



UNIVERSITY OF SWAZILAND

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE

BSc DEGREE IN ENVIRONMENTAL HEALTH SCIENCES

MAIN EXAMINATION, MAY, 2019

TITLE OF PAPER : HEALTH RISK ASSESSMENT
COURSE CODE : EHS 332

TIME : 2HOURS

TOTAL MARKS : 100

INSTRUCTIONS:

- 1. QUESTION 1 IS COMPULSORY**
- 2. ANSWER ANY OTHER THREE QUESTIONS**
- 3. ALL QUESTIONS ARE WORTH 25 MARKS EACH**
- 4. BEGIN THE ANSWER TO EACH QUESTION IN A SEPARATE SHEET OF PAPER.**

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QUESTION 1

Multiple choices: Write True or False against each letter corresponding to the following statements as they apply to risk management.

- a) The primary mechanisms used to identify and assess occupational health risks are occupational hygiene measurements and medical surveillance.
- b) The likely consequences of a hazard must be evaluated in order to determine what measures should be taken to control it.
- c) Investigations into accidents and other health threatening occurrences are unimportant in risk identification and assessment.
- d) It is necessary to rely on some form of observation or measurement to verify that the hazard exists.
- e) The health effects associated with exposures in the workplace and the evaluation of the data is not dependent on the nature of the exposure.
- f) Skin penetration is best assessed by biological monitoring of urinary metabolites and blood samples.
- g) The primary reason for conducting a workplace assessment is to assess the risk(s) to the health of employees.
- h) A hazard is something that can cause harm if not controlled.
- i) A risk is a combination of the probability that a particular outcome will occur and the severity of the harm involved.
- j) Risk assessment is about identifying sensible measures to control the risk(s) in the workplace.
- k) Occupational health management is about improving workplace conditions and eliminating illness and disability related to work.

(22 marks)

- II. The reduction or elimination of workplace risk, disease and disability mainly depends on the factors where risk is managed at operational level, name **three** of those factors.

(3 marks)

QUESTION 2

Using the information in the case study below:

- a) Identify four high exposure groups and give support to your answer. **(12 marks)**
- b) Conduct a SHE risk assessment on high exposure group. **(8 marks)**
- c) Identify existing controls measures and also identify gaps **(5 marks)**

N.B :Use data provided in the Case study and also data in APPENDIX 1

Case study

Imbewulenhle(PTY) Ltd has a coal mine. The company has a Managing Director and 10 Administrative staff members.

The coal is mined with the use of a continuous miner. Recycled water is used for dust control purposes. Two hundred employees climb 30 flights of stairs, with 50 each, covering approximately 3km to the coalface. Supervisors visit 3 similar workplaces a day. Operations managers visit one coalface every week.

Raw coal received from the mine is offloaded by means of a tipper and conveyed to be stored in open bunkers, blending beds and silos. Before the coal is loaded into the ovens it is crushed into smaller particles and sieved into a couple of size fractions by a screening process. Each fraction is sent through various washing and separation processes. 10 workers oversee this process.

Exposure monitoring shows that the OEL-TWA was exceeded.

The crushed coal is then conveyed from the overhead coal bunkers by conveyer belts to a charging car at the Coke oven to be charged. 2 employees walk up and down the conveyer belt covering 100m every hour. The charging car removes the charge hole covers and dumps the coal into the oven by opening its charge bin gates. Because crushed coal is used the working environment is polluted with coal dust. The oven covers are replaced as the car moves to collect some more coal.

As the ovens are charged vast amounts of smoke and dusts occur. Coke oven and blast furnace gases are used as fuel to heat the coal in the oven. Blast furnace gases contain a high percentage per volume carbon dioxide, carbon monoxide, and nitrogen. 20 operators continuously complain about headaches, fatigue and nausea, irritation of the upper respiratory tract and burning of eyes and noise.

An employee collects gas samples every 30 minutes. He transports the samples to the laboratory where 20 employees are continuously doing qualitative and quantitative analysis on the gases.

At the end of the coking period the pusher machine operator push the coke (cake) with a pusher bar out of the oven. Understandably, large amounts of gas and dust are released during this process. The operator of the guide machine on the opposite side of the oven aligns the guide machine exactly opposite the pusher machine. Two assistants remove the side door to allow the coke to be pushed out of the oven. The quench car, pushed around by the quench loco, collects the coke underneath the oven the ovens and transports the coke to the quench tower, where water is spread over the coke to prevent it from burning. During this process a large quantity of steam, and also fine coke particles, and even organic and inorganic matter may pollute the working environment. During the process a faint smell of rotten egg is noticeable.

The clay running on the same track as the guide machine is used to seal the openings between the doors and the doorframes to prevent gas escaping the ovens. To allow

operators to seal the entire door (4m high) the car can lift the operator alongside the door. The cleaning of the doors and frames is essential before it is being replaced to ensure optimisation of the process.

