1-5)

Each ship emits light of wavelength 200 nm.
A sees B's emission at 180 nm
B sees C's emission at 165 nm.

First, we need to find the velocities of the ships. We already have the Doppler relationship for receding sources.

$$\beta = \frac{\lambda^2 - \lambda_o^2}{\lambda^2 + \lambda_o^2}$$

For B as seen from A,

$$\beta_{B,A} = \frac{180^2 - 200^2}{180^2 + 200^2} = -0.105 \ .$$

The negative sign indicated that B is approaching A, or vice versa.

For C as seen by B,

$$\beta_{C,B} = \frac{165^2 - 200^2}{165^2 + 200^2} = -0.190 \ .$$

The negative sign indicated that C is approaching B, or vice versa.

Now, find the speed of C as seen by A:

$$\beta_{C,A} = \frac{\beta_{C,B} + \beta_{B,A}}{1 + \beta_{C,B}\,\beta_{B,A}} = \frac{-0.190 + (-0.105)}{1 + (-0.190)(-0.105)} = -0.289 \ .$$

Then,

$$\lambda = \lambda_o \left(\frac{1+\beta}{1-\beta}\right)^{1/2} = 200 \left(\frac{1 + (-0.289)}{1 - (-0.289)}\right)^{1/2} = 149 \text{ nm} \ .$$