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# Minerals Council South Africa

**EXAMINATION PAPER**

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| **SUBJECT:**<br><br>**CHAMBER OF MINES OF SOUTH AFRICA – CERTIFICATE IN MINE ENVIRONMENTAL CONTROL - PAPER 4**<br>**SUBJECT CODE: COMMEC4**<br><br>**EXAMINATION DATE: 12 OCTOBER 2018**<br><br>**TIME: 14:30 – 17:30** | **EXAMINER: R A Rabaji**<br><br>**MODERATOR: A R Nundlall**<br><br>**TOTAL MARKS: [100]**<br><br>**PASS MARK: 60%** |

**Examination Instructions:**

This examination question paper consists of **3** pages **FORMULA HANDOUT IS AVAILABLE**

1. Answer all **5** questions in *English*.
2. Put your identification 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 your answers are based**.
4. Hand-held electronic calculators may be used for calculations only.
5. Write in ink on the **right hand page** only – the left hand page 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 units 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. This is **NOT** an open book examination but the approved formula hand out may be used.
11. Cell phones are **NOT** allowed in the examination room

**QUESTION 1**

An underground trackless section is using the following diesel powered rubber tyre equipment, 132 kW LHD vehicle with exhaust flow rate of 0.30$m^3$/s, 165 kW dump truck with exhaust flow rate of 0.25$m^3$/s (both de-rated), an electrically driven drill rig, auxiliary vehicles such as a 45 kW scissors lift and a 41 kW utility vehicle.

a) Name six major airborne pollutants emitted from diesel engines, and their respective Occupational Exposure Limits (OELs) **(6)**

b) Determine the quantity of air required in the section with an air ratio factor of 0.08$m^3$/s/kW. **(4)**

c) Calculate the amount of air required at the point of application of the LHD if the exhaust fumes contains 150ppm $NO_x$ fumes. **(4)**

d) How much fresh air would be required if both the LHD and dump truck are operating each emitting 150ppm $NO_x$ concentrations. **(6)**

**QUESTION 2**

a) An inspector visits your mine to investigate an alleged exposure to fumes where the LHD caught fire in the section. Name <u>thirteen items of information</u> you will present as an appointed Sect 12.1 (MHSA). **(13)**

b) Briefly explain the following terminology in terms of reducing the risk of coal dust explosions. **(7)**

i. Active workings
ii. Face Area
iii. Last Through Road
iv. Too wet
v. Chain Road
vi. Multi Road
vii. Longwall

## QUESTION 3

**a)** State five common human failings during a fire emergency. **(5)**

**b)** Give three swift but appropriate actions required during a fire emergency. **(3)**

**c)** If fires do occur, they should be _____ and _____ without delay. **(2)**

**d)** List the approximate percentages or volumes of gases produced by free burning fires for: **(10)**

- Wood (%Co & %$Co_2$)
- HDPE (%Co)
- LDPE (%Co)
- PVC (%Co & %HCL)
- Phenol formaldehyde (%Co & %$SO^2$)
- Polystyrene (%Co & %$SO^2$)

## QUESTION 4

You have been informed that a fire is burning in a section of the mine. Immediately after this the fire was sealed off, the barometric pressure on both sides of the wall was measured as 111kPa. On the next visit, the barometric pressure behind the wall was 118kPa and 111kPa again on the access side. The seal was also found to be leaking. If the specific resistance of the seal was estimated to be 400$Ns^2/m^8$, then:-

**a)** Which way did the air leak through the seal?

**b)** What is the air quantity leaking through the seal?

**c)** If 20$m^3$/s of normal air is containing nil ppm CO, and 3000 $CO_2$ flows past the seal, where the air leakage from the seal contains 8% $CO_2$ and 2% CO by volume, determine what the ppm concentrations of these gases would be on the return side of the fire, after dilution.

**d)** Comment on the resultant gas concentrations and compare them with any statutory requirements. Would you allow people to continue to work downstream of the seal?

**e)** Determine and comment on the quantity of fresh air required to ensure that conditions downstream of the seal comply with statutory requirements. (1**5)**

**QUESTION 5**

**a)** List any ten steps of conducting an effective risk assessment. (**10)**

**b)** Give **SEVEN reasons** for abnormally high flammable gas emissions. (**7)**

**c)** Describe the four main advantages of creating an efficient (preferably Computerised) database of occupational hygiene and medical information to: - **(8)**

- The occupational hygienist
- The occupational medical practitioner

**TOTAL MARKS: 100**