Mineral Resources Infrastructure Work

NTQF Level -1

Learning Guide 45

Unit of Competence: - Read and Interpret Laboratory Procedures and Specifications

Module Title: - Reading and interpreting laboratory procedures and specifications

LG Code: **MIN MRI1 M13 LO1-LG-45**
TTLM Code: **MIN MRI1 TTLM 0819v1**

LO No 1: Identify types of procedures and their functions

Instruction sheet	**Learning Guide 45**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Laboratory terminology
- Identifying standard operating procedures of geosciences laboratory
- Site and equipment safety requirements
- Identifying key functions of each type of procedures
- recognize and adhering quality requirements of company operations
- Identifying environmental controls from job plans, specifications and environmental plan
- Job Safety Analysis(JSA)

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Identify The main types of standard operating procedures used in the Geosciences' Laboratory
- Identify The key functions of each type of procedures
- recognize and adhere Quality requirements of company operations
- Identify Environmental controls are from the job plans, specifications and environmental plan

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1 up to self- check7 in page 5,9,13,15,18,21and 24 respectively"**.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Laboratory terminology

1. Concept of laboratory terminology On first impression, sample preparation may seem the most routine aspect of an analytical protocol. However, it is critical that analysts realize and remember that a measurement is only as good as the sample preparation that has preceded it. As a general rule, the error in sampling and the sample preparation portion of an analytical procedure is considerably higher than that in the methodology itself, One goal of laboratory sample preparation is to provide, without sample loss, representative aliquant that are free of laboratory contamination that will be used in the next steps of the protocol.

FIG 1.1 Mining laboratory room

FIG1.2 Automated weighing different mineral

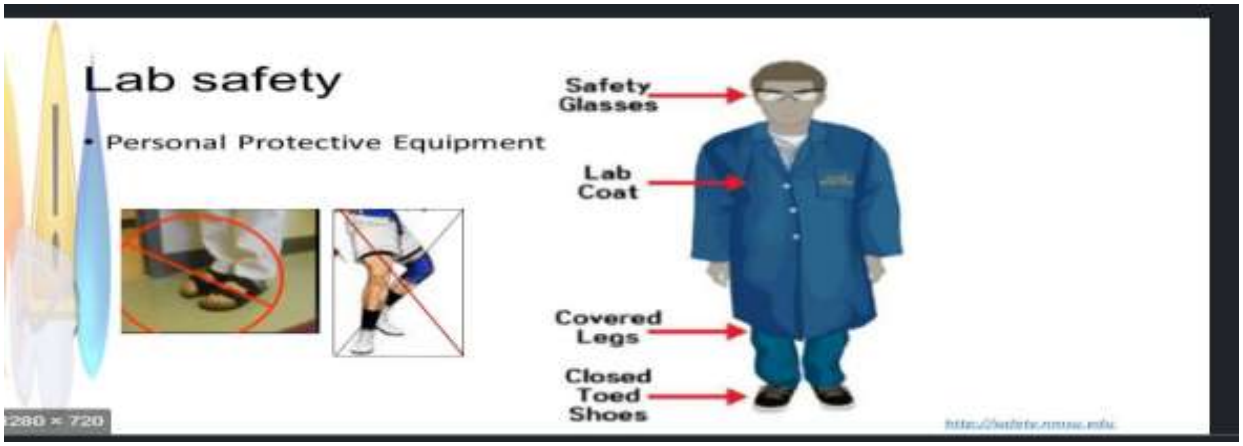

FIG 1.3 Personal protective equipment of mining lab

1.1. General Guidance for Sample Preparation

Some general considerations during sample preparation are to minimize sample losses and to prevent contamination. Possible laboratory terminology for sample loss during preparation steps are

A. **Potential Sample Losses During Preparation**

Materials may be lost from a sample during laboratory preparation. The following sections discuss the potential types of losses and the methods used to control them. Such preparation steps may include homogenization or sample heating. The addition of tracers or carriers prior to these steps helps to account for any analytic loss during sample preparation.

B. **Losses as Dust or Particulates**

When a sample is dry ashed, a fine residue (ash) is often formed. The small particles in the residue are resuspended readily by any air flow over the sample. Air flows are generated by changes in temperature (e.g., opening the furnace while it is hot) or by passing a stream of gas over the sample during heating to assist in combustion.

C. Losses Through Volatilization

Some radio nuclides are volatile under specific conditions (e.g., heat, grinding, strong oxidizers), and care should be taken to identify samples requiring analysis for these radio nuclides. Special preparation procedures should be used to prevent the volatilization of the radionuclide of interest.

