

EWCE 131
Ecology and Environmental Pollution

Lecture 10

Instructor

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Lecture Outline

Environmental parameters, measurement and impacts on ecology

Topics

- ❖ **Water parameters**
- ✓ **Physical parameters**
- ✓ **Chemical parameters**
- ✓ **Microbiological Parameters**

Water Parameters - Physical Parameters

Water Temperature

- Water temperature can vary widely over 24 h.

- In the dry season, shallow water bodies, swamp and lagoons can cool by 10 ºC between dusk and dawn and shallow, slow moving rivers may do likewise.

- The physiological activity of fish and invertebrates is very different at the extremes of the range, and biological sampling procedures should take account of it.

Physical Parameters of Water **- Temperature**

- At the high end (higher temperature), fish and invertebrates are under more natural stress in shallow water due to increased respiration, lowered dissolved oxygen levels and increased toxicity of many pesticides.

- In deeper rivers, pools and lakes, the temperature extremes are narrower and the dilution factor improves the acute toxicity of deposited pesticide (not for surface-dwelling invertebrates).

Physical Parameters of Water **- Temperature**

Temperature Measurement

- **Unit of measurement** – ˚ C (degree Celsius)

- **Resulting data:** Average daily temperature, which may be plotted as a line graph over time.

- **Sampling period:** Every time a sample is taken in a water body.

- **Equipment:** Glass or electronic thermometer, or thermistor/thermocouple attached to oxygen or conductivity electrodes.

