

SENIOR SECONDARY INTERVENTION PROGRAMME 2013



GRADE 12

GEOGRAPHY

LEARNER NOTES

The SSIP is supported by



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TEACHER NOTES

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TOPIC 1: CLIMATE AND WEATHER SA AND THE WORLD: CHANGE IN ENERGY BALANCE – THE DEVELOPMENT OF WINDS AND GLOBAL CIRCULATION

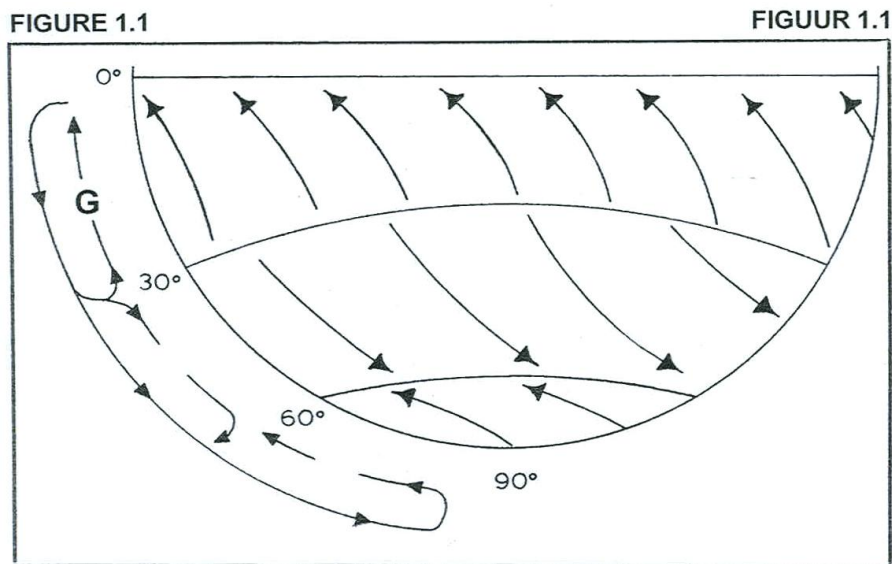
Teacher Note: It is very important that the learners understand the content in this topic. They must be able to link back to it when they do cyclones and South African weather later on. The global circulation sketch must be emphasised and all learners must be able to draw it, label it fully and explain the processes illustrated on it.

LESSON OVERVIEW

- Spend most time on Topic 1 as Topic 2 only rarely appears in the exams.
- Explain why temperatures differ over the surface; emphasise latitudinal differences.
- Explain that temperature differences lead to pressure differences and wind.
- Explain the difference between low pressure and high pressure cells and compare the weather expected at the different pressure cells.
- Explain what Coriolis does to moving air and why.
- Explain in detail the pressure belts and wind belts and circulation cells.
- Explain that regional climate will be influenced by the global circulation, e.g. deserts at sub tropical HP and torrential rain and storms at Low pressure cells.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: Global Circulation 5 minutes 10 marks (*Adapted from: DoE November 2008*)



QUESTION 1

- 1.1 Refer to FIGURE 1.1. Four options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.5), for example 1.1.6 A.
- 1.1.1 Identify the cell labelled **G** which occurs between 0° – 30° north and south of the equator.
- A Hadley
 - B Ferrell (mid-latitude)
 - C Polar
 - D Equatorial
- 1.1.2 The area near the equator where the winds die out is referred to as the ...
- A polar front.
 - B inter-tropical convergence zone (ITCZ).
 - C doldrums.
 - D inter-tropical front.
- 1.1.3 Winds associated with the ITCZ are ...
- A southeast trades.
 - B southeast and northeast trades.
 - C northwesterlies and southwesterlies.
 - D polar easterlies
- 1.1.4 A force that influences the speed of winds is called the ...
- A pressure gradient force.
 - B Coriolis force.
 - C geostrophic force.
 - D primary force.
- 1.1.5 Air rises at the equator and sinks at the poles due to ...
- A divergence at the equator and convergence at the poles.
 - B divergence at the poles and convergence at the equator.
 - C surplus heat at the equator and a heat deficit at the poles.
 - D surplus heat at the poles and a heat deficit at the equator
- (5 x 2) [10]

HINTS

Hint 1: Never leave out questions – especially not multiple choice questions.

Hint 2: Number correctly and write only the correct letter next to the number, e.g. 1.1.5 C

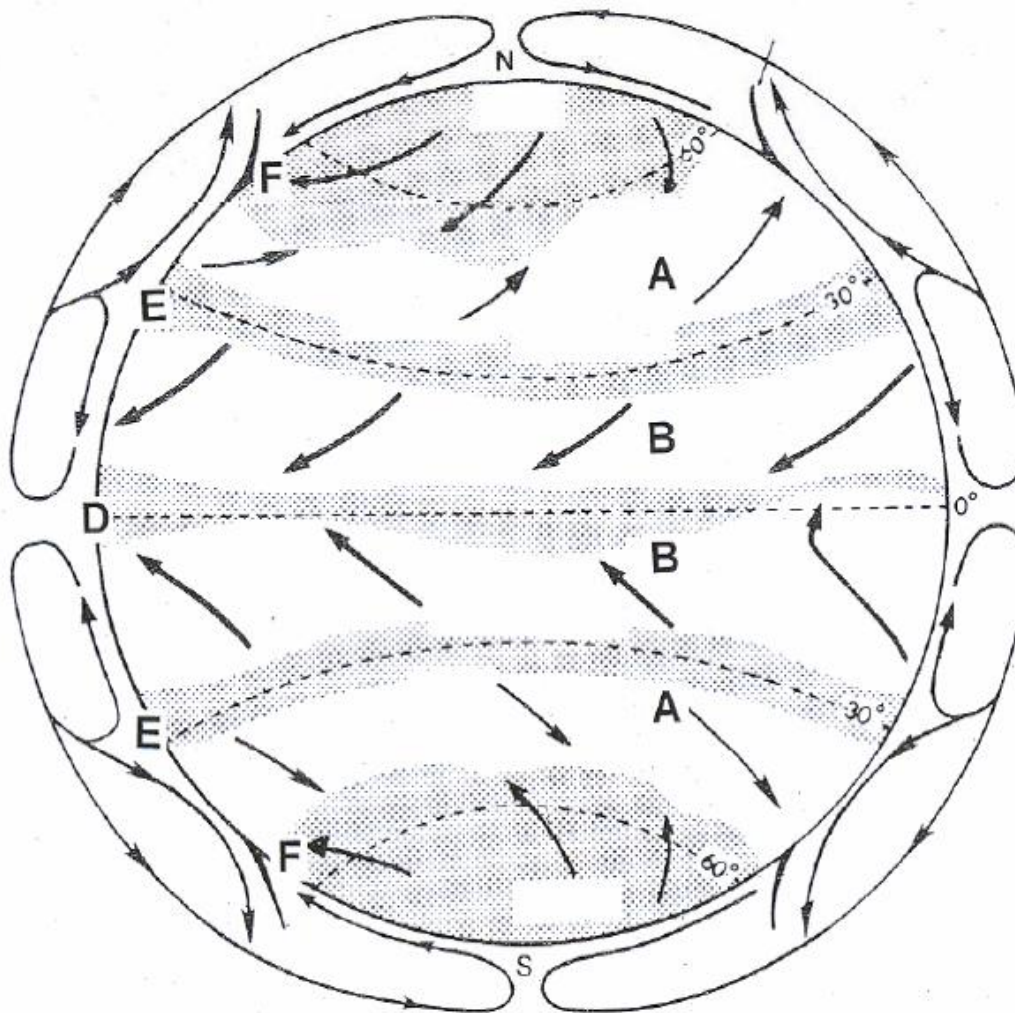
Hint 3: Never write down two answers. If you do, you will get no marks.

QUESTION 2: 15 minutes 22 marks (Adapted from: DoE March 2009)

Refer to figure below showing the global distribution of the earth's pressure belts, planetary wind belts and the tri-cellular circulation of air and answer the questions that follow. The planetary wind system is the result of the Coriolis force which causes air to deflect.

- 2.1 (a) What is responsible for the existence of the Coriolis force? (1 x 2) (2)

- ((b) How does the strength of the Coriolis force change from the equator to the poles? (1 x 2) (2)
- ((c) Explain how the Coriolis force results in the planetary wind belts as illustrated in the figure below. (2 x 2) (4)
- 2.2 ((a) Identify the planetary wind belts labelled A and B respectively. (2 x 2) (4)
- ((b) In which ONE of the planetary wind belts mentioned in QUESTION 2.2(a) do mid-latitude cyclones develop? (1 x 2) (2)
- ((c) Taking your answer to QUESTION 2.2(b) into account, give the general direction of movement of a mid-latitude cyclone (1 x 2) (2)
- 2.3 ((a) At which position, D, E or F, does one expect to find convective thunderstorms? (1 x 2) (2)
- ((b) Explain your answer to QUESTION 2.3(a). (2 x 2) (4)



[22]

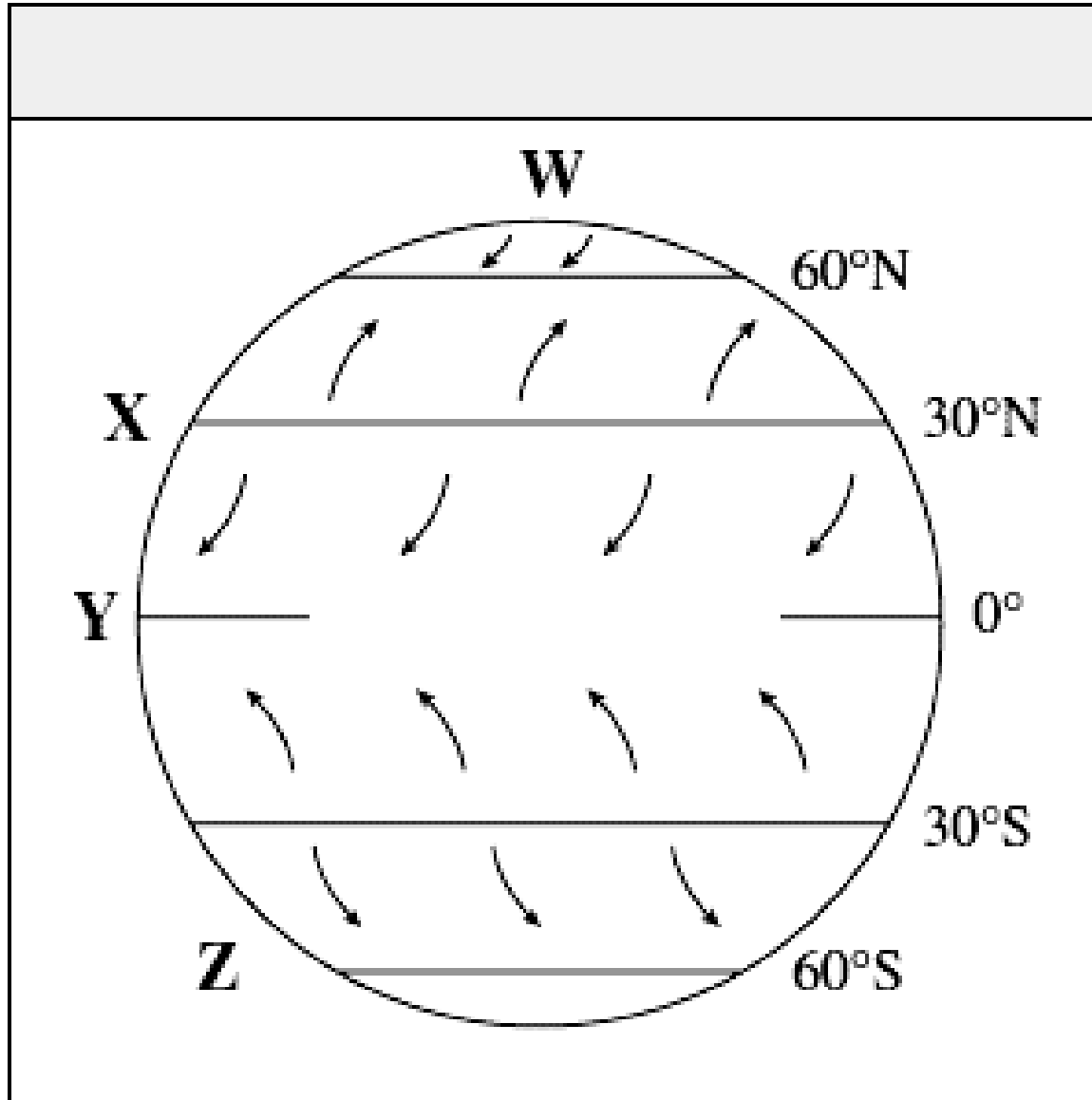
HINTS

Hint 1: You need to know the sketch above off by heart and must be able to label all the wind belts and pressure belts as well as the ITCZ and polar fronts.

Hint 2: You need to explain how these winds blow and understand how the system works.

Hint 3: Do not confuse wind belts and pressure belts. If you are asked for a pressure belt and you give a wind belt as an answer, you will not get marks.

QUESTION 3: **5 minutes** **10 marks** (*Adapted from: DoE November 2010*)



- 3.1 Refer to the figure above showing global pressure belts and winds. Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number.

3.1.1 The figure above illustrates ... circulation.

- A primary
- B secondary
- C tertiary
- D upper atmospheric

3.1.2 Convergence occurs in this area to form the ITCZ:

- A W
- B X
- C Y
- D Z

3.1.3 The westerlies and polar winds converge here to form the polar front:

- A W
- B X
- C Y
- D Z

3.1.4 The northwesterlies diverge from this pressure belt:

- A W
- B X
- C Y
- D Z

3.1.5 This area is associated with the origin of the polar easterlies:

- A W
- B X
- C Y
- D Z

(5 x 2) [10]

QUESTION 4: **5 minutes** **10 marks** (*Adapted from: DoE November 2010*)

Refer to the figure below showing the tri-cellular arrangement of atmospheric circulation.
Match each statement below with the Hadley/tropical, Ferrell/midlatitude or polar cell.

4.1.1 Convergence of surface air causes uplift along the equator.

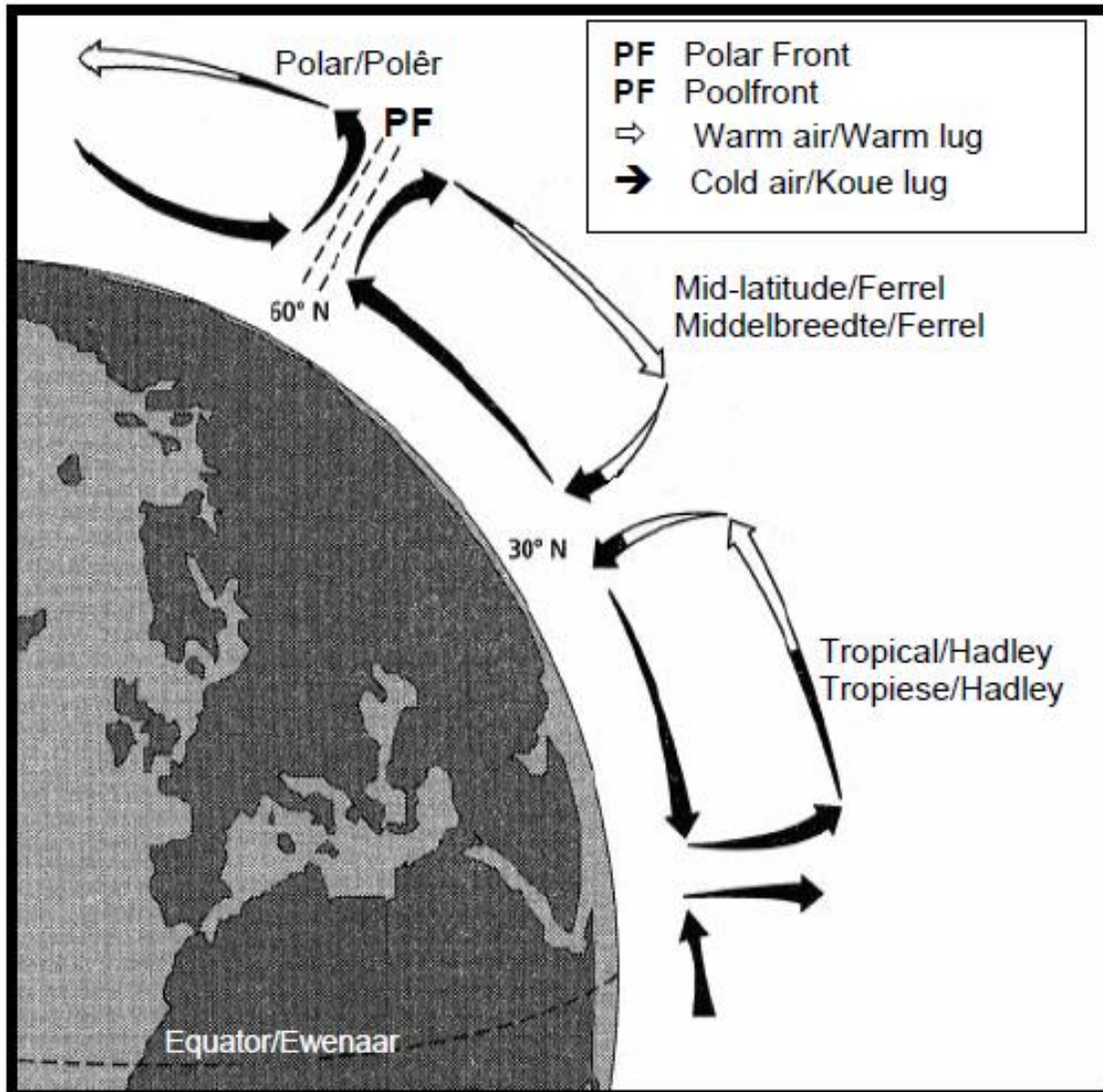
4.1.2 Occurs between 60° – 90° N of the equator.

4.1.3 Air in the upper atmosphere is heated as it moves towards the equator.

4.1.4 This is a heat-generated cell of circulation.

4.1.5 Develops on the northern side of the polar front.

(5 x 2) [10]

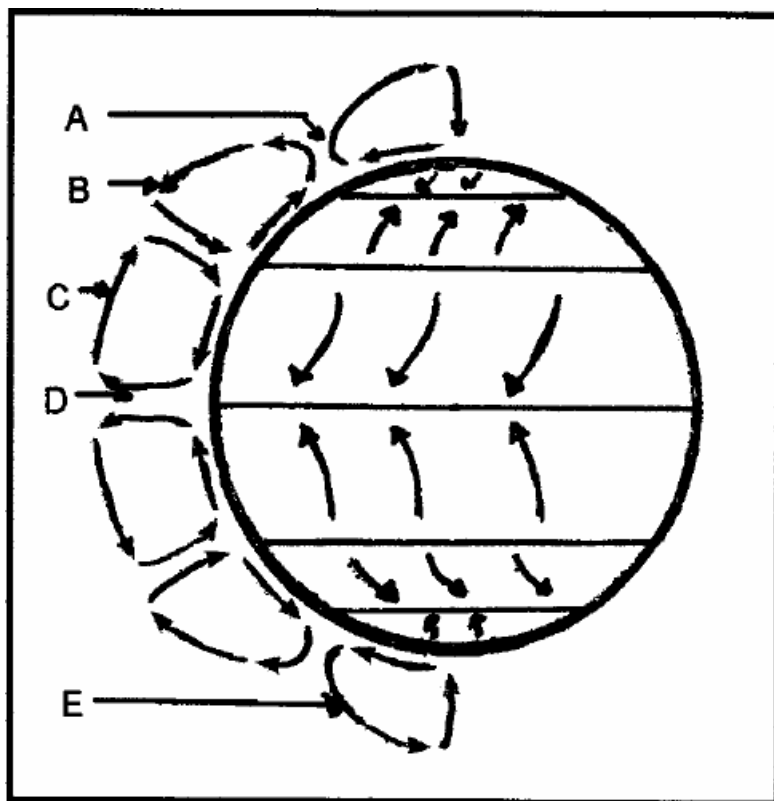
**HINTS**

Hint 1: Read the question carefully and match it with the feature that fits the description best.

Hint 2: You have a choice of three answers for each question – given in the question – so all the answers must be either Hadley/Tropical or Ferrell/Mid latitude or polar cell.

QUESTION 5: **5 minutes** **10 marks** (*Adapted from: DoE September 2008*)

- 5.1 Refer to the figure below showing the tri-cellular arrangement of the atmosphere. Various options are provided as possible answers to each of the following questions. Choose the answer and write only the letter (A – D) next to the question number.



5.1.1 The front at A is known as the ... front.

- A tropical
- B mid-latitude
- C polar
- D moisture

5.1.2 The air circulation cell labelled B is the ... cell.

- A Hadley
- B Ferrell
- C polar
- D tropical

5.1.3 The surface air flow in the air circulatory cell labelled C is ...

- A convergence.
- B divergence.
- C uplift.
- D subsidence

5.1.4 The ...winds meet at D.

- A polar easterly
- B tropical easterly
- C polar westerly
- D tropical westerly

5.1.5 At E there is a general ... of air.

- A subsidence and heating
- B rising and heating
- C subsidence and cooling
- D rising and cooling

(5x2) [10]

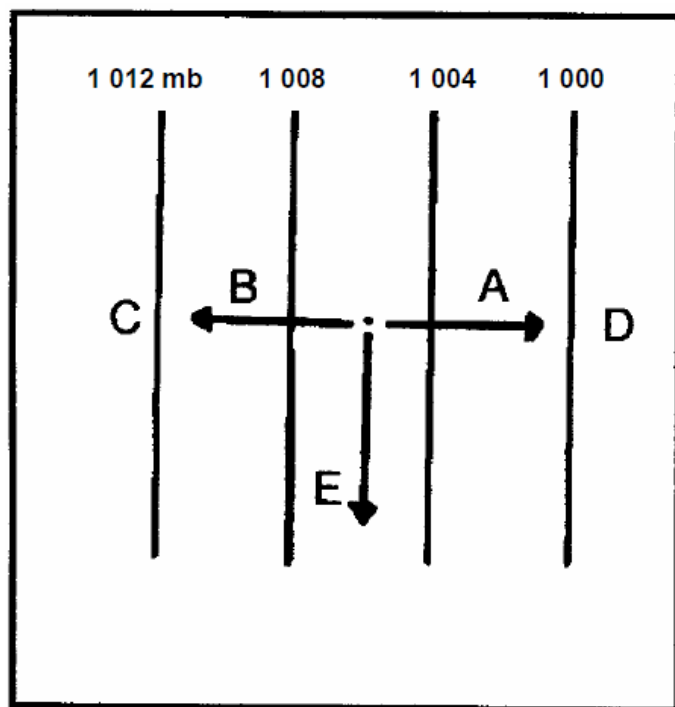
QUESTION 6: **10 minutes** **10 marks** (*Adapted from: DoE September 2008*)

6.1 Refer to FIGURE 2.1 showing the deflection of winds. Match each of the letters **A, B, C, D** and **E** with ONE of the terms listed below. Write down only the letter (A – E) and next to it the correct term, for example G – Pressure cell.

- High pressure area
- Frictional force
- Low pressure area
- Convergence
- Geostrophic wind
- Pressure gradient force
- Coriolis force

(5x2) [10]

FIGURE 2.1



SECTION B: SOLUTIONS TO SECTION A**QUESTION 1**

- 1.1.1 A ✓✓ Hadley
 1.1.2 C ✓✓ Doldrums **OR**
 B ✓✓ inter-tropical convergence zone (ITCZ) 2
 1.1.3 B ✓✓ southeast and northeast trades
 1.1.4 A ✓✓ pressure gradient force
 1.1.5 C ✓✓ surplus heat at the equator and a deficit at the poles **(5x2) [10]**

QUESTION 2

- 2.1 (a) Rotation of the earth ✓✓ (1 x 2) (2)
 (b) Strengthens/get stronger ✓✓ (1 x 2) (2)
 (c) Air moves from HP to LP ✓✓
 Coriolis force results in air being deflected to left in S hemisphere
 and right in N hemisphere ✓✓ (2 x 2) (4)
 2.2 (a) A – westerlies ✓✓
 B – tropical easterlies/trade wind belt ✓✓ (2 x 2) (4)
 (b) A – westerlies ✓✓ (1 x 2) (2)
 (c) West to east/eastwards ✓✓ (1 x 2) (2)
 2.3 (a) D ✓✓ (1 x 2) (2)
 (b) Extremely warm air at equator / high temperature ✓✓
 Warm air rises rapidly to great altitudes / heights ✓✓
 Large scale condensation results in thunderstorms ✓✓ [Any TWO] (2 x 2) (4)
[22]

QUESTION 3

- 3.1.1 A/B ✓✓
 3.1.2 C ✓✓
 3.1.3 D ✓✓
 3.1.4 B ✓✓
 3.1.5 A ✓✓ **(5 x 2) [10]**

QUESTION 4

- 4.1.1 Hadley/Tropical ✓✓
 4.1.2 Polar cell ✓✓
 4.1.3 Ferrell/Mid-latitude ✓✓
 4.1.4 Hadley/Tropical ✓✓
 4.1.5 Polar ✓✓ **(5 x 2) [10]**

QUESTION 5

- 5.1.1 C ✓✓
 5.1.2 B ✓✓
 5.1.3 B ✓✓
 5.1.4 B ✓✓
 5.1.5 A ✓✓ **(5 x 2) [10]**

QUESTION 6

- 6.1 A – Pressure gradient force ✓✓
 B – Coriolis force ✓✓
 C – High-pressure area ✓✓
 D – Low-pressure area ✓✓
 E – Geostrophic flow (wind) ✓✓

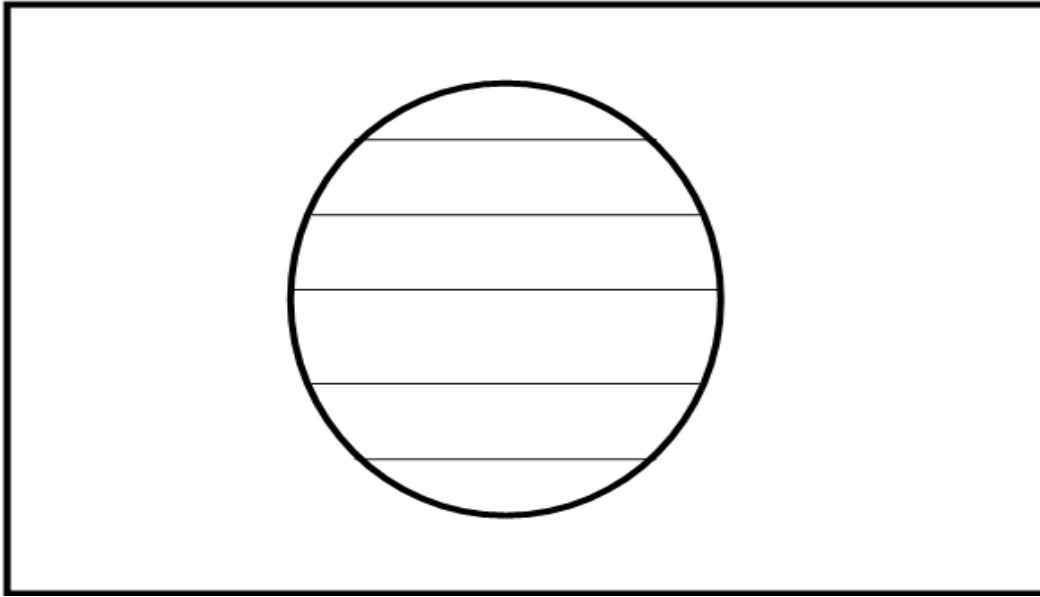
(5x2) [10]**SECTION C: HOMEWORK****TOPIC 1:****QUESTION 1: 10 minutes 20 marks**

Indicate whether the following questions are true or false:

1. Primary circulation cells are set in motion by winds
2. The Ferrell cell is thermally driven.
3. Coriolis force is caused by the different rotation speeds at different latitudes.
4. Coriolis force is absent at the equator.
5. Coriolis force deflects winds to the left of their original direction, the Southern hemisphere.
6. Air move clockwise away from a low pressure in the southern hemisphere.
7. High pressure cells are associated with clear dry weather, because there is rising air.
8. Clouds can only form in rising air.
9. The polar front is at 90° North and South.
10. The global circulation cells are not completely stable.

(10 x 2) [20]**QUESTION 2: Global Circulation and Winds 1 hour 50 marks**

- 2.1. Label the sketch below to illustrate the following information about global circulation:
- 2.1.1. Indicate the global circulation cells. (3)
 - 2.1.2. Indicate all the air pressure belts. (7)
 - 2.1.3. Draw in and label all the wind belts. (6)
 - 2.1.4. Indicate where the ITCZ / Doldrums and the polar fronts occur. (3)

Global Circulation

- 2.2. What sets the global circulation cells in motion? (2)
- 2.3. Explain with a well labelled sketch why the air ascends at the I.T.C.Z. (5)
- 2.4. Explain what happens at the Doldrums. (3)
- 2.5. Describe the air movement at the sub-tropical high pressure cells in the southern hemisphere. (3)
- 2.6. Which two air masses meet at the polar fronts? (2)
- 2.7. Explain how the heat equator influence the positioning of the primary circulation cells during a year. (4)
- 2.8. Why can tropical cyclones not develop on the equator? (1)
- 2.9. Where do mid-latitude cyclones start? (1)
- 2.10. Explain how Coriolis force influence wind in the southern and northern hemispheres respectively. (2)
- 2.11. Explain how upper air divergence influences the convection at the equator. (2)
- 2.12. Describe what happens to descending air.
Refer to temperature, humidity and air pressure. (3)
- 2.13. Describe what happens to unstable air. (3)

[50]

SECTION D: SOLUTIONS TO HOMEWORK

TOPIC 1: CLIMATE AND WEATHER

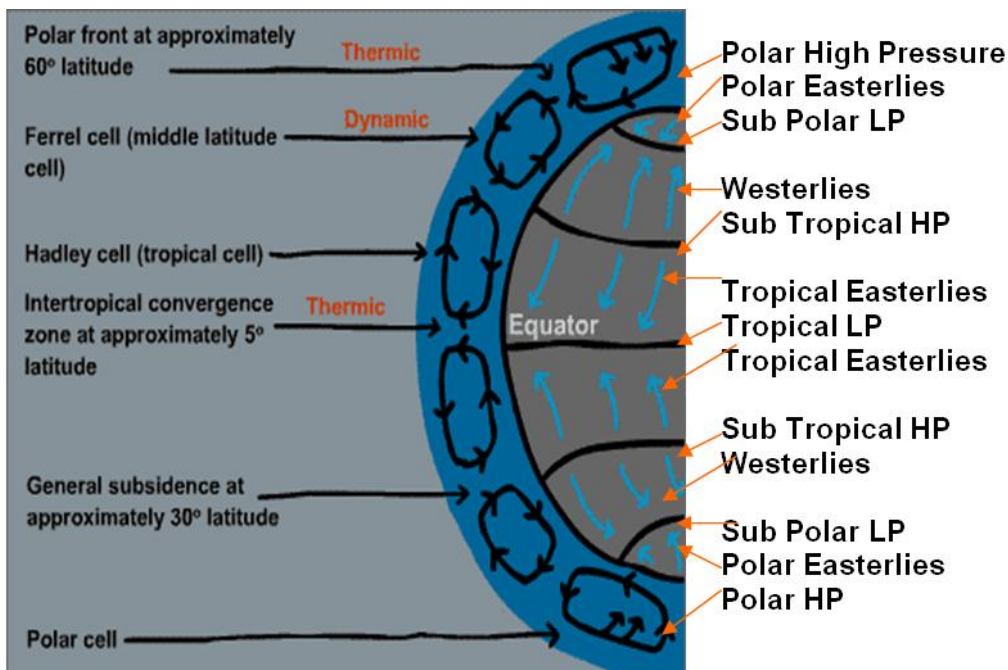
QUESTION 1

1. False – temperature and pressure differences
2. False – dynamically driven
3. True
4. True
5. True
6. False – clockwise to a low pressure in the southern hemisphere
7. False – subsiding air
8. True
9. False - 60° North and South.
10. True

[10]

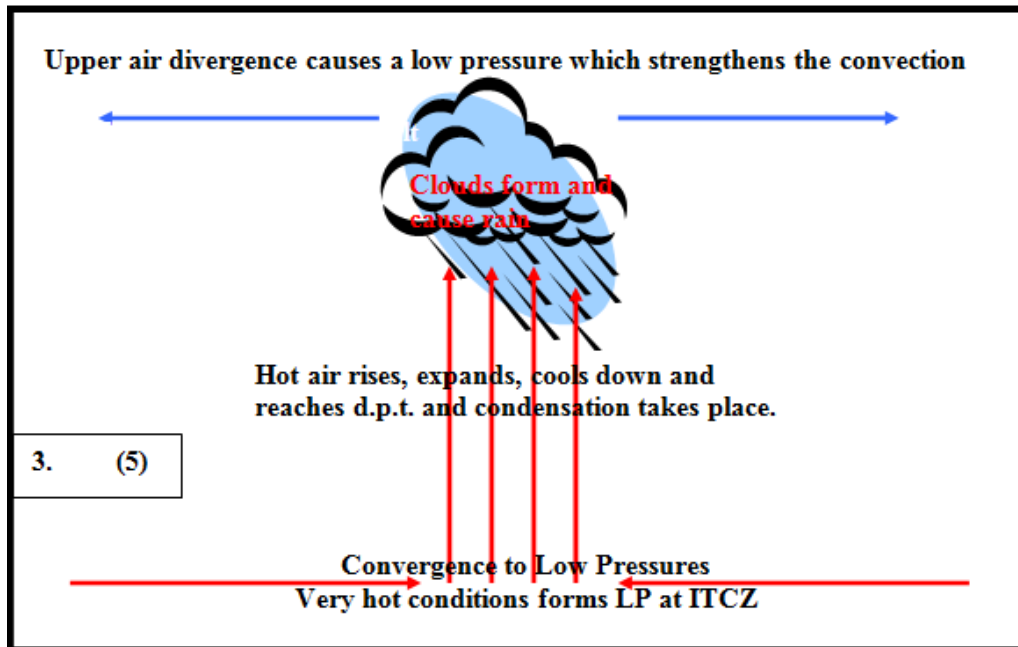
QUESTION 2

- 2.1.1 (3)
- 2.1.2. (7)
- 2.1.3. (6)
- 2.1.4. for each correct label on the diagram (3)



- 2.2 Temperature differences that lead to pressure differences and pressure gradients that cause wind. (2)

2.3.



3. (5)

- 2.4. Owing to rising of air there is very little horizontal movement of air. There are rain and windless conditions. (3)
- 2.5. Air descends / sinks anticlockwise and then moves outward from the high Pressure on the surface. (3)
- 2.6. The cold polar easterlies and the much warmer westerlies. (2)
- 2.7. The heat equator (ITCZ) influence the positioning of the primary circulation cells as it follows the direct sunlight through the year. In September and March it will be near to the equator, but the ITCZ and all the circulation cells will move north in June and South of the equator in July. (4)
- 2.8. Coriolis force is absent (1)
- 2.9. At the polar fronts. (1)
- 2.10. Coriolis force deflects winds to the left of their original directions in the Southern hemisphere and to the right of their original direction in the Northern hemisphere. (2)
- 2.11. Upper air divergence causes a low pressure in the upper air which strengthens the convection currents. (2)
- 2.12. Temperature increases at D.A.L.R. $1^{\circ}\text{C}/100\text{m}$
Humidity decreases,
Air pressure increases (3)
- 2.13. Unstable air rises and cools down at D.A.L.R. $1^{\circ}\text{C}/100\text{m}$
When it reaches d.p.t. condensation takes place and latent heat is released
Temperature only then drops at W.A.L.R. $0,5^{\circ}\text{C}/100\text{m}$
It will stop rising as soon as it is not warmer than the surrounding air. (3)

[50]

TOPIC 2: SECONDARY AND TERTIARY CIRCULATION

Teacher Note: There are always questions on these sections in the exams. It is relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks in the exam.

LESSON OVERVIEW

Explain the following: Secondary circulation: Identify and describe the characteristics of the following: the recap on Global Circulation from session 1. This is more localised and is called Secondary circulation.

Refer to: Tropical Easterlies: Warm, moist, unstable winds blowing to the equator

Westerlies: occur in mid-latitudes where mid-latitude cyclones influence the weather – horse latitudes because it is so stormy

Polar Easterlies: Cold stable dry winds blowing from the poles

ITCZ: Inter tropical Convergence Zone – Heat Equator, shifts with direct sunlight between seasons. Rest of wind systems shift with it to the North in June, winter, and South in December.

Monsoon: Weather conditions that change completely from one season to the next as winds change direction due to pressure belts shifting with the direct sunlight.

Briefly explain what Microclimate / Tertiary circulation is: Local climate and explain the following examples

Valley conditions during the day and the night

Land and sea breezes

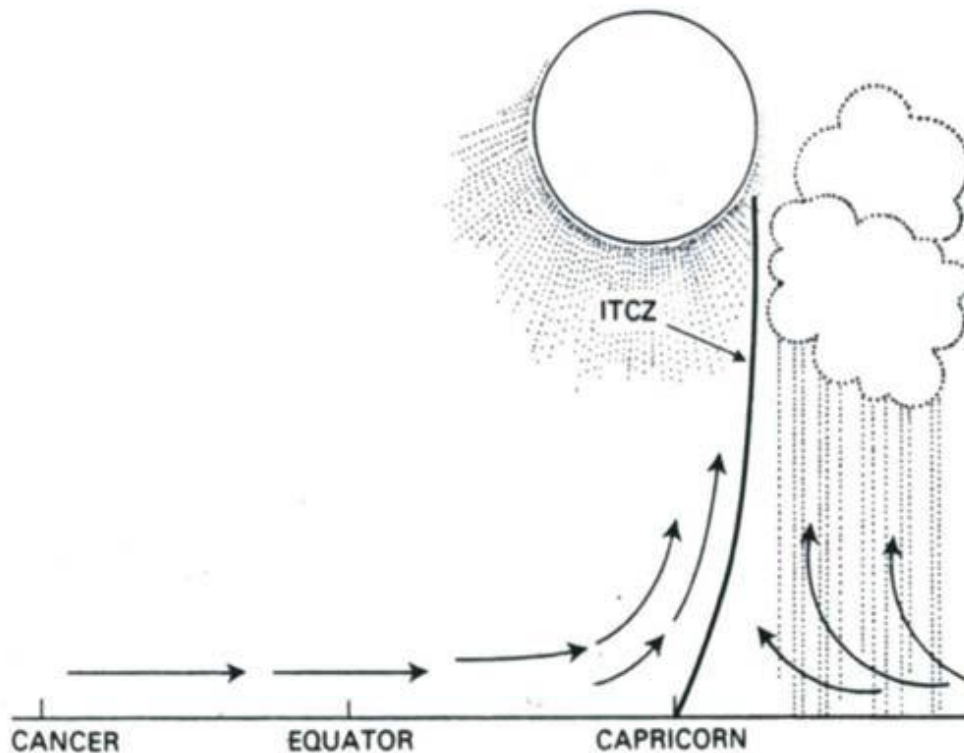
Urban climates

Berg winds

SECTION A: TYPICAL EXAM QUESTIONS ON SECONDARY & TERTIARY CIRCULATION

QUESTION 1: 10 minutes 16 marks (Source: Sunday Times Practice Paper November 2009)

- 1.1. Use the figure on the following page to answer this question. The figure shows a cross section of the ITCZ.
 - 1.1.1 What do the letters ITCZ stand for? (1 x 2) (2)
 - 1.1.2 Over which line of latitude does the ITCZ lie? (1 x 2) (2)
 - 1.1.3 Which season is it in the Southern Hemisphere? Give a reason for your answer (2 x 2) (4)
 - 1.1.4 Name the planetary winds that are blowing towards the ITCZ. (1 x 2) (2)
 - 1.4.5 Explain why heavy rain is shown at the ITCZ. (3 x 2) (6)
- [16]

**HINTS:**

Hint 1: Learners need to be able to apply what they have learnt in session 1 on global circulation.

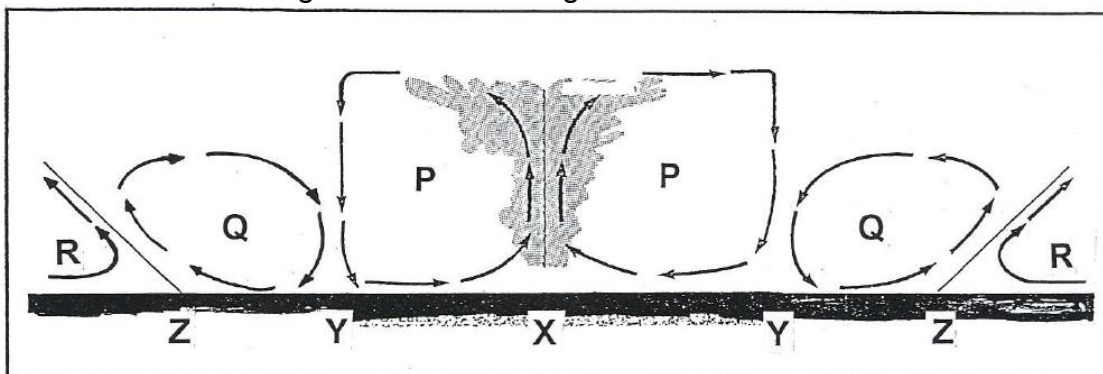
Hint 2: They must draw on what they have learnt in gr. 10 about the formation of clouds and rain to answer this question.

Hint 3: They must look at the location of the pressure cells in comparison to the latitudes to determine the season.

QUESTION 2: 15 minutes 20 marks

(Source: 2008 Exemplar)

2. Refer to the figure below showing the tri-cellular circulation of the atmosphere



2.1.1. Why do meteorologists refer to a tri-cellular circulation of the atmosphere? (1 x 2) (2)

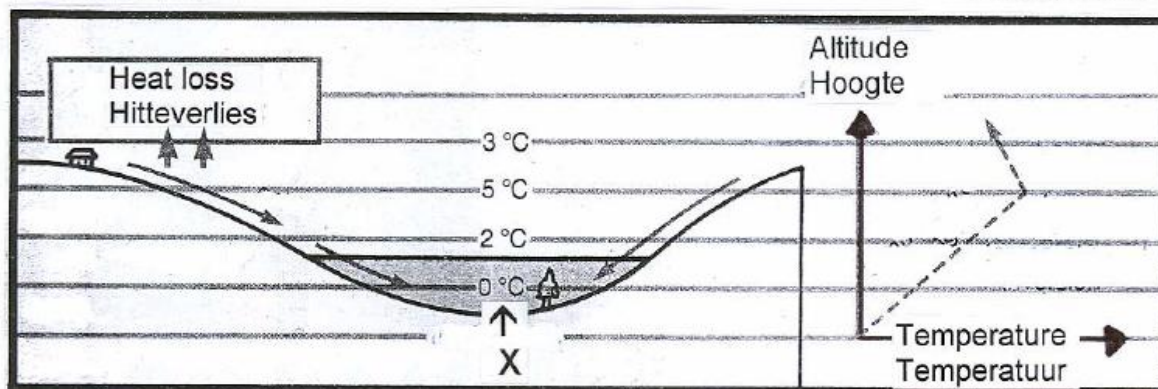
- 2.1.1. Why do meteorologists refer to a tri-cellular circulation of the atmosphere? (1 x 2) (2)
- 2.1.2. (a) Identify the THREE cells of circulation labelled P, Q and R respectively. (3 x 2) (6)
- (b) What does the abbreviation ITCZ stand for? (1 x 2) (2)
- (c) Where, at X, Y or Z, would the ITCZ be found? (1 x 2) (2)
- (d) Name any TWO weather conditions that one will experience at the ITCZ. (2 x 2) (4)
- (e) Explain why the weather conditions mentioned in 2.1.2.d occur at the ITCZ. (2 x 2) (4)
- [20]

QUESTION 3: 5 minutes 10 marks (Source: DoE March 2009 Supplementary Paper)

- 3.1 Refer to the figure below. Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question
- 3.1.1 The diagram illustrates conditions that exist during daytime.
- 3.1.2 The graph illustrates a temperature inversion.
- 3.1.3 The downward flow of air illustrated in FIGURE 1.1 is known as anabatic air flow.
- 3.1.4 The zone marked X is the warm thermal belt.
- 3.1.5 The heat loss is as a result of terrestrial radiation. (5 x 2) [10]

FIGURE 1.1

FIGUUR 1.1



HINTS

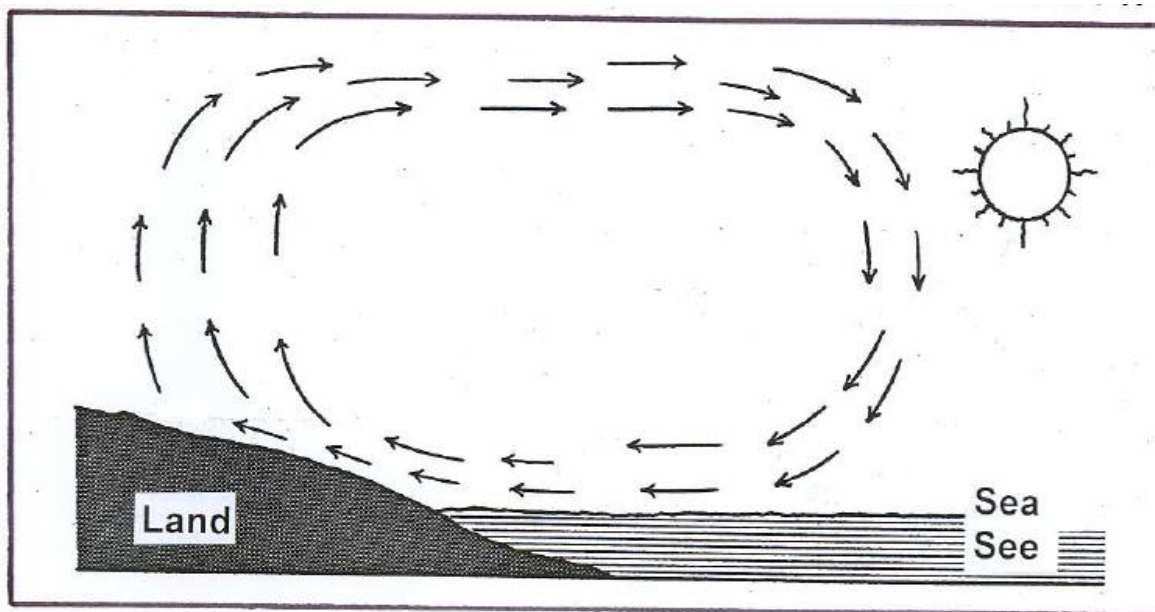
Hint 1: Always determine if day or night conditions are shown in the valley

Hint 2: Describe the process of temperature inversions step by step when asked.

QUESTION 4: 6 minutes 12 marks*(Source: DoE November 2009)*

- 4.1 Climatologists discovered many years ago that a reversal in wind direction occurs along the coastline from daytime to night-time. These reversed wind conditions are referred to as land and sea breezes. Land and sea breezes are localised and have a moderating influence on coastal temperatures. Use your knowledge of land and sea breezes, and also refer to the figure on the following page to answer the questions below.
- 4.1.1 Does the figure illustrate a land breeze or a sea breeze? (1 x 2) (2)
- 4.1.2 What does it mean if one says the breeze is localised? (1 x 2) (2)
- 4.1.3 Briefly describe the development of the breeze illustrated in FIGURE 1.4. (3 x 2) (6)
- 4.1.4 The breeze illustrated in FIGURE 1.4 will result in high-income suburbs with high land values along the coastline bordered by warm ocean currents. Give ONE reason why this is so. (1 x 2) (2)

[12]

**QUESTION 5: 10 minutes 16 marks***(Source: DoE November 2008)*

- 5.1 Geographers discovered many years ago that heat emissions in urban areas affect the climate. Use your knowledge of heat islands and refer to the figure below to answer the questions below.
- 5.1.1 Explain what is meant by the term *heat island*. (1 x 2) (2)
- 5.1.2 Which part of the city is experiencing the highest temperature? (1 x 2) (2)
- 5.1.3 State TWO ways in which you think people's lives have been changed by the existence of heat islands. (2 x 2) (4)

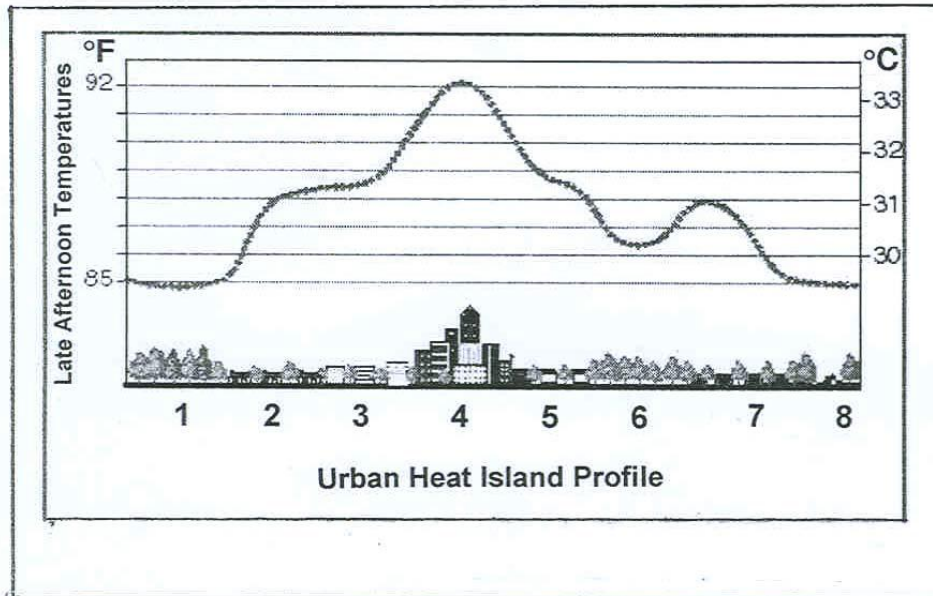
5.1.4. Give TWO reasons why modern buildings have an effect on heat islands.

(2 x 2) (4)

5.1.5 Suggest TWO measures that can be taken to reduce high temperatures in the city centre.

(2 x 2) (4)

[16]

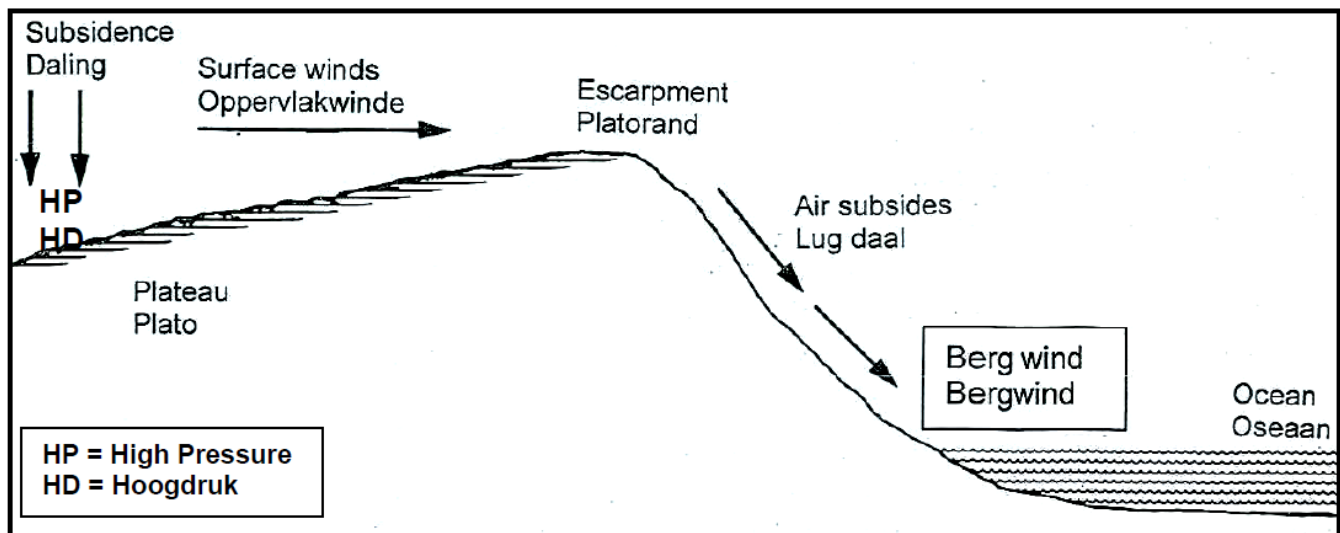


- 1 - Rural
- 2 - Suburban Residential
- 3 - Commercial
- 4 - Downtown
- 5 - Urban Residential
- 6 - Park
- 7 - Suburban Residential
- 8 - Rural Farmland

QUESTIONS 6: 15 minutes 12 marks

(Source: DoE November 2010)

6.1 Refer to the figure below showing the development of the South African berg wind. Strong subsidence over the plateau of South Africa results in a well-developed high-pressure cell over the interior, which will result in specific weather conditions there.



6.1.1 Name the high-pressure cell visible in the figure above that result from subsidence over the plateau.

(1 x 2) (2)

6.1.2 How does the berg wind affect the weather along the southeast coast of South Africa?

(2 x 2) (4)

GEOGRAPHY

GRADE 12

SESSION 1

(TEACHER NOTES)

- 6.1.3 Name the environmental hazard associated with the development of berg winds. (1 x 2) (2)
- 6.1.4 State ONE possible measure that can be introduced to reduce the impact of the environmental hazard named in QUESTION 6.1.3 (1 x 2) (2)
- 6.1.5 During which season do berg winds mainly affect the weather along the southeast coast of South Africa? (1 x 2) (2)
- [12]

SECTION B: SOLUTIONS AND HINTS TO SECTION A:**QUESTION 1**

- 1.1.1 Inter-tropical convergence zone ✓✓ (1 x 2) (2)
- 1.1.2 Tropic of Capricorn/ 23½°S ✓✓ (1 x 2) (2)
- 1.1.3 Summer – sun overhead Tropic of Capricorn/ITCZ in Southern Hemisphere. ✓✓✓✓ (2 x 2) (4)
- 1.1.4 Tropical easterlies ✓✓ (1 x 2) (2)
- 1.3.5 Air is hot air therefore light and rises, ✓✓
Convergence of winds leads to air rising, ✓✓
Rising air cools and condenses. ✓✓ (3 x 2) (6)
- [16]**

QUESTION 2

- 2.1.1 (a) Because circulation occurs in three cells in each hemisphere ✓✓ (1 x 2) (2)
- (b) P – Ferrell ✓✓
Q – Hadley ✓✓
R – Polar ✓✓ (3 x 2) (6)
- 2.1.2 (a) Inter-Tropical Convergence Zone ✓✓ (1 x 2) (2)
- (b) X ✓✓ (1 x 2) (2)
- (c) High temperatures/Hot ✓✓
Cumulonimbus cloud/Heavy cloud cover ✓✓
Thundershowers/Heavy downpours ✓✓ [Any TWO] (2 x 2) (4)
- d) (Along the equator where it is warm (✓✓
Rapidly rising air condenses and form clouds (✓✓
Large scale condensation results in heavy rain ✓✓
[Any TWO. Must refer to weather conditions mentioned above] (2 x 2) (4)
- [20]**

QUESTION 3

- 3.1.1 False ✓✓
- 3.1.2 True ✓✓
- 3.1.3 False ✓✓
- 3.1.4 False ✓✓
- 3.1.5 True ✓✓ (5 x 2) [10]

QUESTION 4:

4.1.1 Sea breeze ✓✓ (1 x 2) (2)

4.1.2 Happens on small / local scale / in immediate surroundings ✓✓

Microclimatic condition ✓✓

Tertiary circulation ✓✓

[Concept]

[Any ONE]

(1 x 2) (2)

4.1.3 Land heats up more during daytime ✓✓

Causes low pressure to develop over land ✓✓

Air rises over land ✓✓

Sea takes longer to heat up during the day ✓✓

High pressure at sea ✓✓

Air moves from high to low pressure ✓✓

Breeze from sea to land ✓✓

[Any THREE] (3 x 2) (6)

4.1.4 High-income suburbs along the coastline will benefit from the cooling /

Moderating effect of the sea breeze ✓✓

Experiences clean, fresh air ✓✓

Breeze blows from sea to land ✓✓

[Any ONE] (1 x 2) (2)

[12]

QUESTION 5

5.1.1 An urban area that records higher temperatures than the surrounding rural areas ✓✓

[Concept] (1 x 2) (2)

5.1.2 Downtown/CBD/area 4 ✓✓

(1 x 2) (2)

5.1.3 Trapped pollutants could result in respiratory problems ✓✓

Use of air-conditioners because of higher temperatures ✓✓

Deterioration of buildings ✓✓

More renovation of buildings such as frequent painting ✓✓

Unpredictable rainfall ✓✓

Increase in health problems/examples related to heat island ✓✓

Increase in stress/discomfort ✓✓

Movement to suburbs/counter-urbanisation ✓✓

[Any TWO. Accept reasonable alternatives]

(2 x 2) (4)

5.1.4 Modern buildings are made of a lot of glass/steel which results in the

Multiple reflection of heat ✓✓

Buildings create a greater surface area which absorbs/reflects heat ✓✓

Buildings are made of concrete which absorbs/reflects more heat ✓✓

Tall buildings trap heat as wind cannot disperse the heat ✓✓

More air conditioners/heaters ✓✓

More buildings therefore less vegetation to play cooling role ✓✓

Any TWO] (2 x 2) (4)

5.1.5 Industrial decentralisation ✓✓

Laws to control/restrict air pollution ✓✓

Reduce building density ✓✓

Introduce open spaces / green belts / parks to absorb carbon dioxide ✓✓

Measures to reduce pollutants / greenhouse gases as they trap heat ✓✓

Public transport to reduce emissions ✓✓

Cleaner fuels ✓✓

Flexi-time ✓✓

Erect green buildings ✓✓

Law enforcement to ensure sustainable units / local agenda 21 ✓✓

[Any TWO. Accept reasonable alternatives] (2 x 2) (4)
[16]

QUESTION 6

6.1.1 Kalahari/Continental high ✓✓

(1 x 2) (2)

6.1.2 Temperatures will warm up ✓✓

Humidity level will be low/dry ✓✓

No/little cloud cover ✓✓

No rain ✓✓

[Any TWO] (2 x 2) (4)

6.1.3 Veldfires/Bushfires ✓✓

(1 x 2) (2)

6.1.4 Educating people on the dangers associated with veldfires – accept example ✓✓

Look-out towers in bergwind season ✓✓

Firebreaks ✓✓

Warning over weather forecast ✓✓

[Any ONE] (1 x 2) (2)

6.1.5 Winter ✓✓

(1 x 2) (2)
[12]

SECTION C: HOMEWORK

QUESTION 1:

5 minutes

10 marks

(Source: DoE November 2010)

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number.

