



EXAMINATION PAPER

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA - INTERMEDIATE CERTIFICATE IN MINE ENVIRONMENTAL CONTROL PAPER 2 SUBJECT CODE: COMIMEC2 Date: 16 October 2017 Time: 14:30 – 17:30	Examiner: MS Davids Moderator: N Kruger TOTAL MARKS: [100] PASS MARK: 60%
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NUMBER OF PAGES: 8

Examination Instructions:

1. Answer all questions in *English*. **THERE ARE NO FORMULAE HANDOUTS**
2. Put your examination 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.
11. Cell phones are **NOT** allowed in the examination room.
12. **Please find attached the psychrometric charts of 100 kPa and 105 kPa**

2

QUESTION 1

1.1 Give the definitions and Units of the following:-

- 1.1.1 Wet-bulb temperature
- 1.1.2 Dry-bulb temperature
- 1.1.3 Sensible heat
- 1.1.4 Latent heat
- 1.1.5 Joule

(5)

1.2

1.2.1 If the kata thermometer is not available, calculate the kata reading when given the following:-

Velocity = 0.6 m/s

Temperature = 31.0/32.5

State whether the calculated kata is acceptable or not

(3)

1.2.2 The measured wet kata reading in a working place is 9.8 and the wet-bulb temperature is 30.9. Calculate the air velocity.

(3)

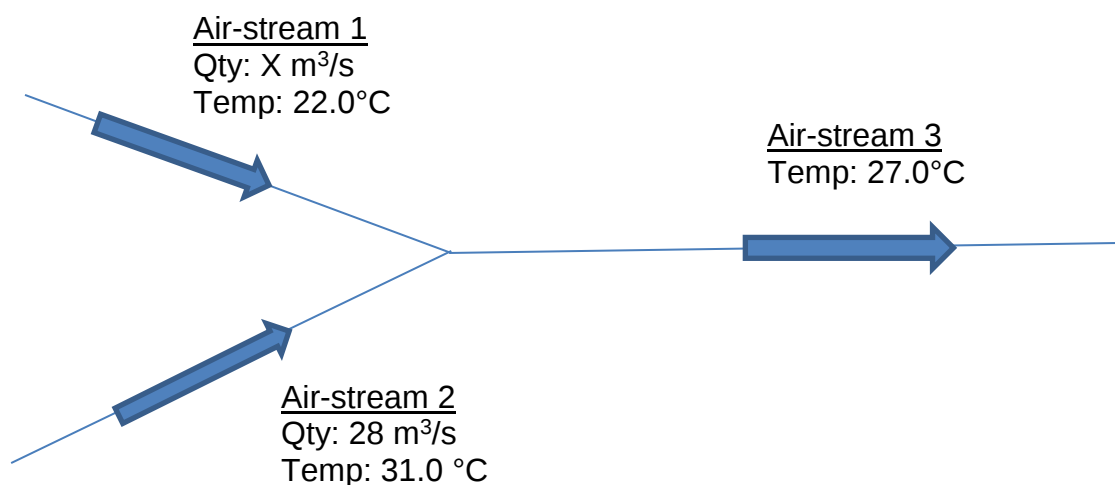
1.2.3 Calculate the approximate VRT at a depth of 2500 m for a gold mine in the Free State.

(4)

(10)

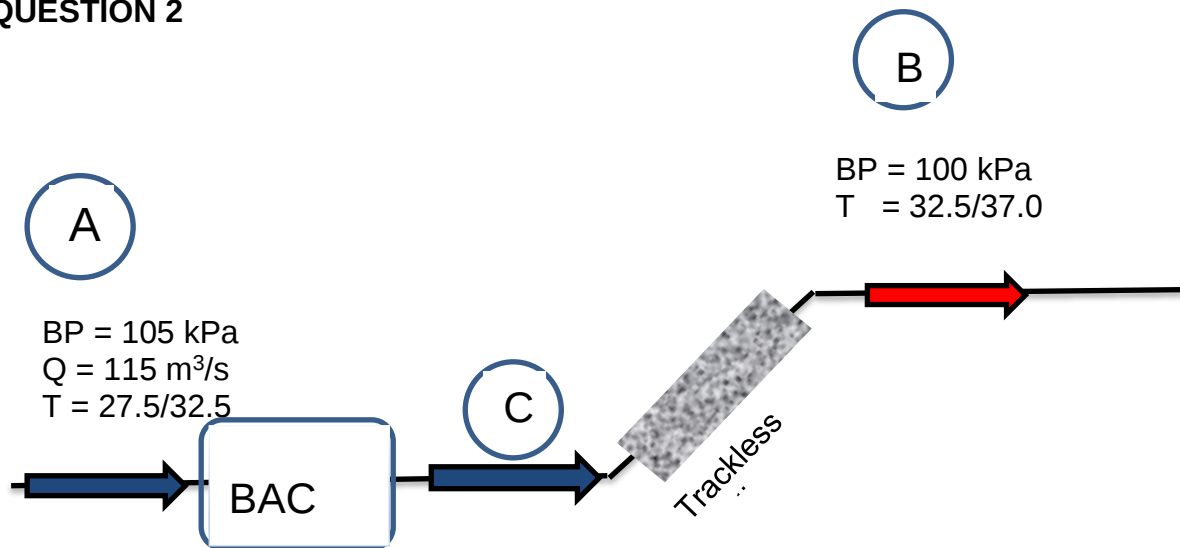
1.3 Calculate the air quantity to be supplied from air-stream 1 to make sure that the dry-bulb temperature after mixing does not exceed 27.0°C