Physical Parameters of Water **- Temperature**

Temperature Measuring Device





Water Parameters – Physical Parameters

Color

Color caused by dissolved matter: tannins



Color caused by suspended material: sediment

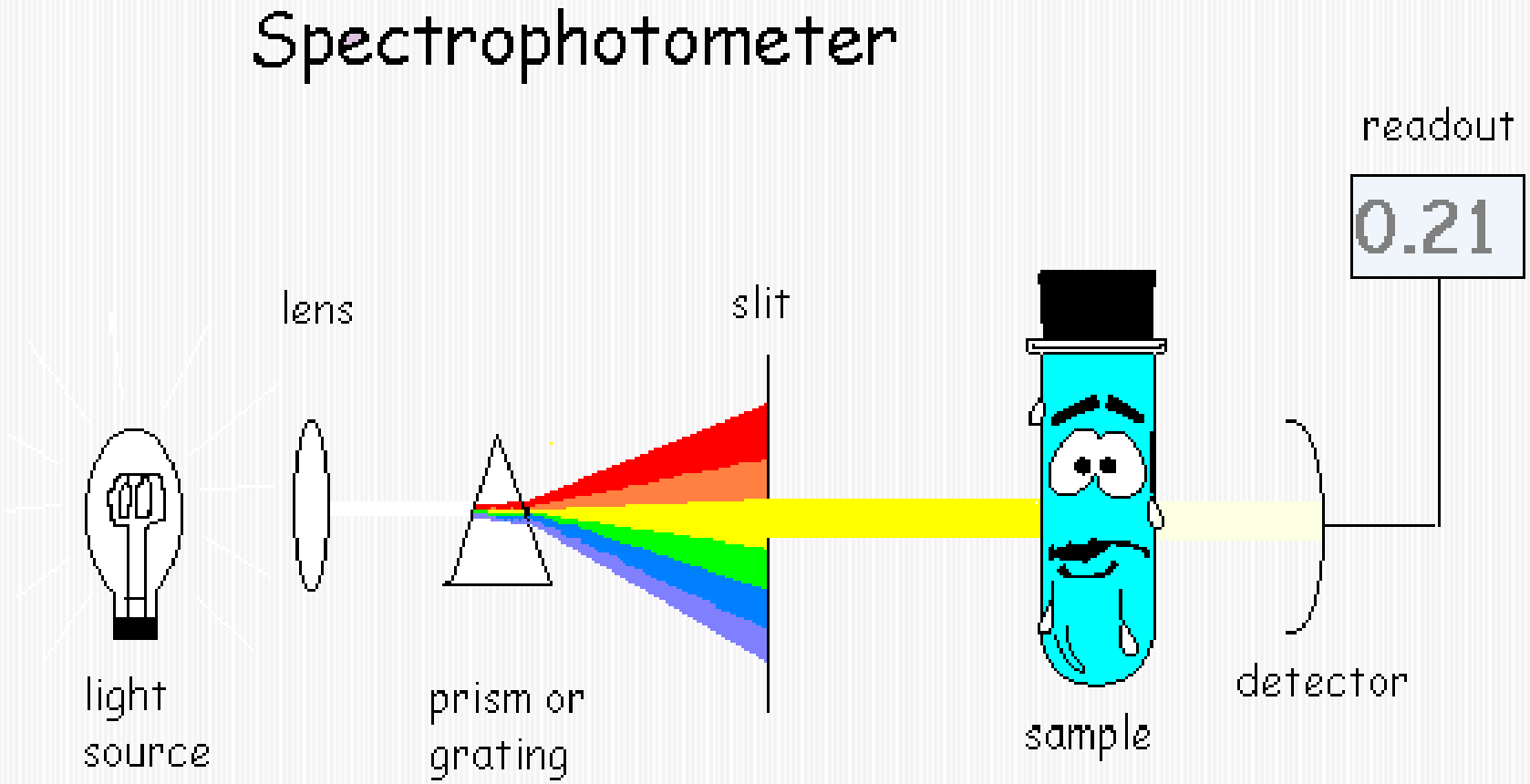


- Impacts –
  - ✓ Aesthetically not acceptable
  - ✓ not acceptable in laundry and other industrial process

- Unit of measurement – TCU (True Color unit)

Physical Parameters of Water - Color

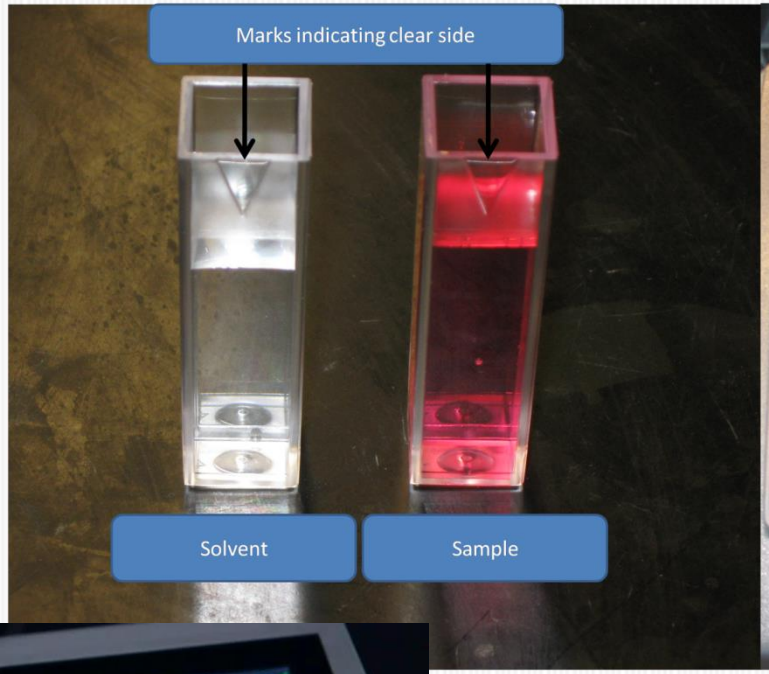
Color Measurement – by Spectrophotometer



