can survive your climate change impact?
- What are some solutions to stop/fix the immediate cause of your impact?
- What are some solutions that will stop/fix the larger causes of climate change (increase of carbon in the atmosphere)?