LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

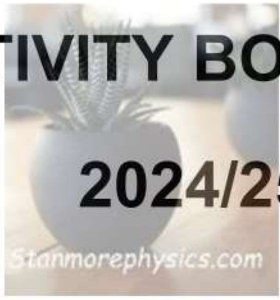
# DEPARTMENT OF EDUCATION

# CAPRICORN NORTH DISTRICT

# GEOGRAPHY GRADE 12

# ACTIVITY BOOKLET

# 2024/25




with **SOLUTIONS**

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Extract from the examination guideline.

# 1. ELABORATION OF CONTENT/TOPICS

## 1.1 PAPER 1

### 1.1.1 Climate and Weather

**Mid-latitude cyclones (frontal depressions, extra-tropical cyclones)**

- General characteristics
- Areas of formation
- Conditions necessary for formation
- Stages of development
- Cross-section through a mid-latitude cyclone
- Associated weather patterns:
- Cold front conditions
  Warm front conditions
- Occluded front conditions
- Impact on human activities (social and economic) and the environment
- Possible pre-cautionary and management strategies
- Identification on synoptic weather maps and satellite images:
- Identification of stages of development on synoptic weather maps
- Impact of South Indian High and South Atlantic High on movement of the cyclone o Reading and interpretation of weather symbols, predicted weather impact

**Tropical cyclones**

- General characteristics
- Areas of formation and associated terms in different parts of the world
- Factors necessary for the formation
- Stages of development
- Associated weather patterns
- Cross-section through a tropical cyclone (interpretation)
- Impact on human activities (social and economic) and the environment (the impact of the weather associated with tropical cyclones)

- Pre-cautionary and management strategies to manage the effects of tropical cyclones
- Identification on synoptic weather maps and satellite images:
- Identification of stages of development on synoptic weather maps
- Reading and interpretation of applicable weather symbols
- Case study of ONE recent tropical cyclone anywhere in the world

**Subtropical anticyclones (high-pressure cells) and the resultant weather over South Africa**

- Location and identification of the THREE high-pressure cells that affect South Africa:
- South Atlantic high-pressure cell
- South Indian high-pressure cell
- Kalahari high-pressure cell
- General characteristics of the THREE high-pressure cells
- Influence of anticyclones on South Africa's weather and climate (integration with plateau, inversion layer, ocean currents and ridging of the SAHP)- summer and winter position
- Reading and interpretation of information related to the THREE high-pressure cells on synoptic weather maps

- Development of travelling disturbances associated with anticyclonic circulation:
- Moisture front and line thunderstorms
- Coastal low pressure
- South African berg wind
- Resultant weather and impact (and strategies to reduce the impact) associated with moving disturbances
- Identification of moving disturbances on synoptic weather maps and satellite images
- Reading and interpretation of synoptic weather maps and satellite images that illustrate weather associated with anticyclonic conditions

**Valley climates**

- Slope aspect:
- Definition
    - Effect on the distribution of temperature in a valley

Definition and development of:

- Anabatic winds
- Katabatic winds
- Inversions
- Thermal belt
- Frost pockets
- Radiation fog
- Influence/impact on human activities (economic, social and environmental):
- Settlement, Farming

**Urban climates**

- Reasons for differences between rural and urban climates
- Urban heat islands:
- Definition
- Causes of urban heat islands/factors contributing to higher city temperatures
- Effects of urban heat islands (economic, social and environmental)
- Strategies to reduce the urban heat island effect
- Pollution domes:
- Definition
- Causes of pollution domes
- Effects of pollution domes (economic, social and environmental)
    - Strategies to reduce the pollution dome effect

**Interpretation of synoptic weather maps** (integrate with the relevant content)

- Use of international symbols
- Identification and characteristics of high- and low-pressure cells
- Interpretation of the impact of high- and low-pressure cells
- Reading and interpretation of station models
- Satellite images – reading and interpretation
- Compare satellite images to synoptic weather maps

## COMMON ERRORS AND MISCONCEPTIONS IN CLIMATE AND WEATHER AND POSSIBLE APPROACHES.

### General challenges across all topics.

1. Learners fail to read, understand and follow instructions on the question paper.

**Approaches**

- Educators must train their learners on how to approach a question paper during the exam session.

2. Learners struggles with the definition of concepts.

**Approaches**

How to effectively teach concepts in class:

- Provide learners with diagrams / pictures.
- Let learners explain what they see on the diagram.
- Let learners interpret or analyse what they see in order to come up with their own definition.
- Emphasise the importance of key words when writing definitions.
- Educator consolidates, and the learners definitions with the correct definition from relevant sources.

3. Learners do not know how to approach or understand instructional verbs in the question paper. For example, learners struggle with questions that require a fact and a qualifier.

**Approaches**

- Educators should make use of glossary of instructional verbs found in the examination guidelines and use this questioning technique in tests and exams.

4 Learners are unable to write paragraph type questions, instead they answer in point form.

**Approaches**

- Learners should be given paragraph type questions as part of informal assessment and formal assessment.

### 1. Global Air circulation (consolidation of grade 11 content)

**Misconceptions**

Differentiating between the pressure belts, pressure cells, planetary winds, their characteristics and associated weather conditions.

**Approaches**

Educators should use a variety of visual aids like diagrams, satellite images, synoptic weather maps, the world map and infographics when teaching pressure cells and global air circulation.

**2. Mid-latitude cyclones/ tropical cyclones**

**Misconceptions.**

2.1. General movement and circulation of the air in the mid-latitude cyclone and tropical cyclones in different hemispheres.

2.2. Inability to interpret cross sections of the different stages of development the mid-latitude and tropical cyclones.

2.3. Inability to differentiate between the economic, environmental and social impacts of the mid-latitude cyclones and tropical cyclones.

2.4. In cases where impacts and strategies are required or positive and negative impacts are required, learners do not focus on both aspects.

**Approaches**.

- Educators must use different synoptic weather maps and diagrams when teaching and assessing this section.
- Educators must let learners draw annotated diagrams of the cross sections.
- Educators must emphasise and use practical examples to clarify different types of impacts and their mitigation strategies.

**3. Subtropical anticyclones and the resultant weather over South Africa.**

Learners fail to analyse the influence of the Kalahari high pressure cell on South African weather in winter and summer.

Learners do not understand the main role played by descending air in the development of the inversion layer.

Learners fail to interpret synoptic weather maps correctly.

Learners unable to differentiate between the moisture content of air masses involved in the formation of line thunderstorms

Learners fail to explain the formation of berg winds, their impacts on the physical environment and the strategies to reduce the impacts.

**Approaches**

- Educators must expose learners to different diagrams, infographics and videos on the above topics.
- Educators must use previous question papers in the informal assessment to ensure that learners get exposure to the type of questions based on these the topic.

**4. Valley climate**

Learners struggle to describe the formation of temperature inversion.

Learners struggle with concept of slope aspect, direct versus oblique radiation, radiation fog and conditions specific to the shadow zone.

**Approaches**

- Educators must expose learners to more questions that align with the structure of the examination.

**5. Urban climate**

Learners are unable to differentiate between the height of the pollution dome and urban heat island during the day and night and associated reasons.

**Approaches**



- Educators must expose learners to diagrams showing the urban heat island and pollution dome during the day and night
- Educators must provide learners with more questions that require them to analyse and interpret diagrams on pollution dome and urban heat island.

**6. Geographical skills and techniques**

Learners struggle to determine true bearing accurately.

Learners are unable to determine map co-ordinates.

Learners struggle with map scale.

**Approaches**

- Educators need to teach map work skills and techniques thoroughly and expose learners to regular practice.

**7. Application of concepts in map work.**

- Learners are unable to integrate climatology theory (topography, aspect, valley climates and urban climates) in map work application.

**Approaches**

- Educators should integrate application of mapwork content on climatology theory in their lessons.

**8. Geographic Information System**

**8**.1. Learners struggle to use tone and texture to identify features on the orthophoto map.

**8.2**. Learners experience challenges to differentiate GIS concepts, like data layer and data layering.

**Approaches**

- Educators are encouraged to include teaching concepts of tone and texture associated with orthophoto maps.
- Educators must use topographical map to illustrate the difference between data layer and data layering.

**EXAMINATION GUIDELINES**

PAPER 1

1.1.1. This is a 3-hour question paper which is written on a SEPARATE DAY from Paper 2.

1.1.2 The mark allocation for this paper is 150.

1.1.3 The question paper consists of two sections, namely SECTION A and SECTION B:

SECTION A: Climate and Weather and Geomorphology (Theory)

SECTION B: Geographical Skills and Techniques

1.1.4 SECTION A consists of TWO questions of 60 marks each.

SECTION B consists of ONE question of 30 marks.

3.3 STRUCTURE OF EXAMINATION QUESTION PAPER

3.3.1 Details of question papers

- Each paper carries 150 MARKS, assessing both theory and mapwork.
- The duration of each paper is 3 HOURS.
- The two papers must NOT be written on the same day.
- Each paper comprises of 3 questions which are ALL COMPULSORY:
- Questions 1 and 2 are found in SECTION A and Question 3 in SECTION B.

SECTION A:

- Questions 1 and 2 are based on theory for 60 marks each.
- Each of the two questions will begin with a variety of short/objective type questions for: 15 marks.
- The format of these questions will vary. This is followed by 3 sub-questions of 15 marks each.
- Each of the two questions will include a paragraph type question for 8 marks, i.e. (4 x 2) = (8).

- The paragraph question may NOT be answered in point form and will require insight and analytical thinking skills. The paragraph question can be in any of these sub-questions
- A variety of source materials will be used, e.g., satellite images, synoptic weather charts, graphs, statistics, tables, info-graphics, sketch maps, cartoons, photographs, case studies and newspaper articles.
- Candidates must be able to illustrate all geographical concepts taught. Illustrations could be simple labelled diagrams/sketches or detailed annotated (with explanatory labels) diagrams/sketches.
- Please note in the 15-mark sub-questions content tested could cover more than one
- aspect within a broad topic.

**SECTION B:**

NOTE: A 1:50 000 topographic map extract and a 1:10 000 orthophoto map extract will be used for testing purposes

Question 3 is based on mapwork, i.e., geographical skills and techniques for 30 marks

and will be divided as follows:

o Map skills and calculations (10 marks)

o Map interpretation (12 marks)

o GIS (8 marks)

NOTE: Multiple choice questions can be integrated in all of the above

1.1.5 All THREE questions are compulsory.

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    - Effect on the distribution of temperature in a valley
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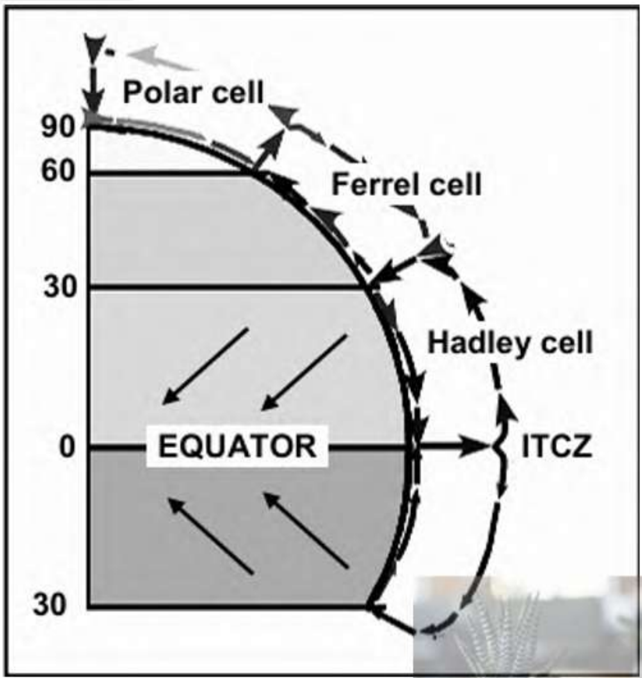
# 1.LOWER ORDER QUESTIONS

1.1 Refer to FIGURE 1.1, (attached) showing the tri-cellular air circulation, to answer the questions that follow. Various options are given as possible answers. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK, for example 1.6 A.




1.1.1 At which latitude is air sinking due to excessive cooling?

A 0º

B 30º

C 60º

D 90º

1.1.2 The winds that result from converging air masses at the equator are called …

A polar easterly.

B tropical easterlies.

C westerly winds.

D subtropical winds.

