

**DEPARTMENT OF MINERALS AND ENERGY
MINE MANAGER'S EXAMINATION**

METALLIFEROUS AND COAL MINING

GEOLOGY

DATE: 13 MAY 2008

TOTAL MARKS: 100

**TIME
ALLOWED: 3 HOURS
(12:30 – 15:30)**

TO PASS: 50%

NOTE:

**Answer all questions
One map is attached**

- **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.**
- **Draughting utensils are to be supplied by the candidate.**
- **The use of computers, laptops and palmtops must be prohibited.**
- **Calculators are permitted.**
- **No cellular phones shall be allowed in the examination venue.**

SECTION A: GENERAL GEOLOGY

GEO. MAT 08

QUESTION 1

With regard to the rock – types listed below :

Conglomerate
Breccia
Agglomerate

- 1.1 Define the class of rock of the above types (1)
- 1.2 Define in detail the origin of the rocks (4)
- 1.3 State the principal differences of appearance, composition, occurrences, area distribution etc. (4)
- 1.4 In the case of economic mineralisation in these rocks, what type of mineralisation would be present (3)

[12]

QUESTION 2

In the history of the Earth, phases of intense volcanism appeared in various stages.

- 2.1 Where does volcanism usually occur (1)
- 2.2 What is the underlying phenomenon of volcanism (2)
- 2.3 Comment on the effects of volcanism on:
- 2.3.1 surface topography (2)
 - 2.3.2 ecological environment (2)
 - 2.3.3 ore genesis (give relevant examples) (2)
 - 2.3.4 rock–types produced by volcanic activity (2)
 - 2.3.5 phenomena related to volcanism occurring after the active phase (give relevant examples) (2)

[13]

QUESTION 3

- 3.1 What is generally understood by the term “IMPACT CRATER”?
Give a definition and quote examples (5)

SECTION B: DEPOSITS**QUESTION 4**

- 4.1 Discuss in detail how coal was formed in South Africa, using diagrams where necessary (10)
- 4.2 In what way does this origin affect the quality and thus the utilisation of the coal (5)
- 4.3 Does Northern Hemisphere coals – for example those mined in Europe – have a similar origin ? Explain your answer (3)
- 4.4 When assessing the quality of coal, what is meant by the properties listed below :
- 4.4.1 calorific value (1)
- 4.4.2 rank (1)
- [20]**

QUESTION 5

Platinum mining in South Africa is fast replacing gold as a main revenue earner for mining enterprises.

Write short notes on the platinum deposit(s) found here in South Africa, mentioning details such as:

- 5.1 location of the deposits
- 5.2 nature of the deposits
- 5.3 rocks and minerals found in these deposits
- 5.4 the names given to the main platinum – bearing ore – body.

Draw diagrams where it could assist you in answering this question **[10]**

QUESTION 6

- 6.1 Supply the missing words in the passage of text below which concerns diamonds in South Africa. The missing words must be written in your answer book and **not on the examination paper !**

In South Africa, the primary host rock of diamonds is (a)....., This is a porphyritic (b) rock containing olivine , mica, pyrope garnet, chrome diopside, ilmenite and zircon, a mineral assemblage which suggests that the rock was formed under (c) conditions of temperature and pressure.

(2)

- 6.2 The following diamond – producing centres each have a different type of diamond bearing deposit. Discuss each locality giving details of what type deposit is being exploited **and the origin of each deposit.**

Draw diagrams where it could assist you in answering this question.

- | | | |
|-------|------------------------------|-----|
| 6.2.1 | Venetia or Koffiefontein | (2) |
| 6.2.2 | Alexander Bay | (2) |
| 6.2.3 | Theunissen | (2) |
| 6.2.4 | Bloemhof or Lichtenburg area | (2) |

[10]

QUESTION 7

GOLD DEPOSITS

Gold mined in the Witwatersrand Basin is a ‘deposit formed by mechanical concentration’ and is now described as a ‘buried placer’.

- 7.1 Explain in detail what is meant by these two terms providing evidence to support your explanations [10]

SECTION C: PRACTICAL

QUESTION 8

Three diamond drill boreholes are shown on the attached (**Map A**). Each borehole cuts through a coal seam at the following depths respectively:

- Borehole A at a depth of 40 m
- Borehole B at a depth of 30 m
- Borehole C at a depth of 60 m

Answer the following questions:

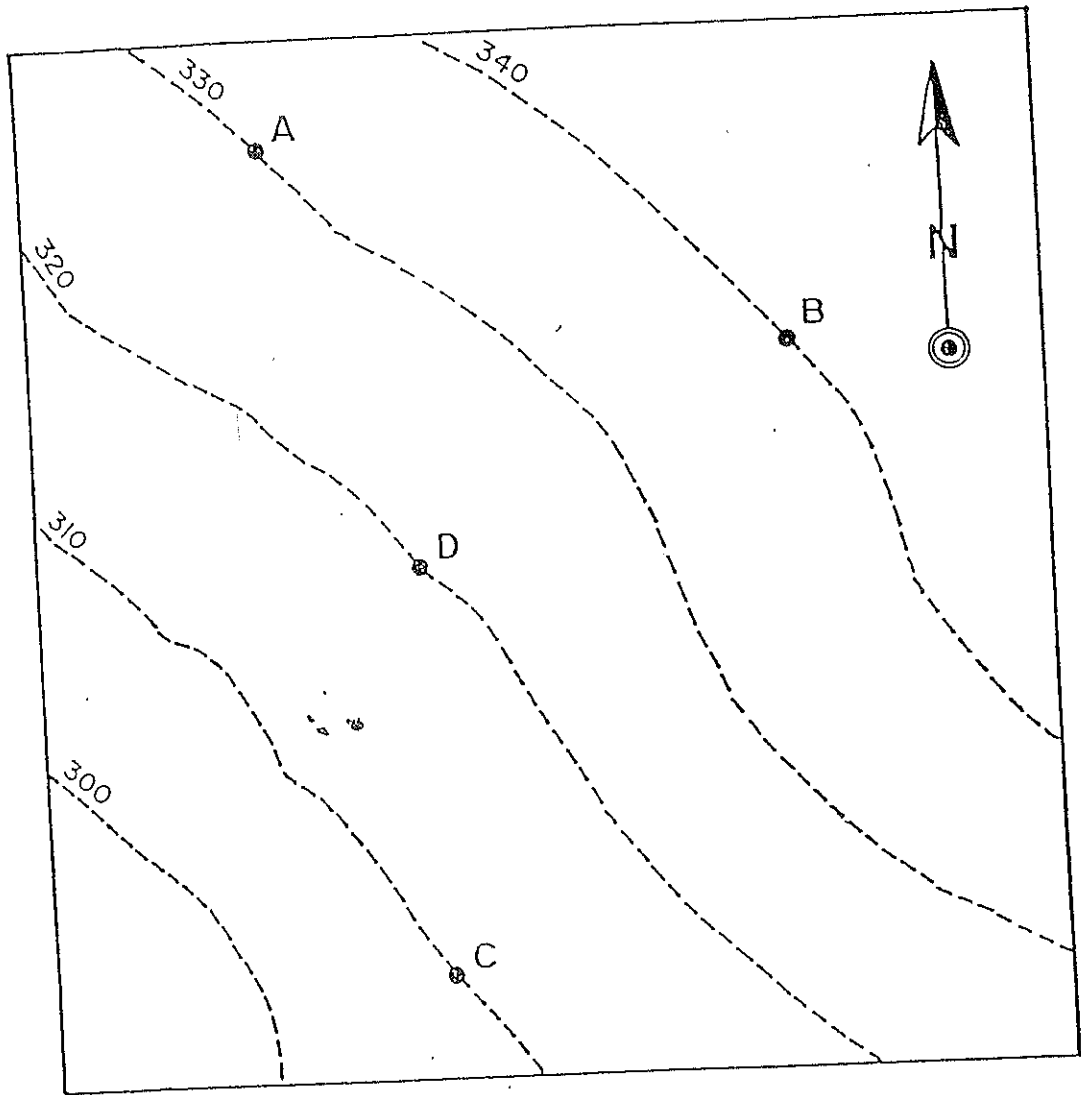
- | | | |
|-----|---|-----|
| 8.1 | At which elevation will a proposed borehole D cut through the same coal seam? | (4) |
| 8.2 | What will the depth of the borehole at position D be? | (4) |
| 8.3 | Determine the strike of the coal seam | (7) |
| 8.4 | Determine the angle <u>and</u> direction of true dip | (5) |

[20]

(Note: the completed Map A to be handed in together with your answer book)

TOTAL MARKS: [100]

MAP A



SCALE 1:1000

NOTE :- THIS SHEET MUST BE HANDED IN TOGETHER WITH YOUR EXAMINATION BOOK.



the dme

Department:
Minerals and Energy
REPUBLIC OF SOUTH AFRICA

MINE MANAGERS EXAMINATION

METALLIFEROUS AND COAL MINING GEOLOGY

DATE: 14 OCTOBER 2008

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 - 15h30)

NOTE:

1. Answer all questions.
2. All calculations must be shown.

- This question paper consists of five pages.
- All answers and sketches must be presented in a neat and decipherable manner.
- Papers will not be marked if undecipherable.
- Restrict the use of highlighters.
- Do not use a red pen.
- Read the directions on the front page of your answer book carefully.
- The use of computers, laptops and palmtops is prohibited.

SECTION A: GENERAL GEOLOGY**QUESTION 1**

With regard to the rock – types listed below:

Conglomerate

Breccia

Agglomerate

- 1.1 Define the class of rock of the above types (1)
- 1.2 Define in detail the origin of the rocks (4)
- 1.3 State the principal differences of appearance, composition, occurrences, area, distribution etc. (4)
- 1.4 In the case of economic mineralisation in these rocks what type of mineralisation would be present? (3)

[12]

QUESTION 2

- 2.1 What is generally understood by the term "*Impact Crater*"?
Give a definition and quote examples

[5]

SECTION B: DEPOSITS**QUESTION 3**

- 3.1 Discuss in detail how coal was formed in South Africa, using diagrams where necessary. (10)
- 3.2 In what way does this origin affect the quality and thus the utilisation of the coal? (5)
- 3.3 Does Northern Hemisphere coals – for example those mined in Europe – have a similar origin? Explain your answer. (3)
- 3.4 When assessing the quality of coal, what is meant by the properties listed below:
 - 3.4.1 calorific value (1)
 - 3.4.2 rank (1)

3.4.3 ash content (1)

3.4.4 inherent moisture (1)

[22]

QUESTION 4

Write short notes on the platinum deposit(s) found here in South Africa, mentioning details such as:

- 4.1 location of the deposits
- 4.2 nature of the deposits
- 4.3 rocks and minerals found in these deposits
- 4.4 the names given to the main platinum-bearing ore body

Draw diagrams where it could assist you in answering this question

[10]

QUESTION 5

The following diamond producing centres each have a different type of diamond bearing deposit. Discuss each locality giving details of what type deposit is being exploited and the origin of each deposit.

Draw diagrams where it could assist you in answering this question.