1.1.1 Primary circulation refers to the circulation within one hemisphere on a global scale.

1.1.2 Pressure gradient refers to the difference in pressure between two points.

1.1.3 Isotherms are lines on a map that join places of equal pressure.

1.1.4 In the southern hemisphere air movement around a high pressure (anticyclone) is clockwise.

1.1.5 The polar front is formed where warm subtropical air and cool sub polar air meet.

(10 x 2) [10]

QUESTION 2: 5 minutes 10 marks*(Sources: DoE November 2009)*

2.1 Refer to the figure below illustrating a very specific climatic condition that will develop in a valley in the southern hemisphere lying outside the Tropic of Capricorn. Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question.

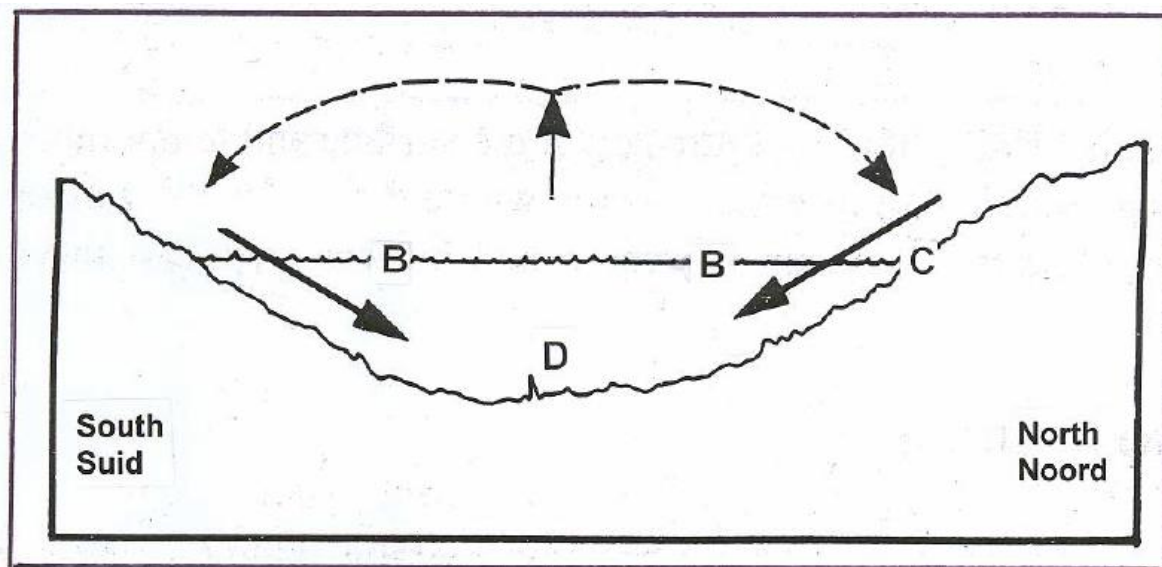
2.1.1 The figure illustrates the development of an anabatic wind.

2.1.2 The climatic condition illustrated in the figure below develops at night.

2.1.3 The zone marked B is the warm thermal belt.

2.1.4 Place C will record the highest temperatures in this valley.

2.1.5 At night warm air sinking down the slope, will collect at D. (5 x 2) [10]

**QUESTION 3: 20 minutes 20 marks***(Source: DoE Prep 2008)*

3.1 Refer to the figure below showing a pollution dome over a large urban settlement.

3.1.1 During night-time the pollution dome is much lower than during daytime.

Give reasons why this is so.

(2 x 2) (4)

3.1.2 State the environmental problem resulting from a pollution dome that is situated closer to the earth's surface.

(1 x 2) (2)

3.1.3 Name ONE way in which we can minimise the environmental problem mentioned in question 3.1.2.

(1 x 2) (2)

3.1.4. Write a paragraph of no longer than 12 lines to explain why cities are warmer than the surrounding rural areas.

(6 x 2) (12)

[20]

SECTION D: SOLUTIONS TO HOMEWORK

QUESTION 1

- 1.1.1 True ✓✓
 1.1.2 True ✓✓
 1.1.3 False ✓✓
 1.1.4 False ✓✓
 1.1.5 False ✓✓

(5 x 2) [10]**QUESTION 2**

- 2.1.1 False ✓✓
 2.1.2 True ✓✓
 2.1.3 True ✓✓
 2.1.4 False ✓✓
 2.1.5 False ✓✓

(5 x 2) [10]**QUESTION 3**

- 3.1.1 During the night the air is cooler ✓✓
 Cooler air heavier and denser thus more subsidence ✓✓
 Pollution dome pushed lower down ✓✓
 During the day the air is warmer ✓✓
 Warmer air lighter and less dense and rises ✓✓
 Pollution dome lifts higher up ✓✓

[Any TWO] (2 x 2) (4)

- 3.1.2 Global warming/greenhouse effect ✓✓

(1 x 2) (2)

- 3.1.3 Cut down the amount of pollution given off in the city ✓✓
 Taller chimneys/stacks to release pollutants above inversion ✓✓
 Limit industrial activities at night time ✓✓
 Use cleaner fuels in engines ✓✓
 Legislation and fines to reduce pollution ✓✓
 Greenbelt development ✓✓

[Any ONE – Accept any other logical answer] (1 x 2) (2)

- 3.1.4 [Must make at least ONE reference to each of the aspects.]

[Single marks only if answered in point form and not in paragraph / essay style]**(6 x 2) [12]****[Award single marks if no labels]****(3 x 2) [6]****[20]**

TOPIC 1: MID-LATITUDE CYCLONES

Teacher Note: There are always questions on these sections in the exams. It is relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks.

LESSON OVERVIEW

Explain the life cycle (cyclogenesis) of a mid-latitude cycle stages, waves stage, mature stage and occlusion stage

Describe weather associated with different parts of mid-latitude cyclone

Describe the impact of the mid-latitude cyclones on human activities

SECTION A: TYPICAL EXAM QUESTIONS ON MID-LATITUDE CYCLONES

QUESTION 1: **15 minutes** **18 marks** (*Source: DoE: March 2009*)

- 1.1 Refer to the figure below showing a satellite image and synoptic weather chart for 26 June 2007. Find the two mid-latitude cyclones labelled P and Q. Carefully read through the weather update and answer the following questions.
- 1.1.1 (a) Provide evidence from the synoptic chart indicating that P and Q are mid-latitude cyclones. (1 x 2) (2)
- (b) Which one of the two mid-latitude cyclones, P or Q, is most likely to be older? (1 x 2) (2)
- (c) Give ONE reason for your answer to QUESTION 1.1.1(b). (1 x 2) (2)
- 1.1.2 (a) With reference to the satellite image and synoptic weather chart, explain why the Eastern Cape is experiencing rain and very cold conditions. (4 x 2) (8)
- (b) Which weather condition, not mentioned in the weather report, is clearly visible on the satellite image? (1 x 2) (2)
- (c) Give ONE reason why it is important for people living in the Eastern Cape to be made aware of the weather conditions mentioned in QUESTION 1.1.2(a). (1 x 2) (2)
- [18]

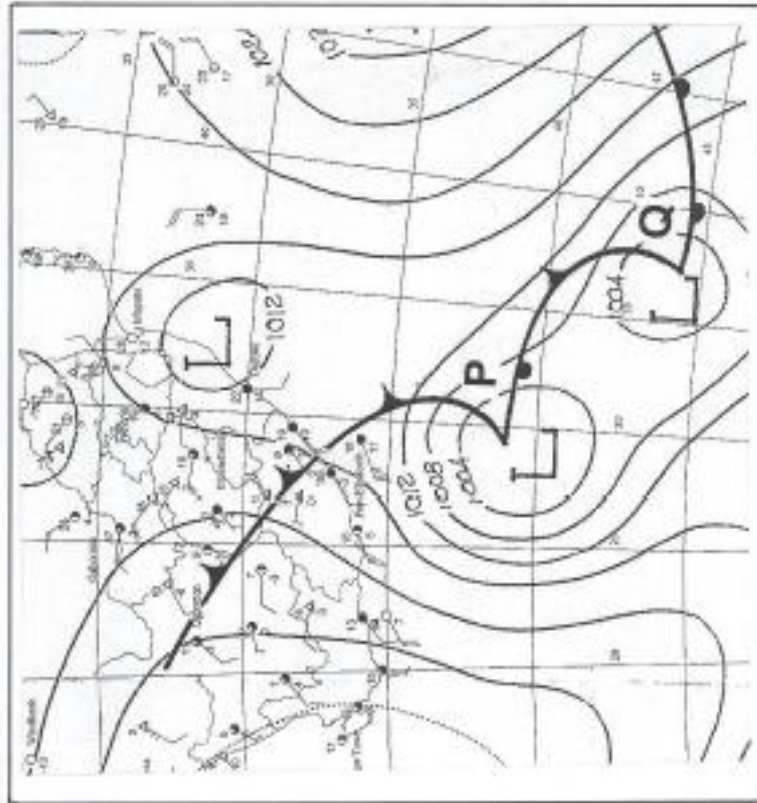
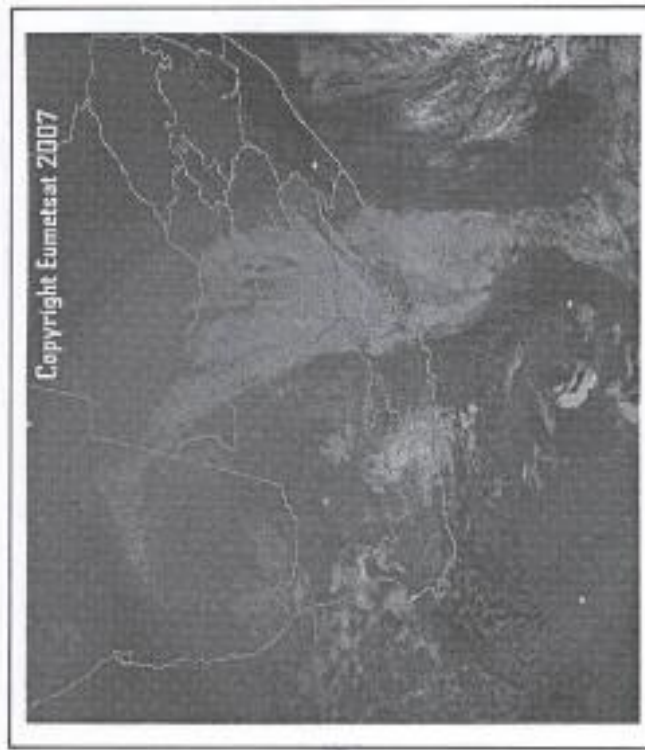
FIGURE 1.4**FIGUUR 1.4**

Update on the cold front heading for Gauteng – 26 June 2007

As the cold front moves over the central and south-eastern parts of South Africa today, it has left a trail of heavy falls, very cold conditions, very rough seas and gale force winds over the interior and along the coast. At present the cold front is positioned over the Eastern Cape, bringing heavy rain and very cold temperatures to the province. Snowfalls are expected on the mountains of the Eastern Cape today, as well as in Lesotho, the Drakensberg and the eastern Free State overnight and tomorrow. Sea conditions remain very hazardous, with gale force winds and very rough seas persisting along the southern Cape coast today, spreading towards the Wild Coast and KwaZulu-Natal coast later on Tuesday.

Inligting oor die koue front wat na Gauteng toe op pad is – 26 Junie 2007

Soos die koue front oor die sentrale en suidoostelike gedeeltes van die land beweeg, het dit 'n spoor van swaar reën, baie koue toestande, 'n stormagtige see en stormsterk winde oor die binneland en langs die kus nagelaat. Tans is die koue front oor die Ooskaap gelê en dit lei tot swaar reën en baie koue temperature in die provinsie. Sneeuvalle word vandag oor die berge van die Ooskaap verwag, en oornag en môre in Lesotho, oor die Drakensberge en die oostelike Vrystaat. Seetoestande bly gevaarlik met stormsterk winde en 'n stormagtige see wat vandag langs die Kaapse suidkus heers om Dinsdag na die Wildkus en KwaZulu-Natalkus uit te brei.



HINTS

Hint 1: Read the article carefully, many of the answers are in there.

Hint 2: Read the synoptic map carefully as it also gives you some of the answers.

QUESTION 2:**5 minutes****10 marks***(Source: DoE November 2008)*

2.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (2.1.1 – 2.1.5). Refer to the figure below.

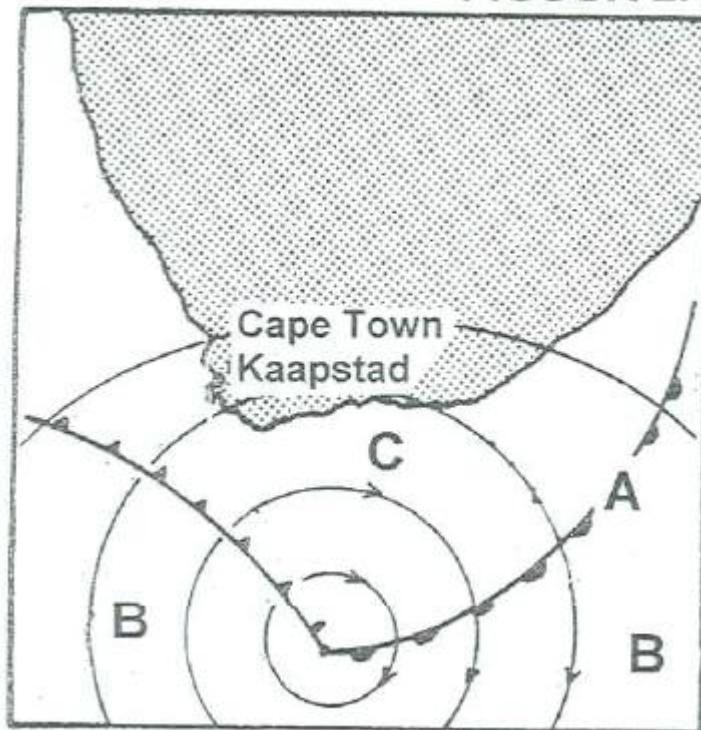
2.1.1 The weather system illustrated in FIGURE 2.1 is a mid-latitude cyclone.

2.1.2 The front at **A** is the warm front.

2.1.3 The zone marked **B** is the warm sector.

2.1.4 The weather system illustrated in FIGURE 2.1 has reached the occlusion stage.

2.1.5 Easterly winds are experienced at **C** (5 x 2) [10]

FIGURE 2.1**FIGUUR 2.1****HINTS**

Hint 1: Learners must not guess.

QUESTION 3: 10 minutes 12 marks (Source: DoE November 2008)

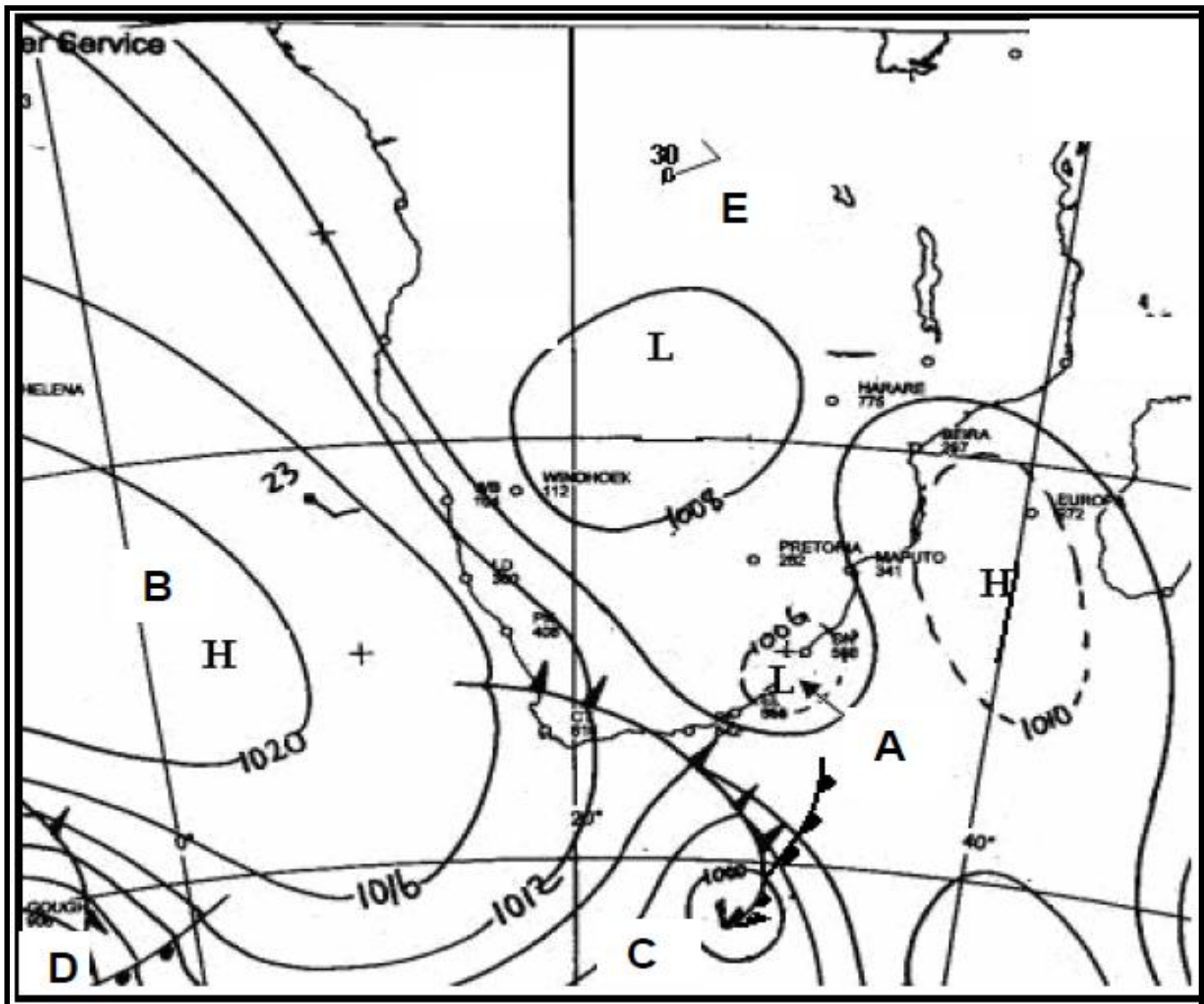
3.1. The South African Weather Service issued the following weather warnings for 26 June 2007. A mid-latitude cyclone was present.

- Gale-force south-westerly winds are expected between Plettenberg Bay and East London, with very rough seas from Lamberts Bay to East London.
- Very cold and windy conditions are expected in the northern parts of the Eastern Cape.
- Snowfalls are expected on the northern high grounds of the Eastern Cape and Lesotho.
- Conditions are favourable for the development and spread of fires over Limpopo, Mpumalanga, Gauteng and the northern parts of KwaZulu-Natal.

- 3.1.1 Why is it important for the South African Weather Service to issue these weather warnings? (2 x 2) (4)
- 3.1.2 Describe the environmental impact this mid-latitude cyclone might have in all the affected regions. (2 x 2) (4)
- 3.1.3 Imagine you are part of a team sent in to assist people affected by this mid-latitude cyclone, what would your plan of action be? (2 x 2) (4)
- [12]

QUESTION 4: 10 minutes 16 marks (Source: DoE November 2010)

- 4.1. Refer to the synoptic weather map on the following page and answer the questions:
- 4.1.1 Identify the low pressure cell labelled **A**. (1 x 2) (2)
- 4.1.2 Indicate why the surface winds that diverge out of cell **B** are dry and cold. (1 x 2) (2)
- 4.1.3 Which of the mid-latitude cyclones, labelled **C** and **D**, originated first? (1 x 2) (2)
- 4.1.4 Give ONE reason for your answer to QUESTION 4.1.3. (1 x 2) (2)
- 4.1.5 Give the term used to describe a series of mid-latitude cyclones passing over an area in quick succession. (1 x 2) (2)
- 4.1.6 Name TWO effects of mid-latitude cyclones on farming in the South-western Cape. (2 x 2) (4)
- 4.1.7 What will happen to low-pressure cell **A** if mid-latitude cyclone **C** moves further eastwards? (1 x 2) (2)
- 4.1.7 What will happen to low-pressure cell **A** if mid-latitude cyclone **C** moves further eastwards? (1 x 2) (2)
- [16]



SECTION B: SOLUTIONS AND HINTS TO SECTION A: TOPIC 1: MID-LATITUDE CYCLONES

QUESTION 1

- 1.1.1 (a) Presence of cold and warm fronts ✓✓ (1 x 2) (2)
 (b) Q ✓✓ (1 x 2) (2)
 (c) Furthest east ✓✓ (1 x 2) (2)

GEOGRAPHY

GRADE 12

SESSION 2

(TEACHER NOTES)

- 1.1.2 (a) Cold front is passing over ✓✓
 Cold air mass (sector) follows cold front ✓✓
 Cold air forces warm air ahead of it to rise ✓✓
 Rising air condenses resulting in cloud formation and rain ✓✓ (4 x 2) (8)
- (b) Clouds ✓✓ (1 x 2) (2)
- (c) Possible flooding and people should evacuate ✓✓
 Snowfall and very cold conditions and people must find shelter ✓✓
 Stock up on food/medical supplies ✓✓
 Purchase lamps/candles in case power is cut ✓✓
 Put sandbags down to prevent water coming in ✓✓ [Any ONE] (1 x 2) (2)
- [18]**

QUESTION 2

2.1

- 2.1.1 True ✓✓
 2.1.2 True ✓✓
 2.1.3 False ✓✓
 2.1.4 False ✓✓
 2.1.5 False ✓✓ (5 x 2) **[10]**

QUESTION 3

- 3.1.1 Prepare for possible damage ✓✓
 Evacuation procedures can be put in place ✓✓
 Save lives ✓✓ [Any TWO. Accept other logical reasons] (2 x 2) (4)
- 3.1.2 Flooding ✓✓
 Soil erosion ✓✓
 Destruction of natural ecosystems ✓✓
 Loss of natural habitat for animals ✓✓
 Veld fires destroy vegetation ✓✓
 Destruction of coastline ✓✓
 Damage to coastal dunes ✓✓
 Loss of agricultural land ✓✓
 Snow / low temperatures result in loss of livestock ✓✓
 Destruction of infrastructure ✓✓
 Destruction of homes ✓✓ [Any TWO] (2 x 2) (4)
- 3.1.3 Co-ordinate rescue attempts ✓✓
 Organise air-lifts ✓✓
 Set up emergency services ✓✓
 Provide food and water ✓✓
 Provide health care ✓✓
 Set up shelters ✓✓ [Any TWO. Accept other logical measures] (2 x 2) (4)
- [12]**

QUESTION 4

- 4.1.1 Coastal low ✓✓ (1 x 2) (2)
- 4.1.2 Cold ocean (cold Benguela current) therefore lack of moisture and the air is cold ✓✓
Diverging air subsides and is dry ✓✓ [Any ONE] (1 x 2) (2)
- 4.1.3 C ✓✓ (1 x 2) (2)
- 4.1.4 It is further east ✓✓
C in occluded stage ✓✓ [Any ONE] (1 x 2) (2)
- 4.1.5 Cyclone/depression family ✓✓ (1 x 2) (2)
- 4.1.6 It brings much needed rain in winter ✓✓
Allows for the planting of winter crops ✓✓
Low temperatures advantage fruit farming/viticulture ✓✓
Snow could impact negatively on people and crops ✓✓
Flooding could cause destruction/death ✓✓ [Any TWO] (2 x 2) (4)
- 4.1.7 Move south-easterly ✓✓
Merge with mid-latitude cyclone ✓✓
Weakens/dissipate ✓✓ [Any ONE] (1 x 2) (2)

[16]**SECTION C: HOMEWORK FOR TOPIC 1: MID-LATITUDE CYCLONES****QUESTION 1: 25 minutes 26 marks***(Source November 2009)*

1. Refer to the satellite image in the information box on the following page, showing the position of an approaching low-pressure. Answer the questions that follow.
- 1.1.1. (a) Identify the low pressure system labelled K on the satellite image in the figure with the essay (1 x 2) (2)
- (b) During which season does the above-mentioned low-pressure system usually affect the weather of South Africa? (1 x 2) (2)
- (c) Give the general direction of movement of the low-pressure system mentioned in QUESTION 1.1.1(a). (1 x 2) (2)
- (d) Give ONE reason for the direction of movement of the low-pressure system as mentioned in QUESTION 1.1.1(c). (1 x 2) (2)
- (e) Draw a sketch map of the satellite image in FIGURE 2.3 on page 19, indicating the position of the low-pressure system in relation to South Africa. Clearly label the cold front, the warm front and the warm sector on the drawing. (3 x 2) (6)

- 1.1.2 Why is it important for the South African Weather Service to issue weather warnings? Use the source in box below and the figure and write a short essay (no longer than 12 lines), clearly indicating the value of weather forecasts and warnings. In your answer also indicate how reports forwarded by the public can improve weather forecasts. (6 x 2) (12)

KEEP YOUR WINTER WOOLIES OUT (Tuesday, 1 July 2008)

Nice clear skies with cool temperatures can be expected for Tuesday and Wednesday, but people in the Western Cape need to brace themselves for another few cold, wet and windy days from Thursday the 3rd of July 2008.

Satellite image showing the approaching low-pressure system on Monday the 30th June 2008 (Image courtesy Eumetsat, 2008).

The South African Weather Service has been issuing advisories for this approaching system since the beginning of the week. On Thursday gale-force northerly to north-westerly winds are expected between Cape Columbine and Cape Agulhas, accompanied by very rough seas, with wave heights in excess of 5 m. Very cold conditions over the western interior of the Western and Northern Cape, spreading to the northern interior of the Eastern Cape and southern Free State, can be expected.

The colder conditions are expected to reach the north-eastern parts of the country on Saturday, with temperatures falling into the cold category.

Isolated heavy falls of rain, which could lead to localised flooding, are expected over the Peninsula, Boland and Overberg areas on Thursday and Friday.

The South African Weather Service appeals to the public to forward to them any reports or confirmation of significant weather events such as snowfalls, hailstorms, heavy rain, damaging winds etc, when they are observed. Such information can also be used for further research, which will contribute to the improvement of weather predictions for that particular area.

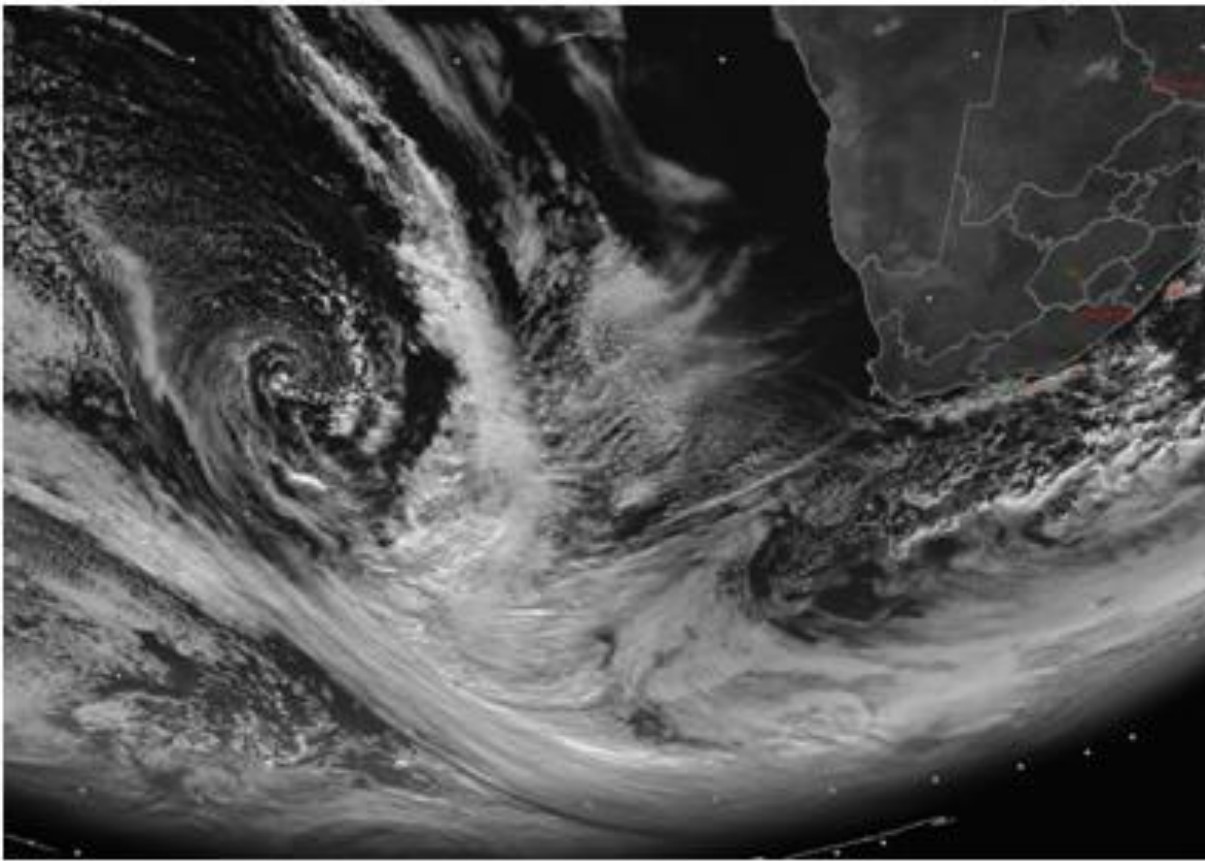


Figure 2.3

QUESTION 2: **5 minutes** **10 marks** (*Source: DoE November 2009*)

2.1. Refer to FIGURE 1.1 below, showing a simplified synoptic weather map of South Africa. Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.5), for example 1.6 A.

2.1.1 High pressure cell H1 is thehigh pressure

- A South Pacific
- B South Atlantic
- C South Indian
- D Kalahari

2.1.2. The following air movements are associated with high-pressure cell H1

- A Subsidence, convergence, clockwise rotation
- B Uplift, divergence, anticlockwise rotation
- C Uplift, convergence, clockwise rotation
- D Subsidence, divergence, anti-clockwise rotation

2.1.3. Low pressure cell L1 is in the stage of development

- A polar front / initial
- B wave
- C warm sector / mature
- D occlusion

2.1.4. The lines on the synoptic weather map linking places of equal pressure are known as?

- A isobars
- B isotherms
- C isohyets
- D isotopes

2.1.5. Low pressure cell C2 is a / an low pressure

- A coastal
- B tropical
- C extra-tropical
- D equatorial

(5 x 2) [10]

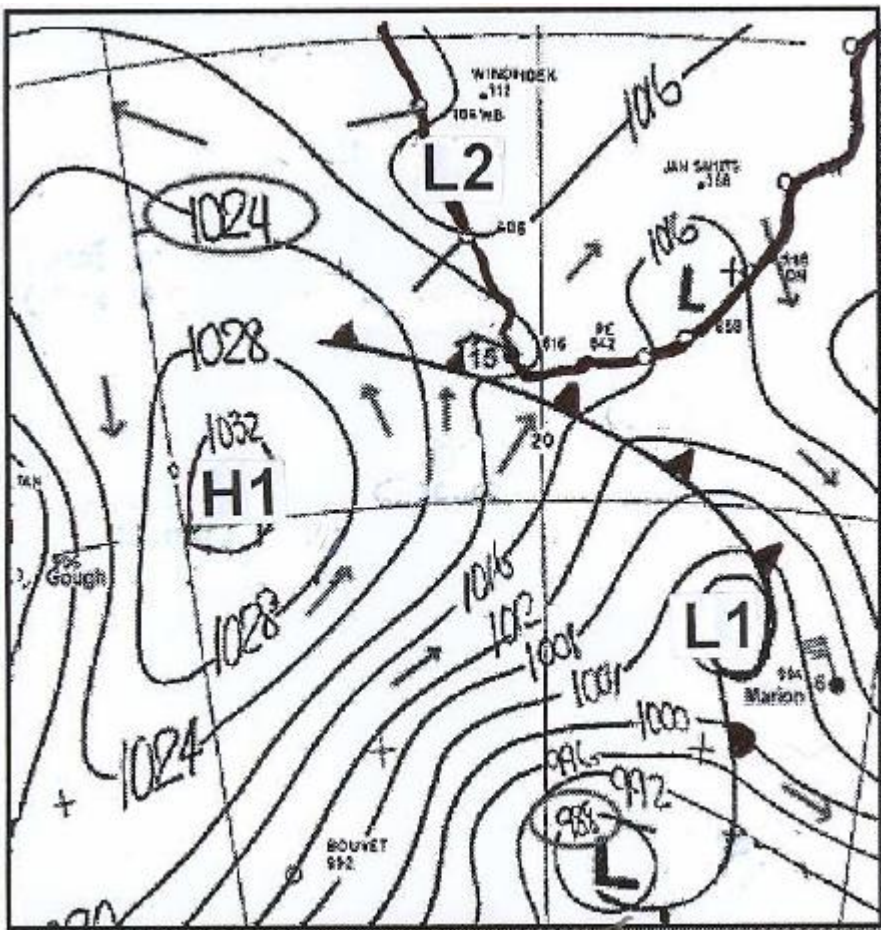


Figure 1.1

SOLUTIONS TO HOMEWORK: TOPIC 1: MID-LATITUDE CYCLONES
QUESTION 1

- 1.1.1 a) Mid-latitude / temperate cyclone / mid-latitude depression /
frontal depression / extra-tropical cyclone ✓✓ (1 x 2) (2)
- b) Winter ✓✓ (1 x 2) (2)
- c) West to east / eastward / to the east ✓✓ (1 x 2) (2)
- d) Situated in the westerly wind belt ✓✓ (1 x 2) (2)
- e) Driven by the westerly winds ✓✓ [Any ONE] (1 x 2) (2)

1.1.2 Value of weather forecasts and warnings:

- To alert people timeously (2)
- Possible precautionary measures can be taken (2)
- Evacuation can take place (2)
- Preparation can be done in terms of protection for harsh weather (2)
- Fishermen will know not to go out on the sea (2)
- Cancel outdoor activities (2)
- Rescue services alerted beforehand (2)
- Tourists can adjust their plans [Accept others] ✓✓✓✓✓✓ (2)

Role of the public:

- Forecasts will be localised and not generalised (2)
- Used for further research (2)
- Will improve predictions (2)
- Preventative measures can also be localised (2)
- ✓✓✓✓✓✓ [Accept others]

[Must make at least ONE reference to each of the aspects.]

[Single marks only if answered in point form and not in paragraph / essay style]

(6 x 2) [12]

[Award single marks if no labels]

(3 x 2) [6]

[26]

QUESTION 2

- 2.1.1 B (2) ✓✓
- 2.1.2 D (2) ✓✓
- 2.1.3 C (2) ✓✓
- 2.1.4 A (2) ✓✓
- 2.1.5 A / B / D (2) ✓✓ (5 x 2) [10]

TOPIC 2: TROPICAL CYCLONES

Teacher Note: There are always questions on these sections in the exams. They are relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks.

LESSON OVERVIEW

- Explain where tropical cyclones develop and under what conditions.
- Refer back to global circulation and explain in which pressure belt and wind system tropical cyclones develop.
- Explain the weather conditions associated with tropical cyclones and the effect they have on coastal areas. Also explain that as global warming increases, so does the frequency and intensity of tropical cyclones increase, and that they now occur further from the equator.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **25 minutes** **36 marks** *(Exemplar 2008)*

1.1 Refer to the extract as well as the satellite images of tropical cyclone Favio in FIGURE 1.2 and answer the questions that follow:

- | | | | | |
|-------|-----|-----------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1.1.1 | (a) | Is tropical cyclone Favio an example of a low-pressure or a high-pressure system? | (1 x 2) | (2) |
| | (b) | With reference to the figure below, give ONE reason to support your answer to QUESTION 1.1.1(a). | (1 x 2) | (2) |
| | (c) | What was the general direction of movement of tropical cyclone Favio? | (1 x 2) | (2) |
| 1.1.2 | (a) | Explain why the Tropical cyclone will move in the direction you have mentioned in 1.1.1.(c) | (1 x 2) | (2) |
| | (b) | Explain how the position of the cyclone has changed on the two satellite imgs. | (2 x 2) | (4) |
| | (c) | What does one call the centre of a tropical cyclone that is clearly visible on the satellite images? | (1 x 2) | (2) |
| 1.1.3 | (a) | Name ONE weather condition that is typical of the centre of a tropical cyclone. | (1 x 2) | (2) |
| | (b) | Explain why the weather condition mentioned in QUESTION 1.1.3(b) exists in the centre of a tropical cyclone. | (2 x 2) | (4) |
| | (c) | 'Favio is now an overland depression ...'
What stage in the development of a tropical cyclone is being referred to here? | (1 x 2) | (2) |
| 1.1.4 | (a) | Fully explain why the stage of development mentioned in QUESTION 1.1.3(a) was reached. | (3 x 2) | (6) |
| | (b) | Name TWO ways in which tropical cyclone Favio caused damage to the environment once it moved | | |

1.1.5

over Mozambique.

(2 x 2)

(4)

Explain why there is a need to establish well-equipped tropical cyclone warning centres in Mozambique.

(2 x 2)

(4)

[36]

Tropical cyclone Favio causing multiple disasters in Mozambique!

Track and Impact

Tropical cyclone Favio developed in the western Indian Ocean about 1 200 km from Madagascar on 14 February 2007. It gradually moved southwest, passing well off-shore of Reunion and Mauritius. By 20 February, it was just off the southern shore of Madagascar as a well-formed, mature storm.

While the storm system had largely skirted around populated areas to that point, forecasters were concerned about its behaviour when it entered the warmer water of the Mozambique Channel.

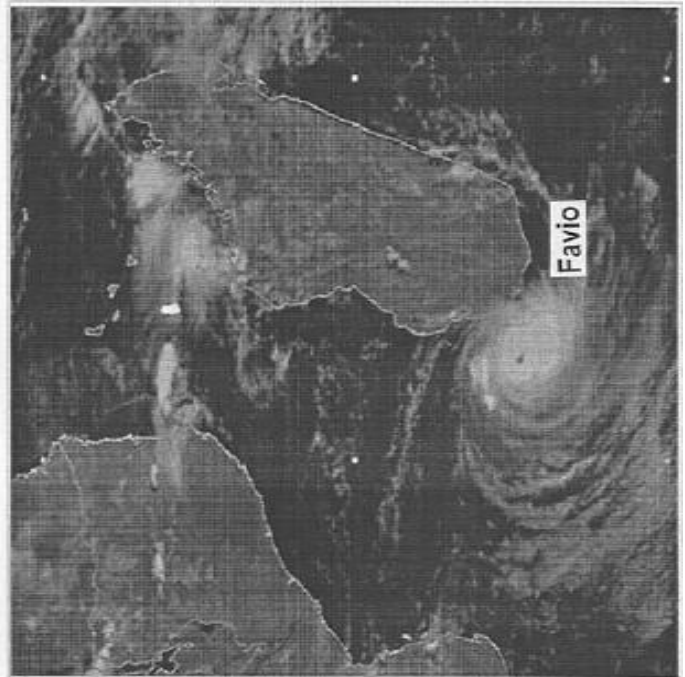
The storm was turning around the southern end of Madagascar, heading for the Mozambique Channel. Favio had a recognisable shape with spiral arms showing its clockwise rotation. The spiral arms were well-defined and tightly wound. The distinct centre of the storm was only partially filled with clouds. These were all signs of a well-developed tropical cyclone.

Tropical cyclone Favio struck the southern part of Mozambique on Thursday 22 February 2007 bringing in large-scale devastation and suffering to tens of thousands of residents.

Current Conditions and Expected Developments – 23 February 2007

Favio has now transformed from being a tropical cyclone to a tropical depression. This is always the case when a tropical cyclone moves over the land. Favio is now an overland depression. The maximum wind speed is about 60 km/h and is being disorganised gradually.

Satellite Image – 20 February 2007



Satellite Image – 22 February 2007

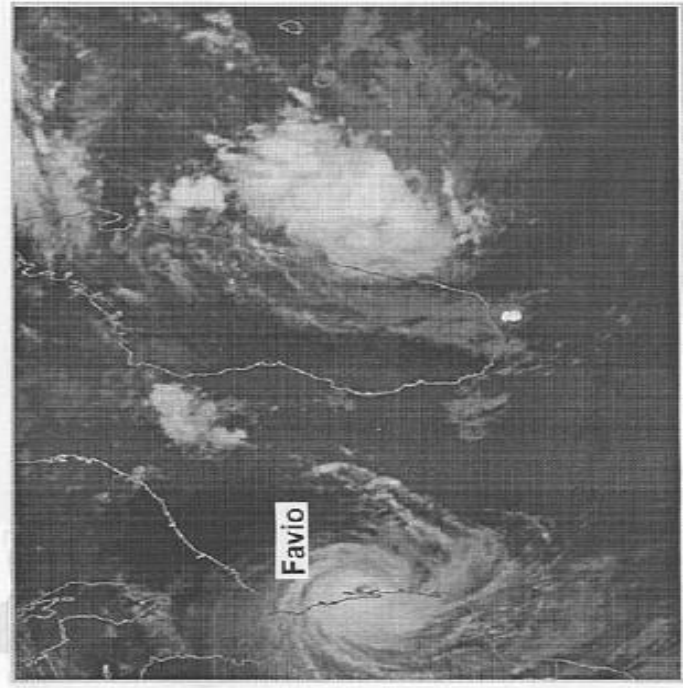


FIGURE 1.2

HINTS

Hint 1: Tropical cyclones are often asked in the form of case studies

Hint 2: Learners must apply their knowledge to the specific situation sketched in the case study

QUESTION 2: **10 minutes** **16 marks** (*Source: DoE November 2010*)

- 2.1. Study the information on tropical cyclone Fanele in FIGURE 2.3 before answering the questions below.
- 2.3.1 State ONE condition that would have favoured the initial development of tropical cyclone Fanele. (1 x 2) (2)
- 2.3.2 Give ONE piece of evidence from the satellite image to suggest that tropical cyclone Fanele is in its mature stage. (1 x 2) (2)
- 2.3.3 Why does tropical cyclone Fanele generally move from east to west? (1 x 2) (2)
- 2.3.4 Explain why tropical cyclone Fanele weakens when it moves over the southern highlands of Madagascar. (2 x 2) (4)
- 2.3.5 What was the duration of tropical cyclone Fanele? (1 x 2) (2)
- 2.3.6 Give TWO reasons why the impact of tropical cyclones on human life is more severe in developing than in developed countries. (2 x 2) (4)
- [16]

Tropical cyclone Fanele leaves trail of destruction in Madagascar

For several days in the middle of January 2009, a very weak low-level circulation persisted in the Mozambique Channel. Environmental conditions favoured the rapid development of the cyclone. Fanele quickly strengthened, developing an eye feature late on 19 January.

Fanele slammed into Madagascar in the early hours of Wednesday morning at wind speeds of up to 260 kilometres per hour. As it passed over the southern highlands it weakened quickly over the land. Within four hours of moving ashore its wind speed decreased and the eye feature dissipated.



Formed	18 January 2009
Dissipated	23 January 2009
Highest winds	185 km/h (115 mph) (10 minutes sustained) 185 km/h

FIGURE 2.3

HINTS

Hint 1: Learners must be able to identify a tropical cyclone on a synoptic weather map as well as satellite images.

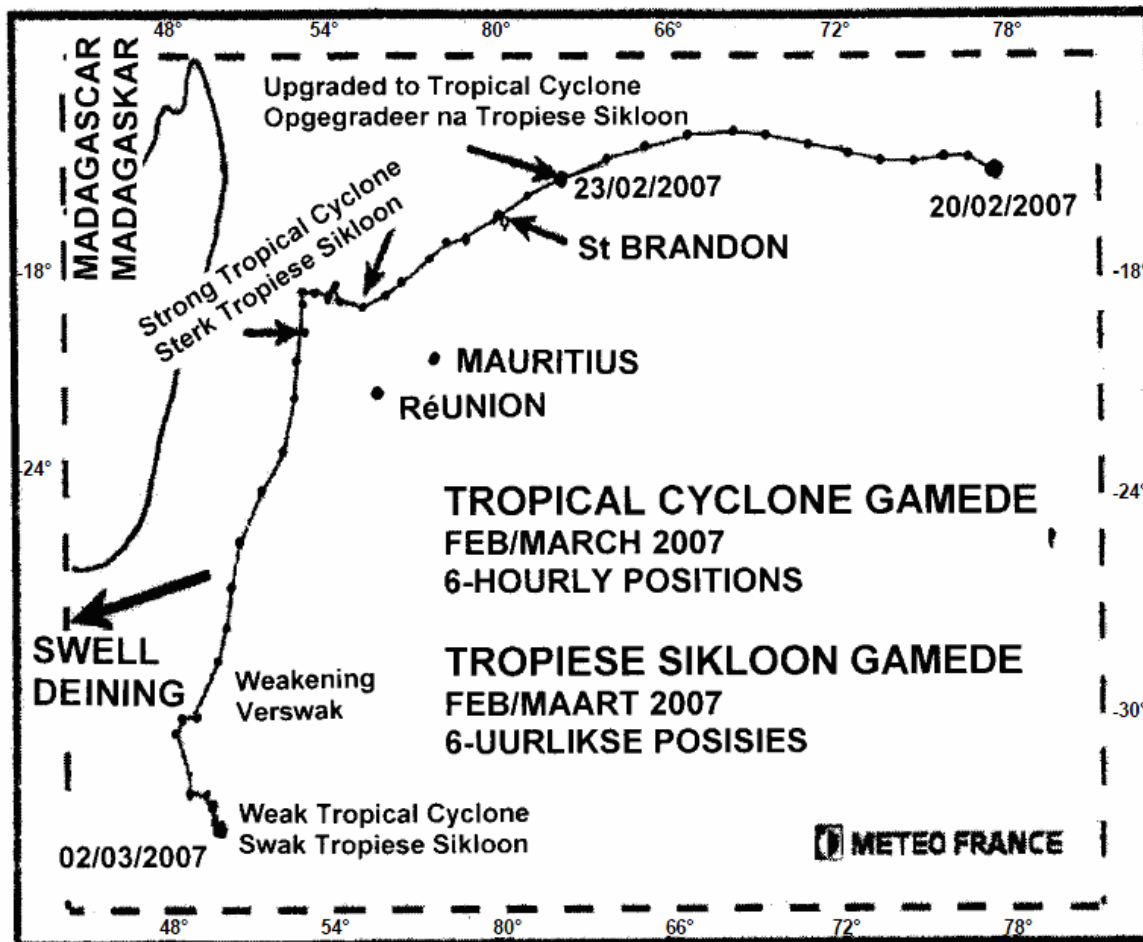
Hint 2: The area where the cyclone occurs is given away by the name, e.g. Hurricane Ann will occur over the Gulf of Mexico and the Caribbean Sea.

QUESTION 3: 10 minutes 18 marks (Source: DoE Prelim 2008)

- 3.1. Refer to the extract below, as well as the figure on the next page showing a map of the path taken by Tropical Cyclone Gamede.

THE LEGACY OF TROPICAL CYCLONE GAMEDE, 12 MARCH 2007

Tropical Cyclone Gamede reached speeds of between 116 km/h and 200 km/h in the regions of Mauritius and Réunion. The Meteorological Weather Service of Mauritius sent out early warnings which some people ignored, and this resulted in the loss of life. Heavy swells were experienced on the coast of KwaZulu-Natal. The port of Durban was closed for two days. The huge swells flooded the lower Marine Parade and beaches had to be closed due to shark nets being tangled up by the heavy seas.



- 3.1.1 (a) Before Tropical Cyclone Gamede, how many tropical cyclones occurred in this area during the 2007 tropical cyclone season? (1 x 2) (2)
- (b) Give ONE reason for your answer to QUESTION 3.1.1(a). (1 x 2) (2)
- (c) Describe the path (direction) taken by Tropical Cyclone Gamede, as illustrated in the map above. (1 x 2) (2)
- (d) Is the path taken by Tropical Cyclone Gamede predictable? (1 x 2) (2)
- (e) Explain ONE consequence of your answer to QUESTION 3.1.1(d) for people living in areas that have a high frequency of tropical cyclones occurring. (1 x 2) (2)

- 3.1.2 (a) Name ONE effect Tropical Cyclone Gamede had on the KwaZulu-Natal coastline. (1 x 2) (2)
- (b) Name ONE precautionary measure that the residents along the coast of KwaZulu-Natal can take to reduce the adverse effects of tropical cyclones. (1 x 2) (2)
- (c) Taking your answers to QUESTIONS 3.1.2(a) and (b) into account, explain the possible effects Tropical Cyclone Gamede had on the local economy of KwaZulu-Natal. (2 x 2) (4)
- [18]

SECTION B: SOLUTIONS AND HINTS TO SECTION A: TOPIC 2
QUESTION 1

- 1.1.1 (a) Low pressure ✓✓ (1 x 2) (2)
- (b) Reference to clockwise rotation of air ✓✓
Satellite image shows clockwise spiralling cloud band ✓✓
Reference made to a depression ✓✓
[Any ONE] (1 x 2) (2)
- (c) East to West direction ✓✓ (1 x 2) (2)
- 1.1.2 (a) The cyclone is in the Tropical Easterly wind belt which blows it from East to West. ✓✓ (1 x 2) (2)
- (b) On 20/02/2007 it was south of Madagascar and on 22/02/2007 it was just off the east coast of Africa/Mozambique ✓✓ (2 x 2) (4)
- (c) Eye ✓✓ (1 x 2) (2)
- 1.1.3 (a) Cloudless ✓✓
Wind-still ✓✓
No rain ✓✓
Low pressure ✓✓ [Any TWO] (1 x 2) (2)
- 1.1.3. (b) Descending column of air in centre heats up ✓✓
No condensation therefore cloudless ✓✓
No rain because there is no condensation ✓✓
Wind-still as air rotates clockwise to isobars around the eye ✓✓
Convergence and rising air results in low pressure ✓✓
[Any TWO] (2 x 2) (4)
- 1.1.3 (c) Dissipating/Decaying stage ✓✓ (1 x 2) (2)
- 1.1.4 (a) It has reached the land ✓✓
Cut off from source of moisture ✓✓
Evaporation reduced ✓✓
Less condensation and release of latent heat ✓✓
Friction over land slows system down ✓✓
[Any THREE] (3 x 2) (6)

- 1.1.4 (b) Soil washed away ✓✓
 Natural vegetation destroyed ✓✓
 Destruction of farmland ✓✓
 Animals drown ✓✓ [Any TWO] (2 x 2) (4)
- 1.1.5 To detect the development of a tropical cyclone in its early stages development ✓✓
 To warn people in time of the approaching tropical cyclone ✓✓
 Evacuation procedures can be put into place ✓✓
 Limit loss of life ✓✓
 To put in place measures that will minimise the impact of a tropical cyclone, e.g. rescue operations can be planned ✓✓
 [Any TWO - Accept other] (2x 2) (4)
[36]

QUESTION 2

- 2.1.1 Sea surface temperatures of $26\frac{1}{2}^{\circ}\text{C}$ and above ✓✓
 Date middle January/late summer ✓✓
 Unstable atmospheric conditions (✓✓)
 Developed between 5° and 20° south of the equator ✓✓
 Coriolis force ✓✓
 Calm conditions ✓✓
 Upper air divergence ✓✓
 High rate of evaporation ✓✓
 Winds that are light and variable ✓✓
 Little friction over the ocean ✓✓ [Any ONE] (1 x 2) (2)
- 2.1.2 Presence of the eye ✓✓
 Cumulonimbus clouds around the eye ✓✓
 Air circulation is well established ✓✓
 Extent of tropical cyclone/large area covered ✓✓ [Any ONE] (1 x 2) (2)
- 2.1.3 Is steered by the easterly winds/trade winds in the easterly/trade wind belt ✓✓ (1 x 2) (2)
- 2.1.4 Lack of moisture ✓✓
 Evaporation and condensation decreases ✓✓
 Less latent heat released into the system/looses energy ✓✓
 Surface wind slows down ✓✓
 Friction with the land ✓✓ [Any TWO] (2 x 2) (4)
- 2.1.5 6 days/18 to 23 January ✓✓ (1 x 2) (2)

2.1.6 People live below the flood line ✓✓

Developed areas have the technology to monitor and track the movement of the storm ✓✓

Developed areas can issue warnings and plan evacuations to prevent large losses ✓✓

Difficult to coordinate rescue plans because of poor infrastructure ✓✓

Inadequate health facilities ✓✓

Inadequate funding to improve infrastructure/health facilities/technology ✓✓

Intended aid does not reach the victims due to corruption ✓✓

People live in remote areas ✓✓

The government does not give assistance when it comes to rebuilding ✓✓

[Any TWO. Accept any other reasonable answers] (2 x 2) (4)
[16]

QUESTION 3

3.1.1 (a) 6 ✓✓ (1 x 2) (2)

(b) Tropical cyclones are named alphabetically, the tropical cyclone before Gamede would start with the letter F ✓✓ (1 x 2) (2)

(c) Westerly direction then a south-westerly direction and then southerly direction ✓✓ (1 x 2) (2)

(d) No ✓✓ (1 x 2) (2)

(e) It is not easy to predict which areas it will effect ✓✓

It makes it difficult to issue warning signals ✓✓

It causes more damage/loss of life ✓✓

[Any ONE] (1 x 2) (2)

3.1.2 (a) Port of Durban was closed for two days ✓✓

The lower Marine Parade was flooded ✓✓

The beaches had to be closed ✓✓

[Any ONE] (1 x 2) (2)

3.1.2 (b) Residents must take warnings seriously ✓✓

Must stock up with food especially canned food ✓✓

Must stock up with water ✓✓

Have battery operated torch and radio ✓✓

Don't use telephone unnecessarily ✓✓

Keep a well-stocked first aid kit ✓✓

[Any ONE – accept any other logical answer] (1 x 2) (2)

(c) The local economy will be damaged ✓✓

Business and industry will come to a virtual standstill ✓✓

A lot of money will be spent to sort out the damages ✓✓

Infrastructure will be damaged which will effect economy ✓✓

Costly insurance claims ✓✓

Negative impact on tourism ✓✓

[Any TWO – accept other logical answers] (2 x 2) (4)

[18]

SECTION C: HOMEWORK - TOPIC 2**QUESTION 1:****20 minutes****28 marks***(Source: DoE November 2009)***HURRICANE IKE**

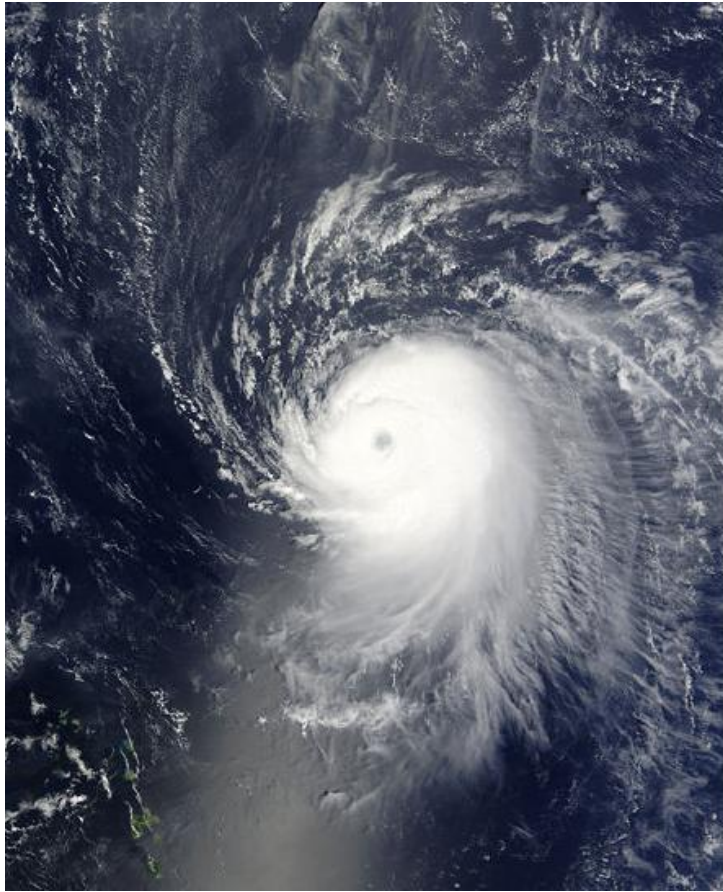
On 10 September, US President George W Bush made an emergency declaration for Texas in advance of Hurricane Ike, making more federal help available for preparations and evacuations.

