

Minerals Council South Africa



EXAMINATION PAPER

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA – CERTIFICATE IN MINE ENVIRONMENTAL CONTROL	EXAMINER: S. Bergh
PAPER 5 - OCCUPATIONAL HYGIENE	MODERATOR: M. Melk
SUBJECT CODE: COMMEC 5	TOTAL MARKS: [100]
EXAMINATION DATE: 15 MAY 2023	PASS MARK: 60%
TIME: 14:30 – 17:30 (3 HOURS)	

NUMBER OF PAGES: 4 including this cover page

SPECIAL REQUIREMENTS:

THIS IS NOT AN **OPEN BOOK EXAMINATION**. **FORMULA HANDOUT IS AVAILABLE**

INSTRUCTIONS TO CANDIDATES:

1. Answer all questions **legibly** in English.
2. Write your **ID number** on the outside cover of each book used and on any graph paper or other loose sheets handed in.

NB: Your name **must not** appear on any answer book or loose sheets.

3. Show all calculations **and check calculations on which the answers are based.**
4. Hand-held electronic calculators may be used for calculations.
5. Write **legibly** in ink on the **right-hand page** only – **left hand pages will not be marked.**
6. Illustrate your answers by means of sketches or diagrams 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).

8. In answering the questions, full advantage should be taken of your practical experience as well as data given.
9. Please note that you are not allowed to contact your examiner or moderator regarding this examination.
10. Cell phones and other electronic devices are **NOT** allowed in the examination room.

QUESTION 1

1. Define the following:

- 1.1. Occupational Stress
- 1.2. Ceiling Limit or OEL-Ceiling
- 1.3. Inhalable Dust
- 1.4. Visual Acuity
- 1.5. The term LD50 when referring to toxicology.
- 1.6. Sampling Areas
- 1.7. Fume
- 1.8. Capture Velocity
- 1.9. Reasonably Practicable
- 1.10. Workplace

(10)

1.2. As the appointed Occupational Hygienist, you are required to conduct an Airborne Pollutants Health Risk Assessment in a new area of the mine. Please describe the minimum information that need to be recorded in the report of the assessment.

(4)

1.3. Illumination measurements taken in a storeroom/workshop area are:
120; 80; 40; 50; 100; 130; 20; 140; 30; 160.

1.3.1. Calculate the average illumination level in lux and compare it to the Standard of 75 lux

1.3.2. Comment on the answer.

(3)

1.4. The concentration of CO is 60 ppm. The molecular mass is 180 and the absolute temperature is 273 degrees Kelvin. The temperature of a substance is 24 degrees Celsius, and the pressure is 760 mm HG.

1.4.1. Calculate the exposure in mg/m^3 .

1.4.2. Based on the answer above, are employees overexposed?

(3)

Total Marks: **(20)**

QUESTION 2

(Statutory Sampling, Reporting and Airborne Pollutants)

2.1. Chapter 9 of the Mine Health and Safety Act Regulations (MHSA, Act. 29 of 1996) states the employer must establish and maintain a system of Occupational Hygiene Measurements where certain hazards limit prevail. List the hazards and state what levels monitoring will be required. (7)

2.2. State the steps to be taken to calculate a 90th percentile (3)

2.3. The data below was obtained during airborne pollutant sampling:

	Flow rate	Time	Weight (mg)
Before	2.5 lpm	7:00	0.0005
After	2.2lpm	11:00	2.0010

2.3.1. What is the employee's 5hr TWA total dust exposure if he/she is exposed to 7% silica? (3)

2.3.2. Is the employee excessively exposed if the employee works 5 hours per day? (1)

2.3.3. Does a mask with the protection factor of 10 provide sufficient protection? (1)

2.3.4. What control measures will you recommend (5)

2.4. Briefly discuss the health requirement for effective ventilation (6)

2.5. Before selecting an appropriate respirator for employees, the occupational hygienist should firstly assess the workplace, which aspects of the workplace need to be considered? (4)

Total Marks: (30)

QUESTION 3

- 3.1. Name the auditory ossicles (3)
- 3.3. The employees are using an earplug with NNR of 35 DB (Witten on the packet) and are exposed to the following equivalent levels:
- 4 hours – 73 dB(A).
 - 2 hours – 90 dB(A).
 - 4 hours – 90 dB(A).

Calculate the following:

- 3.3.1. L_{eq} (7)
- 3.3.2. Does the earplug provide sufficient protect? (3)
- 3.4. How will you go about carrying noise equipment assessment on different equipment and explain legislation applicable to your assessment. (7)

Total Marks: **(20)**

QUESTION 4

- 4.1. Briefly discuss the effects of shift work on employees. (5)
- 4.2. In 2020 the world was hit by a pandemic, which brought it to a standstill. Explain and discuss control measures implemented. (15)

Total Marks: **(20)**

QUESTION 5

- 5.1. Briefly define DPM (1)
- 5.2. Does RSA currently have an OEL for DPM? Please state 2 limitations of OEL's (3)
- 5.3. List the 4 main mechanisms by which particulate matter will be deposited in the respiratory tract (2)
- 5.4. Calculate the maximum breakthrough you would allow when the front portion of the tube contain 250 ppm of a chemical environmental factor (2)
- 5.4.1. The role of the occupational hygienist is to anticipate, recognise, evaluate and control those conditions at a mine, or workplace, which may cause illness or adverse health effects to persons. Considering the role of diesel engines in the underground mining environment, and the exposure of personnel to their output, list 2 common gases associated with internal combustion engines and their respective OEL's. (2)

Total Marks: **(10)**