

Minerals Council South Africa



EXAMINATION PAPER

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA: INTERMEDIATE CERTIFICATE IN MINE ENVIRONMENTAL CONTROL - PAPER 1 SUBJECT CODE: COMIMEC1 EXAMINATION DATE: 09 MAY 2025 TIME: 14:00 - 17:00	Examiner: Mervin van Rooyen Moderator: Inus Labuschagne TOTAL MARKS: [100] PASS MARK: [60%]
NUMBER OF PAGES: 4 (including this page)	
SPECIAL REQUIREMENTS: <i>All candidates are advised to read the below instructions/requirements and adhere to them. Not adhering to them could lead to the loss of marks.</i> THIS IS NOT AN OPEN BOOK EXAMINATION. THERE IS NO FORMULA HANDOUT INSTRUCTIONS TO CANDIDATES: 1. Answer all questions <u>legibly</u> in English. 2. Write your <u>ID number or Passport number</u> on the outside cover of each book used and on any graph paper or other loose sheets handed in. NB: Your name <u>must not</u> appear on any answer book or loose sheets. 3. Show all calculations <u>and check calculations on which the answers are based.</u> 4. Hand-held electronic calculators may be used for calculations. 5. Write <u>legibly</u> in ink on the <u>right-hand page</u> only – <u>left hand pages will not be marked.</u> 6. Illustrate your answers by means of sketches, diagrams and tables wherever possible. 7. Answers must be given to an accuracy which is typical of practical conditions. NB Ensure that the correct unit of measure (SI unit) are recorded as marks will be deducted from answers if the incorrect unit is used. (Even if the calculated value is correct). In answering the questions, full advantage should be taken of your practical experience as well as data given. 8. Please note that you are not allowed to contact your examiner or moderator regarding this examination. 9. Cell phones and other smart devices are <u>NOT</u> allowed in the examination room.	

QUESTION 1

- 1.1 Regarding airways in Series and Parallel what laws are applicable? (6)
- 1.2 Draw a typical ventilation circuit for a deep underground mine. (6)
- 1.3 What guidelines are to be used “when all work must STOP”? (4)
- 1.4 Give the ventilation signs used on the Mine Ventilation and Rescue Plan for the following items (4)
- a) Ventilation Door
 - b) Underground fan
 - c) Regulator
 - d) Telephone

[20]

QUESTION 2

- 2.1 Reproduce/draw the table below and list advantages and disadvantages for the Chemical and Pressurised Oxygen Self-Contained Self-Rescuers. (10)

Chemical Self-Contained Self- Rescuer	
Advantages	Disadvantages
Pressurised Oxygen Self-Contained Self- Rescuer	
Advantages	Disadvantages

- 2.2 Draw a typical layout for a Refuge Bay on **your** mine. Include all statutory requirements that are required in terms of the MHSA. (10)
- 2.3 What 5 factors make up the Explosion Pentagon. (5)

[25]

QUESTION 3

- 3.1 Mine cooling can be done from Surface or Underground. Reproduce/draw the table shown below and list the Pros (Advantages) and Cons (Disadvantages) for both methods. (15)

Mine Cooling – Surface	
Pros (Advantages)	Cons (Disadvantages)
Mine Cooling – Underground	
Pros (Advantages)	Cons (Disadvantages)

[15]

QUESTION 4

- 4.1 Complete the table below regarding friction factors. SI units to be included in the answer. (3)

Airway type	K-Factor
Underground haulage, heavily timbered	4.1.1
Raise bored hole	4.1.2
Concrete line shaft, empty	4.1.3
Galvanised ventilation pipe	4.1.4
Underground haulage, rock lined	4.1.5
Concrete line shaft, streamline buntons	4.1.6

- 4.2 60 m³/s of air at a density of 1.0kg/m³ flows in a haulage with a resistance of 0.1292 Ns²/m⁸. The haulage size is 3.5m x 3.1m with a friction factor of 0.016Nm²/m⁸.

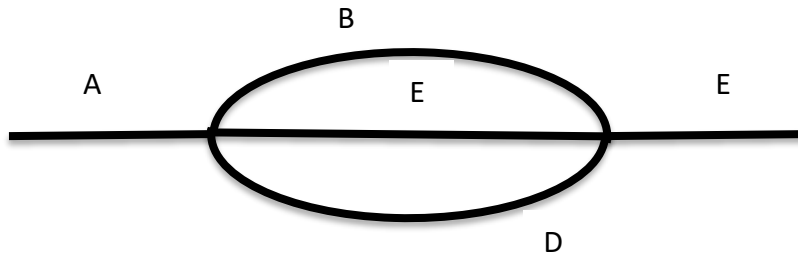
Calculate the length of the haulage (8)

- 4.3 What quantity of air will flow through a 750m long rock tunnel, 4.5m x 3.8m, with a frictional factor of 0.014 Ns²/m⁴. The specific volume of air is 0.90 m³/kg and the pressure required to overcome friction is 600 Pa. (9)

[20]

QUESTION 5

5.1 The sketch below shows diagrammatically the layout of a section of a mine where there is a combination of airways in series and parallel.



Resistances per airway:

$$A = 0.009 \text{ N s}^2/\text{m}^8$$

$$B = 0.20 \text{ N s}^2/\text{m}^8$$

$$C = 0.18 \text{ N s}^2/\text{m}^8$$

$$D = 0.10 \text{ N s}^2/\text{m}^8$$

$$E = 0.020 \text{ N s}^2/\text{m}^8$$

If the total quantity flowing through the section is $81 \text{ m}^3/\text{s}$, calculate:

- a) The overall resistance of the section, (6)
- b) The overall pressure required, (2)
- c) The volumes in each airway. (12)

[20]

TOTAL MARKS: [100]