

Course: Laboratory Organization, Management and Safety Methods (6438)

Level: B.Ed. (2.5/4 Year)

Semester: Spring, 2023

Credit Hours: 03

Total Marks: 100

Pass Marks: 50

ASSIGNMENT No. 2

(Units 5-9)

Q.1 Make a list of chemicals necessary for Chemistry practical at SSC Level.
Explain how these chemicals should be stored and used. (20)

list of commonly used chemicals for Chemistry practicals at the SSC (Secondary School Certificate) level, along with guidelines for their storage and safe usage:

Hydrochloric acid (HCl): Store in a cool, dry place in a tightly closed container. Use in a fume hood due to its corrosive and toxic nature. Avoid direct contact with skin and eyes. Dilute with water when needed, and always add acid to water, not the other way around, to prevent splattering.

Sodium hydroxide (NaOH): Keep in a tightly sealed container away from moisture. Store in a cool, dry place. Sodium hydroxide is caustic, so wear gloves and eye protection when handling. Avoid contact with skin and eyes. Always add NaOH to water slowly while stirring to prevent heat buildup.

Sulfuric acid (H_2SO_4): Store in a cool, dry place in a tightly closed container. Use in a fume hood due to its corrosive and toxic nature. Avoid contact with skin, eyes, and clothing. It is highly exothermic when mixed with water, so always add acid to water slowly while stirring.

Ammonium hydroxide (NH_4OH): Keep in a tightly sealed container and store away from heat and incompatible substances. Use in a well-ventilated area. Avoid contact with skin, eyes, and clothing. Dilute with water as required.

Potassium permanganate (KMnO_4): Store in a cool, dry place in a tightly closed container away from organic materials. Avoid contact with skin, eyes, and clothing as it can cause staining. Use in dilute solutions as directed.

Copper sulfate (CuSO_4): Keep in a tightly sealed container away from moisture and organic materials. Store in a cool, dry place. Avoid inhalation, skin contact, and ingestion. Use gloves and protective eyewear when handling. Dissolve in water to make a solution.

Sodium carbonate (Na_2CO_3): Store in a dry place and protect from moisture. Avoid contact with eyes, skin, and clothing. Use gloves and safety glasses when handling. Dissolve in water to make a solution.

Acetic acid (CH_3COOH): Keep in a cool, dry place in a tightly closed container. Use in a well-ventilated area. Avoid contact with eyes, skin, and clothing. Dilute with water as required.

Iron(III) chloride (FeCl_3): Store in a cool, dry place in a tightly closed container. Avoid contact with skin, eyes, and clothing. Use gloves and protective eyewear when handling. Dissolve in water to make a solution.

Calcium hydroxide (Ca(OH)_2): Keep in a tightly sealed container and protect from moisture. Avoid contact with eyes, skin, and clothing. Use gloves and safety glasses when handling. Dissolve in water to make a solution.

It's crucial to follow safety guidelines and local regulations when handling these chemicals. Always consult your teacher or a qualified chemistry instructor for specific instructions and precautions. They can provide further guidance on storage, handling, and disposal procedures to ensure safe and responsible usage.



Q.2 Write a note on:

(20)

- i. Immunity against certain liabilities.
- ii. Emergency ambulance and rescue vehicles.
- iii. Contact numbers of emergency services.
- iv. Explore need and importance of emergency services.

I. Immunity against Certain Liabilities:

In certain situations, individuals or organizations may be granted immunity against certain liabilities. This refers to legal protection or exemption from being held responsible for damages or injuries that may occur during emergency situations or while providing assistance. Immunity against liabilities is typically granted to emergency service providers, such as paramedics, firefighters, and police officers, who are performing their duties in good faith and within the scope of their responsibilities. This immunity ensures that these professionals can act swiftly and decisively without fear of legal repercussions, enabling them to focus on saving lives and protecting public safety.

II. Emergency Ambulance and Rescue Vehicles:

Emergency ambulance and rescue vehicles play a vital role in responding to medical emergencies, accidents, and other critical situations. These specialized vehicles are equipped with medical equipment, life-saving devices, and trained personnel to provide immediate medical assistance and transport patients to hospitals or other medical facilities. They are designed to navigate through traffic quickly and safely, often with sirens and flashing lights to alert other motorists and pedestrians. These vehicles are crucial for ensuring timely medical intervention and increasing the chances of survival in emergency situations.

