mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Learners/Examiners Guide

for the

Assessment and Certification

of

Blasting Certificate

Holders for Scheduled Mines

February 2017

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

PURPOSE

The purpose of this guide is to assist examiners/assessors and training service providers towards implementing a structured, fair and consistent method of assessment. It also attempts to bring about uniformity across the various Regions of the Department of Mineral Resources.

SYLLABI

The syllabi is clearly defined so that the learners, training service providers and examiners/assessors are fully aligned with the study, assessment/examination material for the Blasting Certificate of Competency for Scheduled Mines. The syllabi is contained in section 2 of this guide.

ASSESMENT GUIDELINES

This section has been included to guide the learners and examiners/assessors on the assessment principles, which have been implemented. The assessment guidelines are contained in section 3 of this guide.

ASSESSMENT SCORE SHEET

This section has been included for assessment purposes. There are two types of assessment score sheets namely score sheet for compulsory questions and score sheet for choice questions. The two types of assessment score sheets are contained in section 4 of this guide.

QUESTIONS AND MODEL ANSWERS

Questions and model answers that are relevant to the Blasting Certificate for Scheduled Mines are contained in sections 5 of this guide.

GENERAL RULES FOR EXAMINATION/ASSESSMENT

Examinations/Assessments are to be conducted in accordance with this guide.

IMPORTANT INFORMATION

This Examiners/Learners Guide for the assessment and certification of Holders of Blasting Certificate for Scheduled Mines has been made available to all the Examiners/Assessors, Employers Representatives, Employees' Representatives, Training Service Providers, Mining Qualifications Authority (MQA) and other interested parties.

Copies of this Examiners/Learners Guide for the assessment and certification of Blasting Certificate Holders for Scheduled Mines can be obtained from the Department of Mineral Resources.

SECTION 2

SYLLABI

BLASTING CERTIFICATE FOR SCHEDULED MINES

This syllabi includes the relevant provisions of the Mine Health and Safety Act, 1996 (Act 29 of 1996) as amended and the regulations under the Minerals Act, 1991 (Act 50 of 1991) still in force in terms of schedule 4 of the Mine Health and Safety Act, 1996 (Act 29 of 1996) as amended.

1 VENTILATION, DUST PREVENTION AND GASES

1.1 VENTILATION

- 1.1.1 Reasons why underground working places must be ventilated
- 1.1.2 Methods of ventilating underground working places
- 1.1.3 Corrective measures in case of ventilation deterioration/failure
- 1.1.4 Legal requirements
- 1.1.5 Basic ventilation lay-outs in terms of underground working places
- 1.1.6 Measurement of thermal conditions in the working place

1.2 DUST PREVENTION

- 1.2.1 Causes of dust in underground working places.
- 1.2.2 Measures to prevent/minimise the appearance of dust in mine air.
- 1.2.3 Legal requirements

1.3 GASES

- 1.3.1 Hydrogen
- 1.3.2 Nitrous Fumes
- 1.3.3 Methane
- 1.3.4 Carbon Dioxide
- 1.3.5 Carbon Monoxide
- 1.3.6 Hydrogen Sulphide
- 1.3.7 Hydrocyanic Acid Gas
- 1.3.8 Oxygen

2 MINING PRACTICES

2.1 ROCK MECHANICS

- 2.1.1 Basic terminology and definitions
- 2.1.2 Types of fracturing
- 2.1.3 Strata Control
- 2.1.4 Pre-conditioning

2.2 BREAKING OF GROUND

- 2.2.1 Support (Stopes and Development)
- 2.2.2 Remnants
- 2.2.3 Drilling (Stopes and Development)
- 2.2.4 Cleaning (Stopes and Development)
- 2.2.5 Emergency Procedures

SECTION 3

ASSESSMENT GUIDELINES

WHAT IS ASSESSMENT?

Assessment is a process of gathering evidence and making judgement about a person's knowledge and skills. There are various purposes and forms of assessment. In the case of the Blasting Certificate, the candidate's knowledge is assessed, using the syllabus, questions and model answers contained in this guide.

During the assessment, evidence is collected that is used as the basis on which to make judgement about the person's knowledge. Assessment should be as close as possible to the way that knowledge are applied.

ASSESSMENT PRINCIPLES

It is envisaged that Blasting Certificate assessment process will be based on the principles listed below:

Principles	**Definitions** Assessment must:-
Access to assessment	Be conveniently available to all employees
Developmental	Yield results that candidates, programme planners and others can use as part of development processes to improve the performance of learners and the services of programmes, such as career counselling.
Fairness	Use methods, instruments and processes which are sensitive to various forms of bias and discrimination, such as cultural values, language, etc.
Integrative	Assess the knowledge and value outcomes of learning in an integrative manner and not in isolation from each other
Multi-lingualism	Be conducted in accordance with the Directive for Blasting Certificate for Scheduled Mines so that language shall not be a barrier to demonstrating one's competence. Candidates have the right to assessment in the language of their choice, whenever possible.
Outcomes-based assessment	Be based on learning outcomes stated in the Directive for Blasting Certificate for Scheduled Mines
Relevance	Focus on knowledge and values that are relevant to the learning outcomes; and be appropriate and close to the ways in which people learned and how they will use or apply the knowledge which are being assessed.
Reliability	Be reliable, i.e. the assessment must produce similar results consistently, regardless of assessor or context
Transparency and democracy	Be clear and understandable to the candidates.

SECTION 4

The examination/assessment consists of two types of questions namely Compulsory questions and Choice questions.

4.1 COMPULSORY QUESTIONS

a) The score sheet to compulsory questions, DMR 304, must be used in preparing for, and assessing a candidate.
b) The examiner must assess/examine the candidate on a minimum of five Compulsory questions in each subject (All candidates must be examined/assessed on equal number of questions).
c) The pass mark on compulsory questions is 100%.
d) Questions asked under the compulsory section relate to core knowledge that a Miner is required to have.
e) The intention of the compulsory question is to ascertain whether the candidate has the knowledge of issues that may impact on the health and safety of employees under his/her control.
f) The candidate must answer all questions asked that may impact on the health and safety of employees by demonstrating an understanding of the associated risks to the satisfaction of the examiner in the abovementioned part of the examination/assessment.
g) The examiner must record all questions asked and complete the 'Assessor Remarks' section on the score sheet if the candidate gives an unsatisfactory answer.

4.2 CHOICE QUESTIONS

a) The score sheet for choice questions, DMR 305, must be used in preparing for, and assessing a candidate.
b) The examiner must assess/examine the candidate on a minimum of five choice questions in each subject (All candidates must be examined/assessed on equal number of questions).
c) The pass mark on choice questions is 60%.
d) The examiner is not restricted to only the abovementioned questions, provided that the question he/she may ask are still within the boundaries of the syllabus and remain relevant to the Blasting Certificate of Competency for Scheduled Mines.
e) The examiner must record all the questions asked and completes the ''Assessor Remarks'' section on the Choice Questions score sheet if the candidate gives an unsatisfactory answer.

SECTION 5

QUESTIONS AND MODEL ANSWERS

5.1 VENTILATION, HEAT, DUST PREVENTION AND GASES

5.1.1 VENTILATION

A COMPULSORY QUESTIONS

Question 1
Why is a mine ventilated?

Answer
a) To provide oxygen for breathing purposes and must be above 19% by volume.
b) To remove heat and moisture to provide comfortable working conditions.
c) To dilute and remove harmful gases that may be encountered during mining operations.
d) To dilute and remove hazardous airborne pollutants created by various mining operations underground.

Question 2
With respect to Mine Standards and Code of Practices, how must a development end be ventilated?

Answer
a) The workings of every part of a mine, where persons are required to travel or work, shall be properly ventilated so as to maintain safe and healthy environmental conditions.
b) The ventilation air shall be of a quantity and quality so that it will remove and dilute harmful gases and airborne pollutants in the ambient air.
c) Fans to be installed and operated in a position so as to prevent dangerous accumulation of flammable or noxious gases and airborne pollutants.
d) Fans to be installed and operated in a position to expel and remove all harmful gases and airborne pollutants before expiry of the re-entry period fixed by the Manager.
e) Fans and ventilation appliance shall be installed in such a position as to ensure, as far as possible, that it is not damaged by the blast.
f) When fans are installed in the force/exhaust overlap system the fans are to be electrically interconnected to ensure that the force fan is not recirculating when exhaust fan has tripped or stopped.
g) When a development end is ventilated by means of a force exhaust system, the overlap distance of the two ventilation columns must be such that the minimum distance prevents recirculation and the maximum distance prevents static air.
h) Every fan must be installed at a position indicated by, and in a manner, prescribed by the Manager or Mine Overseer. The positioning of fans require guidance from the mine's Ventilation/Environmental control Department by means of a layout.
i) When a fan is installed to operate in the return airway from a ventilating district, the fan motor must be situated in intake air.

Question 3
How can heat be controlled?

Answer
a) Ensure that ventilation supply is directed to the working face.

A Development Ends:

i. By means of fans and ventilation columns/ducting

B Stopes:

i. Installation of centre gully brattices

ii. Installation of vent curtains for strike control

b) Prevent recirculation of air in the development end.

c) Control distribution of ventilation flow by means of doors, walls/seals, regulators, brattices.

d) Keep the intake haulages and crosscuts dry as wet conditions add moisture to the air and increase the wet bulb temperature of the air.

e) Prevent any accumulation of material which could cause an obstruction in the intake or return airway to a stope.

Question 4

What quantity of air must be supplied on the working face of any development end?

Answer

Each mine will determine the quantity of air required for a development end through a "Risk Assessment" and will differ from mine to mine. An acceptable quantity of air at the working face of every development end, such as a tunnel, drive, crosscut or winze which is being advanced and at the bottom of any shaft, in the course of being sunk, must not be less than 0.15 m^3/s for each square metre of the average cross-sectional area of the excavation.

Question 5

What must the velocity of ventilation air be in a stope?

Answer

Each mine will determine the velocity of air required in a stope through a "Risk Assessment and will differ from mine to mine. An acceptable velocity of the air current along the working face of any stope must not be less than 0, 25 metre per second over the working height.

Question 6

What measurements are made with the whirling hygrometer?

Answer

a) The dry bulb temperature (thermometer without the wet sock) measures the actual temperature of the air. (Sensible heat)

b) The wet bulb temperature (thermometer with the wet sock) together with the dry bulb temperature gives the humidity of the air (percentage moisture in the air)

c) The closer the two temperatures are to each other the more moisture is present in the air and the larger the difference between the two readings the dryer is the air and the cooling power is increased.

Question 7

What checks must be done on the Whirling Hygrometer before proceeding underground?

Answer

a) Check thermometers that alcohol columns are not broken.

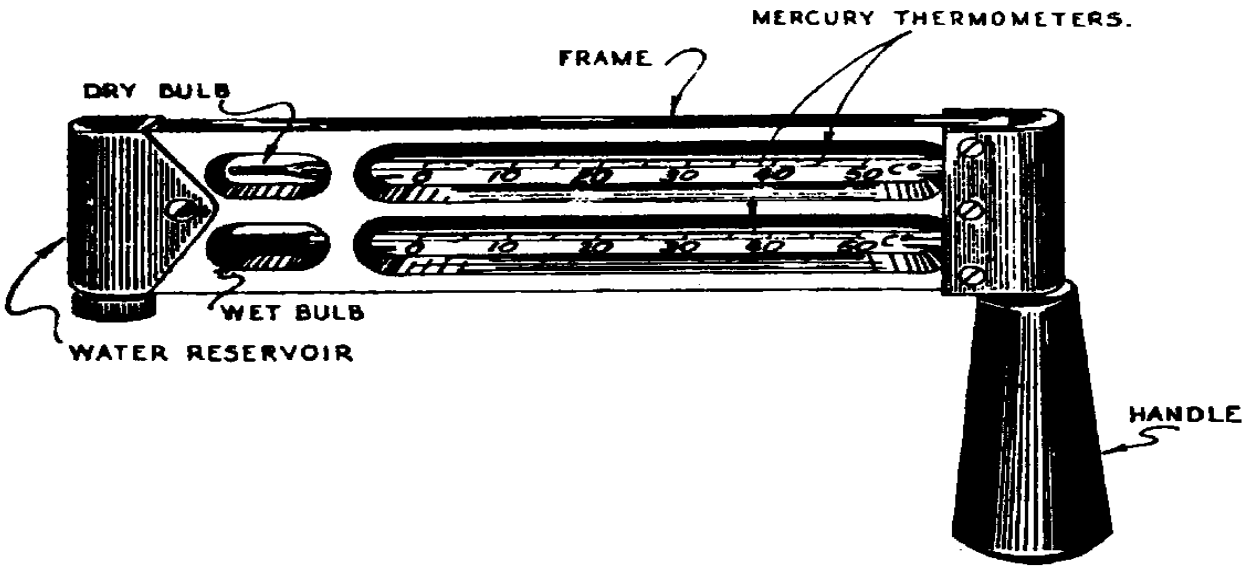
b) The thermometers must not be cracked

c) Thermometers must be checked against a standard and if more than 0.2 ^0C difference, discard

d) Thermometers are to be set so that both can be read without moving the instrument.

e) The sleeve must fit snugly around the thermometer bulb 3 mm beyond the bulb and tied with a string.

f) The sleeve must be clean and new sleeves are to be boiled before fitting.
g) Reservoir to be filled with distilled water and must not leak.
h) Frame and handle must be mechanically sound.
i) Spindle must be able to rotate freely.



WHIRLING HYGROMETER (ORDINARY TYPE)

5.1.1 VENTILATION

B CHOICE QUESTIONS

Question 1
Name the ventilation systems used in development?

Answer
There are three main methods in which air can be utilised to ventilate the working face in a development end:
a) 'Force" or "Blowing" system
b) "Exhaust" or "Suction" system
c) "Force-exhaust overlap" is a combination of the two systems

Question 2
How must the quantity and quality of the air be monitored?

Answer
The Ventilation Department must conduct routine surveys of all the working places to determine the environmental conditions as prescribed in the Mine Standard or Code of Practice.
a) The ventilation report must indicate the temperature (i.e. Wet Bulb & Dry Bulb) and the quantity of the air at the intake airway, at the working face and at the return airway.
b) Working places:

i. If there is a large difference between the volume of air at the intake and the delivery of a ventilation column, it indicates that the ventilation column has numerous leaks.
ii. When there is an increase in wet bulb temperature it means that the air picks up moisture and an increase in dry bulb temperature shows us that the air picks up heat from the rock, machinery, people etc.
iii. A large difference in dust concentration in the air between intake and return of the working place indicates that excessive dust is produced in the working place.
iv. When the measured air volume to the working place is low and that means the:
    - Intake airway or return airway is obstructed.
    - Doors in the section are left open.
    - Fans are not operating.
    - Power failure has occurred.

Question 3
If the ventilation is weak, what will you check?

Answer
a) If any ventilation doors are left open
b) If the cross cut is full of timber or has caved-in restricting the flow of air
c) If the ventilation curtains or brattices in the stope are damaged.
d) If there are excessive leaks in the ventilation column.

Question 4
How would you ventilate an advance strike gully where the ventilation is weak?

Answer
By installing a venturi or a ventilation curtain in the middle of the advance strike gully.

Question 5
What are two biggest ventilation problems we find, when mining at depth?

Answer
a) Heat due to an increase in the rock temperature
b) Heat due to auto compression.

Question 6
What is mine ventilation?

Answer
It is the continuous supply of good quantity and quality air to all the working places of the mine.

Question 7
What must the condition of “intake-air” be?

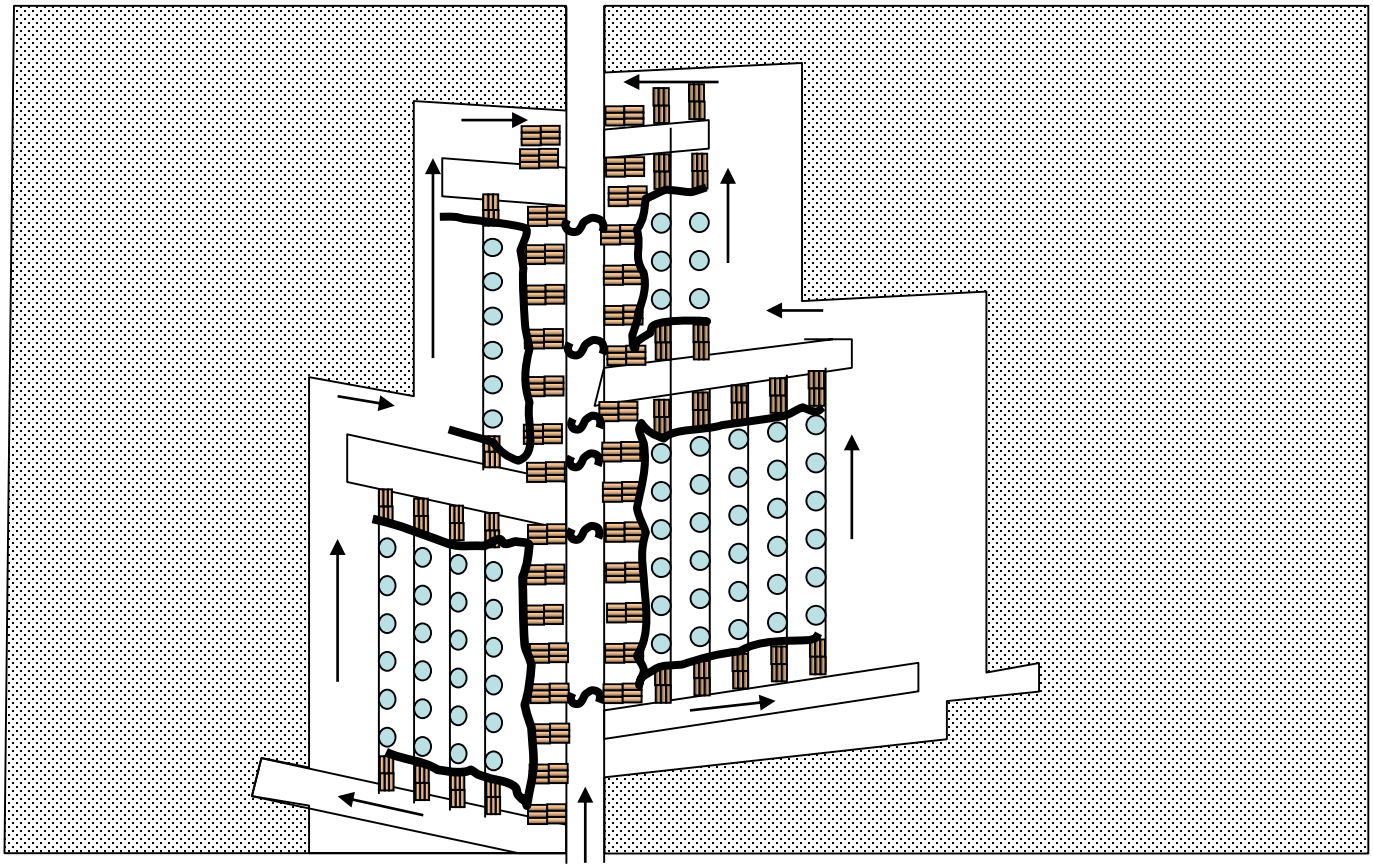
Answer
As far as practical, the ventilating air entering a mine must be free from dust, smoke or other impurities, and preferably dry.

Question 8
May persons work in harmful air?

Answer
No person must enter or remain in, or cause or permit any other person to enter or remain in any working place, if the air contains harmful smoke, gas fumes or dust.

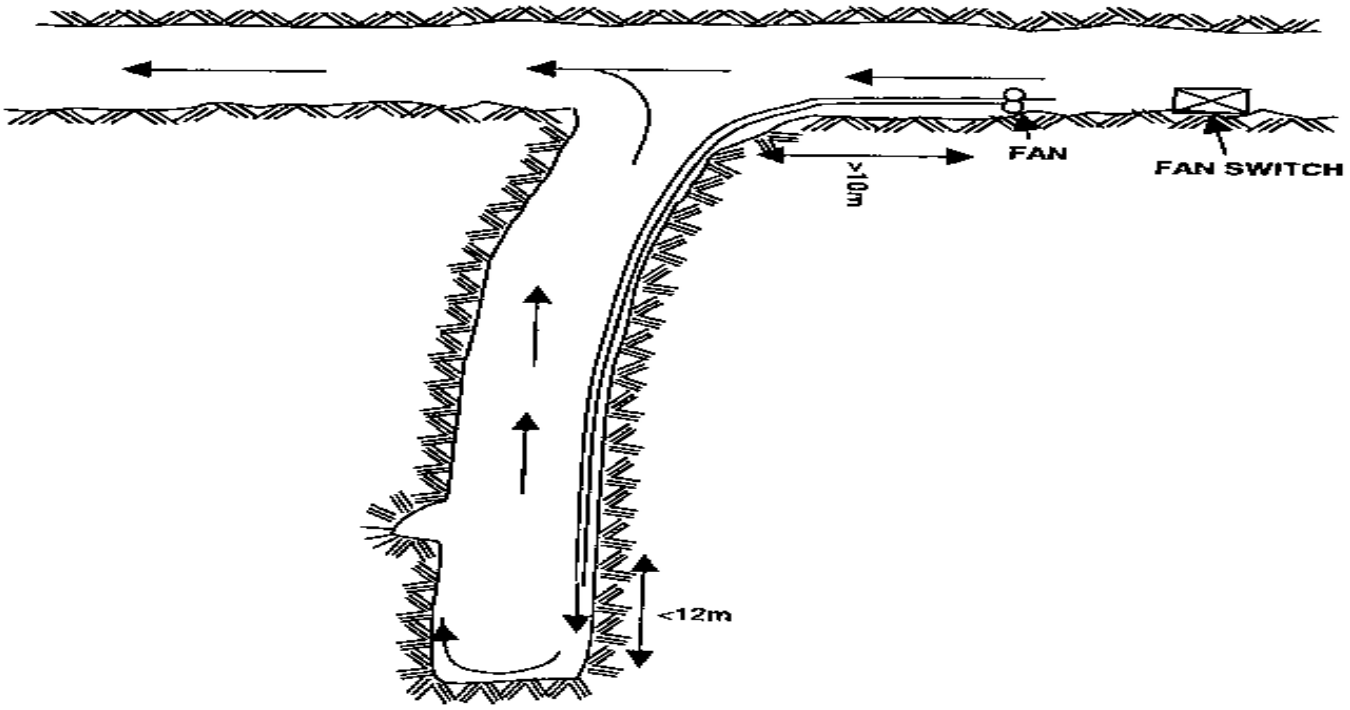
Question 9
Ventilate the stope on the sketch below?