D. Losses Due to Reactions Between Sample and Container

Specific elements may be lost from sample materials from interaction with a container. Such losses may be significant, especially for trace analyses used in radio analytical work. Losses due to adsorption may be minimized by using pretreated glassware with an established hydrated layer.

1.2. Contamination from Sources in the Laboratory Contamination leads to biased data that misrepresent the concentration or presence of radio nuclides in a specific sample. Therefore, laboratory personnel should take appropriate measures to prevent the contamination of samples. Such precautions are most important when multiple samples are processed together. Possible sources of contamination include:

- Airborne
- Reagents
- Glassware/equipment
- Facilities; and
- Cross-contamination between high- and low-activity samples.

The laboratory should use techniques that eliminate air particulates or the introduction of any outside material into samples and that safeguard against using contaminated glassware or laboratory equipment. Contamination of samples can be controlled by adhering to established procedures for equipment preparation and decontamination before and after each sample is prepared.

Some of laboratory terminology listed below

Mineral A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form, and physical properties. CF: metallic

Milling:-The act or process of cutting or grinding away a metal object lost in a borehole with a mill or milling

Microscope An instrument used to produce enlarged images; it consists of a lens (or lenses) of the objective and an ocular set into a tube, with or without

Cutting The opening made by shearing or cutting. her accessories, and held by an adjustable arm over an object stage.

Polishing Removing the last traces of suspended matter from solutions by passing them through a filter coated with diatomaceous earth or similar material.

polished section A slice of rock or mineral that has been highly polished for examination by reflected-light or electron micro beam techniques, a procedure mostly applied to opaque minerals.

Self-Check -1	Written Test

Name _____ **Date**_____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part 1 define the following question

1. write physical manipulation of the sample laboratory. 4points
2. write Potential Sample Losses During Preparation. 3points
3. write Possible sources of contamination include. 3points

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Score = _____

Rating: _____

Information Sheet-2	Identifying and operating procedures of geosciences laboratory

1. Identifying and operating procedures of geosciences laboratory

The key to designing and carrying out safe laboratory experiments is knowledge of the potential hazards. It is the responsibility of each individual working in the laboratory to become thoroughly familiar with the hazards of the chemicals they are using and operations they are performing.

1.1. Controlling Sources of Exposure

All experiments must be designed and carried out to minimize hazardous chemical exposure. Source reduction, engineering controls, and protective equipment, in that order, are the three primary means of controlling exposure. The following are examples of source reduction and engineering control techniques.

FIG 2.1 controlling source of waste

A. Source Reduction:- Use the least hazardous chemical that will serve the intended purpose. Design experiments to use the minimum amount of hazardous chemical required. Always close containers when not in use. Minimize the surface area of open containers (e.g. use of flask vs. beaker).

B. Engineering Controls:- Use fume hoods whenever possible. Do not use fume hoods for long term storage of equipment or chemicals. Avoid the release of hazardous chemicals in rooms with no ventilation system or with re-circulating air systems.

C. Protective Equipment:- Minimum levels of protective equipment ,It should be recognized, however, that source reduction and engineering controls are generally more effective means of exposure control.

1.2. Personal Hygiene Good personal hygiene practices are essential to minimize hazardous chemical exposure and potential injury from other hazardous conditions, such as broken glass, in the laboratory. The storage or consumption of food or beverages, application of make-up, and smoking are prohibited in all laboratory areas and hazardous chemical storage areas. A soiled or contaminated lab coat should be placed in a plastic bag and exchanged for a clean one; contact the Lab Manager. Shoes must be worn at all times in Cole Science Center.

1.3 Housekeeping Keeping the laboratory work area organized and clean is important to safe handling of hazardous chemicals. Only the equipment and chemicals necessary for the particular procedure being performed should be in the work area. This is particularly important when working in a fume hood as storage of numerous containers or pieces of equipment can severely diminish the effectiveness of the hood.

1.4. Lab Project Termination:- When a lab project is completed, will cease to be active for a period of time, or the faculty member or student leaves Hampshire College, clean-up must be done by the faculty member and student, and approved by the Lab Manager. Clean up includes: remove and properly dispose of all hazardous materials from the laboratory or project area, and from any shared storage units, refrigerators, stock rooms, chemical cabinets, and waste collection areas clean and decontaminate all laboratory equipment, hoods, bench tops, cabinets, and shelves.

The Lab Manager inspects for proper clean-up and handling of hazardous materials, and will notify the Dean of Natural Science if proper clean-up, disposal and decontamination procedures have been followed, and that the faculty and her/his student have fulfilled responsibilities for cleanup. Clean-up becomes the responsibility of the faculty member if not completed by the student. Pets in the Laboratory Pets are not allowed in the laboratory.

