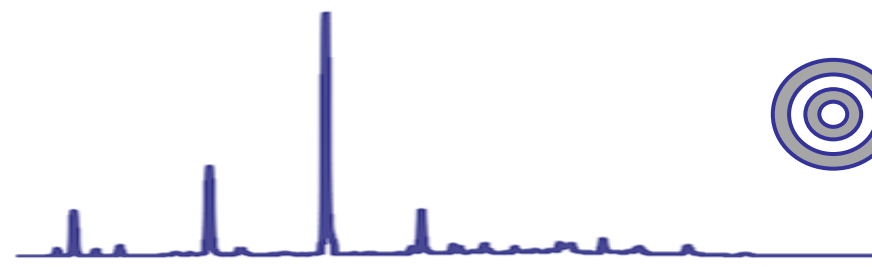
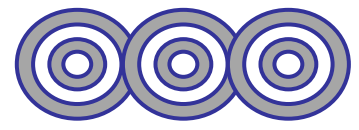


Environmental Analysis Case Studies



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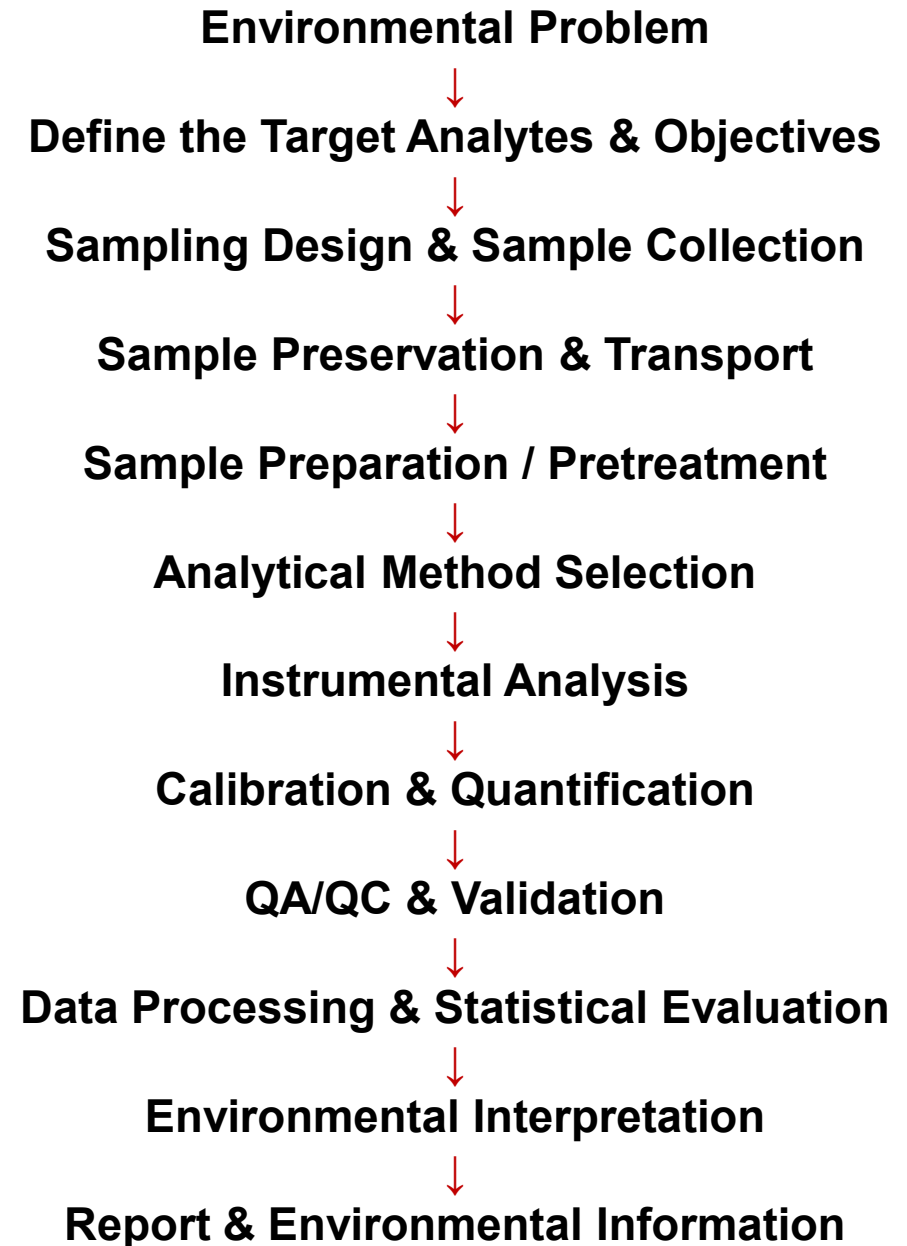
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Case Studies