5.1 Venetia or Koffiefontein (2)

5.2 Alexander Bay (2)

5.3 Theunissen (2)

5.4 Bloemhof or Lichtenburg area (2)

[8]

QUESTION 6

Gold mined in the Witwatersrand Basin is a 'deposit formed by mechanical concentration' and is now described as a 'buried placer'

Explain in detail what is meant by these two terms providing evidence to support your explanations.

[10]

SECTION C: PRACTICAL**QUESTION 7**

Three diamond drill boreholes are shown on the attached (**Map A**). Each borehole cuts through a coal seam at the following depths respectively:

Borehole A at a depth of 40m

Borehole B at a depth of 30m

Borehole C at a depth of 60m

Answer the following questions:

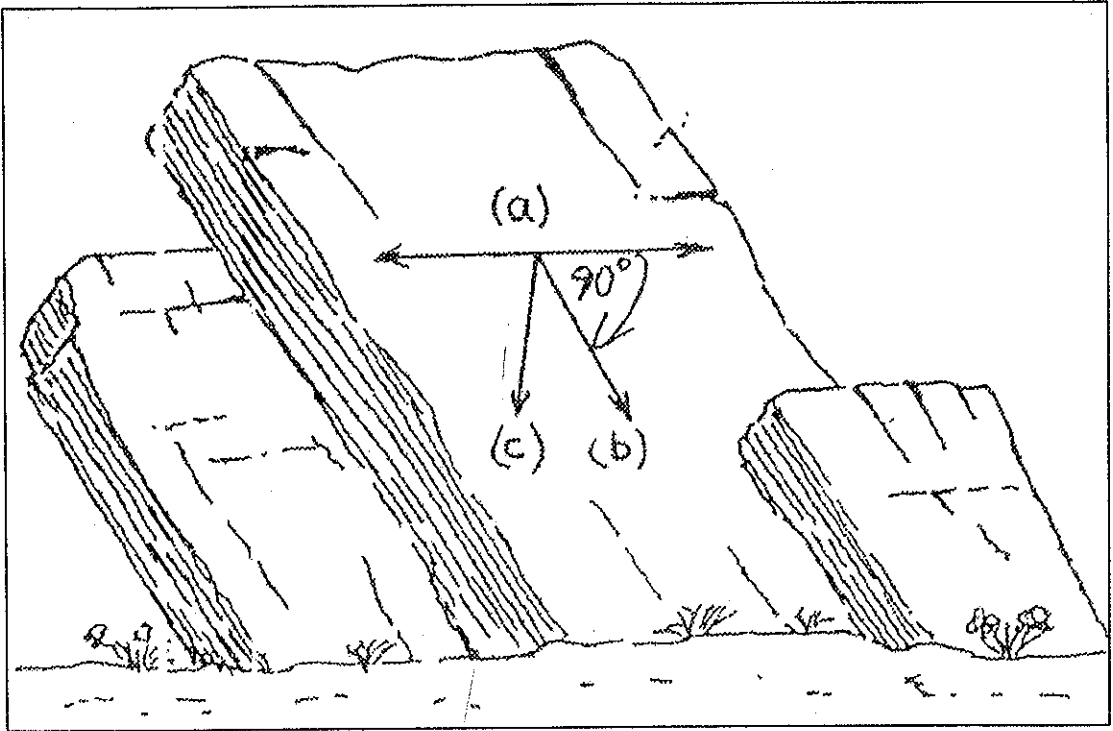
- 7.1 At which elevation will a proposed borehole D cut through the same coal seam? (4)
- 7.2 What will the depth of the borehole at position D be? (4)
- 7.3 Determine the strike of the coal seam (7)
- 7.4 Determine the angle and direction of true dip (5)

[20]

QUESTION 8

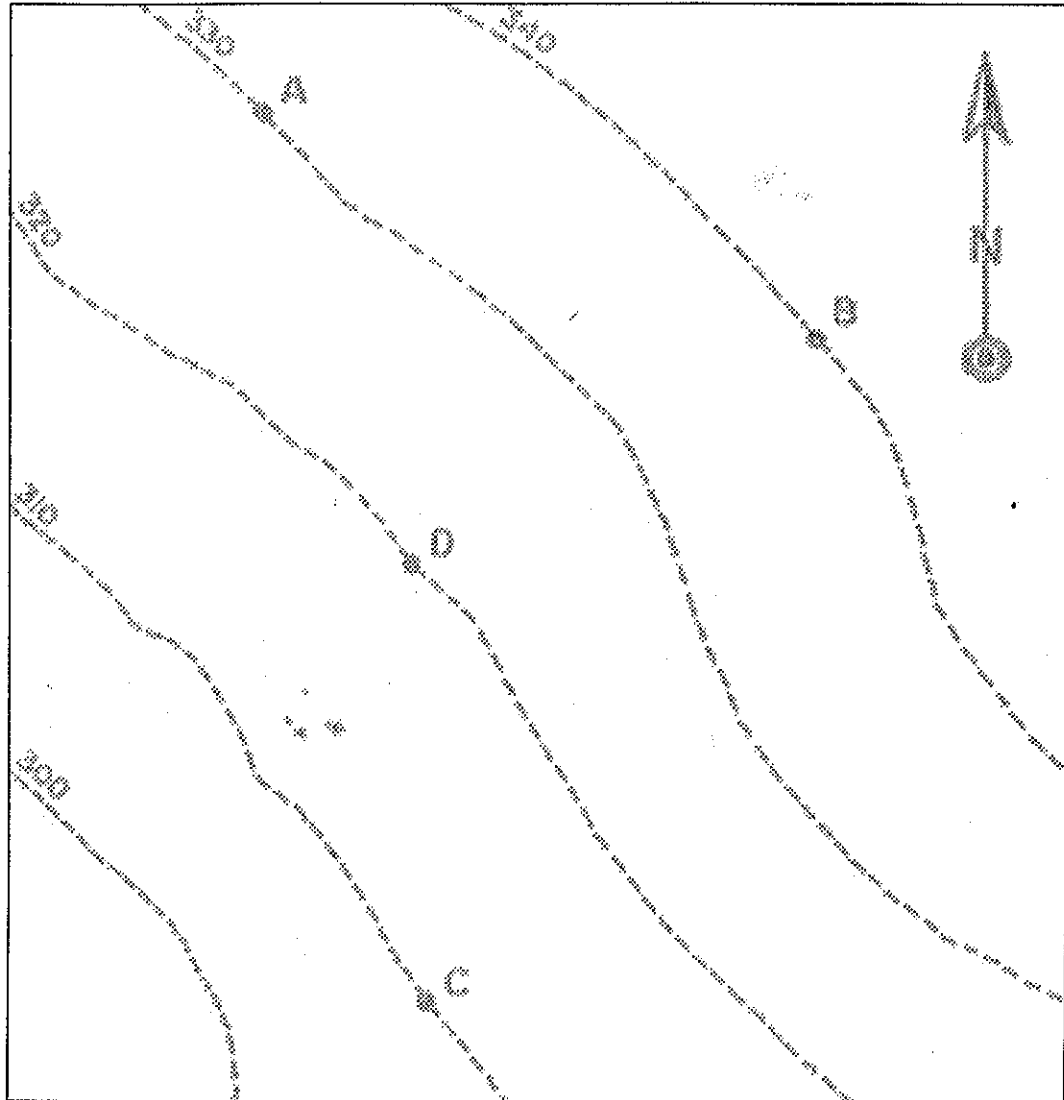
- 8.1 Examine the sketch below and name the geological features marked as (a), (b), (c) (3)
- 8.2 The feature marked as (a) is an important measurement used to assist with mining – both in surface and underground operation. What is the definition of this feature? (2)
- 8.3 What is the definition of the feature marked (b) (2)
- 8.4 Explain the following features by means of sketches:
- 8.4.1 an anticline (2)
- 8.4.2 a syncline (2)
- 8.4.3 an unconformity (2)

[13]



NOTE: THIS SHEET MUST BE HANDED IN TOGETHER WITH YOUR EXAMINATION BOOK

Map A



SCALE 1:1000



the dme

Department:
Minerals and Energy
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S EXAMINATION

GEOLOGY

DATE: 12 MAY 2009

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 to 15h30)

NOTE:

Answer all questions

One map is attached

Enter Student Number on the attached graph and hand it on with your answer book

- **This question paper consists of four pages**
- **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.**
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- **Calculators are permitted.**
- **No cellular phones shall be allowed in the examination venue.**

SECTION A: GENERAL GEOLOGY

QUESTION 1

- 1.1 Describe the different classes of rocks found on the earth. (3)
1.2 State the principal differences in appearance, composition, occurrences, area, distribution etc. between the classes listed in 1.1 above. (7)
[10]

QUESTION 2

Explain (with sketches where appropriate) the following erosion structures:

- 2.1 angular unconformity (2)
2.2 suboutcrop (2)
2.3 disconformity (2)
[6]

QUESTION 3

Describe different types of faults and how it affects the mining of a particular horizon. You may use sketches where necessary. **[4]**

SECTION B: DEPOSITS

QUESTION 4

Describe the formation and occurrence of the following economic deposits in South Africa. Specifically mention the different primary and secondary deposits (where appropriate), associated rock types and the localities where they are exploited.

- 4.1 Gold (10)
4.2 Platinum (10)
4.3 Coal (10)
[30]

QUESTION 5

5.1 The following diamond producing centres each have a different type of diamond bearing deposit. Discuss each locality giving details of what type deposit is being exploited.

Draw diagrams where it could assist you in answering this question relating to the following:

- 5.1.1 Venetia or Koffiefontein (2)
5.1.2 Alexander Bay (2)
5.1.3 Theunissen (2)
5.1.4 Bloemhof or Lichtenburg area (2)

5.2 Explain the two schools of thought regarding the origin of diamonds in kimberlite pipes. (2)
[10]

SECTION C: PRACTICAL

QUESTION 6

Describe different methods that can be used in the exploration for minerals and how these can be applied. [15]

QUESTION 7

7.1 Explain the different classes of Mineral Resources as stipulated in the SAMREC code. (3)
7.2 Explain the difference between Resources and Reserves (2)
[5]

QUESTION 8

Refer to the attached map which shows part of a coal prospect in which a number of vertical boreholes have been drilled. An extract of the borehole logs is given below the map. Assume constant dips for all structures.