1.5. Unattended Operations:- Avoid leaving operations unattended. When it is necessary to leave an experiment unattended, provide for containment of hazardous chemicals in the event of equipment failure.

1.6. Chemical Inventory, Transport, and Shipping:- All chemicals must be included in the chemical inventory. When a new chemical is received it must be tagged and entered into the inventory by the faculty member or Lab Manager. When containers are emptied or the chemical disposed of, the date must be entered into the inventory. When chemicals are moved from one storage location to another, the location on the inventory must be updated. Chemicals taken from a storage area for temporary use in the laboratory do not need to have the location changed.

1.7. Hoods:- There are several different types of hoods in Cole Science Center. Each of these is discussed briefly below. The appropriate hood must be used. Use of the wrong type of hood could increase the potential hazard. All hoods are tested annually to verify proper performance.

1.7.1.General Use Fume Hoods:- These hoods, which are designed to protect the user, are appropriate for working with flammables, acids, bases and organic solvents; they should be operated with the sash lowered to the indicated point (red arrow). Working with the sash lowered to this point creates the necessary draw (air flow into the hood), and adds protection from splashes or explosion.

1. **Before using a fume hood observe the following precautions**

- Remove any bulky items in the hood as these will prevent proper airflow.
- Turn the hood on and confirm that the hood is drawing air (a tissue or Kim wipe held at the opening should be gently pulled into the hood area).
- Do not store chemicals in the hoods, or remove stored chemicals before use.

2. **When using a fume hood observe the following precautions**

- Do not keep unnecessary materials in the hood.
- Chemicals or waste stored in a hood must be in secondary containment.
- Use only intrinsically safe (i.e. explosion proof) equipment when working with flammables. (Intrinsically safe equipment is available from the Lab Manager.)
- Keep all materials back at least 6 inches inside the hood. The sash should be able to be fully

closed in the event of an emergency.

- Work with the sash lowered to the indicated level (red arrows) for proper venting.
- Be aware of air disturbances (from opening doors, fans, passersby, etc.), as these will affect the draw of air into the hood.
- Do not attach signs or materials to the sash as these prevent visibility into the hood and safe operation of the sash.
- Clean up spills immediately. Ask the instructor or Lab Manager for the appropriate way to do this, as some materials must be treated first (e.g., acids and bases must be neutralized).

1.7.2. Laminar Flow Hoods and Biological Safety Cabinets:- Laminar Flow hoods are used to protect microbiological work from contamination; they contain no UV lamp source. These are also called clean benches, and are used for work with non-hazardous materials when very clean environments are needed for high purity work.

Self-Check -2	Written Test

Name _____ Date_____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part 1. Define the following question

1. Write Controlling Sources of Exposure. 2 points
2. Write the hierarchy of controls. 5points

Part 2. Write true or false each 1 points

_____1. Lab coats must be worn in the laboratory when handling.

_____2. Shoes must be worn at all times in Cole Science Center.

Note: **Satisfactory rating - 5 points** **Unsatisfactory -5- below 6points**

Score = _____

Rating: _____

Information Sheet-3	REQUIREMENTS OF SAFETY SITE AND EQUIPMENT

INTRODUCTION Protective equipment must be worn to guard against injury from routine or accidental events. Each faculty or supervising staff member is responsible for choosing appropriate protective equipment for his or her staff and students. The following personal protective equipment is available for persons working in the laboratory. Know what equipment is necessary for your work.

A. Eye and Face Protection Requirements The hazards of each laboratory operation must be identified and the approved eyewear worn. Eye protection meeting, is the minimum level of eye protection required.

B. Operations Requiring Chemical Splash Goggles To protect students, faculty, staff, and visitors from chemical eye hazards, the following operations require chemical splash goggles. When these operations are conducted in a fume hood with the sash lowered, safety glasses are acceptable.

- Use of strong acids or bases
- Use of corrosive gases.
- Use of potentially explosive or water reactive chemicals.
- Use of acutely toxic chemicals in liquid or powder form.
- Use of cryogenic liquids when there is a risk or pressure buildup or splash or particle hazard.
- Use of other hazardous chemicals in liquid form.
- Any activity when there is an explosion or implosion hazard.

C. Operations Requiring Safety Glasses or Splash Goggles:- The following operations require the use of safety glasses or splash goggles.

- Operations using or generating liquid or fine particulate chemicals for which splash goggles are not required.
- Chipping, cutting, and grinding activities.
- UV and/or IR protective safety glasses are required when working with instruments generating and releasing UV or IR emissions unless a safety mechanism automatically shuts of the emission source when exposure is possible.
- When installing or removing regulators on gas cylinders.