1.13 Convergence occurs at the … latitude to form the ITCZ.

A 0º

B 30º

C 60º

D 90º

1.1.4 The … cell forms where the westerlies and the polar winds meet.

A Hadley

B Ferrel

C polar

D ITCZ

1.1.5 The … winds blow from the 90° latitude towards the 60° latitude.

A subtropical

B tropical easterly

B polar easterly

D westerly

1.1.6 Air that converges at the polar front

(i) Westerlies

(ii) Tropical easterlies

(iii) Polar easterlies

(iv) Trade winds


A. (i) and (iv)

B. (ii) and (iii)

C. (i) and (iii)

D. (ii) and (iv)

1.1.7 The Sub-tropical anticyclones will develop along the ……..

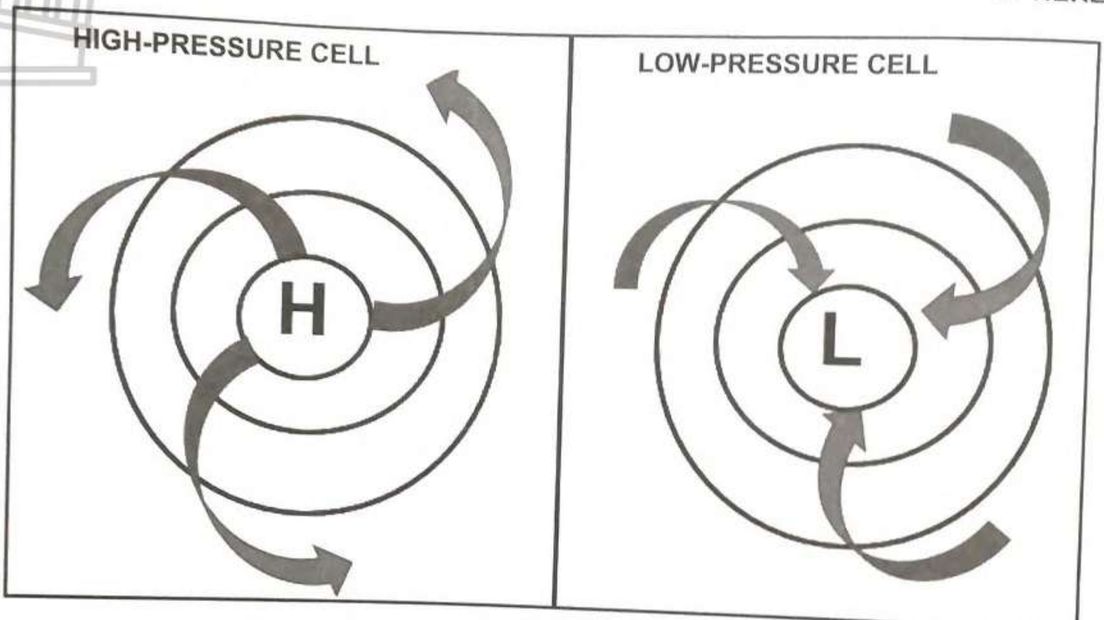
A. 0°

B. 30°

C. 60°

**D.** 90° (1 x 1) (1)

1.2 Refer to FIGURE 1.2 showing a high and a low-pressure cell in the Southern Hemisphere. Match the statements below with the **High-pressure cell** or **low-pressure cell**.




[Source: Examiner's own sketch]

1.2.1 Associated with rising air.

1.2.2 Air diverges on the surface from this pressure cell.

1.2.3 Associated with the clockwise movement of air.

1.2.4 Unstable weather conditions over the interior.

1.2.5 Associated with ridging.

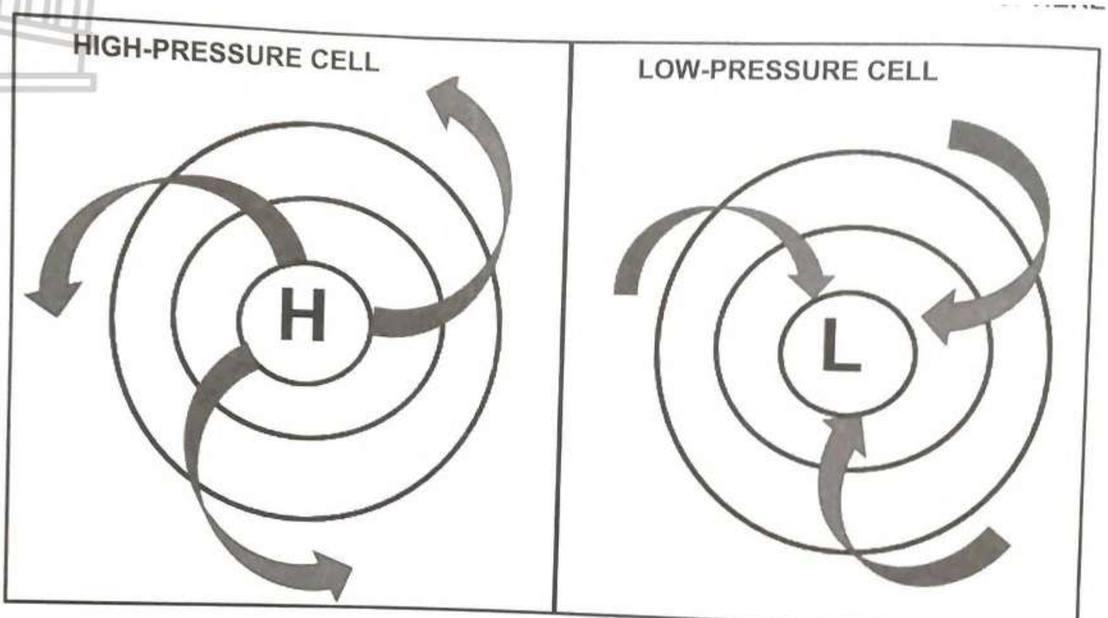
1.2.6 Associated with heavy rain and hail.

1.2.7 Dominates the land in winter.

1.2.8 1Berg wind conditions develop when it interacts with a coastal low.

1 x 8 (8)

1.3 Refer to FIGURE 1.2 showing a high and a low-pressure cell in the Southern Hemisphere. Match the statements below with the **High-pressure cell** or **low-pressure cell**.




[Source: Examiner's own sketch]

1.3.1 Develops mostly in summer.

1.3.2 Associated with convergence of air.

1.3.3 Associated with overcast cloud cover

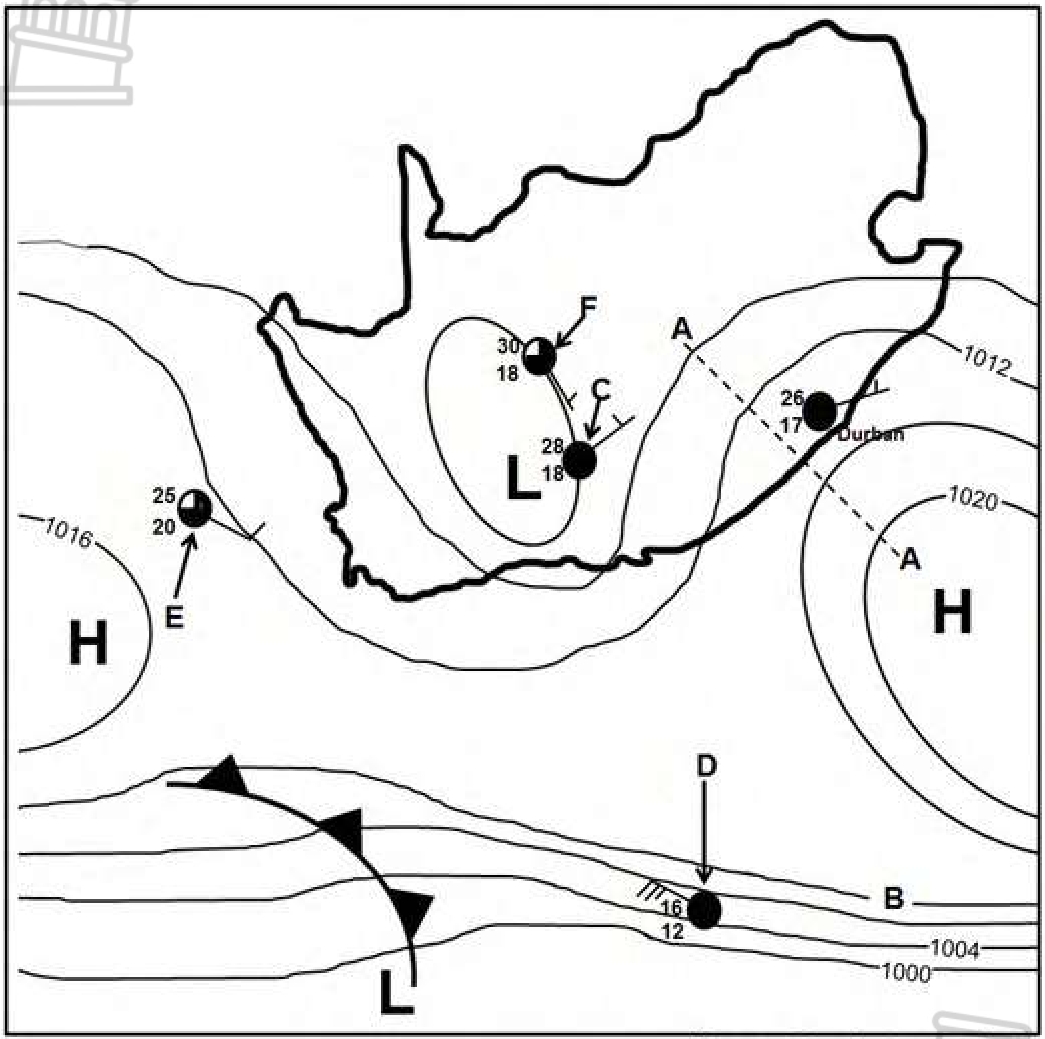
1.3.4 Associated with clear sky

1.3.5 Stable weather conditions over the surface

1.3.6 Pressure readings decrease towards the centre.

1.3.7 Which pressure is also regarded as subtropical anticyclone? 1 x 7 (7)

**1.4 Refer to the sketch below of a synoptic weather map. Complete the statements in COLUMN A with the options in COLUMN B (page 4). Write only Y or Z next to the question numbers (1.4.1 to 1.4.7) in the ANSWER BOOK, e.g., 1.4.8 Y.**



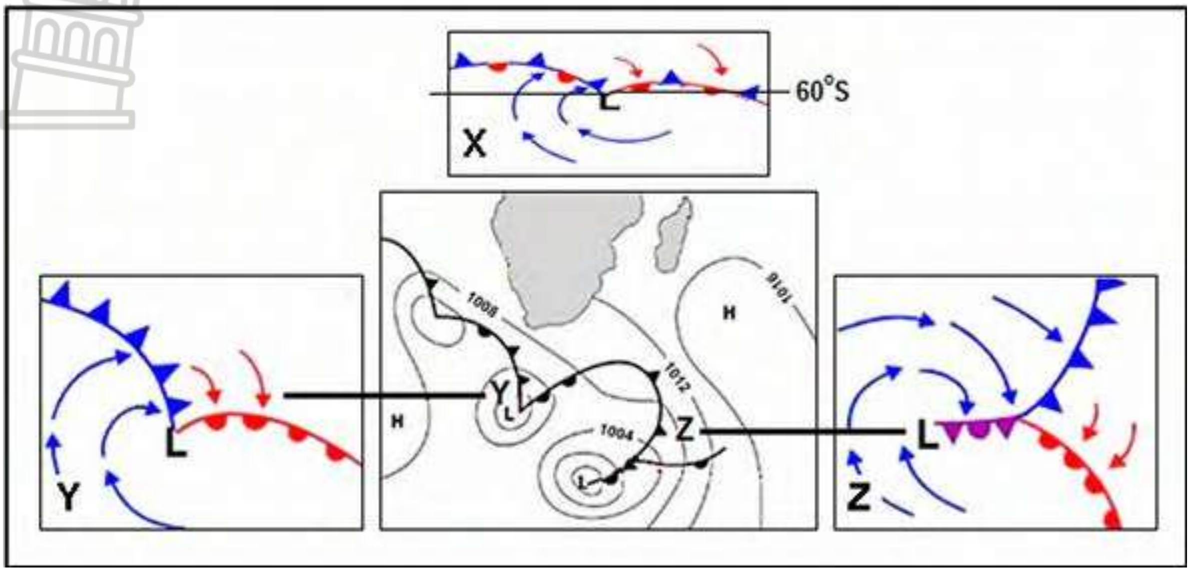

[Source: Examiner's own sketch]

| **COLUMN A** | **COLUMN B** |
|---|---|
| 1.4.1. The synoptic weather map illustrates typical …… conditions. | **Y** Winter<br>**Z** summer |
| 1.4.2. Line **A-A** represents a ……… | **Y** Ridge<br>**Z** trough |
| 1.4.3. The air reading of isobar B is …. hpa. | **Y** 1012<br>**Z** 1016 |

| | |
|---|---|
| 1.4.4. The air pressure gradient is steeper around the weather station at …... | **Y** D<br>**Z** E |
| 1.4.5. The north easterly wind at Durban is influenced by the ……. Circulation of air. | **Y** anticlockwise<br>**Z** clockwise |
| 1.4.6. The unstable weather conditions at weather station C are due to the development of a …… from. | **Y** cold<br>**Z** moisture |
| 1.4.7. Which weather station illustrate the following weather changes at **F** in the next 24 hours?<br>• The wind direction changes to south-west<br>• The air temperature decreases by 6 ° C | **Y**<br><br><br>**Z**<br><br> |

**1.5** Refer to FIGURE 1.5 showing stages in the development of a mid-latitude cyclone.

FIGURE 1.5: STAGES IN THE DEVELOPMENT OF MID-LATITUDE CYCLONES




1.5.1. Name the front at 60° S, in diagram X, where mid-latitude cyclones develop.

1.5.2. Name the stage of development of the mid-latitude cyclone at X.

1.5.3. Give the lowest air pressure recorded in stage Y.

1.5.4. Which mid-latitude cyclone, Y or Z, is older?

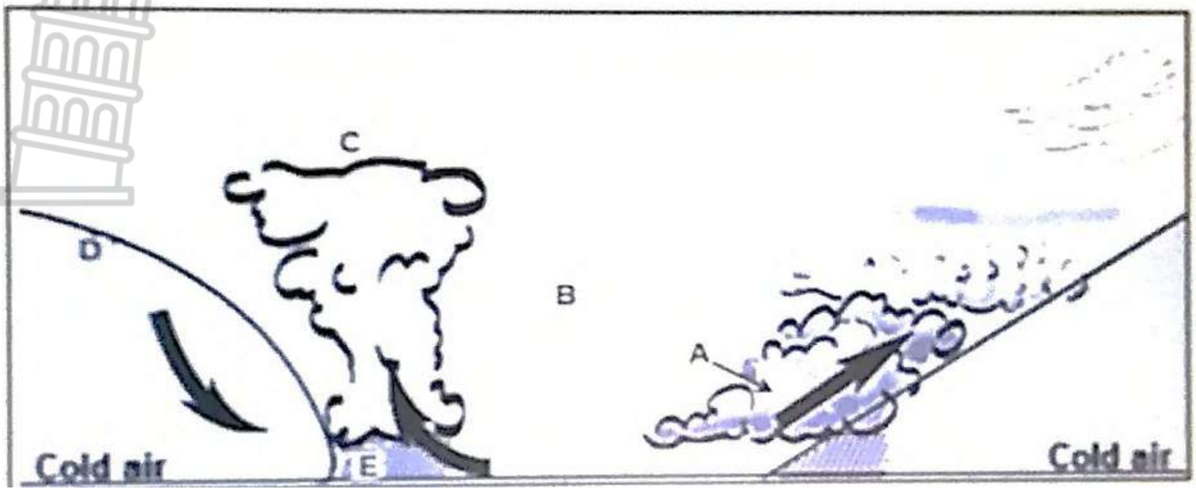
1.5.5. Name the stage of development of the mid-latitude cyclone at Z.