State rural water associations activated mutual aid networks to prepare for the landfall of Hurricane Hanna and Hurricane Ike while still providing assistance to areas impacted by Hurricane Gustav. The Texas Rural Water Association held meetings with state agencies on Tuesday, 9 September, to plan for landfall along the Texas gulf coast.

On 11 September, forecasting models began to show Ike making landfall just south of Galveston. City Manager Steve LeBlanc issued a mandatory evacuation order late Wednesday for the low-lying west end of Galveston Island. Later, the mandatory evacuation order was extended to the entire island of Galveston, as well as low-lying areas around Houston, Texas.

Also on 11 September, at 20:19, the National Weather Service in Houston/Galveston, issued a strongly worded bulletin, regarding storm surge along the shoreline of Galveston Bay. The bulletin advised that residents living in single-family homes in some parts of coastal Texas may face "certain death" if they do not heed orders to evacuate. Reports said as many as 40 percent of Galveston's citizens may not have paid attention to the warnings. It was feared to be much the same in Port Arthur.

Hurricane Ike was the ninth named storm, fifth hurricane and third major hurricane of the 2008 Atlantic hurricane season. The satellite image that follows shows Hurricane Ike at peak intensity.



Hurricane Ike

- 1.1. The map on the following page represents a section of the world map showing the location and movement of tropical cyclones/hurricanes in the South Indian Ocean and the West Indies respectively. Also refer to the article and satellite image of Hurricane Ike above.

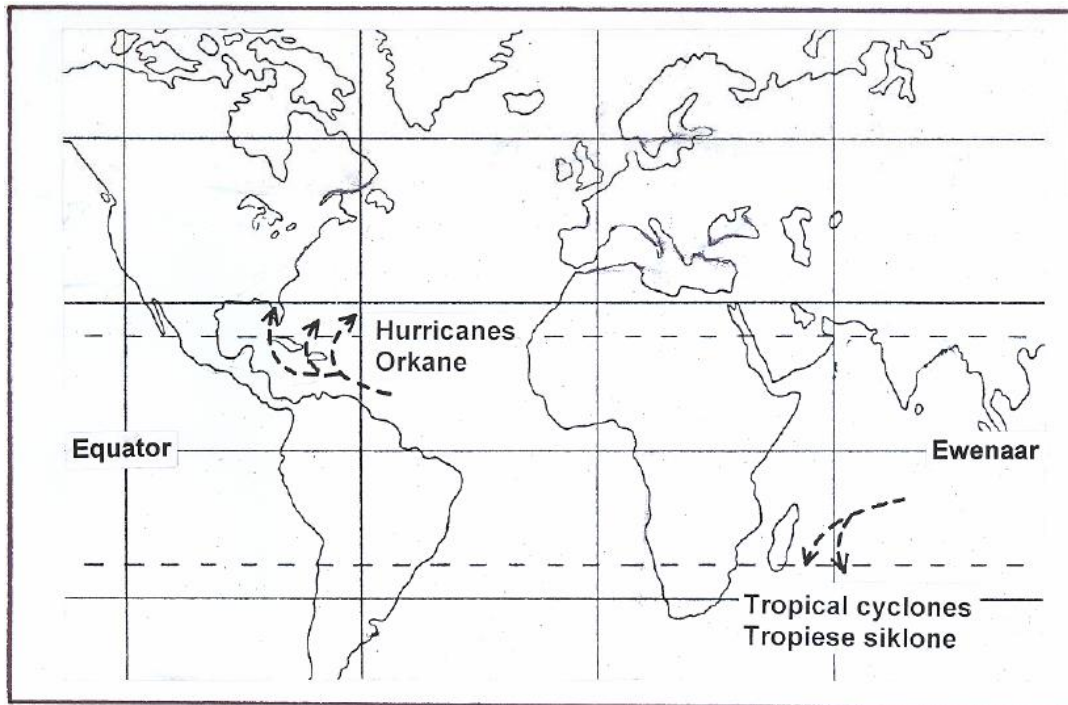


FIGURE 1.3A

- 1.1.1 Give ONE similarity, visible in the figure above, between tropical cyclones in the South Indian Ocean and hurricanes in the West Indies. (1 x 2) (2)
- 1.1.2 Explain the point of origin of both tropical cyclones and hurricanes. (3 x 2) (6)
- 1.1.3 Very intense hurricanes, such as Ike, occur more often and more regularly. Many meteorologists link the latter with global warming. Why is this so? (3 x 2) (6)
- 1.1.4 With reference to FIGURE 1.3A, give ONE reason why tropical cyclones seldom hit the coast of southern Africa. (1 x 2) (2)
- 1.1.5 Should a tropical cyclone and a hurricane of similar strength hit the coast of southern Africa and the United States of America respectively, the United States of America would suffer more damage to infrastructure, while southern Africa would experience more loss of life. Write a short essay (no more than 12 lines) to explain why this is the case. Your answer should refer to the level of development in the two regions respectively. (6 x 2) (12)
- [28]

QUESTION 2:**15 minutes****24 marks***(Source: DoE November 2008)*

- 2.1. You are a weather detective and you are asked to investigate some of the changing weather patterns southern Africa has been experiencing recently. Use the figure on the following page to assist you to answer the questions below.

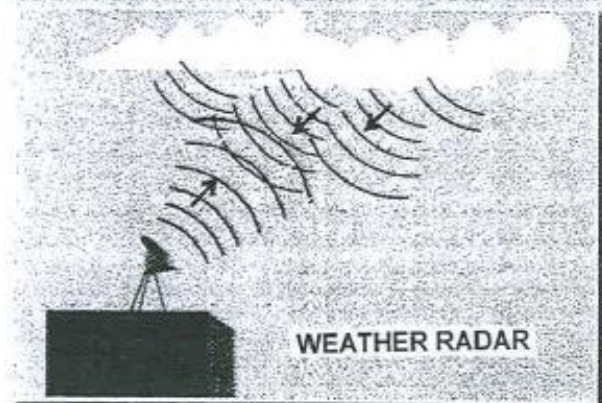
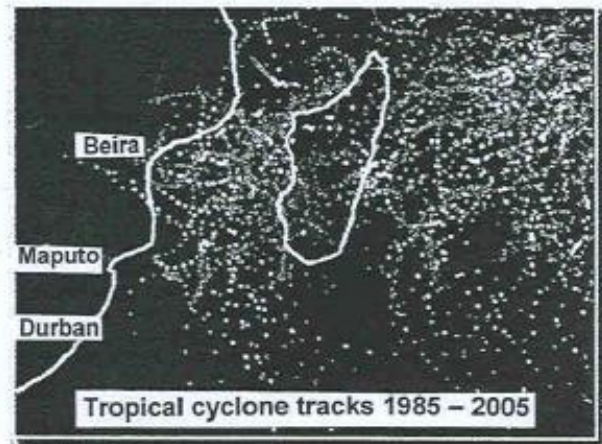
WHY SUCH FLOODS?

Adapted from Liesl Dyson
(University of Pretoria)

The Mozambican floods that killed some 40 people and displaced 280 000 were caused by tropical cyclone Favio, which made landfall on the coast on 22 February 2007. The eye in the centre of the cyclone is a relatively calm area where the atmospheric pressure is lowest. The minimum pressure that occurred during Favio's lifetime is estimated to have been 930 hPa. This very low pressure caused Favio to be fierce enough to be classified as an 'intense tropical cyclone'. A tropical cyclone is 'intense' when the surface winds' strengths are 110 – 210 km/h.

Tropical cyclones are not rare in the southwest Indian Ocean. About 10 occur every year during the summer season, but most frequently between January and February. The statistics show that a tropical cyclone does not make landfall in Mozambique every year, and seldom invades the coast of South Africa – the last time was in 1984, when cyclones Demoina and Imboya caused heavy rainfall over the north coast of KwaZulu-Natal.

In February 2000, tropical cyclone Eline moved in over Mozambique and was responsible for widespread heavy rainfall and flooding. In many ways Eline and Favio are comparable.



After the devastating floods in 2000, the Mozambique weather service acquired two weather radars (radar is the acronym for radio detection and ranging) to provide better information. The radar transmitter sends out high-frequency radio waves in pulses. Radar is useful to weather forecasters for locating rain and hail and for identifying severe storms and heavy rainfall. Once they see the potential for heavy rainfall, they issue warnings and people are advised to vacate dangerous areas.

- 2.1.1 What has been causing the floods in Mozambique over the last few years? (1 x 2) (2)
- 2.1.2 Give TWO reasons why Favio has been classified as an intense tropical storm. (2 x 2) (4)
- 2.1.3 'Tropical cyclones are not rare in the southwest Indian Ocean.'
State and explain TWO factors that favour the formation of cyclones in this area. (4 x 2) (8)
- 2.1.4 Explain why tropical cyclones seldom reach the coast of South Africa. (2 x 2) (4)

2.1.5 What does the acronym *radar* in the word 'weather radar' stand for? (1 x 2) (2)

2.1.6 Of what value is a weather radar to the following?

(a) Weather forecasters (1 x 2) (2)

(b) People living close to rivers and coasts (1 x 2) (2)

[24]

SECTION D: SOLUTIONS TO HOMEWORK - TOPIC 1

QUESTION 1

1.1.1 Develop along east coast ✓✓

Latitudinal position similar ✓✓

Move away from equator ✓✓

Move east to west ✓✓

Develop over warm tropical ocean ✓✓

Develop on western side of ocean ✓✓

[Any ONE] (1 x 2) (2)

1.1.2 Originate between 5° - 25°N and S ✓✓

Need Coriolis force that comes into operation at 5° ✓✓

Coriolis force does not exist at equator ✓✓

Situated over hot ocean / 26°C - 27°C ✓✓

Greatest evaporation between 5° - 25° N and S ✓✓

Latent heat needed for development, stored in water vapour ✓✓

Large scale condensation ✓✓

Temperature high in these latitudes ✓✓

Low pressure ✓✓

Cyclones do not develop where there are high pressures / anti-cyclones ✓✓

Develop along east coast ✓✓

[Any THREE] (3 x 2) (6)

1.1.3 Global warming increases temperatures ✓✓

Ocean temperatures increase and stay warmer for longer ✓✓

Increased temperatures increase evaporation / humidity / condensation ✓✓

Leads to the release of more latent heat ✓✓

Leads to the deepening of the low ✓✓

More energy thus more intense hurricanes developing more often ✓✓

[Any THREE] (3 x 2) (6)

1.1.4 Southern Africa is shielded / protected by Madagascar ✓✓

Tropical cyclones dissipate over Madagascar / friction over Madagascar ✓✓

Steered away by South Indian Anticyclone / High Pressure ✓✓

Recurved away from coast ✓✓

Move to colder ocean ✓✓

[Any ONE] (1 x 2) (2)

1.1.5 United States of America

USA is a developed nation ✓✓

USA has more and better developed infrastructure ✓✓

Eastern coastal areas low lying and damage occurs readily ✓✓

More can be damaged ✓✓

Warning systems are readily available ✓✓

Earlier evacuations can take place ✓✓

Better rescue services ✓✓

Health facilities are more readily available ✓✓

Less loss of life ✓✓

Southern Africa

Southern Africa includes developing nations compared to the USA ✓✓

Southern Africa has little and poorly developed infrastructure ✓✓

Less can be damaged ✓✓

Warning systems are not able to reach the majority of the population as some of them are in deep rural areas ✓✓

Few early evacuations can take place ✓✓

Not enough rescue services ✓✓

Few health facilities are available ✓✓

More loss of life ✓✓

[Candidates can refer to EITHER some aspects for the USA and some for southern Africa **OR** can answer as comparison.]

[Single marks only if answered in point form and not in paragraph / essay style]

(6 x 2) (12)
[28]

QUESTION 2

2.1.1 Tropical cyclones – or mention Eline/Favio ✓✓

(1 x 2) (2)

2.1.2 Surface wind strength between 110 – 210 km/h ✓✓

Very low pressure/±930 hPa ✓✓

Temperature above 27 °C ✓✓

[Any TWO] (2 x 2) (4)

2.1.3 Warm ocean - above 27 °C ✓✓

Needed to provide heat energy and moisture ✓✓

- High evaporation rate ✓✓

For condensation and latent heat to be released ✓✓

- Located between 5° - 30° north / south of the equator ✓✓

As the coriolis force is ineffective at the equator (0° - 5°) ✓✓

- Unstable air ✓✓

Air caused to rise ✓✓

[Any TWO factors + an explanation] (4 x 2) (8)

2.1.4 Cyclones dissipate before reaching the coast of South Africa because the conditions necessary to sustain cyclones such as a warm ocean (27 °C) are not there ✓✓

When cyclones reach Madagascar the intensity is reduced by friction ✓✓ and lack of moisture ✓✓

South Africa is located around the 30° latitude which puts it just beyond / too far south of latitudinal range for cyclones ✓✓

[Any TWO or other reasonable answer] (2 x 2) (4)

- 2.1.5 Radio detection and ranging ✓✓ (1 x 2) (2)
- 2.1.6 (a) Radar is used to predict cloud formation and storms which can lead to flooding
Lightning and thunder and associated hail can be observed with radar. ✓✓
(1 x 2) (2)
- (b) The change of water levels can be measured accurately with radar
and rising levels can serve as a warning for evacuation ✓✓
(1 x 2) (2)
[24]

TOPIC 1: FACTORS THAT INFLUENCE SA WEATHER

Teacher Note: There are always questions on these sections in the exams. It is relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks.

The examiners expect learners to know the following:

Factors determining the weather of South Africa

- Influence of the oceans on South Africa's weather
- Effect of the interior plateau on South Africa's weather
- Influence of latitudinal position of the sub-continent on South Africa's weather

Anticyclonic circulation

- Identification of three anticyclones on synoptic charts
 - o South Atlantic / St Helena High
 - o South Indian / Mauritius High
 - o Kalahari / Continental High
- Resultant weather

SECTION A: TYPICAL EXAM QUESTIONS**QUESTION 1: 15 minutes****20 marks***(Source: DoE Exemplar 2008)*

1. Refer to the FIGURE 1A below showing the weather forecast for 15 May 2007. FIGURE 1B is a cross-section through the eastern half of the country explaining the sunny conditions at all the inland weather stations.
 - 1.1.1. What is meant by the term *inversion* shown in FIGURE 1B? (1 x 2) (2)
 - 1.1.2 Name the high-pressure cell associated with the label *subsided air of continental origin*. (1 x 2) (2)
 - 1.1.3 Why does an inversion develop at the lower side of the high pressure cell mentioned in QUESTION 1.1.2? (2 x 2) (4)
 - 1.1.4 With reference to FIGURE 1B, explain why sunny conditions are indicated for all the inland weather stations. (3 x 2) (6)
 - 1.1.5 Will the inversion shown in FIGURE 1B be higher or lower than its current position during the summer months? (1 x 2) (2)
 - 1.6 The vertical positional change of the inversion from winter to summer is of great importance to farmers on the South African plateau. Explain this statement. (2 x 2) (4)
- [20]

FIGURE 1A

Main City Weather
Tuesday 15 May 2007













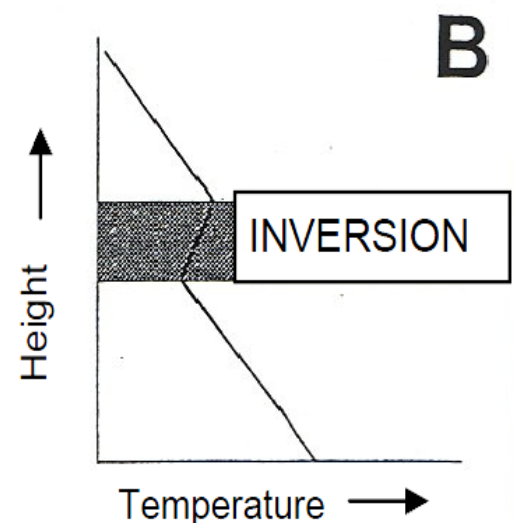
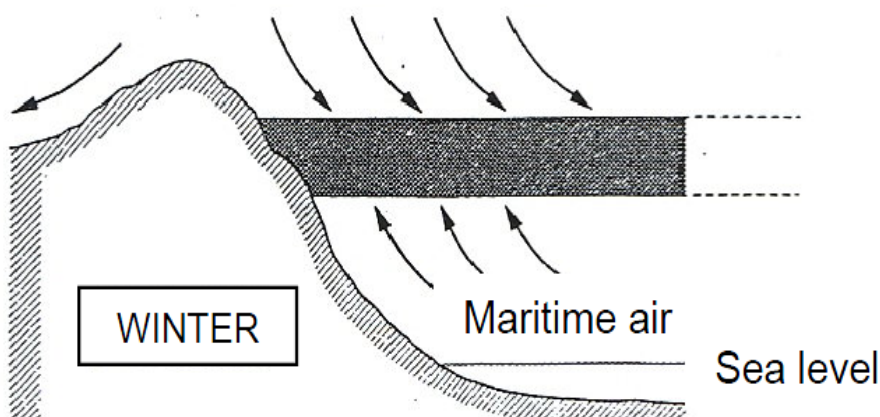
		Min.	Max.
Bloemfontein		7 °C	19 °C
Cape Town		15 °C	19 °C
Durban		15 °C	27 °C
East London		17 °C	24 °C
Johannesburg		13 °C	25 °C
Kimberley		8 °C	19 °C
Mafikeng		10 °C	27 °C
Nelspruit		10 °C	30 °C
Pietermaritzburg		13 °C	26 °C
Polokwane		9 °C	28 °C
Port Elizabeth		14 °C	23 °C
Pretoria		15 °C	27 °C

FIGURE 1B

Subsided air of continental origin



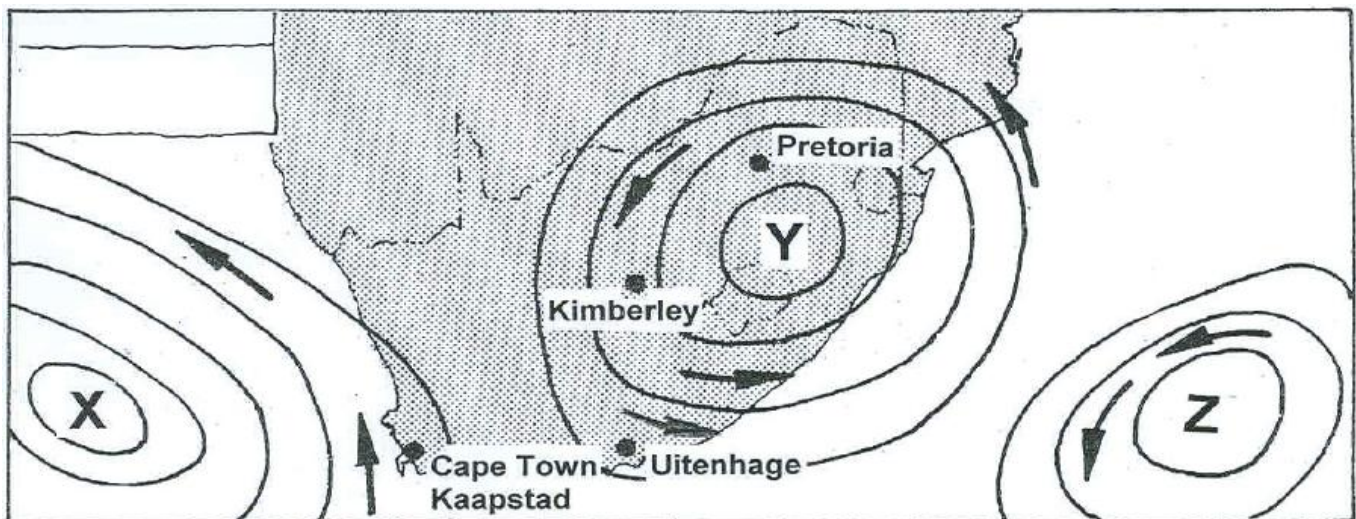
HINTS

Hint 1 - Look at the height of the Inversion layer – if it is below the escarpment it is winter and if it is above the escarpment it is summer

Hint 2 – The bigger the difference between maximum and minimum temperatures, the drier the air. Water vapour retains heat if the air is dry lots of the heat will be lost during the night.

QUESTION 2: 10 minutes 14 marks (Source: DoE November 2008)

- 2.1. Refer to the figure below showing the position of the three high-pressure cells over southern Africa that have major effects on the weather and climate.
Berg wind conditions are experienced in the vicinity of Uitenhage.



- 2.1.1 (a) Identify the THREE high pressure cells labelled X, Y and Z respectively. (3 x 2) (6)
- (b) Which ONE of the three high-pressure cells mentioned in QUESTION 2.1.1(a) is mainly responsible for the different weather conditions experienced over the South African interior during summer and winter? (1 x 2) (2)
- (c) State and explain ONE difference in the weather conditions experienced during winter and summer over the South African interior by referring to the role played by the high pressure cell mentioned in QUESTION 2.1.1(b). (3 x 2) (6)
- [14]

QUESTION 3: 15 minutes 22 marks (Source: DoE Prelim 2008)

- 3.1 Refer to the figure below showing a synoptic weather map of Southern Africa For 16 November 2007.

- 3.1.1 (a) Identify the weather system labelled A. (1 x 2) (2)
- (b) Weather system A has reached its occlusion stage (cold front occlusion). Draw a clearly labelled cross-section of a cold front occlusion showing the position of the air masses and the cold and warm fronts. (3 x 2) (6)

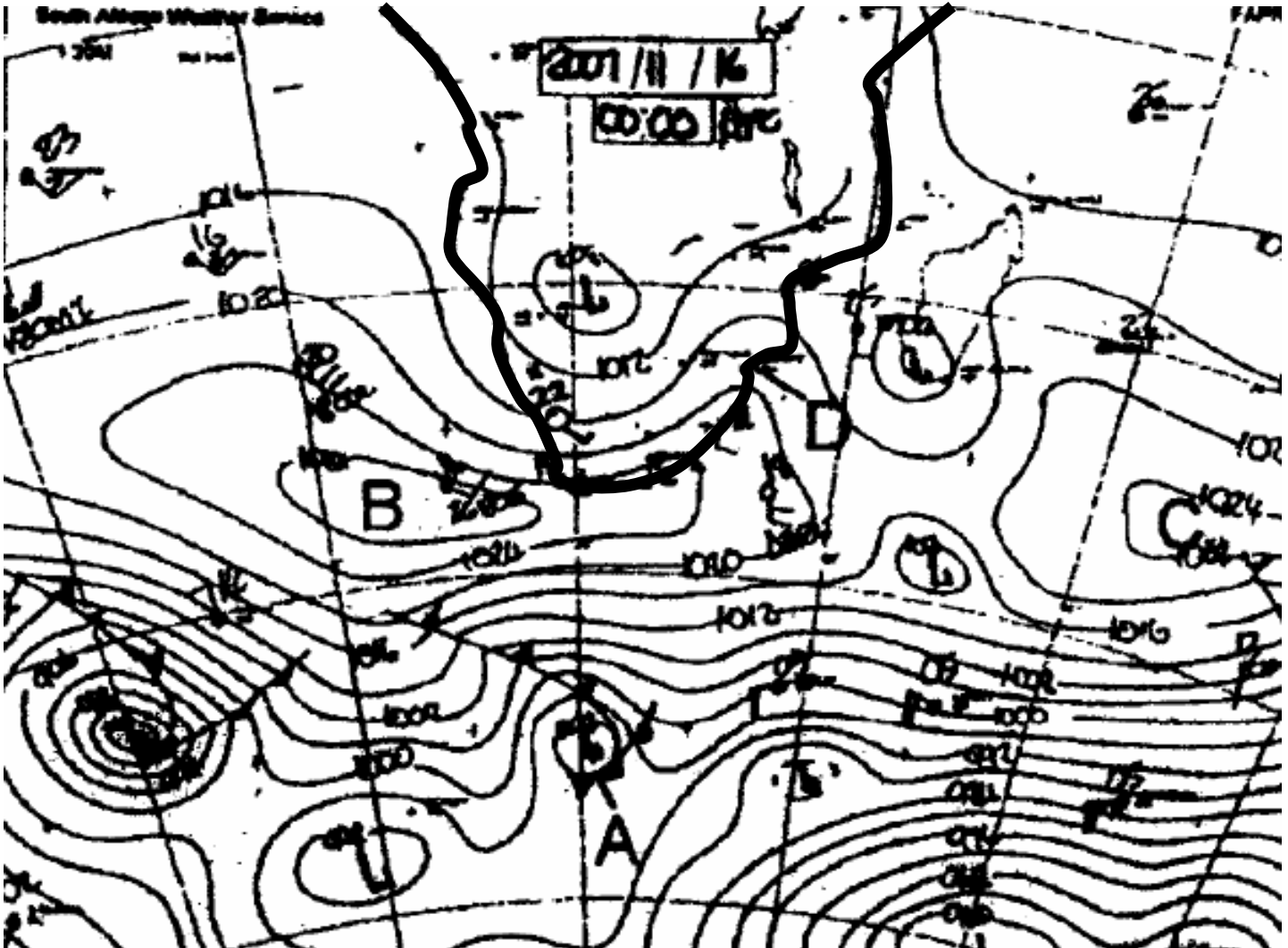
GEOGRAPHY

GRADE 12

SESSION 3

(TEACHER NOTES)

- 3.1.2 (a) Name the high pressure systems labelled **B** and **C** respectively. (2 x 2) (4)
- (b) Explain how high pressure system **B** influenced the weather conditions over the Western Cape. (2 x 2) (4)
- 3.1.3 (a) Name the high pressure system often found over the interior of South Africa. (1 x 2) (2)
- (b) Explain the effect that the high pressure system referred to in QUESTION 3.1.3(a) has on rainfall on the plateau. (2 x 2) (4)
- [22]

**HINTS:**

Hint 1- The High Pressures are named according to where they occur.

Hint 2 - Write the full name of the high pressure, e.g. South Atlantic Ocean High Pressure cell when you need to identify it.

SECTION B: SOLUTIONS AND HINTS TO SECTION A: TOPIC 1

QUESTION 1

- 1.1.1 Temperature rises with altitude ✓✓ [Concept] (1 x 2) (2)
- 1.1.2 Kalahari High Pressure ✓✓ (1 x 2) (2)
- 1.1.3 Descending air heats up ✓✓
 Warm layer of air at bottom of Kalahari High Pressure cell ✓✓
 Warm air meets cooling air that rises from Earth's surface ✓✓
 [Any TWO] (2 x 2) (4)
- 1.1.4 Inversion lower than the escarpment ✓✓
 Warm moist air cannot reach the interior ✓✓
 Little moisture over interior will reduce condensation ✓✓
 No cloud formation to block out the sun ✓✓ [Any THREE] (3 x 2) (6)
- 1.1.5 Higher ✓✓ (1 x 2) (2)
- 1.1.6 During summer moist air reaches the interior ✓✓
 Precipitation over the interior ✓✓
 Rivers filled with water ✓✓
 Farming can take place ✓✓ [Any TWO] (2 x 2) (4)
- [20]**

QUESTION 2

- 2.1.1 (a) X - South Atlantic (St. Helena) HP ✓✓
 Y - Kalahari (Continental) HP ✓✓
 Z - South Indian (Mauritius) HP ✓✓ (3 x 2) (6)
- (b) Y / Kalahari (Continental) HP ✓✓ (1 x 2) (2)

(c)	Differences
Summer	Winter
Moist air	Dry air ✓✓
Cloudy	No clouds ✓✓
Rainfall Little	No rain ✓✓
No frost	Frost at night ✓✓
Small temp range	Large temp range ✓✓

[Any ONE difference]

- Inversion above escarpment in summer and lower in winter ✓✓
 Moist air can reach interior in summer not in winter ✓✓
 Condensation and cloud cover in summer but limited in winter ✓✓
 Increased terrestrial radiation during winter night results in very low temperatures at night ✓✓

[Any TWO for explanation – must fit reason] (3 x 2) (6)

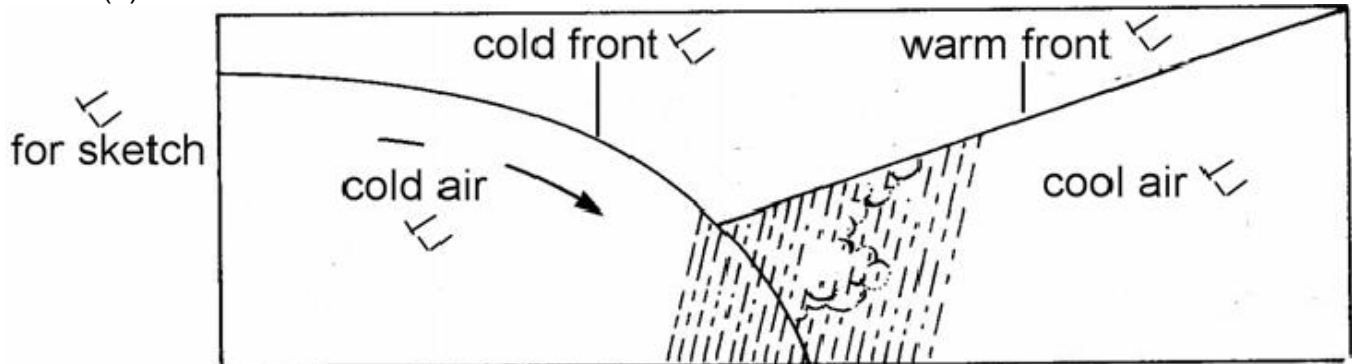
[14]

QUESTION 3

3.1.1 (a) Mid-latitude Cyclone ✓✓/ Temperate cyclone. ✓✓

(1 x 2) (2)

(b)



[Any TWO labels + ✓✓ for correct sketch]

(3 x 2) (6)

3.1.2 (a) B – South Atlantic / St. Helena High Pressure Cell ✓✓

C – South Indian / Mauritius High Pressure System ✓✓

(2 x 2) (4)

(b) B is ridging in south of South Africa and blocking the cold fronts from affecting the Western Cape ✓✓

This will reduce the amount of precipitation, wind, cloud cover and cold conditions over the Western Cape ✓✓

(2 x 2) (4)

3.1.3 (a) Kalahari High Pressure ✓✓/ Continental High Pressure ✓✓

(1 x 2) (2)

(b) During winter the inversion layer associated with the Kalahari high pressure is below the level of the Escarpment, resulting in little or no rainfall ✓✓

During summer the inversion layer associated with the Kalahari high pressure is above the level of the Escarpment, resulting in rainfall ✓✓

(2 x 2) (4)

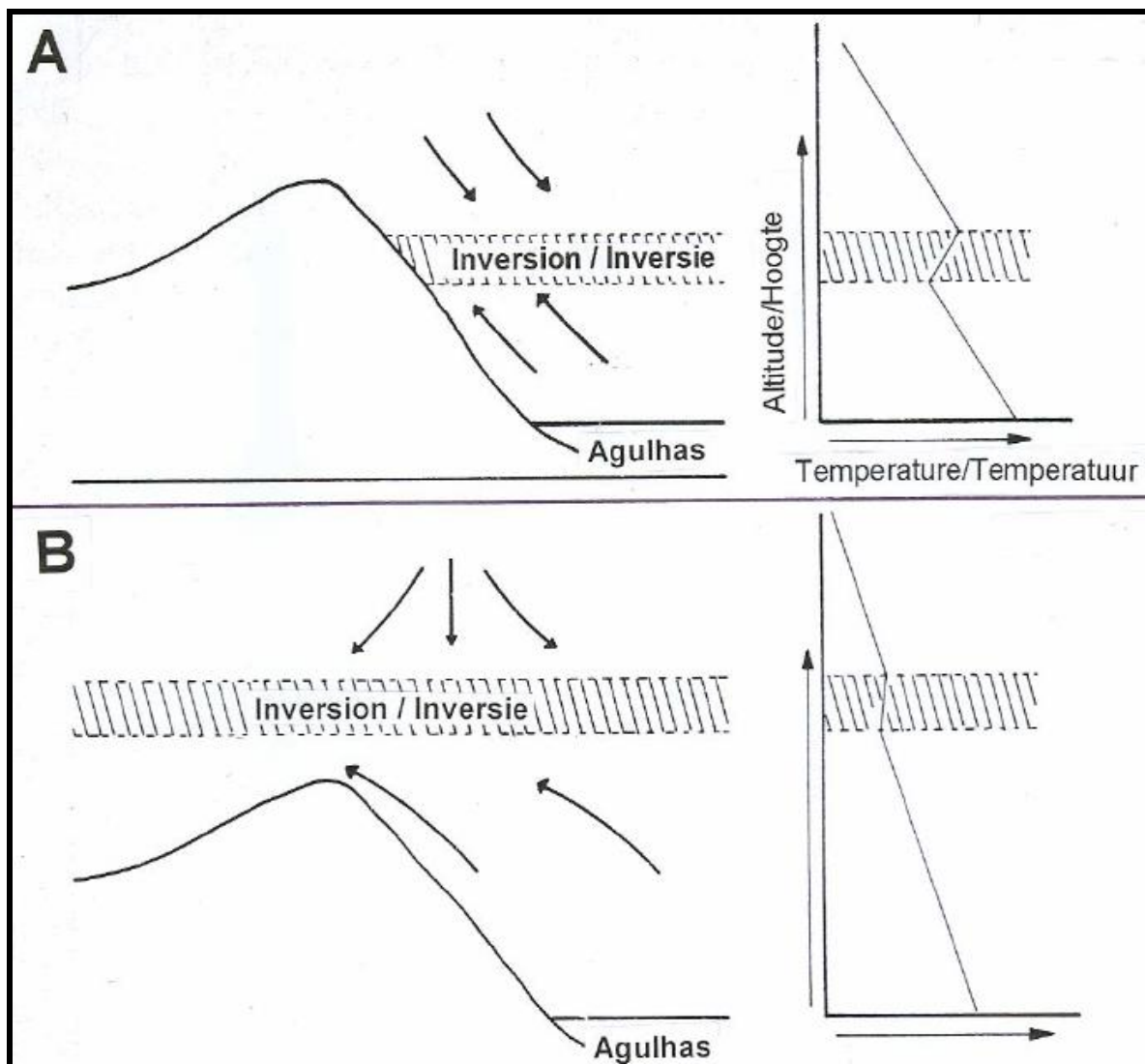
[22]

SECTION C: HOMEWORK

QUESTION 1: 10 minutes 14 marks*(Source: DoE November 2009)*

- 1.1. The Kalahari high-pressure cell causes a subsidence inversion over the South African interior. The base height of this subsidence inversion varies from summer to winter. The figure on the following page is a cross-section that shows how the base height of the subsidence inversion varies from summer to winter.
- 1.1.1 Define the term temperature inversion. (1 x 2) (2)
- 1.1.2 Which of the diagrams, FIGURE A or B, represents summer months? (1 x 2) (2)
- 1.1.3 Give ONE reason for your answer to QUESTION 1.1.2. (1 x 2) (2)
- 1.1.4. Describe the effect that the base height of the subsidence inversion will have on the climate of the South African interior during summer and winter months respectively. (4 x 2) (8)

[14]



QUESTION 2: **5 minutes** **10 marks** (Source: DoE March 2009)

2.1 Refer to the figure on the following page, and extract from a synoptic weather chart. Choose the correct term(s) from those given in brackets to make EACH of the statements below TRUE. Write only the term(s) next to the question number (2.1.1 – 2.1.5) as an ANSWER.

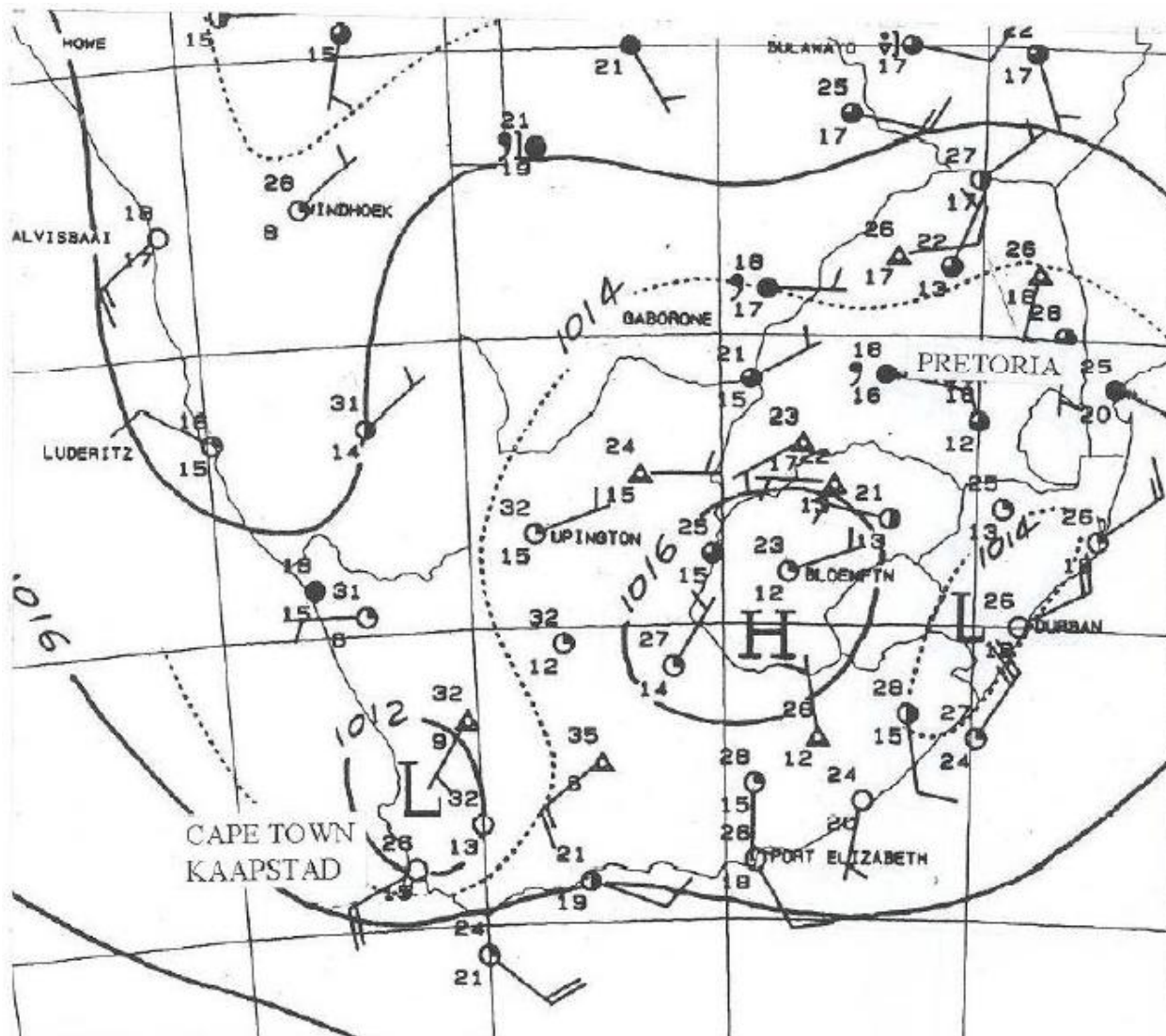
2.1.1 The synoptic chart shows typical (winter/summer) conditions.

2.1.2 The low pressure (L) north of Cape Town is known as a (coastal low/temperate cyclone).

2.1.3 Dew point temperature at Upington is (32 °C/15 °C).

2.1.4 Wind direction at Cape Town is (southwest/northeast).

2.1.5 Pretoria is experiencing (drizzle/rain). (5 x 2) [10]



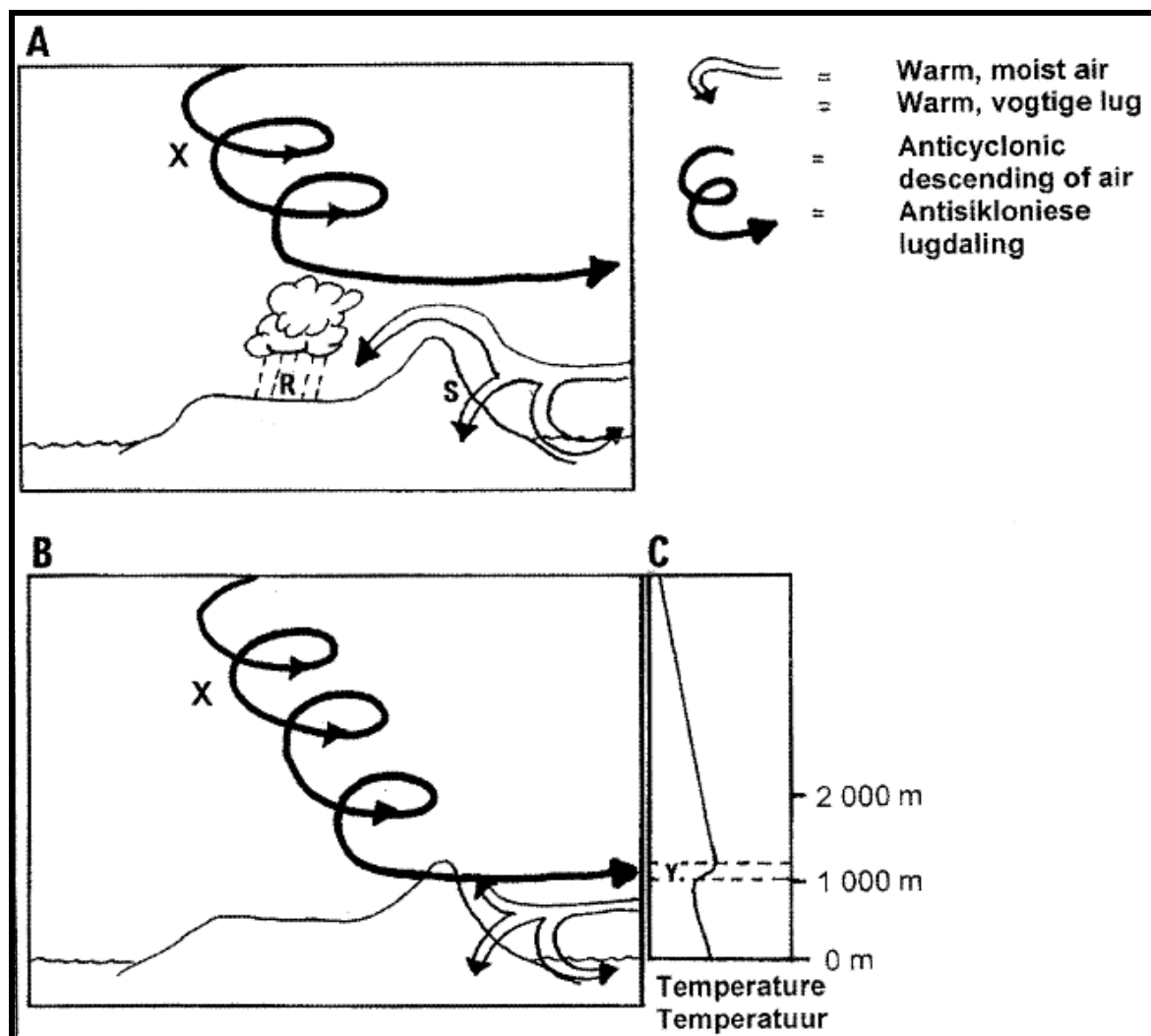
QUESTION 3: 15 minutes 20 marks (Source: DoE March 2010)

3.1 FIGURES 3A and 3B show weather conditions that South Africa will experience at different times of the year. Also read the extract on droughts below. If the conditions illustrated in FIGURE 3B persist, South Africa may experience a severe drought.

Hot, dry weather from January to March 2007 wilted crops in southern Africa. The severe drought produced near-record temperatures that, combined with a lack of rainfall, caused extensive crop damage, particularly in western crop areas. In South Africa, the anticipated yield from the corn crop dropped from ten million tons in December to six million tons in April, because farmers couldn't plant in the dry conditions and many of the crops that were planted, wilted in the dry heat. The last South African drought of this magnitude occurred in 1992.

The CSIR said, "The 1982-'83 and 1991-'92 droughts were the most severe meteorological droughts of the 20th century in southern Africa." In the 1991-'92 drought, 70% of the crops failed. It was estimated that half of the population in the affected area was at risk of malnutrition, other related health problems, and even starvation.

Figure 3



- 3.1.1 During which season would South Africa experience the weather conditions represented in A and B respectively? (2 x 2) (4)
- 3.1.2 Name the weather system labelled X on both diagrams. (1 x 2) (2)
- 3.1.3 Weather system X is responsible for the development of stable conditions which frequently occur over the South African interior during winter. Briefly explain why weather system X is responsible for the development of stable conditions over the interior. (2 x 2) (4)
- 3.1.4 In which one of the diagrams, A or B, is the above-mentioned condition clearly visible? (1 x 2) (2)
- 3.1.5 FIGURE 3C is a graph showing the vertical temperature gradient as experienced in FIGURE 3B.
- (a) Describe the temperature changes as shown on the graph in FIGURE 3C. (3 x 2) (6)
- (b) What is the zone labelled Y known as? (1 x 2) (2)
- [20]

SECTION D: SOLUTIONS TO HOMEWORK: TOPIC 1

QUESTION 1

- 1.1.1 A rise / increase in temperature with increase in altitude ✓✓
[Concept] (1 x 2) (2)
- 1.1.2 B ✓✓ (1 x 2) (2)
- 1.1.3 Inversion layer is above the escarpment ✓✓
The base of the inversion is higher above sea level
Moist air is advected onto the plateau ✓✓
[Any ONE] (1 x 2) (2)
- 1.1.4
- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Summer:</p> <p>Moist air will reach the interior ✓✓</p> <p>High humidity ✓✓</p> <p>More condensation ✓✓</p> <p>Cloud formation ✓✓</p> <p>Precipitation ✓✓</p> <p>Smaller temperature range ✓✓</p> | <p>Winter:</p> <p>Moist air prevented from reaching interior ✓✓</p> <p>Low humidity ✓✓</p> <p>Little condensation ✓✓</p> <p>No / few clouds ✓✓</p> <p>Colder night temperatures ✓✓</p> <p>Frost may occur ✓✓</p> <p>Larger temperature range ✓✓</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
- [Any FOUR. Must refer to summer and winter] (4 x 2) (8)

[14]

QUESTION 2

2.1.1 summer ✓✓

2.1.2 coastal low ✓✓

2.1.3 15 °C ✓✓

2.1.4 southwest ✓✓

2.1.5 drizzle ✓✓

(5 x 2) [10]

QUESTION 3

3.1.1 A = summer ✓✓

B = winter ✓✓

(2 x 2) (4)

3.1.2 Kalahari / Continental High Pressure Cell ✓✓

(1 x 2) (2)

3.1.3 Descending air ✓✓

Air warms adiabatically as it goes down ✓✓

Blocks moisture from reaching the interior ✓✓

No condensation will occur ✓✓

[Any TWO] (2 x 2) (4)

3.1.4 B ✓✓

(1 x 2) (2)

3.1.5 (a) From 0 to 1 000 m there is a decrease in temperature with height ✓✓

At Y there is an increase in temperature with height ✓✓

Above Y there is a decrease in temperature with height ✓✓

(3 x 2) (6)

(b) Temperature inversion ✓✓

(1 x 2) (2)

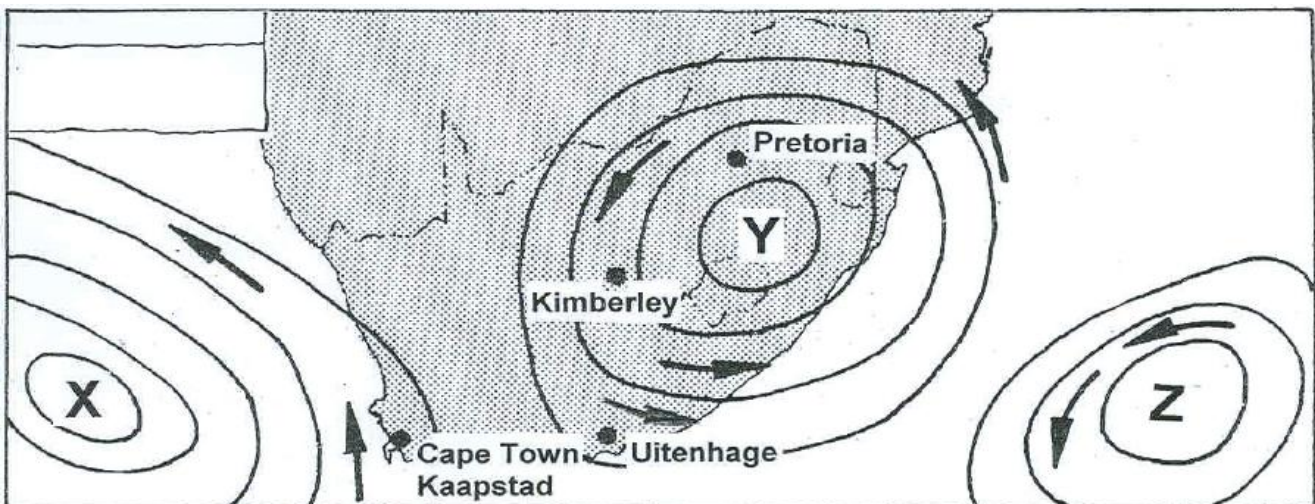
[20]

TOPIC 2: TRAVELLING DISTURBANCES

! Teacher Note: Explain the following – the examiners want learners to understand this content. This section is always covered in exams although usually one of the topics is singled out in different exams.

Traveling disturbances

- Development of
 - o Moisture front and line thunderstorms
 - o Coastal low pressure
 - o South African berg wind
- Resultant weather
- Identification on synoptic charts

SECTION A: TYPICAL EXAM QUESTIONS**QUESTION 1: 10 minutes****14 marks** (Source: DoE November 2008)

- 1.1 (a) During which season do berg wind conditions prevail in South Africa? (1 x 2) (2)
- (b) Describe the cloud cover and temperature conditions that exist during the occurrence of a berg wind. (2 x 2) (4)
- (c) Explain why the weather conditions mentioned in QUESTION 1.1.1.(b) exist during the occurrence of a berg wind. (2 x 2) (4)
- (d) Name the environmental hazard (danger) that is associated with the development of berg wind conditions. (1 x 2) (2)
- (e) Which weather system is responsible for the termination (ending) of berg wind conditions? (1 x 2) (2)

[14]

HINTS

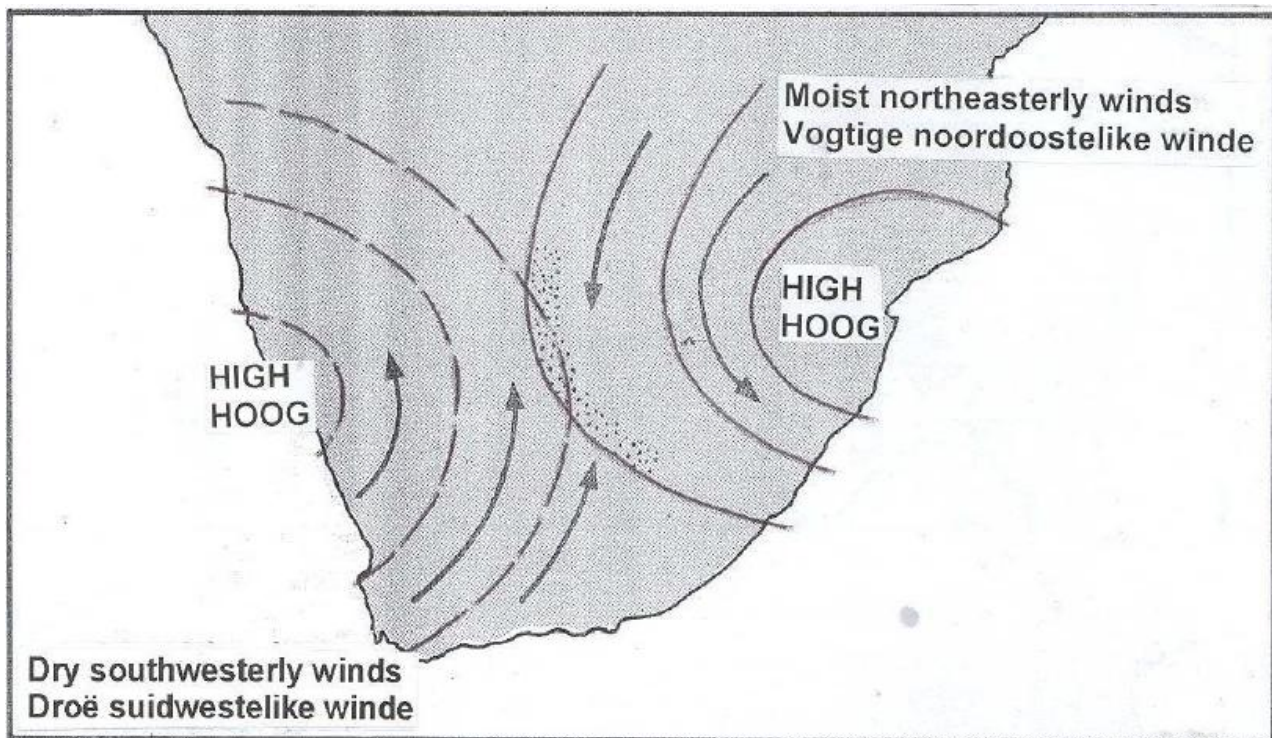
Hint 1 – The Kalahari HP is only well developed in winter

Hint 2 – If winds blow from the central plateau to the coast it will descend down the Drakensberg and become warm and dry.

QUESTION 2: **10 minutes** **16 marks** (Source: DoE March 2009)

- 2.1 Refer to the figure below showing the formation of a storm line.
- 2.1.1 What is meant by the term storm line as mentioned in the statement above? (1 x 2) (2)
- 2.1.2 Describe some of the processes (air movement, influx of air) which lead to line thunderstorms occurring. (3 x 2) (6)
- 2.1.3 What name is given to the band of low pressure that extends across the South African interior along which line, thunderstorms develop? (1 x 2) (2)
- 2.1.4 Do line thunderstorms develop on the eastern or western side of the band of low pressure mentioned in QUESTION 2.1.3? (1 x 2) (2)
- 2.1.5 Discuss the consequences of line thunderstorms for farming activities in South Africa's interior. (2 x 2) (4)

[16]

**HINTS**

Hint 1 – Moisture boundary only occur in summer

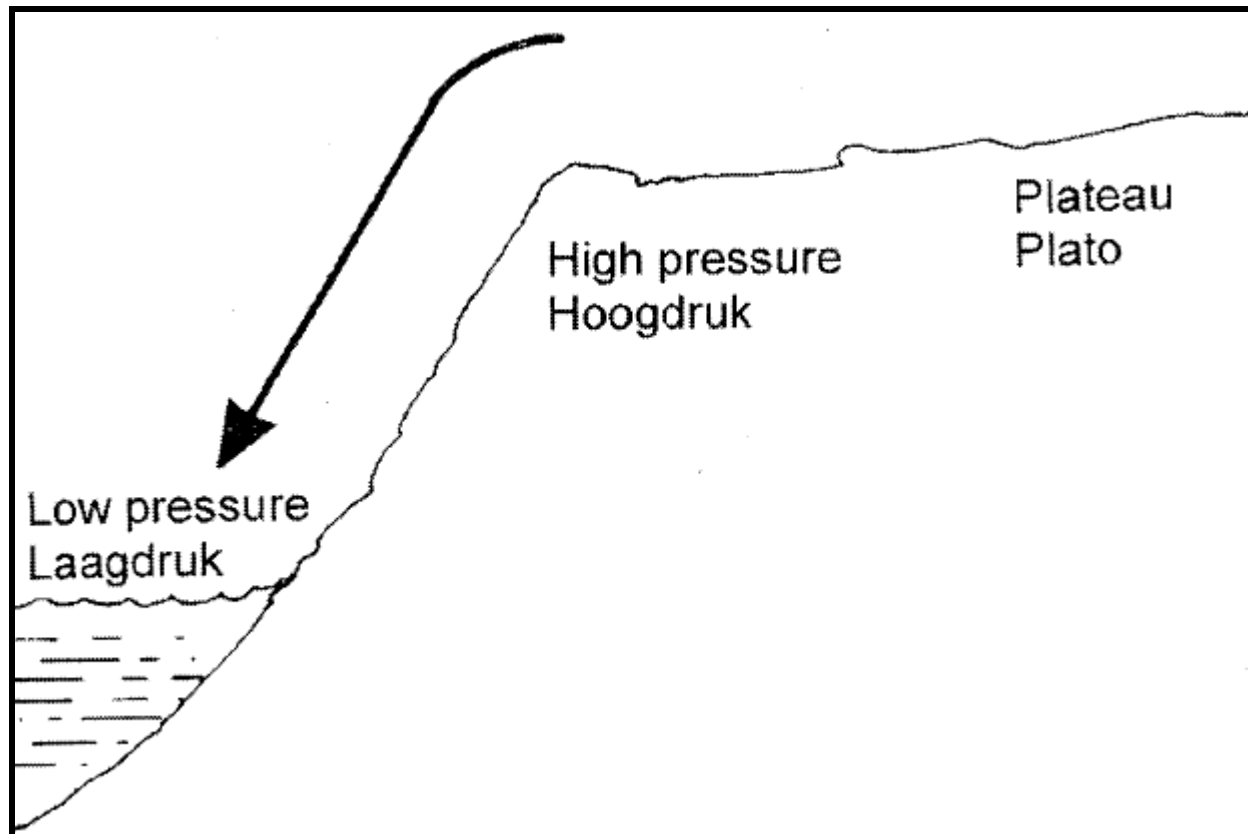
Hint 2 – Rain forms on the Eastern side of the moisture boundary as the air mass from over the warm Benguela current carries more moisture.

