# UNIVERSITY OF SWAZILAND

## FACULTY OF HEALTH SCIENCES

## DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE

## BSc DEGREE IN ENVIRONMENTAL HEALTH SCIENCES

## MAINEXAMINATION, MAY, 2017

TITLE OF PAPER    : PRINCIPLES OF OCCUPATIONAL HEALTH
AND SAFETY

COURSE CODE    : EHS218

TIME    : 2 HOURS

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

I. **Multiple choices: For the following statements as applied in principles of occupational health and safety write whether they are True or False.**

a) A Maximum Exposure Limit is the concentration of an airborne substance, averaged over a reference period, at which, there is no evidence that is likely to be injurious to employees if exposed by inhalation, day after day to that concentration.

b) An Occupational Exposure Limit is the maximum concentration of an airborne substance, averaged over a regulatory required reference period to which employees may be exposed by inhalation under any circumstances.

c) An occupational hazard is a risk accepted as a consequence of a particular occupation

d) Occupational illness is defined as a condition that results from exposure in a workplace to a physical, chemical or biological agent to the extent that the normal physiological mechanisms are affected and the health of the worker is impaired.

e) An air sample has three basic ingredients; amount of pollutant collected, air flow through the filter medium and the run time.

f) Threshold Limit Value (TLV) refers to airborne concentration of a substance and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects.

g) Threshold Limit Value for fumes, mists, and dusts as milligrams per cubic meter (mg/m3) of surrounding air.

h) Threshold Value-Time Weighted Average is the time weighted concentration for a normal 8-hour workday anda 40-hour workweek, to which it is believed that nearly all the workers may be repeatedly exposed day after day , without adverse health effect.

i) Skin Notation designated "Skin" refers to the potential significant contribution to the overall exposure by the cutaneous route.

j) Dermal exposure can result in occupational skin diseases and systemic toxicity.

k) For respirable dust a cyclone is used which separates the respirable fraction, which is above $7\mu$, of the particulate from the atmosphere drawn through it.

**(22 marks)**

II.

Define occupational hygiene.

**(3 marks)**

## QUESTION 2

    i.    Briefly describe the following core occupational health and safety principles:

        a)  Occupational health and safety policies

        b)  A National System for Occupational Health and Safety

        c)  Information is vital for the development and implementation of programmes and policies.

        d)  Health Promotion

        e)  Occupational Health Services.

        f)  Continuous improvement of Occupational Health and Safety

**(18 marks)**

    ii.    An operator is exposed to 0.12 mg/m$^3$ of an air pollutant for 7 hours and 20 minutes. Calculate an 8 hour Time-weighted Average of the pollutant.

**(7 marks)**

## QUESTION 3

    i.    Describe sampling methods under the following heading:
        a)  Filter sampling of inhalable dust
        b)  Filter respirable dust
        c)  Bag sampling

**(9 marks)**

    ii.    Describe the skin hazards

**(10 marks)**

    iii.    Prove that doubling the pressure leads to an increase of 6dB in the sound pressure level.

**(6 marks)**

## QUESTION 4

**a)** A reverberant enclosure 10 m long, 6m wide and 3m high, has an average absorption coefficient of 0.26. What is the reverberation time of the enclosure?

**(6 marks)**

b) Describe three mechanisms by which chemicals diffuse into the skin.

**(9 marks)**

c) A sound source emits 1watt of power, calculate the sound power level.

**(7 marks)**

d) Briefly describe Silicosis

**(3 marks)**

## QUESTION 5

i.   Two sound sources are emitting sound into space concurrently of 85 dB and 90 dB, respectively. Determine the combined sound power level. If the standard is 85 dB, comment on your answer.

**(10 marks)**

ii.  Describe five types of hazards that may be found at the workplace.

**(15 marks)**

## FORMULAE- ACOUSTIC AND HEALTH

1. $W = \sum\limits_{i=1}^{4} \dfrac{p2rms(1)Si}{\rho C}$, where $\rho C = 420$ RAYLS.

2. $L_p = 10 \log (p_1/p_0)^2$

3. $NR = 10 \log_{10} = \dfrac{TA_2}{TA_1}$

4. $SPL_t = 10 \log_{10} [\sum 10^{SPL/10}]$

5. $L_W = 10 \log W/W_0$

6. $I = \dfrac{W}{A}$

7. $I = \dfrac{p^2_{rms}}{\rho C}$ or $p_{rms} = (I \rho C)^{1/2}$

8. $S.I.L = 10 \log_{10} (I/I_{ref})$

9. $R = \dfrac{S\bar{\alpha}}{1-\bar{\alpha}} = \dfrac{19.8}{} = 22.10$

10. $\bar{\alpha} = \dfrac{S_i\bar{\alpha}_i + S_2 \bar{\alpha}_2 + ....}{S_i + S_2}$

11. $SPL_t = SWL + 10 \log_{10} \left\{ \dfrac{Q}{4\pi r^2} + \dfrac{4}{R} \right\}$

12. $T = \dfrac{0.161 \ V}{S\bar{\alpha}}$

13. $T = \dfrac{0.161 \ V}{- S[\ln ( 1- \bar{\alpha})] + 4mV}$

14. $\tau = \dfrac{p_t^2/\rho C^2}{p_i^2/\rho C^2}$

15. $TL_{brick} = 10 \log_{10}\left\{\dfrac{1}{\tau}\right\}$

16. $[ C_1 T_1 + C_2 T_2 \text{-------} C_n T_n]/ 8$