



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS MINING 11

MINING TECHNICAL SERVICES

DATE: 17 OCTOBER 2012

TOTAL MARKS: 100

TO PASS: 50

TIME ALLOWED: 3 HOURS

(08h30 to 11h30)

NOTE:

- This question paper consists of **FIVE** pages including cover page and psychometric chart.
- All questions must be answered.
- All answers and sketches to be presented in a neat and decipherable manner. Papers will not be marked if not decipherable.
- Restrict the use of highlighters.
- Do not use a red pen.
- Read the instructions on the front page of your answer book carefully.
- No cellular phones shall be allowed in the examination venue.
- The use of computers, laptops and palmtops is prohibited.

QUESTION 1

1. Answer the following questions:
- 1.1 What is the maximum load that can be exerted on a 16mm diameter rock bolt made from 450 MPa high tensile steel? (2)
- 1.2 Calculate the virgin stress at a level 800 metres below surface when the density of the overlying strata is 2 950 kg/m³ (2)
- 1.3 If the K-ratio is 1.6, what will the horizontal stress be for part (1.2) above? (2)
- 1.4 If a pillar has a strength of 80 MPa, what is the maximum depth below surface that a factor of safety of 1.6 can be maintained? (5)

Pillar area	50m ²
Area supported per pillar	400m ²
Rock density	3 000 kg/m ³

[11]

QUESTION 2

Packs are installed 5 metres from the face in a stope with a closure rate of 10mm per metre face advance. The support force on these packs increases by 5 kN for each millimetre of closure. Each pack supports 9m². Assume 3m centres between packs.

- 2.1 Calculate the support resistance in the sweeping area. (5)
- 2.2 At what distance from the face will the support resistance meet the accepted standard of 50 kN/m² (5)

[10]

QUESTION 3

A copper mine has the following characteristics:

In situ copper grade	0.67% copper
Dilution	10%
Draw point dilution	10%
Underground recovery	90%
Mill recovery grade	80%
Mill concentrate grade	20%

- 3.1 How many tons of ore must be mined to produce one ton of concentrate at 20 % copper? **[15]**

QUESTION 4

Sketch and describe a carbon-in-pulp metallurgical plant on a gold mine.

[20]

QUESTION 5

Using the attached Psychrometric chart to find a solution for the following:

Air is conveyed along a dry decline chairlift of 2 500m length at an inclination of 17.5° to the bottom workings of a mine. This air then splits into two circuits, 25% to a pump chamber and the balance passes through a wet area where it picks up 230 g/s of water. The air streams re-join 300m further on. The pump chamber is equipped with five pumps of which four are operating continuously. Each is driven by a 1 200kW air cooled motor with an overall efficiency of 95%. Environmental conditions at the top of the chairlift are:

Barometric pressure	97.5 kPa
Temperature	17.5/27.5°C
Quantity	110 m ³ /s

Determine the following:

- 5.1 Vertical fall of incline (2)
- 5.2 Heat input due to compression (2)
- 5.3 Wet and dry bulb temperature at bottom of shaft (5)
- 5.4 Wet and dry bulb temperature after the air passes through the pump chamber. (5)
- 5.5 Wet and dry bulb temperature after the air passes through the wet section. (5)
- 5.6 Wet and dry bulb temperature after the airstreams have mixed. (5)

[24]

QUESTION 6

What are the points to consider when siting and building a slimes dam at a gold mine. **[20]**

Total Marks [100]