Answer



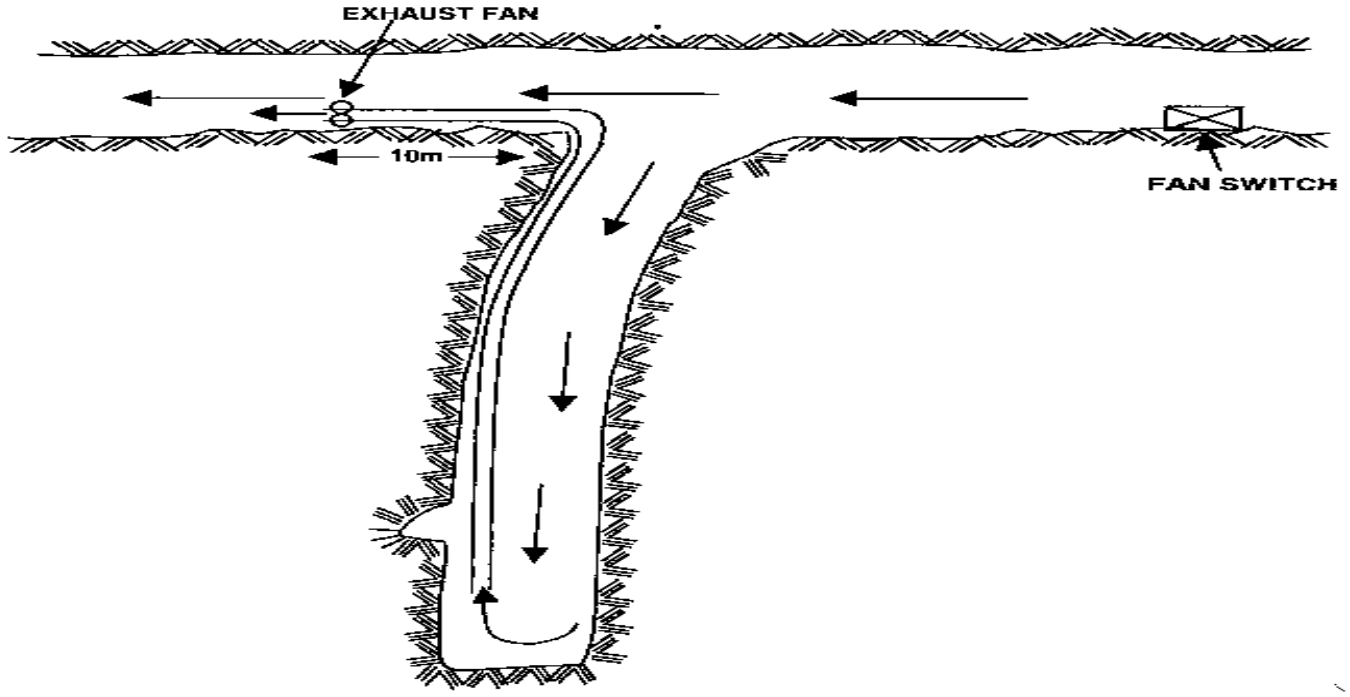
Question 10
Ventilate a development end by means of a force ventilation system on the sketch below?

Answer



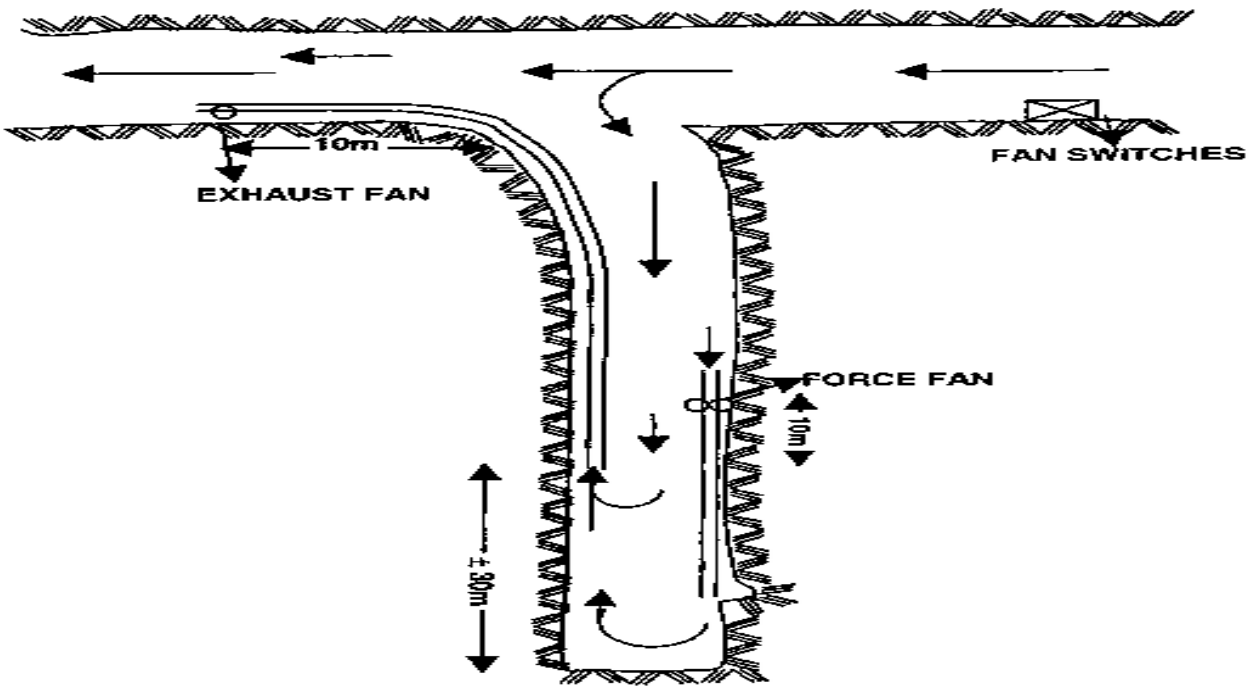
Question 11
Ventilate the development end by means of the exhaust system on the sketch below?

Answer



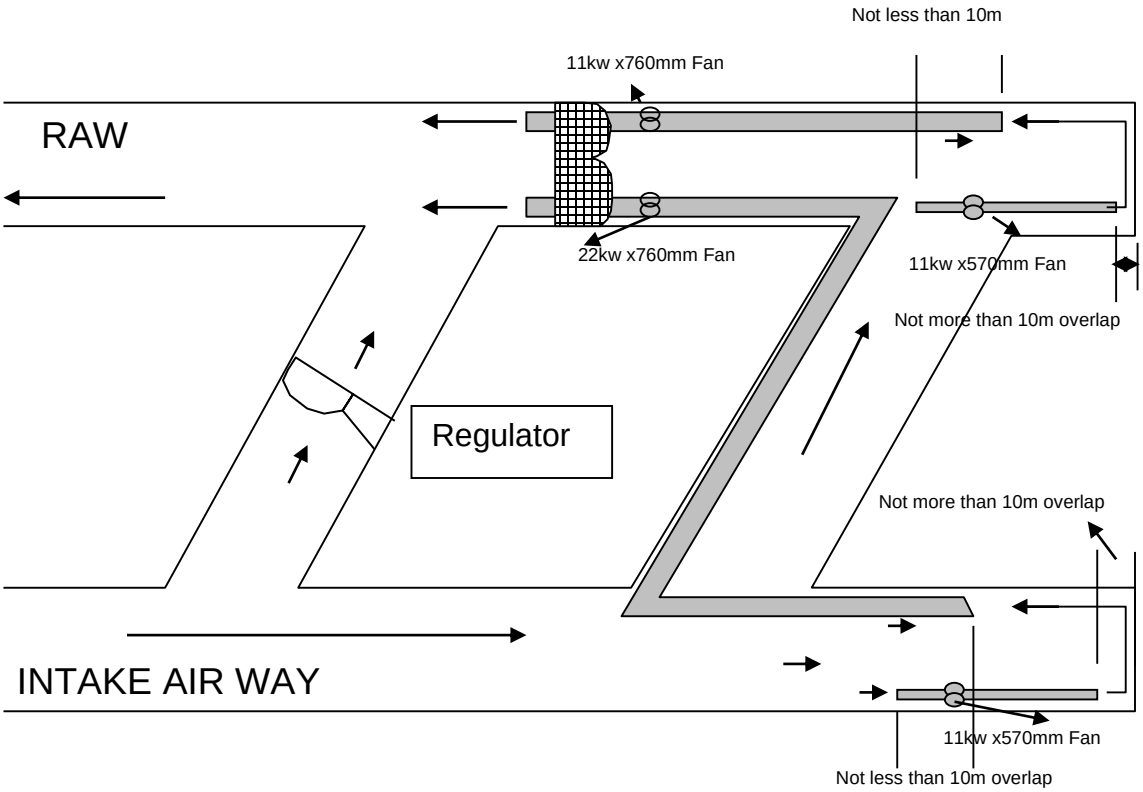
Question 12
Ventilate the development end by means of the force-exhaust overlap system on the sketch below?

Answer



Question 13
Sketch the ventilation system used in “Twin Haulages” – development with multi-blast conditions?

Answer



Question 14
How far must the ventilation pipes be from the face?

Answer
In such a position that all harmful dust, smoke and gases can be effectively expelled and air be supplied to the workers in the face (Usually 12m from the face before the blast).

Question 15
When must a development end be equipped with mechanical means for ventilating the working face?

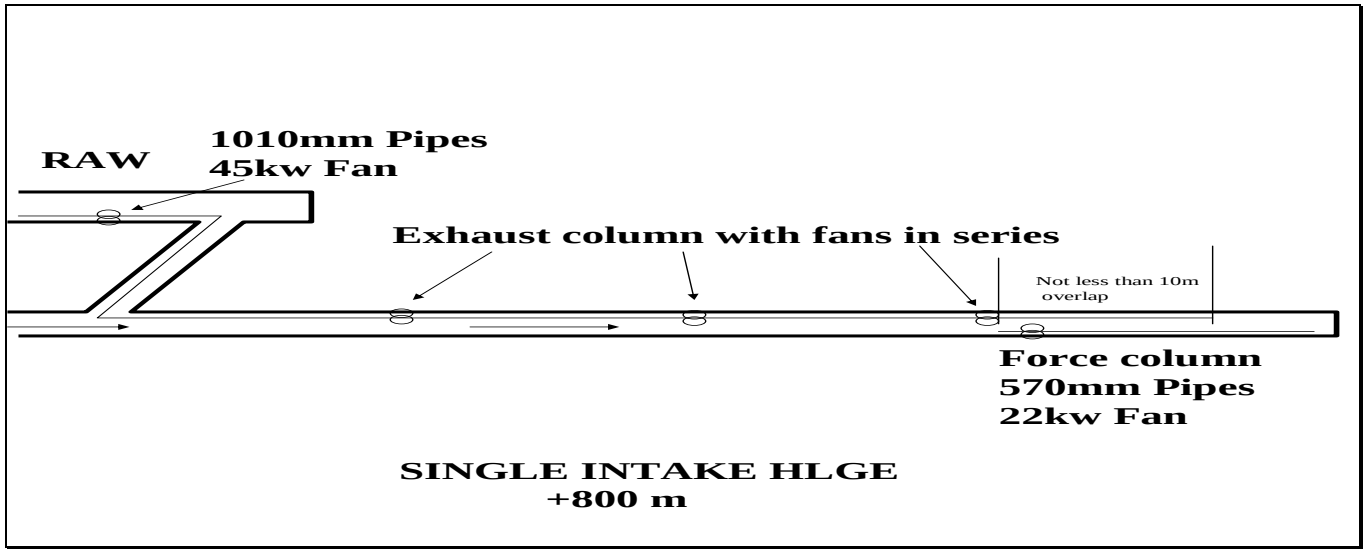
Answer
a) As soon as it is required, for supplying the necessary quantity of air on the face (150 $dm^3/s/m^2$)
b) When it becomes compulsory according to the standard on the mine
c) When the development end has advanced twice its cross sectional dimension"
d) When instructed by the Manager, Mine Overseer, Shift Boss or Ventilation Officer.

Question 16
Give the definitions for:
a) **Abandoned working place/end:** Is a working place/end where no work will take place in the foreseeable future and declared abandoned by the Subordinate Manager.
b) **Working dead end:** Is a development end where flammable gas has never been intersected before, the face has stopped advancing, but other work is taking place, e.g. workshop, store, battery charging bay.
c) **Effective barricade:** Is a barricade, where to gain entry, a tool or tools must be used.
d) **Through ventilation:** Is the air which is solely dependent on "main" fans for its flow through the mine.

e) **Last point of through Ventilation:** That position where the ventilation mixes with the return air from an end or series of ends or a stope.
f) **The flow of ventilation:** Modern mines have a special ventilation shaft which is not used for the conveyance of persons where huge fans are installed on surface to exhaust the used air, blasting fumes and gases out of the mine, up the ventilation shaft (up-cast shaft). This causes a flow of fresh air down the other shaft (down-cast shaft)
g) **Temporary stopped working place/end:** Is a working place/end where work has stopped for a period of 7 shifts or more and work will restart in the foreseeable future

Question 17
Ventilate a development end that has advanced 800m or more by using the sketch below?

Answer
As per sketch



At such a great distance, the force system will not be effective, as a few fans will have to be installed in series on the ventilation column, and that would result in additional heat, caused by the fans and a long return-way for the foul air.

The force-exhaust will ensure that the haulage has fresh air, from the through ventilation position up to the exhaust intake. The foul air is removed directly to the return air way.

Fans are to be installed in series in the exhaust column and their positions will be determined by the Ventilation Department.

Question 18
What are the advantages of the force ventilation system?

Answer
a) Air travels rapidly to the face, and increase of heat and moisture is kept low because the air is in a pipe throughout
b) Provided the delivery end of the column is reasonably near the face, the fresh air reaches workers at the face without danger of contamination by used air.

c) A single fan and single column is required.
d) The fan and motor is always positioned in the fresh air, causing less wear and tear.
e) Leakage in pipes is more easily detected, since it will be outwards.

Question 19
What are the disadvantages of the force ventilation system?

Answer
a) Persons travelling or working in the return airway do so in contaminated air from the face.
b) Not suitable for multi blasting conditions as in a sinking shaft, persons may pass through the blasting fumes and dust on their way to the face.
c) The return air usually flows back into the general airstream and causes contamination.
d) The fan adds some heat to the intake air.

Question 20
What are the advantages of the force-exhaust overlap ventilation system?

Answer
a) All contaminated air is removed in a pipe and no one is exposed to the contaminated air.
b) The development end is filled with clean air.
c) It greatly reduces the re-entry interval and is mostly suitable for multi blast conditions.
d) The return air can be controlled by discharging it directly in the return airway.

Question 21
What are the disadvantages of the force-exhaust overlap system?

Answer
a) Fresh air travels slowly up the drive, and will usually absorb heat, dust and moisture in considerable amounts.
b) Two separate units, each consisting of a ventilation column and fan, are required, and they may cause obstruction near the face, where they overlap
c) Leakage into the main column is inwards, and is more difficult to detect.
d) The additional booster fan and column increase the cost of ventilation.
e) Poor conditions can exist in the overlap section, such as gas accumulation.

Question 22
Which department can assist you to maintain the underground environmental conditions?

Answer
The Ventilation/Environmental Control Department, because they have personnel specially trained for this work.

Question 23
Name five major sources of heat?

Answer
a) Heat flow from rock
b) Auto compression
c) Machinery – engines and exhaust heat
d) Workers – breathing/body heat
e) Blasting

Question 24
What are the symptoms of heat-stroke?

Answer
a) Skin hot to touch – mostly dry – but often still wet from perspiration
b) Body temperature high
c) Aggressiveness, hysterical running about – as if insane
d) Spasm of the limb muscles – like shivering
e) Vacant staring of the eyes – pupils are dilated
f) Collapse and unconsciousness

Question 25
What is the treatment for heat-stroke?

Answer
a) Start treatment immediately and send for trained medical person.
b) Remove the patient's clothing and let the patient lie down.
c) Keep the patient's body wet by splashing water onto him/her by hand and spreading it over his/her skin.
d) Blow compressed air over the patient, from a distance of 1 metre.
e) Give small amounts of water to drink occasionally if conscious.
f) Apply artificial respiration if breathing fails
g) Continue cooling until trained help arrives or until 2 hours have elapsed.
h) After 2 hours of cooling, place the patient on a stretcher, cover the patient's body light with a blanket and remove the patient to a hospital

5.1.2 DUST PREVENTION

A COMPULSORY QUESTIONS

Question 1
What causes dust?

Answer
Where rock or other mineral is reduced in size, moved, transported, tipped, crushed or handled, such as:
a) Blasting operations
b) Rock being broken up (at tips)
c) Loading of broken rock
d) Tipping of ore and waste rock
e) Barring
f) Scraping
g) Large fall of ground and rock bursts
h) Drilling

Question 2
What causes dust to be liberated into the mine air after it has settled on surfaces?

Answer
a) By using compressed air for the following purposes, unacceptable levels of respirable dust will be released into the mine air:

i. Blowing over the foot wall
ii. Cleaning hoppers and skips
iii. Blowing out air pipes
iv. Desludging drill holes
v. Cleaning sockets
vi. Cleaning machinery

b) Repairing ventilation columns.
c) Performing work or travelling in any area underground without watering down first.
d) Tramming done in underground excavations will release dust from surfaces.
e) Hoisting rock in shaft systems will release dry dust from pipes, buntons, etc.
f) Due to evaporation of water from conveyances dust is liberated into the general atmosphere.

Question 3 **[MHSA 9.2(1)]**

How can exposure to dusty conditions and the inhalation of dust be prevented?

Answer **[MA Regulation 4.4.2 and 4.43]**

a) Any person, who has knowledge of excessive dust during working hours, must report the matter and record it in the complaints book.
b) Where any work is to be performed the area is to be watered down effectively.
c) Not use a rock-drill machine unless the means provided for allaying dust is in good working order.
d) Blasting not to take place more than once in 24 hours as per blasting schedule, unless there is a multi-blast ventilation system.
e) Do not enter blasted area before expiry of the re-entry period.
f) Blasting schedule, as laid down by the Manager, must be adhered to.
g) Sufficient supply of ventilation is available to clear the dust and gases after blasting.
h) Ensure adequate supply of ventilation is available to expel any dust during the shift.
i) Adequate supply of clean service water to be available at a pressure of no less than 150 kilopascals to reach all working places.
j) Where tipping of rock is taking place, such as main tips, atomisers, sprays or dust extraction systems shall be provided.
k) Do not blow out holes or sockets with compressed air alone, use the appropriate tool.
l) Clean the foot wall of a stope or development end only by means of a tool of a design and construction provided by the Mine Manager.
m) Use a dust mask when performing work in a higher than expected dusty area eg:
   i. Approaching areas showing visible dust (Refer to Code of Practice)

Question 4

What is the maximum amount of dust allowed in mine air?

Answer **[Schedule 22.9(2)]**

The concentration of dust shall not exceed such standards as may from time to time, be specified by the Chief Inspector of Mines.

a) Not more than 3 mg/m^3 for total dust.
b) Not more than 0.1 mg/m^3 for silica dust.

Question 5

What are the requirements in terms of dust allaying by any machine?

Answer
Each machine for the purpose of ripping, picking, cutting, drilling or loading rock, coal or other mineral must be fitted with means, or means must be provided, either for applying water effectively to prevent dust being created by the operation of such machine, or for effectively trapping such dust by some suitable apparatus/filter as accepted through a Risk Assessment.

Question 6
What are the requirements in terms of the use of rock drill machine?

Answer
No person must use, or cause or permit to be used, any rock drill machine which is designed to supply water to the drill steel through an internal water tube unless:
Such machine is provided with front-head air release ports of a design accepted through a Risk Assessment and which is not blocked.

a) The water tube is not bent, damaged or blocked.
b) The machine drill is fitted with a water tube of such length that, when drill steel of the type supplied for use with the said drill is inserted into the chuck to its fullest extent, when the machine is not operating, the end of the water tube is not less than 6 millimetres and not more than 25 millimetres short of the shank end of the drill steel.
c) The drill steel is provided with an axial hole and the axial hole shall extend over the whole length of the drill steel. An adequate supply of water must flow through such drill steel.
d) The working water pressure at the machine drill is maintained at not less than 150 kilopascals.
e) No branch water hose may be fitted to the water supply of the rock drill.

Question 7
What size dust particle is dangerous to the health of a worker?

Answer
A particle smaller than 7 micron which can normally not been seen by the naked eye.

Question 8
What size dust particle can be seen by the naked eye?

Answer
Particles larger than 50 micron.

Question 9
Name the occupational diseases caused by dust?

Answer
a) Pneumoconiosis (silicosis)
b) Emphysema

Question 10
Define:
a) Inhalable dust
b) Respirable dust

Answer

a) **Inhalable dust** are particles less than 50 microns which can be inhaled, but will precipitate on the mucous membranes of the nose, throat and windpipe.
b) **Respirable dust** are those particles smaller than 7 microns which can be inhaled, but will penetrate into the deepest recesses of the lungs and end up in the alveoli. This however, is applicable to all airborne pollutants.

5.1.2 DUST PREVENTION

B CHOICE QUESTIONS

Question 1
What is the definition of dust?

Answer
Finely divided particles of rock, which can be suspended in the air for long periods and can settle on surfaces.

Question 2
May a person enter or remain in a place that contains a harmful amount of dust?