- 8.1 Determine the strike, dip and thickness of the dolerite and plot its outcrop. Also determine the dip of the coal seams and throw on the dolerite. (10)
- 8.2 At what depth will a vertical borehole at B1 intersect the No. 2 seam and the tillite? (5)
- 8.3 Draw an accurate section along X-Y and shade the area of the map underlain by the No. 1 seam. (5)

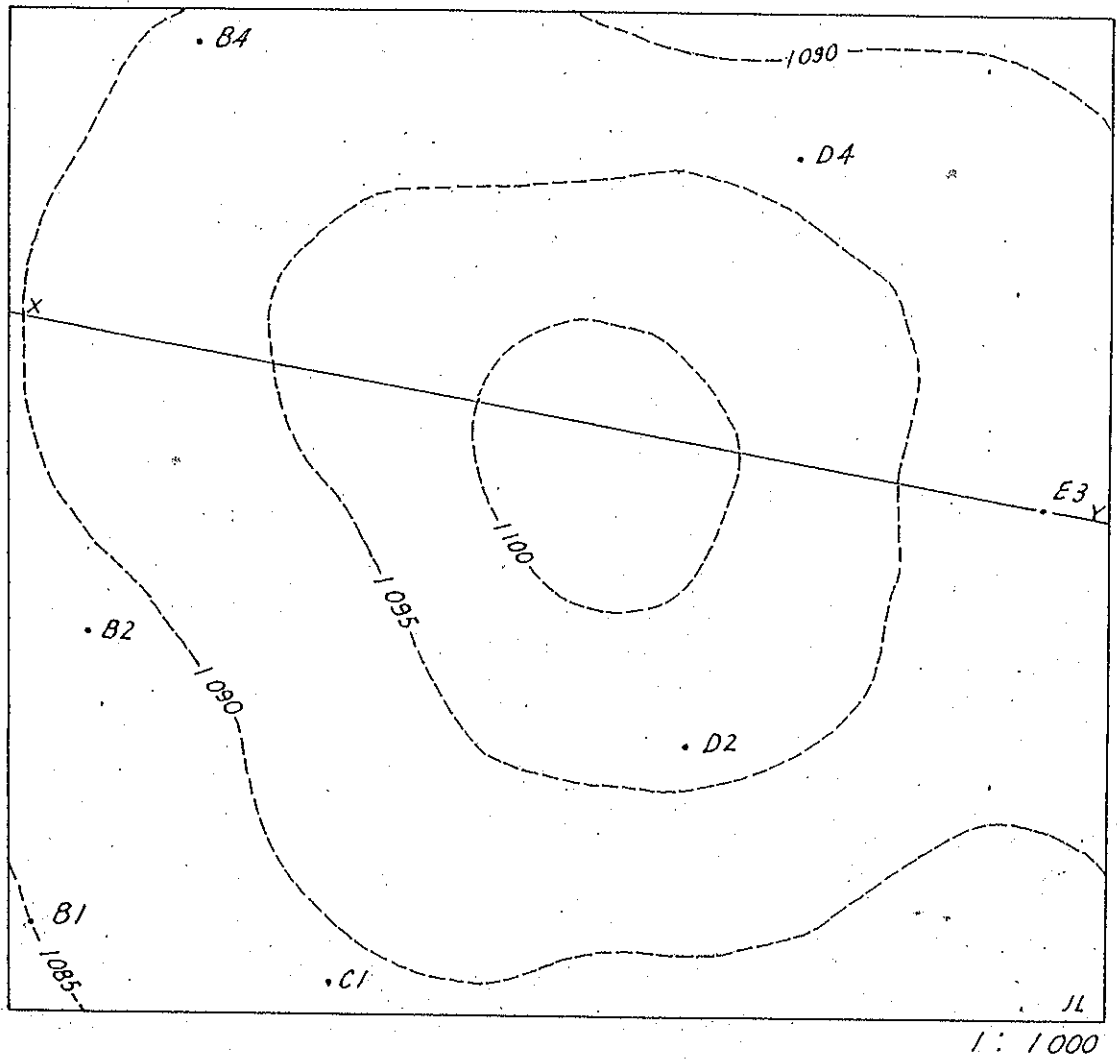
Borehole	Collar elevation (m)	Depth of intersection (m)				
		Coal		Dolerite		Tillite
		No. 2 Seam	No. 1 Seam	Upper surface	Lower surface	
B2	1088	23	33	-	-	38
B4	1092	27	37	-	-	42
C1	1089	19	29	-	-	34
D2	1096	-	31	11	26	36
D4	1094	-	29	9	24	34
E3	1093	28	38	48	63	43

[20]

TOTAL MARKS [100]

QUESTION 8

STUDENT EXAM NUMBER _____



NOTE: THIS SHEET MUST BE HANDED IN TOGETHER WITH YOUR ANSWER BOOK



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S EXAMINATION

GEOLOGY

DATE: 20 OCTOBER 2009

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 - 15h30)

NOTE:

Answer all questions
One map is attached
Enter Student Number on the attached graph and hand it on
with your answer book

- This question paper consists of **FOUR** pages
- 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.
- Read the instructions on the front page of your answer book carefully.
- Draughting utensils are to be supplied by the candidate.
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Section A: GENERAL GEOLOGY

Question 1

- 1.1. Name the three different classes of rock types found on the earth. (3)
- 1.2. State the main differences in the type of environments in which these rocks are formed with examples of rock types per class. (7)

[10]

Question 2

Explain (use sketches where appropriate) the difference between the following terms:

- 2.1 True dip (2)
- 2.2 Apparent dip (2)
- 2.3 Strike (2)
- 2.4 Horst (2)
- 2.5 Graben (2)

[10]

SECTION B: DEPOSITS

Question 3

South Africa hosts major deposits of gold, platinum, coal, iron and diamonds. Explain these deposits in hand of their respective depositional environments (primary and secondary), major rock types with which they are associated and localities where they are exploited.

[30]

Question 4

Name and explain (five) 5 coal types.

[10]

SECTION C: PRACTICAL

Question 5

Name and discuss the application of 5 geophysical prospecting methods.

[15]

Question 6

Explain the effects of dewatering in mining on the environment, with specific reference to the formation of sinkholes in limestone or dolomite areas.

[5]

Question 7

Explain the difference between gain-of-ground and loss-of-ground when referring to faulting and anticline and syncline when referring to folding (use appropriate sketches to explain) [8]

Question 8

What tools are used by a geologist to determine the orientation of bedding (dip, strike, etc.) [2]

Question 9

Referring to Map 1 and accompanying table, determine the following, and show it on the map:

- 9.1 Dip of the coal seam
- 9.2 Strike of the coal seam
- 9.3 Depth of intersection of the coal seam at point D

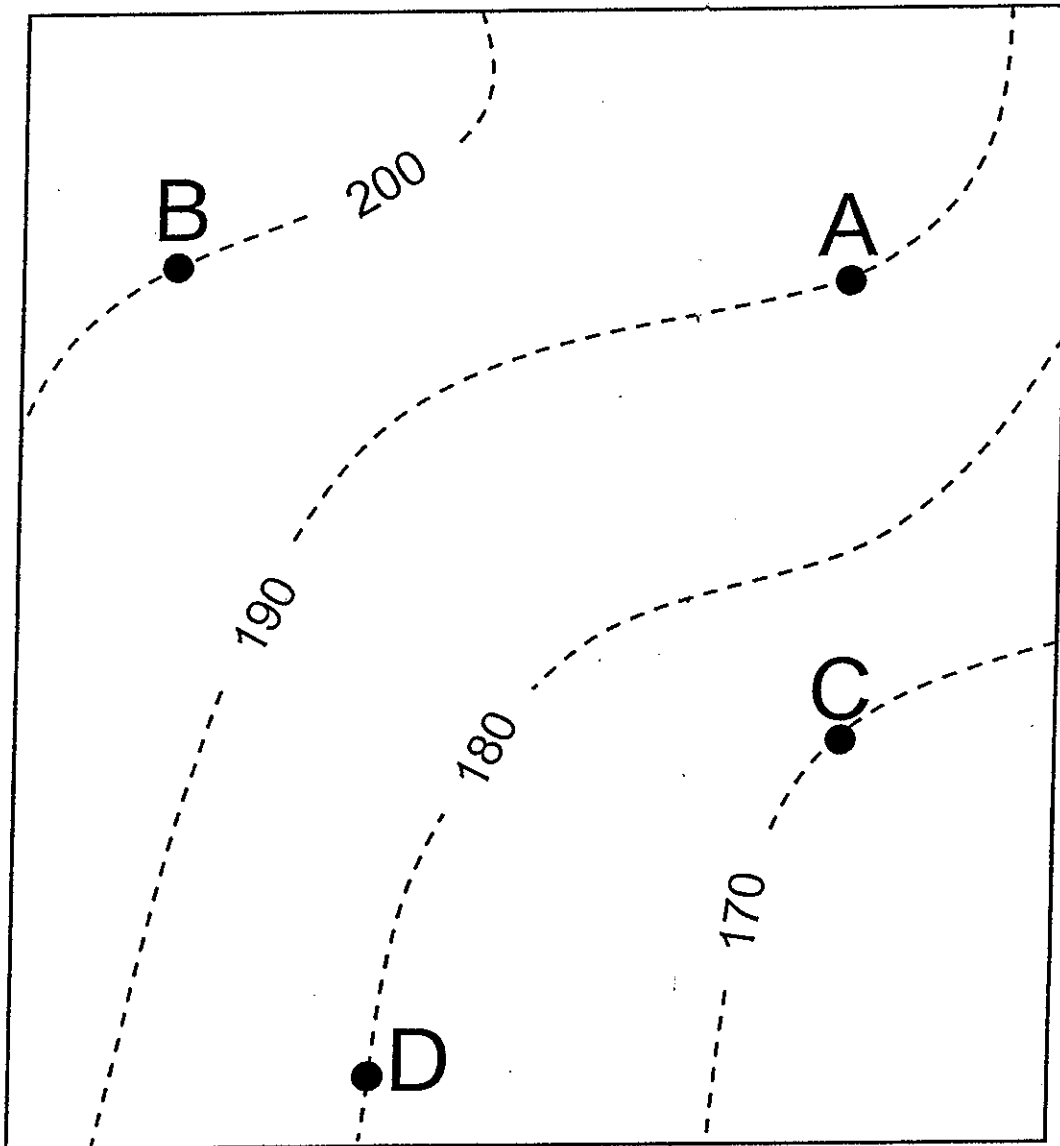
(Hand in map with answer sheet)

[10]

Exam No. _____

Region: _____

Map 1



	Vertical boreholes			
	A	B	C	D
Collar elevation (ground level)	190m	200m	170m	180m
Depth of intersection of coal seam	40m	65m	30m	



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S EXAMINATION

METALLIFEROUS AND COAL MINING

GEOLOGY

DATE: 11 MAY 2010 **TOTAL MARKS: 100**
TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 - 15h30)

NOTE:

Answer all questions
One map is attached

- This paper consists of **FIVE** pages.
- All answers and sketches to be presented in a neat and decipherable manner.
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- Do not use a red pen.
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SECTION A: GENERAL GEOLOGY

QUESTION 1

- 1.1 Rocks can be classified into different classes. Name these classes. (3)
- 1.2 Name the criteria applied for the classification (3)
- 1.3 State the conditions under which these rocks formed, name active agents during the formation (5)
- 1.4 State the name of the process by which loose material is transformed into solid rock. Name this process and its different forms and origins. (5)

[16]

QUESTION 2

- 2.1 Working on an outcrop of rocks, on surface or in a mine, certain important data is collected. Name this data and give their definition. (3)
- 2.2 State how this data is used practically. (5)
- 2.3 Are there any exceptions? Please explain. (2)

[10]

QUESTION 3

- 3.1 Describe different types of faults and how it affects the mining of a particular horizon. You may use sketches where necessary. (4)

[4]

SECTION B: DEPOSITS

QUESTION 4

Describe the formation and occurrence of the following economic deposits in South Africa. Specifically mention the different primary and secondary deposits (where appropriate), associated rock types and the localities where they are exploited.

