1. (i) In general, the Debye temperature decreases as you go down a period column; this is expected since a larger mass should have a lower frequency. The lower values of Fe, Co, & Ni are a result of magnetic ordering. The decrease in $\Theta_D$ near the end of the 4d & 5d series comes from the decrease in ion density. The $\Theta_D$ of Cr is unusually high. The sharp increase in $\Theta_D$ from Nb to Mo & Ta to W correlates with the sharp increase in their bulk modulus.

(ii) $K$ increases as we go from 3d to 5d. Again, this is what we expect as mass increases. We expect linear, slowly increasing trends (like that of the 3d graph); perhaps graphing $\sqrt{M} \Theta_D$ might look better.

* The d-states are filling up near the end of the series.
+ Sharp increase is related to the decrease in $\text{DOS}$ at the Fermi level & filling of the bonding states in Mo & W.

2. (i) $\Theta_D(K)$

![Graph showing $\Theta_D$ vs. atomic number for alkali and noble metals.]

(ii) $K$

![Graph showing $K$ vs. atomic number for alkali and noble metals.]

As in 1(ii), we expect flat lines.

The $\Theta_D$ values go like $1/\text{atomic number}$ for each group, which is expected.