Answer

a) No person must enter or remain in a dusty atmosphere, unless he is wearing effective apparatus to prevent the inhalation of dust
b) No person must work or permit any other person to work in a place where dust in the air exceeds concentrations as may from time to time be specified

Question 3
How must dust be controlled?

Answer **[Code of Practice]**

a) Dust to be controlled by means of watering down at its source.
b) Not to use compressed air to release dust in the atmosphere.
c) Supply sufficient ventilation to dilute and remove dust.
d) Provide effective filtering system or dust extraction system where dust is produced.

Question 4
For what purposes may compressed air *not* be used?

Answer **[MHSA Regulation 9.1(1)]**

a) No person may use or permit any person to use compressed air:
    i. In such a manner that it might endanger the health or safety of any person.
    ii. To clean the body of any person or the clothes being worn by any person.

Question 5
How far must the water blast be from the face?

Answer
Not more than 15m

Question 6
When must a water blast be tested?

Answer
Before charging up

Question 7
Where must you water down?

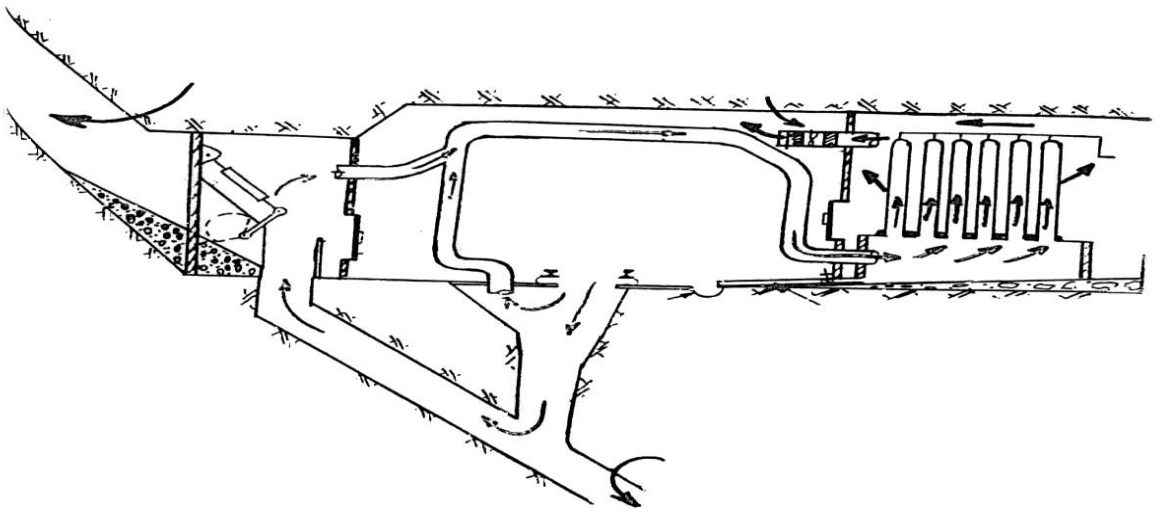
Answer
All places where people work or travel or where rock is being handled

Question 8
How many times during the shift must you water down?

Answer
As many times as *needed to keep the ground wet.* Do not wait until you see dust.

Question 9
How is dust prevented in an inter-level ore pass system?

Answer
By means of an exhaust fan drawing air through the flannel bags in a filter plant



5.1.3 GASES

A COMPULSORY QUESTIONS

Question 1
What are the permissible quantities of the following gases in mine air?

a) Carbon Dioxide CO_2
b) Carbon Monoxide CO
c) Nitrous Fumes (Oxides of Nitrogen) NO_2
d) Hydrogen Sulphide H_2S
e) Flammable Gas (Methane) CH_4
f) Hydrogen H_2
g) Hydrocyanic Acid Gas HCN
h) Oxygen O_2

Answer

Gas	Not exceeding
a) Carbon Dioxide	5 000 parts per 1 000 000 of air by volume
b) Carbon Monoxide	50 parts per 1 000 000 of air by volume
c) Oxides of Nitrogen	3 parts per 1 000 000 of air by volume
d) Hydrogen Sulphide	10 parts per 1 000 000 of air by volume
e) Flammable Gas – 1,4%	1.4 parts per 100 of air by volume
f) Hydrogen	Nil
g) Hydrocyanic Acid Gas – (moisture/liquid draining)	Nil
h) Oxygen – not *less* than 19%	19 parts per 100 of air by volume

Question 2
What does air consist of?

Answer

a) Nitrogen	78%
b) Oxygen	21%
c) Carbon Dioxide and other gases	1%

Question 3
What are the properties/characteristics of Carbon Monoxide (CO)?

Answer
a) It is highly poisonous and it interferes with the blood's ability to transport oxygen.
b) Disables without any warning or symptoms due to the absence of oxygen in the body.
c) It is tasteless, colourless and odourless
d) Relative Density = 0, 97; slightly lighter than air, and can thus be found in both raises and winzes. It tends to accumulate in unventilated or poorly ventilated working places, unholed box holes, blocked ore-passes and unventilated containers, tanks or vessels
e) Slightly soluble in water
f) It is explosive between 12 % and 74 %
g) It is a product of incomplete combustion(When the supply of oxygen is limited)

Question 4
What are the characteristics/properties of Nitrous fumes ($N0_2$)?

Answer
a) It is very poisonous and may lead to delayed accumulation of fluid in the lungs
b) Does not burn or explode
c) It gives warning (irritates the eyes, nose and throat)

d) Smells like nitric acid
e) It has a reddish-brown colour
f) It is very soluble in water
g) It is heavier than air (RD = 1.6)

Question 5
What are the properties/characteristics of Methane (CH4)?

Answer
a) A flammable/explosive gas.
b) None poisonous
c) Gives no warning – tasteless, colourless and odourless
d) At 0 – 5 % burns with a blue flame
e) At 5 – 15 % explodes (most critical at 9,5%)
f) At 15 % and more, displaces oxygen – causes suffocation
g) Lighter than air (R.D. = 0,55)
h) Not soluble in water
i) Found in poorly ventilated panels, up-dip, back stopes, high places, hanging wall, box holes and raises

Question 6
What are the properties/characteristics of Hydrogen Sulphide?

Answer
a) It is a very poisonous gas
b) It is an flammable gas and will explode between 4 % - 44 %
c) It gives warning by its smell – smells like rotten eggs, but in high concentrations it impairs the sense of smell
d) It is slightly heavier than air with a R.D. of 1,18
e) Normally found in stagnant water, but escapes into the air when the water is disturbed
f) It has no colour or taste

Question 7
What are the properties/characteristics of Hydrogen?

Answer
a) It is a non-poisonous, but a highly explosive gas between 4 – 74 %.
b) It gives no warning – colourless, tasteless and odourless
c) It is much lighter than air with a R.D. of 0,07
d) Not soluble in water
e) Due to extreme lightness, it will rapidly accumulate in high places such as roof cavities.

Question 8
Name all the underground explosive gases and their explosive ranges.

Answer

a) CH_4	-	Methane	5 %	-	15 %
b) H_2	-	Hydrogen	4 %	-	74 %
c) H_2S	-	Hydrogen sulphide	4 %	-	44 %
d) CO	-	Carbon Monoxide	12 %	-	74 %

Question 9
Give the relative density of all the gases

Answer

a)	Carbon monoxide	0,97 Lighter than air
b)	Carbon dioxide	1,53 Heavier than air
c)	Nitrous fumes	1,60 Heavier than air
d)	Hydrogen sulphide	1,18 Heavier than air
e)	Methane	0,55 Lighter than air
f)	Hydrogen	0,07 Lighter than air

Question 10
What checks must be done on the Flammable gas measuring instrument (FGMI) before proceeding underground?

Answer
a) Check number on instrument – whether it is allocated to you
b) Check for cracks on casing
c) Check for any loose screws
d) Check if glass (digital display) is not cracked or broken
e) Check if battery is charged
f) Check if leather case and socket, for installing an extension rod for measuring high places, is in order
g) Test instrument at testing point to see if correctly calibrated
h) If FGMI is in order, sign for receiving it, and sign again when returning it at the end of shift

Question 11
How do you test for methane in a development end with the FGMI?

Answer
a) Depress and release the switch on the top right hand side of the instrument
b) The display (Ammeter) will register – and settle on 0.0 in seconds
c) The instrument is now “on” and will remain on for 50 – 60 seconds before automatically switching off
d) Take readings while on “on”, and if high places are to be tested, an anemometer rod or charging stick is required. Screw the rod into the steel fitting at the bottom of the leather case, or fit a charging stick, switch “on”, wait for zero to stabilise, and then extend the rod to the hanging wall and observe reading
e) If during a test, the display reads E.E. then there is more than 4,5% methane present and caution must be exercised
f) If during a test, the concentration exceeds 1,4% methane then the alarm light will flash
g) If, during a test, the battery light is illuminated, and the display goes blank, the instrument cannot be used as the battery is flat and needs re-charging

Question 12
How do you rescue a person suspected to be overcome by a harmful gas in the working place?

Answer
a) Check ventilation and install an air hose
b) Do not go in alone – form a team of 4 persons
c) Compressed air to be continuously blown on them by a team member
d) Team to hold hands or tie a rope to each member of the rescue team
e) Go in slowly and remove person to fresh air

f) Give artificial respiration on arrival in fresh air
g) When breathing, place on stretcher and send to surface
h) Notify a Banksman from underground – he/she will arrange for an ambulance
i) Inform the supervisor – giving full particulars of the incident

Question 13
How will you expel Nitrous fumes (NO_2) from the working place?

Answer

A Development Ends

a) As NO_2 is very soluble in water, the means of watering down must be brought into operation after blasting and before entering the working place
b) Water down well
c) Ventilation supply must be kept to specified mine standards

B Stopes

a) Air velocities to be maintained at specified mine standards
b) Adhere to specified re-entry intervals
c) Water down well in all directions

Question 14
May you work in a place where there is known to be CH_4? (Mine Code of Practice)

Answer
No person shall work or continue to work in any part of the workings if:
a) In the same ventilation district
b) Within a radius of 30 m from such part, there is any place known to contain an amount of more than 1 % of flammable gas in the atmosphere

Exception: Not apply to any person employed in the actual presence, and under immediate supervision of the holder of a blasting certificate, who is engaged in the erection of a brattice or other work necessary for the clearing away of flammable gas.

Question 15
What is the procedure when methane gas is found in your working place?

Answer
Development end/stope/others
If more than 1.4 % in the atmosphere:
a) Stop all work – Withdraw people to through ventilation.
b) Notify the Shift boss or Mine Overseer by a written note.
c) Barricade off all entrances to the working place, and place sign boards: “No entry, Metaan, Methane, Mbaula” and place a guard in through ventilation, warning him/her of the danger of reversal of air and recirculation of air.
d) Warn people on the return air way.
e) If in a development end – open compressed air. (COP).
f) Switch off all electrical appliances – at isolator switches after a test shows negative or at sub-station after testing for flammable gas at the switch, but not the fans ventilating the affected area.
g) Make sure ventilation arrangements are in order.
h) Stop all loco’s that are not flame proofed from tramming in the return air way.

Question 16
What are the characteristics of oxygen?

Answer
a) Colourless, tasteless, odourless
b) Slightly heavier than air (R.D. 1,10)
c) Support combustion, but does not burn itself
d) No life can exist without oxygen
e) Essential for all oxidation purposes

Question 17
What is the procedure when oxygen deficiency is detected?

Answer
Stopes, Development and others:
a) Stop all work – withdraw people to through ventilation
b) Notify Supervisors and relevant departmental heads in writing
c) Barricade off all entrances to the working place, and place sign board: “No Entry”
d) Place a guard at the entrance warning him of reversal of air.
e) Make sure ventilation arrangements are in order

5.1.3 GASES

B CHOICE QUESTIONS

Question 1
What is the danger of insufficient oxygen in the air?

Answer
a) The minimum allowable concentration of oxygen in the atmosphere is 19%
b) At 17% breathing becomes faster and deeper – headaches and dizziness follows
c) Less than 13% - unconsciousness and death due to suffocation

Question 2
How will you get rid of Hydrogen Sulphide from the working place?

Answer
a) Prevent accumulation of water that can become stagnant
b) Good ventilation

Question 3
How can you get rid of Hydrogen gas underground?

Answer
It cannot be prevented, formed by charging of batteries:
a) Situate charging bays in area with good ventilation.
b) Smooth hanging wall will prevent accumulation in battery charging bay.
c) Return air of battery charging bay to be directed into the main return airway.

Question 4
How does the hand held gas sampler operate?

Answer
The hand held sampler operates on the principle that the air to be tested is drawn through a glass test tube which is filled with chemicals that will change colour when in contact with the specific gas for which the gas testing chemical tube is designed. The degree of discolouration read on the glass tube will indicate the percentage of gas present in the air. A test tube is available for each gas which may be encountered.

Question 5
How will you get rid of Carbon monoxide in a working place?

Answer
As carbon monoxide is slightly soluble in water:
a) Open the water blast if installed in a development end.
b) Water down the area.
c) Increase the amount of ventilation to remove the gas.

Question 6
Where is deficiency of oxygen likely to occur underground?

Answer
a) In places affected by underground fires
b) In places affected by explosion of explosives or a gas
c) In raises and box holes where methane gas is emitted
d) In old abandoned workings, where the oxygen has been consumed by the oxidation of minerals and timber

Question 7
When will you report a gassing case?

Answer **[MHSA Regulation 4.18]**
Every person must report, in a manner prescribed by the employer, without delay any case of gassing, however slight, to ensure that such cases receives prompt medical attention.

Question 8
What notices must be posted up at all change houses, accident emergency stations, first aid rooms, refuge chambers?

Answer **[MA Regulations 3.5 and 24.6]**
Approved procedures for the immediate treatment of:
a) Cases of gassing;
b) Heat stroke and heat exhaustion;
c) Drowning; and
d) Electric shock.

Question 9
What must be done if you become aware of any dangerous or unhealthy condition underground over which you have no control?

Answer **[MA Regulations 4.4.3 and 4.4.4]**
Report it verbally to a Shiftboss or other official as soon as possible and enter it in the complaint book, which is kept in the change house for this purpose

Question 10
What is considered a dangerous atmosphere?

Answer
a) An atmosphere in which gases are present in poisonous or explosive concentrations
b) An atmosphere with oxygen content below 17%

c) Dusty atmosphere

Question 11
What are the two (2) types of dangerous gases found underground?

Answer
a) Poisonous gases
b) Explosive gases

Question 12
Name all the poisonous gases

Answer
a) CO - Carbon monoxide
b) NO^2 - Nitrous fumes
c) H^2S - Hydrogen sulphide
d) HCN - Hydrocyanic acid gas

Question 13
Name the gases that are poisonous and explosive

Answer
a) H^2S - Hydrogen sulphide
b) CO - Carbon monoxide

Question 14
What is meant by the characteristics or properties of a gas?

Answer
a) Poisonous or not
b) Flammable / explosive or not – range
c) Can you see, taste, smell the gas – warning or not?
d) Relative density
e) Soluble in water
f) General

Question 15
How is Carbon Monoxide produced underground?

Answer
a) Underground fires (Product of incomplete combustion)
b) Blasting
c) Exhaust fumes, diesel loco's and diesel powered trackless mobile machinery
d) Blasting operations and explosions

Question 16
What effect does Carbon Monoxide have on humans?

Answer
a) Extremely poisonous, disables without any symptoms;
b) It is absorbed by the red corpuscles of the blood 300 times faster than oxygen;
c) It therefore displaces the oxygen in the blood, causing sudden collapse and ultimately death; and
d) The action of CO on the system of the body is accumulative.

Question 17
How does one test for Carbon Monoxide?

Answer
Gas Detection Instrument (GDI)

Question 18
Where would you expect to find Carbon Monoxide in the mine?

Answer
It can be found anywhere as it is very often accompanied by Carbon Dioxide, giving a resultant density of normal air, but in pure concentrations it will be found in high places, such as against the hanging wall or in raises and box holes

Question 19
How must a person be treated after exposure to Carbon Monoxide?

Answer
a) Taken to fresh air, breathing restored by means of artificial respiration, if necessary; and
b) Notify the Banksman to arrange for an ambulance and transport the patient to hospital as soon as possible.

Question 20
Will you permit work to continue in a small percentage of Carbon Monoxide?

Answer
No, because Carbon Monoxide has an accumulative effect, and will build up to dangerous amounts in the bloodstream

Question 21
What is the dangerous aspect of Carbon Monoxide?

Answer
a) It disables you without any warning or symptoms
b) It has an accumulative effect
c) It is taken up in the bloodstream 300 times faster than oxygen and spread through the body rapidly
d) It is extremely poisonous.

Question 22
Is Carbon Dioxide poisonous?

Answer
No, after normal breathing has been restored in fresh air, there will be no after effects. It can only kill in high percentages due to asphyxia

Question 23
What are the effects of Nitrous fumes on humans?

Answer
a) It irritates the eyes, nose and throat
b) It causes headache and pain in the chest, but these symptoms may pass off altogether and the affected person may feel well again
c) The fumes cause blisters on the lungs, which may not manifest itself until 8 - 10 hours after inhalation. This is known as “delayed action”
d) These blisters cause inflammation of the lungs, which results in shortness of breath and coughing of blood-stained saliva
e) if the patient is not treated, these blisters may burst and cause death through drowning

Question 24
How are Nitrous fumes produced underground?

Answer

a) During blasting operations
b) Burning of explosives
c) Exhaust fumes from diesel loco's and diesel powered trackless mobile machinery
d) Arc welding

Question 25
What is the treatment for Nitrous fumes poisoning?

Answer
The person must be sent to hospital for 24 hour observation.

Question 26
How do you test for Nitrous fumes underground?

Answer
Gas Detection Instrument

Question 27
Why are Nitrous fumes a dangerous gas?

Answer
The fumes have a delayed action, before the symptoms manifest themselves by forming water blisters on the lungs if the patient is not treated, these blisters may burst and cause death through drowning

Question 28
How is Methane formed and introduced underground?

Answer

a) Formed by decaying vegetable matter (rotten material) in the absence of oxygen;
b) Liberated from coal and shale seams; and
c) Found at intersections of water fissures, faults and dykes

Question 29
What are the effects of Methane on the human body?

Answer

a) Suffocation above 15% (it displaces the oxygen); and
b) Can cause injury or death by burning or exploding

Question 30
How do you test for Methane?

Answer

a) Use the flammable gas measuring instrument; and
b) Flammable gas warning device (warning only above 1 %).

Question 31
May you blast any place where there is known to be methane gas?

Answer **[Code of Practice]**
No person may fire any explosive charge in any place where there is more than 1 % methane gas

Question 32
When may work resume in a place where more than 1, 4 % methane gas was found?

Answer **[Code of Practice]**
Only after the place has been examined by the Manager, Mine Overseer or Shiftboss, and it has been found that there is less than 1 % of flammable gas, and has been certified by the Manager, Mine Overseer or Shiftboss to be safe

Question 33
May you blast if methane gas was found in your working place within preceding 24 hours?

Answer **[Code of Practice]**
The Miner must not fire any charge in any place in his section in which flammable gas has been found during the preceding 24 hours, unless he has examined with a flammable gas measuring instrument, not only the place where the charge is to be fired, but also all accessible working places within a radius of 30m from such charge and has found no flammable gas in a quantity in excess of 1 %.

Question 34
Must all development ends be tested for gas?

Answer **[Code of Practice]**
Every development end must be tested for flammable gas at the beginning of each shift. For this purpose a flammable gas detection instrument must be used by a competent person who has been trained and found competent in its use

Question 35
Where and how do you test for methane in a development end? When using a force system.

Answer

a) At the waiting place:

i. Re-check Flammable Gas Measuring Instrument
ii. Ensure that no contraband is taken beyond the waiting place
iii. Leave all workers except those directly involved to assist with entry examination
iv. Check the ventilation system and if the fans are running in the right direction

b) At entrance of working place:

i. Test intake air
ii. Test return air from the end, ± 15m downstream
iii. Test return air directly from end, ± 6m from entrance of end or from through ventilation
iv. Test at all switches and at any other electrical appliances, e.g. winches, etc.
v. Test all high places, F.O.G.'s, faults, dykes and fissures
vi. Test at pilot holes of previous round
vii. Test at face starting from the bottom and working your way up to the hanging wall
viii. If no gas is found, send for workers and commence early examination

Note:

a) If gas is found at fan switch or any other electrical appliance, do NOT switch off there, but at isolator switch or in sub-station after testing for Methane.
b) When testing at a force-exhaust system, do the following additional tests:
   i. Test return air at outlet of exhaust column
   ii. Test in overlap area
   iii. 2m in front of intake of exhaust column

Question 36
Where and how do you test for methane in a development end? When using a force exhaust system

Answer

a) Test intake air
b) Check if fans are running in the right direction
c) Test the return air at outlet of exhaust column

d) Test 5 – 7m in away from through ventilation
e) Test at the overlap area
f) Test at all high places, FOG's, faults, dykes, fissures and old pilot holes of previous round
g) Test 2m in front of the intake of the exhaust column
h) Test at the face of the development end from bottom to top

Question 37
When must a full examination for methane be done in development ends?

Answer
a) At the beginning of every shift
b) When the working place has stood for more than 6 hours
c) On re-entry after a blast
d) On re-entry after a ventilation failure
e) On taking over from another Ganger

Question 38
When must additional test be done during the shift in development ends?

Answer
a) After the pilot holes have been drilled
b) After the round has been completed
c) Before charging up
d) Before blasting
   i. at the face
   ii. at the blasting point
e) When water or gas is intersected
f) After a fall of ground (FOG)
g) If methane is suspected for any reason, whatsoever
h) Before doing any work with cutting torches, welders, etc.
i) Before and during diamond drilling operations
j) When drilling through into abandoned workings

Question 39
Show all the methane testing points in a stope?

Answer
a) Check the flammable gas detection instrument
b) Test the intake air
c) Test at all winches and electrical equipment
d) Test behind ventilation brattices and curtains
e) Test at all FOG's
f) Test in all headings (ASG's)
g) Test at all top limits of faces
h) Test in swept areas
i) Test all high places, faults, dykes and fissures
j) Test the return air

Question 40
When must full examination for methane be done in a stope?