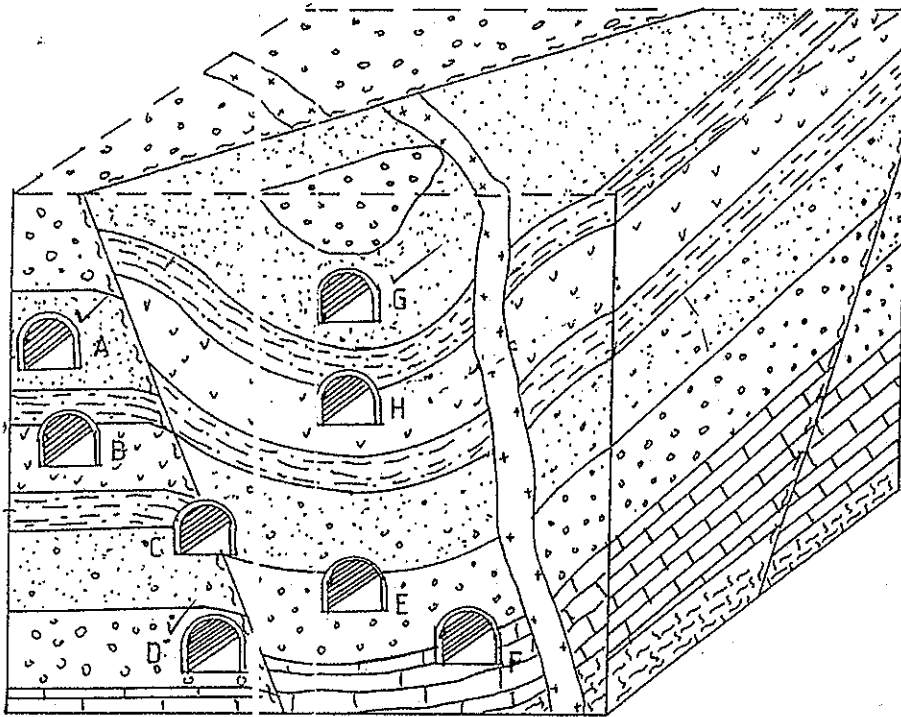
- 4.1 Gold (10)
- 4.2 Platinum (10)
- 4.3 Coal (10)

[30]

SECTION C: PRACTICAL

QUESTION 5

5.1 The diagram on the sheet attached shows a series of proposed tunnel positions in a wide variety of geological settings. Examine each tunnel position carefully and write brief notes on the problems associated with each proposed site and at the end decide which of the proposed positions would be the most suitable – in the interests of safety and stability for prolonged usage. (20)



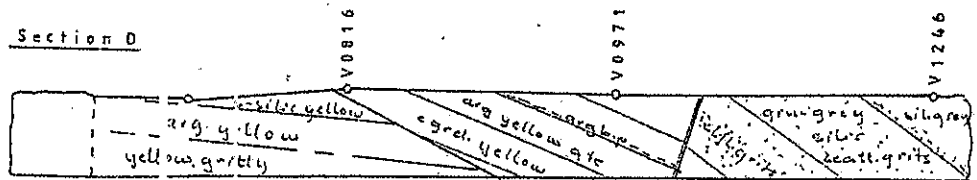
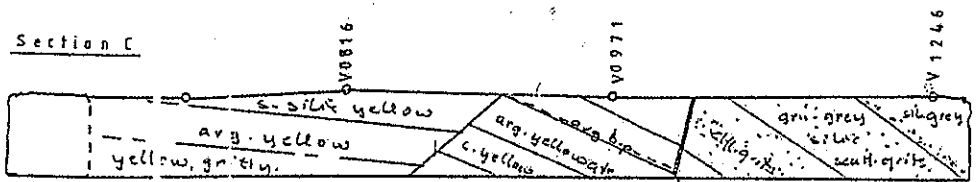
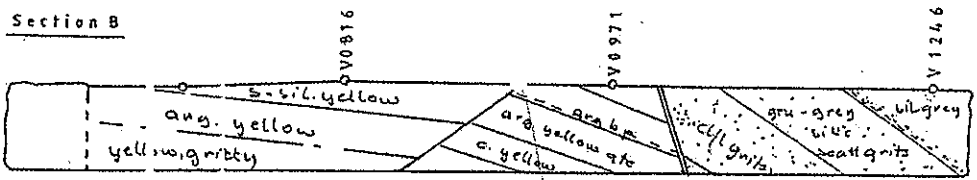
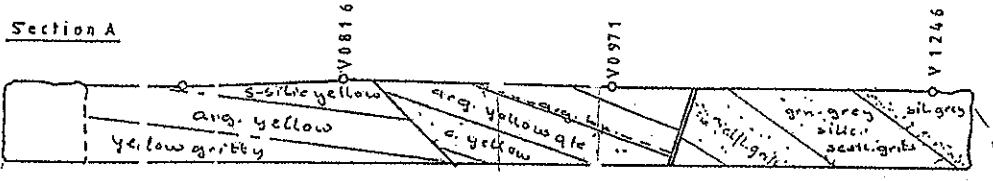
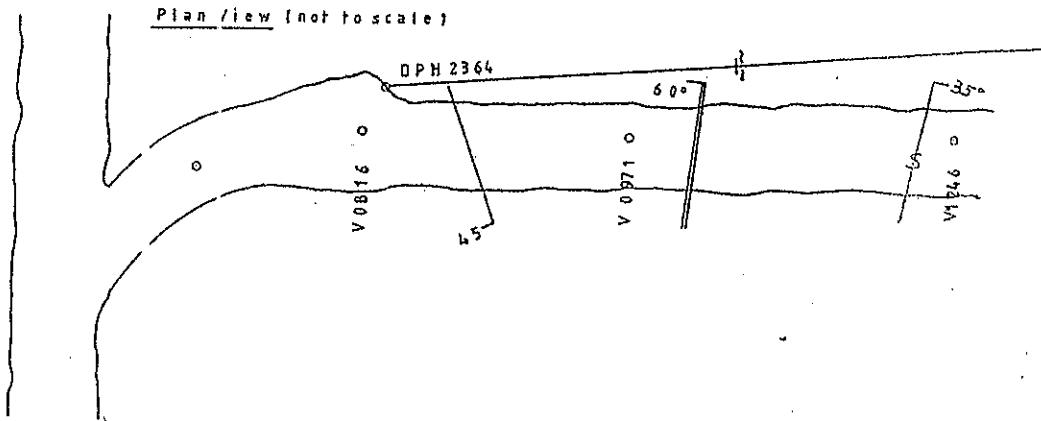
LEGEND

	intrus. dyke
	fault zone, hear
	conglomerate
	sandstone
	sandy shale
	lava
	pebbly quartzite
	limestone
	dolomite

QUESTION 6

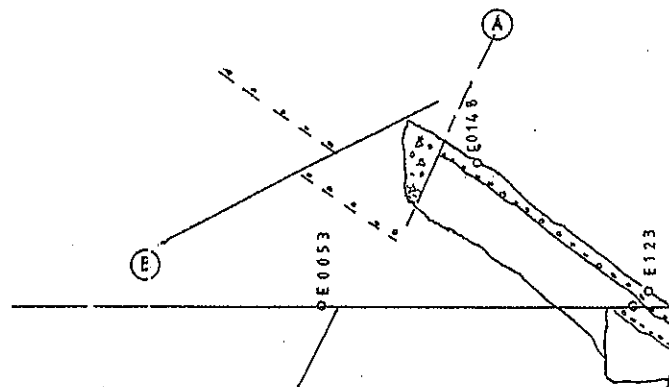
6.1 Match one of the sections shown below to the plan.

(5)

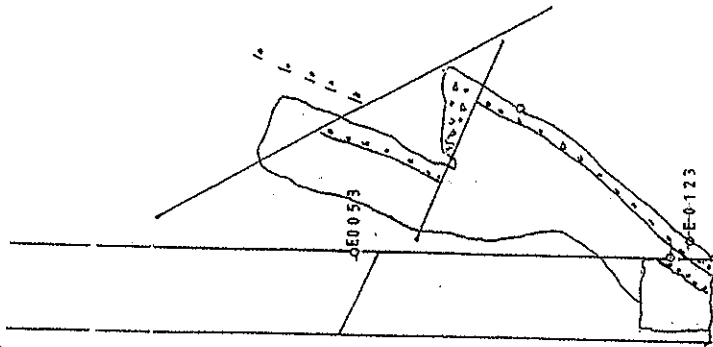


6.2 What are the Geological elements named A and B on the sketch? (2)

6.3 What are the effects related to each of these elements? (3)



6. Reef has been lost in one of the raises (see sketch). What will your instructions be to overcome the problem? (6)



[16]

QUESTION 7

- a) Explain the different classes of Mineral Resources as stipulated in the SAMREC code. (2)
- b) Explain the difference between Resources and Reserves (2)
- [4]

TOTAL [100]



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS AND COAL MINING GEOLOGY

DATE: 19 OCTOBER 2010

**TOTAL MARKS: 100
TO PASS: 50**

**TIME ALLOWED: 3 HOURS
(12h30 to 15h30)**

NOTE:

Table to be handed in with the answer sheet and examination number to be clearly indicated on the sheet.

- This question paper consists of seven pages.
- Answer all the questions.
- 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.

Question 1

- 1.1. Generally, rocks can be classified into three (3) different groups on the basis of their origin. What is the name of each group and next to each name give a specific rock type example. (6)
- 1.2. Which **ONE** of these rock groups would you expect generally to be the least competent? Explain your answer. (4)
- 1.3. Molten magma can intrude the local rock formation in one of two ways – conformably or cutting through the existing structures. Provide a name for each such intrusive feature making sure that the correct name appears next to the appropriate intrusive type. (4)
- 1.4. Throughout geological history there are many rock sequences preserved showing an angular conformity or a disconformity. Show in separate diagrams what is meant by each term and briefly explain how each differs from the other. (4)

[18]

Question 2

Explain the difference between the following terms. Appropriate sketches can be used to support answers:

- 2.1 True dip (2)
- 2.2 Apparent dip (2)
- 2.3 Strike (2)
- 2.4 Horst (2)
- 2.5 Graben (2)

[10]

Question 3

After the initial discovery in 1866, the diamond industry developed dramatically. Diamonds are found and mined in deposits of various kinds.

- 3.1 State the different kinds of deposits found in South Africa (4)
- 3.2 Give the names of the areas where these deposits are located. (4)

3.3 What is the source rock of the primary diamond deposits. (1)

3.4 Describe the origin and characteristics of the primary diamond deposits. (3)

[12]

Question 4

There are two original deposits of gold in this country.

4.1 Name the geographical location of each deposit (regional). (4)

4.2 Describe in detail the origin of each deposit, pointing out differences and geological conditions. (4)

4.3 Name the other minerals associated with the orebodies. (2)

[10]

Question 5

At the time of the formation of coal beds in the northern and southern hemispheres conditions with regards to the environment, plant life, climate and subsequent coalification differs greatly.