1.5.6. What evidence suggests that the illustrated mid-latitude cyclone is in the Southern Hemisphere?

1.5.7. What is the term used to describe mid-latitude cyclones that are linked to one another? (1 x 7) (7)

1.6. Various options are provided as possible answers to the following questions based on the cross-section of the mid-latitude cyclone in FIGURE 1.1.

Choose the answer and write down only the letter (A–D) next to the question numbers (2.1.1 to 2.1.8), e.g., 2.1.9 D.




1.6.1. The general direction of movement of the mid-latitude cyclone in the Southern Hemisphere is … -wards.

A. North

B. west

C. east

D. south

1.6.2. Identify cloud A that is associated with the warm front:

A. Stratus

B. Cumulus

C. Nimbostratus

D. Cumulonimbus

1.6.3. The area at B is referred to as the …

A. warm sector.

B. cold sector.

C. polar front.

D. apex.

1.6.4. The type of cloud at C is …

A. stratus.

B. cirrus.

C. cumulonimbus.

D. nimbostratus.

1.6.5. The gradient at D can be described as …

A. steep.

B. gentle.

C. weak.

D. vertical.

1.6.6. The … front is found at D.

A. polar

B. cold

C. occlusion

D. warm

1.6.7. The more active and faster moving front is the …

A. polar front.

B. cold front.

C. warm front.

D. moisture front.

1.6.8. The type of rainfall at E is/are …

A. light showers.

B. frontal rain.

C. orographic rain.

D. convectional rain. (8 x 1) (8)

1.7. **Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.8) in the ANSWER BOOK, e.g., 1.1.9 D**.

1.7.1. A mid-latitude cyclone occurs between … north and south of the equator.

A 5° and 25°

B 30° and 60°

C 0° and 5°

D 60° and 90°

1.13.1. A mid-latitude cyclone is steered (driven) by the …

A easterlies.

B polar easterlies.

C trade winds.

D westerlies.

1.13.2. The change in wind direction of the mid-latitude cyclone in the Southern Hemisphere is called …

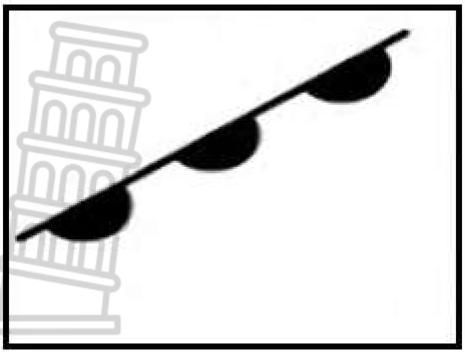
A veering.

B backing.

C rotating.

D converging.

1.13.3. The front below is a … front.



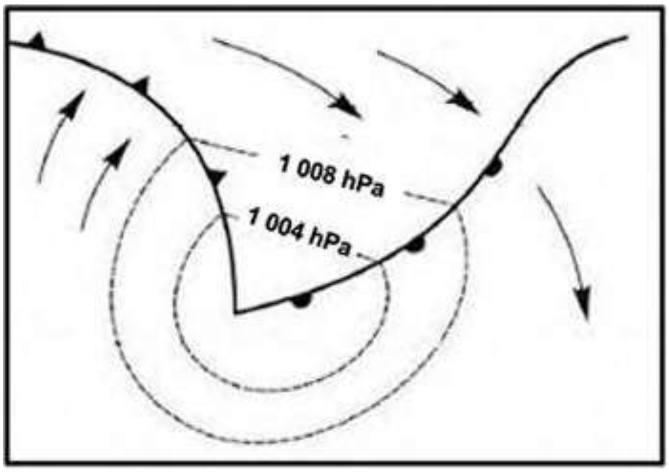
A cold

B occluded

C warm

D stationary

1.13.4. The mid-latitude cyclone below is in the … stage.




[Source: https://www.google.com/search?q=mid-latitude]

A. initial

B wave

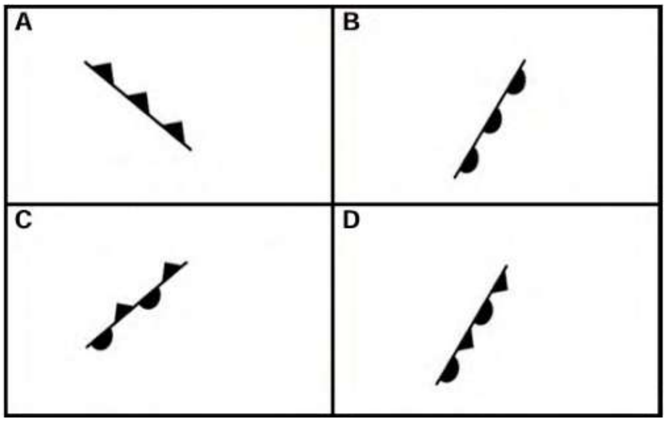
C mature

D occluded

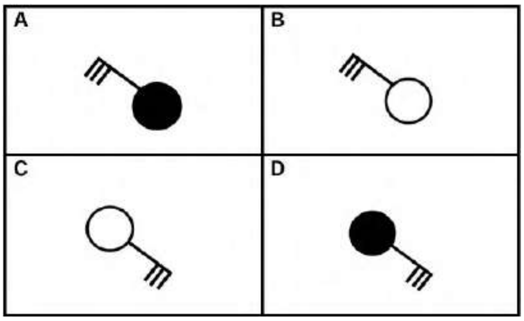
1.13.5. The conditions experienced behind a cold front are a/an …

A. increase in pressure and decrease in temperature.
B. decrease in pressure and decrease in temperature.
C. increase in pressure and increase in temperature.
D. decrease in pressure and increase in temperature.

1.13.6. Which symbol below illustrates the merging of a cold and warm front?




1.13.7. The station model generally associated with a cold front in the Southern Hemisphere:




1 x 8 (8)

**1.8. Refer to the satellite image above to answer questions 1.8.1 – 1.8.7.**

**Choose the correct word in bracket to make the following statements true. Write only the word/words next to the question numbers in your answer book.**

1.8.1. Tropical cyclone George is a (low/high) pressure cell.

1.8.2. The general movement of tropical cyclone George is (west to east/ east to west).

1.8.3. The area of development of Tropical Cyclone is between (5°-30 °/ 30°-60°) north and south of the equator.

1.8.4. The air (converges/ diverges) at the surface of the tropical cyclone.

1.8.5. This tropical cyclone occurred in the (northern/ southern) hemisphere.

1.8.6. The diameter of the tropical cyclone is (30-65 km/300-500 km).

1.8.7. This satellite image represents the (mature/immature) stage.

(7 X 1) (7)

1.9. **Choose the letter X or Y in column B that matches the statements in column A. Write only X or Y next to the question numbers.**

| COLUMN A | COLUMN B |
|---|---|

| | |
|---|---|
| 1.9.1. ……. cyclones occurred before cyclone George. | X 6<br>Y 7 |
| 1.9.2. The circulation of air around this cyclone is ………… | X anti-clockwise<br>Y clockwise |
| 1.9.3. The centre of the tropical cyclone is Known as ………… | X vortex<br>Y eye |
| 1.9.4. The types of clouds associated with this cyclone are called……… | X cumulus<br>Y cumulonimbus |
| 1.9.5. The tropical cyclone is associated with ……… rainfall. | X heavy<br>Y light |
| 1.9.6. The weather condition at the centre of the cyclone is……. | X cloudy<br>Y calm |
| 1.9.7. ……… provides energy that contributes to the formation of the tropical cyclones | X latent heat<br>Y Coriolis force |
| 1.9.8. Tropical cyclone dissipates due to …. a/an …. moisture as it moves over the land | X increase<br>Y decrease |

(8 x 1) (8)

1.10. With reference to tropical cyclones, match the term in COLUMN B with the description in COLUMN A. Write only the letter (A–I) next to the question numbers (1.10.1 to 1.10.8) in the ANSWER BOOK, e.g., 1.10.9 J.

| COLUMN A | COLUMN B |
|---|---|
| 1.13.1. Provides energy that | A dissipating |

| | |
|---|---|
| contributes to the formation of the tropical cyclone | B eye wall |
| 1.13.2. Local name given to a tropical cyclone in South-east Asia | C immature |
| 1.13.3. Cooler air sinks and there is no rain in this section of the tropical cyclone | D formative |
| | E latent heat |
| 1.13.4. The stage where cooler air flows into the tropical cyclone, increasing the pressure | F typhoon |
| 1.13.5. Pressure drops to below 1 000 hPa and wind speeds increase to approximately 120 km/h in this stage | G eye |
| | H hurricane |
| 1.13.6. The stage characterised by a well-developed forward left-hand quadrant | I mature |
| 1.13.7. The stage where the pressure is above 1 000 hPa and the tropical cyclone starts to develop | |
| 1.13.8. Created by the upward spiralling movement of air around the centre | |

(8 x 1) (8)

1.11. Study FIGURE 2.1, a cross-sectional view of a tropical cyclone.

Choose the correct word(s) from those given in brackets which will make each statement geographically CORRECT. Write only the. word(s) next to the question numbers (2.1.1 to 2.1.8) in the ANSWER BOOK.

1.11.1. The (eye/vortex) at A is characterised by descending air.

1.11.2. The area at B is an area of (high/low) air pressure.

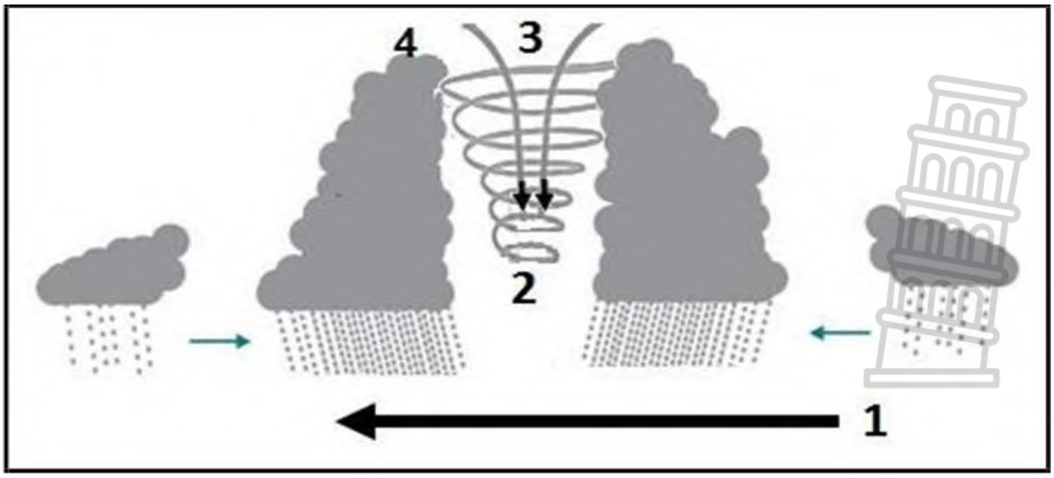
1.11.3. (Light/Heavy) rainfall occurs at C.