III. Contact Numbers of Emergency Services:

Having readily available contact numbers for emergency services is essential for prompt response during crises. Emergency services include police, fire departments, medical services, and other specialized units dedicated to handling critical situations. In many countries, the common emergency number is 911, which connects callers to the appropriate emergency service based on their needs. It is crucial to have these numbers memorized or easily accessible on mobile phones, as they can save valuable time when reporting emergencies or seeking immediate assistance.

IV. Need and Importance of Emergency Services:

Emergency services are crucial for maintaining public safety, responding to accidents, disasters, and medical emergencies, and providing timely assistance to those in need. These services are designed to handle a wide range of emergencies, including natural disasters, fires, criminal activities, and health crises. The need for emergency services arises from the unpredictability and urgency of these situations, where a quick and coordinated response can mean the difference between life and death. The importance of emergency services lies in their ability to save lives, minimize damage, and restore order during critical incidents. These services are a fundamental component of any well-functioning society, ensuring the safety and well-being of its citizens.

In conclusion, immunity against liabilities protects emergency service providers, emergency ambulance and rescue vehicles are essential for timely medical interventions, contact numbers of emergency services enable swift response, and emergency services play a crucial role in safeguarding public safety.

Understanding the significance of these aspects helps create a safer and more efficient emergency response system.

Q.3 There are different approaches of sequencing. Elaborate each one with the help of examples. (20)

Certainly! There are several different approaches to sequencing in various fields, such as genetics, computer science, and linguistics. Here are four common sequencing approaches along with examples:

Sanger Sequencing:

Sanger sequencing is a classic method used in genetics to determine the nucleotide sequence of DNA. It involves the incorporation of chain-terminating dideoxynucleotides during DNA replication. Each dideoxynucleotide is labeled with a different fluorescent dye, allowing the identification of the terminating base. The resulting fragments are separated by size using capillary electrophoresis. By analyzing the sequence of the terminated fragments, the original DNA sequence can be deduced. Sanger sequencing played a significant role in the Human Genome Project.

Next-Generation Sequencing (NGS):

NGS is a high-throughput sequencing technology that revolutionized genomic research. It allows the parallel sequencing of millions of DNA fragments, enabling rapid and cost-effective sequencing of entire genomes. NGS platforms, such as Illumina, Ion Torrent, and Pacific Biosciences, use different methodologies. For example, Illumina sequencing utilizes reversible dye terminators and fluorescent imaging to identify nucleotides incorporated during DNA synthesis. NGS has facilitated numerous advancements in genomics, personalized medicine, and evolutionary biology.

De Novo Sequencing:

De novo sequencing refers to the sequencing of a genome or transcriptome without a reference sequence. This approach is useful when studying organisms with unknown or complex genomes, such as non-model organisms. De novo sequencing involves fragmenting the DNA or RNA into smaller pieces, sequencing them, and assembling the reads to reconstruct the original sequence. Bioinformatics tools like Velvet and SOAPdenovo aid in the assembly process. De novo sequencing has been instrumental in discovering novel genetic variations and studying biodiversity.

Shotgun Sequencing:

Shotgun sequencing is a technique used to sequence large genomes. It involves randomly breaking the DNA into small fragments, sequencing them, and then assembling the overlapping sequences to generate the complete genome. This approach was used in the sequencing of the human genome. Shotgun sequencing allows for parallel processing of multiple DNA fragments, reducing the time and cost required for sequencing large genomes.

These are just a few examples of sequencing approaches, each with its own advantages and applications. The choice of sequencing method depends on the specific research objectives, the complexity of the genome, the available resources, and the desired level of sequencing depth and accuracy. Advancements in sequencing technologies continue to drive breakthroughs in various fields, enabling new discoveries and applications of genetic information.

Q.4 Describe qualitative assessment techniques for laboratory work. (20)

Qualitative assessment techniques for laboratory work focus on observing and evaluating students' skills, understanding, and behaviors during their practical experiments. These techniques provide insights into students' ability to apply theoretical knowledge, use laboratory equipment properly, analyze data, and draw appropriate conclusions. Here are some common qualitative assessment techniques used in laboratory work:

Observations: The teacher or instructor closely observes students as they perform laboratory experiments. This includes assessing their practical skills, adherence to safety protocols, attention to detail, and their ability to follow experimental procedures accurately. Observations can help identify areas where students may struggle, make mistakes, or exhibit good laboratory practices.