Mechanism

Physical Parameters of Water - Color

Color Measurement – by Spectrophotometer







Water Parameters – Physical Parameters

Turbidity

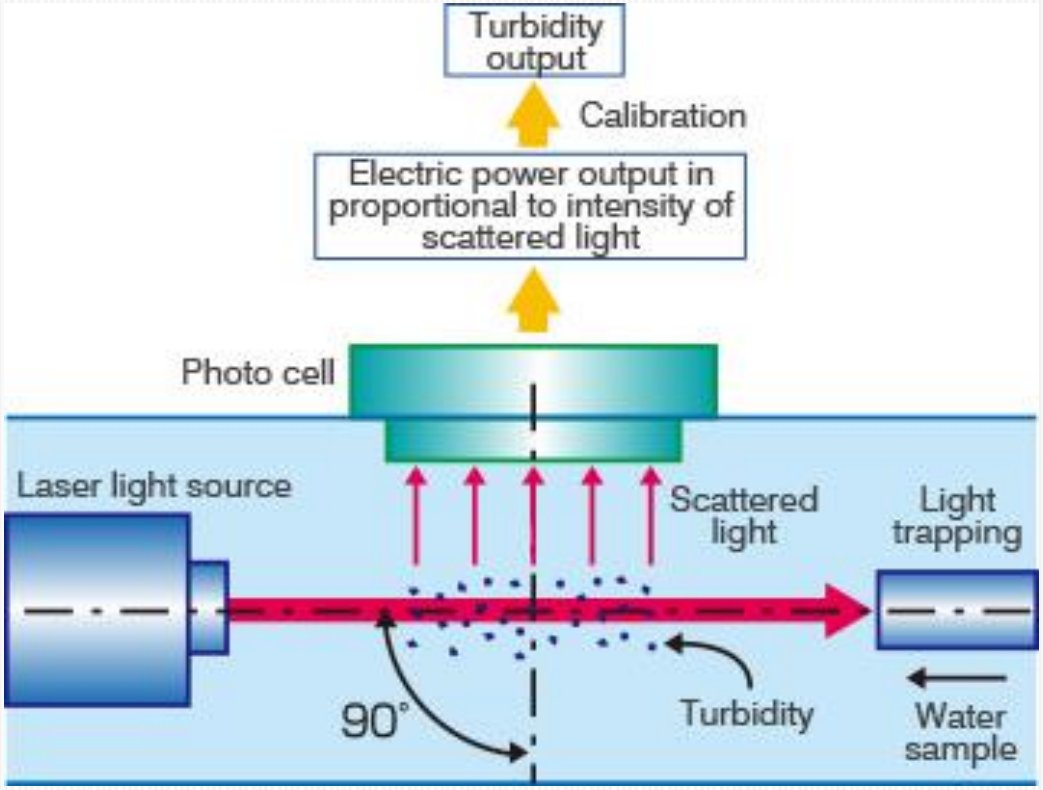


- **Impacts –**
  - ✓ Aesthetically objectionable
  - ✓ May interfere with light penetration and photosynthetic reactions in streams and lakes

- **Unit of measurement –** JTU (Jackson Turbidity unit), NTU (Nephelometry Turbidity Unit)

Physical Parameters of Water - Turbidity

Turbidity Measurement – by Turbidity meter





Portable Turbidity Meter

Water Parameters – Physical Parameters

Taste and Odor

- **Impacts –**
  - ✓ Aesthetically displeasing
  - ✓ some of the materials causing taste and odor may be carcinogenic

- **Unit of measurement –** TON (Threshold Odor Number)

Physical Parameters of Water – Taste and Odor

Odor Measurement – by Odor meter (Olfactometer)





