**Lab 1: Image Processing**

Q1: Landsat 8, OLI, August 30 2020, Collection 2 Tier 1. **(2)**

Q2: Geometric calibration means that pixels are spatially aligned between acquisitions. Radiometric calibration means that differences in reflectance are due to changes in surface properties and not the sensor. Both are needed so that changes in pixel values over time can be attributed to changes in the environment and not properties of the sensor. **(4)**

Q3: The reflectance in the visible bands is much higher without atmospheric correction. This is due to scattering of visible light, especially blue, in the atmosphere. It is important to correct atmospheric effects so that differences in reflectance can be attributed to the ground/environment and not the atmosphere. **(4)**

Q4: Raster B: NAD 1983 UTM Zone 9, integer.  
 Raster A: NAD 1983 UTM Zone 10, floating point. **(2)**

Q5: Radiometric resolution is the number of discrete values that a sensor can detect. Higher radiometric resolution means the sensor can detect a greater range of possible values (is more sensitive) **(3)**

Q6: 8-bit = 256 values (Raster B), 32-bit = 2,147,483,648 (Raster A) **(2)**

Q7: So that pixels representing the same stand are spatially aligned and you are not comparing reflectance from different (nearby) stands over time. **(2)**

**Screenshot of spatial reference information should show that the raster is in UTM Zone 10 (1)**

Q8: Continuous: Bilinear interpolation – because it takes into account values from neighboring pixels and better represents smooth gradients/slopes between pixels  
Discrete: Nearest Neighbor – takes the value of the nearest pixel and won’t interpolate a new value. This is appropriate for discrete data where the pixel values represent categories. **(6)**

Q9: No cloud, no cloud shadow, high confidence **(3)**

**Screenshot of masked Landsat as false color NIR (4)**

Q10: Something reasonable, very high reflectance in blue/SWIR bands could indicate clouds, very low could represent cloud shadows. **(4)**

Q11: Light areas are high NIR reflectance and dark areas are low reflectance. Vegetation appears bright and urban areas appear dark **(2)**

Q12: A histogram represents the frequency distribution of pixel values within the image. The X-axis represents the range of values and the Y axis shows how many pixels have a specific value. The mean value for this image is 0.31 **(4)**

Q13: A linear stretch maps pixel values to new values that cover the full range of possible values (defined by radiometric resolution). Decreasing the maximum value will stretch the low and middle range of values – thus increasing the contrast in the darker parts of the image **(4)**

Q14: 5 **(1)**

**Screenshot of smoothed and sharpened images (6)**

Q15: Sharpened images have greater variation and smoothed images have less. Sharpened images enhance contrast and edges and can better visualize roads and buildings. Smoothed images can be more aesthetically pleasing and are good for visualization and for reducing spatial noise. **(4)**