

Planning of Science Laboratory

Dr. Poulami Jana

I. Introduction:

A science laboratory is a dedicated space where students can perform practical experiments, observe scientific phenomena, and apply theoretical knowledge. Effective planning is paramount to ensure safety, functionality, accessibility, and an optimal learning environment.

II. Key Considerations for Laboratory Planning:

1. Location:

- **Ground Floor Preference:** Ideally, laboratories should be located on the ground floor to facilitate easy access, minimize vibrations, and simplify plumbing and drainage systems.
- **Isolation from Classrooms:** It should be reasonably isolated from regular classrooms to prevent the spread of fumes, noise, and potential hazards.
- **Accessibility:** Easily accessible for all students, including those with disabilities (e.g., ramps, wider doorways).
- **Ventilation:** Needs to be well-ventilated, preferably with windows on opposite sides for cross-ventilation. Fume hoods should have proper exhaust systems directed away from other buildings.

2. Space and Dimensions:

- **Adequate Space per Student:** There should be sufficient working space for each student (e.g., typically 1.5 - 2.5 square meters per student, depending on the type of lab and activity).
- **Class Size:** The layout and size should accommodate the maximum expected class size comfortably.
- **Functional Areas:** Dedicated areas for:
 - Student workstations
 - Teacher's demonstration area
 - Preparation room/store room
 - Washing/sink area
 - Safety stations (eyewash, safety shower, fire extinguisher)
 - Emergency exits

3. Furniture and Fittings:

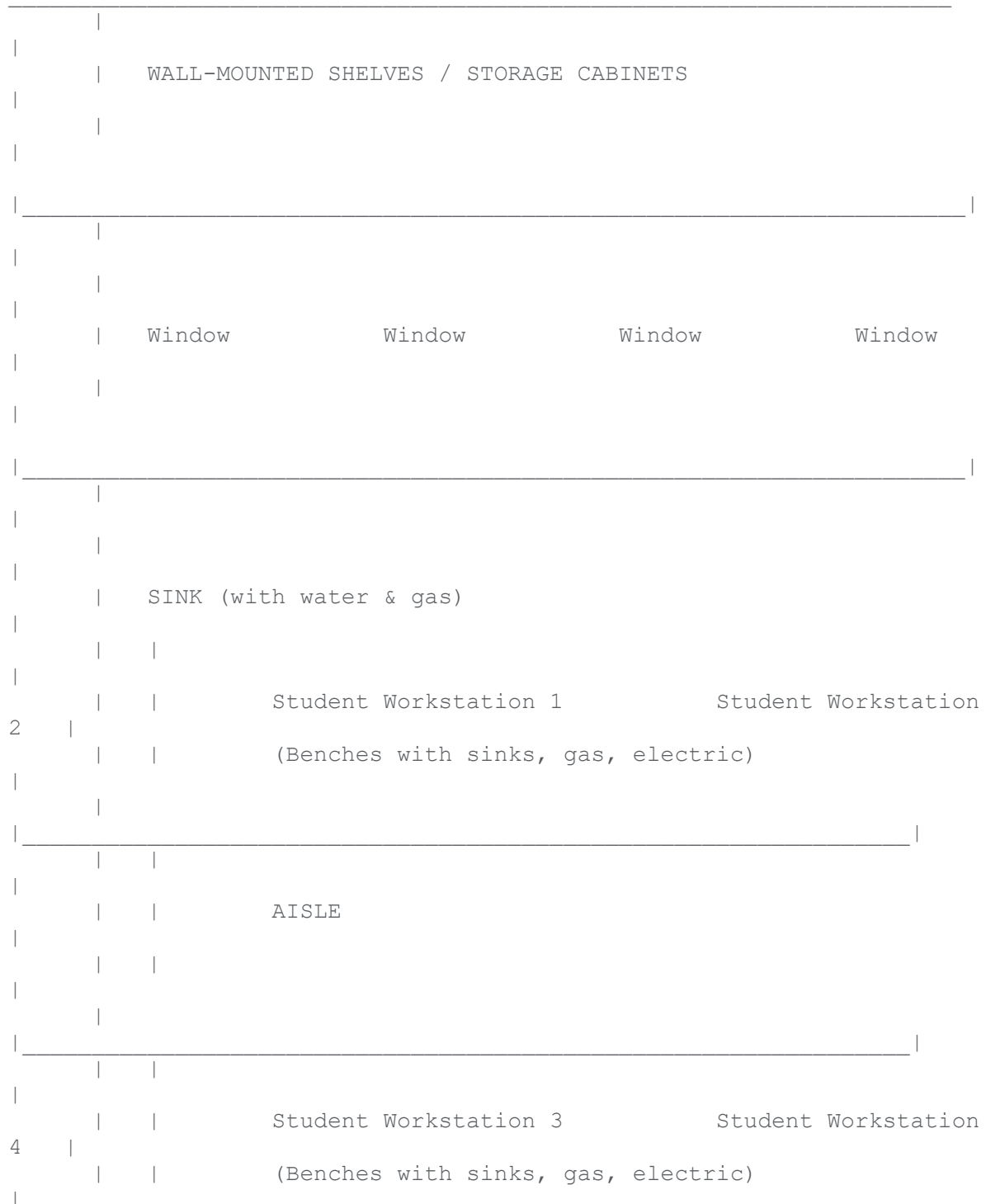
- **Student Workstations:**
 - **Benches/Tables:** Sturdy, chemical-resistant, and heat-resistant surfaces (e.g., phenolic resin, epoxy resin, or treated wood). Height should be appropriate for the age group (usually around 3 ft for standing work).
 - **Integrated Sinks/Gas/Electrical Points:** Each workstation or group of workstations should have access to water (hot and cold), gas taps, and electrical outlets.
 - **Storage:** Under-bench cupboards or drawers for student kits.
- **Teacher's Demonstration Table:**
 - Elevated platform for clear visibility.