5.1 Complete table 1 by summarizing the differences between the northern and southern hemisphere coal formation. (*Hand in the table with answer sheet*). (14)

(TABLE 1 – QUESTION 5.1)

STUDENT EXAMINATION

NO.: _____

FEATURE	NORTHERN HEMISPHERE	SOUTHERN HEMISPHERE
PALAEOENVIRONMENT	(2)	(2)
PLANT LIFE	(2)	(2)
PALAEOCLIMATE	(2)	(2)
INORGANIC MATERIAL CONTENT: High / low	(1)	(1)

NOTE: This table must be handed in with your answer sheets.

5.2 Coal varies greatly in quality. Explain or define the properties influencing the qualities listed below:

- 5.2.1 Rank (2)
- 5.2.2 Calorific Value (2)
- 5.2.3 Ash content (2)
- 5.2.4 Volatile matter content (2)

[22]

Question 6

6.1 When a geologist is called underground to sort out a geological problem what information is he/she most likely to look for? Name at least four. (4)

6.2 Figure 1 represents a plan view of a cross-cut breakaway from a haulage in a geologically complex block of ground, with units dipping at approximately 25 degrees. A dyke dipping at 45 degrees to the southwest and a fault dipping at 55 degrees to the east are also shown where they have been mapped on the grade lines of the sidewalls.

Discuss potential problems that you would expect from the information provided in the sketch. The normal footwall rock type is generally competent and consistent throughout the area covered in the diagram. The dyke is a dolerite dyke. What action would, or should, you take in future to avoid such a situation occurring. (10)

[14]

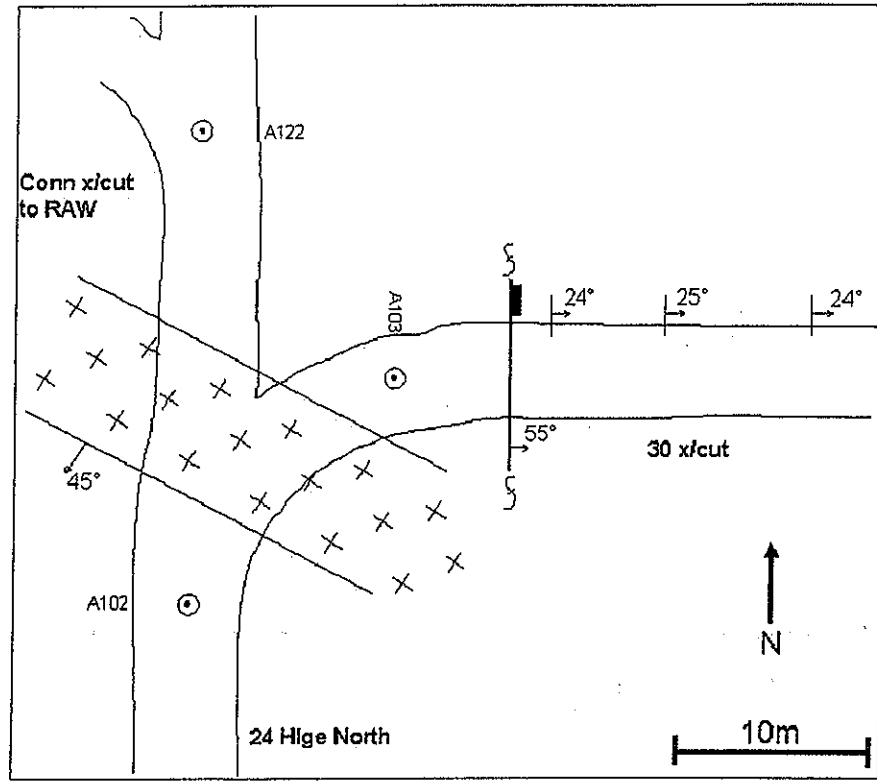


FIGURE 1: GEOLOGICAL PLAN OF HAULAGE WITH CROSS-CUT BREAKAWAY.

Question 7

Referring to Map 1 and accompanying table, determine the following, and show it on the map:

- 7.1 Dip of the coal seam (3)
 - 7.2 Strike of the coal seam (3)
 - 7.3 Depth of intersection of the coal seam at point D (4)
- (Hand in map with answer sheet)

[10]

Question 8

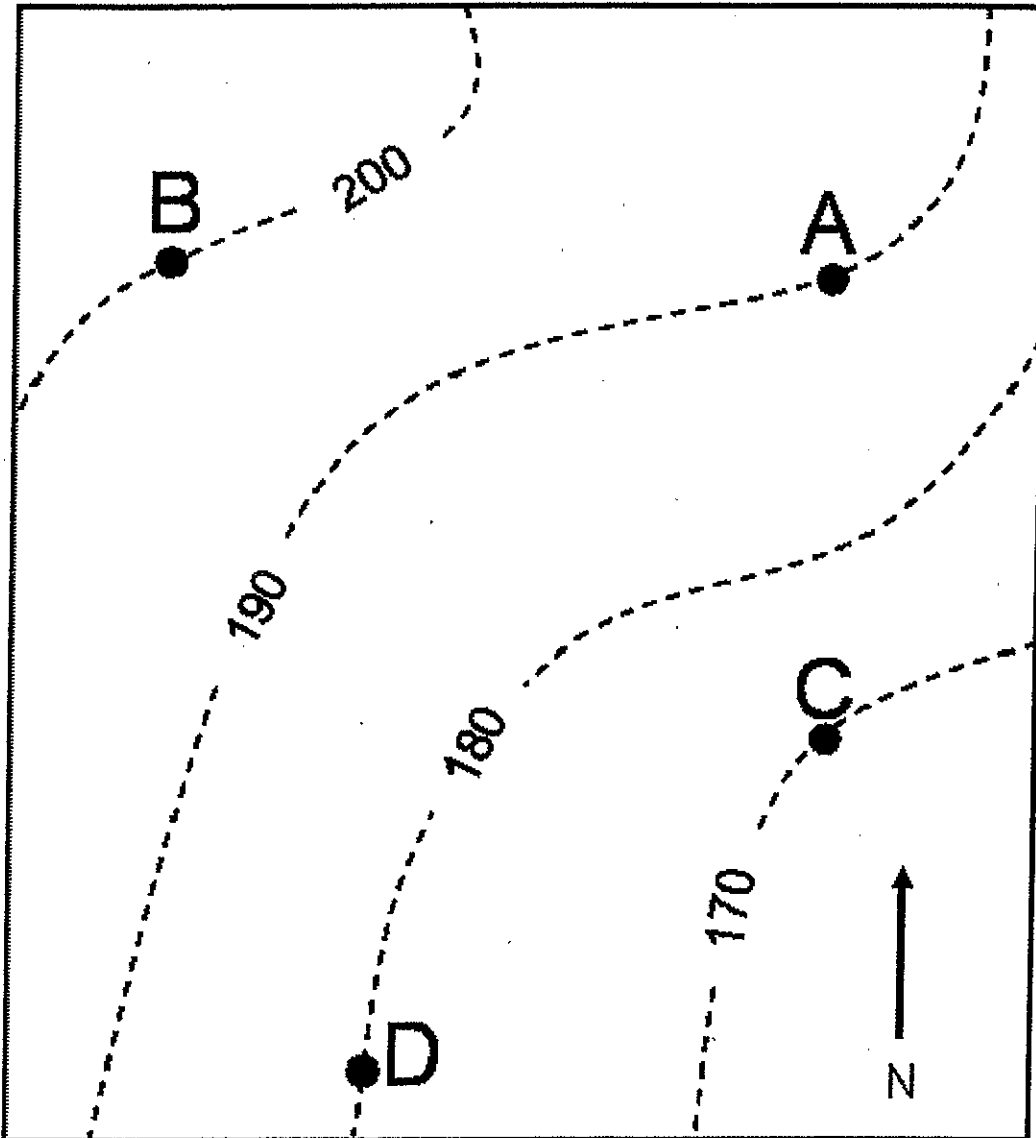
- 8.1 Name the different Mineral Resource classes as stipulated in the SAMREC code (3)
- 8.2 What are the factors termed that are applied to Mineral Resources to convert them to Mineral Reserves (1)

[4]

TOTAL MARKS: 100

STUDENT EXAMINATION NO.: _____

Map 1



	VERTICAL BOREHOLES			
	A	B	C	D
COLLAR ELEVATION (GROUND LEVEL)	190m	200m	170m	150m
DEPTH OF INTERSECTION OF COAL SEAM	40m	65m	30m	

NOTE: HAND IN WITH ANSWER SHEET



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS AND COAL MINING GEOLOGY

DATE: 10 MAY 2011

**TOTAL MARKS: 100
TO PASS: 50**

**TIME ALLOWED: 3 HOURS
(12h30 to 15h30)**

NOTE:

**Answer all questions
One map is attached**

- This question paper consists of **SIX** pages including cover page.
- All answers and sketches to be presented in a neat and decipherable manner.
- Papers will not be marked if not decipherable.
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- Calculators are permitted.

SECTION A: GENERAL GEOLOGY

QUESTION 1

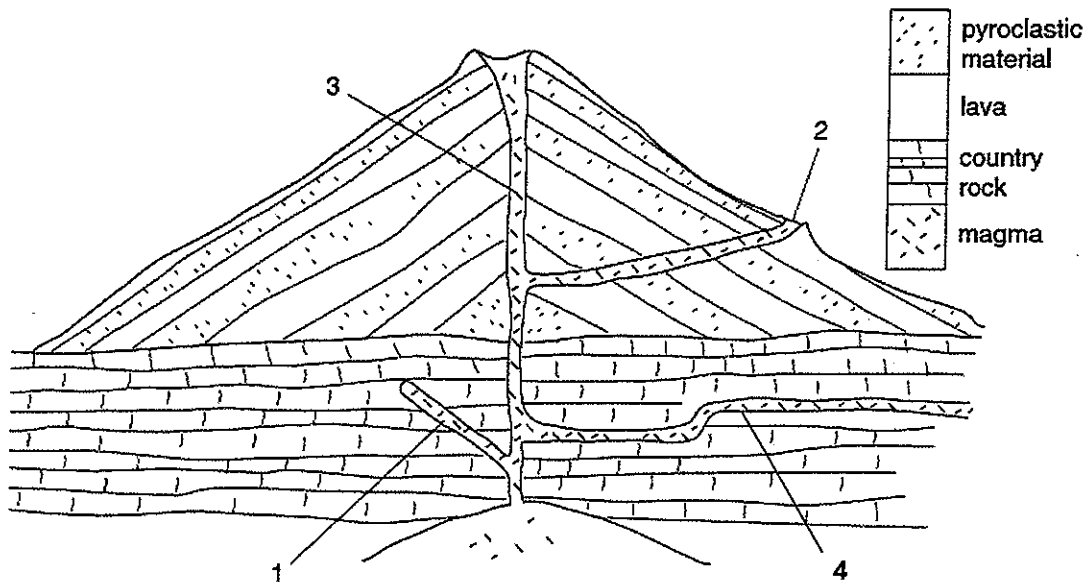
1.1 Explain briefly the concept of plate tectonics and the phenomena you may find at plate margins.