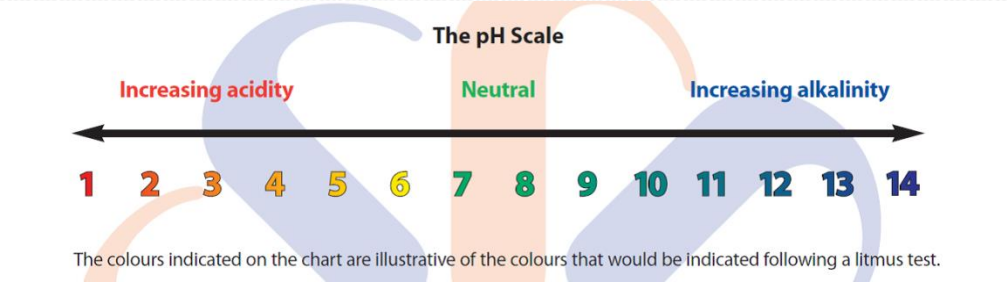
Olfactometer

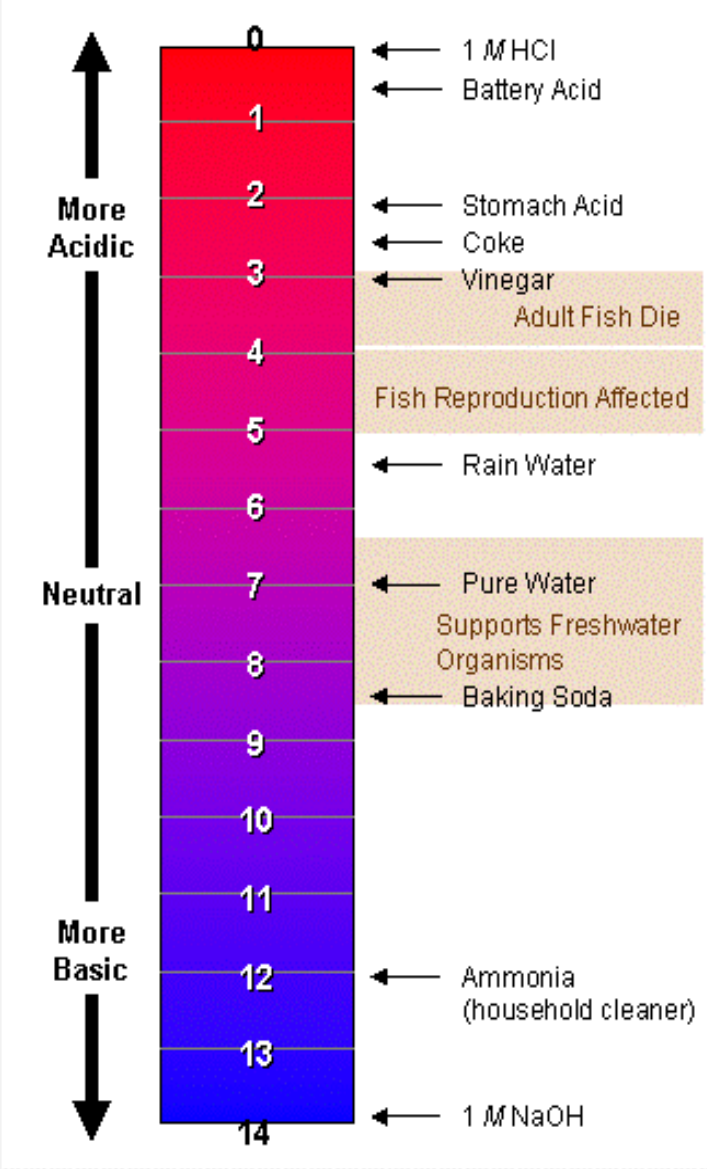


Water Parameters – Chemical Parameters

pH

- pH represents the potential of hydrogen ions, i.e., the activity of hydrogen ion.
- Dissolution, precipitation of various minerals in water depends greatly on the pH of water.
- Pollutant movement in aquatic media and their removal processes are very much depended on pH of the media.

