Applied Remote Sensing Training (ARSET) Program

Monitoring Water Quality in Lakes and Coastal Regions Using STREAM

Homework Questions

Question 1

STREAM water quality data are derived from which satellites/sensors?

Answers: (bold correct)

a. Landsat 8&9/ OLI & OLI2 and Sentinel-3/OLCI
b. Sentinel 2/MSI and Sentinel-3/OLCI
c. Aqua/MODIS & PACE/OCI
d. Landsat 8 &9 / OLI & OLI2 and Sentinel-2/MSI

Feedback:
STREAM data derived from Landsat 8 & 9/ OLI and OLI2 and Sentinel-2/MSI because of their relatively high spatial resolution.

Question 2

STREAM water quality data are available at:

Answers: (bold correct)

a. 5-10 meters
b. 20-30 meters
c. 250-300 meters
d. 500-1000 meters

Feedback

One of the key benefits of STREAM is its relatively high-resolution data products from Landsat 8 & 9 (OLI/OLI-2) and Sentinel-2 (MSI), compared to existing products from Terra/Aqua MODIS, SNPP/JPSS VIIRS, Sentinel-3 OLCI, and PACE OCI, which are available at 300–1000 m resolution.

Question 3

Go to STREAM web tool → Add Layer Directly → Product Type. Which products are included in STREAM?

Answers: (bold correct)

a. Chlorophyll-a and Sea Surface Temperature
b. Total Suspended Solids & Chlorophyll-a
c. Secchi Disc Depth & True Color Composite
d. a & b
e. b & c

Feedback:
STREAM provides four products: Chlorophyll-a, Total Suspended Solids, Secchi Disc Depth & True Color Composite.

Question 4

Visually compare Chlorophyll-a concentration on 5 February 26 and 5 February 2025 in Clear Lake (CA). Under Add Layer → Active Layers (Drag to Reorder) → Expand to view the color bar. Both images use the same (0 to 30 mg/m3). In the southern tail of the lake Chlorophyll-a concentration was:

Answers: (bold correct)

a. Higher on 2/52025 than in 2/5/2026
b. Higher on 2/5/2026 than 2/5/2025

Feedback:
In the southern tail of the lake, Chlorophyll-a values were higher on 5 February 2026, as indicated by the red colors representing higher concentrations.

Question 5

To download Chlorophyll-a maps for multiple days for Clear Lake (CA) using STREAM API, based on the map for 5 February 26, which tile number should be used?

Answers: (bold correct)

a. **10SEJ**
b. 10SDJ
c. 10TKD

Feedback:
Sentinel-2 tile numbers are displayed on the map. Clear Lake is located within the tile number 10SEJ, which should be specified in the STREAM API.

Question 6

Review the Part-1 demonstration of 'Making timeseries of water quality parameters using STREAM and QGIS'. Based on the time series of mean Total Suspended Solids (TSS) in the Chesapeake Bay shown in the demonstration, the highest TSS during this period was closest to:

Answers: (bold correct)

a. 5 g/m3
b. 10 g/m3
c. 15 g/m3
d. **20 g/m3**

Feedback:
For the selected region of interest in the Chesapeake Bay, the highest TSS was 20.167 g/m3, as shown in the CSV file and time-series plot.

Question 7

Go to the Lake Tahoe Secchi Disk Depth map for 30 October 2025. The map indicates water transparency of the lake in meters. Hover over different regions of the lake. On the **Add Layer** window, note the coordinates and the corresponding Secchi Depth value shown under **Active Layers → Pixel.** Note down **any one pair of coordinates** from the lake map along with the **corresponding Secchi depth** value.

Feedback:
As you hover on various regions of the lake you will notice that the Secchi Depth (water transparency) is generally decreasing in the northwestern part of the lake. pixel value will be blank or sometimes negative if data are missing or not valid.

Question 8

STREAM uses top-of-the atmosphere (TOA) radiances from satellites as input to the Mixture Density Network (MDN) model to derive water quality parameters.

Answers: (bold correct)

a. True
b. False

Feedback:
STREAM does not use TOA radiances directly. Instead, atmospherically corrected Landsat and Sentinel-2 TOA data (remote sensing reflectances) are used as inputs to the MDN model.

Question 9

The MDN model is trained with satellite observations.

Answers: (bold correct)

a. True
b. False

Feedback:
The MDN model is trained using globally distributed in situ measurements of Chlorophyll-a, Total Suspended Solids, and colored Dissolved Organic Matter.

Question 10

What differentiates MDNs from 'standard' machine learning models?

Answers: (bold correct)

a. The loss function
b. The output layer
c. The use of normalization
d. The use of backpropagation