You may use sketches to assist in the explanation (6)

[6]

QUESTION 2

2.1 The cross sectional diagram below shows the relationship between several igneous features and the surrounding country rocks. Name the igneous features shown. (4)



[4]

QUESTION 3

3.1 What is denudation and describe in detail processes that may lead to it. (10)

[10]

QUESTION 4

4.1 List and describe the most important rock forming minerals. (10)

[10]

QUESTION 5

- 5.1 Diamond and graphite are both minerals made of pure carbon, yet diamond is clear, very hard and relatively dense while graphite is silvery black, very soft and relatively light. How can you best explain this difference? (4)

[4]

SECTION B: DEPOSITS

QUESTION 6

Describe the formation and occurrence of the following economic deposits in South Africa. Specifically mention the different types of deposits (where appropriate), associated rock types and the localities where they are exploited.

- 6.1 Iron (10)
- 6.2 Coal (10)
- 6.3 Gold (10)

[30]

SECTION C: PRACTICAL

QUESTION 7

- 7.1 Describe different methods that can be used in the exploration for minerals and how these can be applied. (15)

[15]

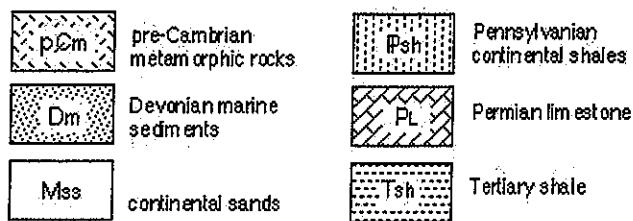
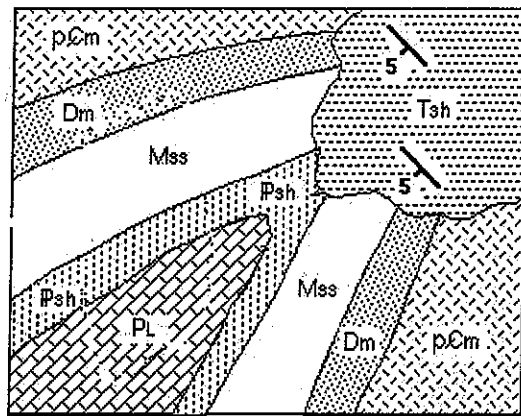
QUESTION 8

- 8.1 Explain the different classes of Mineral Resources as stipulated in the SAMREC code. (3)
- 8.2 Explain the difference between Resources and Reserves (2)

[5]

QUESTION 9

The following questions refer to the geological map below.

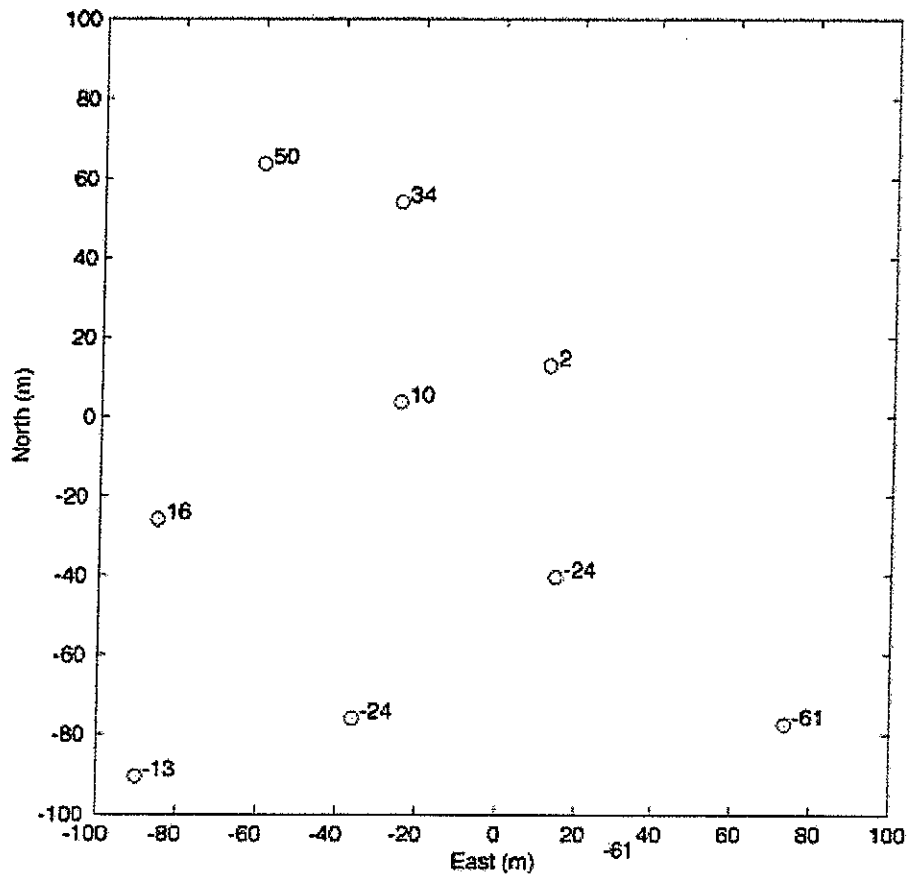


- 9.1 Which bed is the oldest? (1)
- 9.2 Which bed is the youngest? (1)
- 9.3 Are there any unconformities evident on the map? (1)
- 9.4 What sort of geological structure do the sedimentary beds form? (1)

[4]

QUESTION 10

The points on the attached map lie on a planar bed, and the labelled elevations for the points are in metres.



- 10.1 Draw structural contours of the bed (5)
- 10.2 Determine the strike of the bed (2)
- 10.3 Draw a cross section perpendicular to the lines of strike, and by projecting at least 4 points onto the cross section, determine the dip of the plane and the general dip direction. (5)

[12]



mineral resources

Department:
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MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS AND COAL MINING GEOLOGY

DATE: 18 OCTOBER 2011

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 to 15h30)

NOTE:

Answer all questions

1. This question paper consists of **FIVE** pages including cover page
2. The **last page** is to be handed in with the answer and examination number to be clearly indicated on the sheet.
3. All answers and sketches to be presented in a neat and decipherable manner.
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10. No cellular phones shall be allowed in the examination venue.
11. Calculators are permitted.

GENERAL GEOLOGY

QUESTION 1

- 1.1. Rocks can be classified into three (3) groups. Name the groups and provide an example of each. (6)
- 1.2. Explain the origin of natural oil and gas. (4)

[10]

QUESTION 2

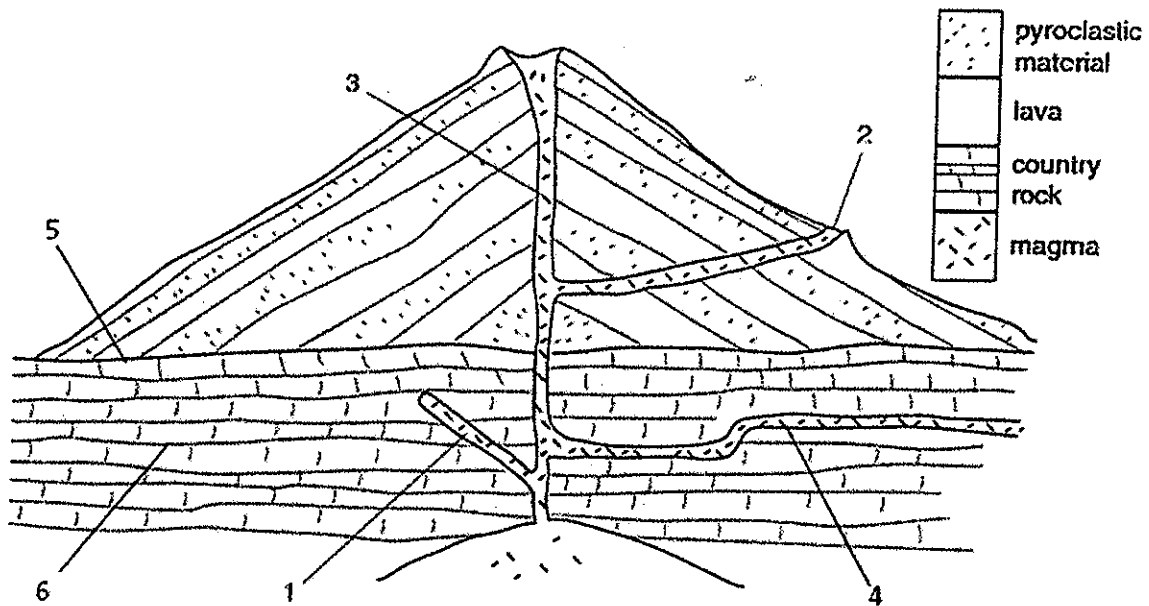
Differentiate between the following pairs. Use sketches to support your explanation:

- 2.1 Dome and basin (4)
- 2.2 True dip and apparent dip (4)
- 2.3 Horst and graben (4)
- 2.4 Normal fault and reverse fault (4)
- 2.5 Overthrust and underthrust faults (4)

[20]

QUESTION 3

The cross sectional diagram below shows the relationship between several igneous features and the surrounding country rocks



- 3.1 Name the igneous features labeled 1 to 4 in the above diagram. (4)
- 3.2 Name the surface types labeled as 5 and 6 in the above diagram (2)
- 3.3 Explain what is meant by pyroclastic material. (2)

[8]

ECONOMIC GEOLOGY

QUESTION 4

There are two original deposits of gold in South Africa.

- 4.1 Describe the origin of each deposit, pointing out differences and geological conditions. (4)
- 4.2 Name the geographical location of each deposit (regional). (4)
- 4.3 Name the secondary minerals associated with these deposits. (2)

[10]

QUESTION 5

Coal varies greatly in quality. Name and explain any (4) four of the properties that are taken into account in assessing the quality of coals. (12)

[12]

QUESTION 6

In the Bushveld Complex platinum group metals occur predominantly in two horizons.

Name these and describe their differences. (6)

[6]

QUESTION 7

Chromium, Copper, Nickel, Manganese and Iron are major base metals that are mined in South Africa.