D. Gloves :-The need to wear gloves, and selection of the appropriate gloves, depends on the hazard of the chemical, the potential for contamination during the experiment, and dexterity requirements. It is the responsibility of the faculty to choose the appropriate gloves for their staff and students. Proper glove selection is a function of the specific chemical resistance of the material as measured by permeation rate and breakthrough time

E. mining Clothing:- The purpose of protective clothing is to prevent contamination of the skin and to prevent the carrying of contaminants outside the laboratory. Street clothes may afford limited skin

protection but may result in contaminants being carried outside the laboratory. Bulky or dangling attire and easily combustible clothing should not be worn in lab.

Protective Clothing: The use of a lab coat is strongly recommended in all laboratories. Lab coats must be worn in the laboratory when handling: any quantity of select carcinogens or reproductive toxins that are absorbed through the skin any quantity of acute toxins . greater than 25 mL of strong acids or bases (outside pH range 2 - 10) Lab coats are available from the lab manager. A soiled or contaminated lab coat should be placed in a plastic bag and exchanged for a clean one; contact the lab manager.

Protective Footwear: Shoes must be worn at all times in Cole Science Center. When working with hazardous chemical or biological materials, or moving heavy objects, closed-toe shoes must be worn. Sandals or perforated shoes are not acceptable, as feet are not protected from spills or falling objects.

F. Safety Data Sheets and Lab Safety Information:- The Laboratory Standard defines a "hazardous chemical" as one that exhibits physical or health hazards.

"**Physical Hazard"** - a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, (reactive) or water reactive.

"**Health Hazard"** - a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health *effects* may occur...includes...carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, agents which act on the hematopoietic (blood) system, and agents which damage the lung, skin, eyes, or mucous membranes.

G.**Electrical Safety:-**The voltage and current used in laboratories are potentially lethal. The Lab Manager should be notified if unsafe electrical situations exist (e.g., wires are strung across pathways, frayed wires are found, grounding plugs have been removed), or if equipment malfunctions.

Mining Machine:- The use of stationary machine tools and powered hand tools is subject to the following requirements

- Use of mining hand tools and power tools must be done under the instruction and direct supervision of a faculty or staff member familiar with the hazards and appropriate safeguards for the mining being used.
- All mining machines and tools must be stored in a locked area or locked out when a supervising faculty or staff member is not present.
- Choose the right tool for the job. Makeshift or undersized tools are always a hazard.
- Eye protection must be worn at all times. Safety glasses with side shields meeting Standard are the minimum level of protection. Goggles may be advisable under certain situations.
- Be sure all safeguards are in place and working before starting work. Guards as supplied by the manufacturer must be used when operating equipment. Fabricated tools guards must meet OSHA/occupational health and safety administration/ requirements.
- Check portable mining power tools for poor wiring or loose switches. Do not use a tool with a

frayed cord or with the grounding prong removed.

- Chuck keys, calipers, gauges, and other tools should be removed immediately after use. Forgetting to do so may lead to the tool becoming a projectile when the equipment is started.
- Never wear gloves, wristwatches, rings, bracelets, or other jewelry while operating machinery. Long hair and loose clothing should be controlled near operating machinery. Rags, drawings, hand tools, lubricant containers and other loose objects should be kept away from moving machine parts and machine surfaces that may vibrate during machine operation.
- Use a vise or clamps to secure the work when possible.
- When using portable tools do not overreach. Keep good balance and proper footing at all times.
- Be aware of potential hazards in your work area. Don't overlook the hazards and workspace requirements of others working nearby. When operating power tools in a strange environment check for flammable liquids, combustible materials and other hazards before beginning work.
- Keep out of the way of things that may be thrown by machinery. Some machines produce large amounts of debris. Debris not caught by the machine's dust collection system may be propelled out of the machine in a particular direction and distract or obstruct the vision of the operator. Some machines may also eject stock material under some circumstances. Table saws and wood jointers for example will eject wood stock in the direction of the rotation of the blade if the material is improperly fed. These machines should be operated from one side, minimizing any possible hazards.
- Chips and debris should be cleaned with a brush and not with compressed air or by hand.
- The machining of pyrophoric metals (such as magnesium) or toxic metals (such as beryllium, cadmium, lead, and osmium) requires special precautions. Any work on these types of materials requires approval of the Safety Office.
- Do not remove stock or reach near any moving parts of a machine until those parts have come to a complete stop. Turning the machine "off" does not immediately halt the hazardous motion of many machines.
- Machine/equipments/ adjustments or lubricating may be done while the machine is operating only if no safeguards are removed or bypassed and only if the operator is not exposed to any hazardous energy.
- Repair and servicing must be done in accordance with the Hampshire College Lockout/Tag out Program.