Answer
a) At the beginning of every shift
b) When the working place has stood for more than 6 hours
c) On re-entry after a blast
d) On re-entry after ventilation failure or power failure

e) When taking over from another Miner or Ganger

Question 41
When must additional test during the shift be done in a stope?

Answer
a) When water or gas is intersected
b) In the return air from such faces before charging up
c) In the intake air to such stope faces before blasting and at blasting point
d) After a FOG
e) If methane is suspected for any reason whatsoever

Question 42
What is the danger in an area where methane has exploded?

Answer
There will be a large concentration of Carbon Dioxide and Carbon Monoxide and oxygen deficiency after the explosion

Question 43
What can cause a methane explosion underground?

Answer
a) Matches, lighters, cigarettes (contraband)
b) Blasting operations and explosions
c) Faulty electrical appliances and non-flame proof electric gear
d) Underground welding and cutting torches
e) Underground fires
f) Sparks from pinch bar when barring, scrapers and loaders when cleaning

Question 44
How do you get rid of methane from a working place?

Answer
Methane is a natural gas – it cannot be prevented.
Displace and dilute it by means of sufficient ventilation (remember it is not soluble in water)

Question 45
What is required for a methane explosion?

Answer
a) An explosive gas must be present
b) The gas must reach explosive range
c) There must be sufficient oxygen
d) There must be a spark

Question 46
How is Hydrogen Sulphide produced underground?

Answer
It is formed by the reaction of acid water on sulphides. It is usually found in stagnant water, but can be liberated when water is disturbed. It can also exude from fissures, faults and dykes

Question 47
What effect does Hydrogen Sulphide have on humans?

Answer

a) Extremely poisonous.
b) Causes irritation to eyes and air passages. In high concentration it impairs the sense of smell.
c) It seriously damages the lungs.
d) 0,1% will produce quick unconsciousness, and 0,2% can be fatal in a few minutes

Question 48

How do you test for Hydrogen Sulphide underground?

Answer

Gas Detection Instrument

Question 49

How is Hydrogen produced underground?

Answer

a) It can occur in underground battery charging bays. The gas can be liberated when accumulators are overcharged
b) It is associated with methane in fissures

Question 50

What effect does Hydrogen have on a human?

Answer

It has no effect on a human. It can explode between 4 – 74%. Displaces oxygen in high concentrations and will cause suffocation.

Question 51

How does one test for Hydrogen underground?

Answer

Gas Detection Instrument

Question 52

Where would you expect to find Hydrogen in a mine, on a daily basis?

Answer

At all battery charging bays

Question 53

What is the most dangerous aspect of Hydrogen?

Answer

It is highly explosive between 4 – 74%

5.2 MINING PRACTICES

5.2.1 ROCK MECHANICS

A COMPULSORY QUESTIONS

Question 1
Explain the meaning of the following mining terms:

A Rock Mechanics
Rock Mechanics can be regarded as the study of the properties and behaviour of rock in response to the stresses and changes in stress resulting from mining operations.

B Strata Control
Strata Control is the control of the immediate rock, surrounding an excavation. That is the rock we can see to identify hazardous geological discontinuities and touch to support.

C Deformation
If a body is prevented from moving the applied force will cause deformation or change the shape of the body (elastic movement).

D Displacement
Displacement is the distance a body will move if a sufficient force is applied. It is normally permanent movement (inelastic movement).

E Rock Fracture
Rock fracture is the formation of planes of separation in the rock. It can have weakening effects on bedding planes

F Seismicity
Seismicity is the occurrence of sudden ground movements, which are sometimes accompanied by damage to underground workings. A seismic event, which causes damage to the underground workings, is known as a rock burst.

G Face Burst
A face burst is a violent ejection of the rocks on the face caused by or accompanied by a shock or seismic event.

Question 2
List and demonstrate an understanding of the various types of geological conditions

Answer

i. Faults

Any break in the rock mass along which movements has taken place is defined as a fault. The more common faults encountered underground are:

- A normal fault which will result in a loss of ground
- Reverse fault which will result in a gain of ground

ii. Dykes and Sills

Dykes are formed when molten volcanic rock forces its way across existing layers of rock causing them to break apart. The molten rock then cools and gets hard resulting in separate surfaces which are not bonded together strongly.

Sills are also formed by molten volcanic rock. The difference is that these intrusions takes place between layers of bedding planes and thus lie parallel on top of the layer. There is very little bonding between the sill and surrounding rock.

iii. Jointing

Joints are normally formed when the rock cools causing fracture planes, which can vary in size.

iv. Key blocks

Key blocks are formed when two or more types of geological discontinuities or fractures dip towards each other creating blocky ground.

v. Bedding planes

Bedding planes are the contact planes between different layers of rock. The strength of bond between these layers varies but generally they are weak and start to separate when the weight of the rock exceeds the strength of the bond.

vi. Rolls

Rolls are the result of deposits taking place on the surface that rolls or may have been caused by volcanic intrusion causing the layers of rock to bend before or after the deposition took place.

H Pre-Conditioning

Question 1

Define pre-conditioning

Answer

Pre-conditioning is the de-stressing blast ahead of your production holes in a stope face.

Question 2

Why do we pre-condition a stope face?

Answer

a) To control face bursting
b) To blast of pre-condition holes in order to fracture the rock ahead the face
c) To control the release of high strain energy in the rock mass
d) To transfer stresses away from the stope face
e) To remobilize the existing fractures
f) To create a fractured zone ahead of the mining face

Question 3

Describe the principles of pre-conditioning.

Answer

a) A single row of longer holes, drilled in conjunction with the usual rows of production holes
b) Pre-conditioning holes timed to detonate prior to the blast holes with a lead of 3 meters

c) Must pre-condition the face with every blast
d) It does more harm to pre-condition incorrectly than not to precondition at all

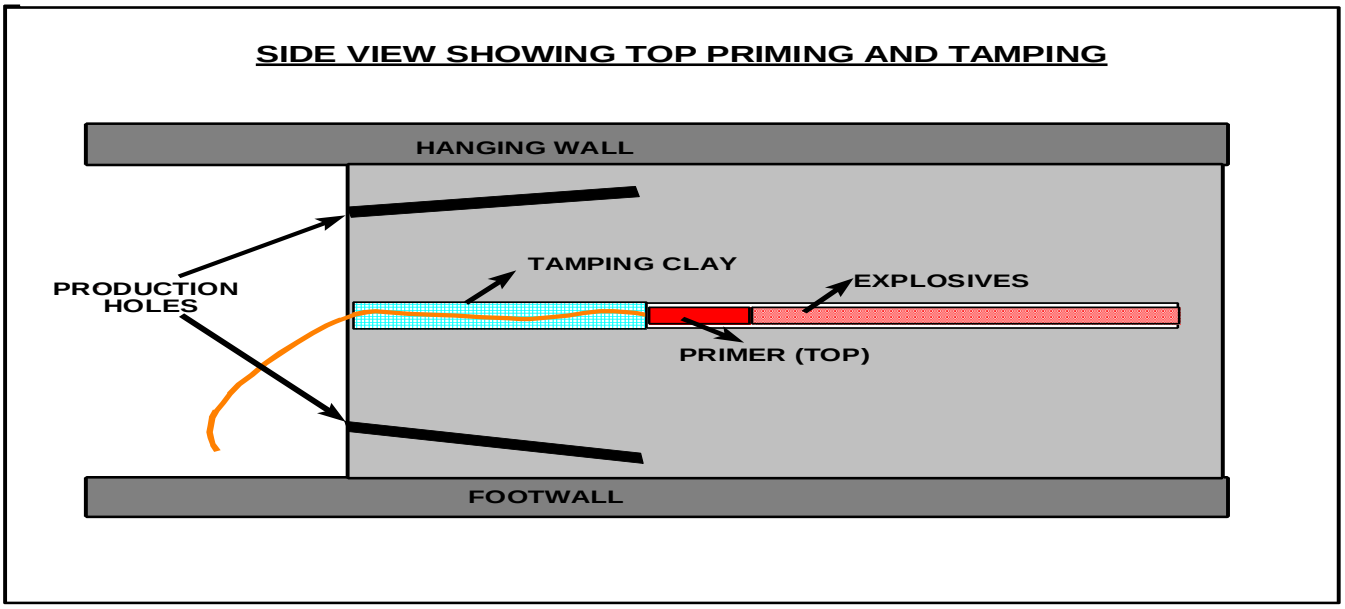
Question 4
List the advantages of pre-conditioning

Answer
a) Improve the hanging wall and face conditions.
b) Better control of the stope width.
c) Increase the advance per blast.
d) Increase the drilling rate.
e) Reduce the fragment size of blasted rock.
f) Fractured ground ahead of face absorbs the impact of seismic event.

Question 5
What are the consequences of not pre-conditioning?

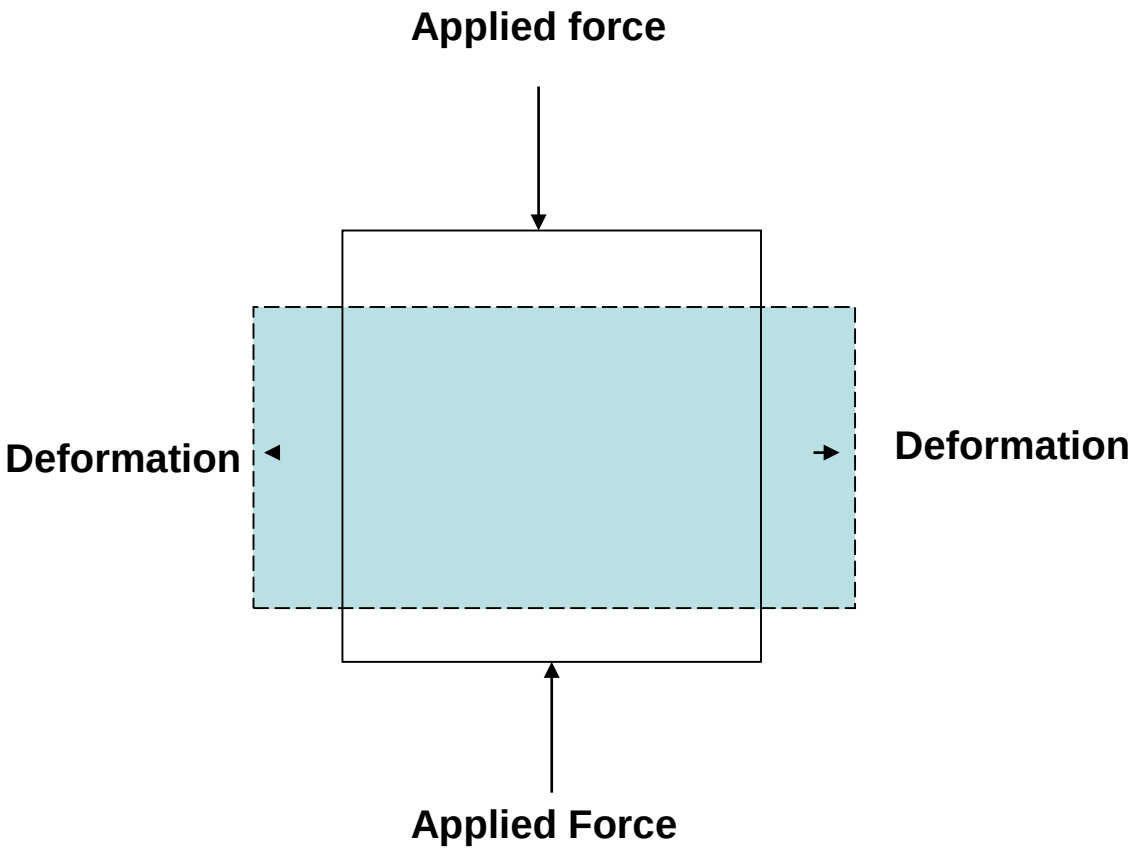
Answer
a) Potential of a face burst increases
b) Should a face burst occur the persons in the vicinity will sustain injuries or even fatalities
c) Hangingwall / face conditions damaged resulting in lost blasts

Question 6
Illustrate by means of a sketch how do you charge up a pre-conditioning hole?

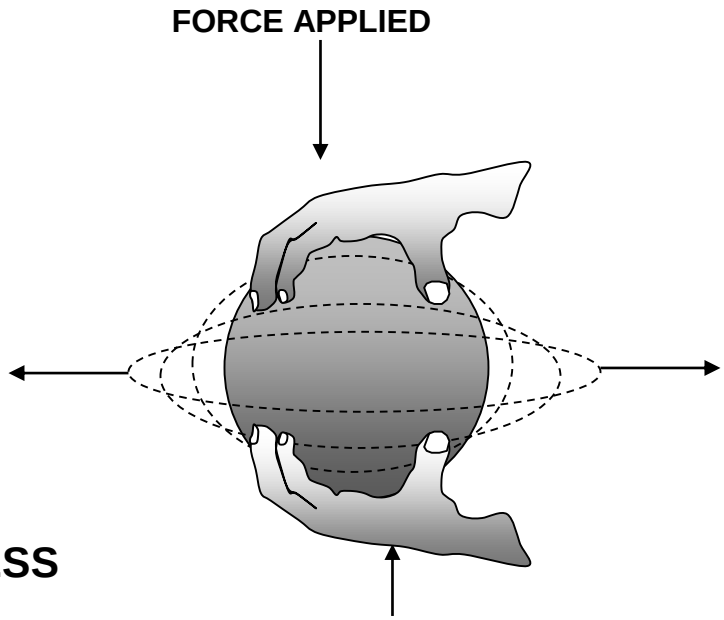


Question 7
Illustrate, by means of a simple sketch, the following:

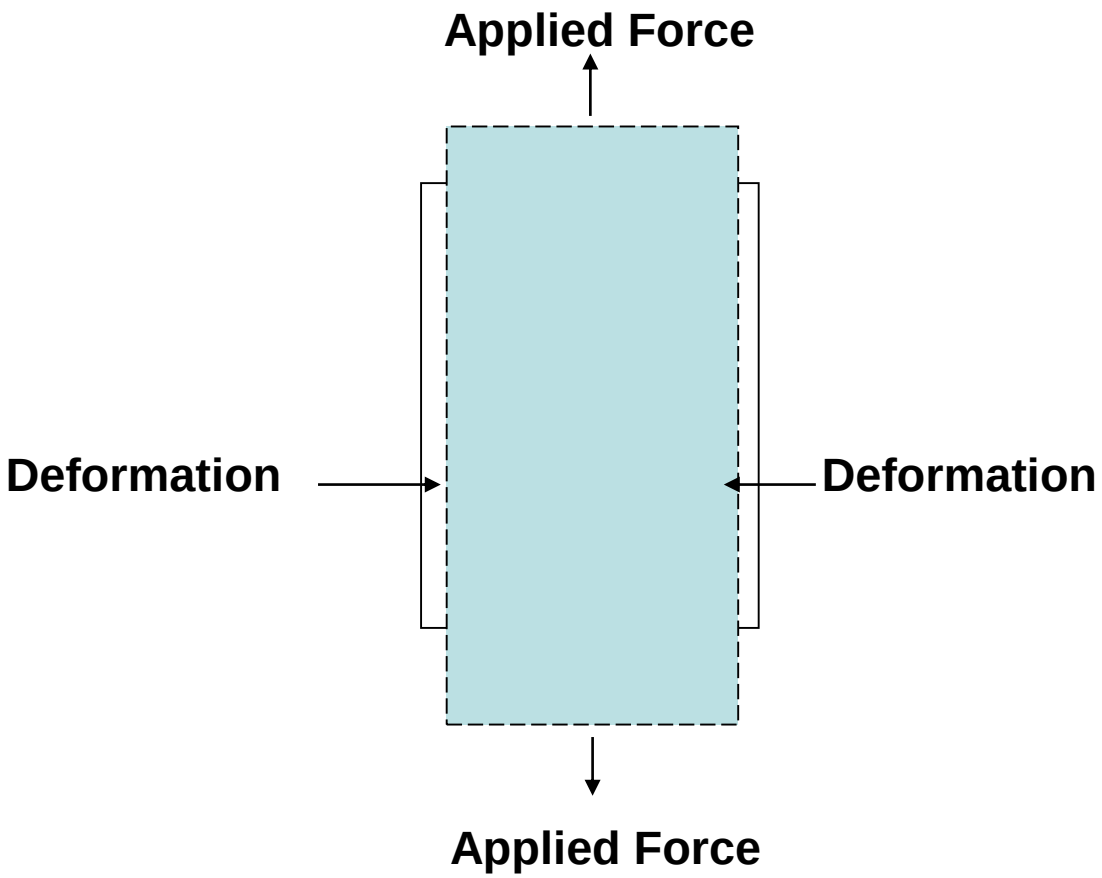
Compressive Stress



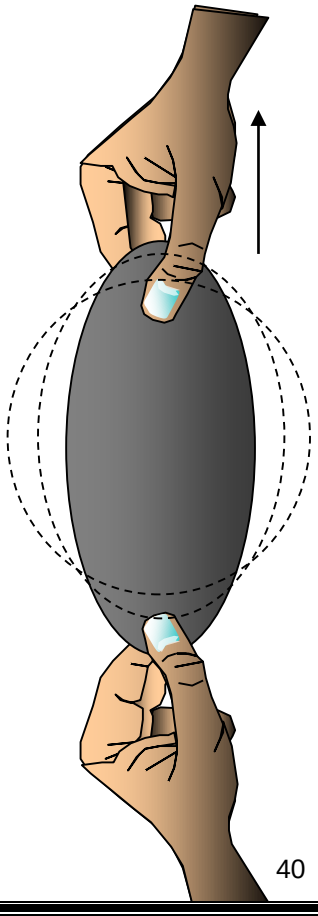
Example:

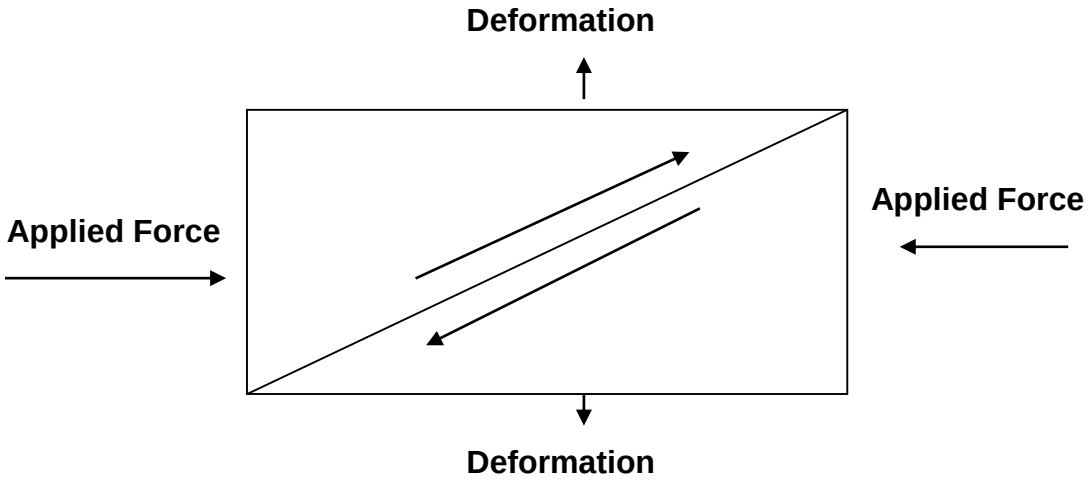


TENSILE STRESS



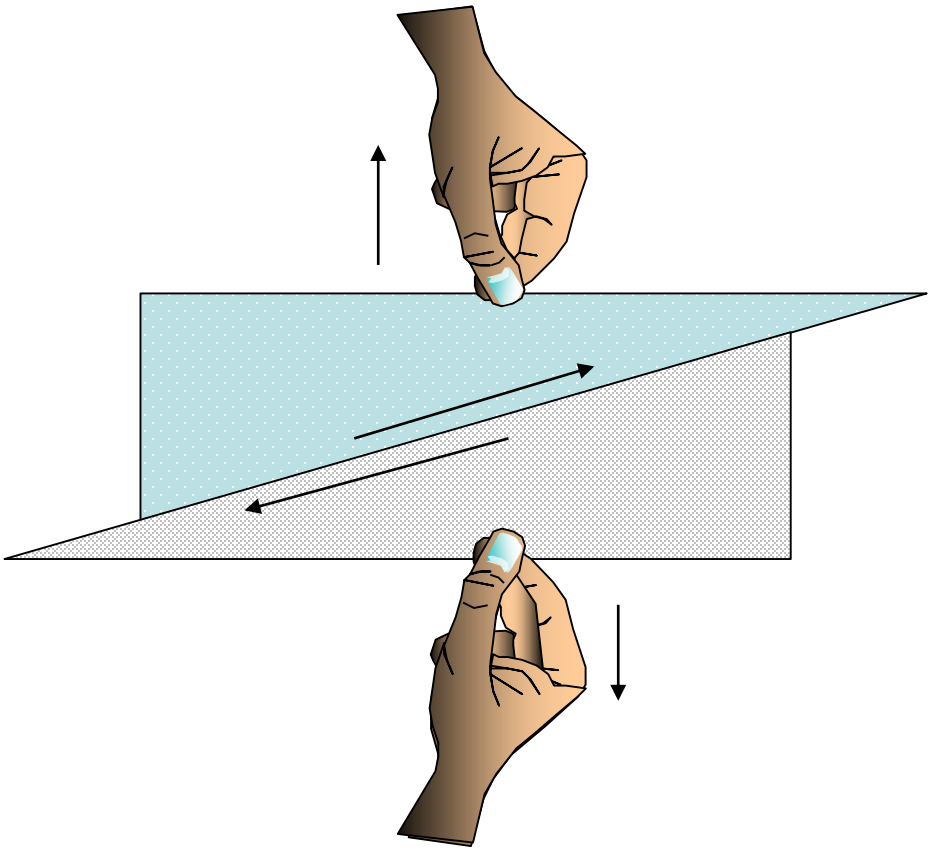
Example:





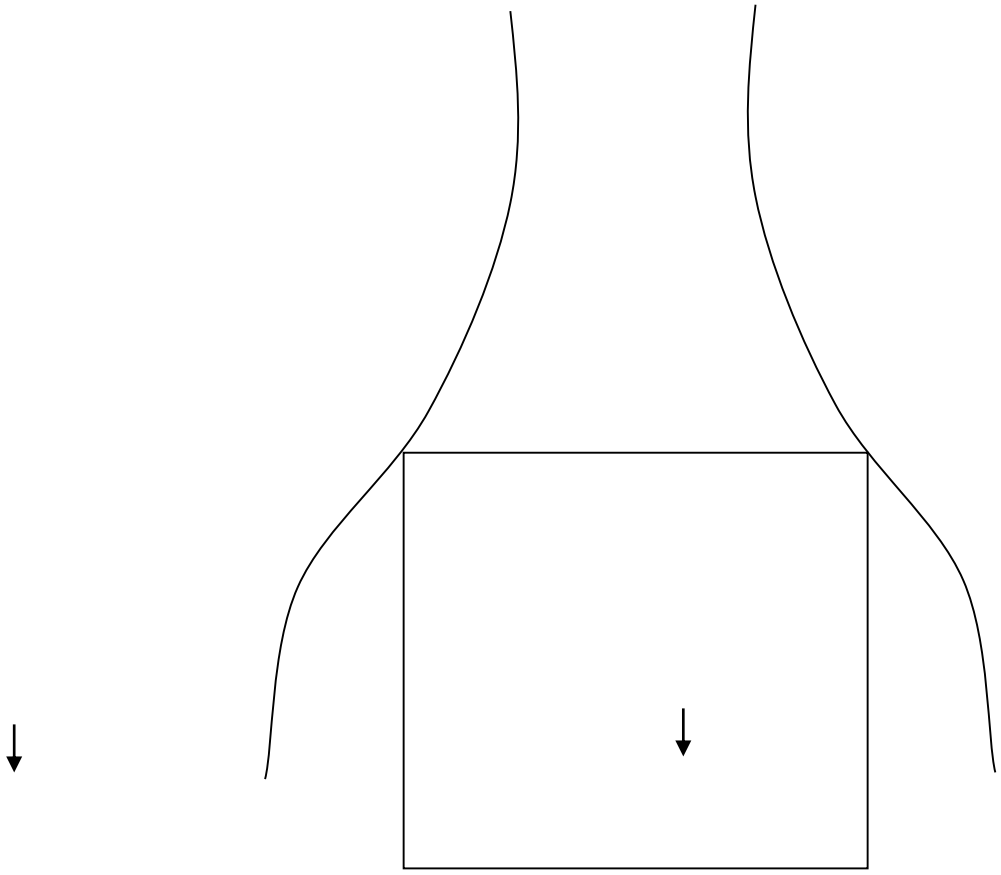
Shear Stress

Example:



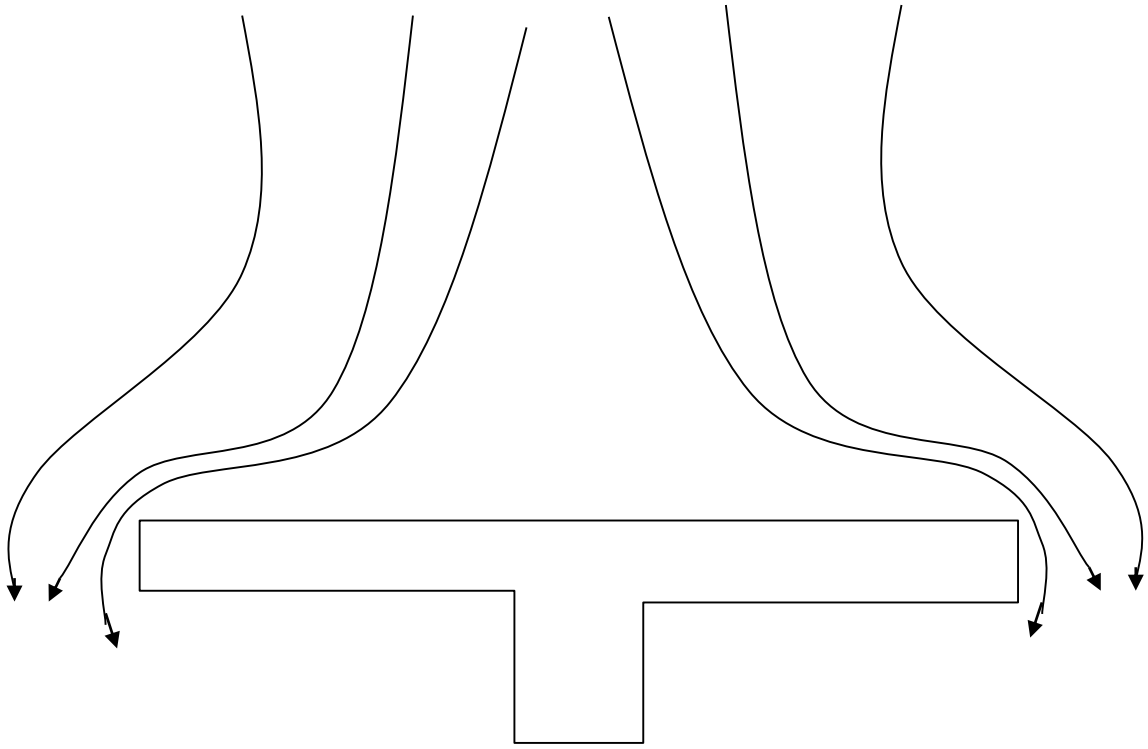
Question 8

By means of two progressing sketches, explain the stress distribution around a stope (cross-section)



Development Raise

Stress Diverted Around the Excavation



Stress Around A Ledging Stope

The larger the span becomes – the more the stress will be concentrated ahead of the face

5.2.2 BREAKING OF GROUND

A COMPULSORY QUESTIONS

A Support

Question 1
Explain why underground working places are required to be supported?

Answer
a) To comply with regulations
b) To comply with the Code Of Practice
c) To ensure that safe and healthy working conditions exist where persons work and travel
d) To *minimise, eliminate and control* falls of ground
e) To control convergence and closure of workings

Question 2
When is it necessary to support underground workings?

Answer **[MA Regulation 7.4.1 to 7.4.4]**
a) When instructed by the Principal Inspector of Mines.
b) When required by the Mines Code of Practice

Question 3
When must additional support be installed or other precautions be taken to safeguard persons from dangerous hanging-wall?

Answer **[Code of Practice]**
a) *During initial examination* of the working place, the Miner shall take reasonable precautions to ensure that any person assisting him is safeguarded against falls of ground.[MHSA 14.1 (1)]
b) If at any time a working place or part thereof becomes unsafe *during the shift*, the Miner must make it safe, or barricade it off, or place guards, until it is safe.
c) Before cutting hitches, setting props, building pigsties or packs or *erecting other support* under dangerous hanging or allowing dangerous ground to be drilled into with the object of rock bolting it or blasting it down, the Miner or Ganger in charge must be setting props or otherwise adequately safeguard any person engaged in such operation (before any drilling).
d) *When removing props or other support***:**
e) No support must be withdrawn except on the instructions of the Ganger or Miner and only after additional support has been installed or taken precautions as may be necessary.
f) *Friable hanging***:**
g) Where the roof or hanging is friable, props support must be provided with headboards.
h) *Whenever instructed* by the Shift boss, Mine Overseer or Manager, additional support must be installed.
i) *At all faults, dykes, fissures, slips and brows*, additional support must be installed on either side, especially the weak side.
j) *If attempts to take down dangerous ground is unsuccessful:* The Miner in charge must not allow any person to work or remain in an area where he/she may be endangered by the ground, which any person has attempted to take down, until such ground has been made safe.

Question 4
When attempts to bar down dangerous ground has failed, what must the Miner do before any person is allowed to work or travel under it?

Answer
a) It must first be made safe by installation of additional support before any person is allowed to enter such area; or
b) Barricade the area off to prevent persons from inadvertently entering such area.

Question 5
What precautions must be taken when barring down dangerous hanging?

Answer
a) The pinch bar must have the correct length and both ends must be sharp
b) Ensure that a gasket is fitted to the pinch bar
c) Clear all people on down dip side
d) Take precautions against rock falls and rolling rocks by standing on the up-dip side of the dangerous hanging to be barred down
e) Test the hanging wall of the surrounding area and support the surrounding area if necessary
f) Bar only from a safe side to unsafe side (if possible from between support.)
g) Have a firm standing position with both feet
h) Check for an escape way in all directions
i) Guard against injury to the person who is barring, the assistants and the bystanders
j) Bar with pinch bar positioned on the side and not in the front of any part of the body.

B Remnants

Question 1
Give the definition of a remnant?

Answer
A *remnant* is any intact area of ground which, owing to its size, situation or due to geological disturbances is considered likely to produce rock bursts. When a stope is declared a remnant, special precautions are taken and special methods of working are adopted in order to minimise the danger of rock burst.

Examples:
a) Support or fire pillars left behind during previous mining
b) Approaching a large fault or dyke leaving an un-mined block of ground
c) Holing two working places
d) When faces are mined on different reefs (different elevations) remnant conditions prevail at the point or points where one face crosses over another

Question 2
Name the general remnant precautions?

Answer
a) Maintain *the safety of ingress and egress above and below* the remnant by installing additional support in the travelling ways (Use active or stiff support).
b) Ensure that there is *a minimum span across gullies*.

c) *The stoping width* must be kept to a minimum.
d) A footwall gully on strike must be developed halfway up the panel (*if the panel is in excess of 20m in length) to act as an escape way* (Up-dip panels must have two dip gullies.
e) An *escape* way must be a minimum of 1,5m deep and not further than 5m from the advancing face.
f) Strike and dip gullies must be developed at *a minimum of 1,8m deep*.
g) The *face shape* must be kept straight.
h) Cleaning must only be conducted by *using scraper winch*.
i) The *escape ways to be always kept clear* of obstructions and clearly demarcated.
j) *Support system to be posted up on the 1:200 scale plan* on the waiting place notice board.
k) If a blasting barricade is installed, the *escape way must be left opened*.
l) A *minimum work force must be used*.
m) *The Miner or Ganger must keep a record* (or gang book) in writing of all personnel within the remnant area throughout the shift (Visitors book to be signed and checked)
n) A *Remnant Officer* must be appointed for each remnant area – certificated mine surveyor.
o) *Written instructions* concerning remnant precautions must be posted up at the waiting place notice board.
p) *Night shift work* must not be permitted.
q) *Telephone* to be installed close~~r~~ to the working place.

C Drilling

Question 1
Who may mark shot holes for drilling?

Answer **[MHSA Regulation 4.4 (1)]**
No person may mark shot holes or point out shot holes to be drilled, except a competent person.

Question 2
What are the requirements before shot holes are marked for drilling after the initial examination and making safe has been conducted on a stope face?

Answer
a) Remove loosened rock for *at least 2 metres*.
b) Thoroughly wash over with water under a pressure of not less than 150 kilopascals all surfaces to a distance of *at least 2m in all directions for the purpose of exposing any misfired hole or socket*.
c) Where the ground to be examined is under water, *blow it over with compressed air for the purpose of exposing any misfired hole or socket*.
d) Search for any misfired hole or socket within a distance of *at least 2 metres*.
e) Examine every socket to ascertain its direction and depth and whether it contains any explosives by means of water under adequate pressure applied through a pipe of design and material determined by the Risk Assessment conducted in consultation with the explosives manufacturer or supplier, or if water under adequate pressure is not available, *by means of a scraper of design* and material determined by the Risk Assessment conducted in consultation with the explosives manufacturer or supplier.
f) On the discovery of any misfires that he does not immediately deal with, *clearly mark, where practical, a ring around it with a red crayon or paint*. Write MF above the misfire.
g) *Plug every socket* and every such misfired hole with a plug supplied for that purpose by the Manager.

Question 3
How far away from sockets or misfires may holes be marked or drilled in stopes?

Answer

a) No person may drill a hole that is marked closer than 150mm from any socket and is drilled in such direction that it will nowhere come nearer than 150mm to any socket
b) The hole to be marked two metres away from any misfire and is drilled in such direction that it will nowhere come nearer than two metres from any misfire
c) No holes drilled may deviate from the direction given by the Ganger/Miner

Question 4

May drilling of holes for eyebolts to anchor or secure eyebolts at the face or sheave wheel or other attachments be done in a development end where a misfire exists?

Answer

The Ganger or Miner shall satisfy himself that no misfired hole exists within a distance of 2 metres in all directions from the proposed position of the hole to be drilled.

Question 5

May drilling of holes be done when there is a misfire in a development end face?

Answer

No person must drill or cause to be drilled any hole in any shaft, drive cross cut or other development end face or other confined space underground where there is known to be a misfired hole.

Question 6

When may a drill hole be deepened?

Answer

No person must deepen or cause to be deepened any drill hole that has been left standing, unless it is a hole that is not finished at the end of a previous shift, has not been charged with explosives and has been clearly described by the Ganger or Miner in charge of the shift leaving off work, to the Miner in charge of the shift about to commence work

Question 7

When may socket plugs be removed?

Answer

No person other than the holder of a blasting certificate, or a competent person appointed by the Manager, Mine Overseer or Shiftboss, must remove a plug from a socket or misfire. Provided that when the Miner charges up, he may instruct a member of his gang to do so. When inspection of sockets is done the plug to be removed but must be replaced into the sockets until charging up commences.

D Cleaning

Question 1

What procedure must be followed prior to holing of a box hole into a raise?

Answer

a) Test for flammable gases.
b) Make area safe and water down.

c) According to the survey holing note examine the holing point in the raise for misfires and sockets and mark the holing position on the hanging wall in the raise.
d) Protect the ventilation pipes, compressed air and water columns against the effects of the blast.
e) Install an effective barricade at the entrance of the raise until the holing has been effected.

Question 2
When a box hole has holed into a raise, what must be done before work may resume in the raise?

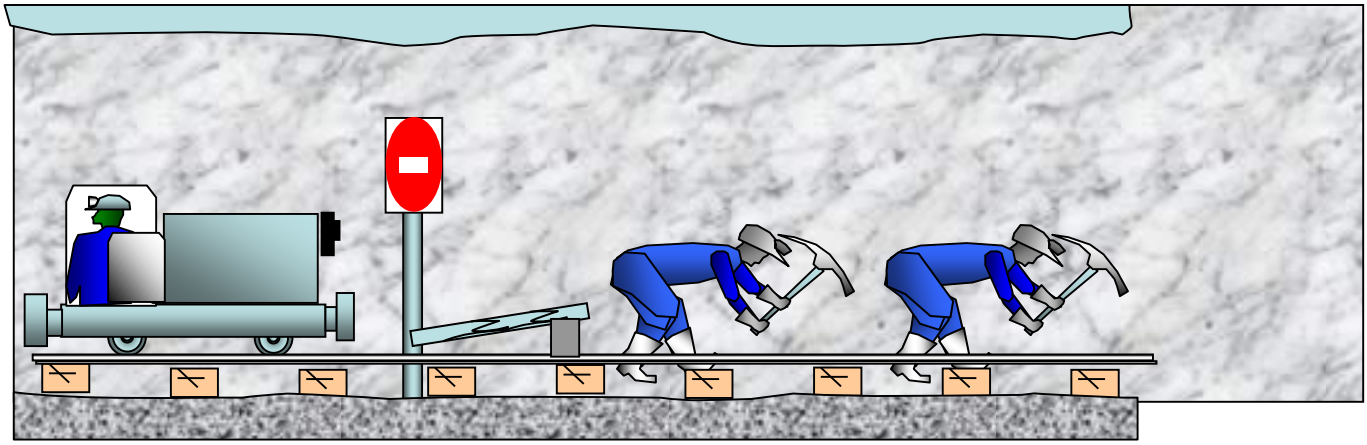
Answer
a) Test for flammable gases.
b) Make the area safe and water down.
c) Examine for misfires and sockets.
d) Establish a temporary travelling way around ore-pass.
e) A robust constructed platform must be built over and around the holing to prevent persons and loose rocks falling therein.
f) A box front must be installed before the platform is removed.
g) Install a well-constructed grizzly.

Question 3
Name the safety requirements at a stope tip

Answer
a) Must be effectively barricaded off.
b) Establish a travelling way around the tip.
c) Notice sign – no unauthorised entry must be posted on the tip barricade.
d) A properly constructed grizzly must have been installed.
e) Correct tools for clearing the grizzly must be available at a safe area at the stope tip.
f) Lighting must be installed.
g) Proper water drainage system must be installed to prevent water entering the stope tip.
h) The hanging wall must be well supported.
i) Safety belt must be available at the safe area at the stope tip.
j) Certificated and appointed scraper winch driver, or a trained and experienced person to work on the tip.
k) Never blast big rocks that are located or situated on top of the grizzly.
l) Do not over-fill the tip.
m) Repair any damage to the grizzly immediately.
n) Signalling device must be within reach from the tip.

Question 4
What safety precautions must be adhered to when persons are working on or close to a haulage way?

Answer **[Code of Practice]**
a) Effective warning signs must be placed at safe distances on either side of such persons to warn the locomotive driver or trackless mobile machine driver of their presence.
b) When persons are working on railway lines, stop signs must be placed at a safe distance on either side, and the driver of the locomotive must not proceed beyond such stop sign, unless permitted to do so by the person in charge of the work
c) Persons working on railway lines, must wear reflective clothing.



E Emergency Procedures

Question 1
What are the responsibilities of the Miner when an accident causes the immediate death of a person or an injury to such an extent that a person is likely to die, in his/her working place?

Answer **[MHSA Section 11(8)]**
After the removal of the body the Miner to barricade off the working place. No person may without a consent of the Principal Inspector of Mines disturb the site at which the incident occurred or remove any article or substance involved in the incident or install any article or substance: Provided that an article or substance may only be removed/installed if it is necessary to:

a) Prevent any further incident.
b) Remove the injured or dead.
c) Rescue any person from danger.

Question 2
What is the procedure for rescue and transport of an injured person after a serious accident on the working face?

Answer

a) Rescue operation to start immediately.
b) Send for first aid equipment.
c) Send a written note to the Shiftboss and notify the Banksman.
d) Move the injured to a safe place if necessary.
e) Apply first aid and secure patient on a stretcher.
f) Send a reliable person to accompany the stretcher out of the working place in order to supply information in connection with identification of the patient.
g) Barricade off the scene of accident until investigation by the Shiftboss, Mine Overseer, Safety Officer or Manager, who will then instruct the Miner to continue work at the affected working place, or arrange further investigation.
h) An accident report must be made out by the Miner and particulars of witnesses to be included in the accident report.
i) When a person is trapped under the rock, and cannot be removed, the mine rescue team must be notified.
j) If the accident resulted in a death of a person, the Principal Inspector of Mines will arrange for the investigation.

Question 3
Where must workers take refuge when there is a fire underground?

Answer
At the nearest Refuge Bay and the escape route and the position of the Refuge Bay must be clearly demarcated with symbolic signs or other means of identification.

Question 4
When a fire occurs and cannot be controlled, how must the Miner evacuate the workers from a working place?

Answer
a) Workers must be trained in the emergency procedures.
b) Fire drills must be arranged at intervals as specified by the Manager.
c) Persons effected by the fire or smoke, must be removed from the working place, to the nearest Refuge Bay via the demarcated escape route.

Question 5
What are the requirements when constructing a Refuge Bay?

Answer
a) The Refuge Bay must be robustly constructed (i.e. constructed of concrete brick walls) and where there is a significant risk of explosions it must be able to withstand the effects of such an explosion.
b) The Refuge Bay must be airtight and sealed in such a manner so as to ensure a positive pressure that will make the Refuge Bay inaccessible to air containing noxious smoke, fumes or gases.
c) The entrance door must open to the inside of the Refuge Bay.
d) The size of Refuge Bay should be determined by the maximum number of persons likely to be present in the area served by the Refuge Bay, with a minimum floor area of 0.6 square metres per person.
e) Life sustaining material installed in the Refuge Bay should be of fire resistant material or else be fire protected.
f) Access arrangements into the refuge bay should be such that it does not negatively affect the integrity or size of the Refuge Bay.
g) Refuge bay must be provided with seating arrangements.
h) An identification system of refuge bays must be implemented and must be clearly indicated on the inside and on the outside of the Refuge Bay. This corresponding identification must be indicated on the Mine Rescue Plan contemplated in regulation 17(19) of MHSA.
i) Where the life sustainability of the Refuge Bay is dependent on compressed air, the supply to the inside of the Refuge Bay must be tamper-free, with a control valve on the inside of the Refuge Bay.
j) The Refuge Bay must be kept clean and the entrance must be clear of any obstructions.
k) Adequate lighting must be installed on the inside and on the outside of the Refuge Bay.

Question 6
What equipment or facilities are required to be provided for the Refuge Bay?

Answer
All Refuge Bays must have:
a) A supply of potable water (a minimum of 2 litres per person for 24 hours is recommended).
b) An effective communication system to surface, with operating instructions. The appropriate contact details must be displayed.
c) A clearly visible type “Refuge Bay” symbolic sign must be displayed at the entrance to the Refuge Bay.

d) A conspicuous light with a reliable independent power supply, or any other physical means placed in such a position in the travelling way so as to indicate the location of the refuge bay.
e) An audible device positioned outside the refuge bay that can be activated from the inside the Refuge Bay.
f) Toilet facilities.
g) The following first aid equipment:
   i. A first aid box
   ii. A stretcher
   iii. Two blankets
h) A notice board inside the Refuge Bay, displaying the procedure to be followed in the Refuge Bay during an emergency.
i) A reliable supply of respirable air so as to ensure proper flushing and to create positive pressure. Where compressed air is used an arrangement for silencing must be provided.

Question 7
Describe the procedure when entering the Refuge Bay during an emergency?

