



Minerals Council South Africa

EXAMINATION PAPER

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA – CERTIFICATE IN MINE ENVIRONMENTAL CONTROL – OCCUPATIONAL HYGIENE PAPER 5 SUBJECT CODE: COMMEC5 EXAMINATION DATE: 15 OCTOBER 2018 TIME: 14:30 – 17:30	EXAMINER: Ms. S Wheeler MODERATOR: Prof C Badenhorst TOTAL MARKS: [100] PASS MARK: (60%)
NUMBER OF PAGES: 7	
SPECIAL REQUIREMENTS: THIS IS NOT AN OPEN BOOK EXAMINATION. FORMULA HANDOUT IS AVAILABLE INSTRUCTIONS TO CANDIDATES: 1. Answer all questions <u>legibly</u> in English. 2. 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. 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 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 are <u>NOT</u> allowed in the examination room.	

QUESTION 1

1.1 Welding fumes consist of mixtures of airborne gases and fine particles which if inhaled or swallowed may result in risks to health. The degree of risk will depend on, the composition of the fume, the quantity of the fume in the air which is breathed in and the duration of exposure. List and discuss the main health effects associated with excessive exposure to welding fumes.

(4)

1.2 List ten (10) aspects that should be included in a report on occupational exposure assessment.

(5)

1.3 List and briefly discuss the 7 steps that should be addressed in a Code of Practice pertaining to the “**Determination of HEGs**”, as stipulated in the new Guideline for the Compilation of a Mandatory Code of Practice: Occupational Health Programme on Personal Exposure to Airborne Pollutants.

(14)

1.4 Name two analytical methods commonly used in South Africa to identify and quantify the crystalline silica content of a collected respirable dust sample.

(2)

[25]

QUESTION 2

- 2.1 The following exposure data was collected for a specific HEG. Using the statistical method described in the new Guideline for an Occupational Health Programme on Personal Exposure to Airborne Pollutants, determine whether the HEG is statistically correctly defined. Interpret your results.

(10)

Exposure Data (HEG A)
0.89
1.32
1.78
1.87
1.51
1.45

Descriptive Statistics	
Mean	1.47
Standard error	0.14
Median	1.48
Mode	N/A
Standard deviation	0.35
Sample variance	0.12
Kurtosis	0.57
Skewness	-0.72
Range	0.98
Minimum	0.89
Maximum	1.87
Sum	8.82
Count	6
Confidence level (95%	0.36

- 2.2 List five consequences associated with shift work (5)
- 2.3 Briefly discuss and give examples of the two basic types of hearing loss. (6)
- 2.4 Describe the key objectives of industrial audiometry. (4)

[25]

QUESTION 3

3.1 Define the following terms

(5)

3.1.1 Raynaud's symptoms

3.1.2 Physiology

3.1.3 Visual Acuity

3.1.4 Sensitisers

3.1.5 Ionising radiation

3.2 Briefly discuss exposure to radiation associated with underground mining activities under the following headings:

a) Short-lived alpha emitting radionuclides

b) Long-lived alpha emitting radionuclides.

(8)

3.3 Discuss the effects of radiation on the human body under the following headings

(a) Physiological effects

(b) Biological effects

(8)

3.4 List four underground areas where exposure to radiation is most likely to occur.

(4)

[25]

QUESTION 4

A gravimetric dust sampling pump was issued to an underground employee in a gold mine. The dust pump operated for 520 minutes at a flow rate of 2.2l/s. The pollutant is crystalline silica quartz and was determined as 23.5% by means of a laboratory analysis. The gravimetric sampling analyst recorded the following information in the laboratory:

The average reference filter pre and post filter masses were as follows:-

Pre reference filter mass	Post reference filter mass
20.01mg	20.08mg
19.98mg	20.00mg
20.17mg	20.17mg

The pre weight sample filter mass was 20.15mg. whilst the post weight of the sample was 20.98mg. Determine the following:-

- The corrected sample mass;
- The sample concentration;
- The TWA dust concentration;
- The pollutant concentration;
- AQI

4.2 What will the calculated Air Quality Index be if a known concentration of 0.6mg/m³ insoluble nickel was measured in the same location.

(5)

7

4.3 State the current 8hr TWA OEL (as per the South African Mine Health and Safety Act and Regulations, Act 29 of 1996) for the following health stressors and give a typical example of sources of the stressors in the mining industry.

(5)

4.3.1 CO₂

4.3.2 Noise

4.3.3 CO

4.3.4 DPM

4.3.5 SiO₂

[25]

TOTAL MARKS: 100