(3)



- 1.4 Calculate the energy required to convert 2kg of ice at -2°C to superheated water vapour at 105°C . If the process took 0.0833 hours, calculate the power involved.

(7)

[25]**QUESTION 2**

- 2.1 A trackless section in a deep underground mine experienced high reject temperatures and installed a BAC on the intake side of the section. By using psychrometric charts calculate the following parameters:

- 2.1.1 Calculate the total heat load in the trackless with the readings at points A and B before the BAC was installed. (Ignore the effects of auto compression). (2)
- 2.1.2 The BAC installed is rated at 5000 kW, but can only operate at 50% of the designed duty due to insufficient water supply. Determine what will be the expected wet and dry bulb temperatures at point C (BAC return). Assume the air/water heat transfer was 100%. (4)

2.1.3 Determine the wet and dry bulb temperatures at point B (trackless return) with the BAC operating. The return humidity is 70%. (3)

2.1.4 An additional trackless fleet has been allocated to increase production and will generate at least 1200 kW more heat into the section. Determine new reject temperature at point B. (3)

2.2 A bulk Air cooler (BAC) was installed in the main intake to an underground section. The water intake temperature was 8°C, water outlet temperature only 16°C with a flowrate of 90 l/s. An air volume of 105 m³/s enters the BAC at 29.0/32.0 °C with a barometric pressure of 105 kPa.

2.2.1 Calculate the water heat transfer duty of the BAC and the air Massflow through the BAC. (2)

2.2.2 The wet bulb air outlet temperature of the BAC if it was operating at 100 % and 50 % efficiencies. (7)

2.2.3 What is the minimum BAC efficiency to be maintained to ensure an outlet wet bulb temperature of not less than 25 °C. (3)

2.2.4 What will be the main reason for a BAC to start losing efficiency if the water flow remains constant? (1)

[25]

QUESTION 3

3.1 Name the objectives of sampling for airborne pollutants. (6)

3.2 Name advantages and disadvantages of cyclones infiltration of air in table form. (6)

Cyclones	Advantage	Disadvantage

3.3 Name reasons for sampling mine water. (6)

3.4 Complete the properties of the following gases:- (6)

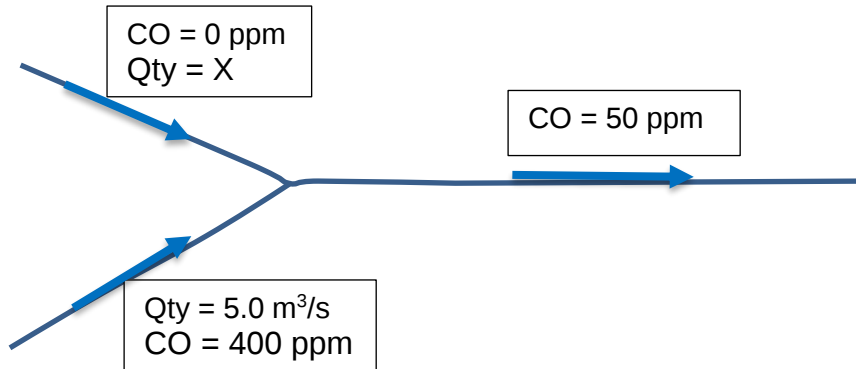
Properties	Butane	Ethane	Propane
Explosive range			
Specific gravity			

3.5 Name the Occupational Exposure Limit of Oxygen. (1)

[25]

QUESTION 4

4.1



Calculate the quantity to be supplied from air-stream 1 to ensure that the CO concentration after mixing does not exceed the TWA OEL. (5)

4.2 Name and describe the three types of hearing loss induced by exposure to noise and describe each effect. (6)

4.3 Name any five (5) effects of whole body vibration (5)

4.4 Name any five effects of localized vibration. (5)

4.5 Name any 4 (Four) beneficial effects of good or improved illumination? (4)

[25]**TOTAL MARKS: 100**

100,0 kPa