Answer
a) Activate the ventilation arrangements.
b) Activate the audible device.
c) Place guard at door and keep it close as nobody is allowed to leave the Refuge Bay without permission (Door must open to the inside).
d) The most senior person to take charge of the emergency operations and to contact the surface control room or any senior official at the mine.
e) Take roll-call and record and report any missing persons.
f) Report to the Banks man/control room /Manager according to the emergency numbers on notice board and give location of Refuge Bay and any serious injuries and gas inhalation incidents.
g) Await further instructions from the control room.
h) Check on the well-being of the persons in the Refuge Bay and encourage them to remain calm and ensure that they do not move around unnecessarily.
i) Conserve lights. Keep only enough cap-lamps on at any one time.
j) Persons are required to remain in the Refuge Bay until otherwise instructed by the official in charge of the emergency situation at the Refuge Bay, or rescued.

Question 8
What must be done in all development ends to detect water-bearing fissures?

Answer
Bore holes (pilot holes), sufficient in number and length to give ample warning, must be drilled in advance of all development ends as determined by the Risk Assessment.

Question 9
What must the length of the pilot hole be?

Answer
At least 1½ times the length of the drill steel to be used for drilling the round, at 5^0 down and out for bottom holes and 5^0 up and out for top holes.

Question 10
What are the most common steps you are required to take in event of a total power failure?

Answer

a) All persons must be withdrawn from working places and proceed to the Shaft landing stations.
b) Activate the emergency power supply system.
c) Each supervisor must ensure that all persons under his/her supervision are accounted for.
d) No blasting to take place until the power has been restored.

5.2.2 BREAKING OF GROUND

B CHOICE QUESTIONS

A Support

Question 1
When will an underground working be declared as a remnant?

Answer
The stage at which a residual block of ground becomes a remnant, depends on:

a) Depth below surface
b) Stope span
c) Stoping width
d) Geological phenomena and size and shape
e) Mined out distance from surrounding workings

Question 2
What are the uses of a pinch bar?

Answer

a) To take down loose rocks from the hanging wall
b) To test the hanging wall
c) To use as a lever for moving heavy objects
d) To dig with when cleaning the foot wall
e) To bar the face before marking holes

Question 3
Name seven types of stope support

Answer

a) Packs
b) Stick support
c) Elongates
d) Roof bolts
e) Pillars
f) Backfill
g) Mechanical props

Question 4
Name seven types of development support

Answer

a) Roof bolts
b) Packs
c) Steel props
d) Timber and steel sets
e) Rope lacing and meshing
f) Mechanical anchors

g) Mechanical props

Question 5
Who must specify the details of systematic support?

Answer **[MA Regulation 7.4.1]**
At any time, in the opinion of the Principal Inspector of Mines, the roof or hanging is of a nature requiring systematic support, he may give notice to that effect to the Manager, who, in consultation with the Principal Inspectors of Mines, must specify the support to be provided and the system according to which it shall be installed.

Question 6
May any person deviate from the prescribe pattern of systematic support?

Answer **[MA Regulation 7.4.3]**
Any person who fails to comply with the specifications of such system must be guilty of an offence, and such an offence must be reported to the Shiftboss.

Question 7
How will workers be informed of the system of permanent support to be in use?

Answer **[MA Regulation 7.4.2]**
a) The Manager must ensure that persons concerned are made aware of such system and notices setting out its specifications are posted up at suitable places where they can conveniently be read
b) The training centre must be informed of the system and training must be based on that
c) It must be included in the mine's standard working guide

Question 8
Who may change the standard distance between the lines of permanent support?

Answer **[MA Regulation 7.4.4]**
The Principal Inspector of Mines may require modifications of the distances between supports being excessive or for any other reason. He/she may by notice in writing require the manager to modify the method

Question 9
What must be done before allowing dangerous rock to be drilled into with the object of rock-bolting it?

Answer **[Code of Practice]**
The Miner shall take all reasonable precautions to safe-guard any person engaged in such operations. However, the following precautions must be taken:
a) The hanging must be examined and barred down
b) Additional support to be installed – two props in front of the machine operator and two props behind him
c) Or the driller to operate from a safe, supported position, but dangerous ground to be drilled into, must be supported

Question 10
Who may mark off roof bolt holes?

Answer
The holder of a blasting certificate and the competent "A" person

Question 11
Where may roof bolts be used as support?

Answer **[MA Regulation 7.4.1]**
a) The manager must when necessary, after consultation with the Principal Inspector of Mines, specify the support system to be used

b) As additional support in all development ends
c) In tramming ways and scraper gullies where other means of support is not practical
d) When it is required for installing rope lacing, or for wire-meshing, hanging and side walls

Question 12
May roof bolts be taken out after installation?

Answer
No

Question 13
On examining a working place the Miner finds dangerous hanging which he cannot immediately make safe or support. What can he/she do?

Answer
a) If attempts to bar it down have failed, additional support must be installed or the place must be fenced off or a guard must be placed there to prevent entry.
b) The Miner must then arrange for material and trained persons to work under his/her direct supervision to support the area systematically.
c) The Shift boss must also be notified if he/she thinks it necessary, or a barricade must be erected to stop inadvertent entry with “no entry” signs.

Question 14
May any other support, except systematic support be installed in your working place?

Answer
Additional support must constantly be placed, when dangerous hanging or sidewall is encountered, or for making safe

Question 15
How must friable hanging be supported?

Answer
Where the roof or hanging is friable, props must be provided with headboards, or other suitable means shall be provided to present an adequate bearing surface.

Question 16
What is the Miner’s responsibility when support has been blasted out?

Answer
Install temporary support, and then replace support blasted out

B Remnants

Question 1
How are remnants classified?

Answer
Remnants are classified as follows:
a) “Listed remnant” – considered not to require any special precautions
b) “Support remnant” – the pattern and/or type of support requires modification from mine support standard
c) “Special remnant” – all possible remnant precautions must be observed
d) Special areas – modify mining method, support type and/or pattern and take necessary precautions

Question 2
What must be considered when working within a remnant area?

Answer

a) Mine towards solid (high to low stress)
b) Mine away from unstable geological structures
c) Do not split remnants
d) Do not single raise in remnants
e) Avoid leads and lags
f) Require two access ways
g) Mine to the recommended sequence

C Drilling

Question 1
How many plugs must the Miner have in supply?

Answer
He/she must have a sufficient supply

Question 2
How must holes be marked?

Answer
Clearly mark with crayon or paint the exact position and direction of each hole to be drilled (or point out) and must report not later than the end of the shift to the Mine Overseer or Shiftboss of his/her section or to the Shiftboss on duty any person deviating from the position or direction indicated.

Question 3
May metal objects be placed into sockets?

Answer
Under no circumstances must an eyebolt or other metal implement other than a tool determined for that purpose by the employer in consultation with the explosives manufacturer/supplier, be inserted into any socket or misfired hole.

Question 4
How do you mark a development end?

Answer

a) Haulage – 3m x 3m Drag round
b) Haulage and cross cut – 3m x 3m Burn cut round

Question 5
How must a stope face be marked?

Answer
According to a system decided by the Manager, and including

a) Reference line
b) Burden of holes
c) Angle of drilling
d) Method of marking/drilling
e) Stoping width
f) Grid lines
g) Length of holes

D Cleaning

Question 1
Who may operate a scraper winch?

Answer **[MHSA Regulation 8.4(2)(a)]**
Competent persons authorised by the employer to do so.

Question 2
Who may give signals to a winch operator?

Answer
Any person may give signals.

Question 3
What must the driver of a scraper winch do, before operating the scraper winch?

Answer **[MHSA Regulation 8.4(2)(b)]**
The scraper winch must not be operated until it is examined and declared safe to operate by a person authorised to do so by the employer

Question 4
How must a signalling system of a scraper winch be installed?

Answer **[MHSA Regulation 8.4(2)(d)]**
The employer must ensure that means are provided to signal to the operator, from any access point to the installation, to shut down the operation of the scraper winch installation.

Question 5
How can the fouling of ropes or scrapers be prevented if two scraper-winch installations work in conjunction with each other?

Answer **[MHSA Regulation 8.4 (2) (g)(ii)]**
The employer must ensure that a written procedure is prepared and implemented for the installation of the winch system, covering at least the crossover and anti-fouling arrangements of ropes from two or more winches

Question 6
How must the sheave wheels or snatch blocks be secured?

Answer **[MHSA Regulation 8.4 (2)(g)(iv)]**
The employer must ensure that a written procedure is prepared and implemented for the installation of the winch system, covering at least appropriate sheave and return pulley anchor and rigging arrangements, including the use of safety slings.

Question 7
How must the safety of persons be ensured when a mono-rope conveyance system is installed in a travelling way?

Answer
No mono-rope conveyance system must be installed in a travelling way, unless it is fenced off or guarded in such a manner, that no moving part can endanger the safety of persons.

Question 8
Who may drive a loco?

Answer **[MA Regulation 28.28]**
Only a holder of a locomotive engine-driver certificate

Question 9
May a person leave a loco idling or unattended?

Answer **[Code of Practice]**

a) No person operating a loco must leave it unattended, unless he/she has taken reasonable precautions to prevent it from being set in motion by an unauthorised person; and
b) Except when doing tests, no person must allow any diesel engine to idle for a period longer than 5 minutes underground.

Question 10

How must the fumes from the diesel loco exhaust be rendered harmless?

Answer **[Code of Practice]**

Every diesel engine used underground must be provided with means (purifier) whereby the air entering the engine is cleaned, the exhaust gases are cooled and diluted, and the emission of flames or sparks is prevented

Question 11

May any engine other than a diesel internal combustible be used underground?

Answer **[MA Regulation 10.25.1]**

No engine, other than a diesel engine may be used underground

Question 12

When may a diesel engine not be used underground?

Answer **[Code of Practice]**

a) When there is insufficient ventilation to render the exhaust gases harmless
b) When the air in the place where it is being used, contains more than 50 p.p.m. of carbon monoxide or 3 p.p.m. of oxides of nitrogen by volume, or more than 1 % (p.p.h.) of flammable gas
c) If the ventilation flow stops, reverses or weakens

Question 13

How must a manually-operated rail switch be operated?

Answer **[Code of Practice]**

Only from a safe position clear of the rail track and by means of a suitable tool or device

Question 14

What measures may be required at a tramming way, where persons are permitted to travel?

Answer **[Code of Practice]**

a) A fenced off travelling way must be provided
b) A suitable cross-over or cross-under arrangements must be provided

Question 15

How wide must the travelling way in haulage be?

Answer **[MA Regulation 18.4.2.3]**

a) Not less than 500mm from any moving machine, rolling stock or vehicle
b) Where the travelling way lies between two lines of tracks, there shall be a clearance of not less than 500mm between the sides of any two vehicles passing each other

Question 16

What are the requirements of a scraper winch installation?

Answer

a) Properly bolted down on the winch bed.
b) Level on the winch bed
c) Ropes under laid on drums

d) Lighting
e) Winch switch within easy arms reach
f) Winch chamber height – minimum 1,8m
g) Area well supported
h) Kept clean and effectively ventilated
i) Protection/guards over all moving parts
j) Electric cable suspended properly
k) Earth leakage to be on motor
l) Operator in possession of certificate
m) Operator to use the checklist daily
n) Air whistle in working order and bell wires in order
o) Proper tools and personnel protective equipment available

Question 17
How must persons be warned, when a remote-controlled scraper-winch is about to operate?

Answer
It must be fitted with an automatic device, which will provide a distinctive audible signal to warn any person in the vicinity that the operator intents to start the winch.

Question 18
How must a mono-rope system be installed?

Answer **[Code of Practice]**
Installation of a mono-rope system
a) Install the mono-rope winch in the cross cut timber bay or any suitable position in a safe and dry position
b) Install the winch on a solid horizontal bed 80cm above the foot wall
c) The installation must be well illuminated
d) The switch box must be easily accessible to the operator and in a safe position
e) Ensure that the hand guard at the chimes wheel is in position
f) Coil the mono-rope cable twice around the chimes wheel
g) Install an effective signalling device at the winch operated by a bell wire along the entire path of the installation
h) Fence the whole path of the system off, when it is installed in the travelling way
i) Rope pullies to be guarded
j) Operator to be certificated and appointed

Question 19
When an extreme mud rush has occurred, how must the stuff be cleared from the tracks?

Answer
a) Stop scraping activity in the working place immediately.
b) Close the tipping point of the orepass with a tip cover, or place a guard there to prevent rock from entering.
c) Load the broken rocks or mud in the cross cut away with a mechanical loader if possible.
d) Rectify the cause of the mud rush.

Question 20
What action must be taken when the tip becomes filled with water?

Answer
The water in the tip must not be drained from the bottom, as it may cause a mud rush
a) Place a guard at the box front to prevent tramming and lock the box front controls
b) Lower a submersible pump down the ore/rock pass with a chain and pump the water out
c) Fill the ore/rock pass with ore to displace all the water, if water cannot be pumped
d) When the water has been cleared, ore must be scraped into the tip before the loco crew can resume tramming
e) Investigate the source/cause of the water in the tip and prevent a re-occurrence thereof

Question 21
Who may drive a loco while it is being used for the conveyance of persons?

Answer **[Code of Practice]**

a) An authorised person who is the holder of a "locomotive-engine driver's certificate"
b) The Manager, Mine Overseer or Engineer may authorise a person in writing who is not the holder of a "locomotive-engine driver's certificate" to drive a locomotive, while it is being used for the conveyance of persons, provided that the locomotive is:
   i. Driven at a speed, not exceeding 16 kilometres per hour
   ii. Fitted with a device that will prevent the speed of traction from exceeding 16 km/h
   iii. Authorised in writing.

Question 22
May a person drive a loco whilst standing or walking?

Answer **[MA Regulation 18.2.1]**
No person must drive a loco, unless he/she is positioned properly in a seat provided.

Question 23
How must the driver's cabin of a loco be designed?

Answer **[Mine Standards]**
The driver of a loco must be safeguarded adequately to prevent accidental falling from the driver's cabin and it must be designed as such that all controls are within easy reach.

Question 24
What are the requirements for the use of loco's underground?

Answer **[Regulations 15.3.2, 18.8.2 and Mine Standards]**

a) Underground loco's must be equipped with an alarm, hooter or siren, or a clearly visible flashing light.
b) Underground loco's must be equipped with a fire extinguisher.
c) Batteries may only be charged in battery bays.
d) No underground loco must be left unattended in a position where it may inadvertently run out of control.
e) Where the underground loco is used on an inclined plane, of which the gradient exceeds 1 – 50, effective safety devices shall be provided to prevent it from running out of control.
f) Light on the leading end of the underground loco must not be less than 10 lux at a distance of 20m.

Question 25
What is the danger of diesel loco's if they are left idling for too long?

Answer
The effect of dangerous gases from the exhaust fumes accumulating around the loco where ventilation flow is weak

Question 26
Name 3 types of loco's used underground

Answer

a) Electric loco's with overhead conductors
b) Battery operated loco's
c) Diesel powered loco's

Question 27
Where are electric loco's normally used?

Answer
In main tunnels for long distance hauling

Question 28
What is the danger associated with electric loco's?

Answer
Electrocution, if contact is made with "live" overhead wire

Question 29
What are the advantages of using the battery loco?

Answer
a) No dangerous gases (no exhaust)
b) Can be used in narrow drives inaccessible for large electric loco's and trolley lines

Question 30
What must be done by the driver before a loco is used?

Answer
Check the loco according to the "pre use checklist" and report any defects before using it

Question 31 **[Mine Standards]**
What are the precautions when operating an electric locomotive?

Answer
a) The operator must use rubber gloves
b) The conductor-stick must be insulated

Question 32
What must be done in haulage ways, where the clearance from the moving vehicles to objects on the sides is less than 500mm?

Answer
a) Water doors, ventilation doors, walls for support or any other obstruction, closer than 500mm from moving vehicles, must be marked, so that it will be clearly visible to all persons and,
b) Places of refuge must be provided at places not further than 15m apart
c) When any machine or rolling stock or vehicle is parked near a haulage way, the minimum clearance between any moving vehicle or rolling stock and the stationary vehicle or rolling stock must not be less than 500mm.
d) Stop blocks/aeroplane sprags must be provided at the intersection of haulages and cross cuts to prevent collisions

E Emergency Procedures

Question 1
How must water be prevented from entering rock passes?

Answer
Every drain must be so constructed to prevent water from entering a rock pass (in stopes it can be piped pass the tip)

Question 2
How much water will constitute a danger to persons or mining operations?

Answer
The quantity will be decided by the Manager, but normally:
a) Less than 200 l/h, work can resume if no methane is present
b) More than 200 l/h, work must stop and report to supervisor
c) Water must be blocked and the drill-hole be pumped with cement

Question 3
Explain what is the purpose of a pilot board and its contents close to the development ends?

Answer
To provide protection against the inrushing of large volumes of water at a high pressure when intersected during mining operations.

Question 4
Where must refuge bay be provided?

Answer **[Code of Practice]**
Refuge Bays must be provided at locations indicated by the Employer. Refuge bays are to be positioned in areas free of combustible materials or combustible materials rendered inert, within an appropriate distance from the working places. Further due consideration must be given to factors such as:

a) The travelling conditions from the workplace, e.g. height, walking surface, gradient, possible disorientation, etc.
b) The duration of self-contained rescuers used at the mine

Question 5
In terms of self-rescuing devices, what is required in general?

Answer **[MHSA Regulation 16.2(2)]**
No person must go underground at a mine without a self-contained self-rescuer:

a) Keep on his/her person or be within reach
b) Maintained in good working order
c) Be of the self-contained type
d) It must comply with the SA Bureau of Standards specification SABS 1737
e) Directions for use has been integrated in the training programme

Question 6
What precautions must be taken when danger of flooding from surface exist?

Answer **[MHSA Regulation 14.4]**
The employer must take reasonable measures to ensure where the condition at any working place pose or might pose a significant risk to the health and safety of persons resulting from an ingress of water or other fluid material likely to cause drowning, asphyxiation, inundation, physical impact, chemical exposure or being trapped, that all working places are adequately protected against such ingress of water or other fluid material.

Question 7
Who must be contacted in the case of an underground fire?

Answer **[MHSA Regulation 9.1(2)]**
Where the risk assessment at the mine indicates a significant risk of a fire, the employer must provide an early warning system or systems at all working places.

Question 8
When must an accident be reported to the Principal Inspector?

Answer **[MHSA Regulation 23.1]**
Whenever an accident results in:

a) The death of any person; or
b) An injury to any person likely to be fatal; or
c) Unconsciousness from heatstroke, heat exhaustion, electric shock or the inhalation of fumes or poisonous gas; or
d) An injury that incapacitates the injured person from performing his normal duties for 14 days or more, or which the injured employee to suffer the loss of a joint or part of a joint, or sustain a permanent disability; or

e) An injury that incapacitates the injured employees normal or similar occupational the next calendar day.

Question 9
List and describe the sources of fires underground

Answer
The main sources of a fire underground in mines are:
a) Electrical sources
b) Frictional sources (scraper ropes, conveyor-belting etc.)
c) Blasting
d) Cutting and welding
e) Smoking or contraband
f) Diesel engines and fuel
g) Flammable fluid or greases
h) PVC or other similar materials
i) Methane or other gas explosions
j) Impact generating sparks

Question 10
When and where must firefighting equipment be available for use?

Answer
a) When using a cutting torch or a welding equipment.
b) At loco battery charging bays.
c) At underground re-fuelling stations.
d) Electric sub-stations underground.
e) At underground stores especially where paint and other flammable material are kept.
f) At each station underground.
g) Explosives accessories issuing bays.

Question 11
What action is required for fire prevention?

Answer
a) No person must place or leave any naked light or flame or burning torch or burning cigarette on or near any combustible material or any flammable substance where this may cause a fire
b) No waste material of a combustible nature must be stored in a quantity sufficient to cause a fire hazard.
c) No flammable substance or explosive must be stored near any electric apparatus
d) No cutting or welding to take place unless a fire extinguisher is immediately available and surrounding area is sufficiently watered down
e) On completion of any welding or flame cutting, an examination must be carried out by a competent person to ensure that no fire will result from such operation
f) No person must smoke in a conveyance
g) Empty explosives cartons must be sent to surface in a locked, empty explosives car.
h) Electric cables must not be suspended close to packs sticks or other timber.
i) Timber near winches to be coated with fireproof material.
j) Plastic pipe columns to be used only where it cannot cause a fire hazard.

Question 12
When must the pilot holes be drilled?

Answer
a) Before any other holes are drilled, bore-holes sufficient in number and length shall be carried in advance of all development headings.
b) The Miner must test for methane at each such pilot hole before the round is drilled.

Question 13
How many pilot holes must be drilled in a development end?

Answer
The manager will decide, normally two, but four when necessary.

Question 14
What are the dangers of a sudden inrush of water underground?

Answer
a) Loss of life or injury to person.
b) Loss or damage to machinery and equipment.
c) Loss in production.
d) Added costs for pumping or installation of plugs.

Question 15
What is the procedure when intersecting water?

Answer
a) Stop work and test for methane.
b) The employer must report to the Principal Inspector of Mines any uncontrolled flow of water.

5.2.3 MINE HEALTH AND SAFETY ACT, 1996 (ACT NO 29 OF 1996), AS AMENDED

A COMPULSORY QUESTIONS

Question 1
What are the employees' duties for health and safety?

Answer **[MHSA Section 22]**
Every employee at a mine, while at that mine, must:
a) Take reasonable care to protect their own health and safety.
b) Take reasonable care to protect the health and safety of other persons who may be affected by any act or omission of that employee.
c) Use and take proper care of protective clothing, and other health and safety facilities and equipment provided for the protection, health or safety of that employee and other employees.
d) Report promptly to their immediate supervisor any situation which the employee believes presents a risk to the health or safety of that employee or any other person, and with which the employee cannot properly deal.
e) Co-operate with any person to permit compliance with the duties and responsibilities placed on that person in terms of this Act.
f) Comply with prescribed health and safety measures (Code of Practice, Mine Standards, etc.)

Question 2
Explain the employees' right to leave dangerous working place?

