



EXAMINATION PAPER

<p>SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA – INTERMEDIATE CERTIFICATE IN MINE ENVIRONMENTAL CONTROL</p> <p>MEC INTERMEDIATE - PAPER 2</p> <p>SUBJECT CODE: COMIMEC2</p> <p>EXAMINATION DATE: 11 MAY 2026</p> <p>TIME: 14:00 – 17:00 (3 HOURS)</p>	<p>EXAMINER: NEO DIKGALE</p> <p>MODERATOR: CASSIUS MALEBANYE</p> <p>TOTAL MARKS: [100]</p> <p>PASS MARK: (60%)</p>
<p>NUMBER OF PAGES: 4 (including this page)</p>	
<p><u>SPECIAL REQUIREMENTS:</u></p> <p><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></p> <p>THIS IS <u>NOT</u> AN <u>OPEN BOOK EXAMINATION</u>. THERE IS NO FORMULA HANDOUTS FOR THE CANDIDATES</p> <ol style="list-style-type: none"> Answer all 5 questions <u>legibly</u> in English. Write your <u>ID number</u> on the outside cover of each book used and on any graph paper or other loose sheets handed in. <u>NB:</u> Your name must not appear on any answer book or loose sheets. Show all calculations and check calculations on which the answers are based. Hand-held electronic calculators may be used for calculations. Write <u>legibly</u> in ink on the <u>right-hand page</u> only – <u>left hand pages will not be marked</u>. Illustrate your answers by means of sketches or diagrams wherever possible. Answers must be given to an accuracy which is typical of practical conditions. <u>NB:</u> Ensure that the correct unit of measure (SI unit) is recorded as marks will be deducted from answers if the incorrect or no units are used. (Even if the calculated value is correct). Please note that you are not allowed to contact your examiner or moderator regarding this examination. Cell phones and any other electronic devices are <u>NOT</u> allowed in the examination room. <u>Only Calculator</u> You are encouraged to make use of the CoMCert Tip-off Hotline whenever you witness or suspect any wrongdoing related to the CoMCert Examinations on landline 0800 118 998 or alternatively you can use email <u>COMCert@tip-offs.com</u>. This tip-off hotline and tip-off email is managed anonymously and confidentially through an independent service provider. A 100kPa Psychrometric chart is included for your reference. 	

**QUESTION 1**

- 1.1 What is the objective of Heat Tolerance Screening (HTS)? (1)
- 1.2 Describe the climatic conditions under which HTS should be conducted (3)
- 1.3 Define the following terms:
 - a. Surface rock temperature. (1)
 - b. Auto compression of air. (1)
 - c. Geothermal gradient. (1)
 - d. Thermal capacity. (1)
 - e. Latent heat of fusion. (1)
- 1.4 Provide two reasons why refrigeration is introduced as a last resort when considering engineering controls for thermal stress management. (2)
- 1.5 What is the main driving force of heat transfer? (1)
- 1.6 Name two practices of acclimatization that are used in the South African gold mining industry. (2)
- 1.7 Name two ways in which air volumes can be increased. (1)
- 1.8 List and briefly describe five methods that can be used to reduce or minimise the heat flow from the rock (5)

[20]**QUESTION 2**

- 2.1 The estimated VRT for a mine in Klerksdorp is 47.6°C. Calculate the approximate depth in meters. (3)
- 2.2 A refrigerant in a condenser adds 2250kW of heat to the water flowing to a cooling tower. The water enters at a temperature of 36°C and leaves at a temperature of 45°C. Calculate the flow rate of the water. (2)
- 2.3 Calculate the amount of heat required to change 3kg ice at -3°C to superheated water vapour at 107°C. Also state the type of heat involved in each of the processes. (8)
- 2.4 Calculate the total heat added to a 380m³/s of air at a mean density of 1.2kg/m³ that flows down a 2050m downcast shaft. (3)
- 2.5 What are two signs and symptoms of hypothermia and describe how you will treat a person who has the above symptoms? (4)

[20]

**QUESTION 3**

- 3.1 Define and explain Boyle's law. (2)
- 3.2 A kilogram of air on surface at a pressure of 83.5kPa, has a volume of 1.0m³. What would the volume of a kilogram of compressed air at a gauge pressure of 480kPa be at the same temperature? (2)
- 3.3 Inhalation of respirable particles causes different physiological effects on the body, depending on the type of pollutant. Name and describe six physiological effects. (6)
- 3.4 Explain under which circumstances can a Lombard's air density chart be used. (1)
- 3.5 Name five ways in which dust exposures can be controlled or prevented. (5)
- 3.6 Tabulate two advantages of each of the following:
- a. Cyclones (1)
 - b. Electrostatic precipitators (1)
 - c. Wet scrubbers (1)
 - d. Fibre filters. (1)

[20]**QUESTION 4**

- 4.1 A 72 bag filter is installed at an underground main tip. The bags are 2m long and 20cm in diameter. Calculate and include any assumptions related to your answer with regards to the volume of air filtered through one bag. (5)
- 4.2 List four health hazards associated with ineffective water treatment. (4)
- 4.3 Explain the term "sublimates". (1)
- 4.4 How can flammable gas accumulation can be prevented? (2)
- 4.5 Differentiate and give an example of two types of asphyxiants. (4)
- 4.6 Describe four conditions that must exist for an underground flammable gas explosion to occur. (4)

[20]

**Question 5**

- 5.1. With the aid of a sketch, explain the procedure you would follow to test for flammable gas in force ventilation system in a development end containing a diamond drilling cubby. Describe and illustrate the correct sequence of testing steps. (12)
- 5.2 A quantity of $8\text{m}^3/\text{s}$ of air entering a cooling coil at $28.0/31.0^\circ\text{C}$ and leaves the coil at 25.0°C saturated.
- Calculate the total heat removed from the air by the cooling coil if the absolute pressure is 100kPa . (3)
 - Calculate the water flowrate through the coil, if the water enters the coil at 10°C and leaves at 17.5°C . (2)
- 5.3 Briefly describe how to test and remove hazardous and toxic gases from a confined space. (3)

[20]**[100]**

PSYCHROMETRIC CHART

100,0 kPa