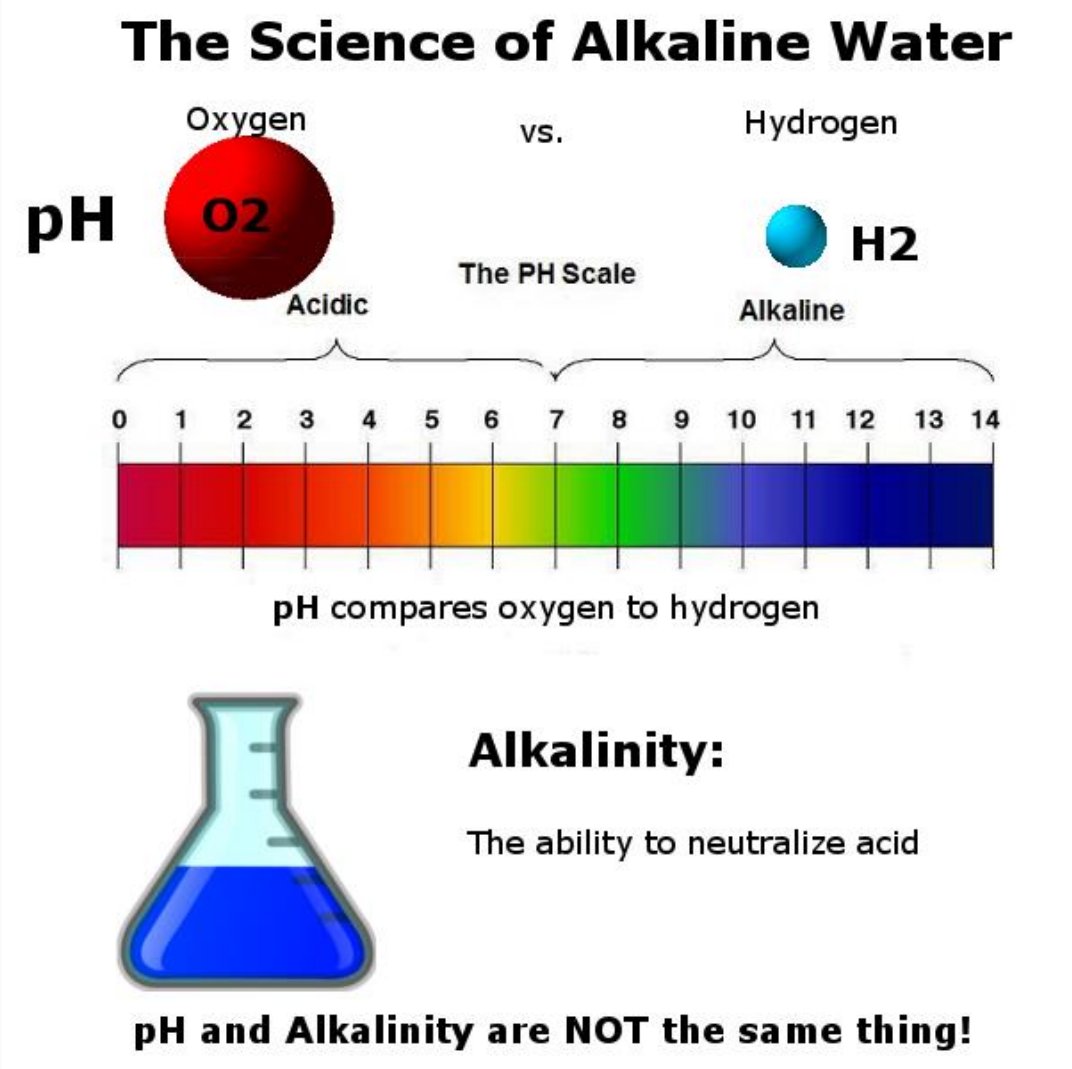




Water Parameters – Chemical Parameters

Alkalinity

- Indicates acid neutralizing capacity.
- Causes bitter taste and odor
- Precipitates cause fouling in pipes and appurtenances



Water Parameters – Chemical Parameters

Alkalinity



Water Parameters – Chemical Parameters

Hardness

- Capacity of water for reducing and destroying the lather of soap
- Indicates the presence of divalent cations, such as Ca^{2+}, Mg^{2+} etc.
- Surface water is softer than ground water
- Causes encrustations in water supply structures





Water Parameters – Chemical Parameters

Heavy Metals – Iron

- High iron causes brown or yellow staining of laundry, household fixtures

- Imparts metallic taste, offensive odor, poor tasting coffee





Water Parameters – Chemical Parameters

Heavy Metals - Arsenic

- Occur in ground water
- Other sources include - industrial waste, agricultural insecticide
- High arsenic causes various type of dermatological lesions, muscular weakness, paralysis of lower limbs, can also cause skin and lung cancer