Self-Check -3	Written Test

Name _____ Date_____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part 1 Say true or false the following question each 2points

_____1. Protective Footwear must be worn at all times in Cole Science Center

_____2. The Laboratory Standard defines a "hazardous chemical" as one that exhibits physical or health hazards.

_____3. each laboratory operation must be identified and the approved eyewear worn.

_____4. do not Any activity when there is an explosion or implosion hazard.

_____ 5. The purpose of protective clothing is to prevent contamination of the skin and to prevent the carrying of contaminants outside the laboratory

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

Score = _____

Rating: _____

Information Sheet-4	Identifying key functions of each type of procedures

1. Introduction This Section outlines general safety procedures and policies that apply to all laboratory work procedures. The Safety Committee may establish additional requirements to address potential hazards that could result from specific operations. The attitude of those working in the laboratory is one of the most important factors in the safe conduct of laboratory experiments. All stages of an investigation, from design through completion, must consider safety as a guiding principle. The key to designing and carrying out safe laboratory experiments is knowledge of the potential hazards. It is the responsibility of each individual working in the laboratory to become thoroughly familiar with the hazards of the chemicals they are using and operations they are performing.

2. Duty to establish and implement safety management system A mine operator also has duties under the WHS (Mines) Regulations, including establishing and implementing a safety management system (SMS) before mining operations commence. WHS (Mines) Regulations

1. The mine operator of a mine must establish a safety management system for the mine, in accordance with this Subdivision.
2. The mine operator must implement the safety management system for the mine, so far as is reasonably practicable.
3. The mine operator must ensure that no mining operations take place during any time at which the safety management system is not established and implemented at the mine in accordance with this subdivision.
4. The safety management system must form part of any overall management system that is in place at the mine.
5. The safety management system must be designed to be used by the mine operator as the primary means of ensuring, so far as is reasonably practicable:

A. the health and safety of workers at the mine, and
B. that the health and safety of other persons is not put at risk from the mine or work carried out as part of mining operations.

6. Subject to sub clause the safety management system must provide a comprehensive and integrated system for the management of all aspects of risks to health and safety in relation to the operation of the mine.
7. The safety management system must comply with sub clause to the extent appropriate to the mine having regard to:

A. the nature, complexity and location of the mining operations, and
B. the risks associated with those operations.

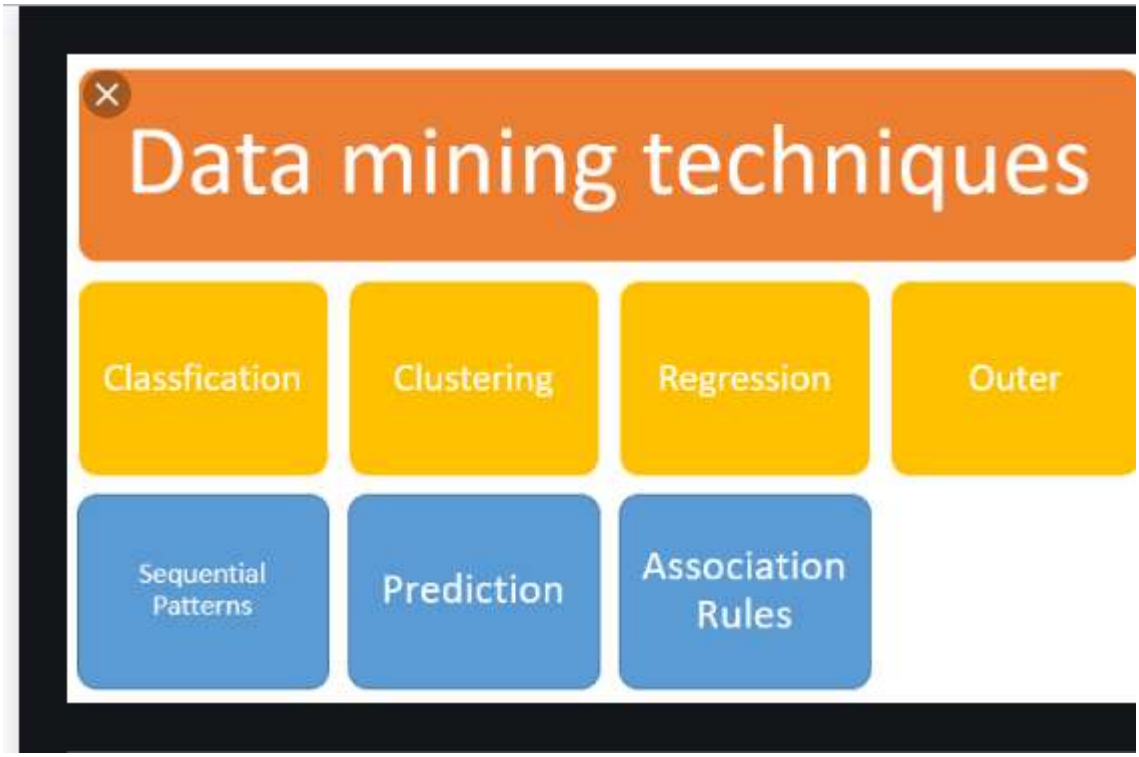

Fig 4.1. Procedure of techniques

Self-Check -4	Written Test

Name _____ **Date**_____

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part 1 define the following questions 5points

1. draw /write data procedures of mining techniques

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3points**

Score = _____

Rating: _____

Information Sheet-5	recognize and adhere Quality requirements of company operations

1. Introduction All the client-focused plans that will be produced and implemented for this project must be listed here. Include the target available dates for each of these plans. The precise list of plans to be included **must** be agreed with the Project Officer for the specific project.

1..1 Confirm here the adherence to the standard PMQP approval process which is:

- The supplier's Project Manager prepares the PMQP.
- An initial draft is introduced for review at the project kick-off meeting, which normally occurs within 2 weeks of contract signing.
- The user representative, the any designated Quality Assurance authority, and the Project Officer review the PMQP. Collated comments are then fed back to the supplier within the specified turnaround period.
- Comments are integrated into the PMQP in order to produce the final version which has to be approved by the IDA Project Manager.
- The first issue is delivered within two weeks of the kick-off meeting.

1.2. Lack of adherence to the PMQP;-Define a process that would allow the supplier's and the Commission's quality authorities to:

- identify the lack of adherence to the PMQP
- evaluate the impact and consequences as a result of the non-adherence
- initiate corrective actions.

Either describe, in detail, the procedure to be followed or make reference to the applicable Quality System procedure if available.

2. Quality Requirements Plans All the client-focused plans that will be produced and implemented for this project must be listed here. Include the target available dates for each of these plans. The precise list of plans to be included must be agreed with the Project Officer for the specific project. The following list, which is not exhaustive, should be tailored and used according to the needs based on the size and complexity of the project:

- Acceptance Plan
- Configuration Management Plan
- Change Control Management Plan
- Installation Plan
- Migration / Conversion / Transition Plans
- Product Support Plan
- Project Operational Quality Plan
- Requirements Management Plan

- Replication, Delivery, Installation and Servicing Plan
- Resources Plan
- Risk Management Plan
- Security Plan
- Service Implementation Plan
- Test Strategy Plan
- Test Plans
- Training Plan

2.1 Progress measurement and monitoring The means and the types of information that would be needed and used to assist with measuring and monitoring the progress of the project must be described here. The following list, which is not exhaustive, should be tailored and used accordingly based on the size and complexity of the project: Information about work progress. The progress of a project is usually reported in the form of a Project Progress Report, which is produced by the Supplier's project manager and sent to the Project Officer before the progress meeting, along with the meeting notification and agenda. The frequency and the format of the Project Progress Report must be agreed in conjunction with the Project Officer. Other documents that provide details for monitoring purposes.

2.2.Project progress meetings The project progress meeting **must** be held at least monthly until the final acceptance. The Supplier is responsible for preparing and sending the meeting notification and agenda to all the expected participants 5 working days before the meeting. It is, however, up to the Commission to make sure a meeting room is available. Minutes of the meeting are to be provided by the Supplier after each project progress meeting within 5 working days.

2.3.Technical and informal meetings These may be held more frequently, especially at the beginning of the project, to maintain a good co-ordination between the Supplier's team, the Commission and other involved parties. The participants to these meetings will vary according to the meeting's objectives.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part 1 say true or false each 1points

_____**1**. The precise list of plans to be included must be agreed with the Project Officer for the specific project.

_____ 2. for monitoring purposes are: A first version of the project time plan.

part 2 define the following questions 5 points

1. write at least 5 Quality Requirements Plans of project

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-6	Identifying environmental controls from job plans, specifications and environmental plan

1. Hazards in the working environment and environmental protection

1.1 General provisions of working environment

1. It should be the duty of the operator of an opencast mine to ensure that persons are not exposed to airborne contaminants, harmful physical and chemical agents or other hazards present in the working environment.