Answer **[MHSA Section 23(1)]**
The employee has the right to leave any working place whenever:
a) Circumstances arise at that working place which, with reasonable justification appear to that employee to pose a serious danger to the health or safety of that employee; or
b) The health and safety representative responsible for that working place directs that employee to leave that working place

Question 3
When must a mine have a safety representative and a health and safety committee?

Answer **[MHSA Section 25]**

a) Every mine with 20 or more employees must have a health and safety representative for each shift at each designated working place at the mine.
b) Every mine with 100 or more employees must have one or more health and safety committee.
c) A health and safety representative or a member of a health and safety committee does not incur any civil liability only because of doing or failing to do something which a health and safety representative or a member of a health and safety committee may do or is required to do in terms of this Act.

Question 4
Name the rights and powers of workplace representatives

Answer **[MHSA Section 30(1)]**

A health and safety representative may:

a) *Represent* employees on all aspects of health and safety;
b) *Direct* any employee to leave any working place whenever circumstances arise at that working place which, with reasonable justification, appears to the health and safety representative to pose a serious danger to the health and safety of that employee;
c) *Assist* any employee who has left a working place in terms of Section 23;
d) *Identify* potential hazards and risks to health or safety;
e) Make *representations or recommendations* to the manager or to a health and safety committee on any matter affecting the health or safety of employees;
f) *Inspect* any relevant document which must be kept in terms of this Act;
g) *Request* relevant information and reports from an Inspector;
h) With the approval of the manager, be assisted by or *consult* an advisor or technical expert who may be either another employee or any other person;
i) *Attend any meeting* of a health and safety committee:
   i. Of which that representative is a member; or
   ii. Which will consider a representation or recommendation maybe by that representative;
j) *Request*:
   i. An Inspector to conduct an investigation in terms of Section 60; or
   ii. The Chief Inspector to conduct an inquiry in terms of Section 65;
k) Participate in *consultations* on health and safety with:
   i. The manager or person acting on behalf of the manager; or
   ii. An Inspector
l) Participate in any *health and safety inspection* by:
   i. The employer or person acting on behalf of an employer; or
   ii. An Inspector
m) *Inspect* working places with regard to the health and safety of employees at intervals agreed with the manager;
n) Participate in any internal health or safety *audit*;
o) *Investigate complaints* by any employee relating to health and safety at work;
p) Examine the *causes* of accidents and other dangerous occurrences in collaboration with the employer or person acting on behalf of the employer
q) *Visit the site* of an accident or dangerous occurrence at any reasonable time;
r) Attend a *post-accident inspection*;
s) *Co-operate* with the manager in the conducting of investigations in terms of Section 11(5);
t) *Participate* in an inquiry held in terms of Section 65; and

u) Perform the functions:
   i. Agreed by the health and safety committee; or
   ii. Prescribed

Question 5
Name the rights and powers of the health and safety committee

Answer **[MHSA Section 36. (1)]**
A health and safety committee may:
a) *Represent employees* on all aspects of health and safety;
b) *Participate in consultations* on any health and safety matter listed in the Schedule referred to in Section 97(2);
c) Request the Chief Inspector to *review* any code of practice;
d) *Request relevant information* from any person who is required, in terms of this Act, to provide that information to the committee;
e) *Agree on additional* qualifications or functions of health and safety representatives;
f) Request:
   i. An Inspector to *conduct an investigation* in terms of Section 60; or
   ii. The Chief Inspector to *conduct an inquiry* in terms of Section 65
g) With the approval of the manager, *be assisted by or consult* an adviser or a technical expert who may be either another employee or any other person;
h) Take reasonable time to *prepare for each meeting* of the committee; and
i) Take reasonable time to *report on meetings* of the committee to the health and safety representatives at the time.

Question 6
What are the requirements for Safety Representatives?

Answer
To qualify to serve as a health and safety representative, an employee must:
a) Be employed in a full time capacity in the designated working place.
b) Be acquainted with conditions and activities at the designated working place.

5.2.3 MINE HEALTH AND SAFETY ACT, 1996 (ACT NO 29 OF 1996), AS AMENDED

B CHOICE QUESTIONS

Question 1
How are health and safety committees established?

Answer **[MHSA Section 34(1)]**
a) If a collective agreement is concluded in terms of Section 33(1), health and safety committees must be established in terms of that agreement.
b) If no collective agreement is concluded in terms of Section 33(1), the manager must establish health and safety committees after the consultation referred to in Section 33(6) or (7) and in accordance with this section and the regulations.

Question 2
Describe the composition of a health and safety committee.

Answer **[MHSA Section 34(3)]**
a) A health and safety committee must consist of:

i. At least four *employee representatives*; and
ii. A number of *management representatives* equal to or less than the number of employee representatives.

b) The health and safety representatives must appoint the *employee representatives* on the health and safety committee. The employee representatives must be:
i. Broadly representative of the working places at the mines; and
ii. Full time employees at that mine.

c) *No more than two of the employee representatives* may be appointed from full time employees who are not health and safety representatives, unless all of the health and safety representatives have been appointed to the committee and there are still employee committee positions to be filled.

d) The manager must appoint the *management representatives* on the health and safety committee. The persons appointed must include persons who have authority to develop and implement health and safety policies at the mine.

5.2.4 REGULATIONS/CODES OF PRACTICE

A COMPULSORY QUESTIONS

Question 1
What does the regulation state in terms of "Not entering a working place except with a Miner's permission"?

Answer **[MHSA Regulation 14.1(1)]**
The employer may not permit any person, other than those persons examining and making safe, to enter any of the following areas at the mine until such areas are declared safe by competent persons:

a) The area between the face and the nearest line of permanent support.
b) Access ways, travelling ways or places where persons need to travel or work.

Question 2
What does the regulation state in terms of making safe by the competent "A" persons?

Answer **[MHSA Regulations 14.1 (5) and 14.2]**

a) The employer must ensure, if at any time a working place or part thereof becomes unsafe during the shift, that all persons, other than those examining and making safe, are removed from such unsafe area and are not permitted to return thereto until declared safe by competent persons.
b) The employer must ensure that no persons, other than those persons examining and making safe, may enter any of the areas contemplated in regulation 14.1(1) until such areas have been declared safe as contemplated in regulation 14.1(1) and 14.1(5).

Question 3
What does the Flammable Gas Code of Practice state in terms of "flammable gas – no work"?

Answer
No further work may be done within 30m of the source and beyond the last point of through ventilation in a development end and in any adjacent working place within 30m of the point of issue of the gas where the atmosphere contains more than 1,4% of flammable gas.

Question 4
What is the Miner/Ganger's "responsibility for others' safety with respect to explosives"?

Answer
The Miner/Ganger must take all reasonable measures to safeguard all persons who may be in or in the vicinity of his working place against accident in any way connected with the use of explosives, whether such persons are under his direct supervision or not

Question 5
What does the regulation state in terms of "gassing to be reported"?

Answer **[MHSA Regulation 4.18]**
Every person must report, in a manner prescribed by the employer, without delay any case of gassing, however slight, to ensure that such case receives prompt medical attention

5.2.4 REGULATIONS/CODES OF PRACTICE

B CHOICE QUESTIONS

Question 1
What does the regulation state in terms of "Workings to be made and kept safe"?

Answer **[MHSA Regulation 14.1(1)]**
At every underground mine where a risk of rock bursts, rock falls or roof falls exists, and every other mine where a significant risk of rock bursts, rock falls or roof falls exists, the employer:

a) May not permit any person other than those persons examining and making safe, to enter any of the following areas at the mine until such areas are declared safe by competent persons:
   i. The areas between the face and the nearest line of permanent support.
   ii. Access ways, travelling ways or places where persons need to travel or work.

Question 2
What does the regulation state in terms of "Crossing fences"?

Answer **[MA Regulation 7.3.3]**
No person other than the manager, mine overseer or Shiftboss must cross or open any fence, barrier, gate, wall, door or cover provided for protection in workings until he/she has received definite instructions or permission to do so from the Ganger or Miner or other responsible person in charge.

Question 3
What does the regulation state in terms of "Ganger's responsibility – fenced workings"?

Answer **[MA Regulation 7.3.4]**
The Ganger or Miner or other responsible person in charge must not cross or open, or cause or permit any other person to cross or open, any fence, barrier, gate, wall, door or cover provided for protection in workings except for the purpose conducting repairs or other necessary operations and then only if effective precautions for the safety of persons are taken.

Question 4
What does the Code of Practice state in terms of "Friable hanging"?

Answer **[Code of Practice]**
Where the roof or hanging is friable, props must be provided with headboards, or other suitable means must be provided to present an adequate bearing surface.

Question 5
What does the regulation state in terms of "hard hats"?

Answer **[MA Regulation 7.7.1]**

No person must enter or remain in, or cause or permit any other person to enter or remain in, the underground workings of a mine unless he/she or such other person wears a hard hat in good condition and a type approved by the Chief Inspector.

Question 6

What does the regulation state in terms of “Life lines – steep workings”?

Answer **[MA Regulation 7.8.1]**

No person must work, or cause or permit any other person to work, in or near any part of the workings of a mine where inadvertent slipping or overbalancing may result in his/her sliding or falling down any slope that has an inclination from the horizontal of 45 degrees or more, or in his/her falling vertically, unless he/she is secured by a life-line or otherwise safeguarded.

Question 7

What does the Code of Practice state in terms of “Drains and rock passes”?

Answer **[Code of Practice]**

a) The manager must take reasonable precautions to ensure that every person employed in the workings of a mine is safeguarded against inundation by water or mud or a flow of rock, sand, silt or other similar materials.
b) Every drain must be so constructed, positioned and maintained as to prevent water inadvertently entering a rock pass.
c) Every drain and every borehole provided for the purpose of drainage must, as far as practicable, be kept free from blockage.
d) No person must enter or cause or permit any person to enter a rock pass at the discharge end while it contains water, mud or rock.
e) Any rock pass, which has become blocked, must be cleared only in accordance with a procedure laid down by the manager.

Question 8

What does the regulation state in terms of the “Principal Inspector of Mines” may call for systematic support”?

Answer **[MA Regulation 7.4.1]**

If the roof, hanging or sidewalls in the workings or any mine or part of a mine are in the opinion of the Principal Inspector of Mines of a nature requiring systematic support he/she may give notice to that effect to the manager who must, after consultation with any Deputy Chief Inspector of Mines, specify the support to be provided and the system according to which it must be placed.

Question 9

What does the regulation state in terms of the “Principal Inspector of Mines” may require modification of support”?

Answer **[MA Regulation 7.4.4]**

If, in the opinion of the Principal Inspector of Mines, the method of supporting the roof, hanging and sidewalls in the workings of any mine or part of a mine is unsafe either by reason of the distances between supports being excessive or for any other reason, he/she may by notice in writing require the manager to modify the method.

Question 10

What does the regulation state in terms of “loose articles”?

Answer **[MA Regulation 7.5.1]**

No timber, rock, tools or other articles must be placed or allowed to remain where they accidentally can fall or be cause to fall down any vertical or steeply inclined excavation and thereby endanger the safety of persons.

Question 11

What does the regulation state in terms of “tools, etc. not to be carried on ladder ways”?

Answer **[MA Regulation 7.5.2]**

No person must carry or be permitted to carry any drill, tool or any loose material on a ladder way in a vertical or steeply inclined shaft or winze except so far as may be necessary in executing repairs.

Question 12

What does the regulation state in terms of “barricades in steeply inclined workings”?

Answer **[MA Regulation 7.5.3]**

Every opening from a vertical or steeply inclined excavation into a travelling way or working place situated on the lower or dip side of such excavation must be kept barricaded so that persons travelling or working below or near such opening are effectively protected against danger from the falling or rolling of timber, stones, tools or other articles.

Question 13

What does the regulation state in terms of “stulls to be examined”?

Answer **[MA Regulation 7.6]**

Every stull in or above every place where any person works or travels must be examined at least once a week and maintained in a safe condition and adequately loaded.

5.3 EXPLOSIVES AND DUTIES OF GANGERS/MINERS

5.3.1 BLASTING

A COMPULSORY QUESTIONS

A Explosives

Question 1
Name the most common types of explosives and explosive accessories?

Answer
Blasting Agents

a) Pumpable explosives
   i. Anfex/Expanfo
   ii. Emulsion
b) Cartridge explosives
   i. Explogel
   ii. Powergel
c) Detonating cord

Accessories

a) Electric delay detonating fuses
b) Electric detonators
c) Shock tubes

Initiation systems

a) Electronic Blasting Initiation Systems
b) Shot Exploder
c) Centralised Blasting Systems

Question 2
How must primers be prepared?

Answer
When preparing a primer, comprising blasting cartridge and detonator, make a hole of sufficient diameter and depth in the cartridge with a sharpened wooden stick or pricker of non-ferrous material, press the detonator into the cartridge and securely fasten it to the cartridge by means of string or other suitable material so that it cannot inadvertently be withdrawn.

B Holes to be blasted

Question 1
How must a charging rod be?

Answer
The Miner/Ganger must ensure that in charging or tamping a shot hole only a rod determined by the employer in consultation with the explosives manufacturer or supplier and one that is an easy fit in the hole and has its ends cut off square is used: provided that in the case of pumpable explosives it is not necessary to use a charging rod.

Question 2
What does the regulation state in terms of “blasting at a time to be fixed by the employer”?

Answer **[MHSA Regulation 4.16(4)]**
The employer must take reasonable measures to ensure that in any mine blasting take place only at the time determined in writing by the employer.

C Sockets, misfired holes and shot holes

Question 1
Give the definition of a socket, misfired hole and shot hole?

Answer
a) “**Socket**” means any shot hole, or part of any shot hole, known not to be a misfired hole, which remains after having been charged with explosives and blasted or which, for any other reason, may be suspected of having contained explosives at any time and includes any shot hole, or part of any shot hole, from which all explosives have been extracted.
b) “**Misfired holes**” means a shot hole or part of a shot hole in which any explosive or any portion thereof has failed to explode after initiation.
c) “**Shot hole**” means any drill hole charged with or intended to be charged with explosives.

Question 2
What does the regulation state in terms of “examination for misfired holes and sockets”?

Answer **[MHSA Regulation 4.12(1)]**
The employer must take reasonable measures to ensure that a written procedure is prepared and implemented, after consultation with the explosives manufacturer or supplier, to prevent persons from being exposed to the significant risks associated with marking, drilling and blasting of shot holes. Such procedure must include:
In underground mines:
a) Before the competent person referred to in regulation 4.4(1) points out or marks any shot hole for drilling, such competent person:
   i. Removes or causes to be removed all loose or loosened rock, mineral or ground to a safe distance from the shot hole determined by a risk assessment; and
   ii. Searches for any misfired hole or socket within a distance of at least two metres from the proposed position or mark.

Question 3
What does the regulation state in terms of “misfired holes to be marked?

Answer **[MHSA Regulation 4.11(1)]**
The employer must take reasonable measures to ensure that a written procedure is prepared and implemented, after consultation with the explosives manufacturer or supplier, to prevent persons from being exposed to significant risk associated with misfires, sockets and old explosives. Such procedure must include measures to ensure that no person gains inadvertent access to any misfired hole which is not immediately dealt with, and which measures should include clearly marking the misfired hole or barricading it off and requiring reporting of the misfired hole to all subsequent shifts, at the start of each such shift, until the misfired hole has been dealt with.

Question 4
What does the regulation state in terms of “removal of plugs?

Answer **[MHSA Regulation 4.11(5)]**

The employer must take reasonable measures to ensure that a written procedure is prepared and implemented, after consultation with the explosives manufacturer or supplier, to prevent persons from being exposed to significant risk associated with misfires, sockets and old explosives. Such procedure must include measures to ensure that no person removes or causes any other person to remove the plugs that are used to plug sockets or misfired holes unless such plugs are removed by the competent person referred to in regulation 4.4(1) for the purpose of inspection or are removed at the end of the shift prior the initiating of explosives charges.

D Obstructions in box hole

Question 1

How would you clear a blocked rock pass?

Answer **[Code of Practice or Mine standard]**

No person to enter the rock pass:

a) Make sure it cannot be cleared manually from a safe position, by means of pinch bars.
b) Obtain permission from the Manager, Mine Overseer or Shift Boss to free the blockage by means of blasting during the shift.
c) Tie a made up primer to three blasting cartridges with a sufficient length of a string.
d) Secure the explosive charge to the one end of a charging stick and connect a blasting wire of sufficient length, to reach from the charge to be ignited, to a safe place.
e) Push the charge up to the blockage and secure it by tying the bottom end of the charging stick onto the chute of the box front.
f) If the blockage is high up, two or more charging sticks may be joined together.
g) Remove all persons in the vicinity.
h) Water down for a distance of 10 metres in all directions
i) Test for flammable gas.
j) Ensure that the ventilation is in order.
k) Warn all persons on the return air side.
l) Place guards at all entrances with clear instructions not to let any person through until instructed by you.
m) Initiate the explosive charge.
n) Wait at a safe place on the intake air side and wait for 30 minutes after the shot has gone off.
o) Enter and check if there are any fumes or smoke. If there are still fumes present, wait for another 30 minutes.
p) Water down the effected surroundings for 10 metres.
q) Examine and make safe where necessary.
r) Inspect the rock pass to see if the blockage was freed and if there is any damage to any equipment.
s) Relieve the guards from their duties.
t) If the attempt to free the blockage has failed, further blasting can only be done with the permission in each instance by the Manager, Mine Overseer or Shiftboss.
u) If successful in removal of obstruction ensure all explosives and accessories are removed and locked away.

5.3 EXPLOSIVES AND DUTIES OF MINERS/GANGERS

5.3.1 BLASTING

B CHOICE QUESTIONS

A Explosives

Question 1
What does the regulation state in terms of "precautionary measures before initiating explosive charge"?

Answer **[MHSA Regulation 4.6(3)]**
The employer of every underground mine must take reasonable measures to ensure that -

a) Explosives are not brought to the working place where blasting is to be carried out unless the:
   i. Drilling of shot holes have been completed.
   ii. Shot holes are ready to be charged with explosives.
   iii. Quantity of explosives do not exceed the estimated required quantity to be used for the blast.
b) The competent person referred to in regulation 4.4(1) does not initiate any explosive charge unless:
   i. The shot hole between the explosive charge and the collar is completely filled with stemming material and tamped.
   ii. All persons have been removed from the working place where explosives charges are to be initiated.
   iii. All entrances to the working place(s) where explosive charges are to be initiated, or to places where the safety of persons may be endangered by such initiation, are effectively guarded so as to prevent inadvertent access to such places while such explosive charges are being initiated.
   iv. Such competent person, give or cause to give due warning in every direction and is satisfied that no person remains where they might be exposed to danger from the initiating of such explosive charges.

Question 2
What does the regulation state in terms of "receipt, storage, issuing and transportation of explosives"?

Answer **[MHSA Regulation 4.2(1)]**
The *employer* must ensure that:

a) Explosives that are not being transported or prepared for use are stored in ***explosive*** stores, silos or containers which are securely locked or, as far as *reasonably practicable*, designed and located so as to facilitate the safe and secure receipt, storage and issuing of ***explosives*** by a *person referred to in regulation 4.1(2)*
b) A written procedure is prepared and implemented, after consultation with the *explosive manufacturer* or supplier, to prevent persons from being exposed to the significant *risk*s associated with the receipt, storage, issuing and transportation, inadvertent initiation and the deterioration of *explosives*. This written procedure referred to in this sub-*regulation* must include the following:

Storage of explosives

a) Measures to ensure that every container used for the storage of *explosives**,*** including *old explosives,* is:
   i. Of robust construction;
   ii. Provided with an effective lock and the key kept only by an *authorised person referred to in regulation 4.1(2);*
   iii. Clearly marked to indicate the type of *explosives* to be placed therein;
   iv. Of a capacity deter*mine*d by the *employer* in consultation with the *explosive manufacturer* or supplier;
   v. Spaced apart from any other container used for storage of *explosives*, at a distance deter*mine*d by the *employer* after consultation with the *explosive manufacturer* or supplier;
   vi. Approved in writing for that purpose by the *employer*;
b) Measures to ensure, at every *mine* where there is a significant *risk* of *old explosives* being present, that adequate storage facilities are provided for such *old explosives*;
c) No person must place, or cause or permit any other person to, place any other materials or any implements or tools, in the *explosives* containers other than those necessary for the preparation of initiation systems or *primers*; and
d) Measures to ensure that *primers* are kept separate from other *explosives* and stored in a container complying with *regulation* 4.2(1)(b)(i).

Issuing of explosives

a) Measures to ensure, as far as reasonable practicable, that the *explosives* that have been ordered or issued do not exceed the *explosive* storage capacity of the storage facility in which it is intended to store those *explosives***,** either underground or on surface; and

Transportation of explosives

a) Measures to ensure, as far as *reasonably practicable*, that *explosives* are only transported in vehicles, conveyances, unopened cases or locked containers approved in writing for that purpose by the *employer*.

Question 3

What does the regulation state in terms of "use of more than one detonator in a charge"?

Answer **[MHSA Regulation 4.16(8)(d)]**

The competent person referred to in regulation 4.4(1), except as may be necessary to re- initiate a misfired hole, does not insert more than one detonator into an explosive charge, provided that in wet workings two detonators may be used only if they are both inserted into the same cartridge and securely fastened to it;

Question 4

What does the regulation state in terms of "shot holes to be stemmed and tamped"?

Answer **[MHSA Regulation 4.14]**

The employer must take reasonable measures to ensure that:

a) Tamping of each shot hole is of a minimum length of 0.4m or a third of the length of the shot hole, whichever is the greater, to a maximum length equal to the burden used in the blast pattern; and
b) No explosives contained in a shot hole are initiated unless the portion of the shot hole between the explosives and the collar is stemmed and tamped by means of a material determined for that purpose by the employer after consultation with explosive manufacture or supplier.

Question 5

What does the regulation state in terms of "approved explosives and usage of explosives at mines"?

