

**REPUBLIC OF SOUTH AFRICA  
DEPARTMENT OF MINERAL RESOURCES  
EXAMINATION FOR THE MINE SURVEYORS CERTIFICATE OF COMPETENCY**

DATE: 16 October 2009 (Friday)  
TIME: 12:30 to 14:30 (2 Hours)

TOTAL MARKS: 100  
TO PASS: 50

**GEOLOGY**

**QUESTION 1**

Name and describe six (6) different types of coal. (12)

**QUESTION 2**

Write short notes on the following Geophysical Prospecting methods:

- 2.1 Gravimetric Surveying
- 2.2 Magnetometric Surveying
- 2.3 Seismic Methods
- 2.4 Radiometric Surveying (10)

**QUESTION 3**

Minerals can be classified by their various properties.  
Complete the attached tabulation to indicate some of these properties. (15)

**QUESTION 4**

There are three agents that bring about metamorphism:

- 4.1 Name the three agents.
- 4.2 Name and discuss the three types of metamorphism.
- 4.3 List six metamorphic rocks. (15)

**QUESTION 5**

Give the relative densities of the following minerals:  
Gold, Pyrite, Galena, Limonite, Quartz and Copper.

(6)

## QUESTION 6

Discuss volcanic eruptions under the following headings:

6.1 How is a volcano formed?

6.2 Types of volcanic eruptions.

6.3 Products produced from a volcanic eruption.

6.4 Some famous eruptions that have occurred. (12)

## QUESTION 7

Name the five family groups into which Igneous Rocks can be divided. (5)

## QUESTION 8

Define and discuss the Coalification Process. (5)

## QUESTION 9

In regards to the Physical characteristics of a mineral, define or describe the following terms:

9.1 Tenacity

9.2 Brittle

9.3 Flexible

9.4 Fusibility

9.5 Malleable (10)

## QUESTION 10

Discuss "Diamonds" in South Africa with reference to the following:

Uses, location, and types of deposits. (10)

**TOTAL 100**

QUESTION 3

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EXAM NO.

MINERAL					
Physical Properties	Graphite	Cuprite	Cassiterite	Calcite	Malachite
Crystal System					
Streak					
Lustre					
Fracture					
Cleavage					
Hardness					

(15)

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SURVEY III

- Note:
- (1) Work to 1 second of arc and 0,001m.
  - (2) Trigonometrical functions must be shown to six (6) decimal places.
  - (3) All steps and checks must be shown.
  - (4) All calculations and answers to be shown clearly.
  - (5) Sketches have been reduced and are not to scale and attached herewith.
  - (6) The make and model number of your calculator **must** be written on the front cover of your answer book.

re-survey were conducted from trig beacons to a vertical shaft. Following are the notes from the surveyor's field book:

Co ordinates of A	Y= -75 000,562	X= 2 800 456,632
Co ordinates of B	Y= -75 243,212	X= 2 800 470,572
Co ordinates of C	Y= -74 969,421	X= 2 800 167,465
Co ordinates of D	Y= -75 189,521	X= 2 800 162,285
Angle	E F C	140:05:18
Angle	E F D	107:05:06
Angle	C F D	112:49:36
Angle	E F W1	51:12:50
Angle	A E F	105:56:51
Angle	B E F	135:55:18
Angle	A E B	118:07:51
Angle	F E W3	85:54:29
HD	S1 – W2	49,156
HD	W1 – W2	59,535
Angle	W2 S1 W1	1:08:51
Angle	W1 S1 S3	157:24:28
Angle	W2 W1 F	126:13:47
HD	S2 – W4	49,589
HD	W3 – W4	59,146
Angle	W4 S2 W3	1:43:32
Angle	W3 S2 S3	152:01:03
Angle	W4 W3 E	169:06:28
HD	S1 – S3	99,368
HD	S2 – S3	104,596
HD	S3 – S4	137,728
HD	S4 – S5	146,740
Angle	S2 S3 S4	145:33:51
Angle	S3 S4 S5	86:44:28

Measurements made F – W1:

Measured distance = 94,562m

Distance measured with 100m steel tape known to be 0,016m too long.

Standard Temperature of tape = 20 degrees C.

Actual Temperature during measurement = 12 degrees C.

Elevation at point F = +1 704,926m

Elevation at point W1 = +1 705,453m

Radius of earth at 30 degree latitude = 6 373 000m

Co-efficient of expansion (C.O.E.) = 0,0000113 per 1 degree C

Measurements made E – W3:

Measured distance = 98,684m

Distance measured with 100m steel tape known to be 0,016m too long.