2. The manager should establish a suitable system of determining the quality of the air, and identifying any physical or chemical agent likely to be hazardous in the atmosphere in the vicinity of the mining operation, and of all locations in or about the mine where workers may be called upon to work or travel.

3. National laws or regulations should specify and regularly review exposure limits for all airborne contaminants, harmful physical and chemical agents, and other hazards which may be encountered in the working environment.

4. The mine operator should make the necessary provisions to ensure that:

- the safe working methods and, as far as is reasonably practicable, the safest physical and chemical agents are chosen and used;
- special procedures, approved by the competent authority, are enforced wherever workers may be exposed to ionizing radiation hazards from any source; and
- he exposure limits specified by national laws and regulations are not exceeded.

5. Where it is necessary in order to minimize the risk to workers, the manager should prepare written instructions specifying the correct procedure to be observed in these circumstances. The manager should also take the necessary steps to inform all workers of the possible hazards and the precautions to be taken when hazardous substances are likely to be encountered at the mine.

6. National legislation should specify the standards necessary to protect workers in opencast mines situated at high altitudes. Specific regard should be paid to the particular characteristics of these mines and the hazards to which the miners are exposed because of the location of such mines.

1.2 General Protection of the environment

1. In accordance with national laws, the operator of an opencast mine should ensure the introduction of a programme of environmental management to be taken into account at every stage of a mining project from the feasibility study, through the planning and operational phases, up to the closure of the mine and during subsequent monitor in

2. The environmental management programme for an opencast mine should provide guidelines covering:

- the sitting of the mine;
- a hydrological study;
- the method of operation;
- evaluation and monitoring of discards, slurry and other residues;
- control of spontaneous combustion and air pollution from waste dumps;
- a rehabilitation plan; and
- procedures for the closure, abandonment, replanting and after-care of the site such that there are no external environmental impacts and no safety hazards.

3. The programme of environmental management should be submitted to the competent authority for approval before the commencement of operations.

2. Identifying hazards and preparing plans The SMS is used as the primary means of ensuring the health and safety of workers at the mine. Establishing an SMS requires a mine operator to, among other things:

- Identify all principal mining hazards (PMH), assess the risks and prepare a principal mining hazard management plan (PMHMP) for each PMH
- Prepare principal control plans depending on the legislative requirements, type of mine and/or risks present

All mines

o emergency

o health

Underground mines

- ventilation

Any mine identifying risks associated with

- mechanical aspects of plant and structures
- electricity
- explosives.

Maintain, audit and review the SMS This includes assessing emerging hazards and evaluating the effectiveness of existing risk assessments and the controls implemented.

3. Managing risks Effectively controlling risks at a mine requires the mine operator to follow a risk management process. This code provides practical guidance on how an SMS can assist a mine operator to manage and control risks associated with mining operations

4. Precautions against harmful gases

A. In every case where toxic gases or fumes are liable to be present or to escape from any furnace or other plant used in connection with any process or operation, approved devices should be installed to ensure that such fumes or toxic gases are neutralized, suppressed or otherwise rendered harmless.

B. Such devices should be operated at all times in an approved manner.

C. If there is a danger of an explosion of gas, dust or vapors in any part of an open cast mine, the manager should take adequate precautions to prevent such an explosion, and inform the competent authority of the precautions that have been taken

D. In cases where waste gases are discharged into the atmosphere, the emissions should conform with the requirements of national laws or regulations.

E. Persons should not be permitted to enter the vicinity of a working face after shot firing until the gaseous products of the blast have dissipated.

- In cases where harmful gases may be given off by fluid or slurry drained or pumped from any source, all sumps, manholes, tanks or other collection points should be closed off effectively.
- The supervisory official, before allowing persons to enter such a locality, should ensure that it has been thoroughly ventilated and freed from water if practicable, and the atmosphere within tested to ensure its purity.
- Where such tests have not been performed, or where there may be an oxygen deficiency, workers entering the pit should be equipped with approved respiratory devices.
- Any person required to enter such a locality should be trained in the use of the respiratory device provided and be assisted by a second person stationed in fresh air.

Self-Check 6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part1 :- define the following questions each 5points

1. Write the abbreviation of (PMHMP)
2. What the precaution hazard Underground mines

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-7	Job Safety Analysis(JSA)

Job safety analysis

A. Work organization

1. The employer, in consultation with workers and their representatives, should study the work process in order to determine the tasks that make up job or work operation. Each of those tasks should then be analyzed to determine the hazards, assess the risks, and devise suitable means for performing the task as safely as possible. Special attention should be given to maintenance tasks

2. Where the job safety analysis does not identify suitable controls to protect workers' safety, the task should not be undertaken.