Oral Presentations: Students may be required to give oral presentations or demonstrations to explain their experimental procedures, discuss their observations, or present their findings. This assessment technique evaluates students' communication skills, clarity of thought, ability to explain complex concepts, and their understanding of the experimental process.

Laboratory Reports: Students prepare written laboratory reports documenting their experimental procedures, observations, data analysis, and conclusions. Qualitative assessment of laboratory reports examines students' ability to organize and present information coherently, interpret data, draw valid conclusions, and demonstrate scientific writing skills.

Reflections and Self-Assessment: Students may be asked to reflect on their laboratory experiences and assess their own performance. This self-assessment helps students evaluate their strengths, weaknesses, and areas for improvement. It encourages metacognition and promotes a deeper understanding of the laboratory process.

Group Discussions and Peer Evaluations: Collaborative laboratory work often involves group discussions where students analyze data, compare results, and share their findings. Peer evaluations within the group can provide insights into

individual contributions, teamwork skills, and the ability to engage in scientific discourse.

Problem-Solving Tasks: In addition to the actual laboratory experiments, students may be given problem-solving tasks related to the experiments or related concepts. These tasks assess students' ability to apply their knowledge, critical thinking skills, and problem-solving strategies.

Safety Awareness: Laboratory work requires adherence to safety protocols and practices. Qualitative assessment techniques can evaluate students' understanding and implementation of safety measures, including proper handling of equipment, use of protective gear, and awareness of potential hazards.

Experimental Design: Some laboratory assessments may involve students designing their own experiments or modifying existing ones. This assesses their ability to formulate research questions, identify variables, plan experimental procedures, and anticipate possible outcomes.

It is important to note that qualitative assessment techniques in laboratory work are often combined with quantitative assessments, such as measuring accuracy, precision, and consistency of data, calculating percentages or averages, or conducting statistical analysis when applicable. The combination of both qualitative and quantitative assessments provides a comprehensive evaluation of students' laboratory skills, conceptual understanding, and scientific practices.

Q.5 Suggest the ways and procedures to avoid Biological hazards for the following: (20)

- i. Animals in the laboratory
- ii. Microorganisms
- iii. Plants
- iv. Insecticides and pesticides

To avoid biological hazards associated with different elements in the laboratory and environment, here are some ways and procedures specific to each category:

i. Animals in the laboratory:

- **Proper Handling and Restraint:** Ensure that laboratory animals are handled and restrained using appropriate techniques to minimize the risk of bites, scratches, or other injuries.
- **Personal Protective Equipment (PPE):** Wear appropriate PPE, such as gloves, lab coats, and protective eyewear, when working with animals to protect against potential allergens, zoonotic diseases, or physical hazards.

- **Vaccinations and Health Checks:** Ensure that laboratory animals are properly vaccinated, regularly monitored for signs of illness, and treated as required to prevent the spread of diseases.
- **Animal Welfare Regulations:** Follow ethical guidelines and local regulations for animal care and use in research or educational settings to maintain the well-being of laboratory animals.
- **Proper Waste Disposal:** Dispose of animal waste, bedding, and carcasses according to the recommended protocols to prevent the spread of infections or contamination.

ii. Microorganisms:

- **Biosafety Measures:** Follow appropriate biosafety protocols, such as using biosafety cabinets, wearing gloves and lab coats, and implementing proper waste management, when working with microorganisms to minimize the risk of exposure and cross-contamination.
- **Risk Assessment:** Conduct a thorough risk assessment to identify potential hazards associated with specific microorganisms and implement appropriate containment and control measures accordingly.
- **Proper Training and Education:** Provide comprehensive training on safe handling and manipulation of microorganisms, including proper aseptic techniques, use of disinfectants, and emergency procedures.

- **Use of Appropriate Barriers:** Use physical barriers, such as biological safety cabinets, containment equipment, and sealed containers, to prevent accidental release or exposure to microorganisms.
- **Regular Cleaning and Disinfection:** Establish protocols for routine cleaning and disinfection of laboratory surfaces, equipment, and work areas to minimize the risk of microbial contamination.

iii. Plants:

- **Identification and Assessment:** Identify potential hazards associated with specific plants, including toxic or allergenic properties, and conduct a risk assessment to determine appropriate control measures.
- **Handling and Storage:** Handle plants carefully, wearing gloves if necessary, to avoid contact with irritants, toxins, or allergenic substances. Store plants in appropriate containers or locations to prevent accidental exposure.
- **Knowledge of Poisonous Plants:** Familiarize yourself with common poisonous plants and their characteristics, especially if working in educational or public settings, to prevent accidental ingestion or contact.
- **Education and Warning Signs:** Provide clear educational materials and warning signs to inform individuals about the potential hazards associated with specific plants and appropriate precautions to take.