QUESTION 3: **10 minutes** **12 marks** (Source: DoE March 2010)

- 3.1. FIGURE 3 is a cross-section showing a berg wind that often occurs along the south coast of South Africa. Use your knowledge of berg winds and also refer to FIGURE 3 to answer the questions below.
- 3.1.1 Identify the type of low pressure, visible in FIGURE 3, which plays a role in the development of berg winds. (1 x 2) (2)
- 3.1.2 Explain why berg winds will result in warm, dry conditions along the south coast of South Africa. (3 x 2) (6)
- 3.1.3 Veld fires often accompany berg winds. Give ONE preventative measure that can be introduced to reduce the spreading of veld fires. (1 x 2) (2)
- 3.1.4 Which weather system is responsible for the dissipation of berg wind conditions? (1 x 2) (2)

[12]

FIGURE 3

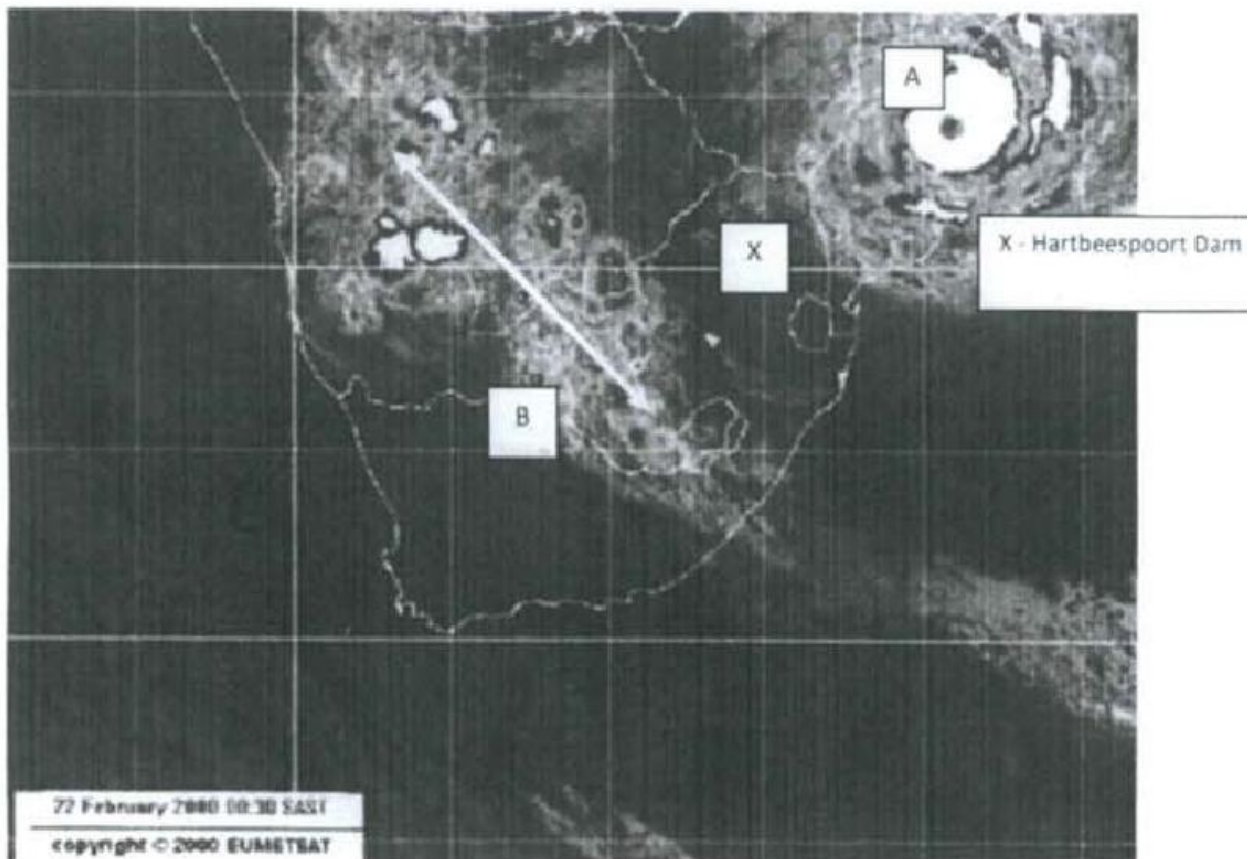


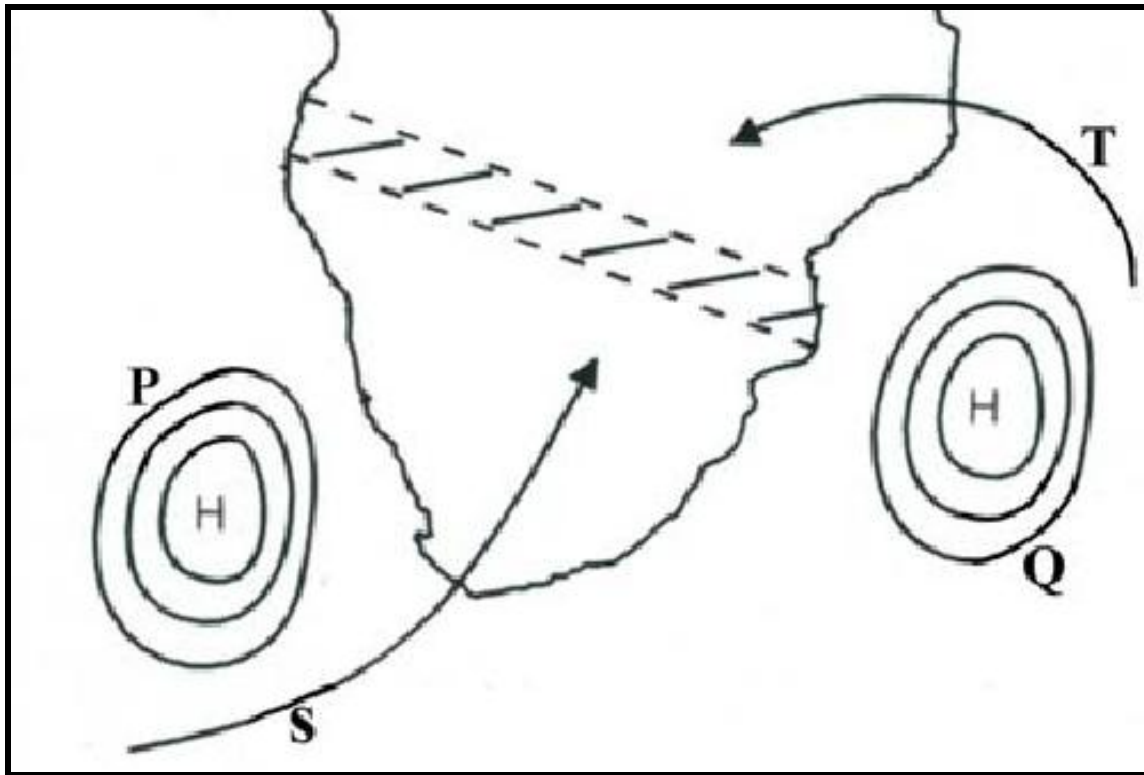
QUESTION 4: 10 minutes 22 marks (Source: Sunday Times 2009 Exemplar)

4.1. Refer to the Satellite images and simplified map of the same conditions on the next page to answer the following questions:

- 4.1.1. a) Identify the weather features A and B on the satellite image. (2 x 2) (4)
 b) What season was captured on the satellite image? (1 x 2) (2)
 c) Explain why feature B is associated with heavy cloud cover. (2 x 2) (4)
- 4.1.2 a) Name the high pressure cells at P and Q. (1 x 2) (2)
 b) Name the winds at S and T and state the characteristics of each. (2 x 2) (4)
 c) Compare winds S and T in table form. Refer to temperature, humidity and rain bearing potential. (3 x 2) (6)
 [22]

EUMETSAT of South Africa 22 February 2000



**QUESTION 1**

- 1.1.1 (a) Late autumn / winter ✓✓ (1 x 2) (2)
 (b) Clear sky / no clouds / cloud cover 0/8 ✓✓
 High temperatures ✓✓ (2 x 2) (4)
 (c) Air subsides down escarpment / adiabatic heating ✓✓
 Subsiding air heats up ✓✓
 Subsiding air does not allow for condensation ✓✓
 Subsiding air gets drier ✓✓
 [Any TWO] (2 x 2) (4)
 (d) Veld fires ✓✓ (1 x 2) (2)
 (e) Mid-latitude cyclone ✓✓ (1 x 2) (2)

[14]**QUESTION 2**

- 2.1.1 Band of low pressure over land stretching from NW to SE along which line
 thunderstorms occur ✓✓ [Concept] (1 x 2) (2)
 2.1.2 Cold, dry air moves over the country from SW ✓✓
 Warm, moist air moves over the country from NE ✓✓
 Cold, dry air meets warm, moist air over interior ✓✓
 Warm moist air forced to rise rapidly and very high ✓✓
 Large scale cooling and condensation results in thunderstorms ✓✓
 [Any THREE] (3 x 2) (6)
 2.1.3 Moisture front/Trough line ✓✓ (1 x 2) (2)

GEOGRAPHY

GRADE 12

SESSION 3

(TEACHER NOTES)

2.1.4 Eastern ✓✓ (1 x 2) (2)

2.1.5 Large scale soil erosion ✓✓
 Damage to crops ✓✓
 Damage to livestock ✓✓
 Lightning sets veld on fire ✓✓
 Huge economic losses ✓✓
 It does bring some water to the interior. ✓✓

[Any TWO] (2 x 2) (4)
[16]

QUESTION 3

3.1.1 Coastal low ✓✓ (1 x 2) (2)

3.1.2 Air descends the plateau ✓✓
 Warms adiabatically ✓✓
 Subsiding air does not allow for condensation to take place ✓✓
 It is dry since it is an offshore wind ✓✓
 It decreases atmospheric humidity ✓✓
 [Any THREE. Must refer to temperature and humidity] (3 x 2) (6)

3.1.3 Fire breaks ✓✓
 Early warning over weather reports ✓✓
 [Any ONE] (1 x 2) (2)

3.1.4 Mid-latitude cyclone ✓✓ (1 x 2) (2)
[12]

QUESTION 4

4.1.1. a) A: Tropical cyclone ✓✓
 B: Moisture boundary ✓✓ (2 x 2) (4)
 b) Summer ✓✓ (1 x 2) (2)
 c) Cold dense air lift warm moist air and causes rain ✓✓
 Instable air due to high temperatures in summer and large land
 mass heating the air ✓✓ (2 x 2) (4)

4.1.2. a) P: South Atlantic Ocean High Pressure ✓✓
 Q: South Indian Ocean High Pressure ✓✓ (2 x 2) (4)
 b) S: South Westerlies ✓✓
 T: North Easterlies ✓✓ (2 x 2) (4)
 c) **S**
 Cool
 Dry
 Cannot render much rain

T
 Warm ✓✓
 Moist ✓✓
 Renders a lot of rain ✓✓ (3 x 2) (6)
[16]

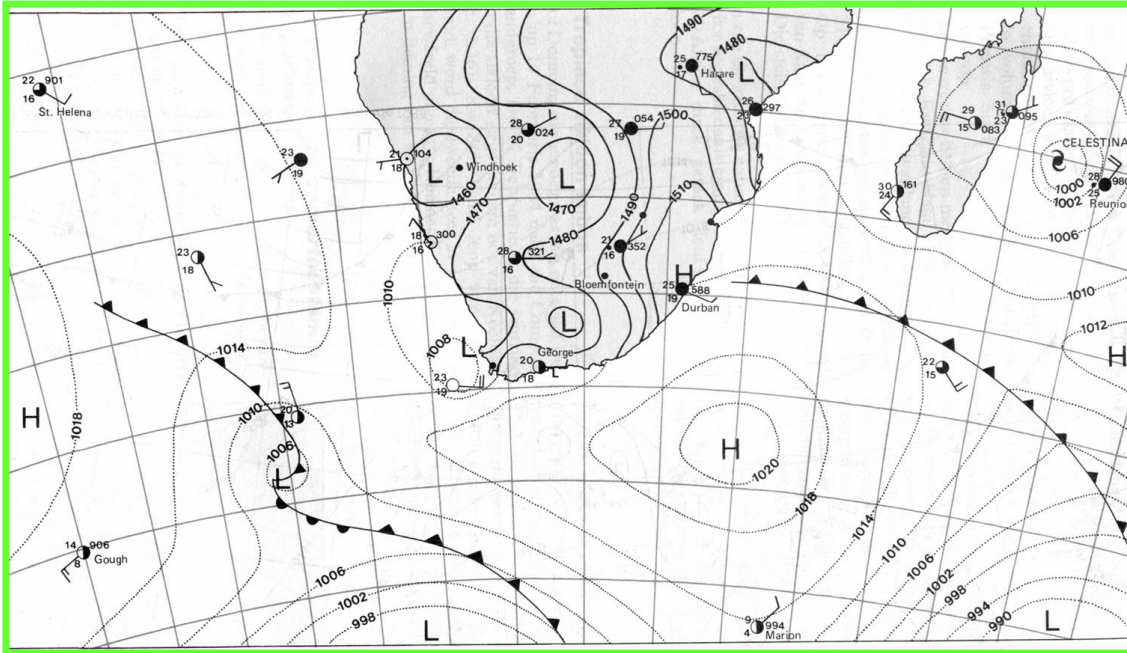
SECTION C: HOMEWORK**QUESTION 1:****10 minutes****20 marks**

1. Mid-latitude cyclones develop
 - a. in summer
 - b. in winter
 - c. all year round
 - d. in spring and autumn
2. Tropical cyclones develop
 - a. in summer
 - b. in winter
 - c. all year round
 - d. in spring and autumn
3. The Kalahari high pressure is best developed i
 - a. in summer
 - b. in winter
 - c. all year round
 - d. in spring and autumn
4. The moisture boundary develop over SA
 - a. in summer
 - b. in winter
 - c. all year round
 - d. in spring and autumn
5. Orographic and convection rain occur most often in SA
 - a. in summer
 - b. in winter
 - c. all year round
 - d. in spring and autumn
6. Frontal rain occur most often in SA
 - a. in summer
 - b. in winter
 - c. all year round
 - d. in spring and autumn

7. Hail and thunder storms occur most often over SA in
- in summer
 - in winter
 - all year round
 - in spring and autumn
8. Mid-latitude cyclones mostly pass over SA in
- in summer
 - in winter
 - all year round
 - in spring and autumn
9. Berg winds occur most often in
- in summer
 - in winter
 - all year round
 - in spring and autumn
10. Urban heat islands are more visible in
- in summer
 - in winter
 - all year round
 - in spring and autumn
- (10 x 2) [20]

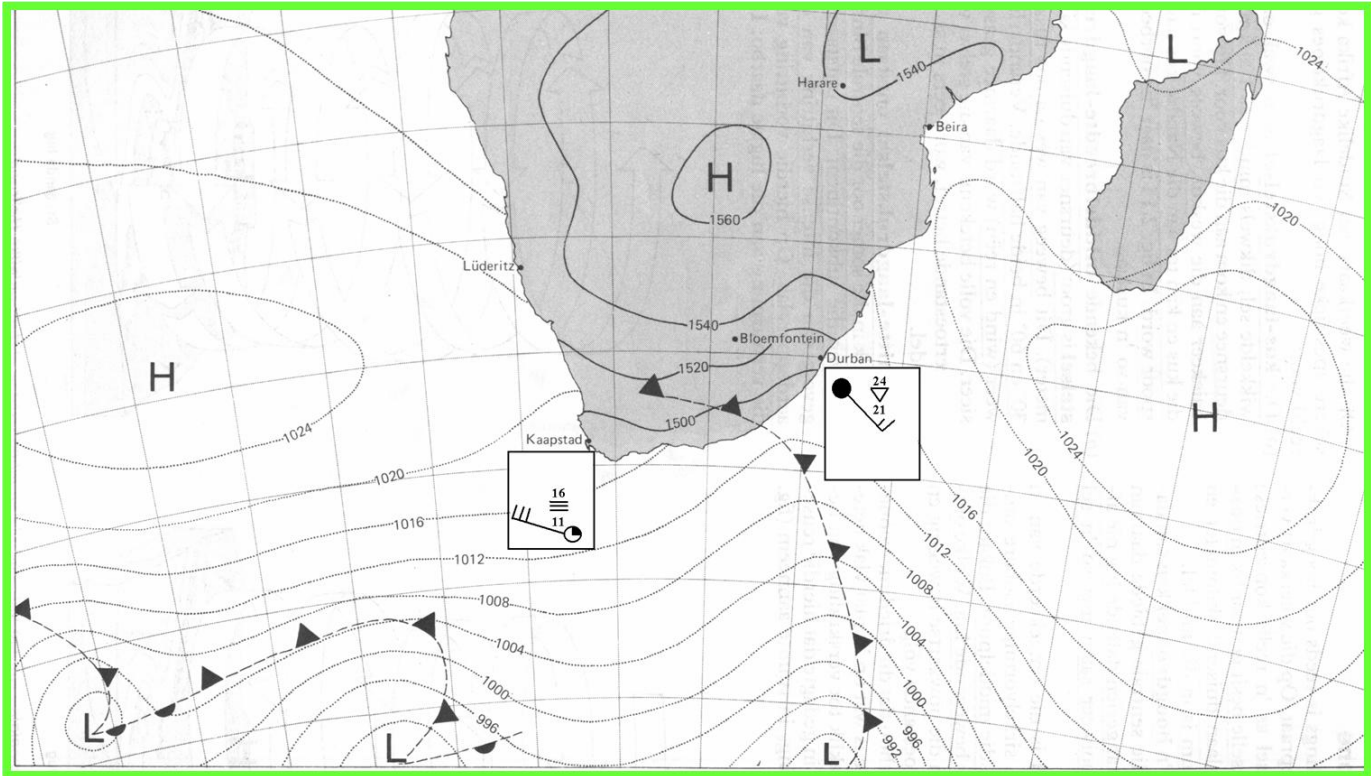
QUESTION 2: 78 marks**2.1 Refer to MAP 1 to answer the questions**

- 2.1.1. Does this map illustrate summer or winter conditions? (1 x 2) (2)
- 2.1.2. Motivate your answer in 1.1. (3 x 2) (6)
- 2.1.3. Identify the weather feature called Celestine in the North Eastern corner of the map. (1 x 2) (2)
- 2.1.4. Where and under what conditions did Celestine develop? (4 x 2) (8)
- 2.1.5. Explain what weather can be expected at Celestine. (3 x 2) (6)
- 2.1.6. Which parts of SA will be influenced by the weather systems like Celestine? (1 x 2) (2)
- 2.1.7. When will Celestine dissipate? (3 x 2) (6)
- 2.1.8. Explain how the rain over the central interior developed. (3 x 2) (6)

MAP 1**2.2 Refer to map 2 to answer the following questions:**

- 2.2.1. Does this map illustrate summer or winter conditions? (1 x 2) (2)
- 2.2.2. Motivate your answer in 2.1. (3 x 2) (6)
- 2.2.3. Identify the weather systems South of SA and over SA. (1 x 2) (2)
- 2.2.4. Describe the weather conditions in Durban. (3 x 2) (6)
- 2.2.5. Explain why the weather is like what you mentioned in 2.2.5. (3 x 2) (6)
- 2.2.6. Identify the 3 high pressures on the map. (3 x 2) (6)
- 2.2.7. Describe the weather over the interior of SA. (3 x 2) (6)
- 2.2.8. Account for the weather over the interior of SA. (3 x 2) (6)

[78]

MAP 2**SECTION D: SOLUTIONS TO HOMEWORK: TOPIC 2****QUESTION 1**

- 1.1. c. ✓✓
- 1.2. a. ✓✓
- 1.3. b. ✓✓
- 1.4. a. ✓✓
- 1.5. a. ✓✓
- 1.6. b. ✓✓
- 1.7. a. ✓✓
- 1.8. b. ✓✓
- 1.9. d. ✓✓
- 1.10. b. ✓✓

(10 x 2) [20]

QUESTION 2

- 2.1.1. Summer conditions ✓✓ (1 x 2) (2)
- 2.1.2. Tropical cyclone Celestine is present ✓✓
 High temperatures over the county ✓✓
 Cloud cover over the summer rainfall region ✓✓
 Low pressure cells over the country ✓✓
 Mid-latitude cyclones and subtropical high pressure belt far south of country ✓✓
 (3 x 2) (6)
- 2.1.3 Tropical cyclone ✓✓ (1 x 2) (2)
- 2.1.4 Tropical cyclones develop over the sea in the tropical areas. ✓✓
 The water must be warmer than 28°C which leads to a lot of evaporation
 and very hot, humid, unstable air. ✓✓
 The hot air starts rising and forms an intense low pressure on the surface. ✓✓
 The tropical jet stream in the upper air causes an upper air low pressure and
 this intensifies the low pressure on the surface. ✓✓
 Air is sucked into the low pressure. If this happens outside 5°N and S,
 Coriolis force will cause the winds to spiral towards the low pressure. ✓✓
 (4 x 2) (8)
- 2.1.5. Torrential rain ✓✓
 Hurricane strength winds ✓✓
 Extreme low pressure ✓✓
 Large waves at sea and storm surge on sea ✓✓ (3 x 2) (6)
- 2.1.6. North eastern part of Mpumalanga and KwaZulu Natal ✓✓ (1 x 2) (2)
- 2.1.7. When the tropical cyclone moves over land ✓✓
 the wind is slowed down by friction ✓✓
 and there is less evaporation to cause unstable air conditions. ✓✓
 The cyclone also moves into cooler sub-tropical areas and the air pressure
 increases. ✓✓
 The weather clears up. ✓✓ (3 x 2) (6)
- 2.1.8. In summer the subtropical high pressure belt moves south with the
 heat equator. ✓✓
 The subsiding air masses and clear conditions shift to south of the country. ✓✓
 Moist tropical air masses bring in humid air over the interior which causes
 summer rain at the moisture front along the centre of the country. ✓✓
 Cool dry air from the south west meet and lift up warmer moist air from the
 north east. ✓✓
 This cause cloud formation and rain. ✓✓
 Low pressures occur over South Africa. ✓✓ (3 x 2) (6)

- 2.2.1. Winter conditions ✓✓ (1 x 2) (2)
- 2.2.2. Cold clear conditions over the interior ✓✓
 Well-developed Kalahari high pressure over the central plateau ✓✓
 Mid-latitude cyclones influence weather in the Cape and cause frontal rain. ✓✓
 Sub-tropical high pressure belt near SA and further north than in summer ✓✓
 Berg wind conditions in Durban ✓✓ (3 x 2) (6)
- 2.2.3. Mid-latitude cyclones ✓✓ (1 x 2) (2)
- 2.2.4. Temperature dropped ✓✓
 Cloud cover – overcast can experience thunder storms ✓✓
 Air becomes dry ✓✓
 Air pressure increasing ✓✓
 Wind direction is changing ✓✓ (3 x 2) (6)
- 2.2.5. The cold dense air moves faster and pick up the light humid less dense air in the warm sector. ✓✓
 This leads to Cumulonimbus clouds to form and heavy rain along the cold front. ✓✓
 The temperature and humidity decreases at the cold front while the air pressure increases. ✓✓
 The air at the cold front is lifted quickly and thus thunderstorms develop at the cold front. ✓✓ (3 x 2).(6)
- 2.2.6. Atlantic Ocean high pressure cell ✓✓
 Kalahari high pressure cell ✓✓
 Indian Ocean high pressure cell ✓✓ (3 x 2) (6)
- 2.2.7. Clear cool dry conditions persist over the summer rainfall area in the interior of SA. ✓✓
 Mild days and cold nights due to fast radiation as air is very dry ✓✓
 Frost occurs on Highveld and in frost pockets of valleys ✓✓ (3 x 2) (6)
- 2.2.8. Winter weather in SA is dominated by the subtropical high pressure cells over and next to the country. ✓✓
 The subsiding air causes a temperature inversion which prevents all the moist maritime air from entering the interior. ✓✓
 A temperature inversion occurs over the country ✓✓ (3 x 2) (6)

[78]

TOPIC 3: CLIMATE CHANGE AND CLIMATE HAZARDS

Teacher Note: There are always questions on these sections in the exams. They are relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks.

LESSON OVERVIEW**Climate hazards**

- Concept of climate hazard
- Basic understanding of
 - Global warming
 - Droughts
 - Floods
 - Storm surges
 - Lightning
 - Hail
 - Tornadoes
- Human vulnerability, response and pre-cautionary measures

Climate Change

- Concept of climate change
- Sustainable measures to prevent climate change
- Climatic changes in Africa and the effect on Africans
- Human response to climate change
 - Kyoto Protocol
 - Reducing the effects of climate change in Africa and developing nations

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **15 minutes** **18 marks** (*Source: DoE Prelim 2008*)

1. Refer to the extract below and answer the questions that follow.

**SOUTH AFRICA'S ENVIRONMENTAL CONDITION IS DETERIORATING
DUE TO CLIMATE CHANGE**

The Western Cape is expected to be heavily affected by the warming and drying associated with climatic change. This area will experience a significant reduction in rainfall and a 10% reduction in run-off by 2015. The greenhouse effect is a significant contributor to global warming. The greenhouse effect can be reduced by decreasing greenhouse gases through greenbelt development. The Kyoto Protocol, a legal document, was designed to ensure that climate change policies are implemented, such as enhancing of energy efficiency, limiting gas emissions and developing sustainable forms of agriculture. South Africa undersigned the Kyoto Protocol.

GEOGRAPHY

GRADE 12

SESSION 3

(TEACHER NOTES)

- 1.1. Define the following terms:
- (a) Global warming (1 x 2) (2)
 - (b) Greenhouse effect (1 x 2) (2)
- 1.2 Name ONE weather change that results from climate change. (1 x 2) (2)
- 1.3 Name TWO ways in which climatic changes could affect people. (2 x 2) (4)
- 1.4 Greenbelt development will reduce greenhouse gases. Explain how this process occurs. (2 x 2) (4)
- 1.5 What is the main reason for implementing the Kyoto Protocol? (1 x 2) (2)
- 1.6 Give ONE reason for some highly industrialised nations such as the United States of America, not signing the Kyoto Protocol. (1 x 2) (2)
- [18]

HINTS

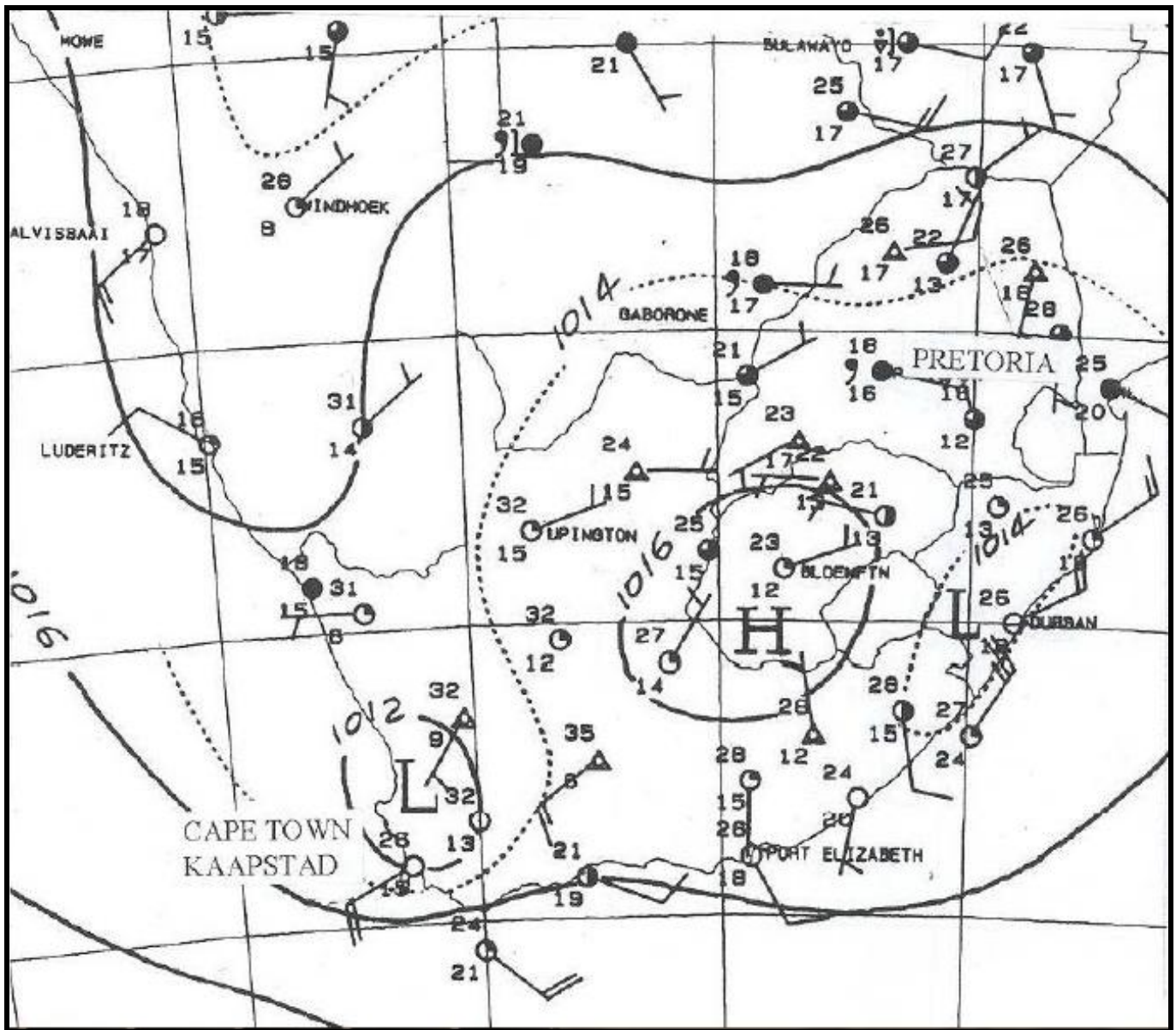
Hint 1: Make sure learners know what the greenhouse effect is – normal temperature control system on earth that allows life on earth – Refer back to gr. 10 work

Hint 2: Make sure learners know what global warming is, how it works and what it implies for humans

Hint 3: Learners must not confuse global warming and ozone depletion – they are not the same thing. Ozone depletion does not cause global warming.

QUESTION 2:**5 minutes****10 marks***(Source: DoE March 2009)*

- 2.1 Refer to the extract from a synoptic weather chart on the following page. Choose the correct term(s) from those given in brackets to make EACH of the statements below TRUE. Write only the term(s) next to the question number (2.1.1 – 2.1.5).
- 2.1.1 The synoptic chart shows typical (winter/summer) conditions.
- 2.1.2 The low pressure (L) north of Cape Town is known as a (coastal low/temperate cyclone).
- 2.1.3 Dew point temperature at Upington is (32 °C/15 °C).
- 2.1.4 Wind direction at Cape Town is (southwest/northeast).
- 2.1.5 Pretoria is experiencing (drizzle/rain). (5 x 2) [10]



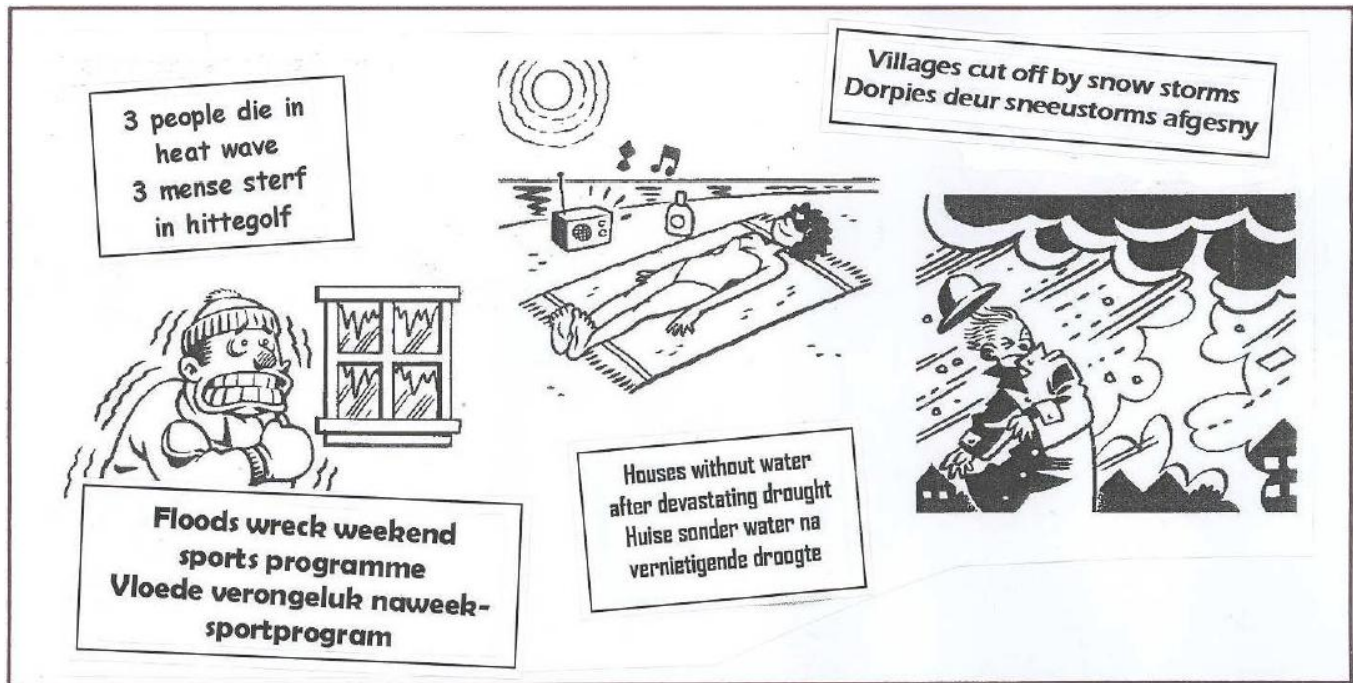
HINTS

Hint 1: The questions on synoptic weather maps should earn marks easily. Make sure learners can read the symbols and information well.

Hint 2: Temperature and Dew Point Temperature are indicated at each station. The difference between the temperature of the air mass and the dew point give an indication of how humid the air is. The bigger the difference between the two temperatures, the drier the air. IF the temperature and dew point are the same, the air mass is saturated and condensation will take place.

QUESTION 3: 15 minutes 22 marks (Source: DoE March 2009)

- 3.1. The figure below shows some extreme weather conditions that have been experienced lately. Africa's population is the most vulnerable to climatic changes that are taking place. Scientists blame global warming for these extreme weather conditions. Global warming is thought to be the result of the emission of more greenhouse gases into the atmosphere. In order to reduce the emission of greenhouse gases into the atmosphere, many countries signed the Kyoto Protocol in 1997.



- 3.1.1. What is the meaning of the term global warming? (1 x 2) (2)
- 3.1.2. Briefly explain why global warming is taking place. (3 x 2) (6)
- 3.1.3. With reference to the figure above, identify TWO extreme weather conditions that are most likely to be experienced by Africa's population. (2 x 2) (4)
- 3.1.4. Why do you think the African population is the most vulnerable to climate change? (2 x 2) (4)
- 3.1.5. In your opinion, do you think the signing of the Kyoto Protocol was successful in reducing global warming? Give reasons for your answer. (3 x 2) (6)
- [22]

HINTS

Hint 1: Learners must not ignore the sketches; the examiner wants them to refer to those examples in their answers.

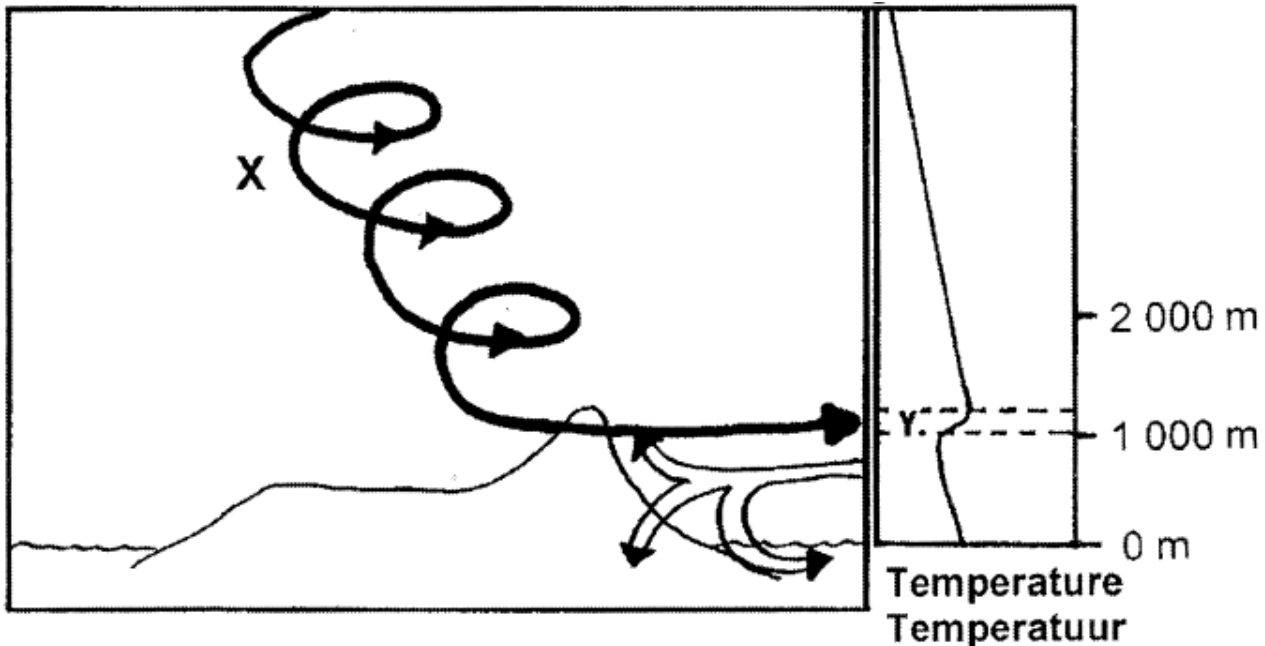
Hint 2: If they just write a yes / no for a question that they must motivate, they will get no marks. They must motivate their answer to get marks for the yes or no – examiners do not accept a guess.

QUESTION 4: **15 minutes** **20 marks** *(Source: DoE March 2010)*

4. Droughts often occur in South Africa and can have detrimental effects on the environment and the economy. South Africa will have to put measures in place to ensure that sustainable development is not compromised due to the impact of droughts.

4.1. What is a drought? (1 x 2) (2)

4.2. Explain why the persistence of the condition illustrated in the figure can result in drought over the South African interior. (3 x 2) (6)



- 4.3. Write a short essay (no longer than 12 lines) in which you discuss measures that can be introduced to reduce the effect of persistent droughts in South Africa. Also give reasons why it is important to reduce the effect of persistent droughts.

(6 x 2) (12)

[20]

HINTS

Hint 1: Make sure learners know the definition of a drought. There is a clear difference between a drought and a desert.

Hint 2: If the questions ask for a paragraph and they write a list or a bulleted list, they will not get all the marks even if they mention all the answers. Even though the memo is written as a list, they must write a paragraph. They need to change the memo answers to sentences that follow on each other.

Hint 3: Learners must highlight all the key words in the question. Most of the paragraph questions want them to respond to more than one idea. They must not only focus on one part of the question. In Question 4.3 they must discuss **A. measures to reduce the effect of droughts** and **B. Reasons to reduce the effects of droughts**. The marks will be split between these two parts of the question.

SECTION B: SOLUTIONS AND HINTS TO SECTION A**QUESTION 1**

- 1.1 (a) An increase in the average temperature of the earth's atmosphere ✓✓
[Concept] (1 x 2) (2)
- (b) Gases, such as carbon dioxide, remain in the upper regions of the atmosphere, trapping heat given off by the earth ✓✓ [Concept] (1 x 2) (2)
- 1.2 Temperature increases ✓✓
Precipitation decreases/increases ✓✓
Increase in evaporation rate ✓✓ [Any ONE] (1 x 2) (2)
- 1.3 They would experience more illnesses ✓✓
More floods may occur ✓✓
More droughts may occur ✓✓
Their food supply would be affected – famine ✓✓
Human comfort conditions would be negatively affected ✓✓
Drowning of low-lying coastal areas ✓✓
[Any TWO – accept other logical answers] (2 x 2) (4)
- 1.4 Trees / plants absorb carbon dioxide during photosynthesis ✓✓
Greenbelt development will increase number of trees / plants that will absorb carbon dioxide ✓✓ (2 x 2) (4)
- 1.5 To reduce carbon emissions ✓✓
To reduce / slowdown climatic change ✓✓
Trees / Plants will restrict uncontrolled urban expansion ✓✓ (1 x 2) (2)
- 1.6 • It would impact negatively on the United States of America's industrial growth ✓✓
• United States of America is a highly industrialised country. It, therefore, gives off a lot of pollution contributing significantly to global warming / climatic change. ✓✓
[Any ONE – accept any other logical answer.] (1 x 2) (2)
- [18]**

QUESTION 2

- 2.1.1 summer ✓✓
2.1.2 coastal low ✓✓
2.1.3 15 °C ✓✓
2.1.4 southwest ✓✓
2.1.5 drizzle ✓✓ (5 x 2) **[10]**

QUESTION 3

3.1.1 A general increase in the average temperature of the atmosphere ✓✓
[Concept] (1 x 2) (2)

3.1.2 Industrialisation ✓✓
Higher pollution levels ✓✓
More greenhouse gases emitted into the atmosphere ✓✓
Greenhouse gases absorb more heat ✓✓
Greenhouse gases decrease terrestrial radiation ✓✓
Heat trapped in the atmosphere and temperatures rise ✓✓
[Any THREE] (3 x 2) (6)

3.1.3 Droughts ✓✓
Heat waves ✓✓
Floods ✓✓
[Any TWO] (2 x 2) (4)

3.1.4 Subsistence farmers are dependent on water sources ✓✓
No back up food resources ✓✓
Malnutrition / famine increases as productivity drops ✓✓
More diseases but lack of health facilities ✓✓
Levels of poverty will increase ✓✓
Land deteriorates in drier conditions ✓✓
Landlessness ✓✓
Poor economy cannot sustain large number of unemployed people ✓✓
Do not have capital to absorb losses ✓✓
[Any TWO. Accept other] (2 x 2) (4)

3.1.5 No ✓✓
Large quantities of greenhouse gases still emitted ✓✓
Less developed countries cannot afford less harmful methods to generate energy ✓✓
General rise in temperatures still evident ✓✓
USA not part of Protocol ✓✓
USA has largest percentage of world's industries ✓✓

OR

Yes ✓✓
Coal fired power stations reduced in developing countries ✓✓
Pollution controlled more effectively in developed countries ✓✓
Energy saving appliances used in developed countries ✓✓
Environmentally friendly power sources used in developed countries ✓✓
Using biogas as alternative ✓✓ [Any TWO reasons for answer] (3 x 2) (6)

[22]

QUESTION 4

4.1. A period when rainfall is below average for a region during which vegetation cover decreases ✓✓ [Concept] (1 x 2) (2)

4.2. Kalahari HP remains lower than escarpment ✓✓
This system blocks all moisture from the ocean to reach the interior of the country ✓✓
The Kalahari high is associated with stable air ✓✓
Rainfall will decrease over the interior ✓✓
If the stability of air persists, the interior will experience dry conditions over a period of time ✓✓ [Any THREE] (3 x 2) (6)

4.3. **Preventative measures**

- Plant trees to reduce run-off and increase infiltration ✓✓
- Eliminate alien trees which use high quantities of water ✓✓
- Build dams in areas with low evaporation ✓✓
- Contour ploughing to reduce run-off / apply scientific farming techniques ✓✓
- Limit irrigation in dry areas / less wasteful irrigation techniques ✓✓
- Water transfer schemes to increase water ✓✓
- Recycling of water for re-use ✓✓
- Conserve underground water supplies ✓✓
- Decentralisation of activities away from one major water source ✓✓
- Public awareness campaigns on importance of using water sparingly ✓✓

Importance of introducing preventative measures

- Droughts reduce yields of crop farmers ✓✓
- Reduction in number of livestock ✓✓
- Negative implications for exporting ✓✓
- Farmers suffer economically ✓✓
- Farm workers laid off ✓✓
- Fewer raw materials for industries ✓✓
- Unemployment rises ✓✓
- Balance of trade affected negatively ✓✓

[Accept if learners refer to positive aspects of limiting the effects of droughts]

[Accept other reasonable answers]

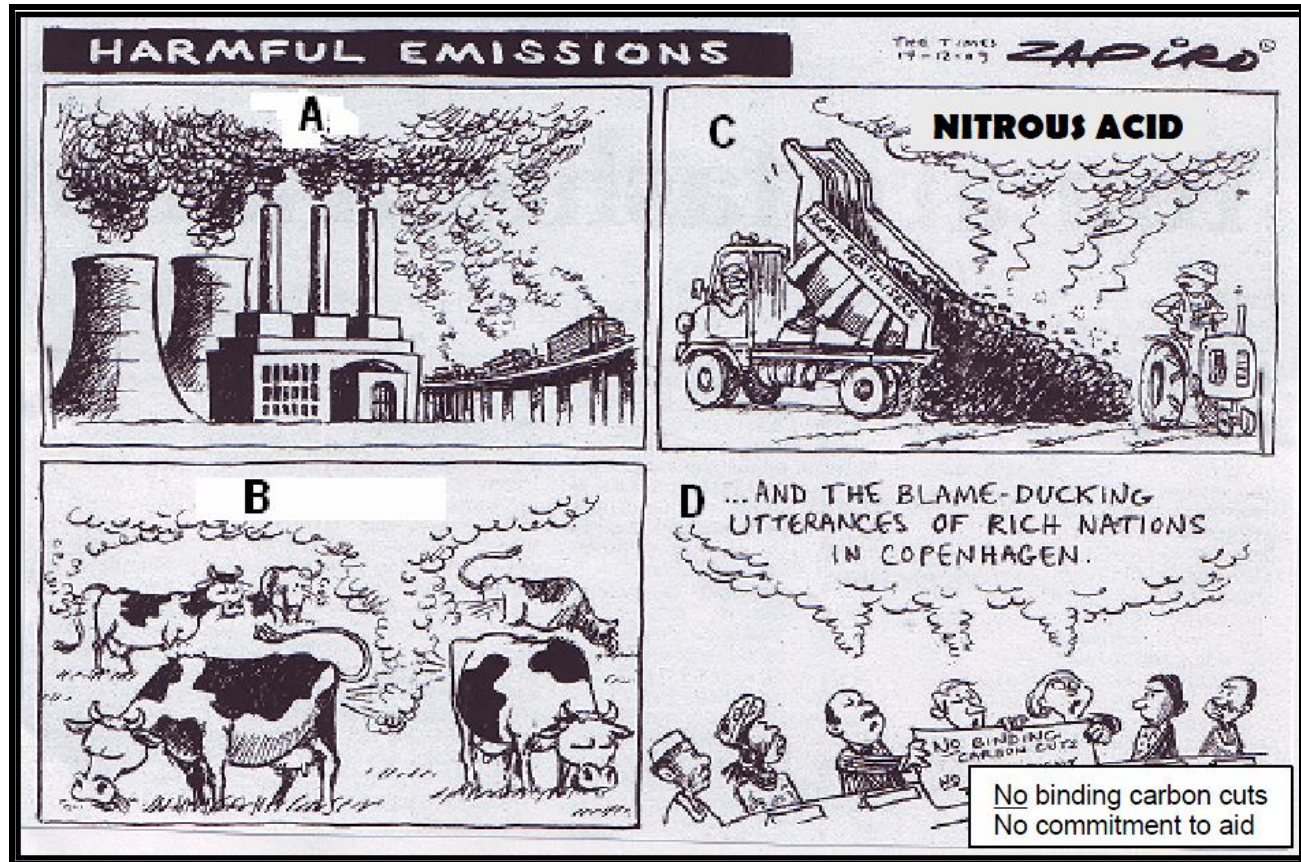
[Any SIX. Must refer to preventative measures and importance of introducing preventative measures] (6 x 2) (12)

[20]

SECTION C: HOMEWORK : TOPIC 1

QUESTION 1: **30 minutes** **24 marks** (Source: DoE November 2010)

1. Refer to the source material below based on the climate summit held in Copenhagen.



- 1.1. Name the greenhouse gas being emitted into the urban environment in Cartoon A. (1 x 2) (2)
- 1.2. Besides industrial activity, explain TWO other factors that contribute to high temperatures in urban environments. (2 x 2) (4)
- 1.3. Identify the greenhouse gas, associated with farming activities (Cartoon B), which is emitted into the atmosphere. (1 x 2) (2)
- 1.4. More severe flooding is an indirect result of increased greenhouse gases in the atmosphere. Name TWO negative effects of flooding on farming activities. (2 x 2) (4)
- 1.5. Environmental groups were not happy with the decisions taken in respect of global warming at the Copenhagen Accord/Summit. With reference to Cartoon D, write a single paragraph (no longer than 12 lines), discussing possible solutions that delegates from developing countries could have proposed to reduce global warming. (6 x 2) (12)

[24]

SECTION D: SOLUTIONS TO HOMEWORK SESSION 3: TOPIC 3**QUESTION 1**

- 1.1. Carbon ✓✓
 Carbon dioxide ✓✓
 Carbon monoxide ✓✓ [Any ONE] (1 x 2) (2)
- 1.2 Artificial material used to construct the city, e.g. concrete, steel and tar which absorb and retain heat ✓✓
 Tall buildings increase the surface area that absorbs heat ✓✓
 Multiple reflection of heat by buildings made from glass and mirrors ✓✓
 City activities generate heat, e.g. air conditioners, streetlights, body heat (2) ✓✓
 Lack of surfaces from which evaporation takes place ✓✓
 Pollution in the city increases and traps heat ✓✓
 Heat trapped inside buildings ✓✓
 [Any TWO. Accept any other reasonable answers] (2 x 2) (4)
- 1.3 methane gas ✓✓ (1 x 2) (2)
- 1.4 Loss of valuable topsoil due to erosion ✓✓
 Crops are swept away/damaged and destroyed ✓✓
 Prices of products go up ✓✓
 Less food production ✓✓
 Livestock die ✓✓
 Food has to be imported ✓✓
 Damage to infrastructure makes it difficult to transport farm products ✓✓
 Equipment and agricultural land can be buried in silt ✓✓
 Impact on subsistence farmers is greater and they may not be able to recover ✓✓
 Loss of income ✓✓
 [Any TWO. Accept any other reasonable answers] (2 x 2) (4)
- 1.5 An international agreement by countries to reduce their greenhouse emissions ✓✓
 More efficient use of energy ✓✓
 Use of renewable sources of energy ✓✓
 Sustainable forms of agriculture ✓✓
 Legislation to limit deforestation ✓✓
 Planting of trees (afforestation)/helps to absorb carbon dioxide ✓✓
 Reduce emission from waste and transport sector ✓✓
 Reduce consumption of beef to control methane emissions ✓✓
 Have a monitoring mechanism to ensure that countries abide by international agreements such as the Kyoto or Copenhagen Protocol ✓✓
 Countries that exceed their carbon footprints be fined ✓✓
 Roof gardens on high-rise buildings ✓✓

Educate people on the efficient use of electricity, e.g. use of energy-saving globes, solar heating ✓✓

Reduce the burning of fossil fuels, e.g. coal ✓✓

[Any SIX. Accept any other reasonable answers]

(6 x 2) (12)

[If listed and only words/phrases used, ONE mark - If full sentences Used, TWO marks]

[24]

TOPIC 1: MULTIPLE CHOICE QUESTION ON MAPWORK

Teacher Note: The mapwork papers consist of 4 different parts namely:

1. Multiple-choice questions - 20 marks
2. Calculations - 20 marks
3. Interpretations of theory on the map – 40 marks
4. GIS – 20 marks

Explain exam technique.

In this topic we will focus on the multiple-choice questions on mapwork.

The main purpose of the map clips used for this section is to illustrate the map symbols and the relationships between features. **They are not to scale** which means that no distance, gradient, area or speed calculations can be done using the map clips.

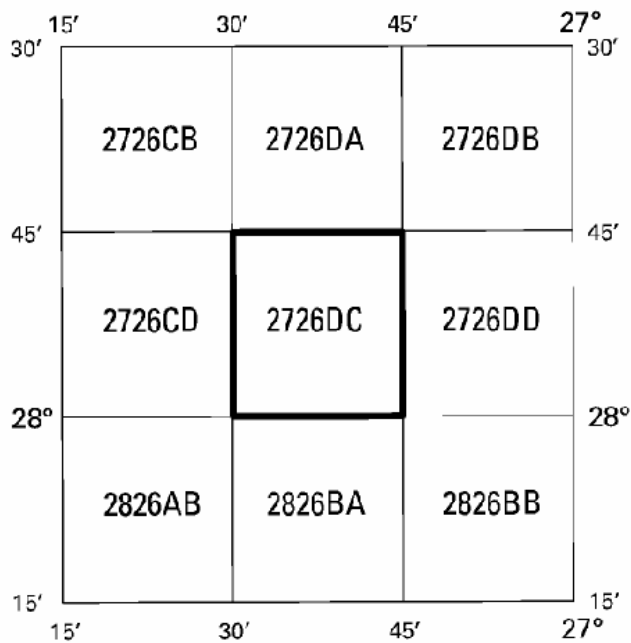
SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **15 minutes** **20 marks** (*Source: DoE Exemplar 2008*)

The following questions are based on the 1:50 000 topographical map, 2726DC, ODENDAALSRUS as well as the orthophoto map of the same area. Various possible options are provided as answers to the following questions. Choose the answer and write only the letter (A – D) next to each question (1.1 – 1.10).

