

48. (a) From Fig. 41-14 we estimate the wavelengths corresponding to the K_α and K_β lines to be $\lambda_\alpha = 70.0\text{ pm}$ and $\lambda_\beta = 63.0\text{ pm}$, respectively. Using the result of problem 3 in Chapter 39, adapted to these units ($hc = 1240\text{ eV}\cdot\text{nm} = 1240\text{ keV}\cdot\text{pm}$),

$$E_\alpha = \frac{hc}{\lambda_\alpha} = \frac{1240\text{ keV}\cdot\text{pm}}{70.0\text{ pm}} = 17.7\text{ keV} ,$$

and $E_\beta = (1240\text{ keV}\cdot\text{nm})/(63.0\text{ pm}) = 19.7\text{ keV}$.

- (b) Both Zr and Nb can be used, since $E_\alpha < 18.00\text{ eV} < E_\beta$ and $E_\alpha < 18.99\text{ eV} < E_\beta$. According to the hint given in the problem statement, Zr is the better choice.