7.1. Where are these predominantly mined? (5)

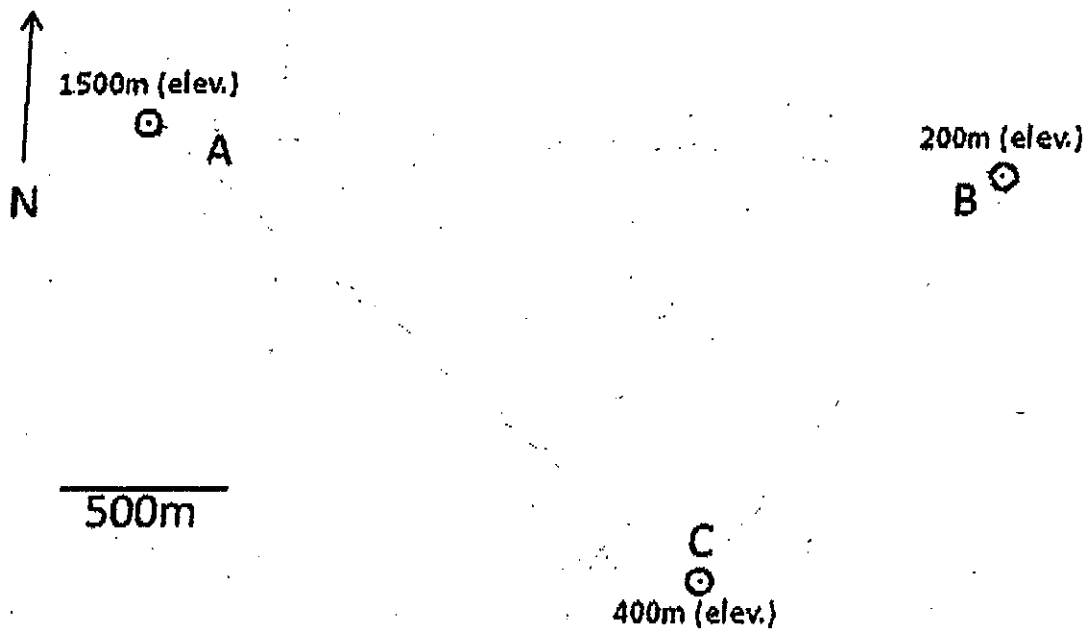
7.2. Describe the geological settings of each of these occurrences (15)

[20]

PRACTICAL

QUESTION 8

- 8.1 The plane below is exposed on a rockface that you are required to map. To your dismay, you have lost your protractor! Not to worry, there are other methods at your disposal to determine the orientation of the plane. Determine the **strike** and **true dip** of the plane graphically and display both on the plan below. (10)



- 8.2 What errors can you think of which may be introduced by the graphical method and what alternative method could be used? (4)

[14]

TOTAL MARKS: [100]



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS AND COAL MINING

GEOLOGY

DATE: 08 MAY 2012

TOTAL MARKS: 100

TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 to 15h30)

NOTE:

Answer all questions

One map is attached

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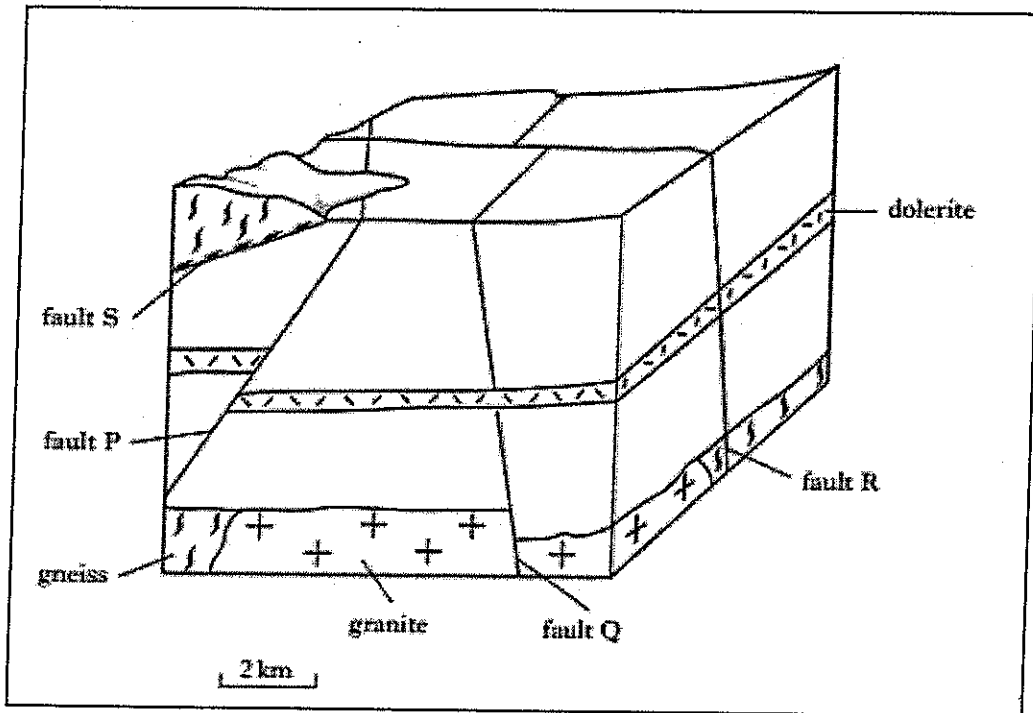
QUESTION 1

The following is an incomplete table prepared by a student. Help the student to complete the table.

Name of rock	Type of rock	Mineral assemblage
Marble	Metamorphic	(3)
(1)	Igneous	Quartz + Feldspar
Sandstone	(2)	(4)

(4)
[4]

QUESTION 2



2.1 What types of faults are P, Q, R and S? (4)

2.2 Which **two** of the following statements are correct? (2)

- A Slate is formed from metamorphosed sandstone
- B Metamorphic rocks can be metamorphosed again
- C Metamorphic rocks are all formed from igneous rocks
- D Metaquartzite consists mainly of calcite
- E Schist usually forms when gneiss melts
- F Mudstones can be turned into hornfels as a result of thermal metamorphism.

Give only the letters.

[6]

QUESTION 3

Working on an outcrop of rocks, on surface or in a mine, certain important data is collected. Name this data and give definitions. Also explain how this data is used practically.

[10]

QUESTION 4

Describe the formation and occurrence of the following economic deposits in South Africa. Specifically mention the different primary and secondary deposits (where appropriate), associated rock types and the localities where they are exploited.

4.1.1 Gold (10)

4.1.2 Platinum (10)

4.1.3 Coal (10)

[30]

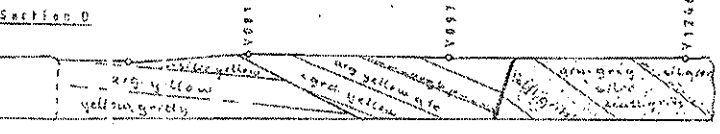
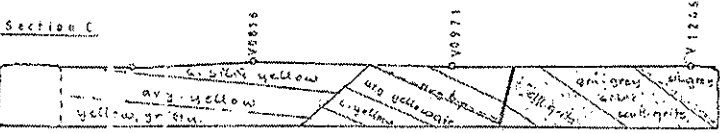
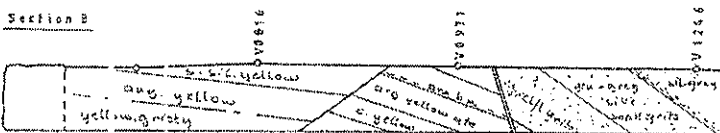
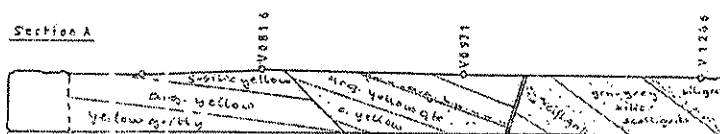
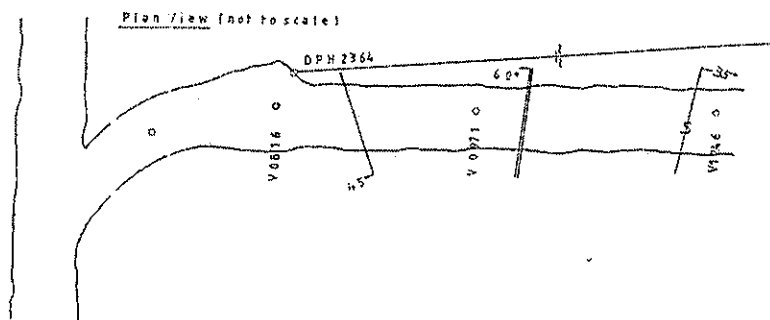
QUESTION 5

Describe different methods that can be used in the exploration for minerals and how these can be applied.

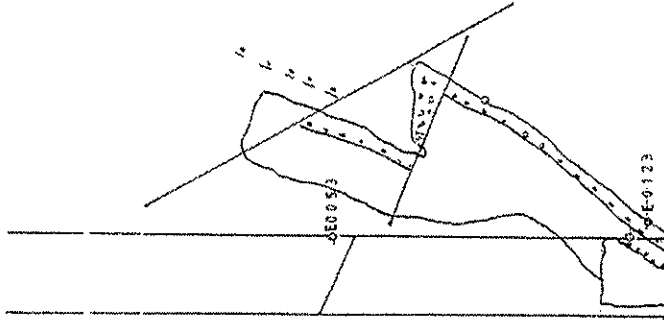
[15]

QUESTION 6

6.1 Match the correct section to the plan (5)



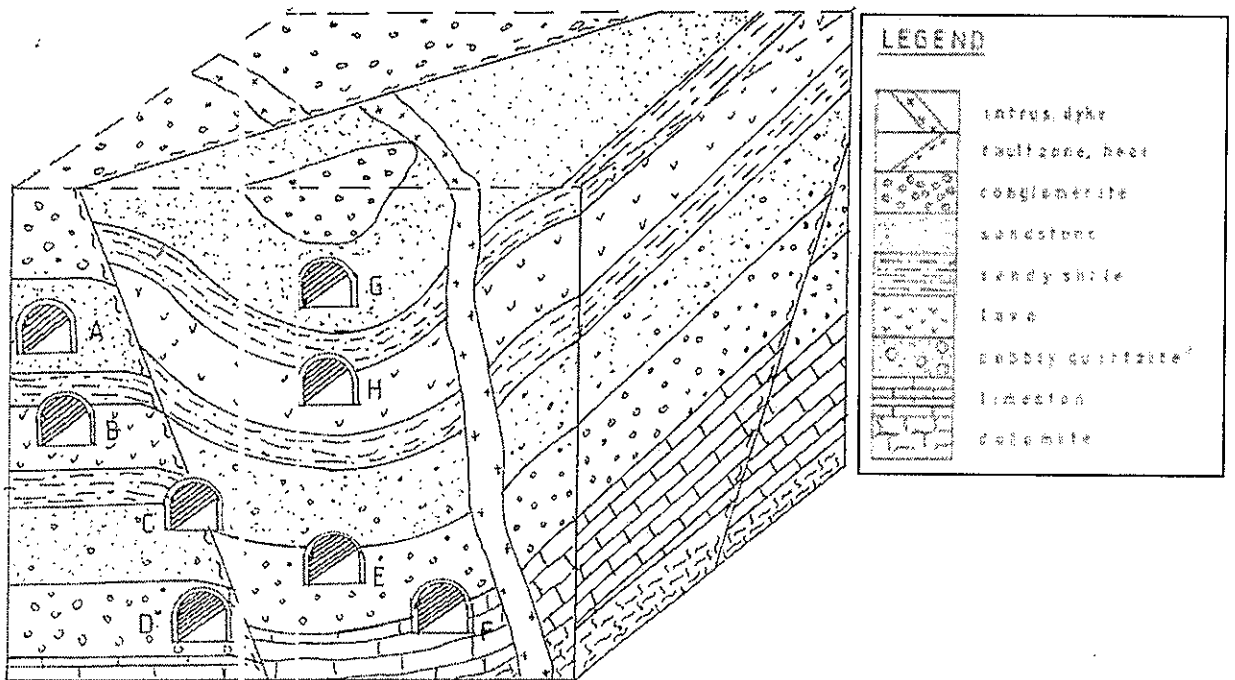
6.2 Reef has been lost in one of the raises (see sketch). What will your instructions be to overcome the problem? (5)