3. The results of this analysis should be used to write a set of safe work procedures (SWPs), listing the hazards, required work procedures, appropriate PPE and procedures to be followed in case of unusual circumstances or emergencies.

4. The SWPs applicable to each task should be readily available to the workers involved. They should be reviewed with each such worker or work crew assigned to the task before the first time they perform it, and frequently thereafter.

5. SWPs should be reviewed, and revised if necessary, whenever the task or its hazards change, when there is an accident involving the task, and periodically.

B. Work teams Work teams should be resourced adequately to undertake the job safely.

C. Persons working alone The employer should take appropriate measures for the protection of workers working alone or in isolation

D. Confined spaces

1. Hazard description

1.1. A confined space is a space where toxic or flammable agents may be confined or which may contain air with a dangerous deficiency of oxygen (for example, through displacement by another gas such as carbon dioxide) and in which people may be required to work from time to time. For example, maintenance or inspection tasks may often require entry to and work in confined spaces.

1.2. While the primary hazard of confined spaces is the atmosphere that they may contain, they are also sometimes cramped spaces which may hinder entry, exit and the activities of a person working in them. Many fatalities occur when first responders, without adequate precautions or personal protection, enter confined spaces in an attempt to rescue colleagues.

2. Assessment of risk

1. In assessing the risk posed by confined spaces at an opencast mine:

- existing and potential confined spaces should be identified by a person familiar with the hazards of confined spaces who is assigned to conduct that identification;
- a register of all identified and potential confined spaces should be compiled and maintained and made available to all workers at the site
- where entry is not required, unauthorized or inadvertent entry into a confined space should be prevented by posting warning signs, locking and securing, or other measures as necessary, to ensure that workers do not enter without proper protection;
- where entry is required by a worker: a confined space should be fully characterized, through

testing and inspection, for all existing and potential hazards in the confined space (hazards can be classified as mechanical, oxygen depletion, flammable or combustible vapours and gases, and toxic gases and vapours); and supply systems to a confined space should be blanked off or bled.

- A confined space should be re-evaluated where there is reason to believe that conditions have changed.

3 Control strategies Because of its hazardous nature, work in confined spaces is often addressed in national laws and accepted standards. Measures should be taken to identify any relevant laws and accepted standards and to follow them.

- Workers who are to enter a confined space, and those who are to act as sentries to protect them, should be trained and competent in confined space entry. Where a competent authority requires certification for confined space entry, those workers should be appropriately certified.
- All identified confined spaces should be clearly marked with warning notices and means provided to prevent unauthorized entry. Lone entry into confined spaces should be clearly prohibited and enforced.
- No confined space entry should be permitted before site-specific confined space entry, work and emergency procedures are implemented. Confined space entry should be controlled by a permit system with an appropriate level of "sign off".
- Prior to any entry into a confined space, the atmosphere should be tested to ascertain its content. It should never be assumed that a confined space remains in the same state as it was left after the last entry.
- Workers entering a confined space should be provided with appropriate respirators and PPE commensurate with the hazards in the confined space.
- Not less than two persons should be present when there is work in a confined space. One should be outside the confined space to keep watch and to offer rescue action or assistance or to activate emergency arrangements.
- Any person not employed at a mine should not be allowed to enter the mine, unless permitted by the employer in charge of the mine to do so and accompanied by a responsible person
- The provision of adequate visitor safety and health induction training is an important consideration. While on-site, all visitors should be adequately supervised. Every person who enters a mine, for whatever purpose, should comply with the provisions of national laws or regulations and with any instructions given by the supervisory officials or the accompanying responsible person with a view to ensuring their safety and that of the workers and the mine.

Self-Check 7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Part1 :- true or false the following questions each 1 points

_____1.The risk posed by confined spaces at an opencast mine

_____2. Artisanal and small-scale mining provides work and income for millions of people

_____ 3. The employer should take appropriate measures for the protection of workers working alone or in isolation.

_____4. Where the job safety analysis does not identify suitable controls to protect workers' safety, the task should not be undertaken.

Note: **Satisfactory rating - 2 points** **Unsatisfactory - below 2 points**

Score = _____

Rating: _____

Name: _____ Date: _____

List of Reference Materials

1. safety and health in open cast mines international labor office Geneva
2. Draft code of practice on safety and health in opencast mines (Geneva, 16–20 October 2017)
3. www.resourcesandenergy.nsw.gov.au/safety
4. WA Department of Mines and Petroleum www.dmp.wa.gov.au