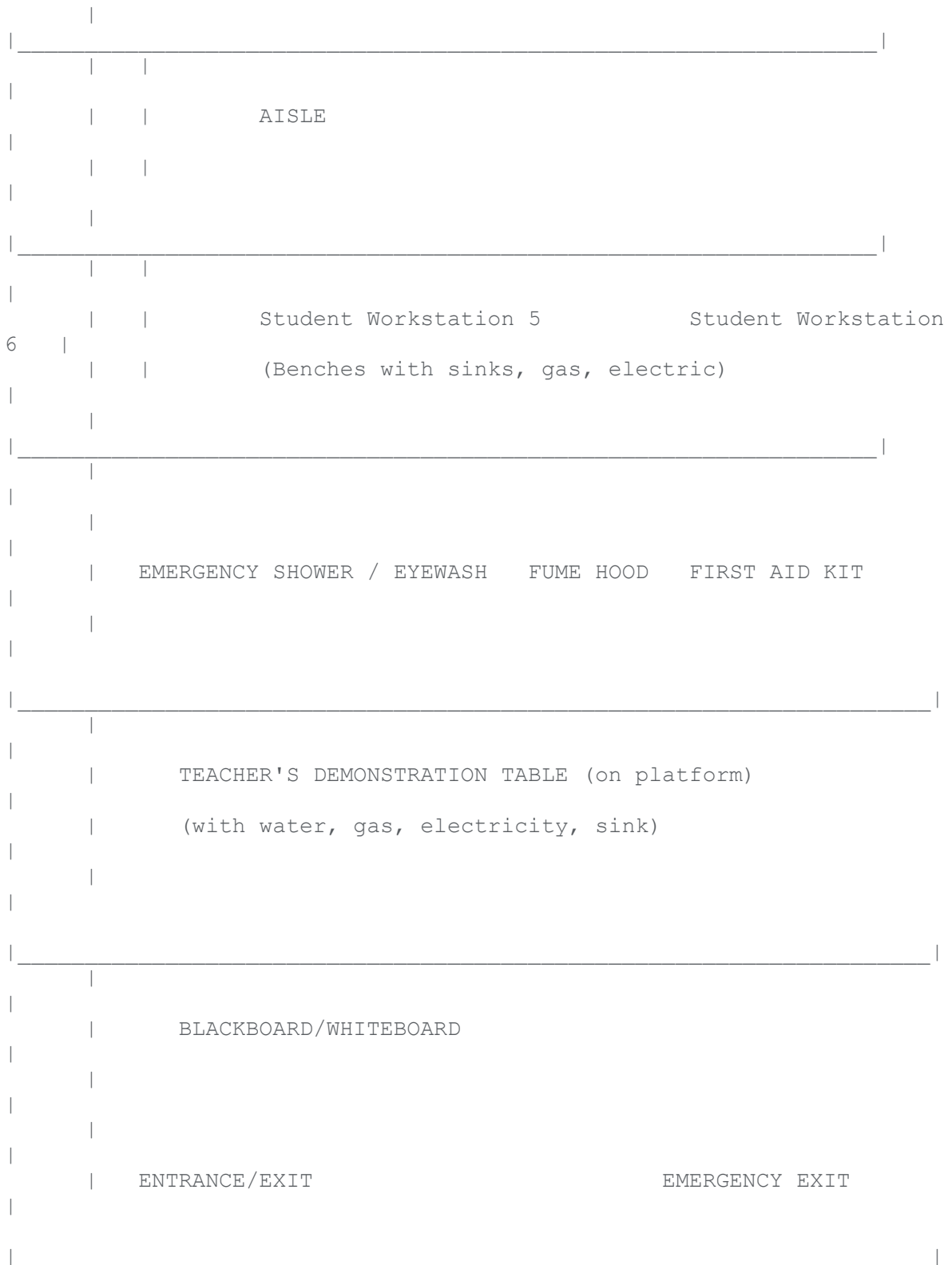
- Equipped with water, gas, electrical points, and a sink.
- Located prominently, usually at the front, with a clear view for all students.
- Blackboard/whiteboard behind it for explanations.
- **Storage Cabinets:**
 - **Chemical Storage:** Separate, secure, well-ventilated cabinets for chemicals, categorized by hazard (flammable, corrosive, toxic). Opaque doors are often preferred.
 - **Apparatus Storage:** Wall-mounted or stand-alone cabinets for glassware, equipment, and models. Often with glass doors for easy identification.
 - **Lockers/Shelves:** For students' bags and personal belongings outside the immediate working area.
- **Fume Hoods:** Essential for experiments involving hazardous fumes, gases, or volatile liquids. Should be properly vented.
- **Sinks and Drainage:** Sufficient number of sinks (acid-resistant) with proper drainage for waste disposal. Separate large utility sinks for cleaning equipment.
- **Chairs/Stools:** Comfortable, durable, and adjustable laboratory stools.
- 4. **Safety Features:**
 - **Emergency Exits:** At least two clearly marked exits, located as far apart as possible, unobstructed at all times.
 - **Fire Safety:**
 - Fire extinguishers (CO₂, ABC type)
 - Fire blanket
 - Sand buckets (for specific chemical fires)
 - Smoke detectors
 - **Emergency Showers and Eyewash Stations:** Easily accessible and clearly marked for immediate use in case of chemical splashes on skin or eyes.
 - **First Aid Kit:** Well-stocked and readily available.
 - **Ventilation:** Adequate general ventilation and specialized exhaust systems for fume hoods.
 - **Master Shut-off Points:** Clearly marked master shut-off valves for gas and electricity for emergency situations.
 - **Safety Signage:** Prominent display of safety rules, emergency contact numbers, and hazard warnings.
 - **Waste Disposal:** Clearly labeled bins for different types of waste (general, glass, chemical, biological).
 - **Non-slip Flooring:** Chemical-resistant, non-slip flooring materials.
- 5. **Lighting and Ventilation:**
 - **Natural Light:** Maximize natural light through large windows.
 - **Artificial Light:** Adequate, well-distributed artificial lighting to ensure visibility for detailed work.
 - **Air Circulation:** Good cross-ventilation and mechanical ventilation system, especially for chemical labs.
- 6. **Utilities:**
 - **Water Supply:** Continuous supply of potable water, both hot and cold.
 - **Gas Supply:** Piped gas supply with individual taps at workstations and a master shut-off.
 - **Electricity:** Sufficient electrical points (with proper earthing) at all workstations and for equipment.
- 7. **Maintenance and Records:**
 - **Regular Cleaning:** Establish a routine for cleaning and maintaining the lab.