1.11.4. The vertical movements of air at D are known as (up draughts/down draughts).

1.11.5. The upper air at E is (converging/diverging).

1.11.6. F is associated with (low/high) air pressure

1.12. The sketch shows a cross-section through a tropical cyclone in the Southern Hemisphere. Choose the word/term from COLUMN B that completes the statement in COLUMN A. Write only **Y** or **Z** next to the question numbers. (1.12.1 to 1.12.7) in the ANSWER BOOK, e.g., 1.12.1.Y




[Adapted from https://maritimesa.org/grade-11/2016/09/23/influence-of-weather]

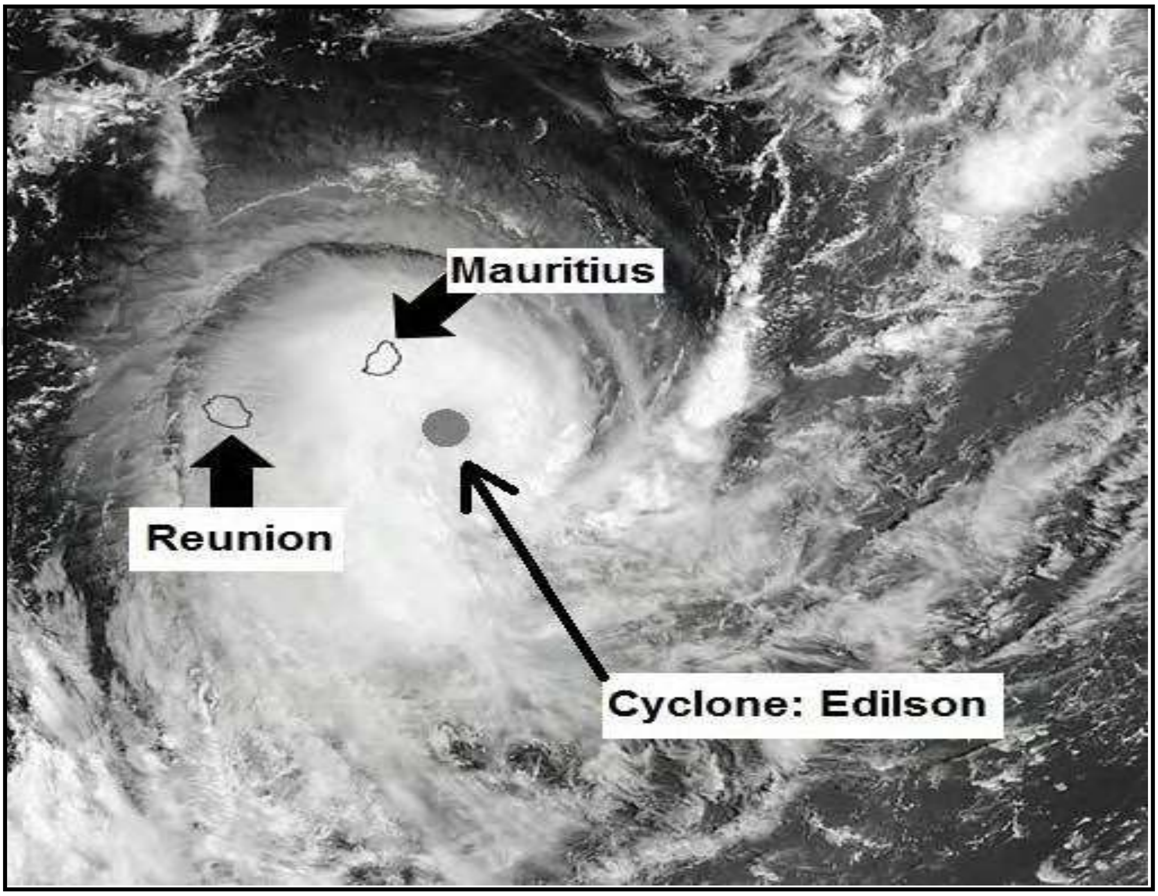
| COLUMN A | COLUMN B |
|---|---|

| | |
|---|---|
| 1.13.1. Wind **1** that steers the tropical cyclone is known as the … | **Y** westerlies<br>**Z** easterlies |
| 1.13.2. is known as the … | **Y** eye<br>**Z** centre |
| 1.13.3. Circulation of air around **2** is … | **Y** clockwise<br>**Z** anticlockwise |
| 1.13.4. The air pressure at **2** … | **Y** decreases<br>**Z** increases |
| 1.13.5. The air at **3** is … | **Y** ascending<br>**Z** descending |
| 1.13.6. The cloud type at **4** is … | **Y** cumulonimbus<br>**Z** stratus |
| 1.13.7. The type of precipitation associated with cloud type **4 is** … | **Y** drizzle<br>**Z** thunderstorms |

(7 x 1)

(7)

1.13. Use FIGURE 1.1, a satellite image of a tropical storm, and answer the questions that follow.




1.13.1. Identify the type of cyclone represented in the satellite image.

1.13.2. Is this a high- or low-pressure system?

1.13.3. In which season does this weather system occur?

1.13.4. Name the prevailing winds that drive this cyclone

1.13.5. Name the global air circulation cell in which this system occurs.

1.13.6. Which ONE, Réunion or Mauritius, will experience less severe weather?

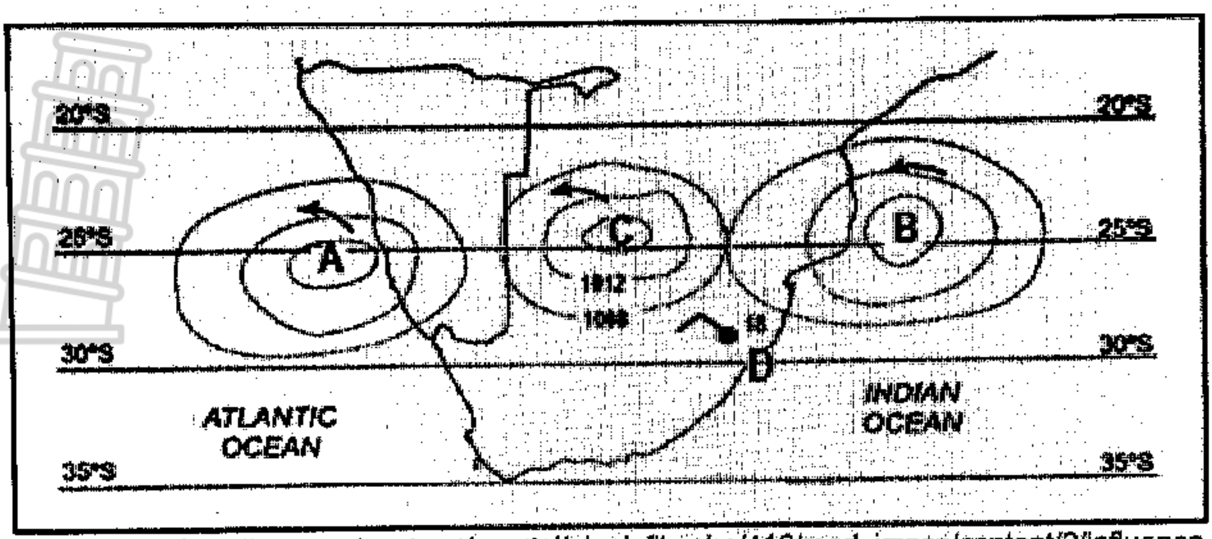
1.13.7. What does the name Edilson reveal about the number of cyclones experienced in this season?

1.13.8. Name the cloud that is found around the eye of this cyclone.

(8 x 1) (8)

1.14. Refer to FIGURE 1.14 which shows anticyclones over South Africa. Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers (1.14.1 to 1.14.7) in the ANSWER BOOK.

FIGURE 4.1 ANTICYCLONES




[Source: http://www.aelsnet.net/eportal/pluginfile.php/412/mod_imscp/content/2/Influence of_pressure_systems.htm]

1.14.1. Pressure cell A is situated further (north/south) in winter.

1.14.2. Pressure cell B is named the (South Atlantic/South Indian) High-pressure Cell.

1.14.3. When isobars are elongated away from pressure cell B, they form a (ridge/trough).

1.14.4. The pressure reading at C is approximately (1 012 hPa/1 016 hPa).

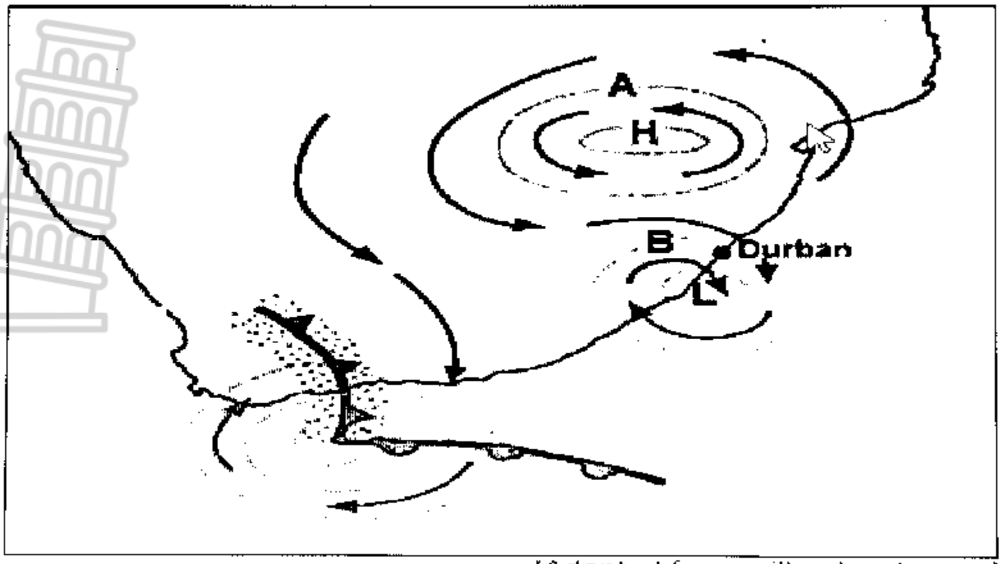
1.14.5. The wind speed at weather station D is (20 knots/10 knots).

1.14.6. The wind direction at weather station D is (north-east/north-west).

1.14.7. Pressure cells A, B and C represent the (equatorial low/subtropical high) pressure belt.

(7 x 1) (7)

1.15. Refer to the diagram showing two pressure cells, A and B. Choose ONE term in brackets to make each of the following statements TRUE:




[Adapted from millarslocal.co.za]

1.15.1. Berg wind conditions occur during (summer/winter).

1.15.2. Pressure cell A is the (Kalahari/South Atlantic) high-pressure cell.

1.15.3. Pressure cell B is a (thermal/coastal) low-pressure cell.

1.15.4. The general direction of movement of the frontal depression is (eastwards/westwards).

1.15.5. Durban will experience (onshore/offshore) winds.

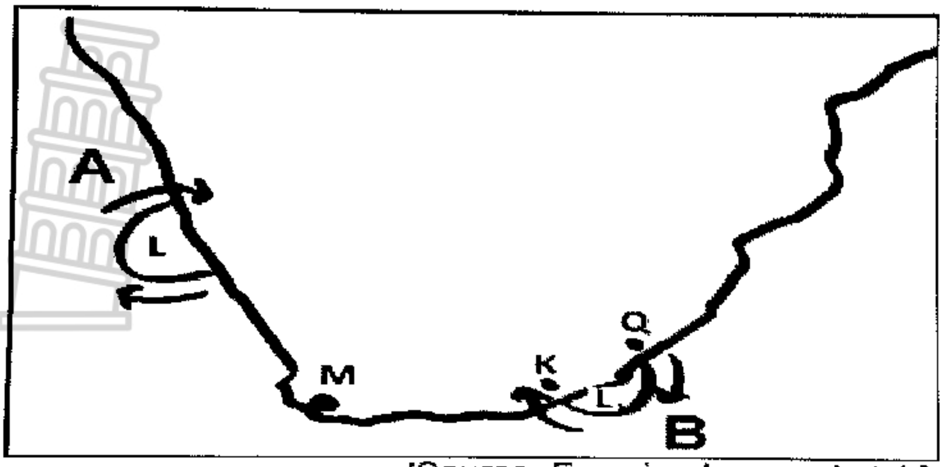
1.15.6. The cloud cover at Durban will be (overcast/clear) due to the winds identified in QUESTION 1.1.5

1.15.7. (Onshore/Offshore) winds are associated with fog and light rain.

1.15.8. The risk of veld fires during berg wind conditions (increases/decreases) in the eastern parts of South Africa. (8 x 1) (8)

1.16. Refer to FIGURE 4.3 showing two coastal lows, A and B. Choose ONE term in brackets to make each of the following statements TRUE:

FIGURE 4.3 COASTAL LOW-PRESSURE CELLS




[Source: Examiner's own sketch]

1.16.1. Air circulation in pressure cells A and B is (clockwise/anticlockwise).

1.16.2. Air (converges/diverges) at pressure cells A and B.

1.16.3. Pressure cell A will have a (lower/higher) moisture content than pressure cell B.

1.16.4. Pressure cell A is associated with (fog/drizzle).

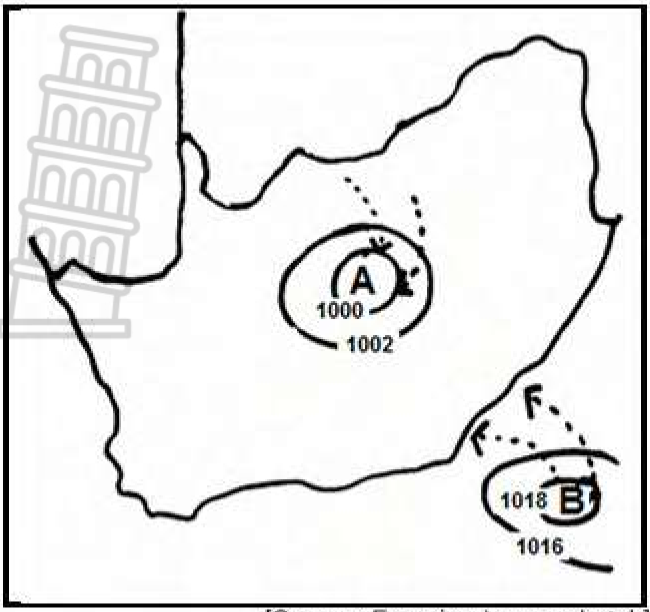
1.16.5. The air pressure at B will be (lower/higher) than at A.

1.16.6. Place M will soon be affected by weather system (A/B).

**1.16.7.** Place (K/Q) will experience berg winds.

(7 x 1) (7)

1.17. Study FIGURE 4.4 which shows two common pressure systems (A and B) that occur over South Africa. Match each of the statements below to either pressure cell A or B.