SHE data

The following SHE data is provided.

| | |
|----------------|--|
| Athletes foot | 10 cases are treated (on average) |
| Fall of ground | 15 incidences per year with an average fatality rate of 10 per annum |
| Hand injuries | 360 minor hand injuries are recorded |
| silicosis | 10 miners have been diagnosed with the disease |
| Dermatitis | 4 laboratory employees suffer from an allergy due to the use of latex gloves. |
| Ergonomics | 3 employees (weighing 110kg and are 2.0 m tall) working on the continuous miner continuously complain about backaches |
| Airflow | At face is 0.5 m/s Within silos 10 – 15 m/s |
| Heat survey | An average of 29.5 degrees Celsius recorded on top of the Coke ovens during the months of June, July and August. |
| Noise survey | Personal noise exposure at the face, a Leq of 110dB(A) Personal noise exposure at the screens, an average Leq of 95 dB(A) |
| General | The administrative staff visits the clinic on a regular basis complaining of headaches and fatigue |
| TB | The prevalence rate for TB is 20% |
| HIV/AIDS | 10% of the workforce, primarily the miners suffer from HIV/AIDS |

Existing control procedures

All employees are supplied with:

- Hard hats
- Safety shoes
- 2 sets of overalls
- Vibraphones

All employees are subjected to:

- Medical examination tests including a physical examination and audiometric tests as well as X-Rays and lung function tests.
- An induction programme, which inter alia covers the hazards, and risks associated with the work being conducted.

QUESTION 3

Describe risk assessment and hazard control under the following headings:

- a) Identifying and assessing risks [12]
 - b) The hierarchy of control [6]
 - c) Investigations [2]
 - d) Training [3]
 - e) Employee participation in risk assessment [2]
- (25 marks)**

QUESTION 4

- a) One of the steps in carrying out a risk assessment is to **identify the hazards**. The hazard identification process involves understanding the adverse effects of a substance or preparation to which workers may be exposed.

Describe ways that may be used to anticipate hazards.

(10 marks)

- b) Describe the components of a safety statement **(10 marks)**
- c) Describe the requirements of a valid measurement as applied in occupational hygiene. **(5 marks)**

QUESTION 5

- a) Describe steps to be followed when developing a safety and health management programme.

(25 marks)

APPENDIX 1

| | | | |
|---------------------------------|---|---|-----|
| Consequence | | | |
| Catastrophic (10% mortalities) | 10% mortalities or damage > E10m | P: mortality recorded; E: Large irreversible impact | 100 |
| Disaster (5% mortalities) | 5% mortalities or damage > E5m | P: mortality possible; E: moderate irreversible impact | 40 |
| Very serious (1% mortalities) | 1% mortalities or damage > E1m | P: mortality unusual; E: minor irreversible impact | 15 |
| | | | |
| Serious (10% permanent illness) | 10% permanent disabilities or damage > E0.5m | P: permanent disability recorded; E: large irreversible impact | 7 |
| Serious (5% permanent illness) | 5% permanent disabilities or damage > E0.1m | P: permanent disability possible; E: moderate irreversible impact | 6 |
| Serious (1% permanent illness) | 1% permanent disabilities or damage > E 20 000 | P: permanent disability unusual; E: minor irreversible impact | 5 |
| | | | |
| Serious (10% temporary illness) | 10% temporary disabilities or damage > E 10 000 | P: temporary disability recorded; E: large controlled release | 4 |
| Serious (5% temporary illness) | 5% temporary disabilities or damage > E 5 000 | P: temporary disability possible; E: moderate controlled release | 3 |
| Serious (1% temporary illness) | 1% temporary disabilities or damage > E 2 000 | P: temporary disability unusual; E: minimal controlled release | 2 |
| | | | |
| Of concern (10% minor illness) | (10% minor disabilities or damage > E 1 000 | P: complaint recorded; E: large nuisance | 1 |
| Of concern (5% minor illness) | (5% minor disabilities or damage > E 500 | P: complaint possible; E: moderate nuisance | 0.5 |
| Of concern (1% minor illness) | (1% minor disabilities or damage > E 200 | P: complaint unusual; E: minor nuisance | 0.1 |

P = Public, E = Entertainment



| | | |
|---------------|----------------|-------------------------------|
| 400 and above | Eliminate | Consider to discontinue |
| 250-399 | Very high risk | Immediate correction required |

| | | |
|---------|-------------|------------------------------|
| 150-249 | High risk | Correction needed |
| 70-149 | Medium risk | Indicate attention necessary |
| 20-69 | Low risk | Little attention necessary |

Table 2: Risk classification

**QUANTITATIVE AND QUALITATIVE RISK ASSESSMENT
EXPOSURE**

- Continuous for 8 hour shift (10)
- Continuous for between 2 and 4 hours (6)
- Continuous for between 1 and 2 hours (3)
- Short periods of time (a few times per month) (2)
- Unusual (a few times per year) (1)
- Rare (yearly) (0.5)
- Exceptionally exposed (0.1)

PROBABILITY OF EXCEEDING OEL

- Exceeding OEL-C (10)
- Exceeding OEL-STEL (6)
- Exceeding OEL-TWA (3)
- Exceeding action level (50% of TWA) (1)
- Exceeding 25% of TWA (0.5)
- Exceeding 10% of TWA (0.2)
- Virtually impossible (approaches the impossible) (0.1)