- **Equipment Maintenance:** Regular inspection and maintenance of all equipment.
- **Stock Registers:** Maintain consumable and non-consumable stock registers.
- **Breakage Register:** Record all breakages.

III. Ideal Science Laboratory Layout (Illustrative Sketch):

A typical science lab layout aims to optimize workflow, ensure safety, and facilitate supervision.





****Illustration Key:****

* ****Student Workstations:**** Arranged in rows or islands, providing ample space for individual or group work. Each station ideally has access to basic utilities.

- * **Teacher's Demonstration Table:** Placed at the front, elevated for clear visibility, allowing the teacher to perform demonstrations and explain concepts.
- * **Fume Hood:** Crucial for experiments involving noxious fumes, positioned against a wall with proper ventilation.
- * **Sinks:** Multiple sinks located strategically for easy access for washing apparatus and hands.
- * **Safety Equipment:** Emergency shower, eyewash station, fire extinguisher, and first aid kit prominently marked and easily accessible.
- * **Storage:** Wall-mounted shelves and cabinets along the walls for apparatus, chemicals, and general storage. A separate, secure storeroom is vital.
- * **Aisles:** Wide, clear aisles to allow free movement and quick evacuation in emergencies.
- * **Windows:** Large windows for natural light and ventilation.
- * **Emergency Exits:** Clearly marked, unobstructed paths to exits.