[Source: Examiner's own sketch]

1.17.1. Known as the heat low pressure cell

1.17.2. Also referred to as an anticyclone

1.17.3. Associated with unstable weather conditions

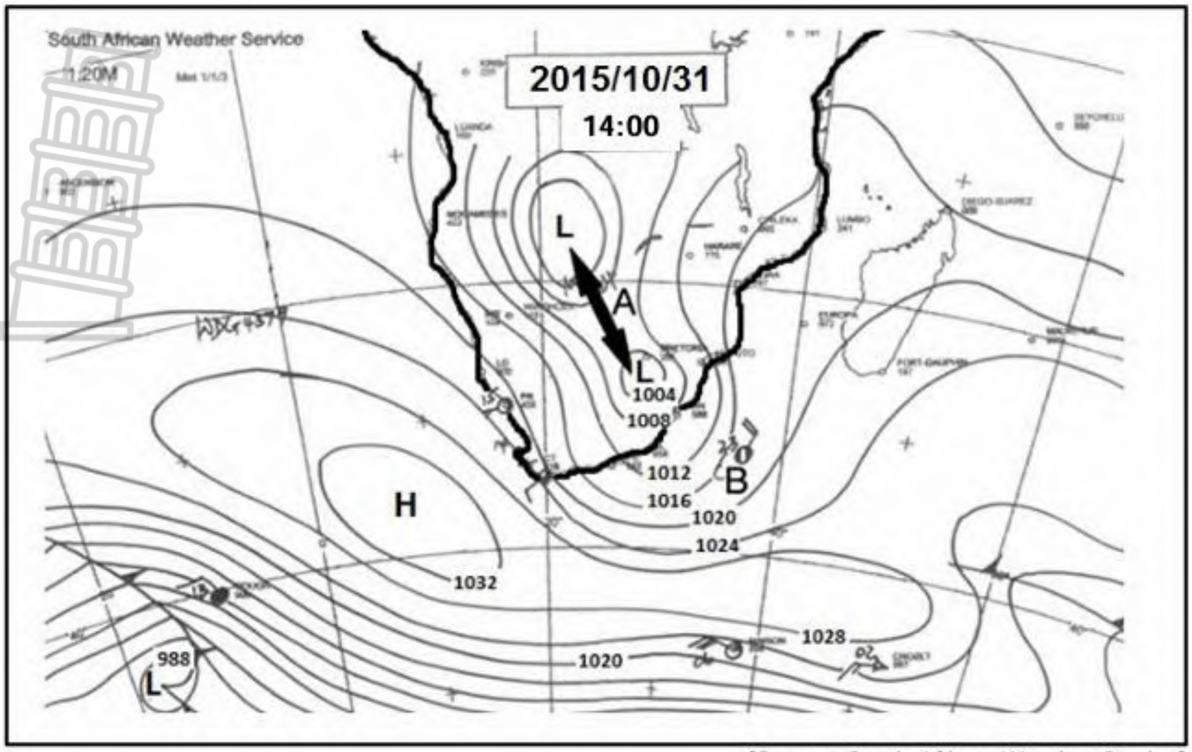
1.17.4. Causes south-easterly winds to blow over the east coast of South Africa

1.17.5. Air diverges from this pressure cell

1.17.6. Dominates the land in summer

1.17.7. Associated with convection thunderstorms (7 x 1) (7)

1.18. . Refer to FIGURE 4.5 showing a synoptic weather map of southern Africa. Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question number (4.5.1–4.5.7) in the ANSWER BOOK.




[Source: South African Weather Service]

1.18.1. The synoptic weather map data was captured at (12:00/14:00).

1.18.2. The season represented by this synoptic weather map is (summer/winter).

1.18.3. Area A on the synoptic weather map is a (ridge/trough).

1.18.4. The weather system associated with the area at A creates (stable/unstable) weather conditions.

1.18.5. The wind at weather station B is a (NNE/SSW) wind.

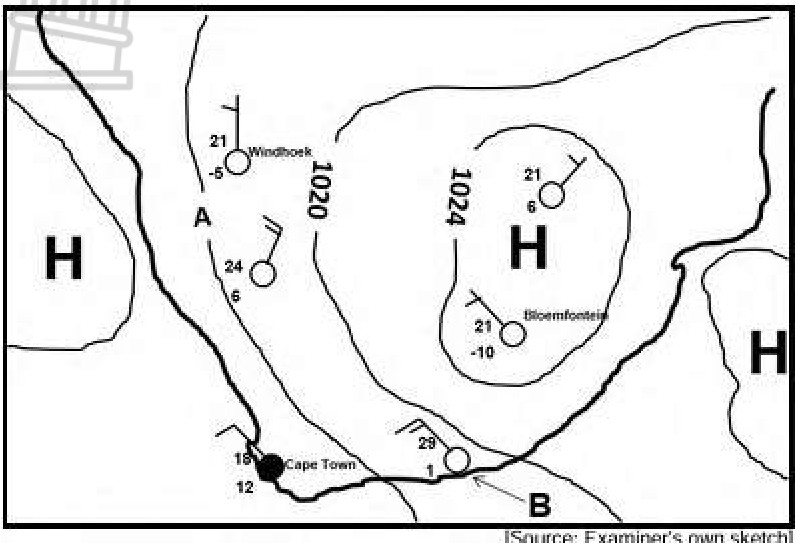
1.18.6. The wind speed at weather station B is (20/10) knots.

1.18.7. The air pressure at the centre of the South Atlantic anticyclone is (lower/higher) than 1 032 hPa/mb.

(7 x 1) (7)

1.19. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.19.1 to 1.19.8) in the ANSWER BOOK, e.g., 1.19.9 D.

Refer to the sketch below to answer QUESTIONS 4.6.1 to 4.6.5.




[Source: Examiner's own sketch]

1.19.1. The season represented on the synoptic weather map is …

A autumn.

B spring.

C summer.

D winter.

1.19.2. The isobaric interval of the isobars on the synoptic weather map is … hPa.

A 2

B 4

C 6

D 8

1.19.3. The air pressure reading at A is … hPa.

A 1016

B 1018

C 1022

D 1024

1.19.4. The dew point temperature indicated at weather station B is … °C.

A 4

B 29

C 1

D 28

1.19.5. The weather stations around the interior high-pressure cell show clear skies due to … air, and the anticlockwise circulation results in … winds.

(i) subsiding

(ii) rising

(iii) south-easterly

(iv) north-westerly

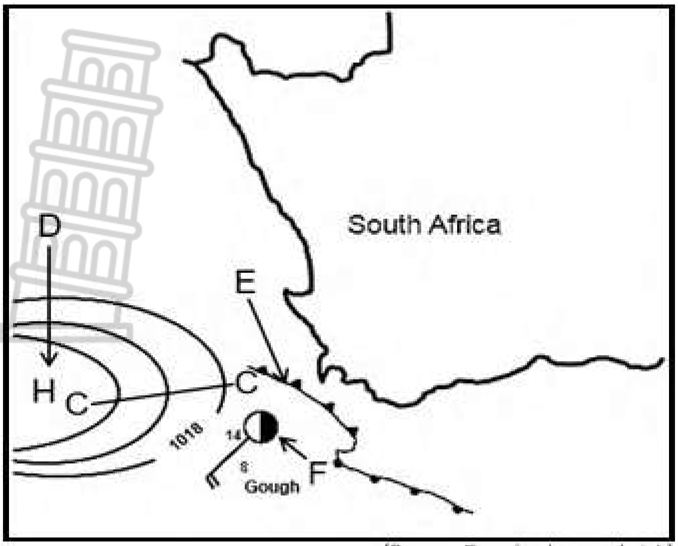
A (i) and (iii)

B (i) and (iv)

C (ii) and (iii)

D (iii) and (iv)

Refer to the map below to answer QUESTIONS 4.6.6 to 4.6.8.




[Source: Examiner's own sketch]

1.19.6. Line C-C represents a …

A ridge.

B saddle.

C trough.

D depression.

1.19.7. The high-pressure cell at D will cause weather system E to move in a … direction.

A south-easterly

B north-easterly

C south-westerly

D north-westerly

1.19.8. The weather conditions at weather station F:

(i) Air temperature is 8 °C

(ii) Cloud cover is 4/8

(iii) South-westerly wind

(iv) Wind speed is 5 knots

A (i) and (ii)

B (ii) and (iii)

C (i) and (iv)

D (ii) and (iv)

(1x 8) (8)

**1.20. The diagram below shows the influence of aspect on different valley slopes located in the Southern hemisphere.**


[Aspect (geography) – Wikipedia]

1.20.1. Is the influence of aspect on the valley slopes more evident in summer or in winter?

1.20.2. Will slope X or slope Y receive direct rays of the sun?

1.20.3. Which slope, X or Y, will have the highest groundwater content?

1.20.4. Will slope X or slope Y be more suitable for crop farming?

1.20.5. Which slope, X or Y, is called the shadow zone?

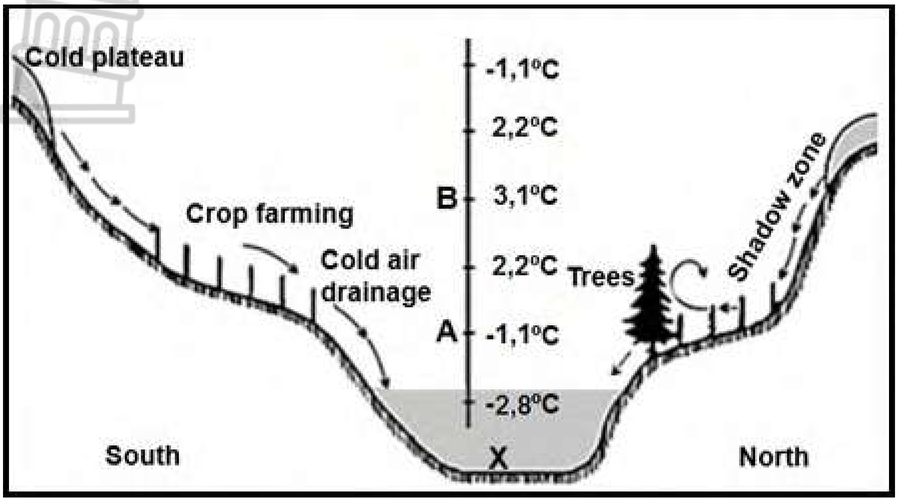
1.20.6. Are settlements more likely to be located at X or Y?

1.20.7. Would valley slopes closer to the equator be more or less influenced by aspect?

1.20.8. Are forests more likely to be found on slope X or slope Y?

(8 x 1) (8)

**1.21. Refer to the sketch below showing valley climates. Complete the statements in COLUMN A with the options in COLUMN B. Write down only Y or Z next to the question numbers (1.21.1 to 1.21.7) in the ANSWER BOOK, e.g.,1.21.8 Y.**




[Adapted from https://journals.ashs.org/hortsci/view/journals/hortsci/43/6/article-p1652.xml]

| COLUMN A | COLUMN B |
|---|---|
| 1.21.1. The direction in which the slope faces in relation to insolation is … | Y orientation<br>Z aspect |
| 1.21.2. The sketch represents a valley in the … Hemisphere. | Y Southern<br>Z Northern |
| 1.21.3. … wind occurs due to terrestrial radiation. | Y Katabatic<br>Z Anabatic |
| 1.21.4. A temperature inversion occurs between A and B due to a/an … in temperature with height. | Y decrease<br>Z increase |
| 1.21.5. The form of precipitation that could occur at X is … | Y dew<br>Z frost |
| 1.21.6. … fog may form in the valley on clear, calm nights. | Y Radiation<br>Z Advection |
| 1.21.7 The northern side of the valley is covered by trees because of … evaporation. | Y high<br>Z low |

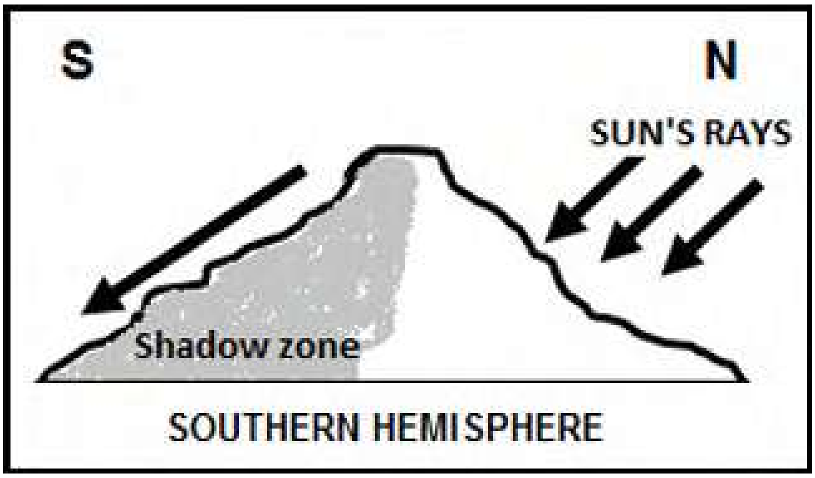
(1 x 7) (7)

1.22. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.22.1 to 1.22.8) in the ANSWER BOOK, e.g., 1.1.9 D.

1.22.1. Climate of a very small area is known as a …

A city climate.
B microclimate.
C macroclimate.
D valley climate.