Standard Temperature of tape = 20 degrees C.

Actual Temperature during measurement = 24 degrees C.

Elevation at point E = +1 703,959m

Elevation at point W3 = +1 705,453m

Radius of earth at 30 degree latitude = 6 373 000m

Co-efficient of expansion (C.O.E.) = 0,0000113 per 1 degree C

Gyro base direction between S5 and S4 = 240:36:21

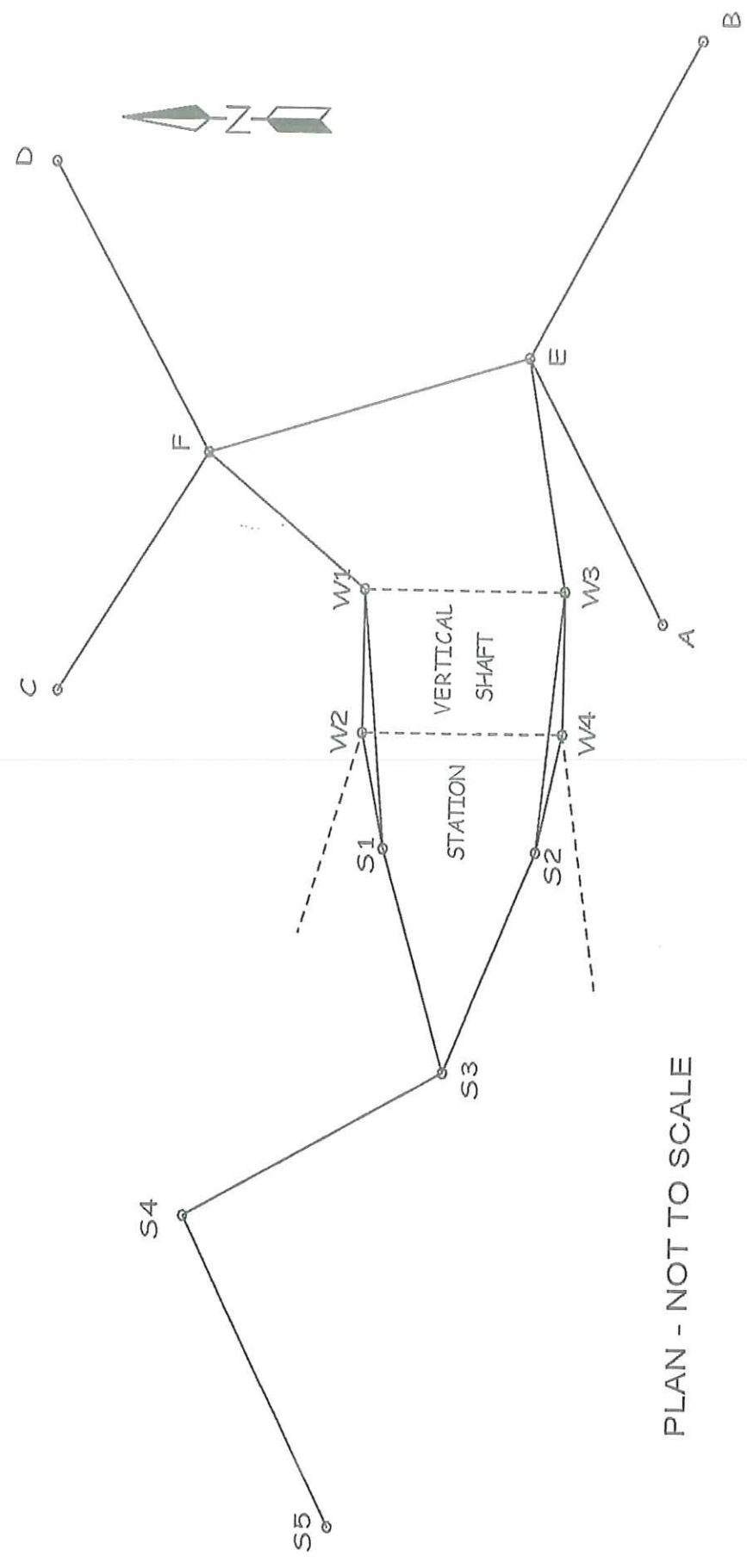
From the above information calculate the following:

1. Co ordinates of S3 from E and F respectively
2. Calculate the co ordinates of S5
3. Calculate the bearing closure between the re-survey and the gyro base direction.

[100 marks]

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SURVEY III - 16 OCTOBER 2009



PLAN - NOT TO SCALE