1.1 The number of the map to the west of map 2726DC ODENDAALSRUS is ...

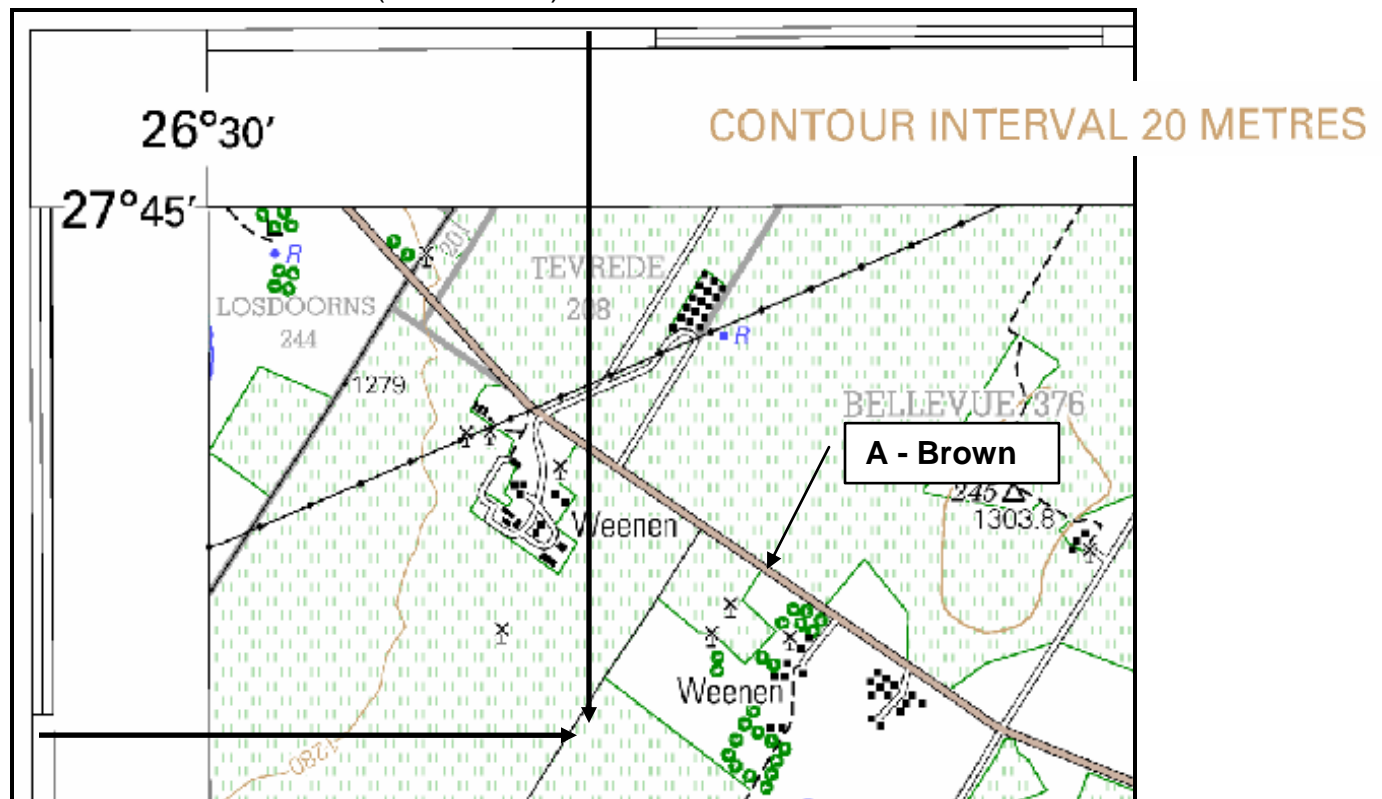
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(This is printed at the bottom of the map)

- A 2726DA
- B 2826BA
- C 2726DD
- D 2726CD

1.2. The exact location (coordinates) of the windmill at the indicate arrows is



- A $26^{\circ}45'09''\text{S } 27^{\circ}45'05''\text{E}$
- B $27^{\circ}45'50''\text{S } 26^{\circ}30'40''\text{E}$
- C $26^{\circ}30'05''\text{S } 27^{\circ}45'10''\text{E}$
- D $27^{\circ}45'10''\text{S } 26^{\circ}30'50''\text{E}$

1.3 The direction of spot height 1279 from $\blacktriangle 245...$

- A South-west
- B West North West
- C South-east
- D East South East

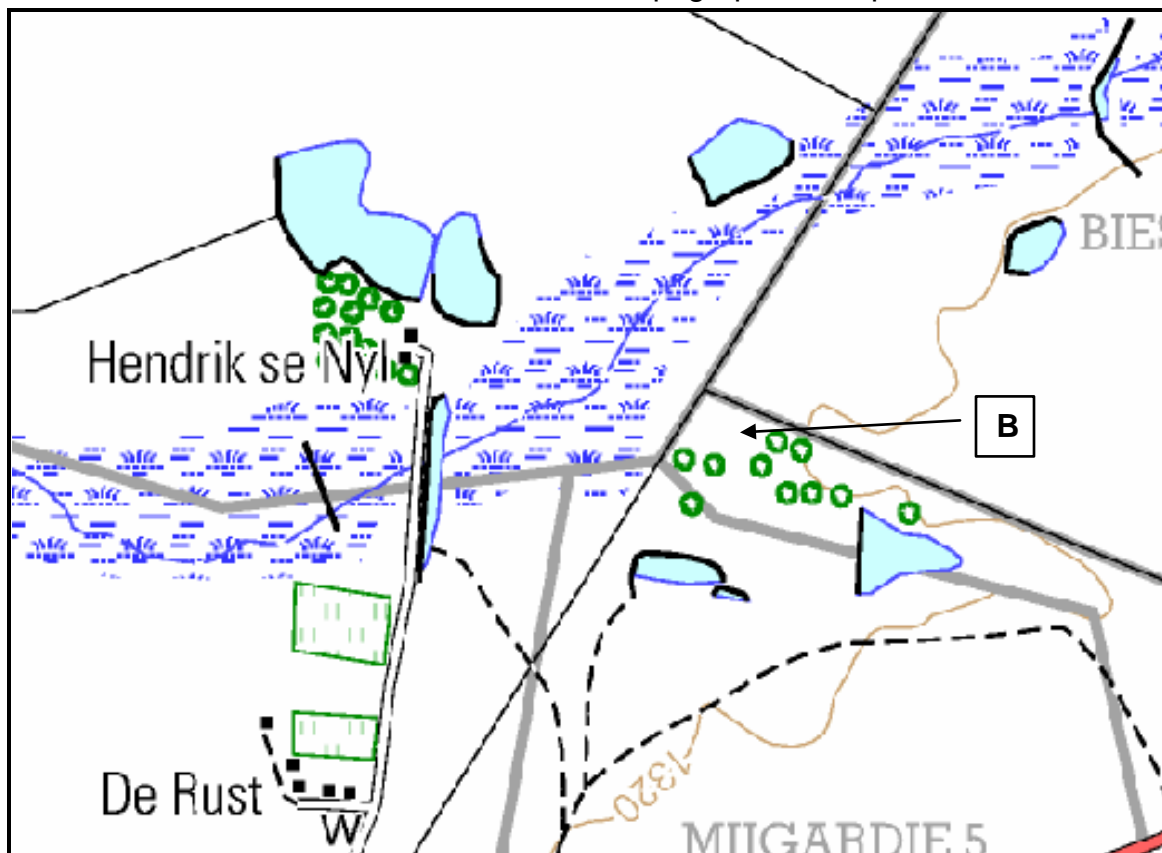
1.4 The man-made feature labelled A on the topographical map is a/an ...

- A main road
- B arterial route
- C secondary road
- D national road

1.5 The contour interval of the topographical map is ...

- A 5 m
- B 20 m
- C 10 m
- D 25 m

1.6 The natural feature marked B on the topographical map is a ...



- A dry pan
- B perennial river
- C non-perennial river
- D marsh and vlei

- 1.7 The map projection used on the orthophoto map is ...
(The following is printed at the bottom of the map)

**Gauss Conform Projection. Central Meridian 27° East.
Hartbeesthoek 94 Datum (WGS84 Ellipsoid).**

- A Mercator
- B Lambert
- C Gauss conform
- D universal transverse

- 1.8 The orthophoto map with a scale of 1:10 000 depicts ... part of the topographical map.
- A 1/5 of the map
 - B 1/2 of the map
 - C 1/4 of the map
 - D 1/25 of the map

- 1.9 Aeroplanes can land in a Direction at the Welkom Aerodrome



- A Northerly
- B Southerly
- C North Westerly
- D Easterly

1.10 The area marked C map is (a) ...

- A mining area
- B non-perennial water
- C mine dump
- D recreational area

(2 x 10) [20]

HINTS

Hint 1: Remind learners to write a capital letter as an answer to make sure the markers know exactly what their intended answer was.

Hint 2: Learners must be sure always to answer this carefully and not to leave out questions.

QUESTION 2:**15 minutes****20 marks***(Source: DoE November 2008)*

The following questions are based on the 1:50 000 topographical map, 3227DD, CAMBRIDGE, as well as the orthophoto map of a part of the same area. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to each

2.1. The topographical map reference number represents ...

- A 32°N27°W
- B 32°S27°E
- C 32°W27°N
- D 32°E27°S

2.2. The scale of the topographical map (1:50 000) is ... than that of the orthophoto map (1:10 000).

- A 5 times smaller
- B 5 times larger
- C 40 times smaller
- D 40 times larger

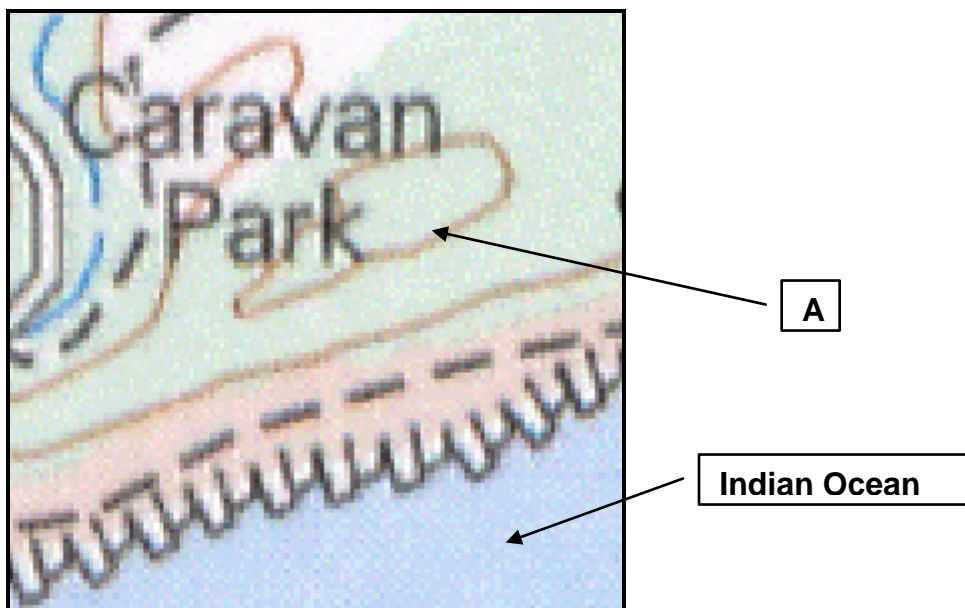
2.3. The contour interval of the orthophoto map is ...

- A 5 m
- B 20 m
- C 10 m
- D 25 m

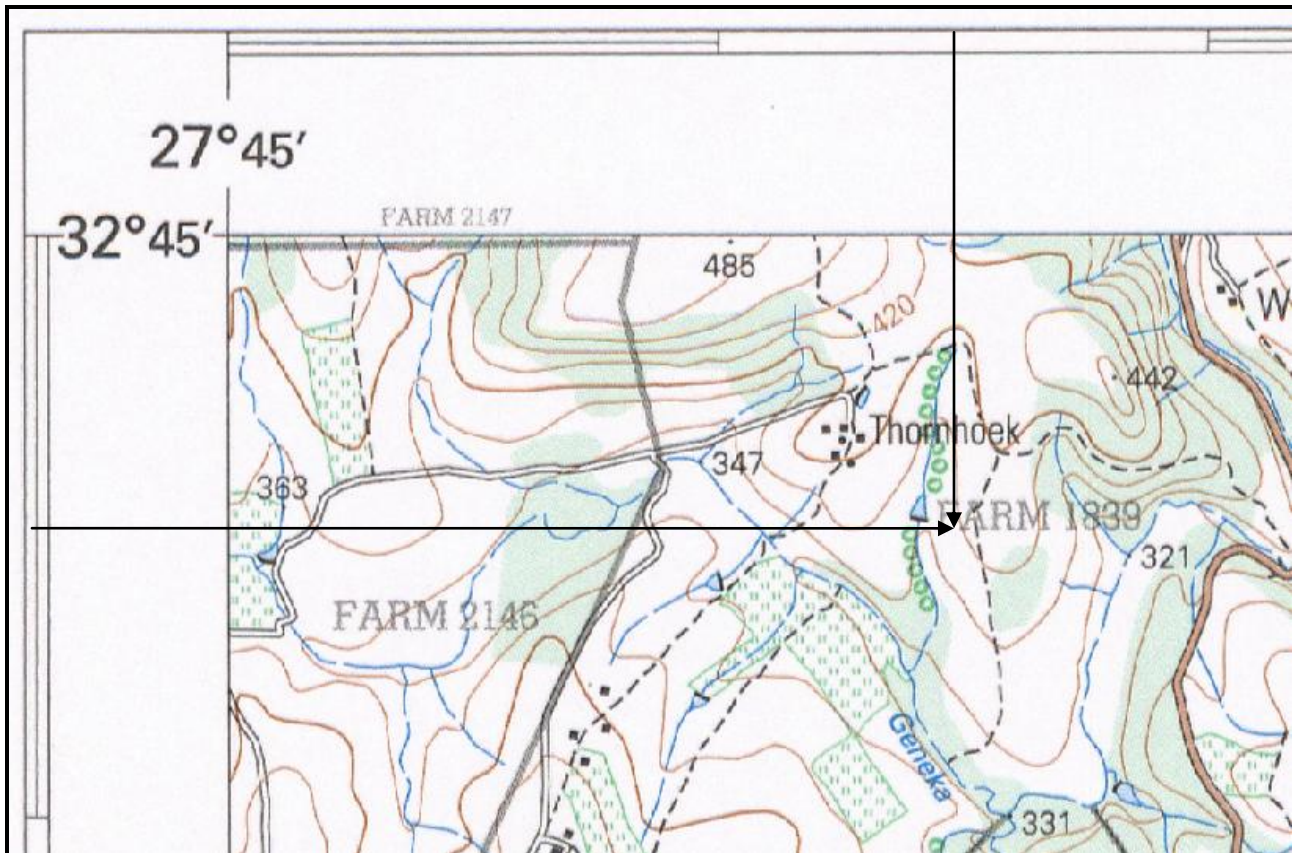


2.4. The coastline in block J7 on the topographical map is mainly ...

- A smooth
- B dry
- C rocky
- D sandy



- 2.5. The altitude of the contour line labelled A is
- A 0m
 - B 20m
 - C 40m
 - D 60m
- 2.6. The caravan park will experience ... winds during the night
- A Sea breezes
 - B Katabatic winds
 - C Anabatic winds
 - D Land breezes
- 2.7. The location (coordinates) of the farm dam is ...



- A $27^{\circ}45'13''\text{E } 32^{\circ}45'8''\text{S} / 27^{\circ}45,2'\text{E } 32^{\circ}45,2'\text{S}$
 - B $32^{\circ}45'29''\text{S } 27^{\circ}46'23''\text{E} / 32^{\circ}45,5'\text{S } 27^{\circ}46,4'\text{E}$
 - C $32^{\circ}45'8''\text{E } 27^{\circ}46'13''\text{S} / 32^{\circ}45,2'\text{E } 27^{\circ}46,2'\text{S}$
 - D $27^{\circ}46'13''\text{S } 32^{\circ}45'8''\text{E} / 27^{\circ}46,2'\text{S } 32^{\circ}45,2'\text{E}$
- 2.8. The direction of flow of the tributary of the Geneka river in 2.7 is
- A West
 - B South
 - C East
 - D North

2.9. The function of the dam in 2.7 is (Which one does not fit?)

- A Recreation
- B Store water
- C Regulate flooding
- D Supply Cambridge with water

2.10 The highest altitude on the map clip in 2.7 is....

- A 347
- B 485
- C 442
- D 521

(2 x 10) [20]

QUESTION 3**20 minutes****20 marks***(Source: DoE November 2010)*

The questions below are based on the 1:50 000 topographical map 3424BB HUMANSDORP, as well as the orthophoto map of a part of the mapped area. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D)

3.1 The earth's curved surface is represented on the topographical map through the ... projection.

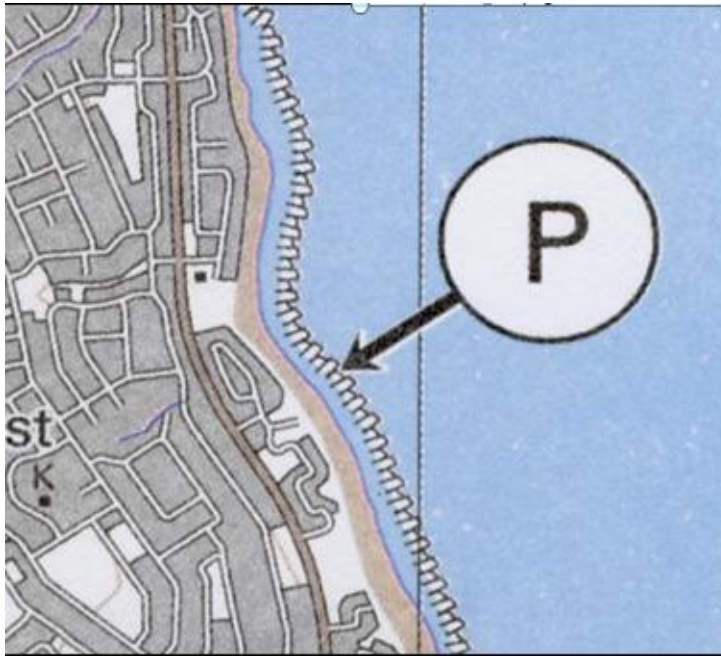
- A Mercator
- B Gauss Conform
- C Lambert
- D Transversal

Gauss Conform Projection. Central Meridian 25° East.

Hartebeesthoek 94 Datum (WGS84 Ellipsoid).

3.2 The landform that is found at P in block B11, is a ...

- A rocky outcrop
- B cape
- C sandy beach
- D coastal rock



3.3 Ashton Bay has a/an ... street pattern.



- A grid iron
- B radial/cobweb
- C planned irregular/free
- D unplanned irregular

3.4 The slope south of Kwa Nomzamo (C2) is ...



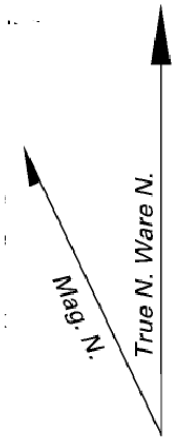
- A gentle
- B steep
- C convex
- D concave

3.5 An aerial photograph which shows contour lines, spot heights, trigonometrical stations and other labelled features, is called a/an ...

- A oblique aerial photograph
- B topographical map
- C orthophoto map
- D vertical aerial photograph

3.6 The mean magnetic declination of this map in 2011 was ... (See next page for info)

- A $26^{\circ}59'$ east of true north
- B $26^{\circ}59'$ west of true north
- C $23^{\circ}59'$ west of true north
- D $23^{\circ}59'$ east of true north



Mean magnetic declination 25°29' West of True North(July 2001).

Mean annual change 9' Westwards(1995–2000).

Supplied by Hermanus Magnetic Observatory.

Gemiddelde magnetiese deklinasie 25°29' Wes van Ware Noord(Julie 2001).

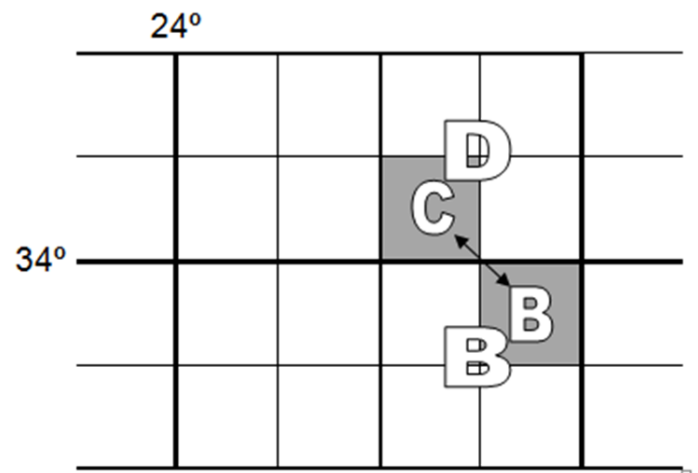
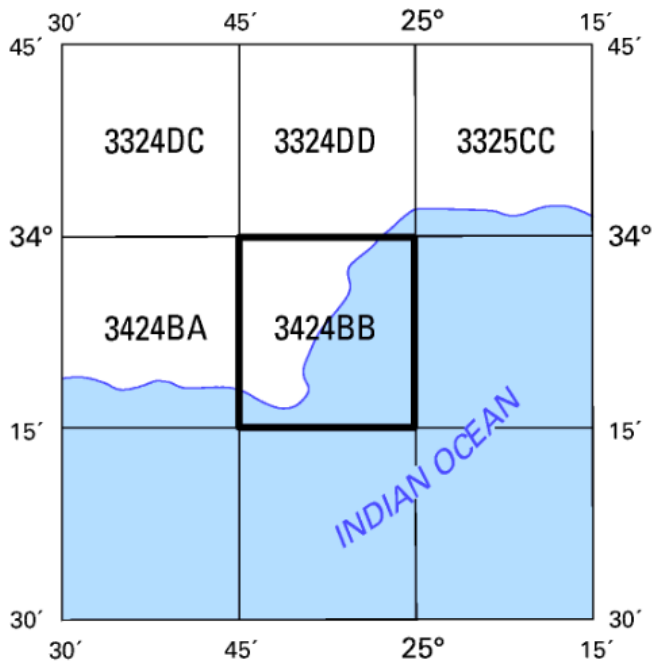
Gemiddelde jaarlikse verandering 9' Weswaarts(1995–2000).

Voorsien deur die Hermanus Magnetiese Observatorium.

3.7 The index of the map sheet northwest of Humansdorp is ...

- A 3324DC
- B 3324DD
- C 3325CC
- D 3424BA

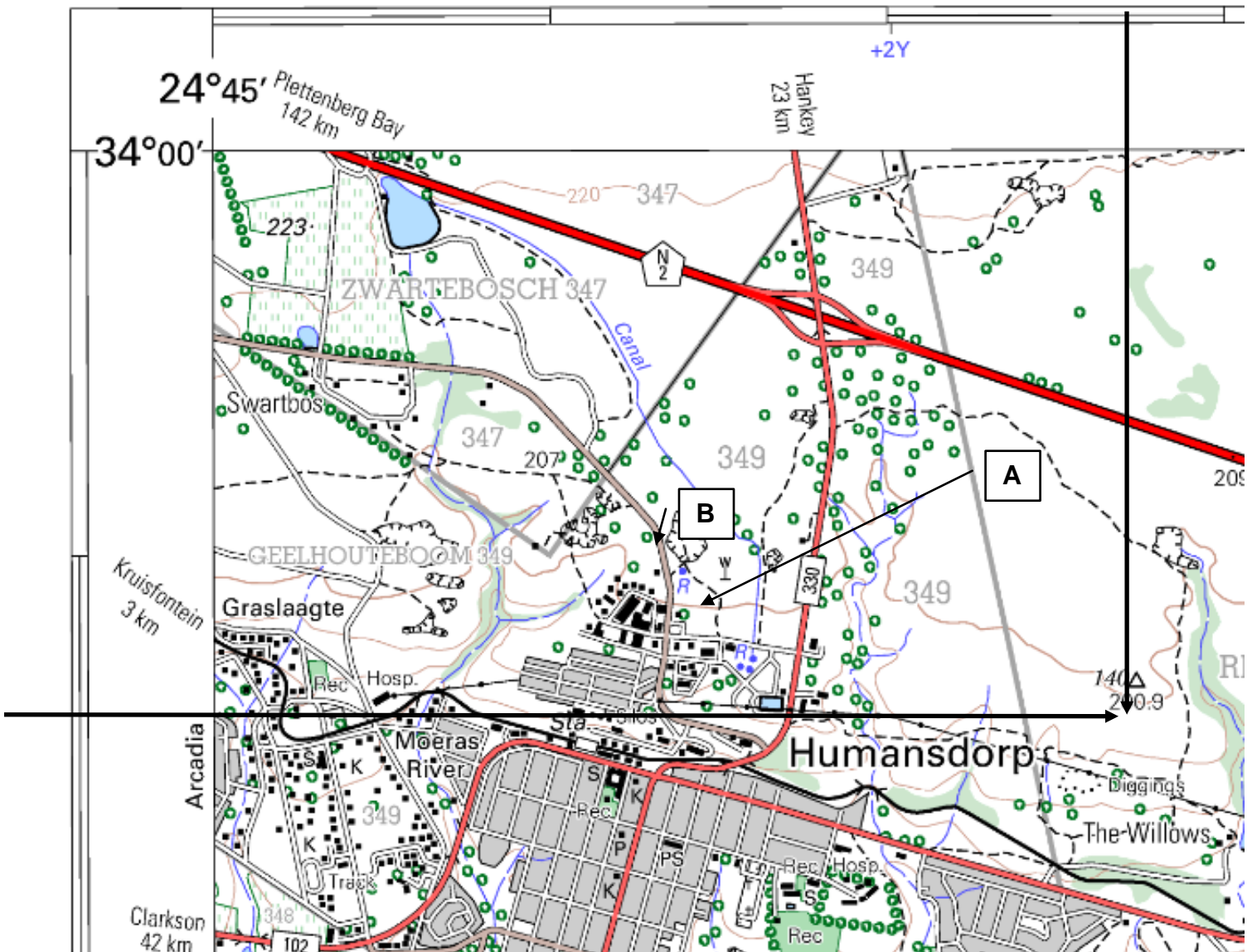
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Use any one of the explanations

3.8 The co-ordinates of trigonometrical station 140 in block B3 are ...

- A 34°01'20"S24°47'44"E / 34°01,3'S24°47,7'E
B 34°02'40"S24°48'16"E / 34°02,7'S24°48,3'E
C 34°01'20"E24°47'44"S / 34°01,3'E24°47,7'S
D 34°02'40"E24°48'16"S / 34°02,7'E24°48,3'S



3.9 The feature numbered A on the map is a ...

- A Wind pump
B Monument
C Communication Tower
D Grave site

3.10 The feature labelled B on the map is a

- A Excavation
- B Mine dump
- C Donga
- D Dam

(2 x 10) [20]

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

- 1.1. D✓✓
- 1.2. B✓✓
- 1.3. B✓✓
- 1.4. C✓✓
- 1.5. B✓✓
- 1.6. D✓✓
- 1.7. C✓✓
- 1.8. D✓✓
- 1.9. C✓✓
- 1.10. D✓✓

(10 x 2) [20]

QUESTION 2:

- 2.1. B✓✓
- 2.2. A✓✓
- 2.3. A✓✓
- 2.4. C✓✓
- 2.5. C✓✓
- 2.6. D✓✓
- 2.7. B✓✓
- 2.8. B✓✓
- 2.9. D✓✓
- 2.10. B✓✓

(10 x 2) [20]

QUESTION 3:

- 3.1. B✓✓
- 3.2. D✓✓
- 3.3. C✓✓
- 3.4. B✓✓
- 3.5. C✓✓
- 3.6. B✓✓
- 3.7. A✓✓
- 3.8. A✓✓
- 3.9. C✓✓
- 3.10. A✓✓

(10 x 2) [20]

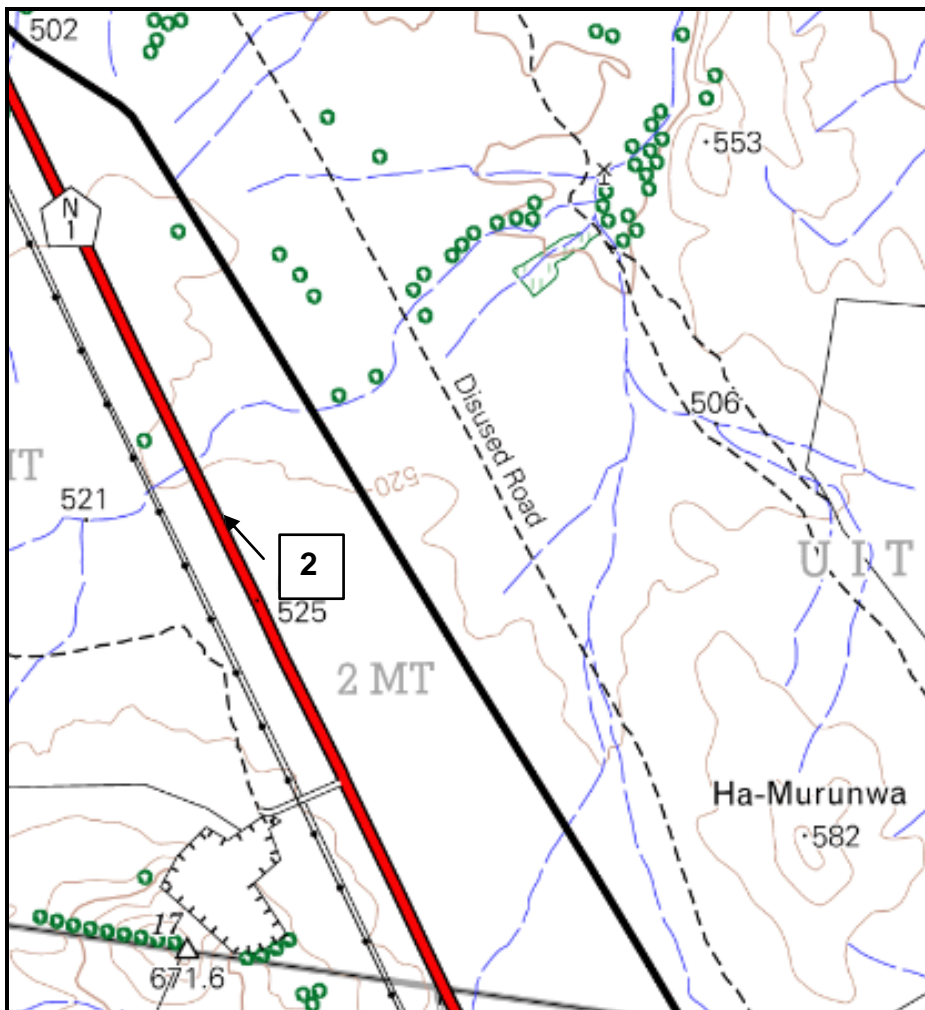
SECTION C: HOMEWORK**QUESTION 1: 30 minutes 32 marks** (Source: DoE March 2010 & November 2009)

The following questions are based on the 1:50 000 topographical map 2230AA&AC MUSINA as well as the orthophoto map of a part of the mapped area.

Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D)

1.1 What is the altitude on the trig beacon on the next map clip...

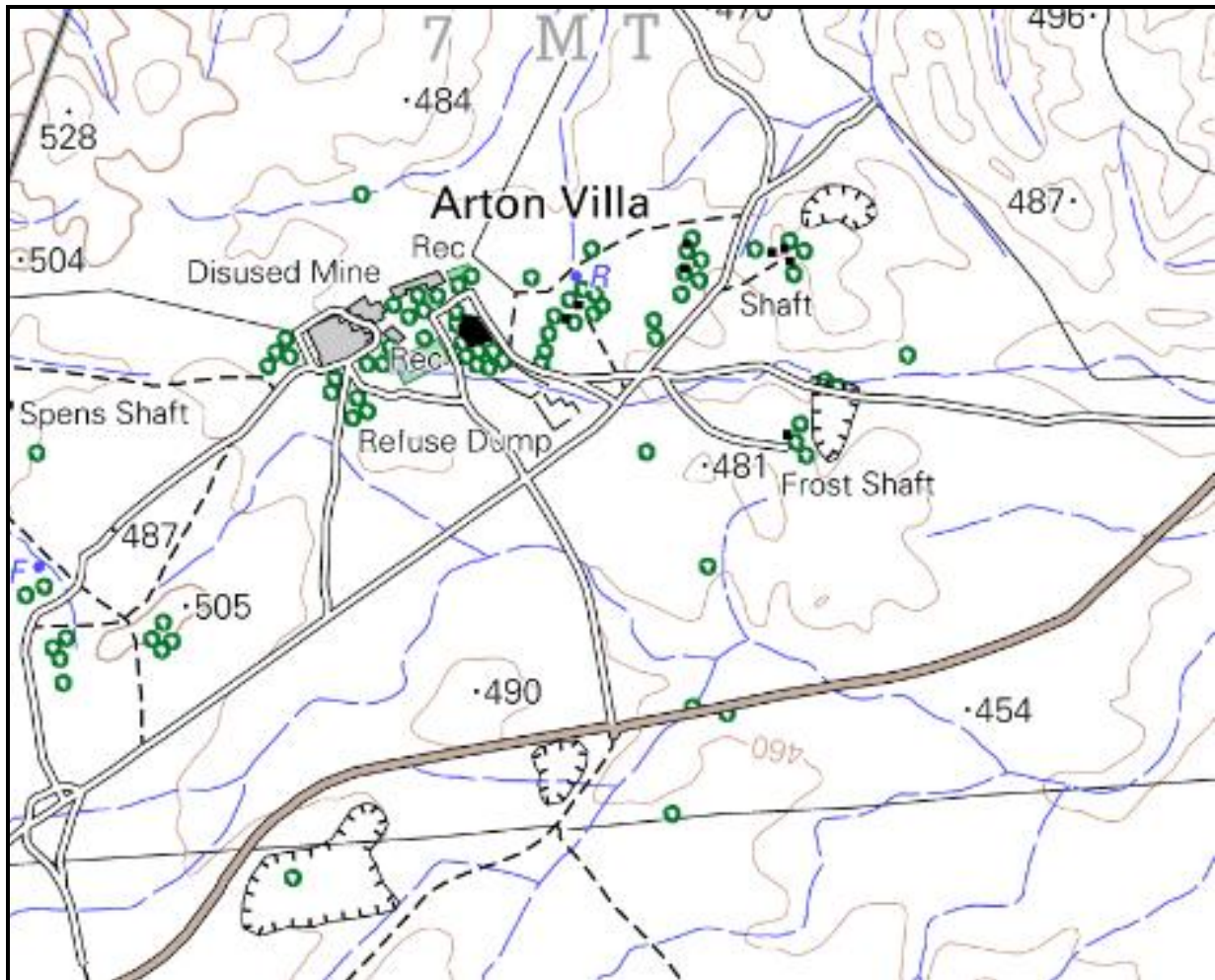
- A 525 m
- B 521 m
- C 17 m
- D 671.6 m



1.2 The height of the N1 National Route at 2...

- A 500 m
- B 520 m
- C 540 m
- D 560 m

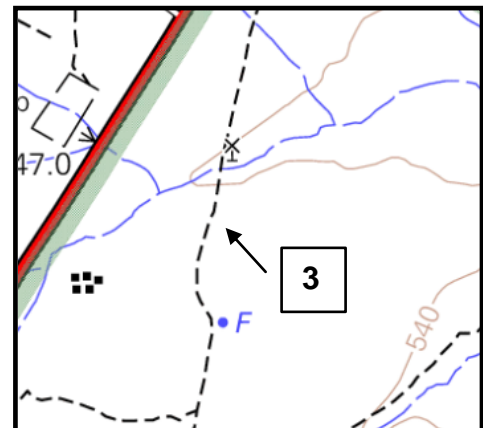
1.3 The settlement of Arton Villa (F6) originally developed as a ... settlement.



- A mining
- B farming
- C resort
- D junction

1.4 The feature numbered 3 is a ...

- A wind pump
- B communication tower
- C grave
- D water tower

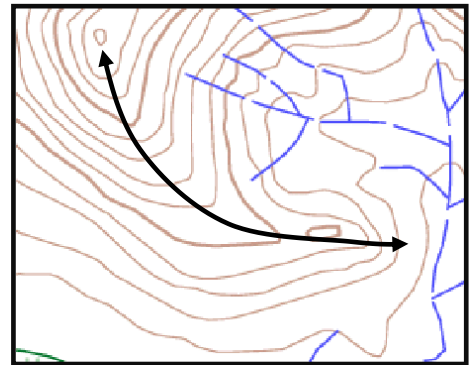


1.5 The word scale of the orthophoto map is: (The orthophoto scale is 1: 10 000)

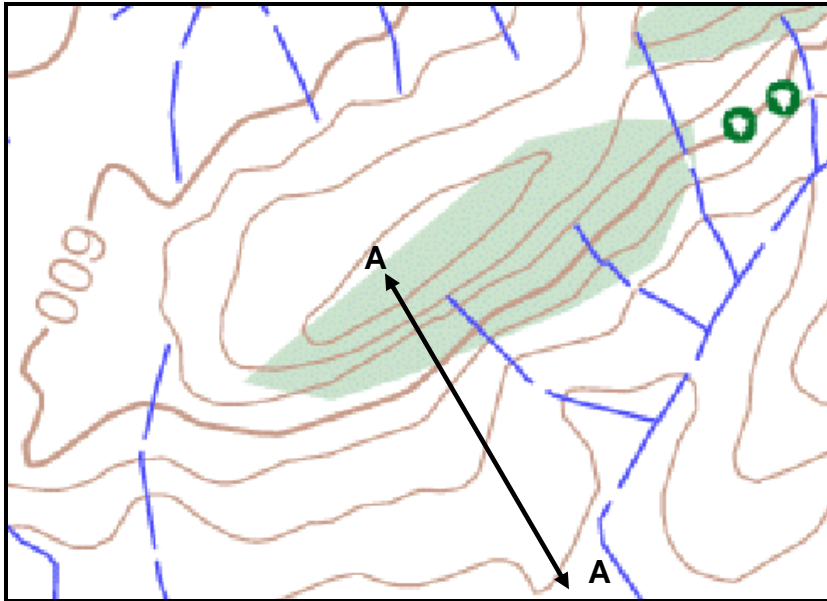
- A 1 cm represents 10 000 m
- B 1 cm represents 1 000 m
- C 1 cm represents 100 m
- D 1 cm represents 10 m

1.6 The landform in the map clip is a ... (arrow)

- A cuesta
- B valley
- C spur
- D mesa



1.7 The slope from A to B on the map is ...



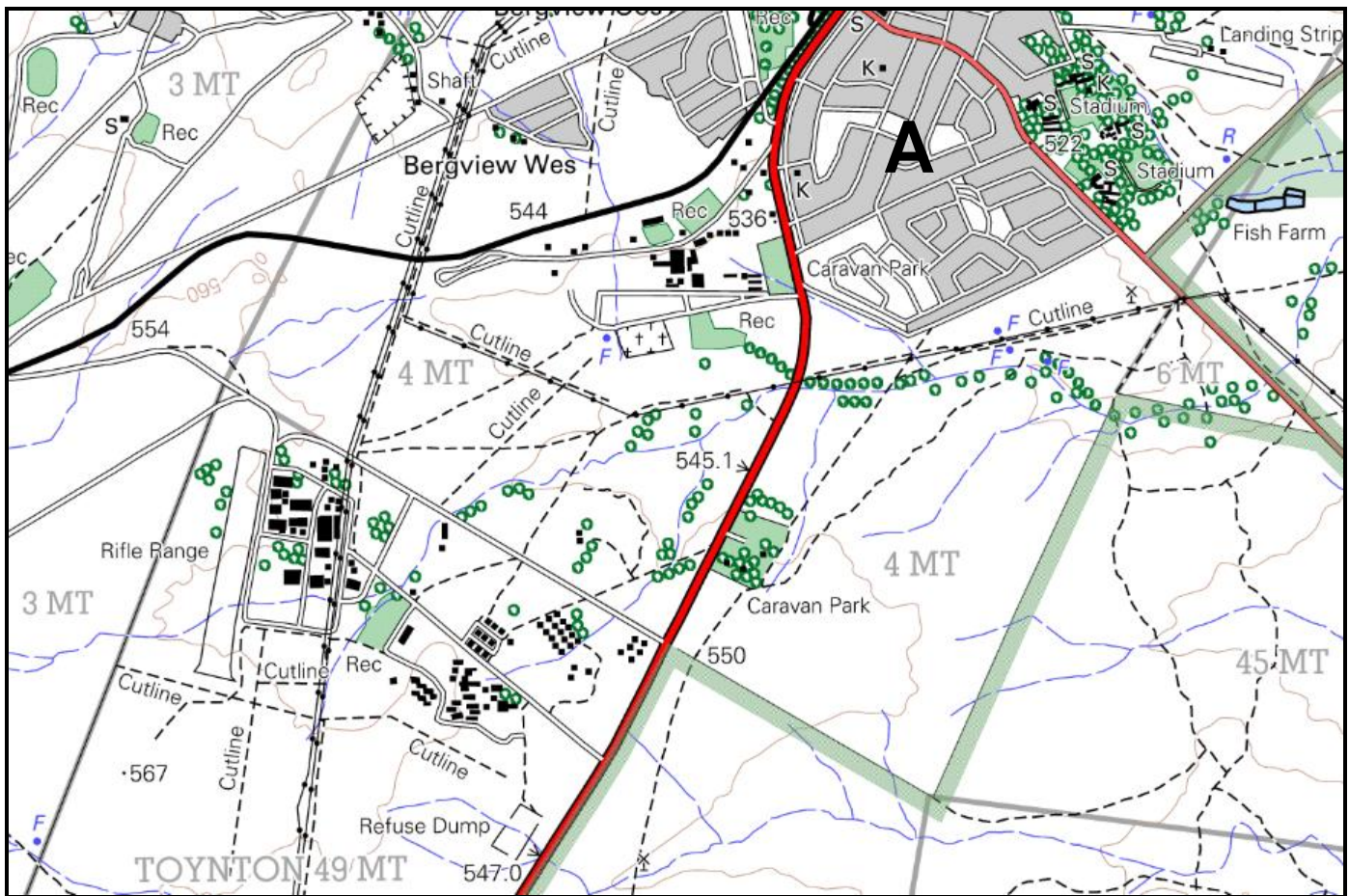
- A convex
- B concave
- C gentle
- D terraced

1.8 The direction from A to B on the map clip is ...

- A west-northwest
- B north-northwest
- C northwest
- D southwest

1.9 The refuse dump at N on the orthophoto map is mainly for ... waste.

- A industrial
- B domestic
- C agricultural
- D mining

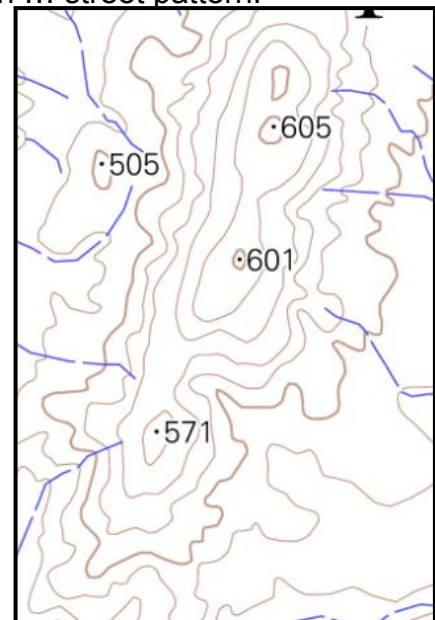


1.10 The residential area marked A on the map shows a rough ... street pattern.

- A grid-iron
- B radial
- C unplanned, irregular
- D planned, irregular

1.11 The landform found between spot height 605 and spot height 601 is a ...

- A poort
- B saddle
- C spur
- D valley

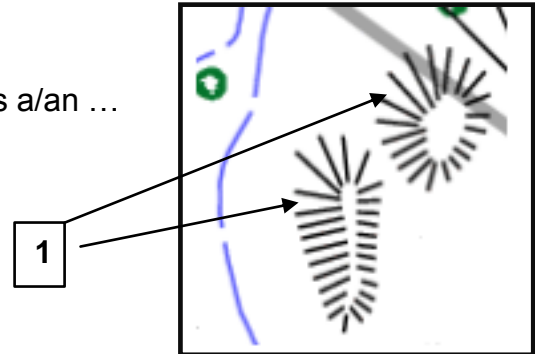


1.12 Musina is an example of a ... town. (The main function is supplying the local rural community with services)

- A central place
- B junction
- C gap
- D bridge

1.13 The feature marked 1 on the topographical map is a/an ...

- A mine dump
- B cutting
- C embankment
- D excavation

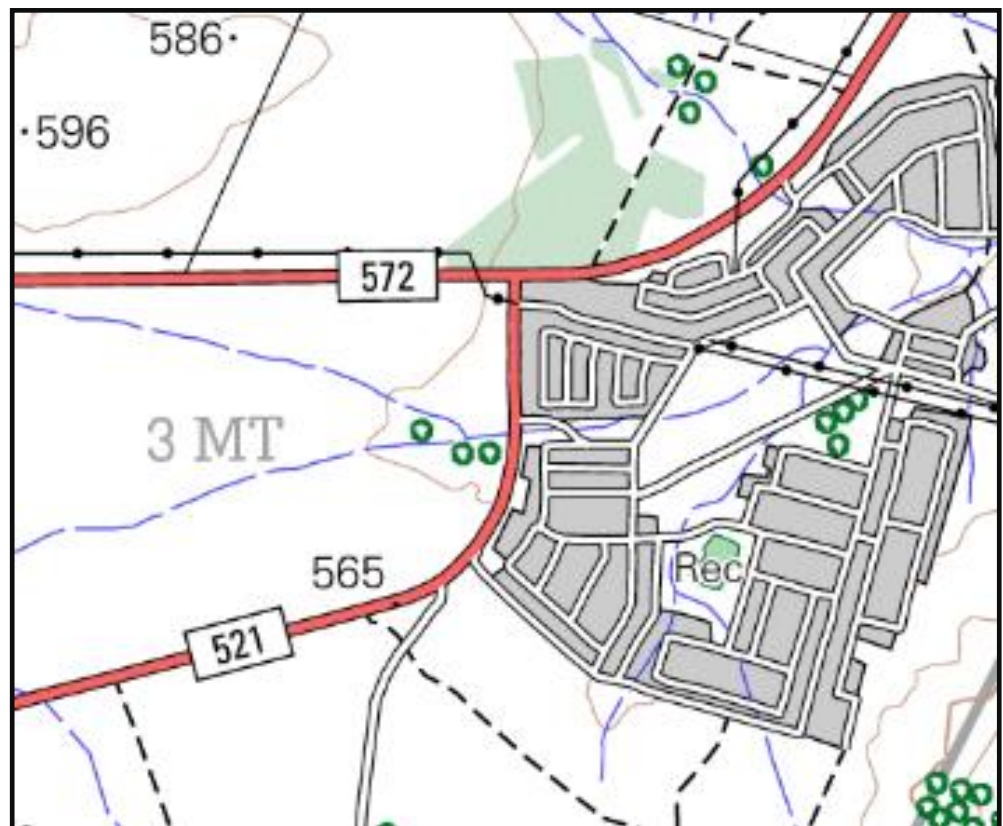


1.14 An orthophoto map is a ... photograph which has contour lines, spot heights, trigonometrical stations and other labelled features drawn onto it.

- A high oblique
- B low oblique
- C horizontal
- D vertical

1.15 The R572 and 521 (thinner red lines) on the map is a/an ... roads.

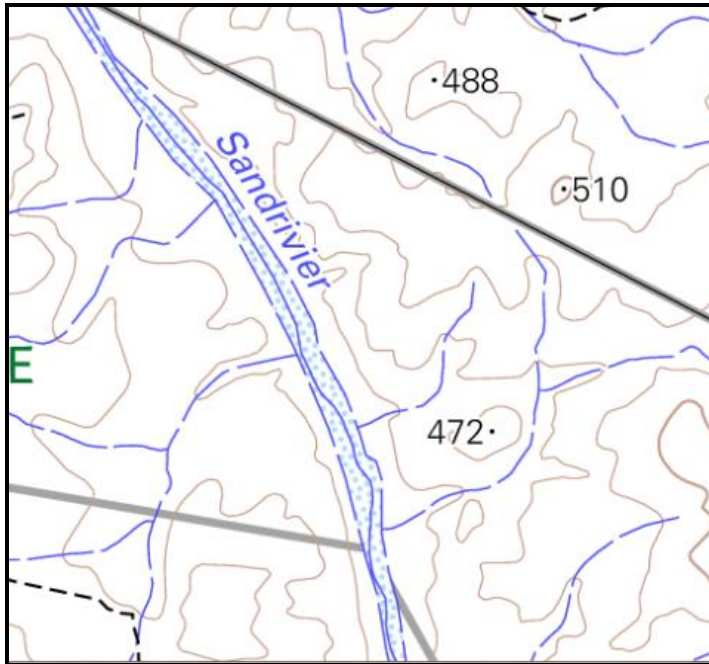
- A arterial
- B main
- C secondary
- D other



1.16 The Sand River (Sandrivier) that flows in the mapped area is a/an ... river.

- A periodic
- B episodic
- C permanent/perennial
- D exotic

(16 x 2) [32]



SECTION D: SOLUTIONS TO HOMEWORK TOPIC 1

QUESTION 1

- 1.1. D✓✓
- 1.2. B✓✓
- 1.3. A✓✓
- 1.4. A✓✓
- 1.5. C✓✓
- 1.6. C✓✓
- 1.7. B✓✓
- 1.8. D✓✓
- 1.9. A✓✓
- 1.10. C✓✓
- 1.11. B✓✓
- 1.12. A✓✓
- 1.13. A✓✓
- 1.14. C✓✓
- 1.15. A✓✓
- 1.16. C✓✓

(16 x 2) [32]

TOPIC 3: GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

Teacher Note: There are always questions on these sections in the exams. They are relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks.

LESSON OVERVIEW

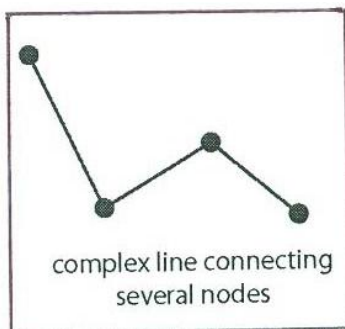
- Explain the concepts of GIS with the aid of topographic maps and orthophoto maps.
- Use additional learner notes.

SECTION A: TYPICAL EXAM QUESTIONS

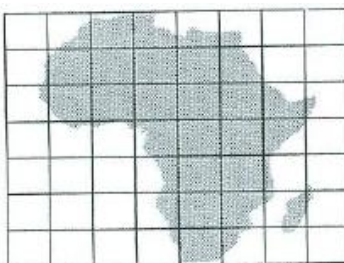
QUESTION 1: **15 minutes** **20 marks** (Source: DoE Exemplar: 2008)

- 1.1. Geographical Information Systems (GIS) can store, manage, analyse and display data. To manage the data in GIS you must look at the different parts that make up the system. Name any TWO parts of GIS that make up the system. (2 x 2) (4)
- 1.2 There are two main types of data, namely spatial data and attribute data. Differentiate between *spatial data* and *attribute data*. (2 x 2) (4)
- 1.3 State whether the following types of spatial data are vector, raster or image data.

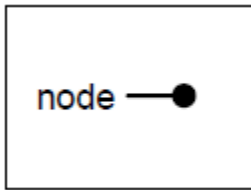
1.3.1



1.3.2



1.3.3



(3 x 2) (6)

1.4 Geographical information is obtained in a number of ways.

1.4.1 State any TWO ways in which geographical information can be obtained.

(2 x 2) (4)

1.4.2 What is a *geographical database*?

(1 x 2) (2)

[20]

HINTS

Hint 1: Learners must know GIS well – it is easy to get marks in this section

QUESTION 2:**15 minutes****18 marks***(Source: DoE November 2008)*

2.1 What is a Geographical Information System (GIS)?

(1 x 2) (2)

2.2 Differentiate between *vector data* and *raster data*.

(2 x 2) (4)

2.3 Classify the following data as vector or raster.

2.3.1. Image

(1 x 2) (2)

2.3.2. Polygons

(1 x 2) (2)

2.4 Name any TWO components of a GIS.

(2 x 2) (4)

2.5 Your friend lives in Nompumelelo and he/she would like to open a business in the area. How could you make use of a GIS in order to ensure the success of his/her business?

(2 x 2) (4)

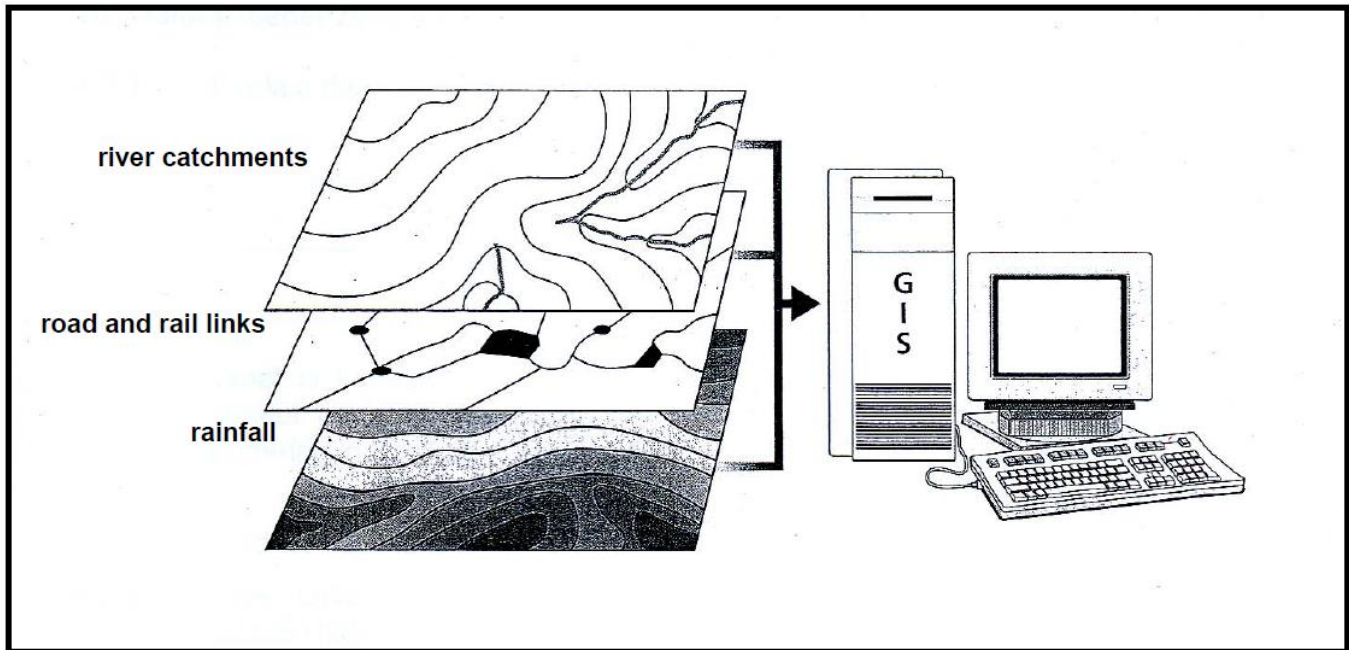
[18]

QUESTION 3:**15 minutes****18 marks***(Source: DoE November 2009)*

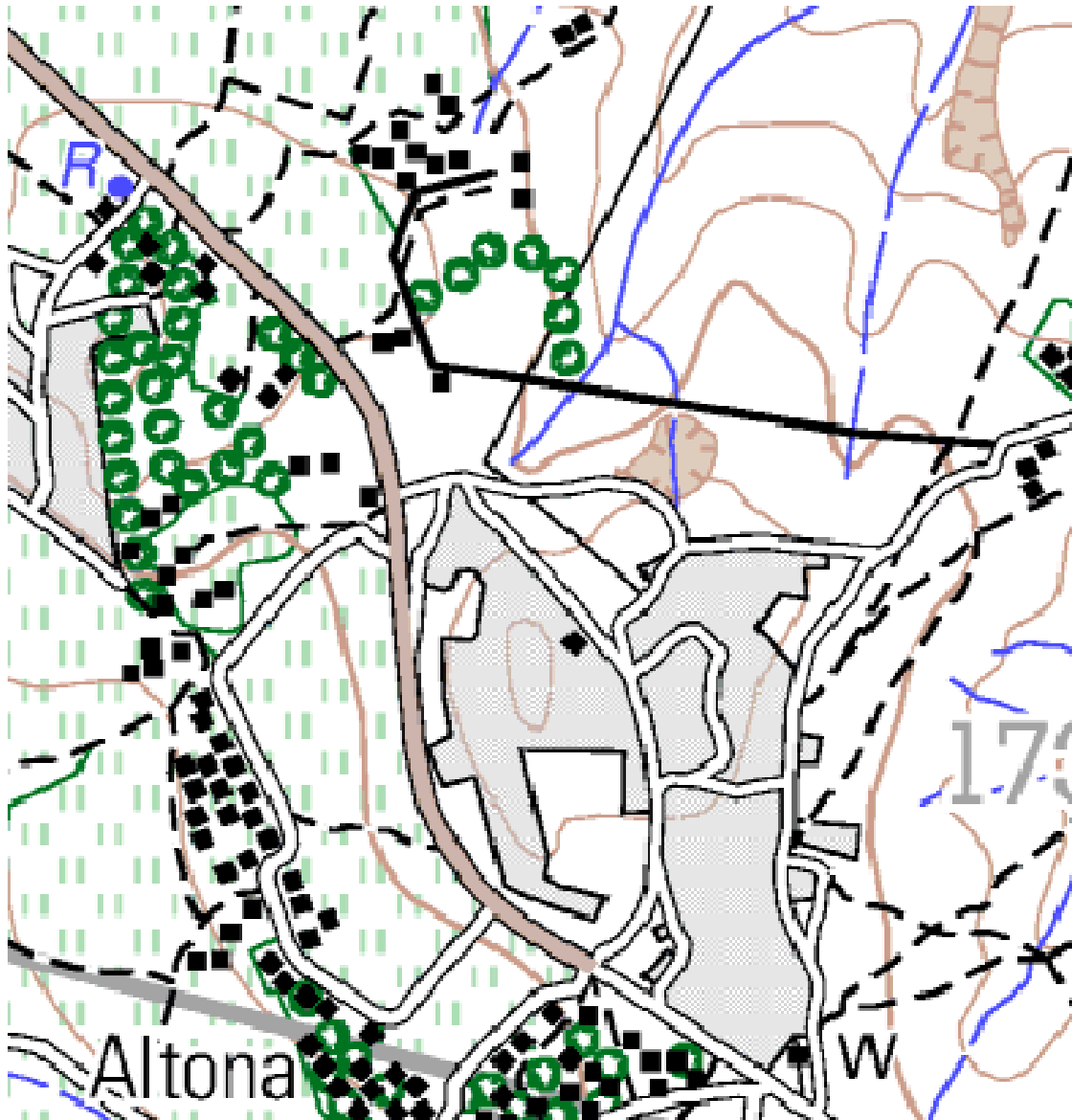
3.1 Differentiate between spatial data and attribute data.

(2 x 2) (4)

3.2 The diagram below illustrates the concept of data layering.



- 3.2.1 Explain the meaning of the term data layering. (1 x 2) (2)
- 3.2.2 Name any TWO layers of information that one can identify in the block from a topographical map. (2 x 2) (4)



3.2.3 Explain TWO uses of data layering in a GIS. (2 x 2) (4)

3.3. Buffering can be used in many different ways in a GIS, for example when determining the natural feeder zone for a school.

