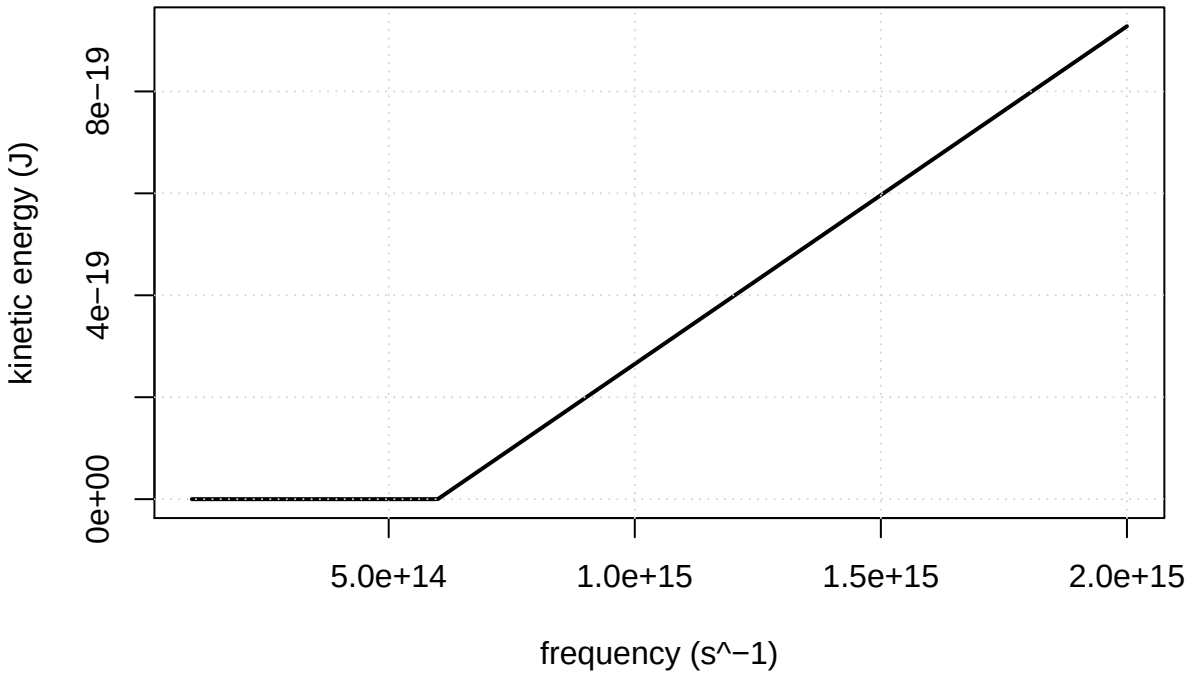
Take-Home Assigment 02 Key

The data below shows the result of a photoelectric effect experiment on an unknown metal that is drawn from the alkali metals alkaline earths, or the first row of the transition metals. Using this data, determine your metal's binding energy in J. Binding energies in the literature typically are reported in electron volts (ev) where 1 eV is equal to 1.6022×10^{-19} J. Convert your metal's binding energy into its equivalent value in electron volts and then use this table to determine your metal's identity. If you cannot narrow it down to a single metal, then identify the possible metals. Binding energies for the possible metals are given here in eV; note that a value for scandium is not available. Your sample id is 44.

metal	binding energy (eV)	metal	binding energy (eV)
lithium	2.35	manganese	3.76
berylliuim	3.92	iron	4.33
sodium	2.28	cobalt	4.20
magnesium	3.68	nickel	5.01
potassium	2.24	copper	4.18
calcium	2.706	zinc	3.73
scandium	NA	rubidium	2.09
titanium	4.06	strontium	2.74
vanadium	3.77	cesium	1.92
chromium	4.37	barium	2.48



First, we have to estimate the threshold frequency, which is the frequency where the electron's kinetic energy first rises above zero; for this data, the threshold frequency is 6.00e+14 s^{-1}. The binding energy, in Joules, is given by the relationship $E = h\nu$, where h is Planck's constant of 6.636×10^{-34} Js; for this data, the binding energy is 3.97e-19 J. Converting to electron volts by multiplying by 1.6022×10^{-19} J/eV gives 2.48. Given this binding energy, the metal is barium.