[10]

QUESTION 7

The diagram below shows a series of proposed tunnel positions in a wide variety of geological settings. Examine each tunnel position carefully and write brief notes on the problems associated with each proposed site. Which of the proposed positions will be the most suitable in the interests of safety and stability for prolonged usage? (10)



[10]

QUESTION 8

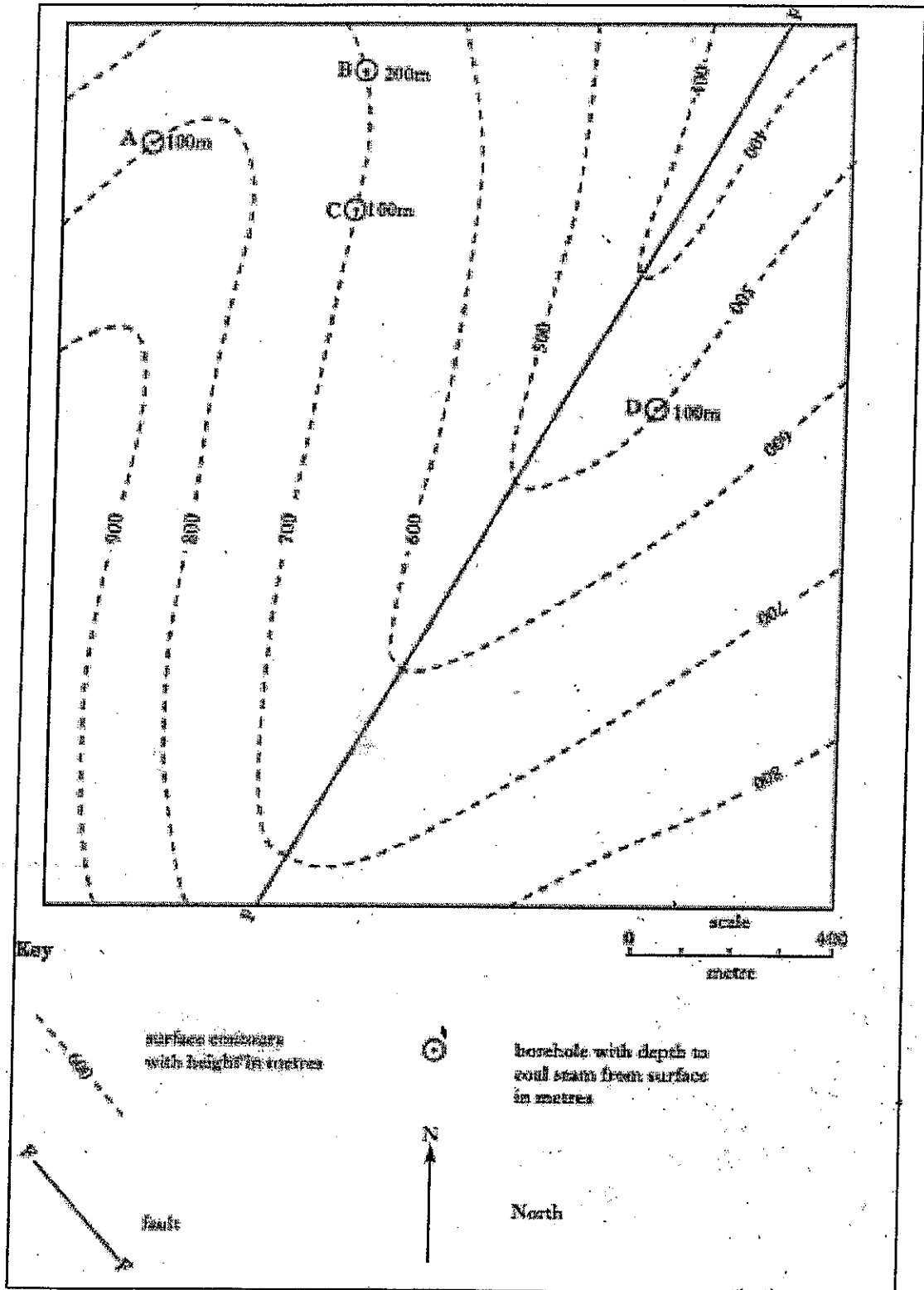
In the attached map a constantly dipping coal seam occurs in boreholes A, B, C and D at the depths shown.

- 8.1 Calculate the heights of the coal seam in boreholes A, B and C. Use these to draw structure contours for the coal seam **across the whole map**. Label the heights of the structure contours **north west** of the fault. (5)
- 8.2 Draw the outcrop of the coal seam **north west** of the fault (2)
- 8.3 In which direction does the coal seam dip? (1)
- 8.4 At what angle does the coal seam dip? (1)
- 8.5 Use borehole D to number the structure contours to the **south east** of the fault (2)
- 8.6 Draw the outcrop of the coal seam on the **south east** of the fault (2)
- 8.7 On which side of the fault have the rocks been downthrown? (1)
- 8.8 By how many metres have the rocks been downthrown? (1)
- [15]**

TOTAL MARKS: [100]

QUESTION 8

STUDENT EXAM NUMBER _____



NOTE: THIS SHEET MUST BE HANDED IN TOGETHER WITH YOUR EXAMINATION BOOK



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS AND COAL MINING

GEOLOGY

DATE: 16 OCTOBER 2012

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(12h30 to 15h30)

NOTE:

Answer all questions
One map is attached

- This question paper consists of **FOUR** pages including cover page.
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SECTION A: GENERAL GEOLOGY

QUESTION 1

- 1.1 Describe the different classes of rocks found on the earth. (3)
1.2 State the principal differences in appearance, composition, occurrences, area, distribution etc. between the classes listed in 1.1 above.

(7)

[10]

QUESTION 2

Explain (with sketches where appropriate) the following erosion structures:

- 2.1 angular unconformity (2)
2.2 suboutcrop (2)
2.3 disconformity (2)

[6]

QUESTION 3

Describe different types of faults and how it affects the mining of a particular horizon. You may use sketches where necessary.

[4]

SECTION B: DEPOSITS

QUESTION 4

Describe the formation and occurrence of the following economic deposits in South Africa. Specifically mention the different primary and secondary deposits (where appropriate), associated rock types and the localities where they are exploited.

- 4.1 Gold (10)
4.2 Platinum (10)
4.3 Coal (10)

[30]

QUESTION 5

State in each case by which method the following resources are concentrated into an economically valuable deposit.

- 5.1 Copper
5.2 Diamonds
5.3 Gold

- 5.4 Gypsum
- 5.5 Lead
- 5.6 Manganese
- 5.7 Uranium

[15]

SECTION C: PRACTICAL

QUESTION 6

Describe different methods that can be used in the exploration for minerals and how these can be applied.

[10]

QUESTION 7

- 7.1 Explain the different classes of Mineral Resources as stipulated in the SAMREC code. (3)
- 7.2 Explain the difference between Resources and Reserves (2)

[5]

QUESTION 8

Refer to the attached map which shows part of a coal prospect in which a number of vertical boreholes have been drilled. An extract of the borehole logs is given below the map. Assume constant dips for all structures.

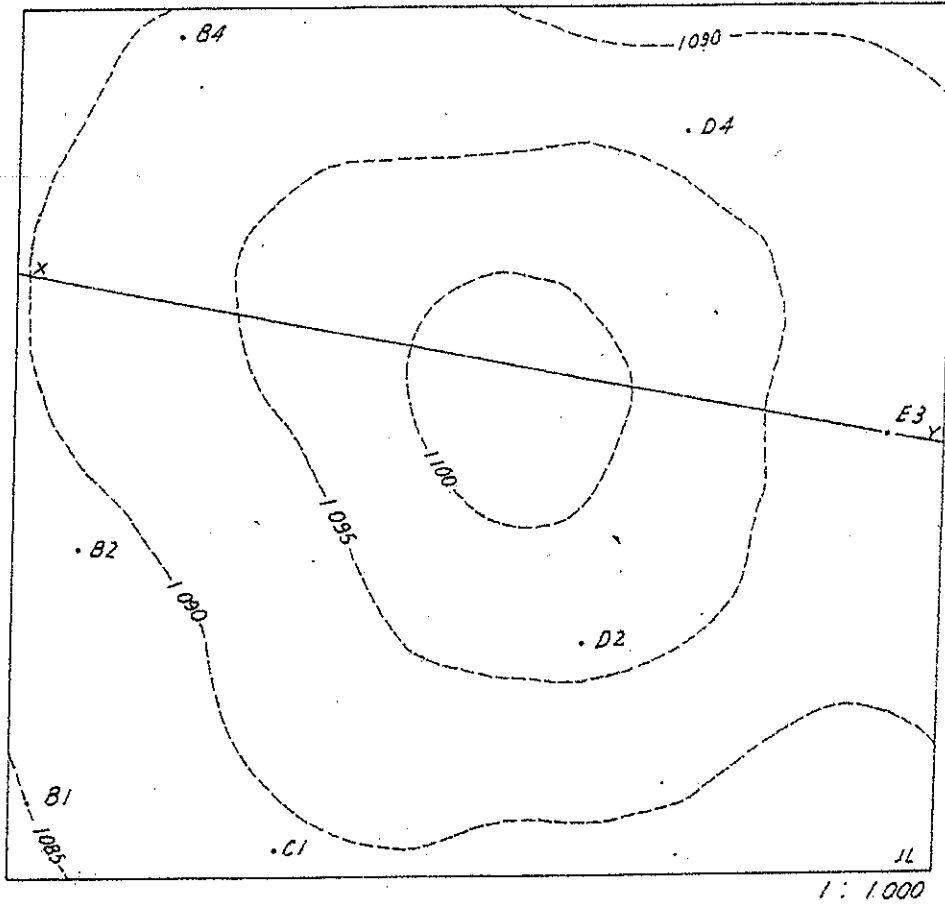
- 8.1 Determine the strike, dip and thickness of the dolerite and plot its outcrop. Also determine the dip of the coal seams and throw on the dolerite.
- 8.2 At what depth will a vertical borehole at B1 intersect the No. 2 seam and the tillite?
- 8.3 Draw an accurate section along X-Y and shade the area of the map underlain by the No. 1 seam.

Borehole	Collar elevation (m)	Depth of intersection (m)				
		Coal		Dolerite		Tillite
		No. 2 Seam	No. 1 Seam	Upper surface	Lower surface	
B2	1088	23	33	-	-	38
B4	1092	27	37	-	-	42
C1	1089	19	29	-	-	34
D2	1096	-	31	11	26	36
D4	1094	-	29	9	24	34
E3	1093	28	38	48	63	43

[20]

QUESTION 8

STUDENT EXAM NUMBER _____



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