Answer **[MHSA Regulation 4.3(1) and 4.3(2)]**

a) The employer must take reasonable measures to ensure that only explosives approved in writing by the employer are used at the mine.
b) The employer must take reasonable measures to ensure that explosives are used in accordance with a written procedure prepared and implemented for that purpose by the employer, after consultation with the explosive manufacturer or supplier. The written procedure must include the following:
   i. All explosives must be used in the same sequence as they are issued;
   ii. Under no circumstances must any blasting cartridge be broken or cut or a wrapper round any blasting cartridge be interfered with, except when preparing the blasting cartridge for the insertion of a detonator or detonating fuse;
   iii. The only primers that must be permitted to be prepared are primers that are required for immediate use;
   iv. Where igniter cord is used, such an igniter cord must be laid as close as practicable to the face and not on, or in contact with timber or other combustible material or flammable substance not forming part of the explosives charges; and
   v. Where pumpable explosives are used, the pumpable explosives are only sensitised at a working place where explosive charges are being prepared prior to the pumpable explosives being pumped into a shot hole.

Question 6

What does the regulation state in terms of "open light not to be near explosives"?

Answer **[MHSA Regulation 4.17(2) and 4.17(3)]**

No person:

a) May smoke, light a fire or bring a naked light or flame, within a distance of 10 metres of where explosives are being loaded, transported, off loaded, handled or explosive charges are being prepared.
b) Who is engaged in handling explosives or who is travelling on a vehicle on which explosives are being transported may carry matches or any other means of producing a flame or a spark.

B Holes to be blasted

Question 1
What does the Code of Practice state in terms of “hole to be of sufficient size”?

Answer **[Code of Practice]**
The Miner/Ganger must not charge or attempt to charge any shot hole, which is not of sufficient size to admit freely the explosives cartridges in use and shall not hit or forcibly press any explosives into such hole.

Question 2
What does the Regulation state in terms of “withdrawal of tamping”?

Answer **[MHSA Regulation 4.8]**
The employer must take reasonable measures to ensure that the stemming or tamping is not withdrawn from a shot hole that has been charged with explosives except when dealing with misfired holes in accordance with the provisions of regulation 4.11(5).

5.3.2 DUTIES OF A MINER/GANGER

A COMPULSORY QUESTIONS

Question 1
What are the duties of a Miner/Ganger from the time of his/her arrival on the mine until he/she proceeds underground?

Answer
a) Sign the daily attendance register kept in the sections office.
b) Communicate with the Shift Boss/Mine Overseer for any special instructions.
c) Check the night shift communication book for any irregularities.
d) Collect the explosives keys.
e) Check the explosives order book
f) Check the notice boards for any new notices.
g) Change to clean underground clothes in the change house.
h) At the lamp room, collect and check your cap lamp, Gas Detection Instrument and Self-Contained Self-Rescuer.
i) Check, test the calibration and sign for your Gas Detection Instrument.
j) Collect relevant material from the store or point of issue.
k) At the shaft head, check your watch against the time on the clock at the shaft bank.
l) Enter the conveyance when permitted by the Banksman.

Question 2
What are the duties of a Miner/Ganger from the time of arrival at the underground landing station?

Answer
a) Check the water and air valves on the main columns.
b) Visually check the hangingwall and sides of the travelling ways.
c) Check the conditions of the Refuge Bay.
d) On your way to your working place, check your explosives boxes.
e) Check ventilation conditions such as opened ventilation doors, fans not operating, damaged ventilation walls and un-operational ventilation or cooling installations.
f) Check that drinking water is available.
g) On your arrival at the waiting place, check if the waiting place is in accordance with the regulations.

Question 3
What are the duties of the Miner/Ganger from the time of entering the working place until blasting time?

Answer
a) The dayshift Miner/Ganger must discuss the entry examination conducted by the competent "A" person/team leader upon his or her arrival at the working place entrance.
b) The dayshift Miner/Ganger must on his entry to the stope re-examine the areas that the competent "A" person/team leader examined at the start of the shift.
c) The Miner must ensure by personal inspection and consultation that the competent "A" person/team leader examined and made safe according to the procedure and that work can continue in a safe manner, and sign the *declaration*.
d) Check on the safety and health of persons under his/her control as prescribed in the regulations and the mine standards.
e) Mark all the shot holes as per mine standard.
f) Receive and lock up explosives.
g) Prepare explosive charges.
h) Ensure that all workers have left the working place before the blast is initiated.
i) Blast only at a time determined in writing by the employer.
j) Follow only the route to surface which is described by the manager.
k) Close the air and water valves on the landing station or cross cut.
l) Proceed to surface on the scheduled time.

Question 4
What are the duties of the Miner/Ganger when returning to surface at the end of the shift?

Answer
a) Hand in the Gas Detection Instrument, cap lamp and Self-Contained Self-Rescuer at the lamp room.
b) At the sections office, report to the Shiftboss and discuss matters that require the Shiftboss attention.
c) Hand in the explosives keys
d) Order explosives and relevant material/equipment.
e) Give work instructions on the day shift/afternoon shift/night shift communication book.
f) Enter any unsafe or dangerous conditions into the night shift communication book
g) Sign off in the attendance register.
h) Report any fumes, dust or gases observed in the complaint book, provided for the purpose in the change house.
i) Shower, change clothes and arrange for your underground clothes to be washed.

Question 5
What are the responsibilities of a Miner/Ganger with respect to primary and secondary blasting?

Answer **[MHSA Regulation 4.4(1)]**
a) Exercise control over all explosives to be used for blasting at those working places for which the competent person is responsible;
b) Prepare primers;
c) Examine any shot hole to be deepened to ensure it is safe to deepen;
d) Examine for and deal with misfires and sockets, in accordance with the written procedure prepared in terms of regulation 4.11;
e) Mark or indicate shot holes for drilling or to authorise the drilling of shot holes marked or indicated by another person authorised to do so by the Employer, except where the shot holes were marked or indicated by means

of electronic software system, including but not limited to Global Positioning System or Laser, the competent person must be required to over inspect and authorise the commencement of drilling of shot holes;

f) Exercise control over any manufacturing at the working places for which such competent person is responsible for, of pourable or pumpable explosives to be used;
g) Connect blasting rounds or circuits;
h) Charge shot holes with explosives or place explosive charges; and
i) Make safe all hot holes in terms of the written procedure contemplated in regulation 4.16(7).

Question 6

What is the duty of a Miner with regards to delivery of explosives in his/her working place?

Answer **[MHSA Regulation 4.4(2)]**

The Miner/Ganger must report to the employer, whenever explosives are delivered to the working place for which that competent person is in charge, whether or not the correct quantity of explosives was delivered.

Question 7

What is the Miner/Ganger's responsibility with regards to safety of persons in a working place where centralised blasting system is used?

Answer **[MHSA Regulation 4.6(4)]**

The Miner/Ganger must not *initiate* an *explosive* charge in any underground *mine* where a centralised *blasting* system is being used, unless all persons who may be endangered by such initiation of *explosive* charges have been moved to a safe area.

Question 8

What is the Miner/Ganger's responsibility with regards to working places where initiation takes place by means of electricity?

Answer **[MHSA Regulation 4.10(2)]**

a) Only uses a blasting cable provided for that purpose and which is in good order and of sufficient length to ensure that the blasting cable cannot come into contact with any other cable or electrical apparatus;
b) Secures the initiating device of the blast in an adequate and reasonable manner so as to prevent unauthorised access or use of the blasting system;
c) Connects the blasting cable to the detonator wires of any explosive charge or charges or to the wires of the initiator or similar device only after completing all blasting precautions, other than those referred to in paragraphs (d), (e) and (g) of this regulation;
d) Does not apply any electrical test to the blasting circuit except through the blasting cable and from a place of safety;
e) Does not connect the blasting cable to the terminals of the initiating device until immediately before initiation of explosive charges or attempting to initiate the explosive charges;
f) Except in the case of a remotely operated centralised electric blasting system, immediately after initiating or attempting to initiate the explosive charges, disconnects both leads of the blasting cable from the initiating device and then:
    i. Removes the operating handle or key of the initiating device; or
    ii. Secures the locking arrangement of the initiating device and removes the key;
g) In the case of a remotely operated centralised electric blasting system, does not connect the blasting cable to the terminals of the blasting box until immediately before leaving such competent person's working place at the end of the shift; and

h) In the case of a remotely operated centralised electric blasting system, disconnects immediately at the commencement of the shift any blasting cable from the terminals of the blasting box.

Question 9
What is the Miner/Ganges's responsibility with regard to the discovery of misfired holes or sockets in any shaft in the course of being sunk?

Answer **[MHSA Regulations 4.11(2) (a)]**
In any shaft in the course of being sunk, in addition to the requirements of *regulation* 4.9, the Miner/Ganger must make a sketch showing the position of every *misfired hole* and *sockets.*

Question 10
What is the Miner/Ganger's responsibility regarding sockets and misfired holes?

Answer **[MHSA Regulations 4.11(7)]**
a) Exa*mine*s every **socket** and **misfired hole** to ascertain its depth, direction and whether it contains any ***explosives***, by a means deter*mine*d by the *Employer* after consultation with the **explosive**s **manufacture**r or supplier; and
b) Extracts ***explosives*** from the ***misfired hole*** in accordance with the provisions of *regulation* 4.11(3) and plugs the ***socket*** with a plug supplied for that purpose by the *Employer*; or
c) Re-primes and **blasts**; or
d) Charges up the ***misfired holes*** with ***explosives*** and **initiates** the ***explosive*** charges; or
e) **Blasts** the ***misfires*** at the end of the shift;

Question 11
What are the Miner/Ganger's responsibility before marking any shot hole for drilling?

Answer **[MHSA Regulation 4.12(1) (a)]**
a) Removes or causes to be removed all loose or loosened rock, mineral or ground to a safe distance from the shot hole determined by a risk assessment; and
b) Searches for any misfired hole or socket within a distance of at least two metres from the proposed position or mark.

Question 12
What are the Miner/Ganger's responsibilities after drilling of shot holes has been completed and before the initiation of explosive charges?

Answer **[MHSA Regulation 4.16(8)]**
The Miner/Ganger must:
a) Take all reasonable precautions to safeguard every person assisting him/her in the preparation of explosive charges against an accident;
b) Only charge shot holes with explosives within a reasonable time of initiation and after all persons not required to assist in the charging have been removed to a safe distance determined by risk assessment;
c) Charge only the shot holes or prepare only the explosive charges that are intended to be initiated at the next blast and, while explosives charges are awaiting initiation, ensures that they are not interfered with;
d) Except as may be necessary to re- initiate a misfired hole, do not insert more than one detonator into an explosive charge, provided that in wet workings two detonators may be used only if they are both inserted into the same cartridge and securely fastened to it;

e) Only use a means, appliance or material supplied by the Employer for the purpose of initiating of explosive charges or testing of a blasting circuit; and
f) Before any charge is initiated, take adequate measures to prevent injury to persons or damage to property caused by blasting operations.

Question 13
What are the Miner/Ganger's responsibilities after charges have been initiated?

Answer **[MHSA Regulations 4.9 and 4.10(3)]**

a) After ***explosive*** charges have been **initiated** or ***misfired holes*** have been **re-initiated**, the Miner/Ganger must not approach, or causes or permits any other person to approach, within the range of the exploding charges until he/she is satisfied that all the ***explosive*** charges have exploded or until a period of 30 minutes has expired, after the **initiation** of the charges.
b) After the ***explosive*** charges have been **initiated** by means of electricity, the Miner/Ganger must:
   i. Carefully exa*mine* for ***misfired holes*** where the charges have been **initiated**, before permitting any person to work there;
   ii. Instruct any person engaged in clearing the broken rock, *mineral* or ground to report immediately to him/her the finding of any wires that may lead to a ***misfired hole****; and*
   iii. Carefully trace any such wires to deter*mine* whether or not a ***misfired hole*** has occurred.

Question 14
Name all the steps when taking over from another Miner?

Answer

a) The Shift Boss must appoint the new Miner/Ganger in writing on his/her log book.
b) Withdraw workers to waiting place and re-examine the working place together with the old Miner/Ganger that was previously responsible for the working place and the competent "A" person/team leader.
c) After completion of the examination, both the new Miner/Ganger and the old Miner/Ganger are required to sign take-over notes or hand over notes.
d) Establish the blasting time.
e) Establish the route to the station.
f) Establish escape route to the Refuge Bay.
g) Take the keys of the explosive boxes and the explosives record book and check the amount of explosives and accessories being recorded and stored.
h) Re-examine the faces/Panels when the rock drill machines are still drilling.
i) Check the Gang card and workers clocking cards.

Question 15
Who may destroy explosives?

Answer **[MHSA Regulation 4.2(3)(i)]**
It is only the Miner or Ganger.

Question 16
What applies on night shift, in places where blasting has taken place, or remained idle for more than 48 hours?

Answer
The Miner/Ganger in charge, may instruct a competent "A" person/team leader, from a centralised instruction point, to do the examination and making safe of working places, and then allow people to enter and work, provided that:

a) The night shift Miner/Ganger have examined and make safe such places within the duration of the shift
b) The night shift Miner/Ganger reviewed with the competent "A" person/team leader the issues resulting from the start of the shift examination.
c) The competent "A" person must inform the night shift Miner/Ganger of any sources of danger found and the steps he/she has taken for the safety and health of his/her workers. The night shift Miner/Ganger must satisfy himself/herself that the working place is safe and that work can continue in a safe manner.

Question 17
What is the duty of a Miner/Ganger regarding prevention of injury against falling rocks?

Answer **[MA Regulation 8.1.4]**
In any working place the Miner/Ganger in charge must take all reasonable precautions against injury to any person from the falling of rolling of timber, rock, tools or other articles.

5.3.2 DUTIES OF A MINER/GANGER

B CHOICE QUESTIONS

Question 1
Who may examine a working place in which blasting has not taken place?

Answer **[Code of Practice]**
In the case of a development end, reclamation area or stope, in which blasting has not taken place since the last examination by the certificated Miner who is responsible, and the working place has not remained idle for more than 48 hours, a competent "A" person to examine such working place and make it safe, provided that such Miner shall, as soon as reasonable possible after work has been resumed therein, re-examine it and where necessary make it safe and sign the declaration.

Question 2
When must the Miner in charge of work not connected with production, examine such working places?

Answer **[Code of Practice]**
Where non-production work, specified and authorised by the manager or mine overseer is to be performed on consecutive days in any working place not being a sinking shaft, must be examined and where necessary made safe by the competent "A" person at the start of the period of work, and thereafter the examination at the commencement of each shift may be done by the competent person: provided that the Miner in charge, must personally examine and where necessary make safe such working at least once in every week at intervals not exceeding 10 days.

Question 3
Who is responsible for the safety of persons working in places that remained idling for more than 48 hours?

Answer **[Code of Practice]**
The Miner/Ganger responsible for such working places.

Question 4
When must a relieving Miner be appointed?

Answer **[Code of Practice]**
In cases of emergency, another Miner must be appointed in a Shift Boss logbook.
Question 5
What will the first duty of a relieving Miner/Ganger be?

Answer **[Code of Practice]**
He/she must re-examine and where necessary make safe the working place which he/she has taken over.

5.3.3 DUTIES OF A COMPETENT "A" PERSON/TEAM LEADER

A COMPULSORY QUESTIONS

A Waiting place procedure

Question 1
Describe the waiting place procedure?

Answer

a) The competent "A" person/team leader must ensure that the waiting place barrier is closed and preventing any person from entering the working place by placing a guard at the position of the waiting place barrier.
b) The competent "A" person/team leader, after arriving, must check the waiting place according to the procedures which includes the following:
   i. Test for methane/carbon monoxide and check ventilation.
   ii. Check waiting place visually and with a pinch bar (remove workers first).
   iii. Ensure that all the notices are displayed.
   iv. Ensure that the waiting place area is clean, dry and disinfected (MA Regulation 4.10)
   v. Check entry examination tool board.
   vi. Collect the workers clocking cards and put the clocking cards into the Clocking Card Box.
   vii. The Clocking card box must be marked "Clocking Card Box" and also be lockable.
   viii. The competent "A" person/team leader must complete the Gang card and place it into the Clocking Card Box.
   ix. Check the first aid equipment and telephone.
   x. Check and examine the workers personal protective equipment
   xi. Hold the health and safety meeting with the workers.
   xii. Show and explain to new workers the following:
      - Refuge Bay location and route to the Refuge Bay.
      - Refuge Bay procedure
      - Drinking water points
      - Location of underground toilets.
      - Travelling ways/escape ways

Question 2
List the topics to be discussed by the competent "A" person/team leader and his crew during the group meeting/communication session at the waiting place?

Answer

a) Health and Safety
b) Production targets
c) Work allocation
d) Briefs
e) Crew administration
f) Any other topic suggested by the line officials
g) Planned inspections as posted on the notice board

Question 3
List the requirements of the competent "A" person/team leader to conduct an entry examination in a working place?

Answer

a) The competent “A” person/team leader must select suitable competent “B” persons to assist him/her in conducting the entry examination.
b) The balance of the crew must follow the entry examination team at a safe distance and within sight of the entry examination team.
c) The examination crew must take the following tools and equipment with them:
   i. Gas Detection Instruments
   ii. Pinch bars
   iii. Whyrling Hygrometer
   iv. Barrier Tape
   v. Lockable Explosives Bag

B Examining a stope by a competent “A” person/team leader with selected team

Question 1

List the duties of the competent “A” person/team leader during the *stope* entry examination?

Answer

a) From the waiting place to the point of holing via the travelling way to the reef horizon, examine and make safe.
b) When entering the centre gully, test for flammable gases, visually check the ventilation flow, hanging wall, side wall and make safe if it is necessary.
c) Proceed upward in the centre gully, checking the ventilation brattices, winch barricades, water in the tips, disconnect the blasting wires from the lateral boxes and lock out, until the entry examination team reach the top of a stope panel/face.
d) When entering the blasted panel, test for flammable gases, check ventilation flow, ambient temperature, water down, test hanging wall and bar down loose rock, and install temporary support immediately as indicated.
e) Check for misfires, mark and plug the misfires.
f) Search for old explosives and old fuses as far as reasonable practicable and place it in the lockable bags provided for this purpose.
g) Install additional support where support has been blasted out or at dangerous hanging that cannot be barred down.
h) Examine the advanced strike gully, check the support, hanging wall, scraper winch signalling device, face winch and scraper attachments.
i) If any portion of the working place is found unsafe and cannot immediately be made safe, barricade it off or place guards until the place has been made safe.
j) If any unauthorised person is found in the working place, he/she must be reported to the Miner.
k) All high places must be tested for flammable gas.
l) Clearly instruct persons to enter in each panel that has been made safe.

C Examining a development end by a competent “A” person/team leader with a selected team

Question 1

List the duties of the competent “A” person/team leader during the development end entry examination procedure.

Answer

a) Testing of flammable gas must be carried out from the last point of through ventilation as per the flammable gas testing procedure.
b) Examine and make safe the route from the waiting place up to the face position of the development end.
c) Ensure that both blasting wires are disconnected at the blasting terminal box.

d) When entering the blasted face, test for flammable gases, check ventilation flow, measure the ambient temperature, water down, test the hanging wall and bar down loose rocks, install temporary support immediately as indicated.
e) Check for misfires, mark and plug the misfires.
f) Search for old explosives and old fuses as far as practical and place it in the lockable bags provided for this purpose.
g) If any portion of the working place is found unsafe and cannot immediately be made safe, barricade it off or place guards there until the working place has been made safe.
h) If any unauthorised person is found in the working place, he must be reported to the Miner.

D Holing procedures

Question 1
What precautions must be taken when a working place reaches a distance of 15 metres from any place, where there is, or is likely to be, a dangerous accumulation of water or noxious or inflammable gas?

Answer **[Code of Practice]**
a) The dimensions of such working to be reduced to a maximum of 2,5m in width and 2,5m in height.
b) The bore holes, sufficient in number and length must be drilled to give warning of gas or water.
c) Additional precautions must be taken to ensure the safety of persons.
d) The competent person referred to in MHSA Regulation 17.2(a) must supply the correct establishment of survey pegs and other written information for the measurement of direction and inclination of the bore holes.

5.3.3 DUTIES OF A COMPETENT "A" PERSON/TEAM LEADER

B CHOICE QUESTIONS

D Holing procedures

Question 1
If an abandoned, disused or discontinued working contains a dangerous accumulation of water or noxious or inflammable gas, who must be aware of this situation?

Answer **[MHSA Regulation 17.5(d)]**
The competent person referred to in regulation 17.2(a) must be aware of the workings being advanced within 50m from such an excavation.

Question 2
What are the requirements with regards to faces which are being advanced?

Answer **[MHSA Regulation 17.5(a)]**
The employer must take reasonable measures to ensure that the competent person referred to in regulation 17.2(a) is at all times aware of the workings which are being advanced.

Question 3
What are the requirements with regards to workings being advanced to come within 50m from any excavation, workings or restricted area?

Answer **[MHSA Regulation 17.6(b)]**
The competent person referred to in Regulation 17.2(a) must notify the employer in writing, of any workings being advanced to come within 50m from any excavation, workings, restricted area or any other place where there is, or is

likely to be a dangerous accumulation of fluid material, noxious or flammable gas. Such notification must include a sketch plan giving the distance to such place from the nearest survey station.

Question 4
When does the Surveyor notify the Manager of the position of a working face, relative to a place where there is an accumulation of inflammable gas or noxious gas or dangerous accumulation of water?

Answer **[Code of Practice]**
Before the face of a working being advanced, reaches a distance of 15 metres, the Surveyor shall give the manager written notification of the position of the working relative to such place.

5.3.4 DUTIES OF A BLASTING ASSISTANT

A COMPUSLORY QUESTIONS

Question 1
What are the duties of a Blasting Assistant regarding primary and secondary blasting?

Answer **[MHSA Regulation 4.4(3)]**
The Blasting Assistant is required to assist the Miner/Ganger with the following activities:

a) Exercising control over those explosives to be used during the performance of the duties of the Miner/Ganger as stipulated in paragraphs (ii), (iii), (iv) and (v) below;
b) The preparation of primers;
c) The charging of shot holes with or the placing of explosive charges;
d) The connecting of blasting rounds or circuits; and
e) The handling and transportation of explosives, initiation systems and accessories.