1.22.2. The slope in the diagram that receives the direct rays of the sun is …-facing.



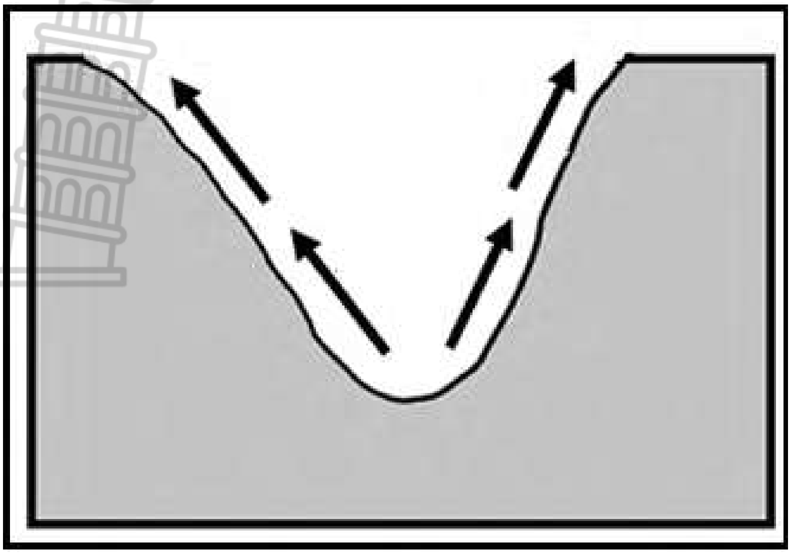

[Examiner's own sketch]

A south
B east
C north
D west

1.22.3. South-facing slopes in the Southern Hemisphere can be described as … natural vegetation.

A dry with sparse
B moist with dense
C moist with sparse
D dry with dense

1.22.4. The air movement shown in the sketch can result in …



[Source: Examiner's own sketch]

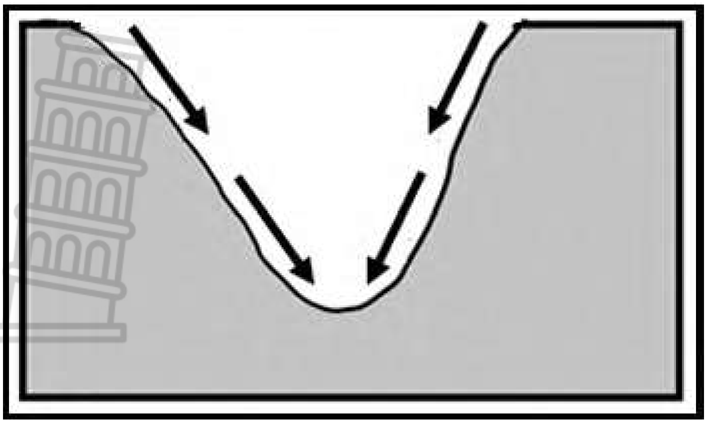
A frost pockets.

B the dispersal of pollutants.

C radiation fog.

D a thermal belt.

1.22.5. The downslope movement of air occurs because of cooling due to …



[Source: Examiner's own sketch]

A solar radiation.

B reflection.

C terrestrial radiation.

D insolation.

1.22.6. 1.Precipitation that forms due to terrestrial cooling at night:

A Radiation fog

B Drizzle

C Snow

D Advection fog

1.22.7. The wind associated with a temperature inversion in a valley is a/an … wind.

A. anabatic
B. B offshore
C. C onshore
D. D katabatic

1.22.8. The CORRECT sequence in which a temperature inversion develops:

(i) Mountain slopes cool

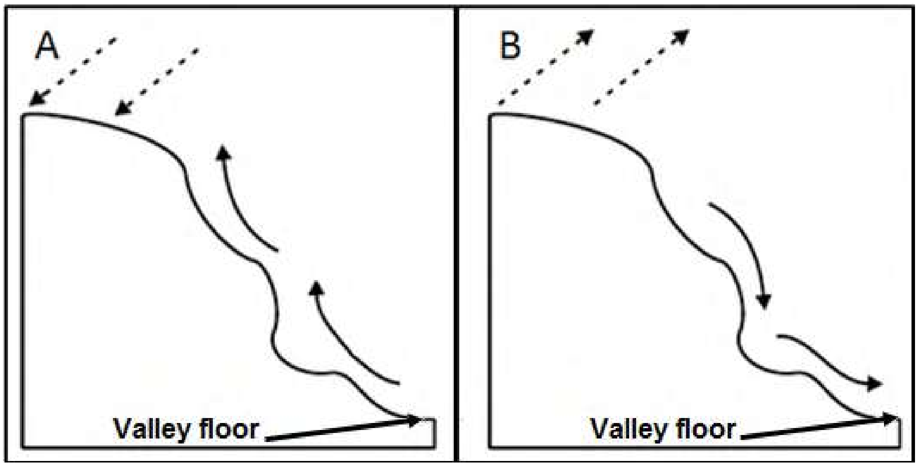
(ii) Warm air is displaced and rises from the valley floor

(iii) Cold air sinks due to the force of gravity

(iv) Temperature increases with height

A (i), (ii), (iii), (iv)
B (iv), (iii), (ii), (i)
C (i), (iii), (ii), (iv)
D (i), (ii), (iv), (iii) (8 x 1) (8)

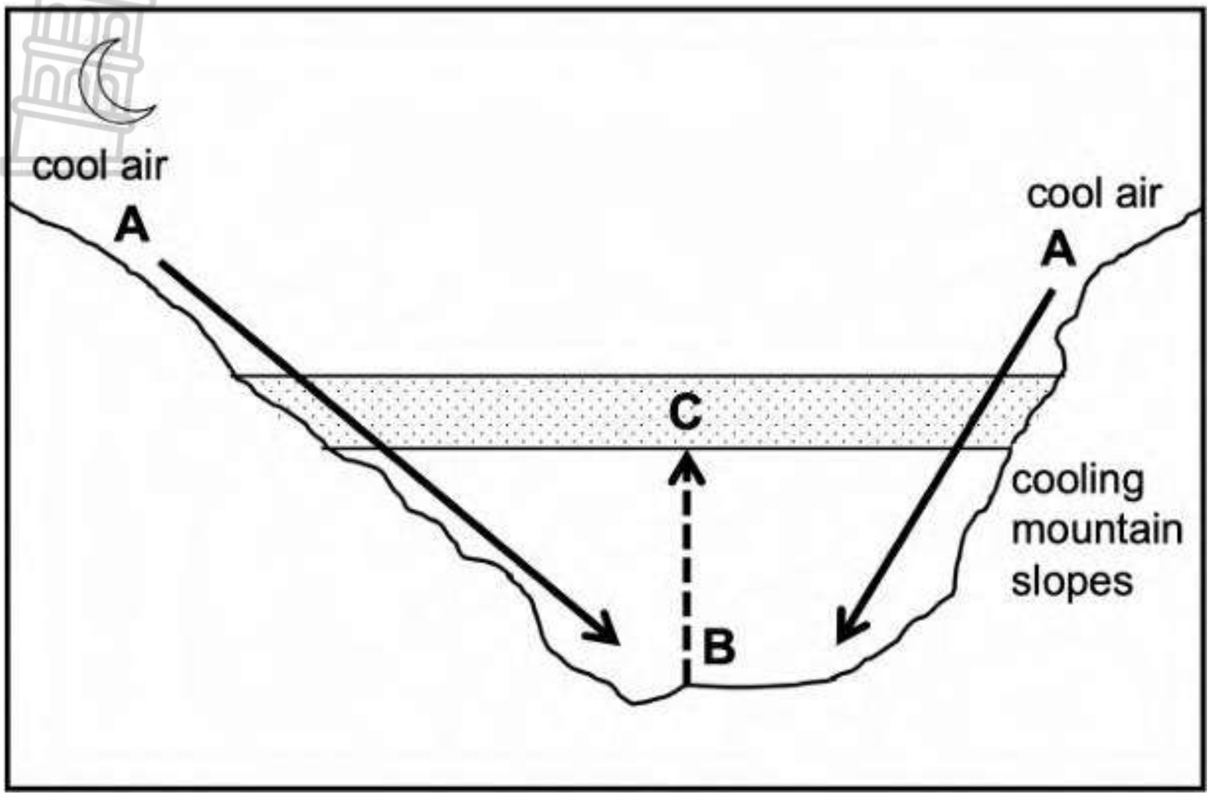
**1.23. Refer to FIGURE 1.1 showing air movement associated with valley climates. Match the descriptions below with winds A and B. Write only the letter A or B next to the question numbers (1.1.1 to 1.1.7) in the ANSWER BOOK, e.g. 1.1.8 B.**




[Examiner's own sketch]

1.23.1. The air movement associated with upslope flow
1.23.2. Air movement that occurs at the night
1.23.3. Air movement that originates due to the rate of insolation
1.23.4. Air movement that mostly reduces air pollution at the bottom of the valley.
1.1.5 Air movement associated with dense, heavy air.
1.23.5. Air movement associated with the formation of frost on the valley floor.
1.23.6. The direction of air movement determined by gravitational forces.
(7 x 1) (7)

1.24. Choose the correct word(s) from those given in brackets. Write only the word(s)
next to the question numbers (1.2.1 to 1.2.7) in the ANSWER BOOK.




[Source: Examiner's own sketch]

1.24.1. Air at A cools because of (solar/terrestrial) radiation.

1.24.2. Downward movement of air along the valley slopes occurs during the (night/day).

1.24.3. Air movement from A to B results in a/an (anabatic/katabatic) wind.

1.24.4. Dew point temperature drops to below freezing point at (A/B) at night.

1.24.5. Precipitation that forms at B when the dew point temperature drops below 0 °C is (frost/radiation fog).

1.24.6. Displaced air from the valley results in a/an (inversion layer/thermal belt) developing at C.

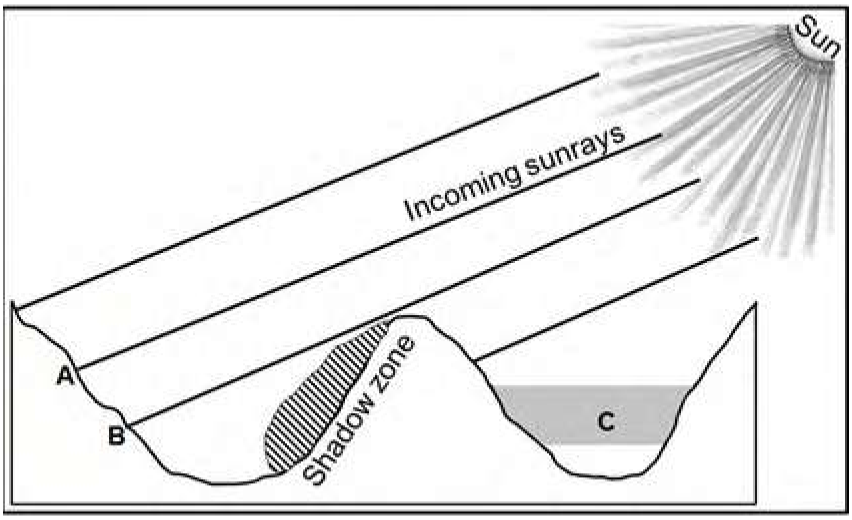
1.24.7. Layer C is more developed during the (day/night).

(7 x 1) (7)

1.25. Various options are provided as possible answers to the following questions.

Choose the answer and write only the letter (A–D) next to the question numbers (1.25.1 to 1.25.8) in the ANSWER BOOK, e.g., 1.25.8. D.

Refer to the sketch below showing valleys in the Southern Hemisphere to answer QUESTIONS 1.2.1 to 1.2.4.




1.25.1. The relationship between slopes and the sun's rays is referred to as …

A insolation.

B aspect.

C north-facing slope.

D terrestrial radiation.

1.25.2. The surface from A to B is intensely heated because it is …

A receiving oblique sunray.

B at a lower latitude.

C receiving direct sunrays.

D at a higher altitude.

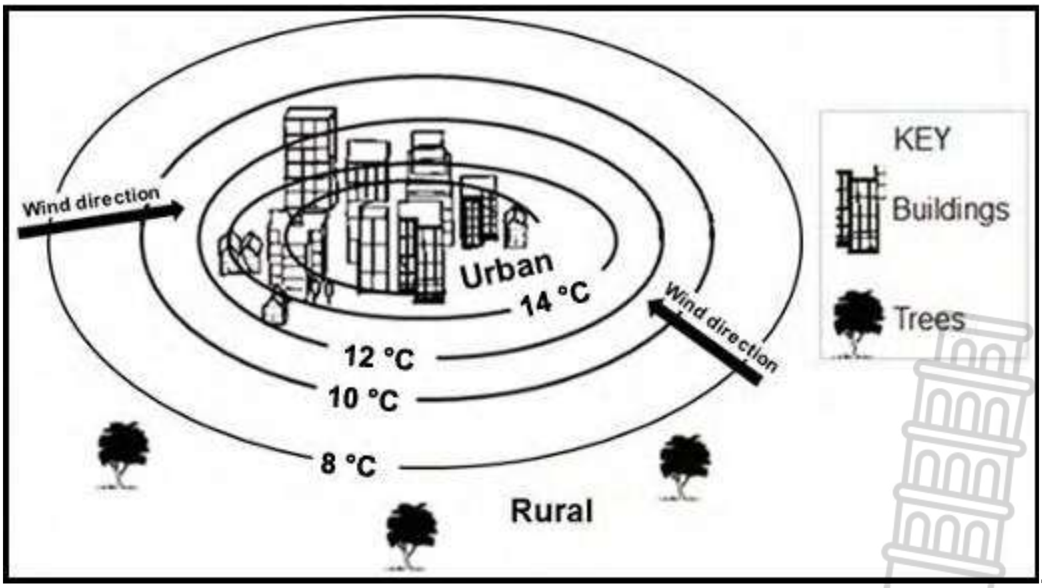
1.25.3. The climatological phenomenon occurring at C is …

A radiation fog..
B advection fog.
C terrestrial radiation.
D a frost pocket.

