PHYS 301 Photoelectric Effect Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Metal | Cs | Na | Ca | Mg | Cu | Ag | Ni | Se | Pt |
| [Work function](http://hyperphysics.phy-astr.gsu.edu/hbase/tables/photoelec.html) (eV) | 2.1 | 2.28 | 2.9 | 3.68 | 4.7 | 4.73 | 5.01 | 5.11 | 6.35 |

Planck’s constant = h = 6.626 x 10-34 J.s hc = 1240 eV.nm 1 eV= 1.6 x 10-19 J

E = hf c = λf

1. Ultraviolet light is responsible for sun tanning. Find the wavelength (in nm) of an ultraviolet photon whose energy is 6.4 times 10 Superscript negative 19 Baseline  Upper J.

2. Find the minimum frequency that light must have to eject electrons from a silver metal surface.

3. Ultraviolet light with a frequency of 3.00 times 10 Superscript 15 Baseline  Hz strikes a metal surface and ejects electrons that have a maximum kinetic energy of 6.1 eV. Identify the metal.

4. The stopping potential for electrons emitted from a surface illuminated by light of wavelength 491 nm is 0.710 V. When the incident wavelength is changed to a new value, the stopping potential is 1.43 V. (a) What is this new wavelength? (b) What is the work function for the surface?

5. (a) If the work function for a certain metal is 1.8 eV, what is the stopping potential for electrons ejected from the metal when light of wavelength 400 nm shines on the metal? (b) What is the maximum speed of the ejected electrons?

6. An orbiting satellite can become charged by the photoelectric effect when sunlight ejects electrons from its outer surface. Satellites must be designed to minimize such charging because it can ruin the sensitive microelectronics. Suppose a satellite is coated with platinum, a metal with a very large work function. Find the longest wavelength of incident sunlight that can eject an electron from the platinum.

7. The following data were obtained in a photoelectric experiment. Plot this data and obtain the following:  
a. Planck’s constant b. Work function c. Identify the metal

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| λ (nm) | 544 | 594 | 604 | 612 | 633 |
| Kmax (eV) | 0.360 | 0.199 | 0.156 | 0.117 | 0.062 |