3.3.1. Explain the meaning of the term buffering. (1 x 2) (2)

3.3.3 Name ONE advantage of buffering for the school identified in QUESTION 3.3.1. (1 x 2) (2)

[18]

HINTS

Hint 2: The conventional symbols are layers of vector data on a map. Some illustrate points, other lines and some areas.

QUESTION 4: **15 minutes** **18 marks** (*Sources: DoE March 2009*)

- 4.1 Give TWO examples of spatial data found on the topographical map and orthophoto map. (2 x 2) (4)
- 4.2 Name two data storage formats in GIS (2 x 2) (4)
- 4.3 State TWO processes when working with a GIS. (2 x 2) (4)
- 4.5 Define the term remote sensing. (1 x 2) (2)
- 4.6.1 Define the term spatial resolution. (1 x 2) (2)
- 4.6.2 Does the orthophoto map or the topographical map have a higher spatial resolution? (1 x 2) (2)
- [18]

SECTION B: SOLUTIONS AND HINTS TO SECTION A – TOPIC 2

QUESTION 1

- 1.1 Hardware ✓✓
Software ✓✓
Data ✓✓
People ✓✓
Methods ✓✓
- [Any TWO] (2 x 2) (4)
- 1.2 **Spatial data** refers to information linked to a specific location through co-ordinates and represented by points, lines or polygons ✓✓
Attribute data refers to a descriptive quality or characteristic ✓✓ (2 x 2) (4)
- 1.3.1 Vector data ✓✓
- 1.3.2 Raster data ✓✓
- 1.3.3 Vector data ✓✓ (3 x 2) (6)
- 1.4.1 Surveys ✓✓
Maps ✓✓
Aerial photographs ✓✓
Fieldwork ✓✓
Statistics ✓✓
Administrative records ✓✓
Satellite Images ✓✓
- [Any TWO] (2 x 2) (4)
- 1.4.2 Digitally recorded information from sources such as maps, photographs, satellite images and so forth (1 x 2) (2)
- [20]

QUESTION 2

- 2.1 GIS is a computer-based technology and method for collecting, analysing, managing, modelling and presenting geographical data for a wide range of users ✓✓ [CONCEPT] (1 x 2) (2)

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(TEACHER NOTES)

- 2.2 Vector: Real world is shown by means of points, lines and polygons ✓✓
 Raster: Real world features shown by means of pixels ✓✓
 [CONCEPT] (2 x 2) (4)
- 2.3.1 Image Raster ✓✓ (1 x 2) (2)
- 2.3.2 Polygons Vector ✓✓ (1 x 2) (2)
- 2.4. People / users ✓✓
 Software / computer programmes ✓✓
 Data / information / maps / photos ✓✓
 Applications ✓✓
 Hardware / computer ✓✓
 Procedure ✓✓ [ANY TWO] (2 x 2) (4)
- 2.5 Find information about other existing businesses (competition) ✓✓
 Find the total population in order to analyse the potential market ✓✓
 Find financial statistics that show growth ✓✓
 Determine income of people in order to establish whether business will be feasible ✓✓
 Determine demand for business ✓✓
 Work out routes for deliveries ✓✓
 Find ideal location for business ✓✓
 Determine crime hotspot areas ✓✓
 [ANY TWO. Any reasonable answers] (2 x 2) (4)
- [18]**

QUESTION 3

- 3.1 Spatial data: Data that can be specified by referring to geographic locations ✓✓
 [CONCEPT]
 Attribute data: Data that is described in words, numbers and pictures ✓✓
 [CONCEPT] (2 x 2) (4)
- 3.2.1 Maps showing different types of information are projected onto one another/placed on top of one another ✓✓ [CONCEPT] (1 x 2) (2)
- 3.2.2 • Vegetation ✓✓
 • Drainage ✓✓
 • Cultivation ✓✓
 • Relief ✓✓
 • Infrastructure (roads, railway lines, etc.) ✓✓
 • Land-use ✓✓
 • Built-up areas ✓✓ [Any TWO] (2 x 2) (4)

3.2.3 Different sets of data can be compared ✓✓

Relationships between different sets of data can be established ✓✓

Analysing different sets of information ✓✓

Comparisons can assist with future developments ✓✓

[Any TWO. Accept others] (2 x 2) (4)

3.3.1. Drawing of rings around features at a specific distance/process of creating areas of calculated distances from a feature/process of demarcating a specified area around a feature ✓✓

[CONCEPT] (1 x 2) (2)

3.3.2 Determine possible number of households/ learners in feeder zone ✓✓

Assist with admissions to the school ✓✓

Planning possible transport routes to and from school ✓✓

Planning of additional schools ✓✓

Determine distance learners must travel to school ✓✓

[Any ONE. Accept others] (1 x 2) (2)

[18]

QUESTION 4

4.1. Roads ✓✓

Rivers ✓✓

Houses or buildings ✓✓

Parks ✓✓

Dams ✓✓

[ANY TWO - Accept other] (2 x 2) (4)

4.2. vector ✓✓

raster ✓✓

(2 x 2) (4)

4.3 Data input ✓✓

Data storage ✓✓

Data manipulation ✓✓

Data analysis ✓✓

Output information ✓✓

Data management ✓✓

Data application ✓✓

[Any TWO] (2 x 2) (4)

4.4 Refers to the observation of the earth from a distance using satellites to gather information without having direct contact with an area ✓✓

[CONCEPT] (1 x 2) (2)

4.5.1 Refers to the detail with which a map depicts the location and shape of the feature ✓✓

[CONCEPT] (1 x 2) (2)

4.5.2 Orthophoto map ✓✓

(1 x 2) (2)

[18]

SECTION C: HOMEWORK: TOPIC 3

QUESTION 1: **15 minutes** **16 marks** (Source: DoE Prelim 2008)

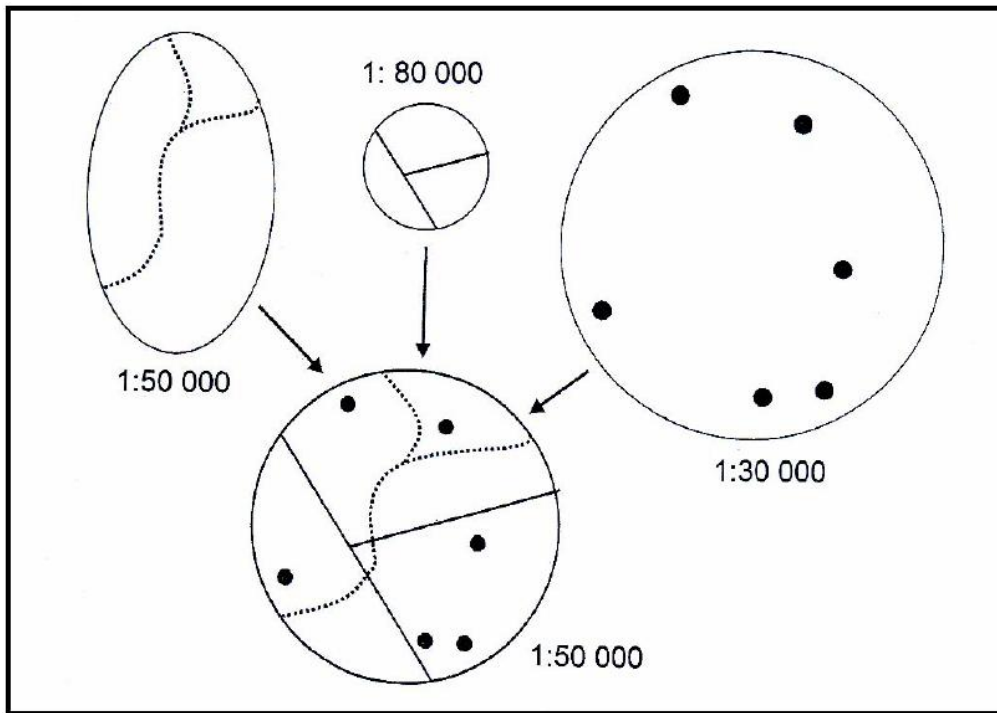
- 1.1 Explain the following concepts:
- 1.1.1 Geographic information systems (GIS) (1 x 2) (2)
- 1.1.2 Remote sensing (1 x 2) (2)
- 1.2 Differentiate between *vector data* and *raster data*. (2 x 2) (4)
- 1.3 Name ONE of the main data inputs of a GIS. (1 x 2) (2)
- 1.4 Classify the following data as either spatial data or attribute data.
- (a) A map showing housing density (1 x 2) (2)
- (b) The shape of a ploughed field (1 x 2) (2)
- 1.5 Give ONE example of possible spatial data found in or around the school on the topographical map. (1 x 2) (2)
- [16]

QUESTION 2: **15 minutes** **20 marks** (Source: DoE March 2010)

- 2.1 Name any TWO components of a GIS. (2 x 2) (4)
- 2.2 Identify a polygon feature, a line feature and a point feature respectively in the block below. (3 x 2) (6)



- 2.3 The diagram below illustrates the concept of data integration. Study the diagram carefully and answer the questions that follow.



- 2.3.1 Explain what is meant by data integration. (1 x 2) (2)
- 2.3.2 Name ONE problem that was experienced with data integration prior to the introduction of GIS. (1 x 2) (2)
- 2.3.3 Of what importance is data integration to a geographer? (1 x 2) (2)
- 2.4 What is a database? (1 x 2) (2)
- 2.5 Why is it sometimes necessary to manipulate data in a database? (1 x 2) (2)
- [20]

QUESTION 3: 10 minutes 10 marks

- 3.1. What is a map projection? (1 x 2) (2)
- 3.2. Name any cylindrical projection. (1 x 2) (2)
- 3.3. Which projection is used for the topographic maps and orthophotographs? (1 x 2) (2)
- 3.4. Why are the projection identified in 1.3 used on 1:50 000 topographic maps? (2 x 2) (4)
- [10]

HINTS - Projections

Hint 1 The map projections are hardly ever asked in exams.

Hint 2 Gauss Conform is always used on topographic maps as it conserves direction, bearing, distance and area on large scale maps to a large degree.

SECTION D: SOLUTION TO HOMEWORK - TOPIC 2**QUESTION 1**

1.1

1.1.1 Computer based technology and method for collecting, analysing, managing, modelling and presenting geographical data for a wide range of uses ✓✓

[CONCEPT] (1 x 2) (2)

1.1.2 Gathering of information about the earth with any instrument from outer space ✓✓

[CONCEPT] (1 x 2) (2)

1.2 Vector: Real world is shown by means of points, lines and polygons ✓✓

Raster: Real world features shown by means of pixels ✓✓

[CONCEPT] (2 x 2) (4)

1.3.1 • Maps ✓✓

• Images ✓✓

• Tables (electronic spread sheet) ✓✓

• Statistics ✓✓

(1 x 2) (2)

1.4.1 (a) Attribute data ✓✓

(1 x 2) (2)

(b) Spatial data ✓✓

(1 x 2) (2)

1.5. • Area of school • Passage / corridors ✓✓

• Grounds • Walkways ✓✓

• Point of entrance ✓✓

[Any ONE] (1 x 2) (2)

[16]**QUESTION 2**

2.1 • Hardware ✓✓

• Software ✓✓

• Data ✓✓

• People ✓✓

• Procedures ✓✓

• Network ✓✓

[Any TWO] (2 x 2) (4)

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(TEACHER NOTES)

- 2.2 Polygon feature: cultivated land ✓✓
 woodland ✓✓
 sewage disposal works ✓✓
 cemetery ✓✓
 slimes dam ✓✓
 mine dump ✓✓
 built-up area ✓✓
- Line feature: non-perennial river ✓✓
 other road ✓✓
 national route ✓✓
 track/hiking trail ✓✓
 railway line ✓✓
- Point feature: fountain ✓✓
 trees ✓✓

[Any ONE for each type of feature] (3 x 2) (6)

- 2.3.1 The integration of data from different maps into one map which summarises the overlaying process ✓✓ [CONCEPT] (1 x 2) (2)

- 2.3.2 Maps have different scales ✓✓
 Different map projections are used on maps ✓✓
 Different georeferenced maps are used ✓✓
 [Any ONE] (1 x 2) (2)

- 2.3.3 A summary of integrated data is produced which makes it easier to analyse data
 (1 x 2) (2)

- 2.4 A storage system with linked tables
OR
 Data is stored in tables which are linked to other tables [CONCEPT] (1 x 2) (2)

- 2.5
- Correct distortions
 - Sharpen definition
 - Ensure colour consistency
 - Correct latitude and longitude registration
 - Makes data more manageable
- [Any TWO] (1 x 2) (2)
[20]

QUESTION 3

- 3.1. A map projection is a method to flatten out the spherical earth onto a flat surface to draw a map. (1 x 2) (2)
- 3.2. Mercator projection (1 x 2) (2)
- 3.3. Gauss Conform Projection (1 x 2) (2)
- 3.4. Gauss Conform is always used on topographic maps as it conserves distance and area on large-scale maps to a large degree. Direction and bearing is not distorted too much. (2 x 2) (4)
- [10]**

TOPIC 1: RIVER SYSTEMS AND RIVER SYSTEM MANAGEMENT

Teacher Note: There are always questions on these sections in the exams. They are relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work. Put a lot of emphasis on terminology and sketches. There are some long questions in these sections as well.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **5 minutes** **10 marks** (*Source: Exemplar 2008*)

1.1. Indicate whether the following statements are true or false:

1.1.1. An aquifer is a rock that is impermeable and does not allow water to move through it.

1.1.2. A flow hydrograph records how much water passes a given point in a given period of time.

1.1.3. A periodic river is a river that only flows in the rainy season when it receives ground water.

1.1.4. Rocks that are uniformly resistant and exposed to the same type of weathering will weather at different rates.

1.1.5. The water table indicates the level of water on the surface of the earth. (5 x 2) [10]

HINTS

Hint 1: Learners need to know the terminology in Geomorphology off by heart. They must study the definitions

Hint 2: Make sure they have a picture that they can associate with the concept.

QUESTION 2: **20 minutes** **28 marks** (*Source: DoE Exemplar 2008*)

Refer to the extract as well as the photograph and diagram of rivers draining into the Hartbeespoort Dam.

100 000 lives at risk

In the summer rainfall regions the lives of some 100 000 people are at risk. They are in danger because they live in flood-prone areas. One of these areas, with 6 000 residents, is an informal settlement below the banks of the Jukskei River within Alexandra Township, north of Johannesburg.

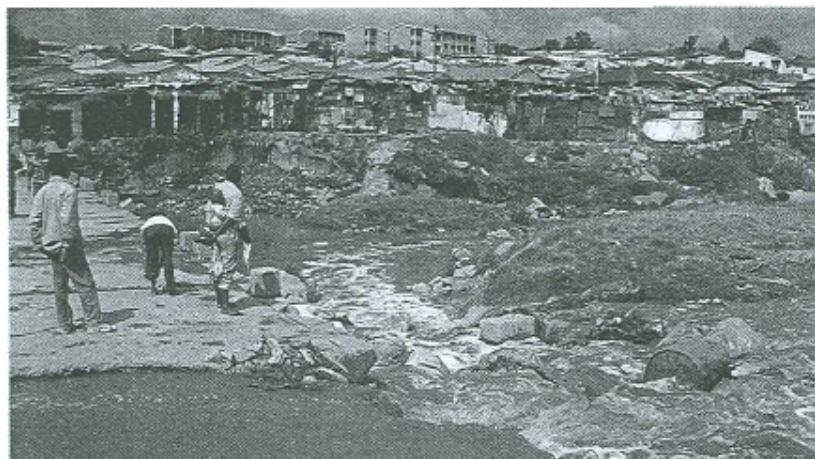
Residents have been warned many times about the dangers of building along the banks of the Jukskei, but they stay because there is nowhere else for them to go. Hundreds of shacks on the river banks have been washed away in the past yet residents remain undaunted and return to build.

This FIGURE shows the Jukskei River and other rivers that drain into the Hartbeespoort Dam.

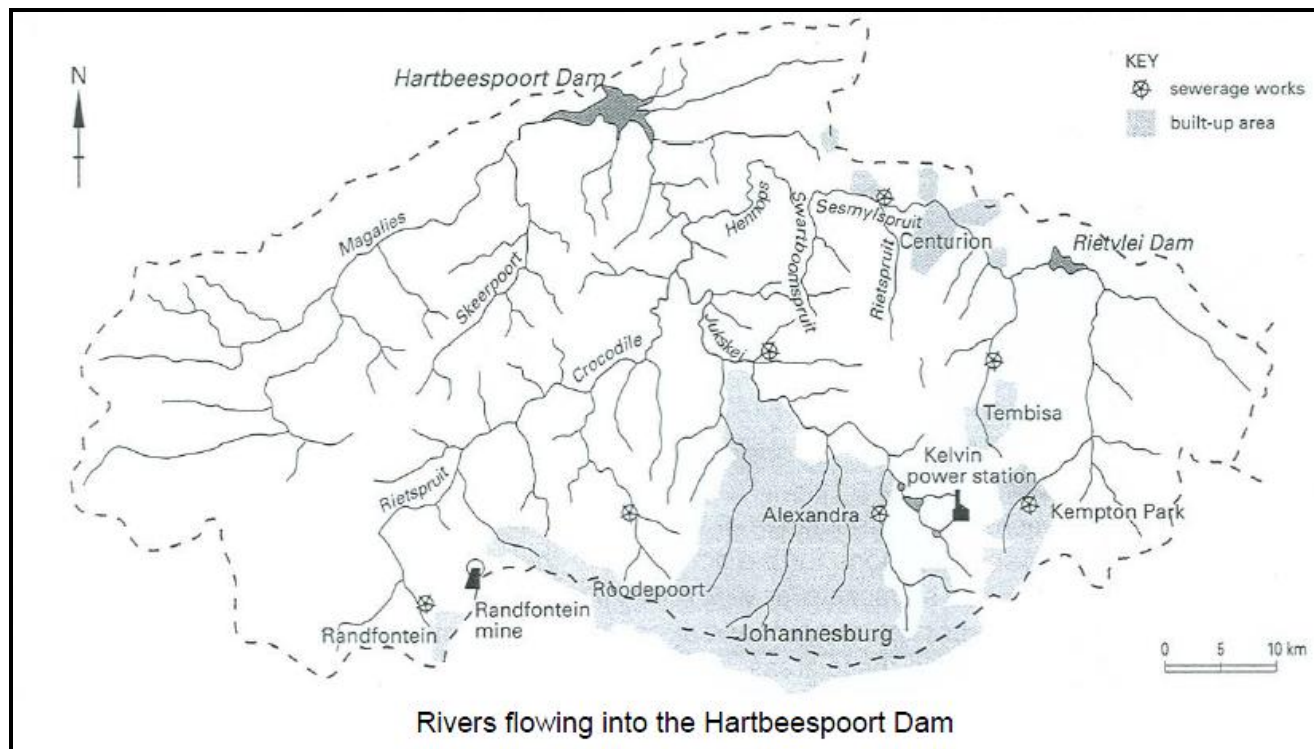
The Jukskei River carries heavily polluted water into the dam. The sources of this pollution are from sewerage, domestic waste and detergents reaching the river from Alexandra Township, as well as effluent from mining areas and industrial waste from the Kelvin power station and the industrial areas of Johannesburg. There are also many sewerage works along the rivers that flow into the dam.

Heavy rains in 1999, 2000 and 2001 have caused

loss of life and homes along the Jukskei River in Alexandra. Building on a flood plain, so close to the river, is hazardous. As the Jukskei River rises north of Alexandra, rainwater does not infiltrate due to the impermeable artificial surfaces of the built-up area. Overland flow occurs and as a result there is a short lag time and high flood peak in the rivers as it flows through the township, which contributes to the heavy flooding experienced.



Living on the edge – Alexandra residents exist dangerously on the banks of the Jukskei River



- 2.1. (a) Identify the drainage pattern of the Jukskei River as seen in the figure above. (1 x 2) (2)
- (b) Give ONE reason for your answer to QUESTION 2.1. (a). (1 x 2) (2)
- 2.2 (a) Flooding is common in Alexandra. What is a *flood*? (1 x 2) (2)
- (b) Why do people still build shacks on the banks of the Jukskei River if the area is threatened by constant flooding? (1 x 2) (2)
- (c) Explain why there is a short lag time and a high flood peak as the Jukskei River flows through Alexandra. (3 x 2) (6)
- (d) Name any TWO consequences of flooding for the inhabitants of Alexandra. (2 x 2) (2)
- 2.3 (a) Describe the locations of the sewerage works in relation to the rivers shown in the figure above (1 x 2) (2)
- (b) What are the consequences of the above for people living on the banks of the Hartbeespoort Dam? (2 x 2) (2)
- (c) State TWO measures that can be introduced by the provincial government to ensure that all rivers flowing into the Hartbeespoort Dam are free of sewerage effluents. (2 x 2) (2)

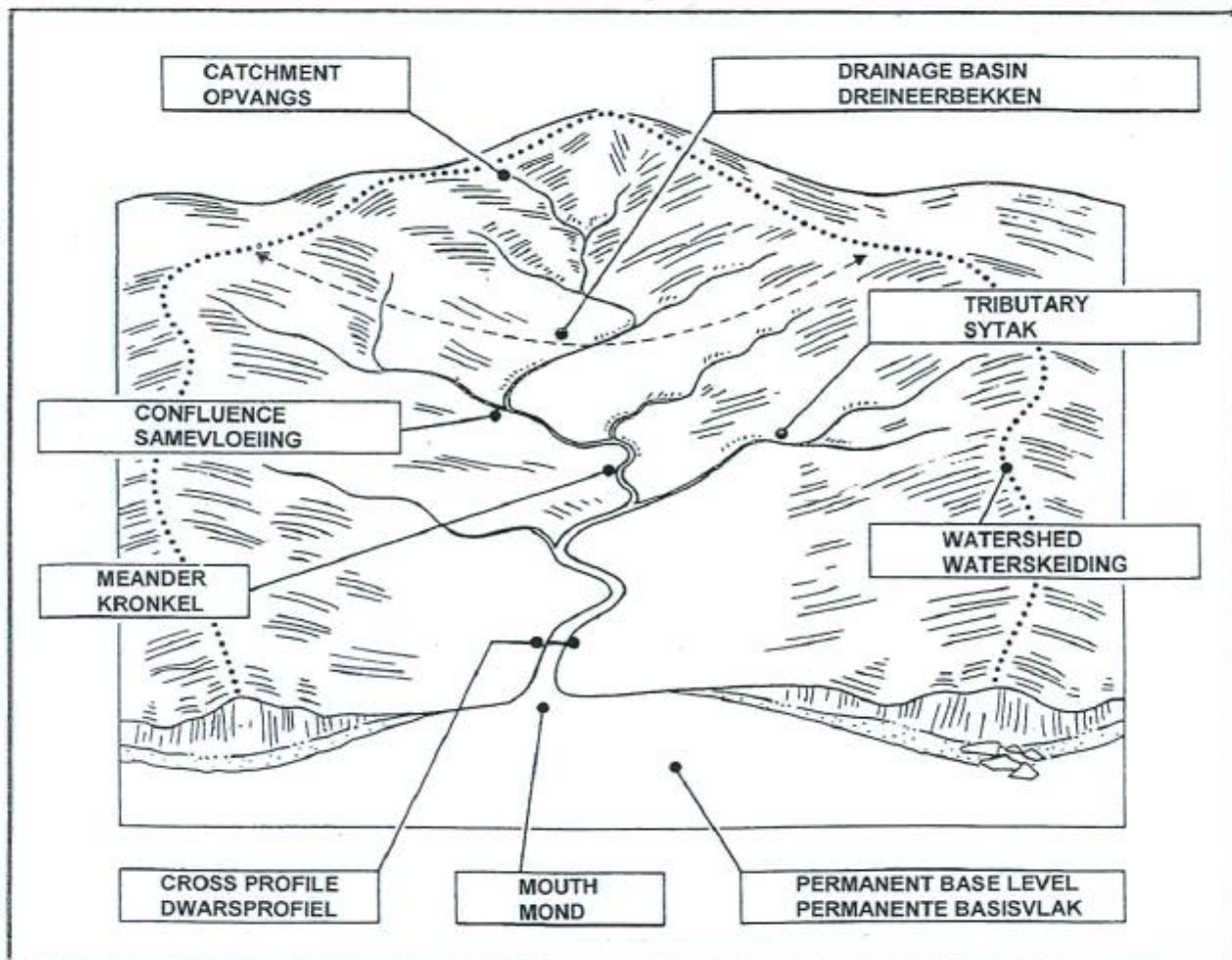
[22]

HINTS

Hint 1: Learners must analyse the resource material carefully. Some of the answers come straight out of the resources material.

QUESTION 3: 5 minutes**10 marks***(Source: DoE: Nov. 2008)*

3. Use the figure below which shows the different fluvial processes and characteristics of a drainage basin to assist you to give ONE term for each of the descriptions below. Write only the term next to the question number as an answer, for example 3.6 base flow.



- 3.1 Area where a river gets its water from
 3.2 Area drained by a river and its tributaries
 3.3 The point where a tributary meets the main stream
 3.4 Section of a stream from one bank to the other
 3.5 High-lying area that separates two drainage basins

(5 x 2) [10]

QUESTION 4: **20 minutes** **28 marks** (Source: DoE Nov. 2008)

4. FIGURE 4 A illustrates a drainage basin. FIGURE 4 B shows the three river courses associated with a river system. Examine both diagrams carefully.

Figure 4 A

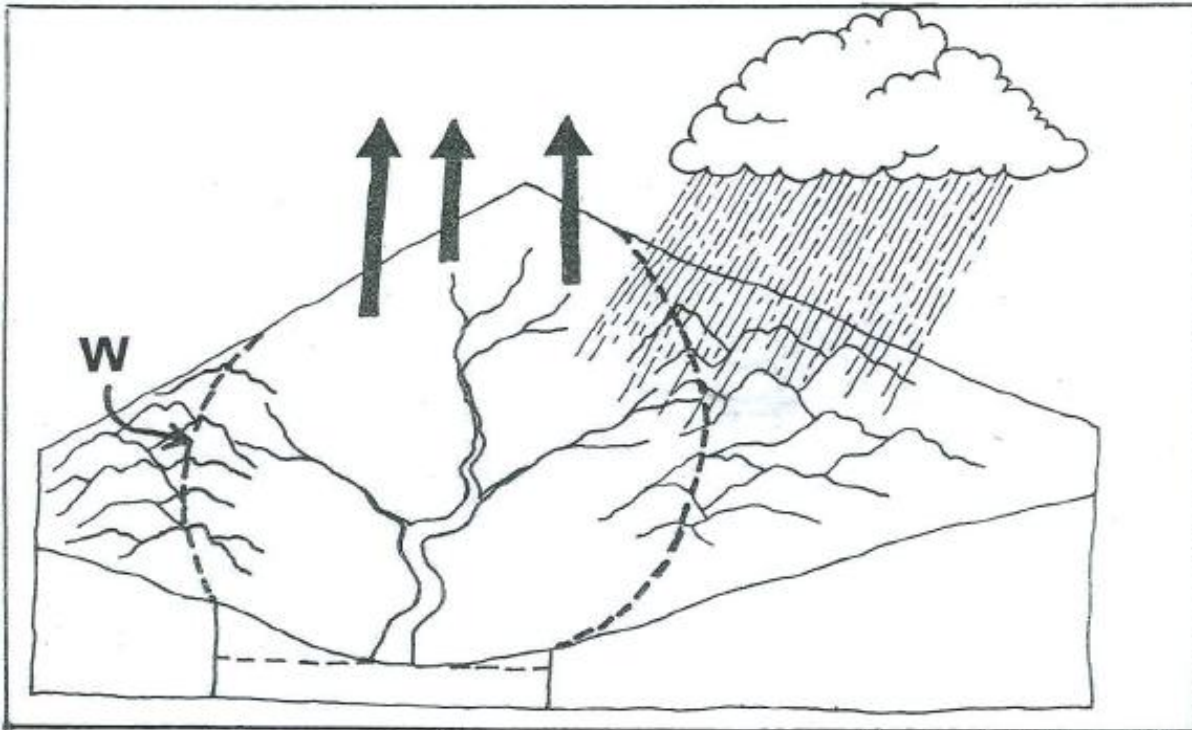
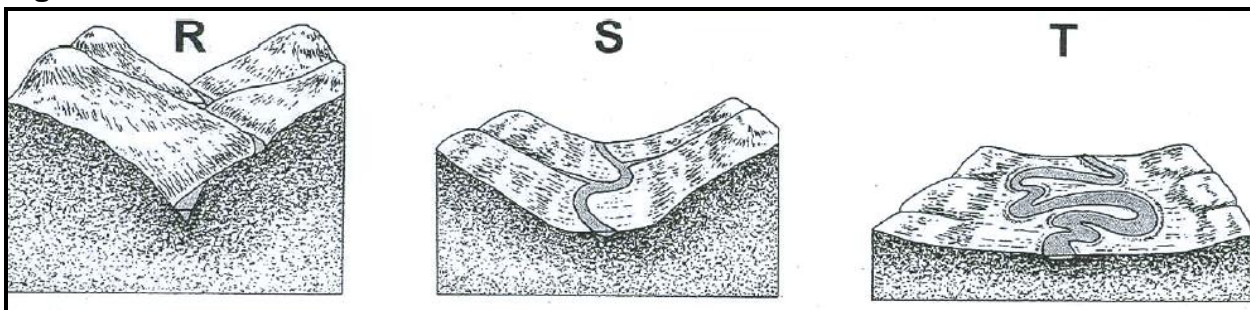


Figure 4 B



- 4.1 (a) The drainage basin illustrated in FIGURE 4A shows a *low drainage density (coarse texture)*. What does this mean? (1 x 2) (2)
- (b) Give TWO possible reasons why this drainage basin has a low drainage density (coarse texture). (2 x 2) (4)
- (c) Explain why the two factors mentioned in QUESTION 4.1(b) will result in a low drainage density (coarse texture). (2 x 2) (4)

- 4.2 (a) Identify the THREE main river courses labelled **R**, **S** and **T** in FIGURE 4 B respectively. (3 x 2) (6)
- (b) Along which ONE of the three courses labelled **R**, **S** or **T** will flooding most likely occur? (1 x 2) (2)
- (c) Explain how the characteristics of the river course mentioned in QUESTION 4.2(b) will promote flooding here. (2 x 2) (4)
- (d) Flooding along the river course named in QUESTION 4.2(b) can be both a blessing and a curse for the people living on the adjacent flood plain. Explain this statement. (2 x 2) (4)
- (e) State ONE method that can be introduced to reduce flooding along the river course named in QUESTION 4.2(b). (1 x 2) (2)
- [28]

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

- 1.1.1. False✓✓
- 1.1.2. True✓✓
- 1.1.3. True✓✓
- 1.1.4. False✓✓
- 1.1.5. False✓✓ (5 x 2) [10]

QUESTION 2

- 2.1 (a) Dendritic ✓✓ (1 x 2) (2)
- (b) It looks like the branches of a tree ✓✓
Tributaries join the main stream at acute/small angles ✓✓
[Any ONE] (1 x 2) (2)
- 2.2 (a) Situation that develops when a river overflows its banks and covers areas with water that are usually not covered by water ✓✓
[Concept] (1x2) (2)
- (b) Shortage of space for development ✓✓
Attachment that they have developed with the area over time ✓✓
[Any ONE] (1 x 2) (2)
- (c) The land is covered by artificial surfaces ✓✓
Water does not infiltrate the surface ✓✓
More water reaches the stream; therefore, flood peak is higher ✓✓
Water flows faster on artificial surfaces thus lag time shortened ✓✓
[Any THREE] (3 x 2) (6)

- (d) Destruction of infrastructure ✓✓
 Loss of life ✓✓
 Houses washed away/damaged ✓✓
 Personal belongings washed away/damaged ✓✓
 Costs involved to rebuild ✓✓

[Any TWO] (2 x 2) (4)
 (1 x 2) (2)

- 2.3 (a) Sewerage works are located on river banks ✓✓
 (b) Contamination of water ✓✓
 Eutrophication ✓✓
 Permanent stunch ✓✓
 Diseases ✓✓
 Dam becomes unsightly ✓✓
 Drop in land value next to the dam ✓✓

[Any TWO] (2 x 2) (4)

- (c) Bilding purification dams ✓✓
 Relocate the sewerage works ✓✓
 Legislation preventing raw sewerage being
 dumped into rivers ✓✓

[Any TWO] (2 x 2) (4)
[28]

QUESTION 3

- 3.1. Catchment area ✓✓
 3.2 Drainage basin ✓✓
 3.3 Confluence ✓✓
 3.4 Cross profile ✓✓
 3.5 Watershed ✓✓

(5 x 2) **[10]**

QUESTION 4

- 4.1 (a) Total length of streams is small in relation to the size of the
 drainage basin ✓✓

[Concept] (1 x 2) (2)

- (b) Low rainfall ✓✓
 Soft soaking rain ✓✓
 Dry soils ✓✓
 Dense vegetation ✓✓
 Permeable rock ✓✓
 High infiltration rate ✓✓
 Gentle gradient ✓✓
 Resistant rock ✓✓
 High evaporation rate ✓✓

[Any TWO] (2 x 2) (4)

- (c) Low rainfall: little surface water to form run-off ✓✓
 Soft soaking rain: water infiltrates thus little surface water ✓✓
 Dry soils: absorbs water thus little surface water ✓✓
 Dense vegetation: retards flow of water resulting in infiltration thus little surface water ✓✓
 Permeable rock: allows infiltration thus little surface water ✓✓
 High infiltration rate: reduces surface run-off ✓✓
 Gentle gradient: slows down flow resulting in infiltration thus little surface water ✓✓
 Rock resistance: the more resistant the rock the fewer streams will be carved ✓✓
 High evaporation: less water available to form run-off ✓✓

[Any TWO. Must refer to answer in QUESTION 4.1(b)] (2 x 2) (4)

- 4.2 (a) R - Upper/torrent/youthful course ✓✓
 S - Middle/valley/mature course ✓✓
 T - Lower/plain/old age course ✓✓ (3 x 2) (6)
- (b) T/lower or plain course ✓✓ (1 x 2) (2)
- (c) Gentle gradient slows down velocity and water spills over banks ✓✓
 Wide, gentle flood plain allows water to spread easily ✓✓
 Large volume of water from tributaries upstream ✓✓
 Deposition of sediments make river shallower ✓✓
 Meander necks are breached to cause floods ✓✓ [Any TWO] (2 x 2) (4)
- (d) Flooding can cause damage ✓✓
 Flooding provides fertile silt that is deposited on the flood plain ✓✓
 [Any ONE positive and any ONE negative effect] (2 x 2) (4)
- (e) Small catchment dams in upper course to release water at intervals into the main stream ✓✓
 Large flood control dams in lower reaches ✓✓
 Raise river banks (levees) artificially ✓✓
 Line rivers with cement to reduce friction and increase velocity ✓✓
 Increase gradient by cutting through meander necks to increase velocity ✓✓
 Increase vegetation/prevent deforestation ✓✓ [Any ONE] (1 x 2) (2)

[28]

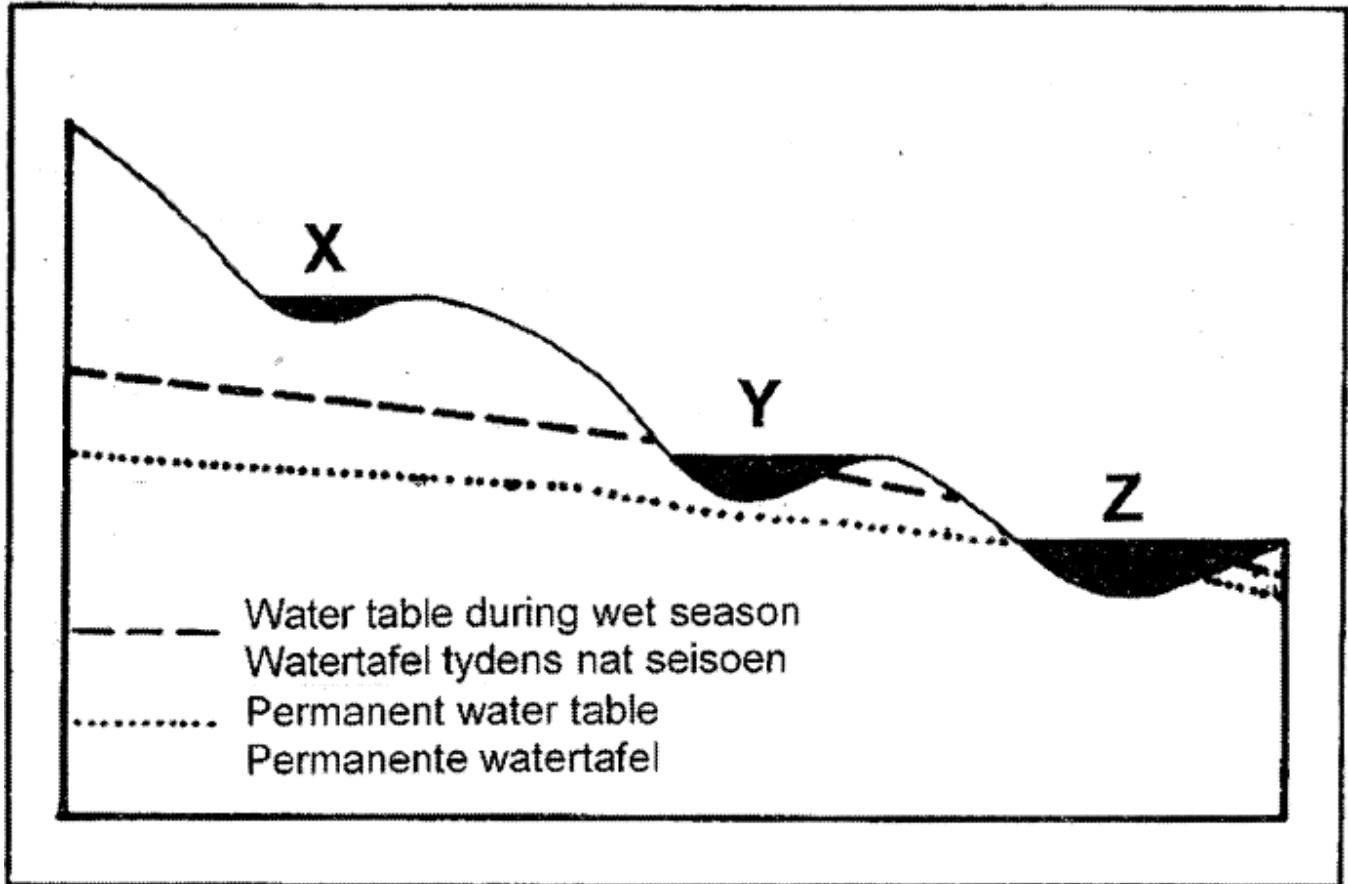
SECTION C: HOMEWORK

QUESTION 1:

5 minutes

10 marks

(Source: DoE March 2010)



1. Refer to the figure above illustrating the relationship between stream type and the water table.

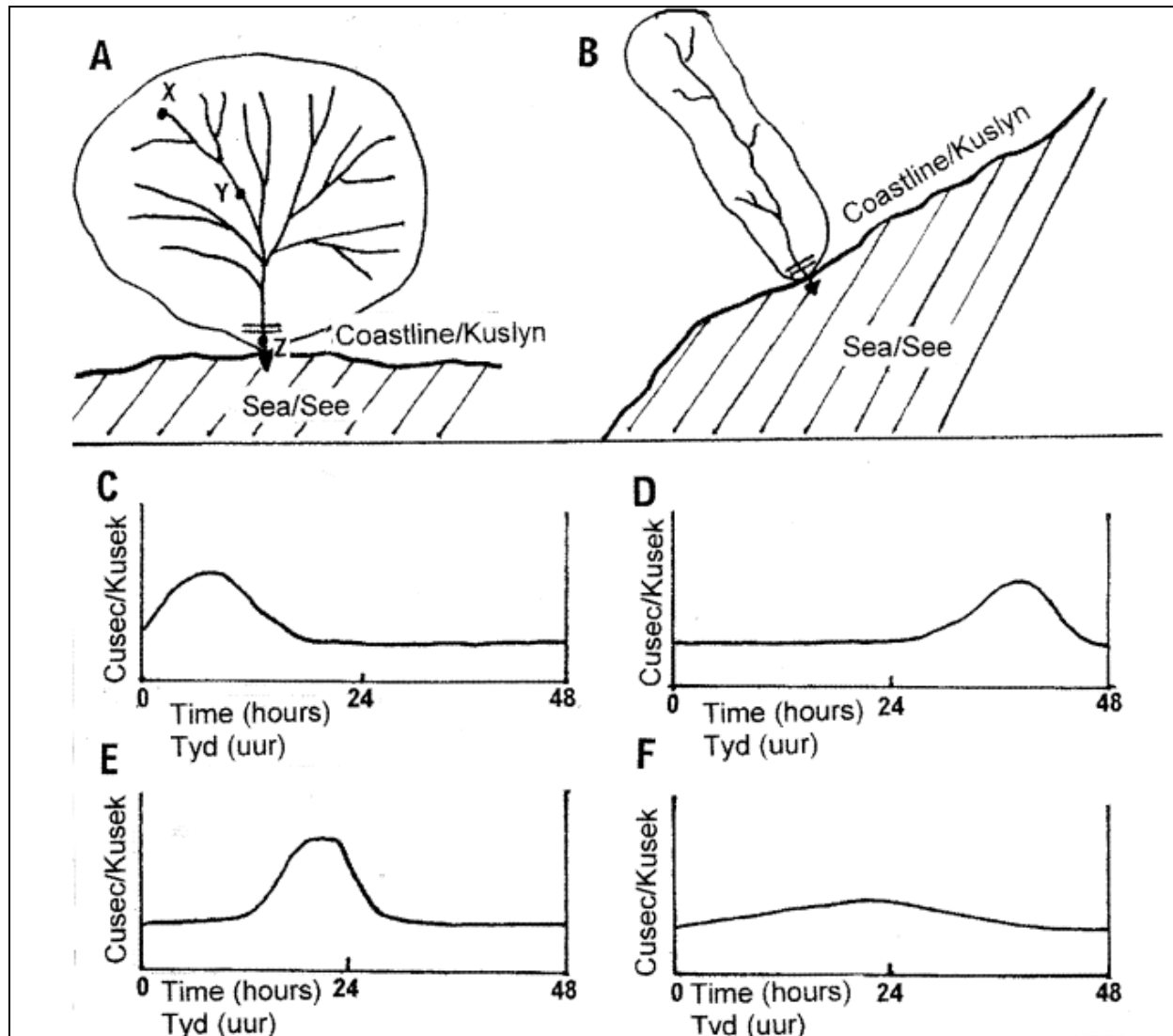
Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number.

- 1.1 River X will only flow after a heavy thunderstorm.
- 1.2 River Y is a periodic river.
- 1.3 River Z will only flow during the wet season.
- 1.4 The water table lies at a lower level during a prolonged drought.
- 1.5 River Z does not receive any water from base flow to support its flow.

(5 x 2) [10]

QUESTION 2: **20 minutes** **20 marks** (Source: DoE March 2010)

Refer to FIGURE 2.4 (A – F) representing the drainage basins of two river systems (A and B) and flow hydrographs (C – F) to show run-off in rivers after rain showers. Also read the extract on floods below.



Flooding occurs when water overflows its normal channels such as streams and storm water drains. Floods may also occur when there is an accumulation of water by drainage into areas which are not normally submerged. Floods are common in South Africa following long periods of drought. Drought, overgrazing and the deterioration of the land make the ecosystem vulnerable. Humans can alter the flow characteristics of a river negatively by clearing vegetation, constructing impermeable tar and concrete surfaces, and building on a river's flood plain.

2.1. Define the following terms referred to above:

- (a) Drainage basin (1 x 2) (2)
 (b) River system (1 x 2) (2)

2.2 Describe the shapes of drainage basins A and B respectively. (2 x 2) (4)

2.3 List and explain any TWO factors that could influence the run-off in a river. (4 x 2) (8)

2.4 Suppose a rain shower of 100 mm occurs in each of drainage basins A and B. Which of the flow hydrographs (C – F) will most likely represent stream flow at the point marked = in drainage basins A and B respectively? (2 x 2) (4)
 [20]

SECTION D: SOLUTIONS TO HOMEWORK

QUESTION 1

- 1.1 True ✓✓ (1 x 2) (2)
 1.2 True ✓✓ (1 x 2) (2)
 1.3 False ✓✓ (1 x 2) (2)
 1.4 True ✓✓ (1 x 2) (2)
 1.5 False ✓✓ (1 x 2) (2)
 [10]

QUESTION 2

- 2.1 (a) The total area drained by the river system ✓✓ [CONCEPT] (1 x 2) (2)
 (b) The main river and all its tributaries ✓✓ [CONCEPT] (2 x 1) (2)
 2.2 A = round ✓✓ (1 x 2) (2)
 B = elongated/long ✓✓ (2 x 2) (4)
 2.3 Nature of rainfall ✓✓ – Soft rain less run-off; storms more run-off ✓✓
 Vegetation ✓✓ – More vegetation less run-off; less vegetation more run-off ✓✓
 Relief of the land ✓✓ – Where land is steep more run-off; where land is gentle less run-off ✓✓
 Rock type ✓✓ – porous and permeable rock will have less run-off; impermeable rock will have more run-off ✓✓
 Soil type ✓✓ – coarse sandy soil promotes infiltration; compact soils

promote run-off ✓✓

Soil moisture content ✓✓ – Saturated soils promote run-off; dry soils

promote infiltration ✓✓

Evaporation ✓✓ – high evaporation reduces run-off and infiltration; low

evaporation increases run-off and infiltration ✓✓

[Any TWO. Must give factor ✓✓ and explain ✓✓] (4 x 2) (8)

2.4 A = E ✓✓

B = F ✓✓ (2 x 2) (4)

[24]

TOPIC 2: RIVER CAPTURE AND RIVER PROFILES

Teacher Note: There are always questions on these sections in the exams. It is relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work as it is sure marks. Focus on sketches and terminology.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **20 minutes** **24 marks** (*Source: DoE November 2008*)

Imagine that you are sailing by boat from the source of the River Blea (K) to the mouth at J. Test your knowledge of fluvial processes and landforms by referring to FIGURES 1.A, 1.B and 1.C to answer the questions below.

- 1.1 Your sail down to the coast is smooth with no obstacles along the way.
What type of profile does the River Blea have? (1 x 2) (2)
 - 1.2 FIGURE 1.A shows a cross-section of a valley.
 - (a) Is the cross-section more likely to match the valley at point K or point J (FIGURE 1.B)? (1 x 2) (2)
 - (b) What is the main type of erosion in this valley and why is this so? (2 x 2) (4)
 - (c) The cross profile provides a geographer with two useful sources of information. Name the TWO sources. (2 x 2) (4)
 - 1.2. Refer to FIGURE 1.C and meet Albert. Explain to Albert what has happened to the river and why it seems to have moved. (Hint: Refer to meanders, erosion, deposition and ox-bow lakes.) (4 x 2) (8)
 - 1.3. Pollution of the River Blea is a major problem. State TWO ways in which this will impact on the lives of the people. (2 x 2) (4)
- [24]

Figure 1A

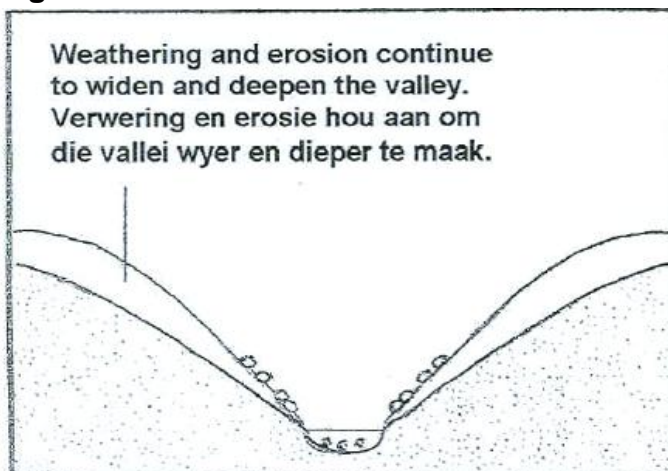


Figure 1B

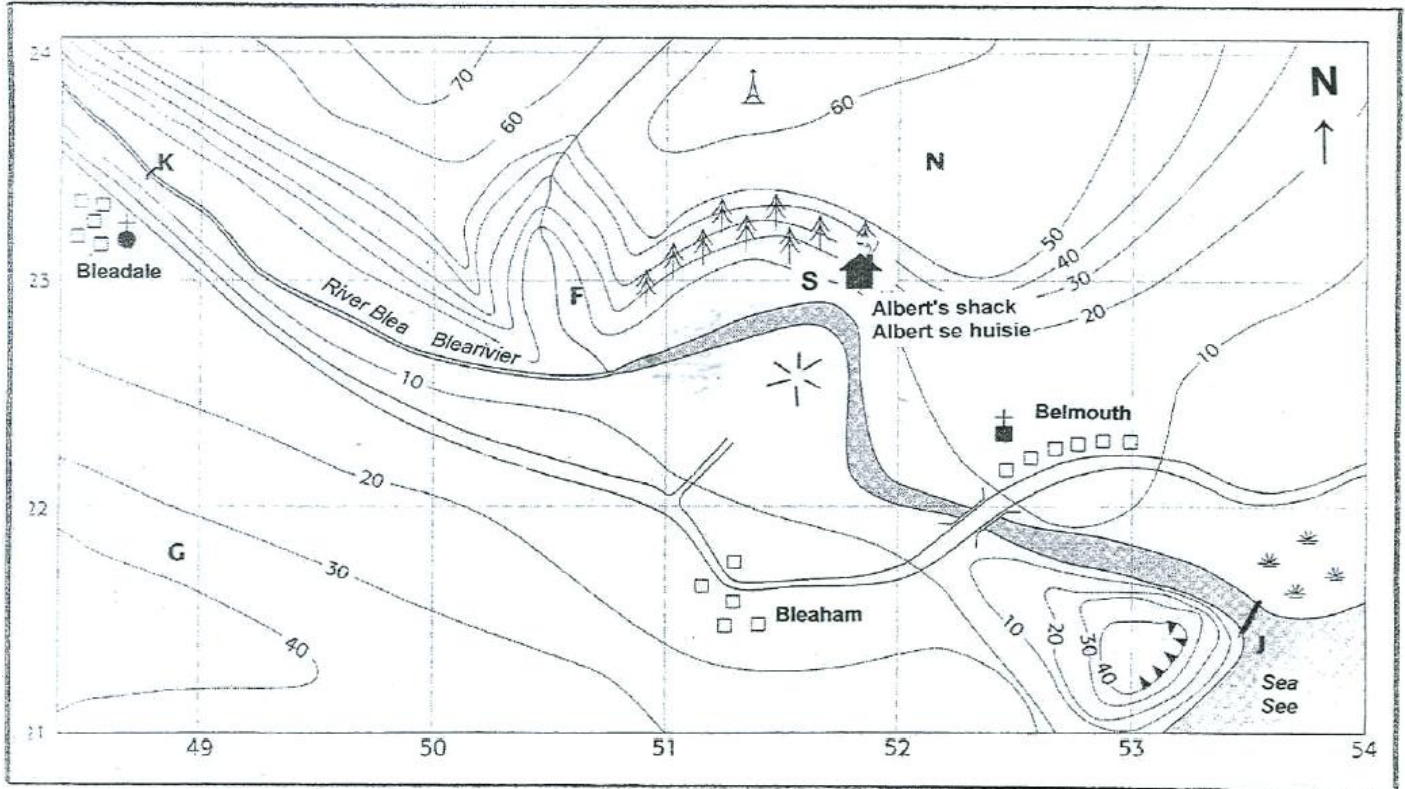
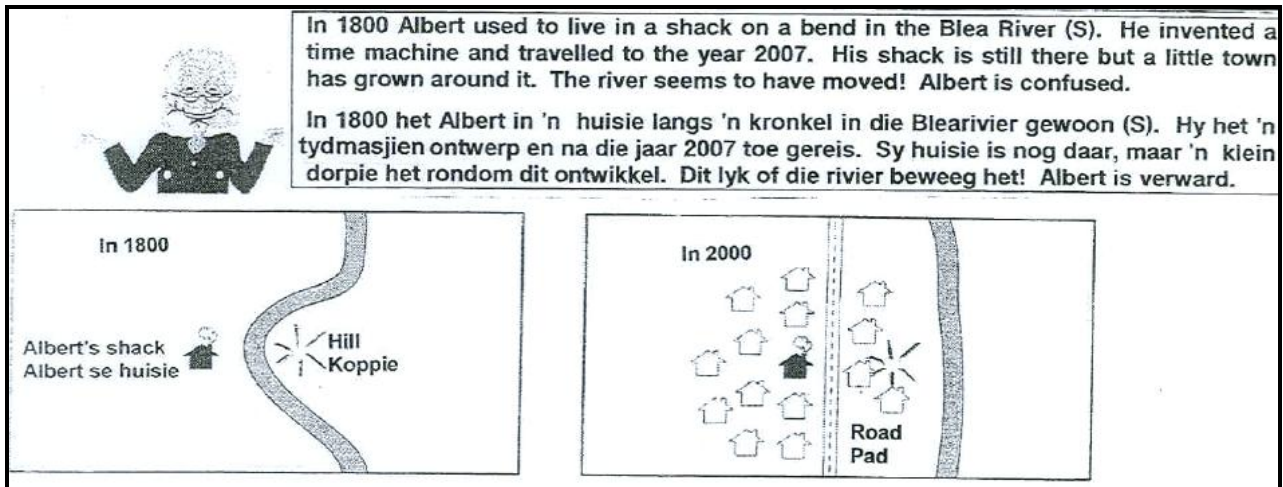


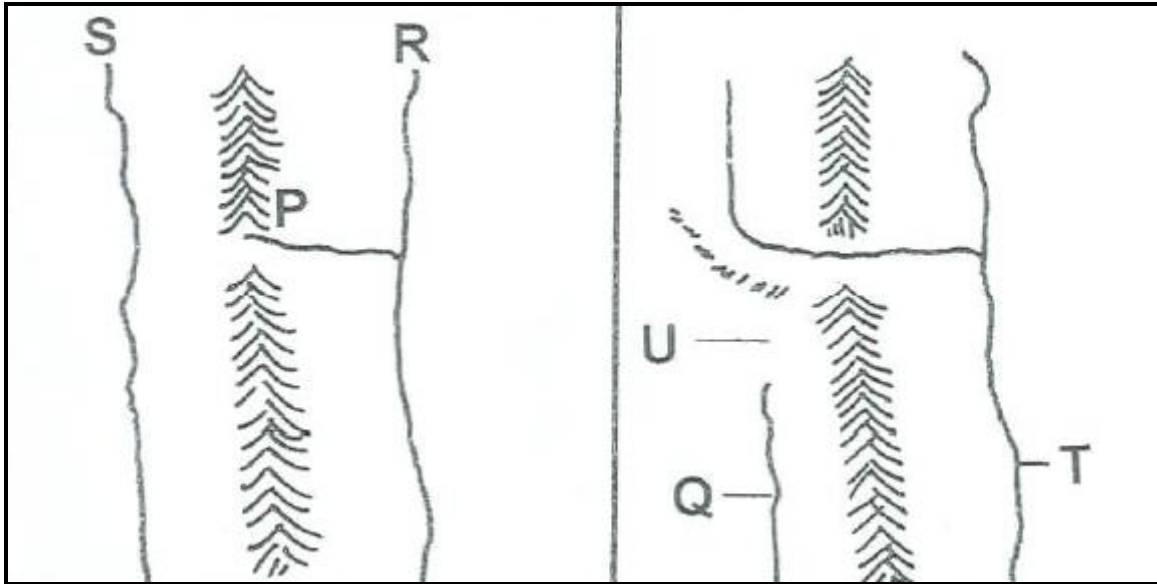
Figure 1C

**HINTS QUESTION 1**

Hint 1: Learners must study the resource material carefully as some of the answers can be extracted from there.

QUESTION 2:**5 minutes****10 marks***(Source: DoE November 2008)*

2. Refer to the figure below illustrating river capture (stream piracy). Choose the correct terms/letters from those given in brackets to make all the statements below TRUE. Write only the terms/letters next to the question number as an answer.



- 2.2.1 Stream (R/S) is situated higher above sea level.
 2.2.2 (Headward/Lateral) erosion will take place at P.
 2.2.3 Q is the (misfit/pirate) stream.
 2.2.4 Rejuvenation will take place in river (Q/T).
 2.2.5 Area U is known as the (wind gap/elbow of capture). (5 x 2) [10]

HINTS

Hint 1 – Stream piracy or river capture is often asked in the exam.

Hint 2 – Learners need to know the sketch, and be able to identify the features that develop, and then describe the process and explain how river capture will change the erosive capacity of the rivers.

QUESTION 3:**20 minutes****24 marks***(Source: DoE March 2010)*

3. Refer to FIGURE 1.5A showing a longitudinal river profile after rejuvenation has occurred. FIGURE 1.5B shows the effects of rejuvenation along the lower course of a river. Meanders may have been present along the river course. These meanders would have formed on a floodplain. Once the river is rejuvenated, it will incise and the meanders will no longer be on a plain but in deep, steep-sided valleys.