1.25.4. Dense vegetation is found in the shadow zone due to … conditions.

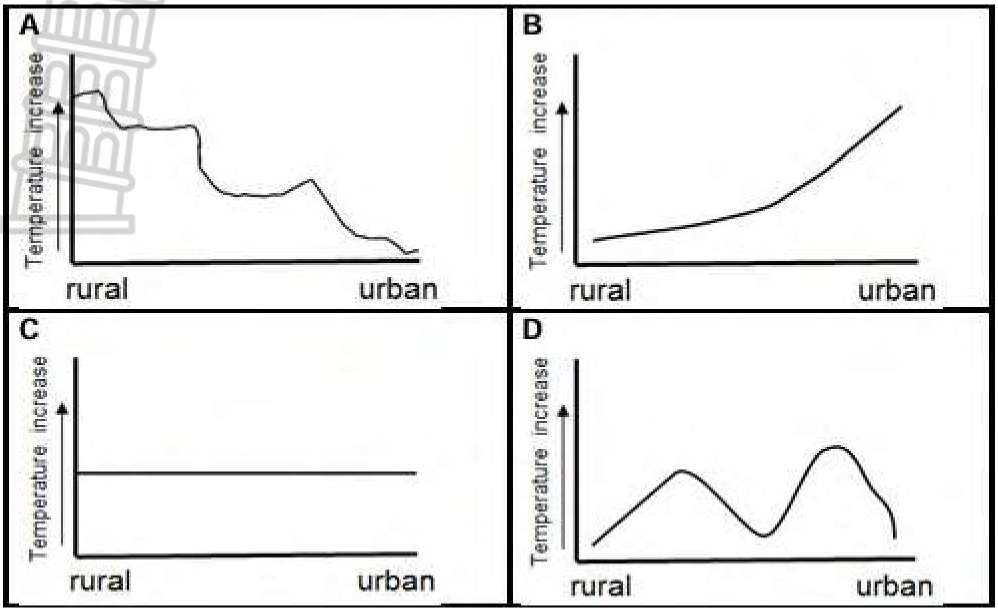
A warm
B dry
C moist
D windy

Refer to the sketch below depicting rural and urban climates to answer QUESTIONS 1.25.5 to 1.25.8




[Adapted from https://www.researchgate.net

1.25.5. Which graph below represents the change in temperature from the rural area to the urban area?




1.25.6. The reason for the change in temperature (answer to QUESTION 1.2.5) is due to … surfaces and … storm-water systems

i. natural
ii. artificial
iii. more
iv. less

A. (i) and (iii)

B. (i) and (iv)

C. (ii) and (iii)

D. (ii) and (iv)

1.25.7. in urban areas. The wind direction from the rural area to the urban area is influenced by … temperatures and … air pressure in urban areas.

(i) warmer

(ii) cooler

(iii) higher

(iv) lower

A (i) and (iii)

B (i) and (iv)

C (ii) and (iii)

D (ii) and (iv)

1.25.8. The urban area will experience … cloud cover with a/an … in precipitation than the rural area.

A more; increase

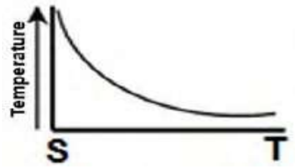
B less; decrease

C more; decrease

D less; increase (8 x 1) (8)

1..26. Complete the statements in COLUMN A with the options in COLUMN B. Write down only **Y** or **Z** next to the question numbers (1.5.1 to 1.5.7) in the ANSWER BOOK, e.g. 1.5.8 Y.

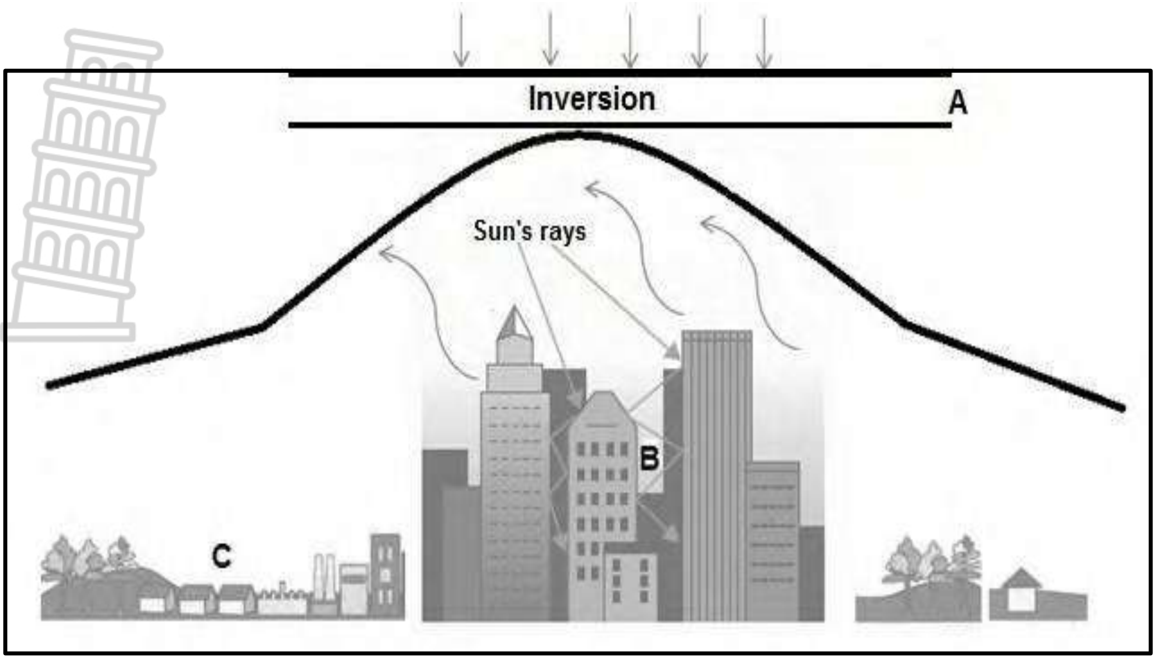
| COLUMN A | COLUMN B |
|---|---|
| 1.26.1. Increased absorption of heat in urban areas is due to … surfaces. | **Y** natural<br>**Z** artificial |
| 1.26.2. The intensity of multiple reflections of heat is increased due to the … dimension of buildings. | **Y** vertical<br>Z horizontal |

| | | |
|---|---|---|
| 1.26.3. The air pressure will generally be … in urban areas than in rural areas. | **Y**<br>Z | lower<br>higher |
| 1.26.4. The wind speed in urban areas is … than in rural areas. | **Y**<br>Z | faster<br>slower |
| 1.26.5. The relative humidity over urban areas is lower than over rural areas due to … evaporation. | **Y**<br>Z | more<br>less |
| 1.26.6. Urban areas have a higher frequency of precipitation than rural areas due to … | **Y**<br>Z | hygroscopic particles<br>building structures |
| 1.26.7. Temperature graph … represents the change in temperature from the urban areas (**S**) to the rural areas (**T**). | **Y**<br>**Z** | <br> |

(7 x 1) (7)

1.31.1. Refer to FIGURE 1.27. on city climates.

Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question number (1.27.1–1.27.8) in the ANSWER BOOK.




[Source: Examiner's own sketch]

The sketch shows a (day/night) situation.

1.27.1. The inversion layer is found at a (higher/lower) altitude during the night.

1.27.2. The inversion layer (increases/decreases) pollution concentration over the city during the night.

1.27.3. The heating of the city at **B** is the result of (multiple reflections of heat/terrestrial radiation).

1.27.4. The channelling of wind between tall buildings (increases/decreases) the wind speed.

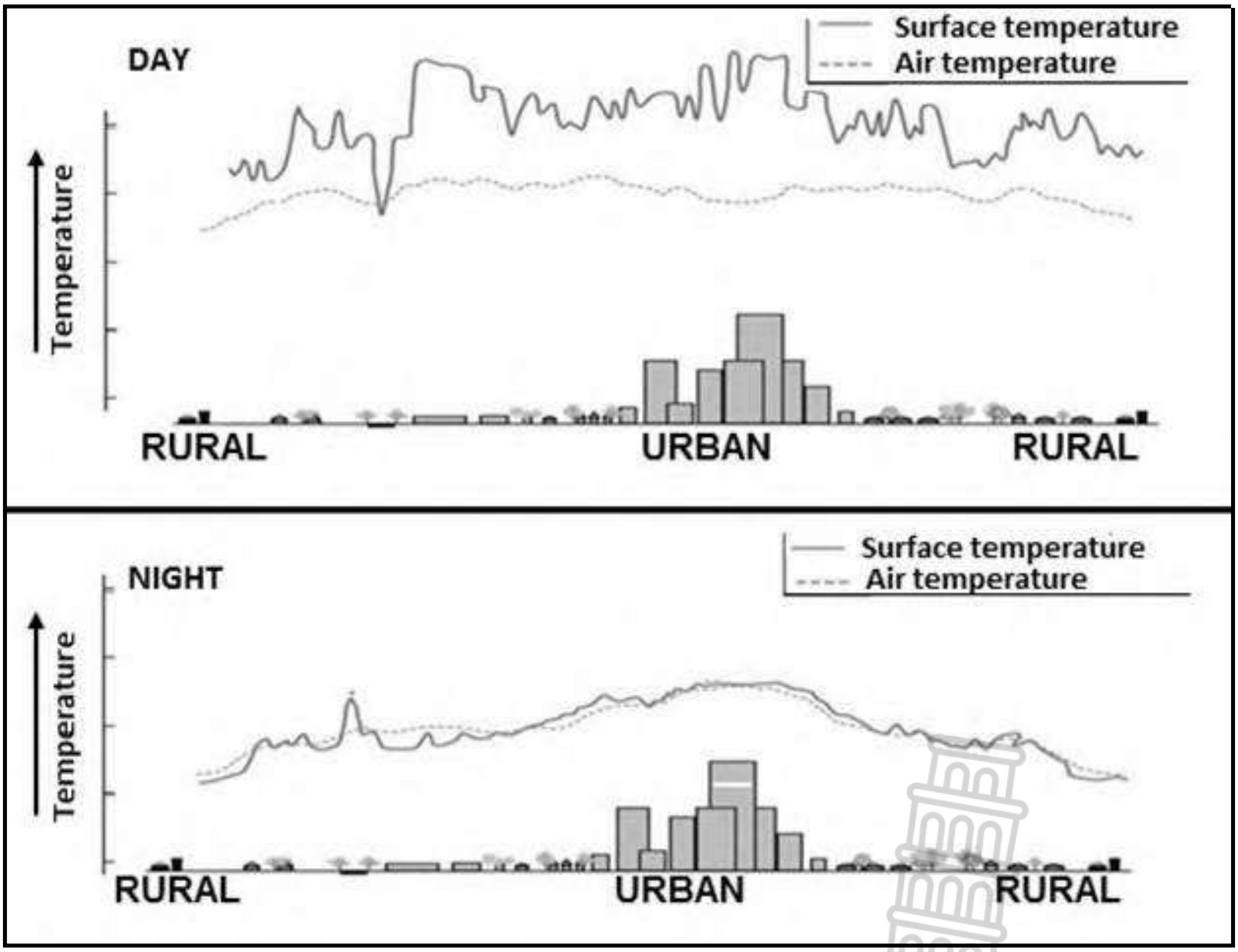
1.27.5. Temperature (increases/decreases) from **B** to **C**.

1.27.6. The influence of evapotranspiration on cooling the air will be (less/more) at **B** compared to **C**.

1.27.7. Area **B** is associated with (more/less) cloud coverage compared to area **C**. (7 X 1) 7

1.31.2. Refer to FIGURE 1.2 that shows an urban heat island effect during the day and night. Match the descriptions below with the diagrams showing DAY and NIGHT. Write only 'day' or 'night' next to the question numbers (1.28.1 to 1.28.7) in the ANSWER BOOK, e.g., 1.28.8 NIGHT

FIGURE 1.28. URBAN HEAT ISLAND EFFECT DURING THE DAY AND NIGHT
1.2.8 day.




[Adapted from USA 2020, https://www.epa.gov/heatislands/learn-about-heat-island]

1.28.1. Reflects the highest temperatures in an urban heat island

1.28.2. Pollution is dispersed over a greater area

1.28.3. Artificial heat generation is at its lowest

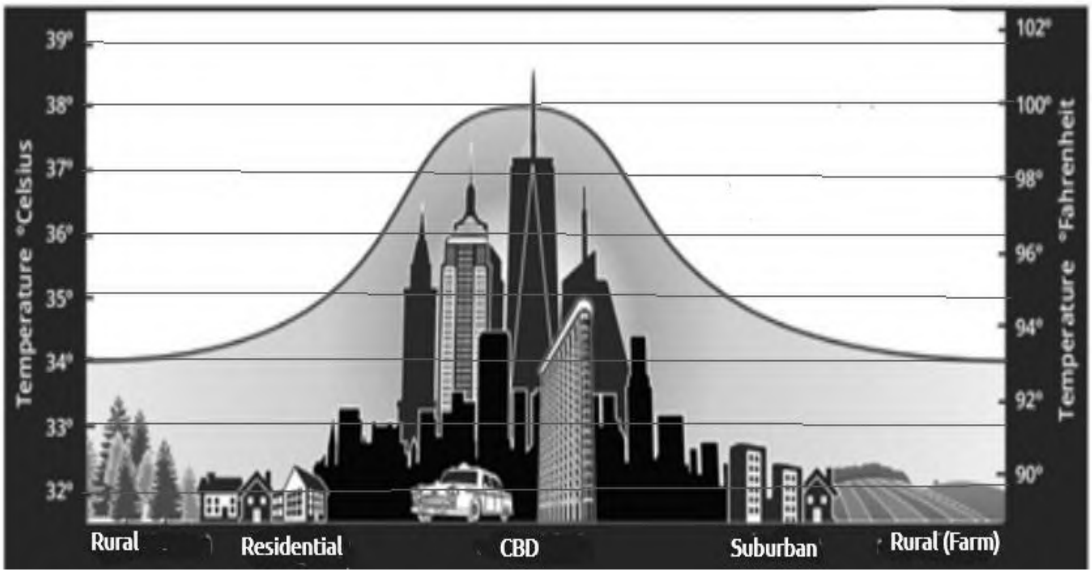
1.28.4. Increased human discomfort due to higher temperature

1.28.5. Greater difference between air and surface temperatures

1.28.6. Limited multiple reflection of heat

1.28.7. Fewer human activities generating heat (7 x 1) (7)

1.31.3. Refer to the sketch on urban climate. Various options are provided as possible answers to the following questions. Choose the correct the answers and write only the letter (A-D) next to the question number (1.29.1 to 1.29.8) in the answer book, e.g., 1.27.9 D.




