**IWS 1**

**Experimental plan for analyzing specific pollutants in water samples using modern analytical techniques**

**Deadline:** January 3-9, 2025 (week 3)

***Objective:***

To identify and quantify specific pollutants in water samples using modern analytical techniques and establish their concentration levels for environmental assessment.

***1. Introduction***

- Provide background information on the importance of water quality monitoring.
- Highlight the key pollutants to be analyzed (e.g., heavy metals, pesticides, pharmaceuticals, or microplastics).
- State the purpose of the experiment and its significance for public health and environmental protection.

***2. Materials and Equipment***

- List required materials
- Outline analytical instruments to be used

***3. Sampling protocol***

- Define the location and timing for water sample collection
- Urban, industrial, and rural areas for variability
- Describe the collection procedure
- Outline storage and transportation procedures to maintain sample integrity

***4. Sample preparation***

- Detail pre-treatment steps
- Specify how samples will be spiked with standards for quality control

***5. Analytical methods***

- Describe the operating principles of each instrument
- Specify the parameters for analysis
- Explain calibration and validation procedures

### *6. Data analysis*

- Describe how raw data will be processed
- Outline methods for determining pollutant concentrations (e.g., calibration curves)
- Mention how detection limits and uncertainty will be addressed

### *7. Quality control*

- Include procedures to ensure data reliability

### *8. Expected outcomes*

- List potential pollutants to be detected and their typical concentration ranges
- Discuss how results will inform water quality assessments and regulatory compliance

### *9. Reporting and documentation*

- Explain the format for presenting findings (e.g., tables, charts, and reports)
- Mention how data will be archived for future reference

**SUMMATIVE ASSESSMENT RUBRICATOR**
**CRITERIA FOR ASSESSMENT OF LEARNING OUTCOMES**

**IWS 1**
**Experimental plan for analyzing specific pollutants in water samples using modern analytical techniques (15 points)**

| Criterion | "Very good"<br>13-15 | "Good"<br>10-12 | "Satisfactory"<br>5-9 | "Unsatisfactory"<br>0-4 |
|---|---|---|---|---|
| **Technical feasibility and completeness** | The experimental plan includes all necessary steps. Modern analytical techniques are appropriately selected based on the nature of the pollutant. Details on equipment, materials, and protocols are well-defined and aligned with the objectives. | The experimental plan includes most necessary steps. Analytical techniques are selected appropriately but may lack detailed justification for their suitability to the pollutant. Equipment, materials, and protocols are provided but may miss minor details or alignment with all objectives. | The experimental plan includes some necessary steps, but key elements such as sample preparation or data analysis are incomplete or unclear. The selection of analytical techniques may be appropriate but lacks alignment with the pollutant's characteristics or is insufficiently justified. Details on equipment, materials, and protocols are present but lack specificity or thoroughness. | The experimental plan is incomplete or poorly organized, with significant gaps in essential steps. Analytical techniques are either inappropriately chosen, not aligned with the pollutant's nature, or entirely absent. Details on equipment, materials, and protocols are vague, incorrect, or missing entirely. |
| **Rationale and justification** | The choice of analytical methods is justified with scientific reasoning, considering factors such as the pollutant's chemical properties, required sensitivity, and expected accuracy. Environmental and practical considerations, such as cost-effectiveness, availability of resources, and regulatory compliance, are clearly addressed. | The choice of analytical methods is supported by reasonable scientific reasoning, addressing some relevant factors like the pollutant's chemical properties or required sensitivity. Environmental and practical considerations, such as cost-effectiveness and resource availability, are mentioned but lack depth or thorough analysis. | The choice of analytical methods is partially justified, with minimal consideration of scientific reasoning. Few factors, such as the pollutant's properties or required accuracy, are addressed, and the reasoning may be unclear or incomplete. Environmental and practical considerations are mentioned briefly or are overly general. | The choice of analytical methods is unjustified or lacks scientific reasoning entirely. Key factors, such as the pollutant's chemical properties or required sensitivity, are ignored. Environmental and practical considerations, such as cost-effectiveness or regulatory compliance, are missing or irrelevant. |
| **Innovation and problem-solving** | Demonstrates originality or creative approaches in designing the experiment, including novel techniques or integration of emerging technologies. Anticipates potential challenges (e.g., sample contamination, interferences) and provides practical solutions or alternatives. | The experimental design shows some originality or creative approaches, incorporating established techniques with minor innovative elements. Potential challenges are identified, but the solutions or alternatives provided are basic or lack depth in addressing complex issues. | The experimental design demonstrates limited originality, relying primarily on standard techniques without incorporating novel elements or emerging technologies. Challenges are only partially identified, and proposed solutions are vague, impractical, or incomplete. | The experimental design lacks originality or creativity, using only conventional approaches without any consideration for innovation. Challenges are ignored, or those mentioned lack relevance, and no viable solutions or alternatives are provided. |