- 3.1 Define the following terms indicated on FIGURE 1.5:
- (a) Graded profile (1 x 2) (2)
 - (b) Base level (1 x 2) (2)
- 3.2 Draw a diagram similar to FIGURE 1.5 to show a graded longitudinal river profile. (1 x 2) (2)
- 3.3 Provide evidence, visible in FIGURE 1.5, that rejuvenation has occurred. (1 x 2) (2)
- 3.4 Provide possible reasons why rejuvenation has occurred in this landscape. (2 x 2) (4)
- 3.5 The local community has proposed the construction of a major dam in the river system shown in FIGURE 1.5. Write a short essay (no more than 12 lines) to outline the advantages and disadvantages of such a proposal. (6 x 2) (12)
- [24]

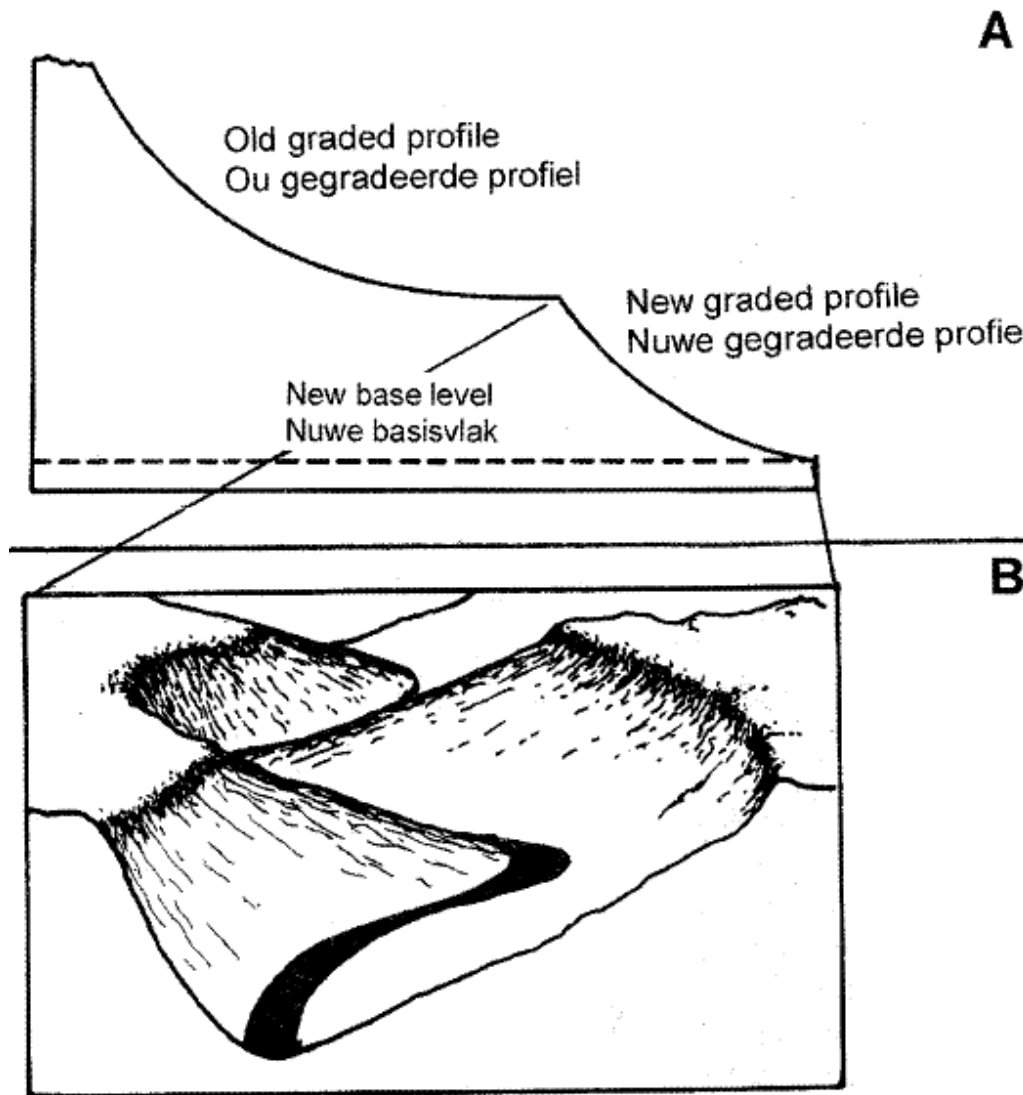


FIGURE 1.5

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1 Graded profile/concave/smooth ✓✓ (1 x 2) (2)

1.2 (a) K ✓✓ (1 x 2) (2)

- (b) Vertical/downward erosion ✓✓
 Because of fast-flowing water ✓✓
 Debris that acts as a cutting tool ✓✓
 Bed load rolls over river bed ✓✓
 K is in upper course ✓✓

OR

- Lateral erosion ✓✓
 Rounded slopes of valley ✓✓
 Valley is widening ✓✓
 Symmetrical profile ✓✓
 Mass wasting along slopes ✓✓
 Middle course ✓✓

[Any ONE] (2 x 2) (4)

- (c) Width of a river ✓✓
 Depth of a river ✓✓
 Fluvial stage of river ✓✓
 Rock type/resistance ✓✓
 Shape of the valley ✓✓
 Gradient of river ✓✓
 Could indicate rejuvenation ✓✓

[Any TWO] (2 x 2) (4)

- 1.3 A meander is a bend along the course of a river ✓✓
 After heavy rainfall the water is fast flowing and cuts/erodes into the outer bank (undercut slope) of a river ✓✓
 Meander neck is reduced ✓✓
 Water is slow moving on the inner bank (slip-off) resulting in deposition ✓✓
 After a period of time when the river cannot negotiate the bend, it will cut through the meander neck (cut off the loop), forming an ox-bow lake ✓✓
 Stream will now follow a straight path ✓✓
 River will start to meander again ✓✓
 The meandering river migrates ✓✓

[Any FOUR] (4 x 2) (8)

- 1.4 Contamination of water – cannot be used for domestic purposes ✓✓
 Cholera ✓✓
 Affects the health of people ✓✓
 Reduces food supply from the river ✓✓
 Loses scenic beauty ✓✓
 Limits recreational activities ✓✓
 Reduce income ✓✓

[Any TWO. Accept reasonable answer] (2 x 2) (4)

[24]

QUESTION 2

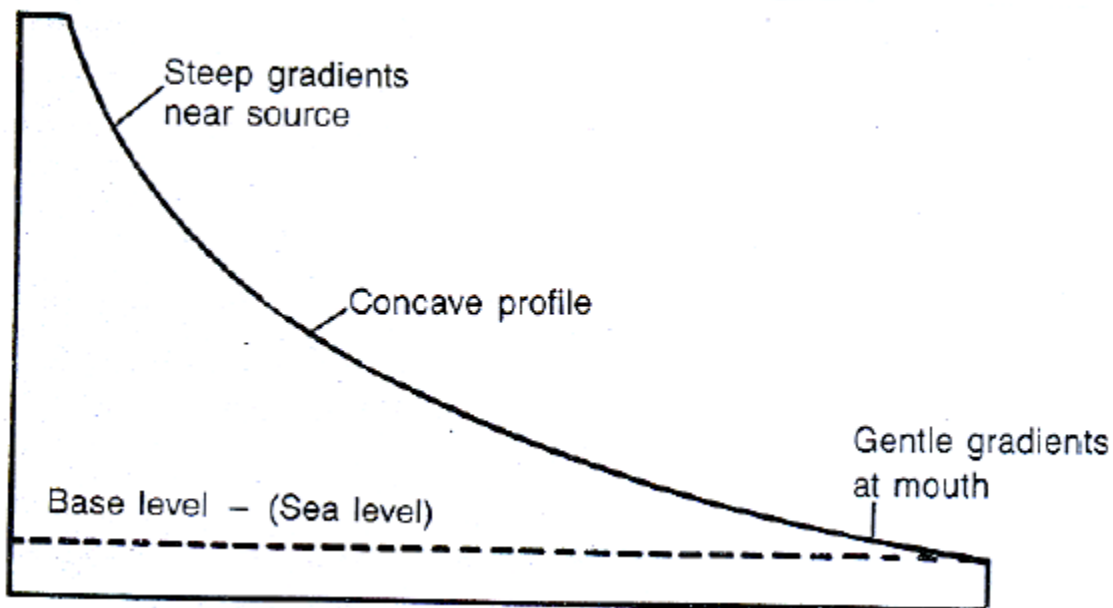
- 2.2.1 S ✓✓
 2.2.2 Headward ✓✓
 2.2.3 Misfit ✓✓
 2.2.4 T ✓✓
 2.2.5 Windgap ✓✓

(5 x 2) [10]

QUESTION 3

- 3.1 (a) Smooth profile showing a river in which there is an equilibrium between erosion and deposition ✓✓ [CONCEPT] (1 x 2) (2)
 (b) The lowest level to which a river can erode ✓✓ [CONCEPT] (1 x 2) (2)
 3.2.

(1 x 2) (2)



- 3.3 Knick-point ✓✓ New base level ✓✓
New graded profile ✓✓

[Any ONE] (1 x 2) (2)

- 3.4 Drop in base level ✓✓
Land rises ✓✓
Periods of glaciation ✓✓
Prolonged higher rainfall ✓✓
Tectonic change in the landscape ✓✓
Global warming increase melt water ✓✓

[Any TWO] (2 x 2) (4)

3.5 Advantages

- Water can be stored ✓✓
Can be used for household purposes ✓✓
Can be used for irrigation ✓✓
Can be used for industries ✓✓
Infrastructural development ✓✓
Economic advantages ✓✓
Flood control (✓✓
Periodic stream can become permanent ✓✓
Recreational facilities and tourism ✓✓

Disadvantages

- Characteristics of the river channel will change (✓✓
Lower reaches of the river may be dry most of the time ✓✓
People living in the lower reaches might not be able to practice crop farming ✓✓
Flow characteristics of river will also change ✓✓
Displacement of local inhabitants ✓✓
Local ecosystems destroyed ✓✓

[Accept other reasonable answers]

[Any SIX. Must give advantages and disadvantages] (6 x 2) (12)

SECTION C: HOMEWORK

QUESTION 1: 5 minutes

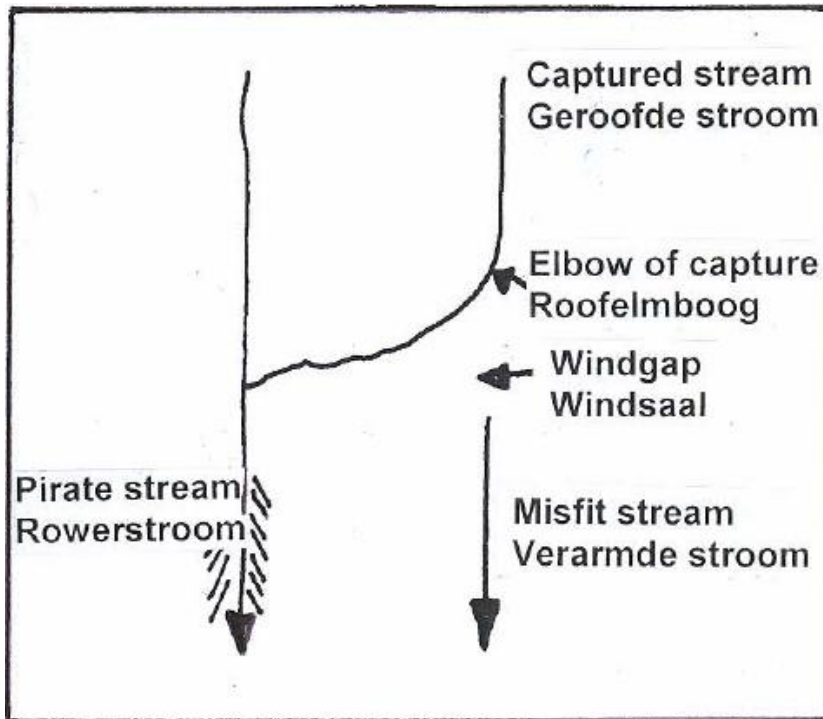
10 marks

(Source: DoE November 2009)

Refer to the figure on the following page showing different features of river capture. Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number as an answer.

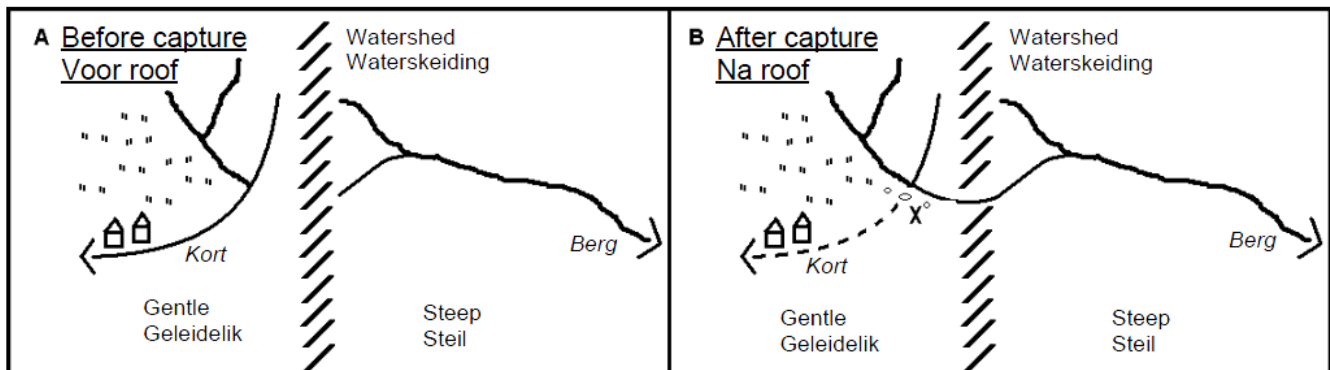
- 1.1 A stream whose headwaters have been intercepted.
1.2 A stream that is smaller than the valley through which it flows.
1.3 The point where an energetic stream intercepts the water of another stream.
1.4 A dry valley where no stream flows.
1.5 A stream that intercepts the water of another stream.

(5 x 2) [10]



QUESTION 2: **20 minutes** **24 marks** (Source: DoE November 2010)

2. The FIGURE below illustrates the concept of river capture/stream piracy.



- 2.1 Name ONE factor which could have resulted in the Berg River eroding through the watershed to capture the Kort River. (1 x 2) (2)
- 2.2 Name TWO features of river capture that could develop at point X. (2 x 2) (4)
- 2.3 Why is the beheaded stream (Kort River) in sketch B referred to as a misfit stream? (1 x 2) (2)
- 2.4 Name TWO effects that river capture has on the captor stream (Berg River) in sketch B. (2 x 2) (4)
- 2.5 Write a single paragraph (no more than 12 lines) presenting a detailed report on how river capture influences human activities along the Kort and the Berg Rivers respectively. (6 x 2) (12)

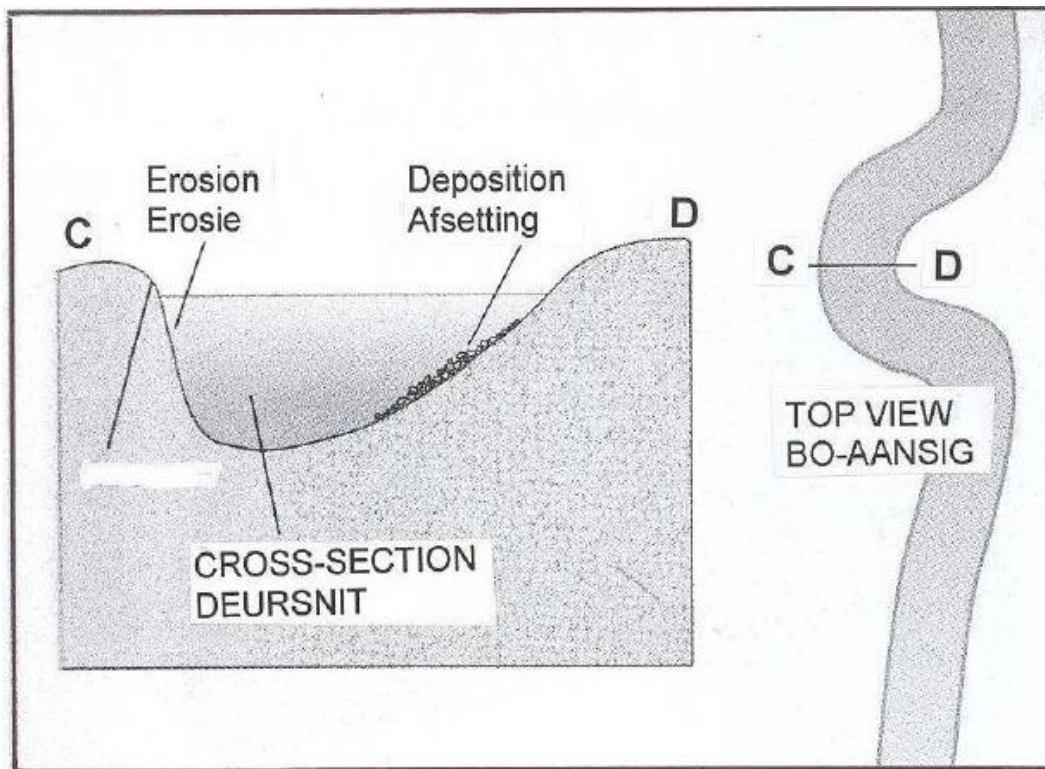
[24]

QUESTION 3: **12 minutes** **12 marks** (Source: DoE March 2009)

Refer to the figure below illustrating the cross profile of a river, before answering the questions that follow.

- 3.1 Identify the river banks (slopes) C and D respectively. (2 x 2) (4)
- 3.2 Why does deposition occur on the inner bend? (1 x 2) (2)
- 3.3 Give and explain ONE way in which a river carries its load. (2 x 2) (4)
- 3.4 Explain why flooding is more likely to occur after heavy rains along the bend of a river. (1 x 2) (2)

[12]

**SECTION D: SOLUTIONS TO HOMEWORK****QUESTION 1**

- 1.1 Pirated / captured / beheaded stream ✓✓
- 1.2 Misfit / beheaded ✓✓
- 1.3 Elbow of capture ✓✓
- 1.4 Windgap / dry gap ✓✓
- 1.5 Captor / pirate stream ✓✓

(5 x 2) [10]

QUESTION 2

- 2.1 Flowing through a steeper gradient ✓✓
 River has a higher velocity therefore rate of erosion is high ✓✓
 River could be flowing on softer rock ✓✓
 Higher rainfall ✓✓
 River could have had a lower flow level ✓✓ [Any ONE] (1 x 2) (2)
- 2.2 River gravels ✓✓
 Windgap/dry gap ✓✓
 Waterfall ✓✓
 Knickpoint ✓✓
 Elbow of capture ✓✓ [Any TWO] (2 x 2) (4)
- 2.3 Very little water in a large valley ✓✓
 Stream seems too small for the valley it occupies ✓✓
 River deprived of headwater ✓✓ [Any ONE. Concept] (1 x 2) (2)
- 2.4 It has an increased volume of water ✓✓
 The drainage basin increases ✓✓
 More erosive power/energy ✓✓
 The river could be rejuvenated ✓✓
 Downward erosion at a faster rate ✓✓ [Any TWO] (2 x 2) (4)
- 2.5 Shortage of water downstream in the captured river (Kort River) ✓✓
 Could affect farming activities along captured river (Kort River) ✓✓
 Could affect fishing activities along captured river (Kort River) ✓✓
 Less water for the generation of electricity ✓✓
 Affect recreational activities because of less water in captured river (Kort River) ✓✓
 Possibility of flooding along the captor stream/Berg River ✓✓
 Excess water will wash away settlements and make it unsafe ✓✓
 Cultivated land washed away (Berg River) ✓✓
 Negative economic impact on farming (Kort River) ✓✓
 After flooding fertile sediments deposited on flood plain (Berg River) ✓✓
 Farming activities increase along the Berg River ✓✓
 Positive impact on farming economy ✓✓

[Any SIX – Accept other reasonable answers. Must refer at least ONCE to the Kort River catchment or the Berg River]

[If listed and only words/phrases used, **ONE** mark. If full sentences used, **TWO** marks]
 (6 x 2) (12)

QUESTION 3

- 3.1. C – Cutback/Undercut ✓✓
D – Slip off ✓✓

(2 x 2) (4)

- 3.2. Water flows slower ✓✓
Stream loses energy and cannot carry its load ✓✓

[Any ONE] (1 x 2) (2)

- 3.3 Fine soluble particles dissolve in water ✓✓ and are transported as solution load ✓✓
Fine, insoluble is carried in suspension ✓✓ and is transported as suspension load ✓✓
Particles too heavy to be carried in suspension; (gravel, sand) is lifted and deposited ✓✓ to bounce along as the saltation load ✓✓
Large stones and rocks are rolled along the riverbed ✓✓ and are transported as the bed load / traction load ✓✓

[Refer to any ONE method of transportation] (2 x 2) (4)

- 3.4 Velocity increases; water can't negotiate the bend and river bursts its banks ✓✓

(1 x 2) (2)

[12]

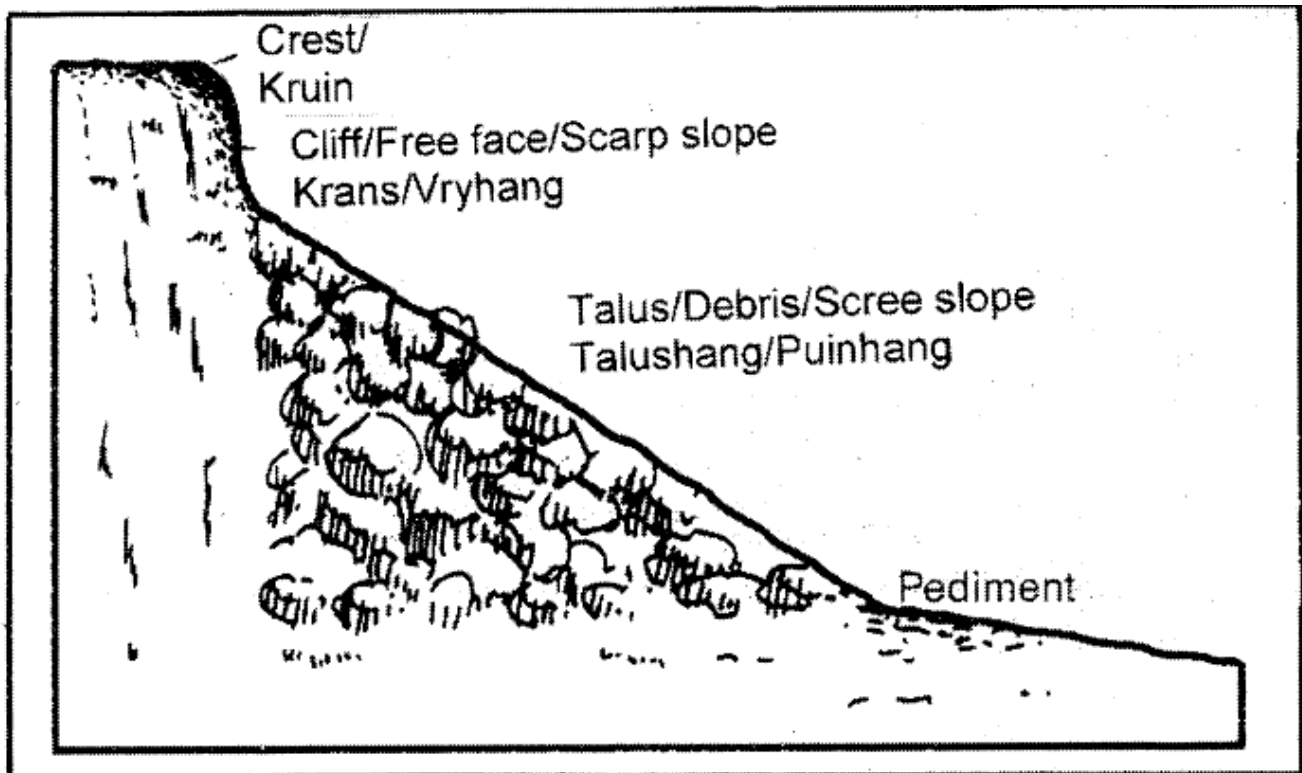
TOPIC 1: FLUVIAL LANDFORMS, CATCHMENT AND RIVER MANAGEMENT, SLOPES AND MASS MOVEMENT

Teacher Note: There are always questions on these sections in the exams. It is relatively easy and, therefore, learners should gain good marks in these questions. Build their confidence and ensure that they know this work.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **5 minutes** **10 marks** (Source: DoE March 2010)

Use the figure below showing the four slope elements to assist you in giving ONE word/term for each of the following descriptions. Write only the term next to the question number, for example 1.6 base flow. The same term may be used more than once.

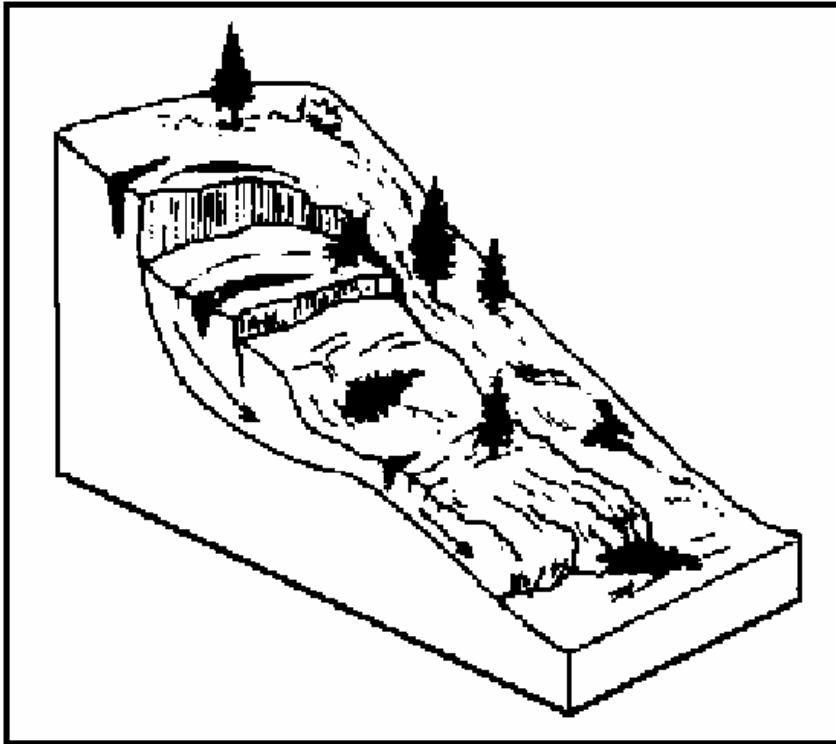


- 1.1 Slope element with a convex shape
 - 1.2 Low-angle slope element
 - 1.3 Soil creep occurs on this slope element
 - 1.4 Slope element that is a rocky, vertical outcrop
 - 1.5 Slope element composed mainly of weathered material
- (5 x 2) [10]

HINTS: Slopes elements are always in the papers; they are easy marks so study them well.

QUESTION 2: 25 minutes**32 marks***(Source: DoE November 2010)*

The figure below contains information on a type of mass movement (mudslide).



400 buried in Taiwanese mudslide

Taipei: A mudslide touched off by a typhoon has buried a mountain village in Taiwan, leaving at least 400 people unaccounted for. Typhoon Morakot slammed Taiwan over the weekend with 2 000 mm of rain. A disaster appeared to be unfolding at the southern village of Shiao Lin, hit by a mudslide on Sunday and now cut off by land from the outside world. A Taiwanese official said 400 people were unaccounted for in the village.

- 2.1. What evidence in the sketch indicates that a mudslide has occurred? (2 x 2) (4)
- 2.2. How was typhoon Morakot responsible for triggering the mudslide in Taiwan? (2 x 2) (4)
- 2.3. State the economic impact of mass movements on small villages like the one in Taiwan. (4 x 2) (8)
- 2.4. Suggest four ways in which humans are responsible for causing mass movements. (4 x 2) (8)

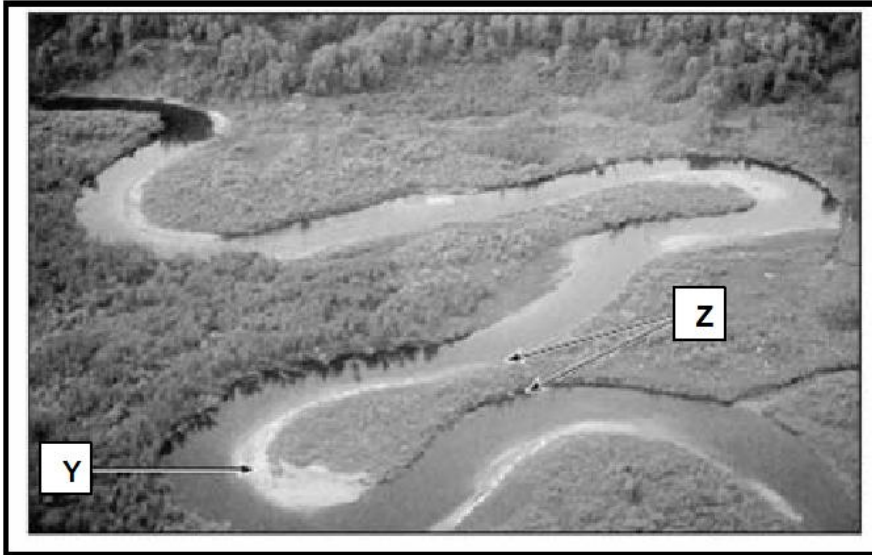
- 2.5. Explain what precautionary measures (methods) people should adopt (put in place) before using slopes for development. Mention four measures.

(4 x 2) (8)

[32]

QUESTION 3: **5minutes** **10 marks** (Source: DoE November 2010)

Study the figure below showing a photograph of a section of a river. Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number.



- 3.1. The feature labelled Y is a/an ...
- A undercut slope.
 - B slip-off slope.
 - C ox-bow lake.
 - D dip slope.
- 3.2. The section of the river shown in the photograph is in its ... course.
- A upper
 - B middle
 - C lower
 - D base
- 3.3. During a flood the river is likely to break through at point Z, resulting in the formation of a/an ...
- A rapid.
 - B ox-bow lake.
 - C meander.
 - D floodplain.

- 3.4 The river shown in this photograph flows throughout the year and is, therefore, referred to as ...
- A episodic.
 - B permanent/perennial.
 - C seasonal.
 - D periodic.
- 3.5 The river shown in this photograph displays a ... stream channel pattern.
- A dendritic
 - B braided
 - C rock-controlled
 - D meandering
- (5 x 2) [10]

HINTS: Learners must always give an answer and never leave an answer out. They must write capital letters as answers when answering multiple-choice questions so as to prevent confusion.

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

- 1.1 Crest ✓✓
 - 1.2 Pediment ✓✓
 - 1.3 Crest ✓✓
 - 1.4 Cliff/ Free face/Scarp slope ✓✓
 - 1.5 Talus/Debris/Scree slope ✓✓
- (5 x 2) [10]

QUESTION 2

- 2.1 Bending/falling over of trees. ✓✓
The steep break in the upper slope. ✓✓
Arrows show the movement of mud downslope ✓✓
 - 2.2 Heavy (2 000 mm) rain/floods ✓✓
Soil became saturated ✓✓
 - 2.3 Mud destroys agricultural land ✓✓
Less food production ✓✓
Loss of jobs ✓✓
Damage to infrastructure ✓✓
Much capital spent on restoration of infrastructure ✓✓
Houses destroyed ✓✓
Costly to rebuild ✓✓
Loss of lives ✓✓
- [Any TWO] (2 x 2) (4)
- [Any TWO] (2 x 2) (4)
- [Any FOUR. Accept other reasonable answers] (4 x 2) (8)

- 2.4 Deforestation/clearing of vegetation ✓✓
 Building on steep slopes ✓✓
 Poor drainage ✓✓
 Down-slope ploughing ✓✓
 Allowing too many tourists on steep slopes that dislodge rocks ✓✓
 Overloading slopes with buildings ✓✓
 Blasting ✓✓
 Road construction and quarrying upset the balance of slopes ✓✓
 Non-engineered construction of roads on slopes ✓✓
 [Any four. Accept any other reasonable answers] (4 x 2) (8)

- 2.5 Plant trees to bind the soil ✓✓
 Stabilise the slopes by erecting wire meshes ✓✓
 Place stone walls, nuts and bolts, ground anchors, buttresses, drainage channels, drill bolts into the side of the hill slopes ✓✓
 Anti-erosion fence / wall ✓✓
 Cement barriers ✓✓
 Spray slopes with concrete ✓✓
 [Any FOUR. Accept any other reasonable answers] (4 x 2) (8)

[32]**QUESTION 3**

- 3.1 B ✓✓
 3.2 C ✓✓
 3.3 B ✓✓
 3.4 B ✓✓
 3.5 D ✓✓ (5 x 2) **[10]**

SECTION C: HOMEWORK**QUESTION 1: 25 minutes 28 marks** (Source: DoE November 2009)

Read the information given below and use the accompanying sketches to answer the questions

- 1.1. Define the term mass movement. (1 x 2) (2)
 1.2. Match the types of mass movement illustrated in sketches (i) and (ii) in figure 1A with the slopes P and Q in figure 1B respectively. In each case, give ONE reason for your choice. (4 x 2) (8)
 1.3. Identify the slopes P and Q in the sketch above. (2 x 2) (4)
 1.4. State the main difference between the two types of mass movement illustrated in sketches (i) and (ii) in FIGURE 1A. (1 x 2) (2)

- 1.5. Poor management of slopes, such as deforestation and poor farming methods, has a detrimental effect on economic activities along these slopes. With reference to the article below and sketch (ii) in FIGURE 1A, write a short essay (no more than 12 lines), highlighting man's contribution to increasing mass movements along slopes, the economic consequences thereof, and what could be done to rectify the situation.

(6 x 2) (12)
[28]

CAUSE AND MANAGEMENT OF MASS MOVEMENTS

Landslides cause destruction of lives and property and also displacement of large numbers of people. There are instances where whole villages have been totally destroyed by landslides.

Apart from the natural factors, man's unwarranted intervention with the environment by way of deforestation, cultivation on slopes, non-engineered construction, obstructing natural drainage, improper drainage, mining and quarrying causing artificial vibration coupled with continuous heavy rainfall or excessive rainfall, may lead to landslides.

The National Building Research Organisation (NBRO) of Sri Lanka is an institution responsible for giving timely information of an impending landslide. In order to identify landslide-prone areas, a Landslide Hazard Zonation Mapping project is in progress in this country. Research has been undertaken in respect of hydrology, geology, slope and soil types for identification of different hazard potential. The NBRO promotes the following:

- Mapping of the distribution of landslides hazard potential in the highlands of Sri Lanka.
- Introduction of standard guidelines and codes on practices for planning human settlements and infrastructure in the landslide-prone areas.
- Establishment of sustained long-term and short-term mechanisms for landslide disaster management in Sri Lanka.

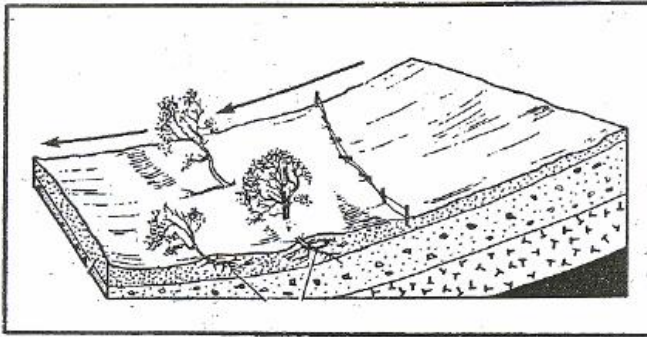
Landslide occurrences are closely associated with rainfall. Therefore, the Meteorology Department also plays an important role by providing weather-related information.


The NBRO also promotes the creation of public awareness about causative factors of landslides. The factors that should be considered, while being watchful during heavy rainfall, can be summarised as follows:

- Big boulders would start moving.
- Trees would slant towards the slope.
- Cracks would appear on the walls and other structures.
- Springs and water spouts would appear and there will be a rise in the water level.
- The earth itself would show cracks and fractures.

Figure 1A

Sketch (i)



uu uu uu	Cultivated land
uu uu uu	Bewerkte landerye
	Impermeable rock
	Nie-deurlaatbare rots

Sketch (ii)

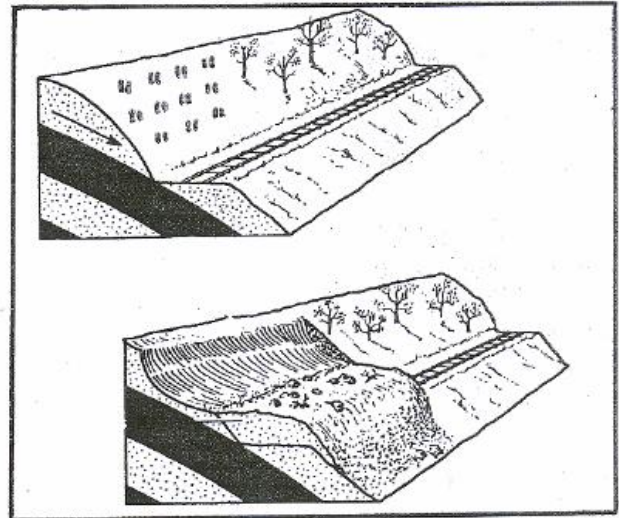
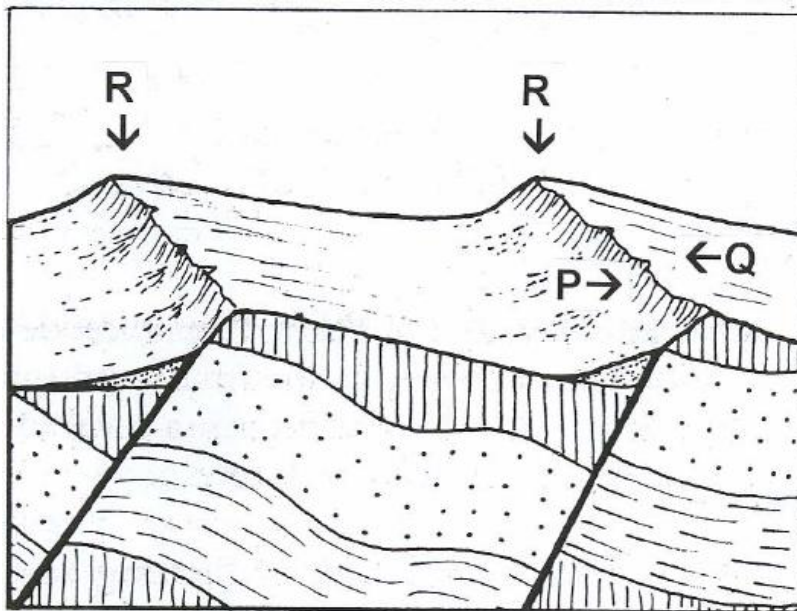


Figure 1B

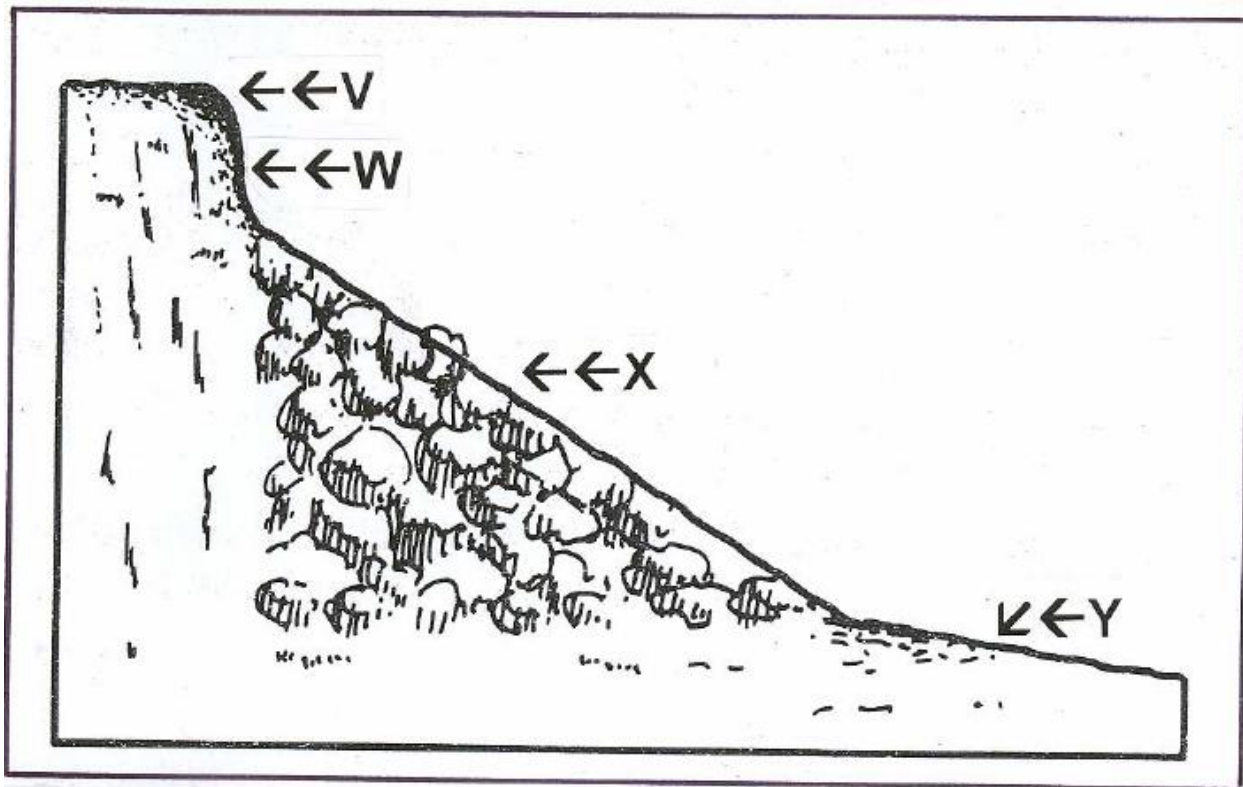


Key / Sleutel

	Soft rock
	Sagte rots
	Resistant rock
	Weerstandbiedende rots
	Fault line
	Verskuiwingslyn

QUESTION 2: **5 minutes** **10 marks** (Source: DoE November 2009)

Refer to FIGURE 2.2 illustrating the four slope elements/forms. Choose the correct term from those given in brackets to make all the statements below TRUE. Write only the term next to the question number.

**Figure 2.2**

- 2.1. The landform illustrated in the figure above is associated with (tilted/horizontal) sedimentary rock layers.
- 2.2. Slope element W is called the (crest/cliff).
- 2.3. Slope element W consists of (soft/resistant) rock.
- 2.4. The angle at which slope element X develops (remains constant/changes constantly).
- 2.5. Slope element Y gets (wider/narrower) as slope element X retreats. (5 x 2) [10]

SECTION D: SOLUTIONS TO HOMEWORK

QUESTION 1:

- 1.1. Bulk movement of material down a slope under the influence of gravity ✓✓
[Concept] (1 x 2) (2)
- 1.2. (i) = Q ✓✓
Reason: Slope is gentle ✓✓
Slow movement ✓✓ [Any ONE reason]
- (ii) = P ✓✓
Reason: Slope is steep ✓✓
Fast movement ✓✓ [Any ONE reason] (4 x 2) (8)

1.3. P: Scarp ✓✓

Q: Dip ✓✓

(2 x 2) (4)

1.4. Speed of the movement of materials down the slope ✓✓

Volume / quantity of material moving down the slope ✓✓

[Any ONE] (1 x 2) (2)

1.5. **Man's contribution:**

Deforestation destabilises slope ✓✓

Cultivation on slopes destabilises slope ✓✓

Non-engineered construction of roads / railways loosens rock particles ✓✓

Obstructing natural drainage increases water in soil ✓✓

Improper drainage increases water in soil ✓✓

Mining and quarrying loosen the rock particles ✓✓

Economic consequences:

Destruction of settlements ✓✓

Destruction of infrastructure ✓✓

Railway line blocked ✓✓

Goods cannot be transported ✓✓

Destruction of cultivated lands ✓✓

Expensive to rebuild ✓✓

Loss of property ✓✓

Measures:

Concrete spraying on slopes ✓✓

Building tunnel roofs ✓✓

Wire mesh ✓✓

Gabions (building of retaining walls) ✓✓

Drilling of bolts into the side of slopes to stabilise slopes ✓✓

Cause artificial rockfalls to clear debris ✓✓

Reforestation or revegetation ✓✓

Putting up wire nets to catch falling rock particles ✓✓

Mapping of landslide hazards ✓✓

Guidelines for planning human settlements and infrastructure ✓✓

Landslide disaster management strategies ✓✓

Avoid developing settlements on slopes ✓✓

No cultivation on slopes ✓✓

(6 x 2) (12)

[Must make at least ONE reference to each of the THREE aspects.]

Single marks only if answered in point form and not in paragraph /essay style]

[28]

QUESTION 2

- 2.1 Horizontal ✓✓
- 2.2 Cliff ✓✓
- 2.3 Resistant ✓✓
- 2.4 Remains constant ✓✓
- 2.5 Wider ✓✓

(5 x 2) [10]

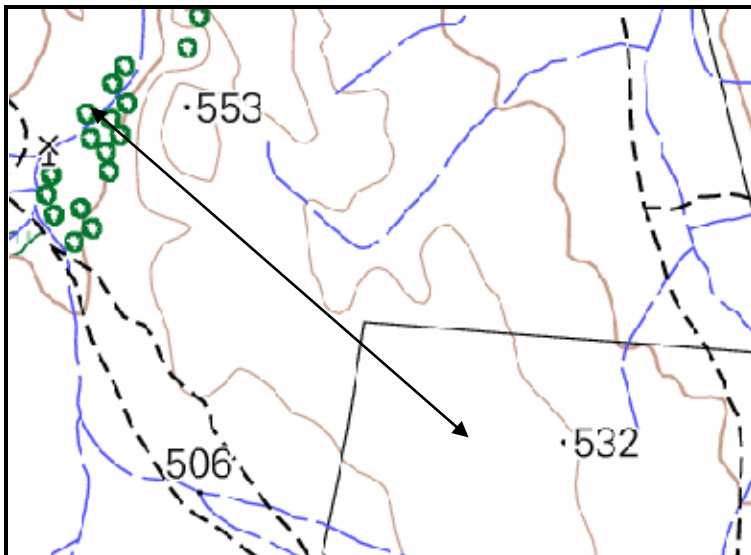
TOPIC 2: MAP CALCULATION

Teacher Note: The calculations part of the mapwork paper counts 20 marks and learners should get good marks here. They must study formulas and make sure that they measure correctly. In this topic we will focus on the calculations part of Paper 2.

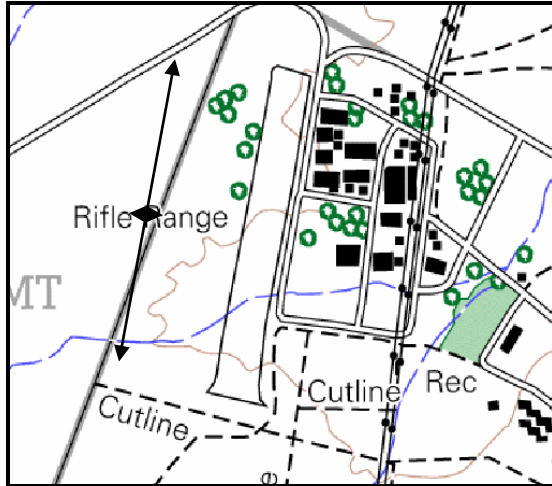
SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **45 minutes** **37 marks** (*Source: DoE Nov 2009 and March 2010*)

- 1.1 The diagram below is a cross-section from spot height 578 (A) to spot height 553 (B) on the orthophoto map.
- 1.1.1 Are features P and R intervisible? (1)
- 1.1.2 Give ONE reason for your answer to QUESTION 1.1.1. (1)
- 1.1.3 Calculate the vertical exaggeration for the given cross-section. Show ALL your calculations. The vertical scale is 1cm: 5m and the horizontal scale is 1:50 000. (4)
- 1.2 Calculate the average gradient between spot height 532 (F3) and spot height 553 (E2) on the topographical map. Show ALL your calculations. (The distance should be 2.5cm but it can be wrong due to reduced notes.) (5)



- 1.2.1. Would you consider the gradient that you have calculated in QUESTION 1.2. to be steep or gentle? (1)
- 1.2.2 Explain your answer to QUESTION 1.2.1. (2)
- 1.2.3 Give evidence from the topographical map to support your answer to QUESTION 1.2.2. (1)
- 1.3. Calculate the area of the rifle range (E) on the map in km². Show ALL your calculations. (6)
- (This calculation will only be correct if the length is 2cm on the notes)



- 1.4. Determine the present magnetic bearing from trigonometrical station 17 (G1) to Spens Shaft (F5). Use the map clips that follow to do your measurements. (8)

Use the following steps as a guide:

Date of map:

Magnetic declination:

Mean annual change:

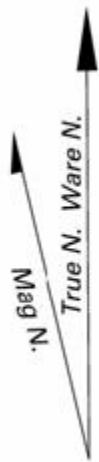
Difference in years:

Total annual change:

Magnetic declination in 2010:

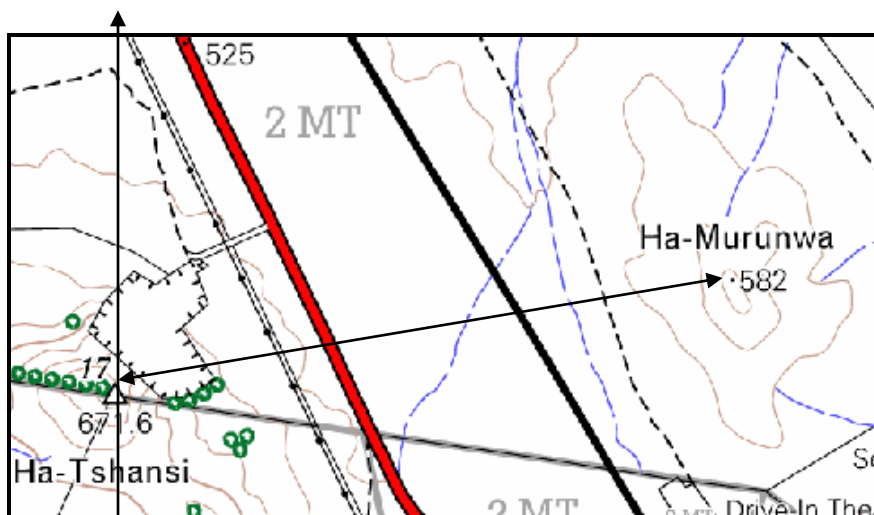
True bearing:

Present magnetic bearing:

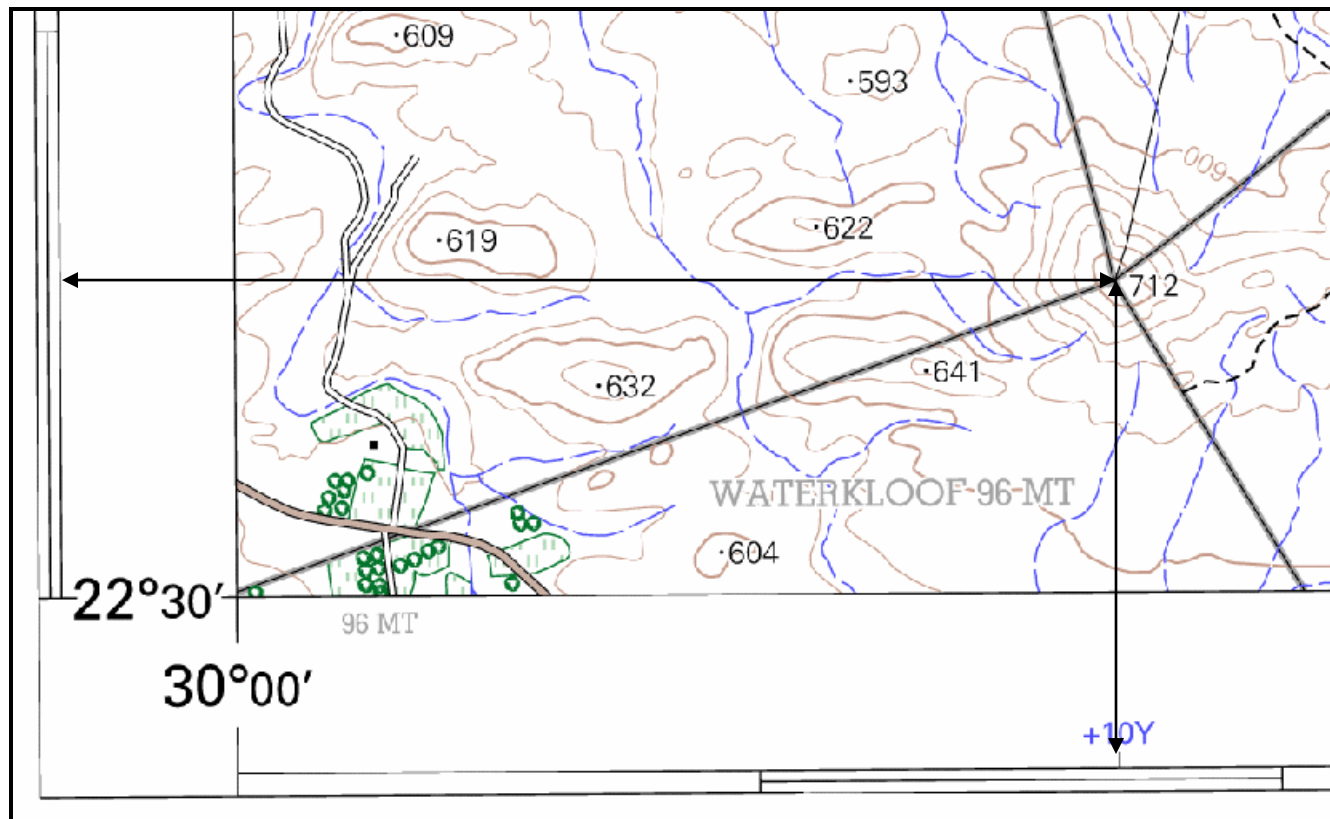


Mean magnetic declination 12°57' West of True North(July 2002).
Mean annual change 7' Westwards(2000–2005).
Supplied by Hermanus Magnetic Observatory.

Gemiddelde magnetiese deklinasie 12°57' Wes van Ware Noord(Julie 2002).
Gemiddelde jaarlikse verandering 7' Weswaarts(2000–2005).
Voorsien deur die Hermanus Magnetiese Observatorium.



- 1.4.1. Which one, the topographical map or the orthophoto map, has a larger scale? (1)
- 1.4.2. Motivate your answer in 1.4.1. (3)
- 1.5. Give the co-ordinates (fix the position) of spot height 712. (4)

**HINTS**

Hint 1 – These answers count less than the rest of the mapwork or theory.

Hint 2 – Learners must start with the formula and show all calculation – each step counts a mark.

Hint 3 – Learners must have their own map work equipment and know how to use it

Hint 4 – Learners must never leave out questions in this section. They must try.

Hint 4 – Calculations is a practical skill – practice makes perfect

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1.1. Yes ✓ (1)

1.1.2. No high-lying ground/obstructions between the two given points ✓ (1)
[Concept]

1.1.3. Vertical exaggeration = $\frac{\text{vertical scale}}{\text{Horizontal scale}}$ ✓
 $= \frac{1:500}{1:10\,000}$ ✓
 $= \frac{1}{500} \times \frac{10000}{1}$ ✓
 $= 20 \text{ times larger than horizontal scale}$ ✓ (4)

1.2.1. Vertical Interval/Rise/Distance = 553 m - 532 m 21 m ✓
 Horizontal Equivalent/Distance/Run = 2,5 cm x 500 (range: 2,4 cm – 2,6 cm)
 $= 1\,250 \text{ m}$ ✓ (Answer must be in meters)

[Accept any other method to calculate distance. Actual marks for measurement and answer.]

