



<u>PROGRAM</u>	: NATIONAL DIPLOMA ENGINEERING METALLURGY
<u>SUBJECT</u>	: EXTRACTIVE METALLURGY II
<u>CODE</u>	: TEX2111
<u>DATE</u>	: SUMMER EXAMINATION SSA 2014 01 DECEMBER 2014
<u>DURATION</u>	: (Y - PAPER) 11:30 – 14:30
<u>WEIGHT</u>	: 40:60
<u>TOTAL MARKS</u>	: 105
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<u>EXAMINER</u>	: Dr. SC DU PLESSIS
<u>MODERATOR</u>	: Mr. M. KALENGA
<u>NUMBER OF PAGES</u>	: 3

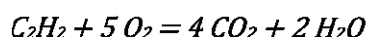
INSTRUCTIONS TO CANDIDATES:

1. PLEASE ANSWER ALL THE QUESTIONS.
 2. CALCULATORS ARE ALLOWED.
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Question 1

$C_2H_2 = + 226.9 \text{ MJ/kg mol}$, $CO_2 = -398.8 \text{ MJ/kg mol}$, $H_2O = - 290.2 \text{ MJ/kg mol}$

- Calculate the heats of reaction for the following reaction:



- in MJ per kg of C_2H_2
- in MJ per cubic meter of C_2H_2
- in MJ per cubic meter of CO_2 formed

(15 marks)

Question 2

A zinc sulphide concentrate contains 50 percent Zn, 13 percent Fe, 32 percent S, and 5 percent SiO_2 . When 100 kg is roasted with air, 85 kg of calcine with 54.5 percent Zn, 14.1 percent Fe, 2.7 percent S and 5.4 percent SiO_2 is obtained. The remaining percentages are assumed to be oxygen. The flue dust is assumed to have the same composition as the calcine. The roast gas contains 8 volume percent SO_2 . Calculate

- 2.1 the weight of the flue dust and its content of the various components as well as
- 2.2 the volume (in Nm^3) and
- 2.3 the composition of the roast gas, and
- 2.4 the volume of the air used. Air may be regarded as containing 21 volume percent of O_2 and 79 volume percent of N_2 .

(20 marks)

Question 3

A gold ore containing 20 % silica, 15 % pyrite, 15 % moisture and 50 % arsenopyrite assays 20g/t gold. In the context of recovery of gold, this ore is "dead" roasted in a roaster before being sent for cyanidation.

- 3.1 Why is this roasting necessary before cyanidation ? (2 marks)
 - 3.2 What would be the assay value of the calcine product in g/t gold ? (10 marks)
 - 3.3 Calculate the volume of SO_2 produced at STP. (4 marks)
 - 3.4 How could the off gases from the roaster be cleaned before discharging it into the atmosphere ? (4 marks)
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Question 3 (continued)

3.5 Why is it not practically possible to remove all S during this "dead" roasting? (3 marks)

3.6 What could be the influence of SiO_2 on this "dead" roasting? (3 marks)

3.7 Describe how the pressure of the gases in the roaster may influence the roasting process.

(4 marks)

Question 4

4.1 Describe the ferrochrome in South Africa with respect to mining, extraction metallurgy processing and uses. Explaining in detail other contributory factors. (20 marks)

Question 5

In fire refining we have the process cupellation. Please explain indepth what the process is.

(20 marks)

TOTAL MARKS: 105