- **Proper Disposal:** Dispose of plant materials, including cuttings, seeds, or harvested parts, following recommended procedures to prevent the spread of invasive species or potential contamination.

iv. Insecticides and Pesticides:

Proper Storage: Store insecticides and pesticides in secure, labeled containers away from food, water sources, and areas accessible to unauthorized individuals or children.

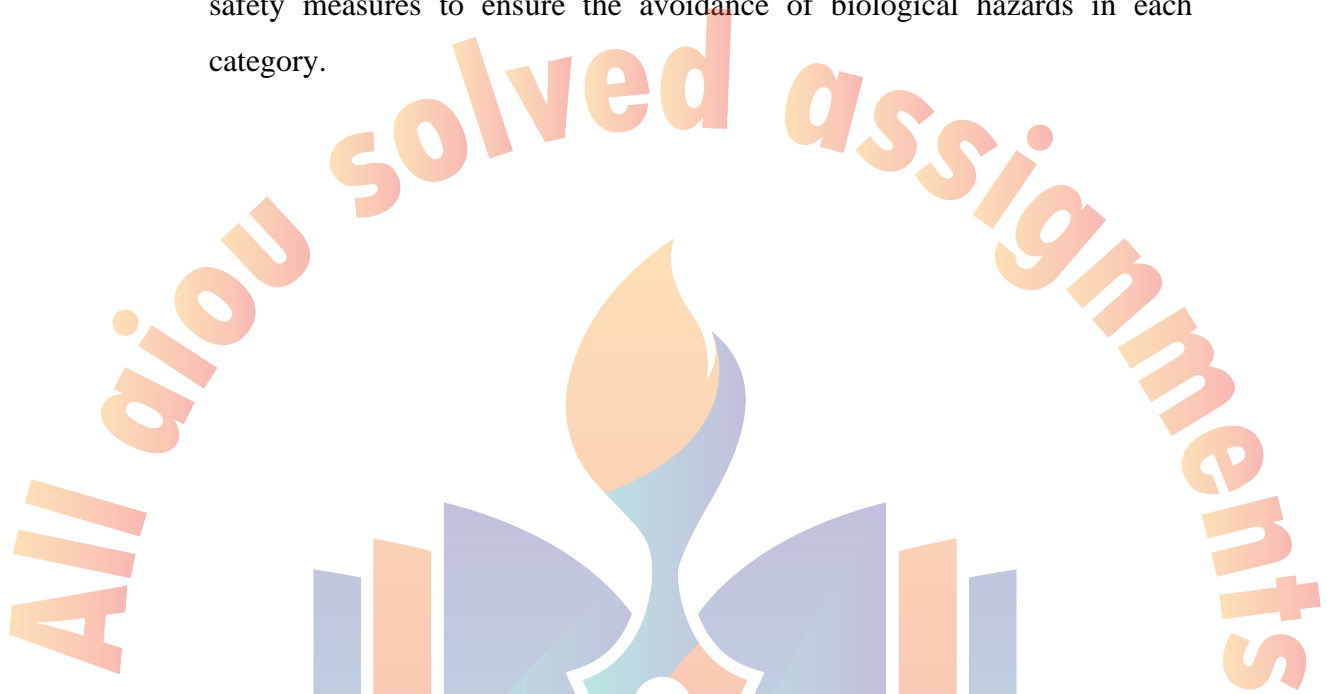
Personal Protective Equipment (PPE): Wear appropriate PPE, such as gloves, masks, and protective clothing, when handling or applying insecticides or pesticides to minimize exposure risks.

Read and Follow Instructions: Read and strictly follow the instructions and safety guidelines provided by the manufacturer for the proper handling, mixing, application, and disposal of insecticides or pesticides.

Environmental Considerations: Use environmentally friendly and targeted approaches whenever possible, such as integrated pest management strategies, to minimize the use of chemical pesticides and their potential negative impacts.

Proper Disposal: Dispose of insecticide or pesticide containers and leftover materials in accordance with local regulations, avoiding contamination of water sources or the environment.

It is important to note that specific guidelines and regulations may vary depending on the country, institution, or specific circumstances. Always refer to local regulations, consult with experts, and follow established protocols and safety measures to ensure the avoidance of biological hazards in each category.



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