**From Environmental Problem to
Environmental Information**

The complete workflow



Suggested environmental analysis case studies

Matrix	Case study	Main environmental problem / focus
Air	Assessment of urban air pollution and PM _{2.5} composition	Fine particulate matter and associated metals, ions, and carbonaceous species
	Investigation of traffic-related air pollution	CO, NO ₂ , SO ₂ , O ₃ , and PM _{2.5} near major roads
	Determination of BTEX and VOCs in indoor and urban air	Volatile organic compounds from fuels, paints, solvents, and building materials
	Assessment of industrial air emissions	SO ₂ , NO _x , particulate matter, and other pollutants around industrial facilities
	Investigation of acid deposition and atmospheric pollutants	pH, sulfate, nitrate, chloride, ammonium, and related atmospheric species
Water	Assessment of heavy-metal contamination in surface and groundwater	Pb, Cd, Cr, Ni, Cu, Zn, As, and other potentially toxic elements
	Determination of nutrients and eutrophication indicators in surface water	Nitrate, nitrite, ammonium, phosphate, and related water-quality parameters
	Investigation of petroleum hydrocarbon contamination in water	TPH, BTEX, PAHs, and petroleum-related pollutants
	Determination of pesticide and emerging-contaminant residues in water	Pesticides, pharmaceuticals, personal-care products, and other emerging contaminants
	Assessment of physicochemical water quality	pH, conductivity, turbidity, TSS, alkalinity, hardness, COD, and related parameters
Soil	Assessment of heavy-metal contamination in agricultural soil	Pb, Cd, Cr, Ni, Cu, Zn, As, and spatial contamination patterns
	Investigation of petroleum hydrocarbon contamination in soil	TPH, BTEX, and PAHs at petroleum-storage or contaminated sites
	Determination of pesticide residues in agricultural soil	Persistent and currently used pesticides and their spatial distribution
	Assessment of PAHs in urban and roadside soil	PAHs associated with traffic, combustion, and industrial activities
	Investigation of soil salinity and agricultural soil quality	pH, EC, major ions, and effects of irrigation and agricultural practices
River water	An environmental sample contains an unknown organic compound.	Unknown contaminant: What is it?

A general student worksheet

#	Step	Student must answer
1	Environmental problem	What environmental issue is being investigated?
2	Objective	What question must the analysis answer?
3	Target analytes	What substances, elements, properties, or indicators should be measured?
4	Environmental matrix	Air, water, soil, sediment, biota, wastewater, etc.?
5	Sampling design	Where, when, how many samples, and why?
6	Preservation & transport	How should samples be preserved and transported?
7	Sample preparation	Filtration, extraction, digestion, SPE, SPME, concentration, cleanup, etc.?
8	Analytical technique	Which technique/instrument should be used and why?
9	Calibration	How will the analyte concentration be determined?
10	QA/QC	How will measurement reliability be demonstrated?
11	Analytical results	What were the measured concentrations/properties?
12	Data interpretation	What patterns, differences, or relationships are observed?
13	Environmental comparison	How do results compare with applicable criteria/background/reference values?
14	Environmental interpretation	What do the results mean environmentally?
15	Report	What should be communicated, and to whom?
16	Environmental information	What decision-relevant information has been produced?
17	Recommendation	Is additional sampling, monitoring, treatment, or investigation warranted?

Thank You!