Gradient = $\frac{\text{Vertical Interval}}{\text{Horizontal Equivalent}}$ ✓
 $= \frac{21 \text{ m}}{1\,250}$ ✓
 $= 1/1:59,52$ ✓ (Range: 57 – 62)
 [ONLY answer give FULL marks. If answer is incorrect mark steps.] (5)

1.2.2. No ✓ (1)

1.2.3. You need to move 59.52 m ✓ horizontally to rise with 1m. ✓ (2)

1.2.4. Contours are far apart ✓ (1)

1.3. Length = 2 x 0,5 (range: 1,9 cm – 2,1 cm) ✓
 $= 1 \text{ km}$ ✓
 Breadth = 0.6 x 0,5 (range: 0.5 cm – 0.7cm) ✓
 $= 0,12 \text{ km}$ ✓
 Area = 1 km x 0,12 km ✓
 $= 0,12 \text{ km}^2$
 (Range: 0,11 km² - 0,13 km²) ✓ (6)

- 1.4. Date of map: 2002 ✓
Magnetic declination: $12^{\circ}57'W$ ✓
Mean annual change: $7'W$ ✓
Difference in years: 9 years ✓
Total annual change: $63'W$ ✓
Magnetic declination in 2010: $14^{\circ}W$ ✓
True bearing: $79^{\circ} - 81^{\circ}$ ✓
Present magnetic bearing: $93^{\circ} - 95^{\circ}$ ✓ (8)

- 1.5.1. Orthophoto map ✓ (1)

- 1.5.2. Orthophoto map shows more detail ✓
Smaller area shown on a large piece of paper ✓
Greater clarity on orthophoto map ✓
 $1:10\,000$ is a larger scale than $1:50\,000$ ✓ (3)

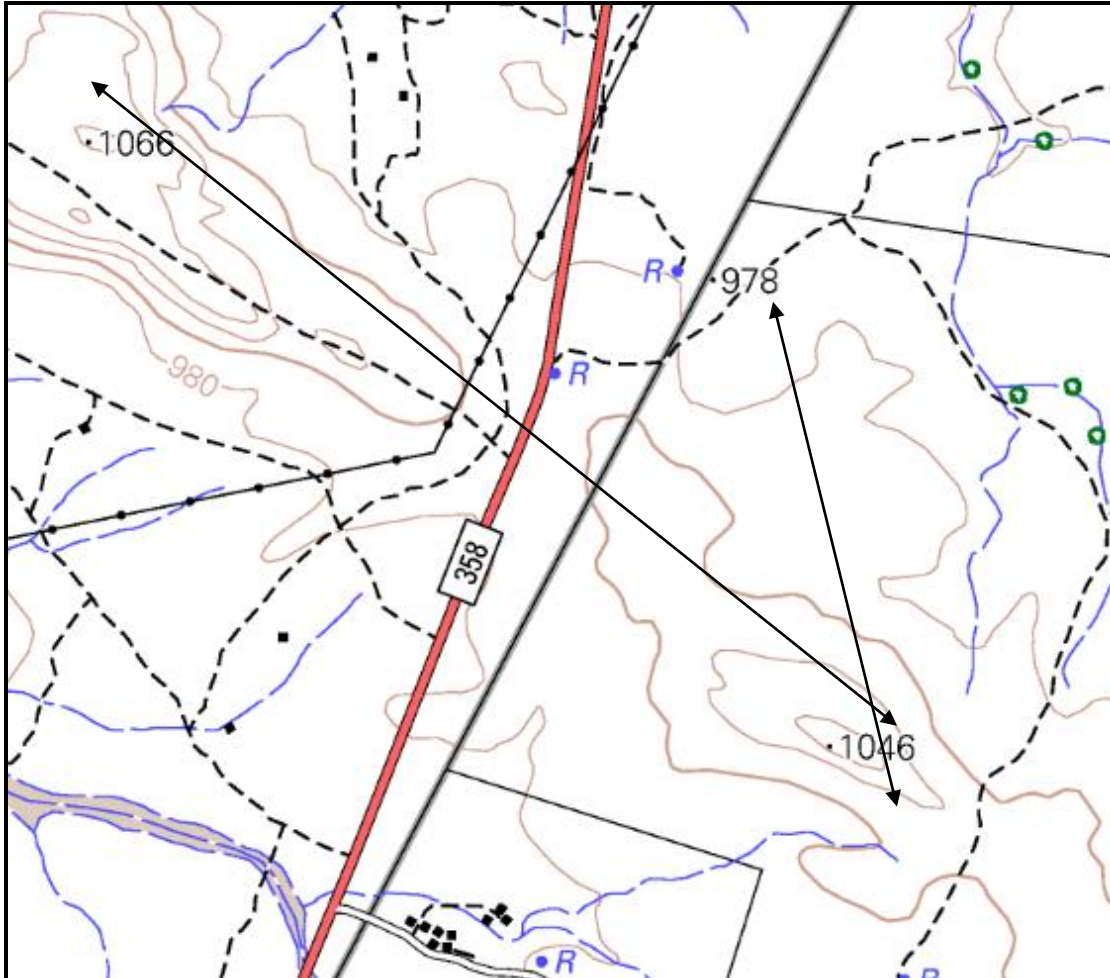
- 1.6. $22^{\circ}29'26''S$ ✓ ✓ $30^{\circ}01'42''E$ ✓ ✓ (4)

OR

- $22^{\circ}29,4'S$ ✓ ✓ $30^{\circ}01,7'E$ ✓ ✓ [37]

SECTION C: HOMEWORK

QUESTION 1: **30 minutes** **26 marks** (Source: Adapted from Nov.2008)



- 1.1. Calculate the area covered by the map clip above if the scale is 1: 50 000 (4)
- 1.2. Calculate the gradient between spot height 978 and 1046. (5)
- 1.3.1. Draw an accurate cross section from spot height 1066 to 1046. (8)

The vertical scale is 1cm represent 20m.
- 1.3.2. Calculate the vertical exaggeration for the cross section (4)
- 1.3.3. Indicate the road and power line on the cross section. (2)
- 1.3.4. Identify the landform you have drawn on the cross section. (1)
- 1.3.5. Why does the road pass through this landform? (2)

[26]

SECTION D: SOLUTIONS TO HOMEWORK**QUESTION 1**

1.1 Length = $4\text{cm} \times 0.5$

$$= 2\text{km} \checkmark$$

Breadth = $3.5\text{cm} \times 0.5$

$$= 1.75\text{km} \checkmark$$

Area = $L \times B \checkmark$

$$= 2\text{km} \times 1.75\text{km}$$

$$= 3.5\text{km}^2 \checkmark$$

(4)

1.2 Height difference: $1046\text{m} - 978\text{m} = 68\text{m} \checkmark$

Distance = $3.3\text{cm} \times 500$

$$1650\text{m} \checkmark$$

Gradient = $\frac{\text{Height}}{\text{Distance}} \checkmark$

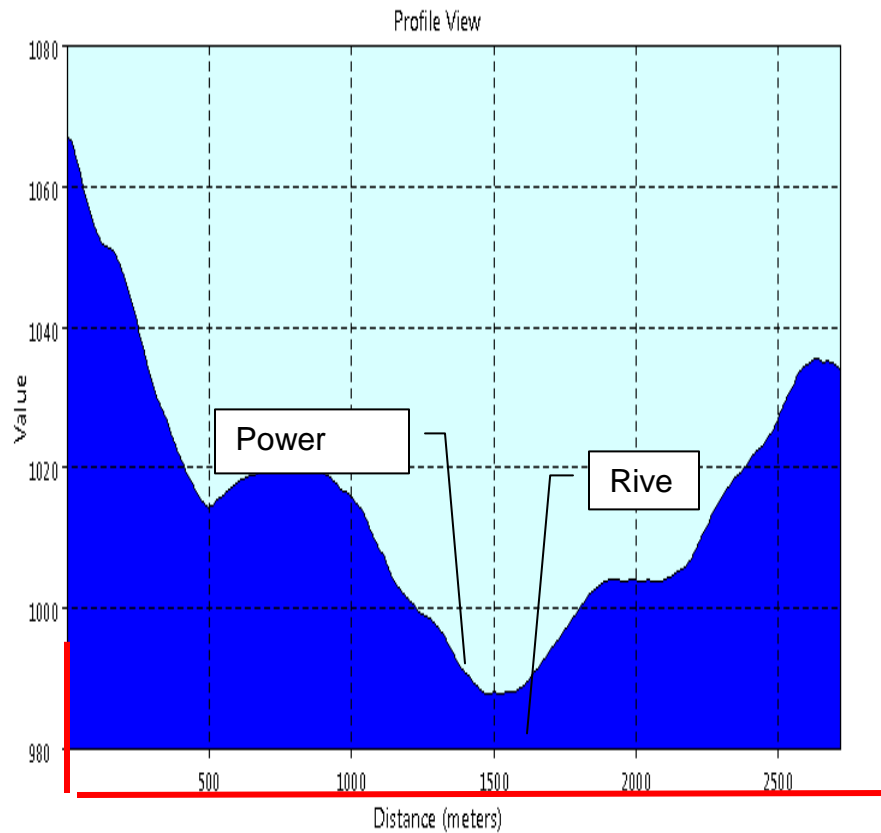
$$\text{Distance}$$

$$= \frac{68\text{m}}{1650\text{m}}$$

$$= 1/24.2 \checkmark$$

(5)

1.3.1. The shape must be the same but the size may differ.



Indicate vertical and horizontal scales ✓✓

Shape ✓✓✓✓✓✓

(8)

$$\begin{aligned}
 1.3.2. \text{ VE} &= \frac{\text{VS}}{\text{HS}} \quad \checkmark \\
 &= \frac{1}{2\,000} \quad \checkmark \\
 &= \frac{1}{50\,000} \\
 &= \frac{1}{2\,000} \times \frac{50\,000}{1} \quad \checkmark
 \end{aligned}$$

= The vertical scale is 25 times larger than the horizontal scale ✓ (4)

1.3.3. Mark on cross section – position of road and power line ✓✓ (2)

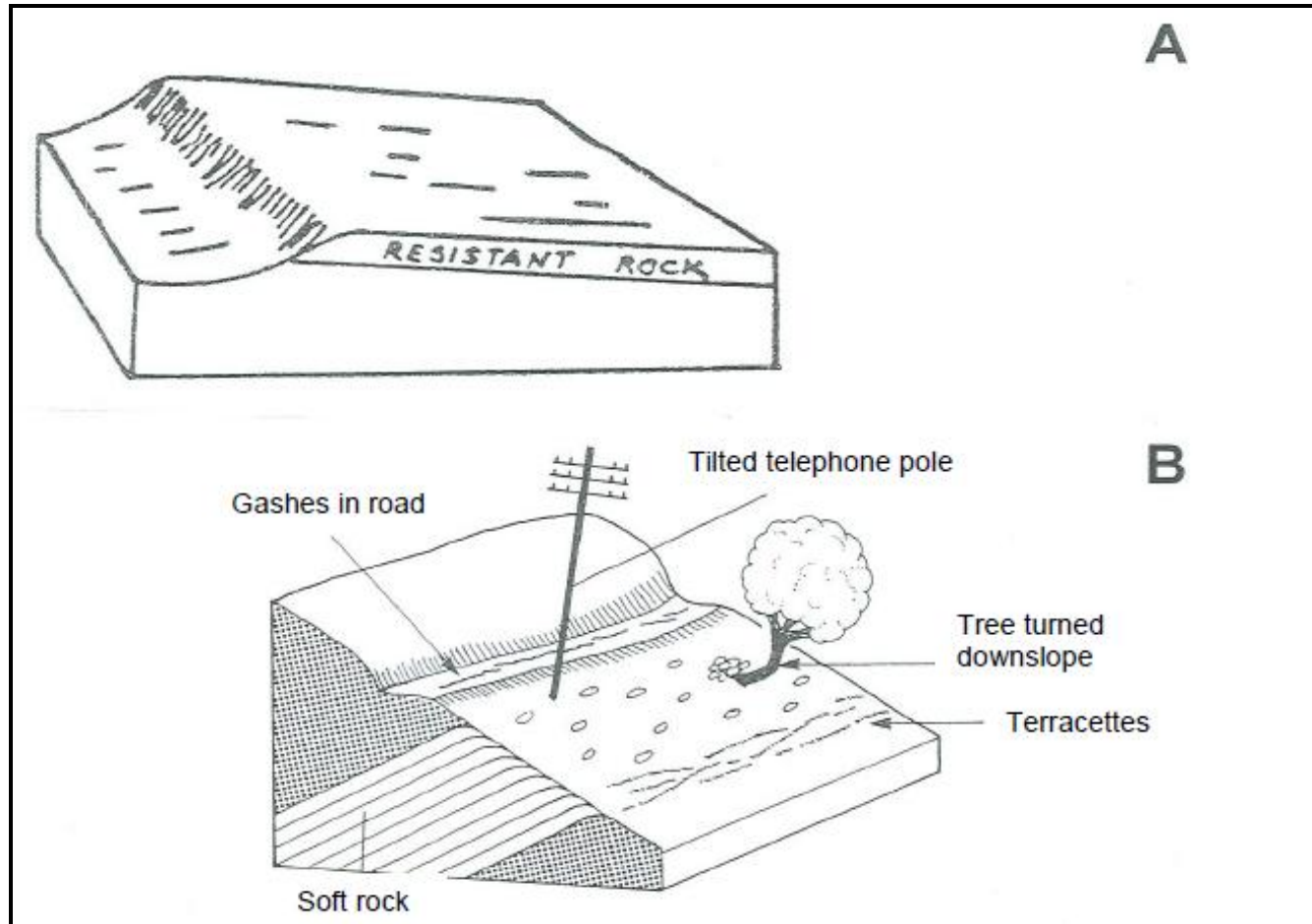
1.3.4. It is a pass through a ridge ✓ (1)

1.3.5. It is the lowest pass through a mountain and the road can stay more level than when it goes over the ridge. ✓✓ (2)

[26]

TOPIC 1: STRUCTURAL LAND FORMS

Teacher Note: This is often asked with reference to sketches and sketch maps. This work occurs in every exam paper. Learners must study it well. The questions are often asked in combination with other parts of the geomorphology or even climate information. This requires learners to be able to interpret the work in a new situation.

SECTION A: TYPICAL EXAM QUESTIONS**QUESTION 1: 20 minutes 24 marks***(DoE Exemplar 2008)*

1.1 Figure A above shows a landform typically found in South Africa. FIGURE B shows the process of mass movement that will take place on the slopes of the illustrated landform.

- Identify the landform (feature) illustrated in FIGURE A. (1 x 2) (2)
- Explain, with reference to the underlying rock structure, how the landform identified in QUESTION 1(a), developed. (3 x 2) (6)

GEOGRAPHY

GRADE 12

SESSION 7

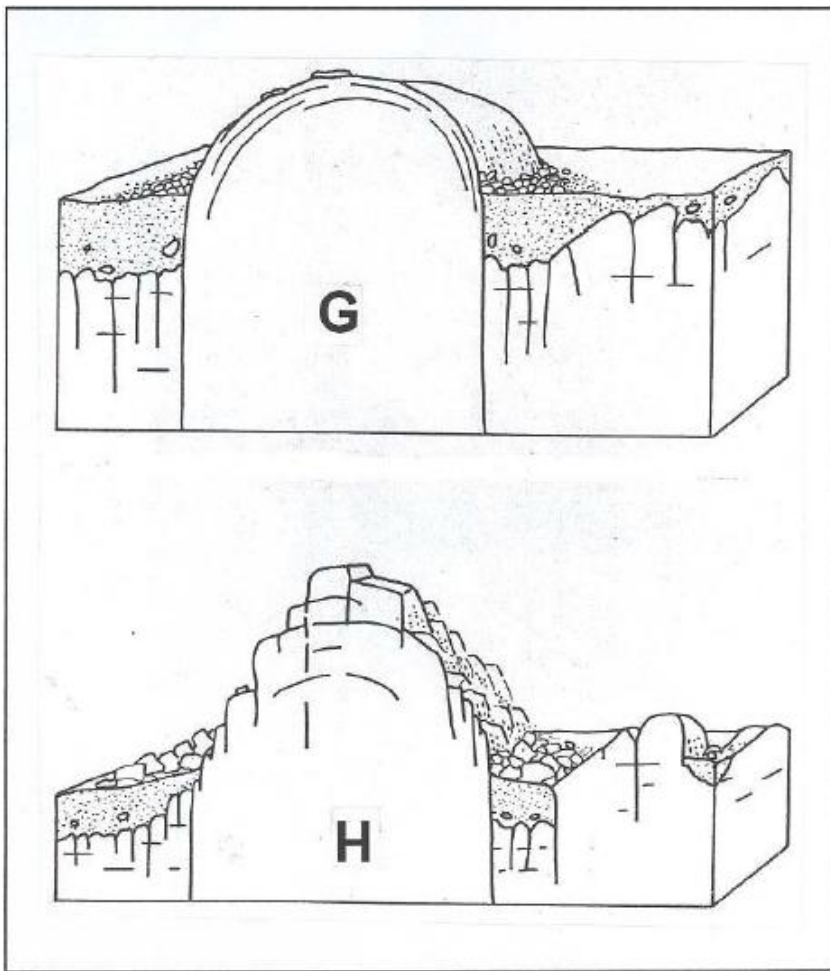
(TEACHER NOTES)

- 1.2 (a) What type of mass movement is illustrated in FIGURE B? (1 x 2) (2)
- (b) Provide evidence from FIGURE 1.4B that mass movement is taking place. (1 x 2) (2)
- (c) On which slope, the dip slope or the scarp slope, is mass movement more likely to take place? (1 x 2) (2)
- (d) Explain your answer to QUESTION 1.2(c). (2 x 2) (4)
- (e) Why do you think people should be made aware of the consequences of mass movement before building on slopes? (2 x 2) (4)
- (f) Name ONE way in which slopes can be stabilised (reinforced) to reduce mass movement. (1 x 2) (2)
- [24]

HINTS

Hint 1 – Look at the angle of inclination on the sketch; in this sketch it is less than 25°

Hint 2 – Know the sketches and definitions very well.

QUESTION 2:**15 minutes****22 marks***(Source: DoE March 2009)*

2. The FIGURE above illustrates the development of a structural landform associated with massive igneous rock.

GEOGRAPHY

GRADE 12

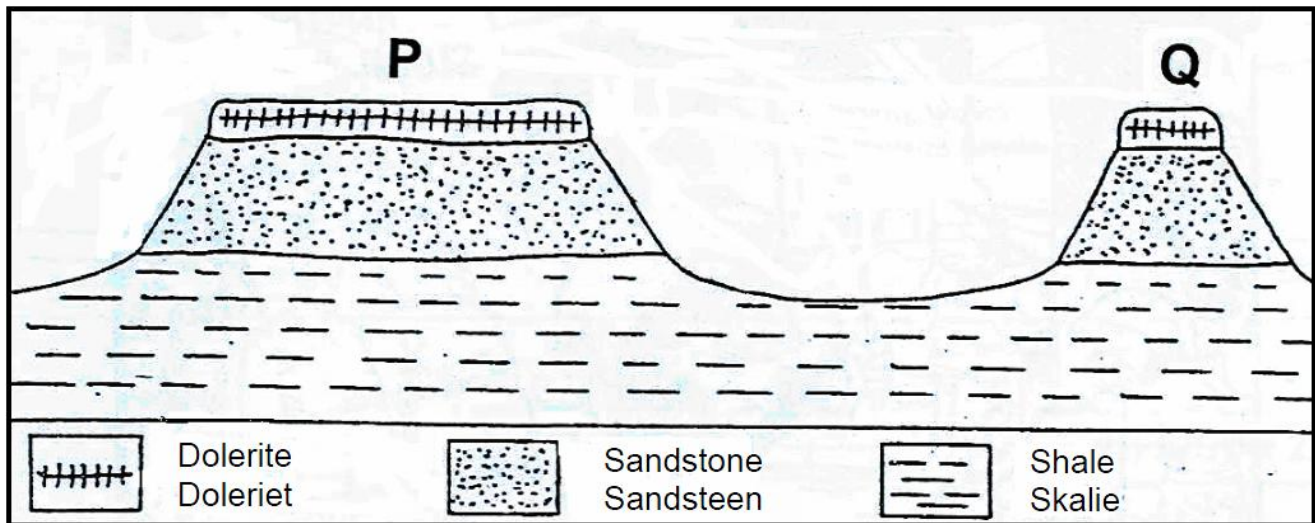
SESSION 7

(TEACHER NOTES)

- 2.1 Identify the landforms labelled G and H respectively. (2 x 2) (4)
- 2.2 Name the original underground igneous landform from which landforms G and H originated. (1 x 2) (2)
- 2.3 Briefly explain how landform H develops. (3 x 2) (6)
- 2.4 Briefly explain how landform G develops. (3 x 2) (6)
- 2.5. What drainage pattern will develop on landform G? (1 x 2) (2)
- 2.6. Explain why the drainage pattern you have identified in 1.5 will develop at G. (1 x 2) (2)
- [22]

QUESTION 3: 10 minutes 16 marks

(Source: DoE Nov 2010)



3. FIGURE 3 above illustrates a structural landscape typically found in the Karoo.
- 3.1 Identify landforms **P** and **Q** respectively. (2 x 2) (4)
- 3.2 What evidence in the FIGURE 3 suggests that landforms **P** and **Q** developed from the same landform that existed earlier? (2 x 2) (2)
- 3.3 Which rock type in the FIGURE 3 is the most resistant to erosion? (1 x 2) (2)
- 3.4 Give ONE reason for your answer to QUESTION 3.3. (1 x 2) (2)
- 3.5 Briefly describe how landform **P** will change into landform **Q**. (3 x 2) (6)
- [16]

QUESTION 4: 10 minutes 16 marks

(Source: DoE March 2010)

4. Refer to the figure below showing the development of a landscape associated with horizontal sedimentary rock. The three diagrams are not arranged in the correct order of development.
- 4.1 Arrange the three diagrams in the correct order of development by writing the letters that appear on the diagrams in the correct order. (3 x 2) (6)

- 4.2. The utilisation of landscape B by humans is limited. Explain the reason for this. (2 x 2) (4)
- 4.3. Which ONE of the diagrams illustrates a typical Karoo landscape? (1 x 2) (2)
- 4.4. Identify the landform in the diagram mentioned in QUESTION 4.3, that is typically found in the Karoo landscape. (1 x 2) (2)
- 4.5. Give a reason why cuestras will not develop in the landscape visible in the figure below: (1 x 2) (2)
- [16]

SECTION B: SOLUTIONS AND HINTS TO SECTION A: TOPIC 1
QUESTION 1

- 1.1 (a) Cuesta/Homoclinal ridge ✓✓ (1 x 2) (2)
- (b) Sedimentary rock layers tilted ✓✓
 Rock layers vary in resistance ✓✓
 Rock layers exposed to the Earth's surface ✓✓
 Soft rock erodes away to form valleys ✓✓
 Hard rock protrudes above surface to form ridges ✓✓ [Any THREE] (3 x 2) (6)
- 1.2 (a) Soil creep ✓✓ (1 x 2) (2)
- (b) Tilted telephone pole ✓✓
 Gashes in the road ✓✓
 Tree turned down slope ✓✓
 Terracettes formed on slope ✓✓ [Any ONE] (1 x 2) (2)
- (c) Scarp slope ✓✓ (1 x 2) (2)
- (d) Steeper slope ✓✓
 Stronger influence of gravity ✓✓
 Material more easily moved down the slope ✓✓ [Any TWO] (2 x 2) (4)
- (e) Buildings can be destroyed ✓✓
 Roads can be destroyed ✓✓
 Damage to buildings and roads could be costly ✓✓
 To take proper precautions before building ✓✓
 [Any TWO – Accept other] (2 x 2) (4)
- (f) Cover slopes with dense vegetation to stabilise the soil ✓✓
 Safety nets to catch falling materials ✓✓
 Lay down mesh wire to stabilise the soil ✓✓
 Create rock embankments to prevent movement down the slopes ✓✓
 Build "undercover" roads (tunnels) to protect vehicles ✓✓
 Do proper environmental impact assessment ✓✓ [Any ONE] (1 x 2) (2)
- [24]

QUESTION 2

- 2.1 G Dome ✓✓
H – Tor ✓✓ (2 x 2) (4)
- 2.2 Batholith/Laccolith ✓✓ (1 x 2) (2)
- 2.3 Batholith crack as weight on it is released due to weathering of rock and soil on top of it. ✓✓
Chemical weathering along cracks as ground water infiltrate cracks ✓✓
Rock mass exposed to Earth's surface ✓✓
Weathered material removed through erosion ✓✓
Rounded core stones remain behind ✓✓
[Order is important -Any THREE] (3 x 2) (6)
- 2.4 Batholith is exposed to surface due to erosion of softer rock and soil around it ✓✓
Dome is rounded by exfoliation of uneven parts on dome ✓✓
Dome stand out as one solid mass of igneous rock ✓✓ (3 x 2) (6)
- 2.5. Radial drainage pattern ✓✓ (1 x 2) (2)
- 2.6. Water will drain from the highest point in the middle of the dome in all directions as it is lower in all directions. ✓✓ (1 x 2) (2)
- [22]**

QUESTION 3

- 3.1 P – mesa/table mountain ✓✓
Q – Butte ✓✓ (2 x 2) (4)
- 3.2 They are joined at the base with shale rock ✓✓
They have same rock layers ✓✓
They have the same height and depth ✓✓
Both have same original height/cap rock ✓✓ [Any ONE] (1 x 2) (2)
- 3.3 dolerite/igneous ✓✓ (1 x 2) (2)
- 3.4 Back-wasting is taking place not downward wasting/downward erosion ✓✓
It is a hard layer of rock that caps (protects) P and Q ✓✓
Original height maintained ✓✓ [Any ONE] (1 x 2) (2)
- 3.5 Cap rock/igneous sill/dolerite reduced from the sides ✓✓
P reduces in size due to erosion by running water ✓✓
P reduces through rock falls ✓✓
Back-wasting occurs ✓✓
Slope retains the height ✓✓
Parallel retreat of slopes ✓✓
Eventually height of feature is greater than diameter ✓✓
[Any THREE] (3 x 2) (6)
- [16]**

QUESTION 4

- 4.1. B ✓✓ - C ✓✓ - A ✓✓ [Must be in correct order] (3 x 2) (6)

- 4.2 The landscape is arid ✓✓
 Coarse grained infertile soil ✓✓
 Narrow floodplain ✓✓
 River flows in deep, steep sided valley ✓✓
 Not suited for agriculture ✓✓
 Not suited for settlement ✓✓
 Development of infrastructure is limited ✓✓
 Only suitable for adventure tourism ✓✓

[Any TWO]

2 x 2) (4)

- 4.3 C ✓✓

(1 x 2) (2)

- 4.4 Mesa ✓✓

(1 x 2) (2)

- 4.5 Because it is horizontally layered ✓✓

(1 x 2) (2)

[16]

SECTION C: HOMEWORK: TOPIC 1

QUESTION 1: 10 minutes 16 marks

(Source: DoE Nov 2009)

Refer to the FIGURE A and B below showing a landscape typical of inclined sedimentary layers. FIGURE B illustrates a drainage pattern that will most likely develop in the landscape shown in FIGURE A.

- 1.1. Name the landforms labelled R in FIGURE A. (1 x 2) (2)
 1.2. Briefly describe the development of the landscape illustrated in FIGURE A. (3 x 2) (6)
 1.3. Name the drainage pattern illustrated in FIGURE B that will develop in the landscape shown in FIGURE A. (1 x 2) (2)
 1.4. Explain why the drainage pattern mentioned in QUESTION 1.3 will develop in this landscape. (3 x 2) (6)

Figure A

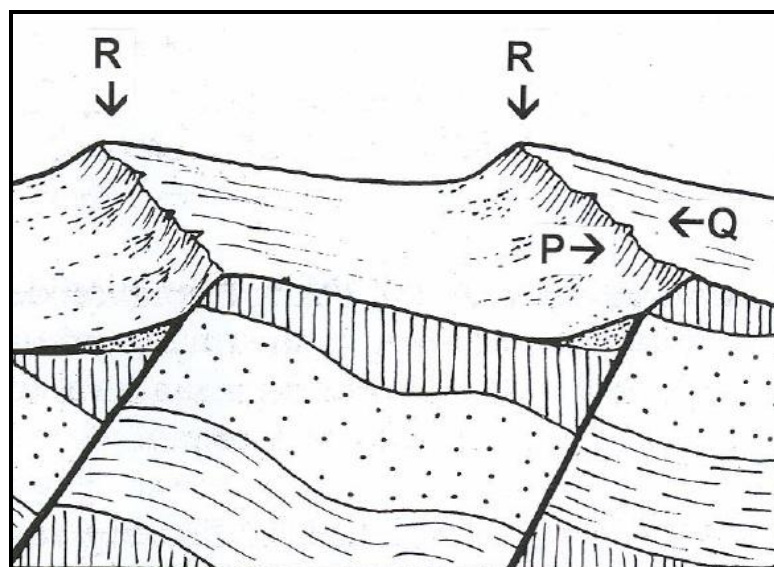
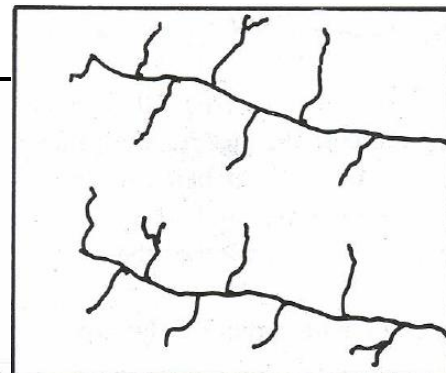


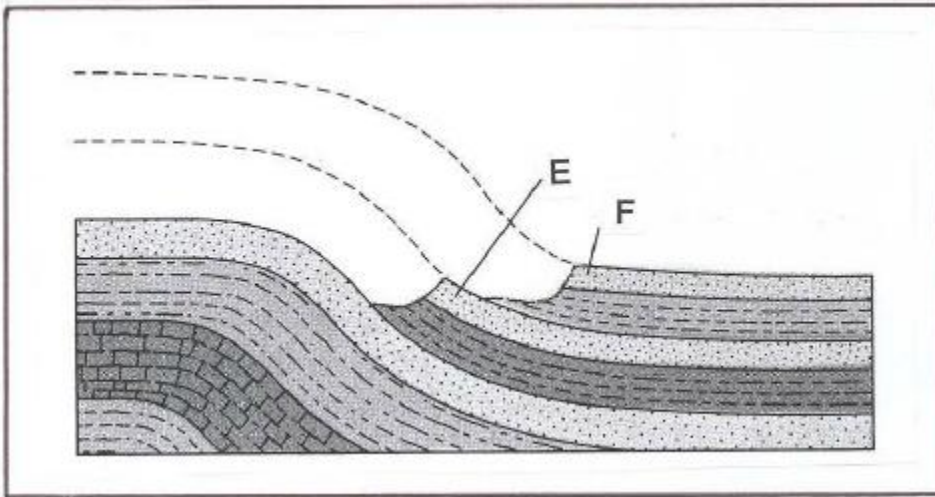
Figure B



Key / Sleutel

- Soft rock
- Sagte rots
- Resistant rock
- Weerstandbiedende rots
- Fault line
- Verskuiwingslyn

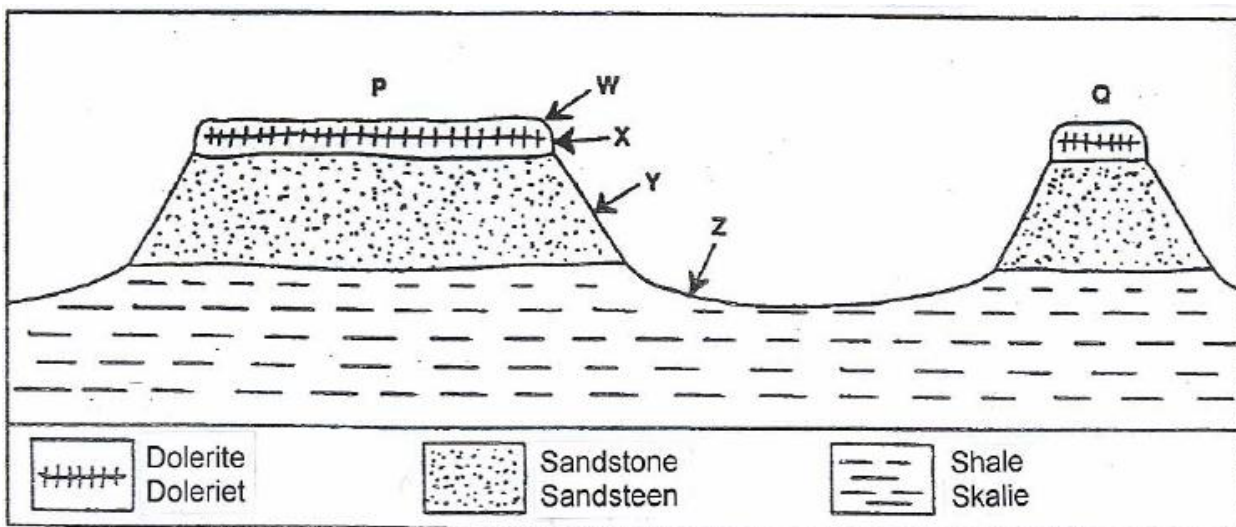
[16]

QUESTION 2:**5 minutes****10 marks***(Source: DoE March 2009)*

2. Rocks have different types of strata which give rise to unique landforms. Use the figure above to observe some of these landforms and answer the questions that follow.
- 2.1 Identify the features (landforms) labelled E and F. (2 x 2) (4)
- 2.2 Give ONE difference between feature (landform) E and F. (1 x 2) (2)
- 2.3 Of what value is this landscape to man? Give TWO reasons. (2 x 2) (4)
- [10]

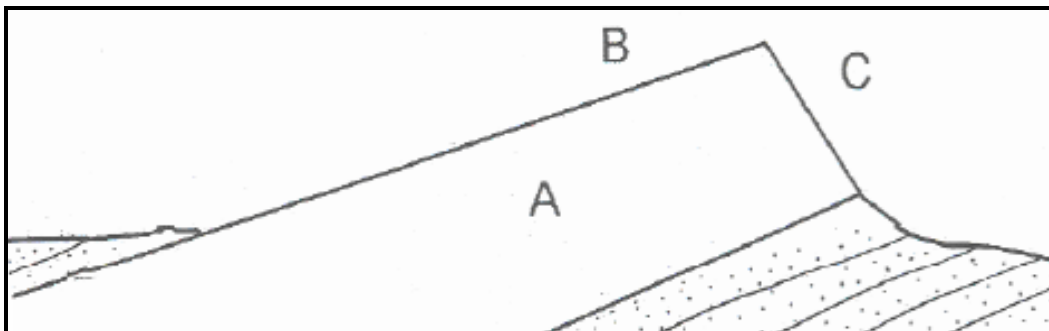
QUESTION 3:**5 minutes****10 marks***(Source: DoE March 2009)*

- 3.1. Refer to the FIGURE below showing a landscape found in South Africa. Four options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number.



- 3.1 The landscape illustrated in the figure above is associated with ... rock.
- A massive igneous
 - B horizontal sedimentary
 - C tilted igneous
 - D tilted sedimentary
- 3.2 Landform P is a ...
- A mesa.
 - B cuesta.
 - C butte.
 - D tor.
- 3.3 Slope element Z is the ...
- A crest.
 - B cliff.
 - C talus.
 - D pediment.
- 3.4 The landscape is typical of ... regions in South Africa.
- A humid and hot
 - B dry and hot
 - C humid and cold
 - D dry and cold
- 3.5 The landscape is typical in ...
- A Mpumalanga.
 - B KwaZulu-Natal.
 - C the Northern Cape.
 - D Gauteng.

(5 x 2) [10]

QUESTION 4:**10 minutes****16 marks***(Source: DoE September 2008)*

- 4 Refer to the figure above showing a ridge labelled A.
- 4.1 (a) Identify the ridge labelled A. (1 x 2) (2)
- (b) State ONE significance of ridge A to humans. (1 x 2) (2)
- (c) Briefly explain the formation of ridge A. (3 x 2) (6)

- 4.2 Identify slopes B and C respectively. (2 x 2) (4)
- 4.3 Mesas will not develop in this landscape. Give a reason why this is so. (1 x 2) (2)
- [16]

SECTION D: SOLUTIONS TO HOMEWORK: TOPIC 1
QUESTION 1

- 1.1 Homoclinal ridges / cuestras ✓✓ (1 x 2) (2)
- 1.2 Sedimentary rock that is tilted ✓✓
 Softer layers will erode faster to form valleys ✓✓
 Resistant layers will erode slower and protrude as ridges ✓✓
 Tectonic activity (faulting / folding) causes sedimentary rock to move past one another ✓✓
 As a result resistant layers will protrude above the surface ✓✓
 [Any THREE] (3 x 2) (6)
- 1.3 Trellis ✓✓ (1 x 2) (2)
- 1.4 Ridges and valleys are parallel ✓✓
 Alternating resistant and soft rock layers ✓✓
 Therefore, main streams flow parallel to each other ✓✓
 Short tributaries flow down the ridges and meet main streams ✓✓
 Tributaries join main stream at right angles ✓✓ [Any THREE] (3 x 2) (6)
- [16]

QUESTION 2

- 2.1 E – Homoclinal ridge / Cuesta ✓✓
 F – Mesa ✓✓ (2 x 2) (4)
- 2.2 E tilted more in relation to the earth's surface ✓✓
 E has two steep slopes ✓✓
 F has similar slopes on either side ✓✓
 E developed in inclined rock ✓✓
 F developed in horizontal strata ✓✓ [Any ONE] (1 x 2) (2)
- 2.3 Of strategic importance – defensibility ✓✓
 Soft layers between ridges form fertile soil suitable for agriculture ✓✓
 If formed around basin shaped features, it could trap ground water ✓✓
 Steep slopes afforested ✓✓ [Any TWO. Accept other] (2 x 2) (4)
- [10]

QUESTION 3

- 3.1 B ✓✓
- 3.2 A ✓✓
- 3.3 D ✓✓
- 3.4 B ✓✓
- 3.5 C ✓✓ (5 x 2) [10]

QUESTION 4

- 4.1 (a) Cuesta/Homoclinal ridge ✓✓ (1 x 2) (2)
 (b) Was used during war to protect settlements ✓✓
 Fertile plains are found between these ridges which are used for agriculture ✓✓
 Water traps which act as artesian basins ✓✓ [Any ONE] (1 x 2) (2)
 (c) It forms in an area which has inclined strata/layers ✓✓
 Alternate hard and soft strata ✓✓
 The soft rock gets eroded forming valleys ✓✓
 Hard rock protrudes above the surface as a cuesta/Homoclinal ridge ✓✓
 [Any THREE] (3 x 2) (6)
- 4.2 B – dip slope ✓✓
 C – scarp slope ✓✓ (2 x 2) (4)
- 4.3 Mesas form in horizontal strata ✓✓/ Mesas do not form in inclined strata ✓✓
 (1 x 2) (2)
[16]

TOPIC 2: MAP INTERPRETATION

! Teacher Note: This section counts the most in the map work paper. Learners must know how to understand what the information on a map means. They must be able to find the relationships between the more conventional map symbols.

LESSON OVERVIEW

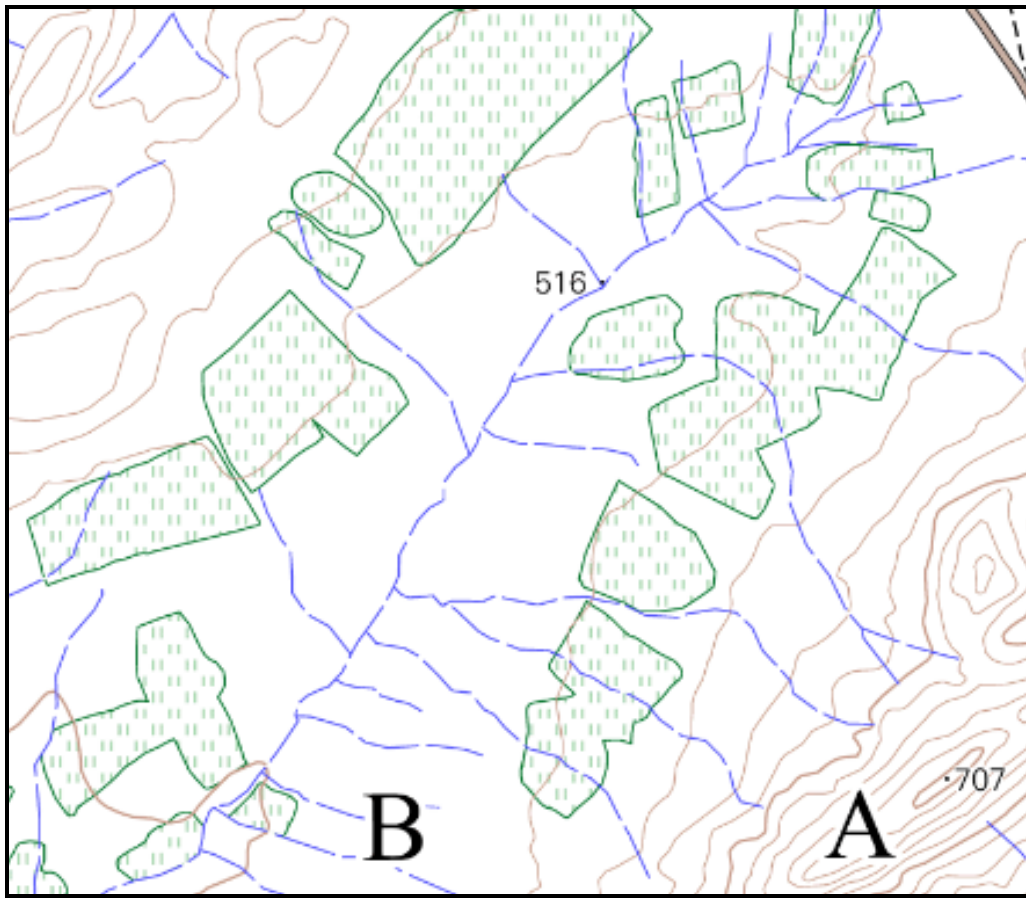
Map interpretation means that learners must be able to take what you have learnt in the other chapters of the subject and apply it on a map. Learners must also be able to look at the map and the symbols that represent features on earth and understand what the relationship between these features are. For this topic we will focus on the theory chapters that we have completed so far for the map interpretation section, namely Climatology and Geomorphology.

There is no calculation required for this section. Bear in mind that the scale of the map clips is not correct due to enlarging and reducing for clarity and the sake of printing.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1: **45 minutes** **52 marks** (*Source: DoE Nov 2009 & March 2010*)

1. The map clips were taken from the AA&AC Musina map. Map Clip 1



1.1.1. Identify the drainage pattern assumed by the river system in these two blocks.

(1 x 2) (2)

1.1.2. With reference to the topographical map, explain why the river system assumed this drainage pattern

(2 x 2) (4)

1.1.3. This area has many non perennial stream. What does this imply about the climate of the area?

(2 x 2) (4)

1.2.1. Identify the landform in which this river in map clip 1 forms.

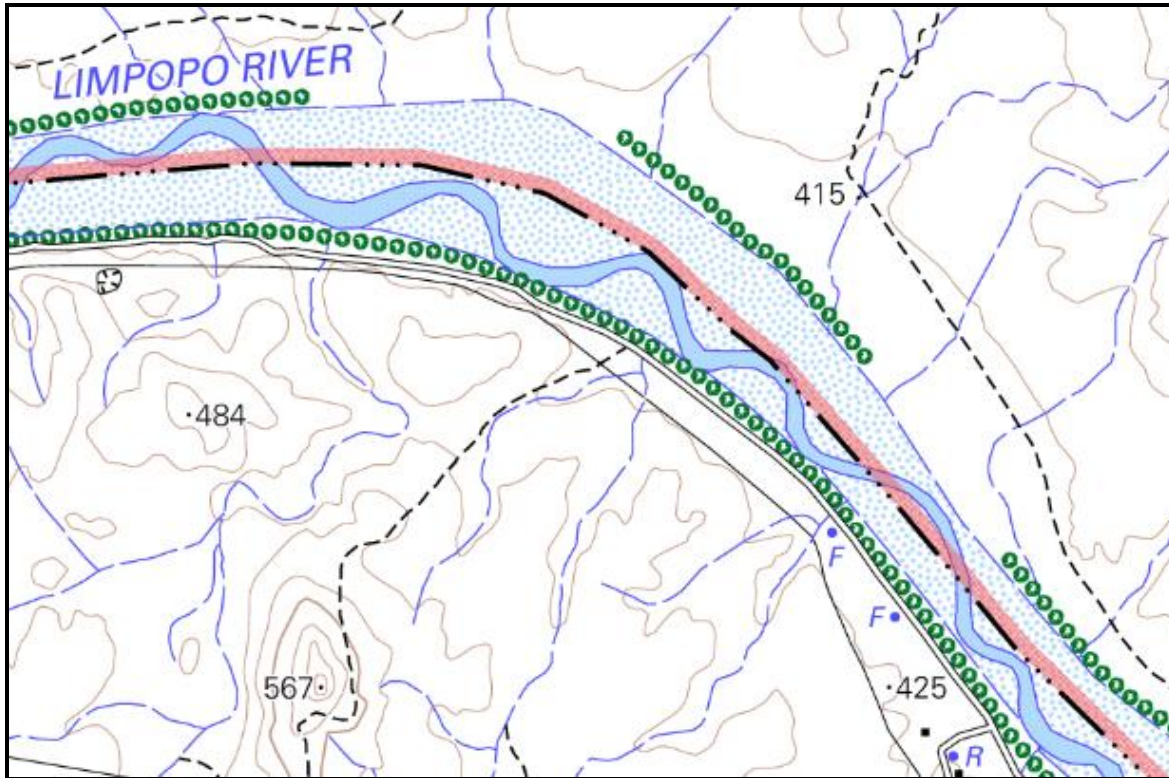
(1 x 2) (2)

1.2.2. Identify the winds that will occur in this landform during the day and night respectively.

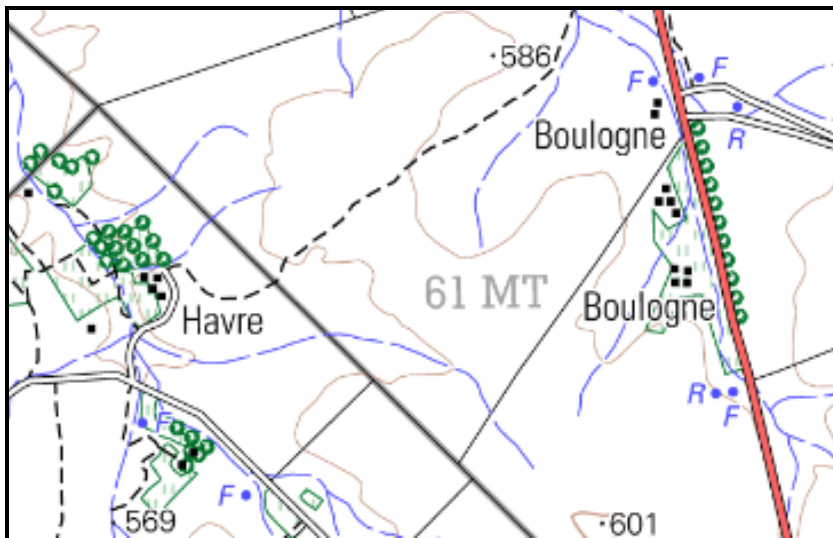
(1 x 2) (2)

1.2.3. Describe how these winds develop during the night and day respectively. (6 x 2) (12)

Map Clip 2.1

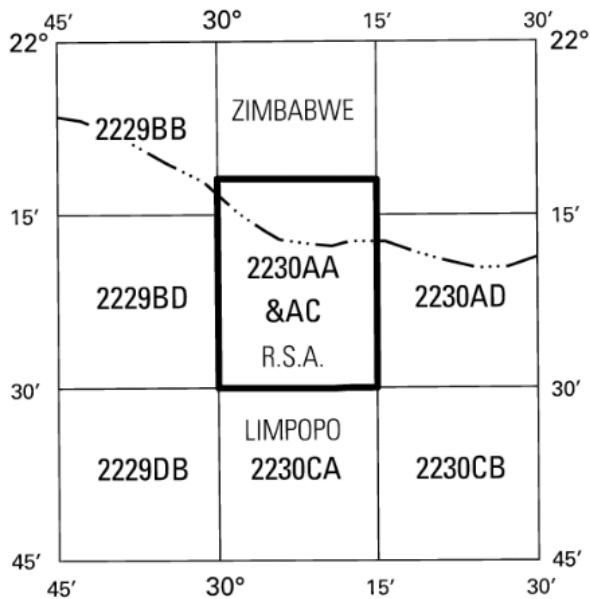


Map Clip 2.2



- 1.3. Refer to map clips 2.1 and 2.2. Give evidence from the topographical map clip above that there are groundwater sources close to the earth's surface in the mapped area. (2 x 2) (4)

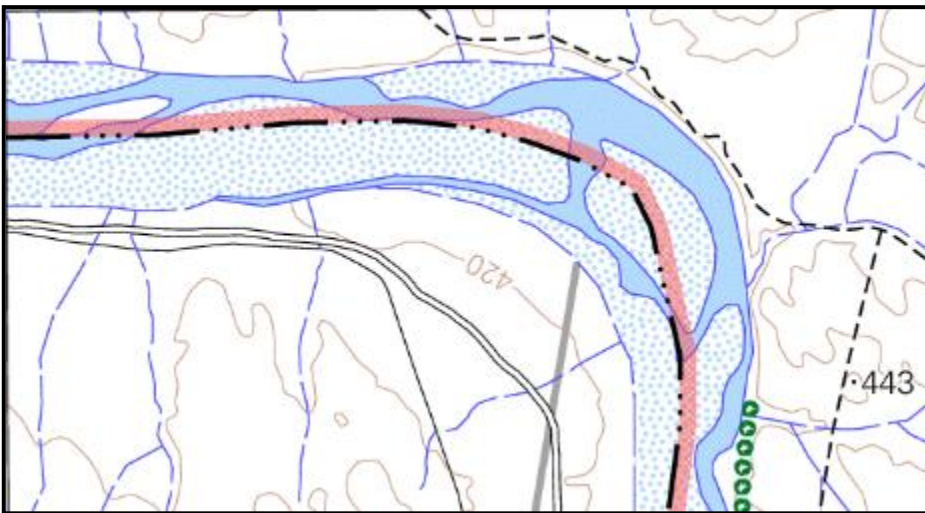
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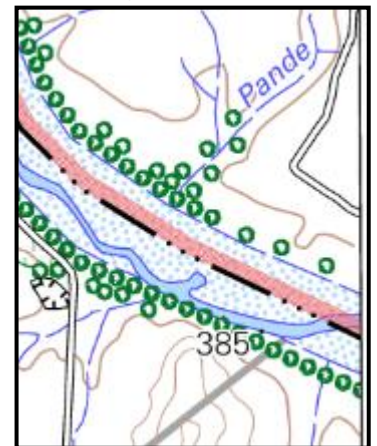
1.4. Which country lies directly to the north of the Limpopo River?

(1 x 2) (2)

Norht West Side of map (Left Side) Map Clip 3



South East (Right side) Clip 4



1.5.1 What is the general direction of flow of the Limpopo River in the mapped area?

(1 x 2) (2)

1.5.2 Give evidence from the map to support your answer to 1.5.1.

(2 x 2) (4)

1.6.1. Identify the stream channel pattern of the Limpopo river in map clip 1 and 3 respectively.

(2 x 2) (4)

1.6.2. In what stages of a river does these stream channel patterns develop?

(2 x 2) (4)

1.6.3. Explain how the islands in map clip 3 form and why.

(3 x 2) (6)

[52]

SECTION B: SOLUTIONS TO SECTION A: TOPIC 2

QUESTION 1

- 1.1.1 Trellis ✓✓ (1 x 2) (2)
- 1.1.2 Main stream flows on valley floor ✓✓
 Short tributaries flow down the valley flanks ✓✓
 Tributaries join main stream at 90° angles ✓✓
 River drains a narrow valley ✓✓ (3 x 2) (6)
- 1.1.3. The area is quite dry ✓✓
 It receives seasonal rainfall ✓✓ (2 x 2) (2)
- 1.2.1. Valley (1 x 2) (2)
- 1.2.2. Day – anabatic ✓✓
 Night – Katabatic ✓✓ [Must refer to day and night correctly] (2 x 2) (4)
- 1.2.3. Day – Hill tops heat up first in the morning ✓✓
 Warm air rise ✓✓
 Low pressure forms on hills ✓✓
 Cold air on valley floor forms High pressure ✓✓
 Air blows upslope from HP to LP ✓✓
 Night - Air near to surface cools down quicker than air further up ✓✓
 Cold air is heavy and dense ✓✓
 Sinks to valley floor forming katabatic winds. ✓✓ (6 x 2) (12)
- 1.3. Permanent River / Perennial River
 Many water points / fountains (2 x 2) (2)
- 1.4. Zimbabwe (1 x 2) (2)
- 1.5.1. South East (1 x 2) (2)
- 1.5.2. River flow down River is just under 420m high in the North West corner ✓✓
 River course subsided to 385m in the South East of the map. ✓✓
 Tributaries join at acute angle generally West – river flow East. ✓✓ (2 x 2) (4)
- 1.6.1 1 – Meanderin ✓✓
 3 – Braided ✓✓ (2 x 2) (4)
- 1.6.2. Meandering – Mature Stage/ middle course ✓✓
 Braided – Old age stage ✓✓ (2 x 2) (4)
- 1.6.3. The river carries a lot of stream load in the mature and old age stages ✓✓
 The river slows down due to a more gradual gradient ✓✓
 The river loses energy ✓✓
 The river deposits the material it is carrying in the form of sandbanks
 that block the flow of the river. ✓✓
 The river dams up behind the sandbank but the finds new courses around
 the sandbanks, and islands become visible in the stream. ✓✓ (3 x 2) (6)

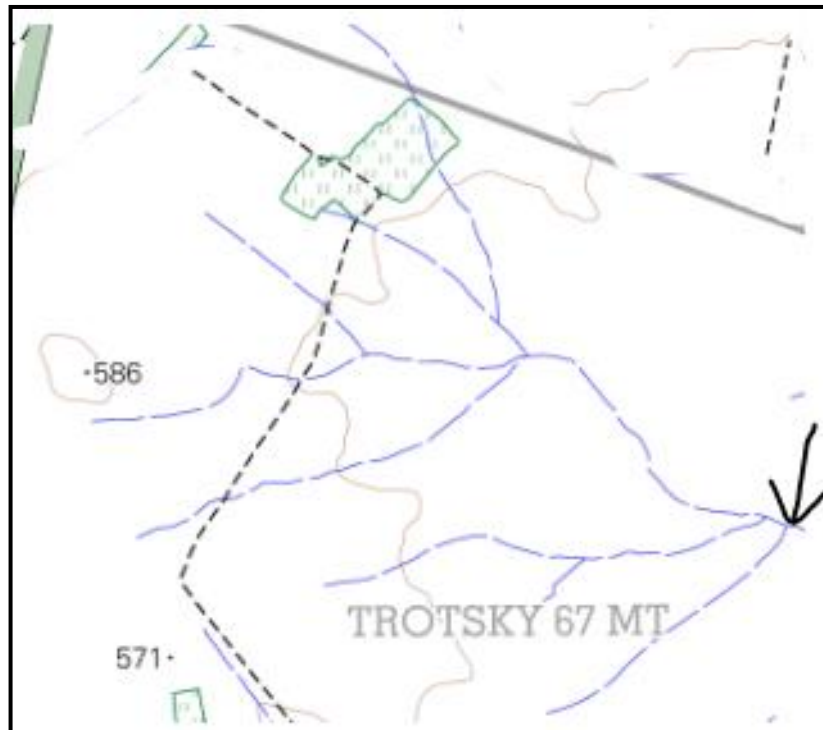
[52]

SECTION C: HOMEWORK**QUESTION 1**

Refer to map clip 5 below when you answer the following questions:

- 1.1.1. Identify the drainage pattern in map clip 5. (1 x 2) (2)
- 1.1.2. On what type of rock strata does this stream pattern develop. (1 x 2) (2)
- 1.1.3. Describe what this stream pattern looks like. (2 x 2) (4)
- 1.1.4. How would this stream pattern change if it occurred on a steeper slope? (1 x 2) (2)
- 1.2.1. Order the stream and give the order at the arrow. (1 x 2) (2)
- 1.2.2. Identify the landform in which the river flows. (1 x 2) (2)
- 1.3.1. Is this a wet or dry area? (1 x 2) (2)
- 1.3.2. Motivate your answer in 1.3.1. (1 x 2) (2)
- 1.4.1. Identify the type of river that is illustrated in map clip 5. (1 x 2) (2)
- 1.4.2. Describe this type of river. Refer to when it flows and where it gets its water from. (3 x 2) (6)
- [26]

Map Clip 5



SECTION D: SOLUTIONS TO HOMEWORK: TOPIC 2

QUESTION 1

- 1.1.1 Dendritic ✓✓ (1 x 2) (2)
- 1.1.2. Uniform rock strata – similar resistance to erosion ✓✓
(All igneous or all sedimentary or all metamorphic) ✓✓ (1 x 2) (2)
- 1.1.3 It looks like a tree trunk with branches ✓✓
The tributaries join the main stream at acute angles. ✓✓ (2 x 2) (4)
- 1.1.4 The tributaries will flow nearly parallel to each other ✓✓
The tributaries will be longer ✓✓
Tributaries will join the main stream at an even more acute angle. ✓✓ (1 x 2) (2)
- 1.2.1 Third order stream ✓✓ (1 x 2) (2)
- 1.2.2 Valley ✓✓ (1 x 2) (2)
- 1.3.1 Semi dry ✓✓ (1 x 2) (2)
- 1.3.2 Non perennial rivers (1 x 2) (2)
- 1.4.1. Periodic river ✓✓ (1 x 2) (2)
- 1.4.2 Flow during the rainy season ✓✓
Get water from base flow and direct runoff during rainy season ✓✓
Get no water during dry season – water table below stream channel ✓✓ (3 x 2) (6)

[26]