



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE SURVEYOR'S CERTIFICATE OF COMPETENCY EXAMINATION

MINING ECONOMICS 1

DATE: 13 APRIL 2016

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 to 11h30)

NOTE:

- This question paper consists of **six** pages including cover page.
- 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.
- **All steps and CHECKS** must be done.
- The make and model number of your calculator must be written on the front cover of your answer book

Notes:

- Density of ore in-situ 2.78 tons/m³
- Density of broken ore 1.67 tons/m³

Question 1

Given the following information:

Size of property	2 000 m x 1 300 m
Average stoping width	120 cm
Payability (reserve/resource factor)	65 %
Back Length	70 m
One stope machine per face	-
Machine efficiency	10 m ² per shift
Ore Milled	35 000 tons per month
Working shifts per month	26
Sorting on Surface	15 %
Percentage of tonnage mined from ore reserve	75 %

Calculate (assuming no losses for dykes or faulting):

- (a) Life of mine in years (5)
- (b) Amount of monthly advance necessary to maintain milling rate (5)
- (c) Number of stope faces to be worked monthly to maintain milling rate (5)

15 Marks

Question 2

A mine is recovering metal A as its main product and metal B as its by-product. The relationship between one to the other in the ore is variable. The total tonnage treated is processed first for recovery of metal A. Thereafter the ore is treated in a flotation plant to produce a concentrate from which metal B is recovered by leaching.

Given the following information:

Recovery of metal A	97 %
Recovery of metal B in flotation	90 %
Recovery of metal B in leaching	75 %
Tonnage Milled	1 480 t
Waste sorted	133 t at 0.25 g/t metal A and 2.00 g/t metal B
Shortfall	290 t
Reclamation	60 t at 8.80 g/t metal A and 25.00 g/t metal B
Sundry sources	72 t at nil value
Measured ore broken in stopes	1 190 t
Mine call factor metal A	97 %
Mine call factor metal B	103 %

- (a) Calculate the joint pay limit in g/t (25)
- (b) Draw the joint pay limit graph: (10)
- ❖ Hint: metal A on vertical axis, scale 0 - 20 g/t
 - ❖ Hint: metal B on horizontal axis, scale 0 – 400 g/t

35 Marks

Question 3

The table below shows key efficiency indicators for a deep level gold mine. Give possible reasons for the variances between target and actual for each indicator. Also investigate if there is a correlation between the actual indicators, e.g. are vamping percentage, shaft call factor and mine call factor related? Explain.

Indicator	Unit	Target	Actual
Block factor	%	100	101
Current Sweepings	%	93	90
Current Vamping	%	7	3
Shaft call factor	%	92	82
Mine Call Factor	%	92	85
Recovery Factor	%	98	97
Plant call Factor	%	100	104

20 Marks

Question 4

The following comprises the proposed monthly plan of a chrome mine:

Milling Rate	100 000 t
Extraction	97 %
Chrome yield	1 400 kg
Surface Sorting	12 % at 0.4 g/t sorted
Shortfall	1 290 tons
Mine call factor	96 %
Block factor	98 %

This will be mined from:

Ore reserve	80 % of area stoped at stoping width of 112 cm
Not in reserve	20 % of area stoped at 11.0 g/t and width of 105 cm
Sorted underground	9 % of stoped ore at 0.2 g/t
Development advance	2 000 m
Reef development	70 % of Development advance of which 50 % trammed as ore to plant at 10.7 g/t
Size of reef development	3 m x 4 m
Development payability	40 %
Ore reserve development	140 t per payable metre advanced
Ore reserve	3 000 000 t at 15.0 g/t at a width of 109 cm

Determine to what extent this policy will result in:

- (a) Under – or overmining of the reserve (10)
- (b) An increase or decrease in the ore reserve inventory of the mine (10)

20 Marks

Question 5

In a gold mine 320 m² was broken in a rescue stope which has an overall stope width of 107 cm at 17.0 g/t. The stope tracks were advanced by 10 m and averaged 1 m wide by 36 cm deep. The waste was loaded on average within 10 cm of the hanging-wall and covered an area of 310 m². The average value of the waste fill is 1.0 g/t.

Calculate:

- (a) Trammed width (5)
- (b) Value of ore to mill (5)

10 Marks

Total marks 100