31. We apply Eq. 38-33 for the Doppler shift in wavelength:

$$\frac{\Delta\lambda}{\lambda} = \frac{v}{c}$$

where v is the recessional speed of the galaxy. We use Hubble's law to find the recessional speed: $v = Hr$, where r is the distance to the galaxy and H is the Hubble constant $(19.3 \times 10^{-3} \, \frac{\text{m}}{\text{s}\cdot\text{ly}})$. Thus, $v = [19.3 \times 10^{-3} \, \frac{\text{m}}{\text{s}\cdot\text{ly}}](2.40 \times 10^8 \, \text{ly}) = 4.63 \times 10^6 \, \text{m/s}$ and

$$\Delta\lambda = \frac{v}{c}\,\lambda = \left(\frac{4.63 \times 10^6 \, \text{m/s}}{3.00 \times 10^8 \, \text{m/s}}\right)(656.3 \, \text{nm}) = 10.1 \, \text{nm} \; .$$

Since the galaxy is receding, the observed wavelength is longer than the wavelength in the rest frame of the galaxy. Its value is $656.3 \, \text{nm} + 10.1 \, \text{nm} = 666.4 \, \text{nm}$.