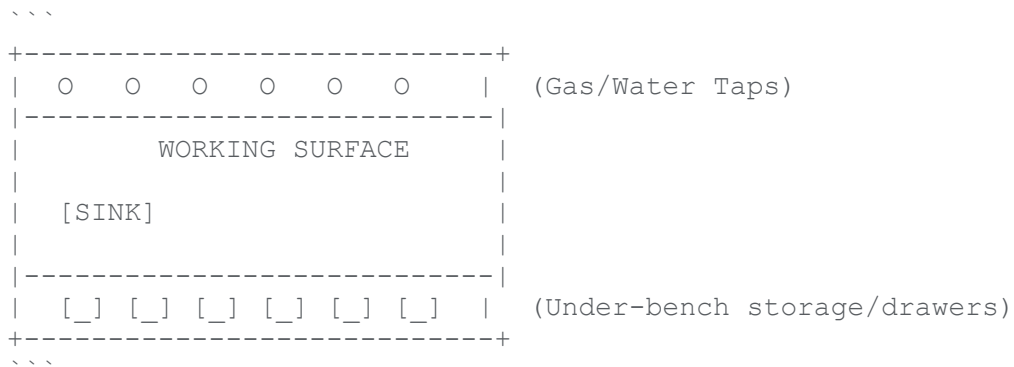
IV. Types of Laboratory Furniture (Illustrated):

1. **Laboratory Benches/Workstations:**

* **Description:** Flat, sturdy surfaces where students perform experiments. Often come with integrated sinks, gas taps, and electrical outlets.

* **Material:** Chemical-resistant tops (e.g., phenolic resin, epoxy resin).

* **Illustration:**

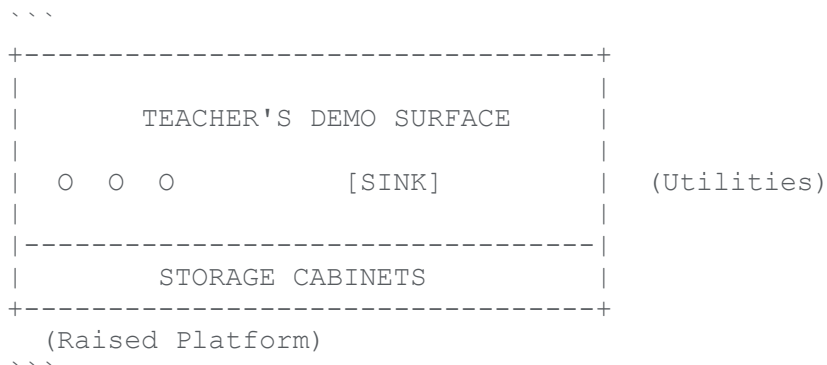


2. **Teacher's Demonstration Table:**

* **Description:** Larger, often elevated table at the front for teacher-led demonstrations.

* **Features:** Similar utilities as student benches, but typically more expansive.

* **Illustration:**



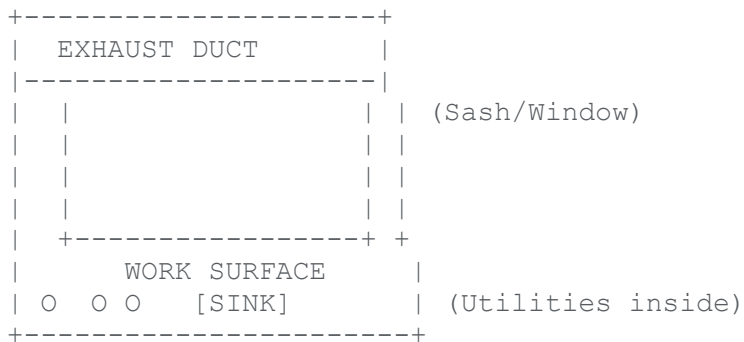
3. **Fume Hood:**

Description: A ventilated enclosure that protects users from inhaling hazardous fumes, vapors, or dust.

Features: Sliding sash (front window), exhaust fan system.

Illustration:

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4. **Storage Cabinets (for chemicals/apparatus):**

Description: Tall cabinets for safe and organized storage.

Features: Often lockable, some with ventilation for chemicals.

Illustration (Chemical Cabinet):

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By meticulously planning and designing a science laboratory with these considerations in mind, educators can create a safe, efficient, and inspiring space for scientific exploration and learning.