1.29.1. What is the term/concept identifying the specific urban climate on the sketch?

A. Pollution dome.

B. Heat island

C. Descending air

D. Heat energy

1.29.2. What would be the difference in temperature between rural and CBD.

A. $38^{0}$c
B. $33^{0}$c
C. $4^{0}$c
D. $5^{0}$c

1.29.3. Factors contributing to higher city temperatures includes…

A. natural surfaces.
B. artificial surfaces.
C. rooftop gardens.
D. fewer cars.

1.29.4. Which of the areas will experience more rainfall?

A. Residential
B. Suburban
C. Rural
D. CBD

1.29.5. The …receive more insolation.

A. Rural
B. CBD
C. Suburban
D. Residential

1.29.6. This area is associated with less heat absorption and retention.

A. CBD
B. Suburban

C. Rural
D. Residential

1.29.7. There is less plant transpiration and evaporation from the soil.

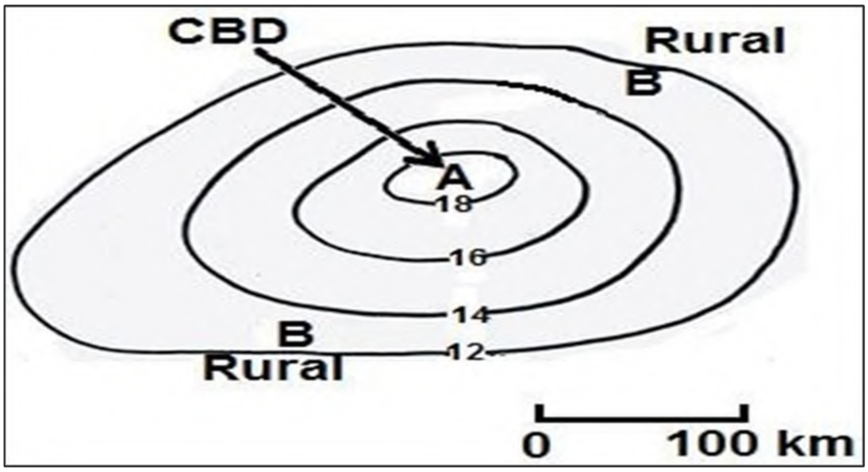
A. CBD
B. Suburban
C. Rural
D. Residential

1.29.8. One of the strategies to reduce the urban heat island effect is through …

A. Lack of vegetation.
B. High rising buildings.
C. Large dark surfaces.
D. Greening the city. (8 x 1) (8)

1.30.1. FIGURE 1.30.1: DISTRIBUTION OF TEMPERATURE OVER AN URBAN AREA

Refer to FIGURE 1.4 showing the distribution of temperature over an urban area. Choose the correct word(s) from those given in brackets to make each of the statements TRUE. Write only the word(s) next to the question numbers (1.30.1 to 1.30.8) in the ANSWER BOOK.



1.30.1. The lines representing temperature on the sketch are known as isohyets/isotherms).

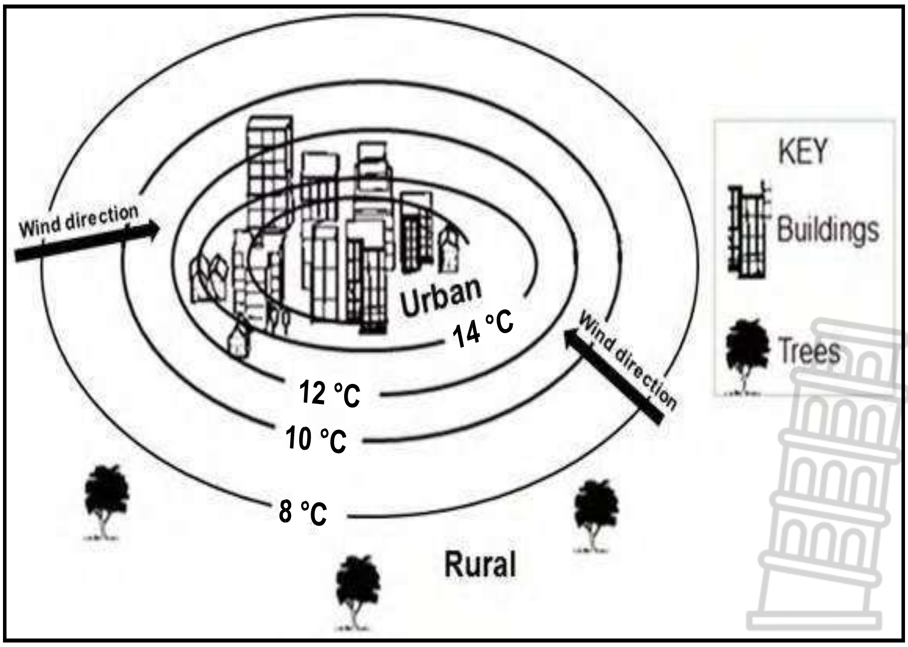
1.30.2. Area (**A**/**B**) consists of more artificial surfaces. The temperature decreases from (**A** to **B**/**B** to **A**). The general horizontal surface air movement will be from (**A** to **B**/ **B** to **A**).

1.30.3. The evaporation rate is higher in area (**A**/**B**). There are more hygroscopic nuclei in area (**A**/**B**), therefore it will experience a greater cloud cover.

1.30.4. Transpiration is higher in area (**A**/**B**). Area (**A**/**B**) is likely to experience more precipitation.

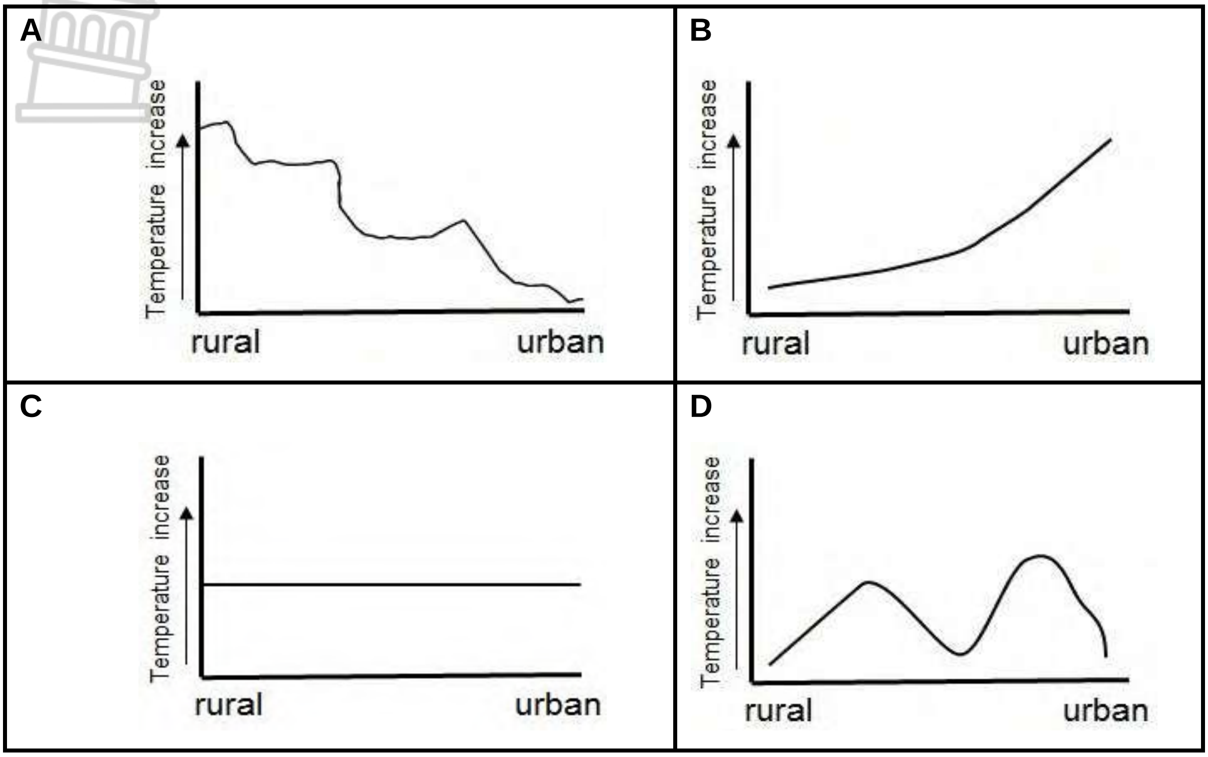
(8 x 1) (8)

1.31. Refer to the sketch below depicting rural and urban climates to answer QUESTIONS 1.31.1 to 1.31.8.




[Adapted from https://www.researchgate.net

1.31.1. Which graph below represents the change in temperature from the rural area to the urban area?




[Source: Examiner's own sketch]

1.31.2. The reason for the change in temperature (answer to QUESTION 1.31.2) is due to … surfaces and storm-water systems in urban areas.

- (i) natural
- (ii) artificial
- (iii) more
- (iv) less

- A (I) and (iii)
- B (I) and (iv)
- C (ii) and (iii)
- D (ii) and (iv)

1.31.3. The wind direction from the rural area to the urban area is influenced by … temperatures and … air pressure in urban areas.

(i) warmer
(ii) cooler
(iii) higher
(iv) lower

A (I) and (iii)
B (I) and (iv)
C (ii) and (iii)
D (ii) and (iv)

1.31.4. The urban area will experience … cloud cover with a/an … in precipitation than the rural area.

A more; increase
B less; decrease
C more; decrease
D less; increase

1.31.5. The urban area will experience …rainfall due to ……cloud cover.
A. high; more
B. less; less
C. low; low
D. more; less

1.31.6. The temperature in rural area is lower due to…….
A. more artificial surfaces
B. more air conditioners
C. taller buildings
D. natural surfaces

1.31.7. Urban area has ……. hygroscopic nuclei because of ……pollution.
A. less; low
B. more; high
C. less; less

D. low; high

(7x1) 7

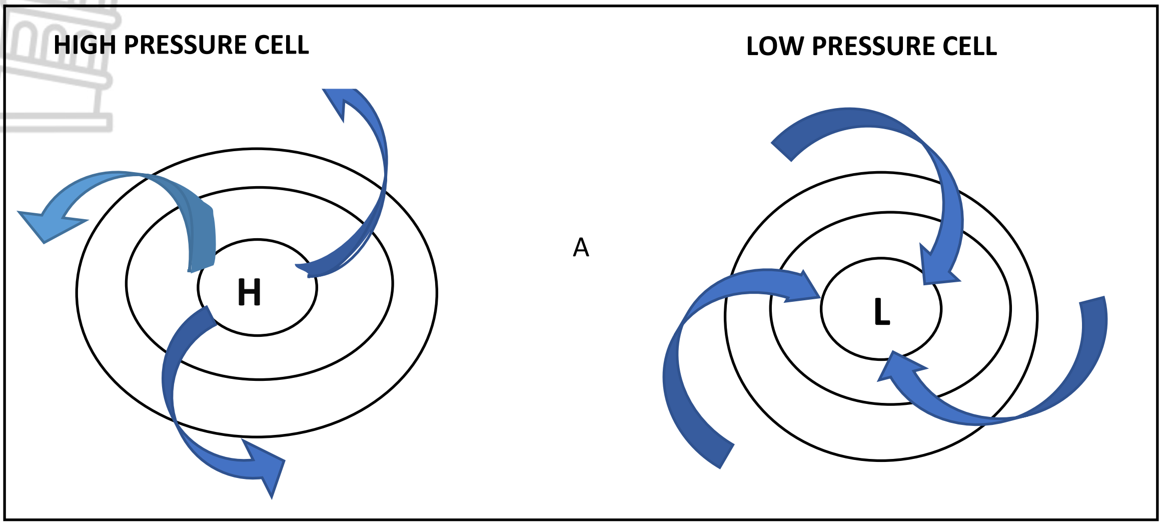
1.32. Choose the term/concept from COLUMN B that matches the description in COLUMN A. Write only the letter (A–H) next to the question numbers (1.32.1 to 1.32.7) in the ANSWER BOOK, e.g., 1.32.8 C.

| COLUMN A | | COLUMN B | |
|---|---|---|---|
| 1.32.1. | An area of warmer temperature than the surrounding rural areas | A | Front |
| 1.32.2. | Lines that join places with the same temperature | B | Thermal belt |
| 1.32.3. | A slope that does not receive the direct rays of the sun | C | Pollution dome |
| 1.32.4. | The climate of a small area such as a valley or city | D | Pollution plume |
| 1.32.5. | The zone where the warm air accumulates midway up the valley | E | Heat island |
| 1.32.6. | The zone between two air masses with a different moisture content | F | Microclimate |
| 1.32.7. | Consists of an accumulation of soot, dust, smoke and other pollutants that form over the city | G | Isotherms |
| | | H | Shadow zone |

(7 x 1) (7)

# DATA RESPONSE QUESTIONS

**a) Refer to the diagram below and answer the question that follow.**




2.1.1. Identify the season associated with high pressures cell over the interior. (1 x 1) (1)

2.1.2. Give reasons for your answer in 2.1.1. (1 x 2) (2)

2.1.3. Identify the seasons associated with low pressure cells over the interior. (1 x 1) (1)

2.1.4. Give reasons for your answer in 2.1.2. (1 x 1) (1)

2.1.5. Describe the cloud cover associated with a high-pressure cell over the interior. (1 x 1) (1)

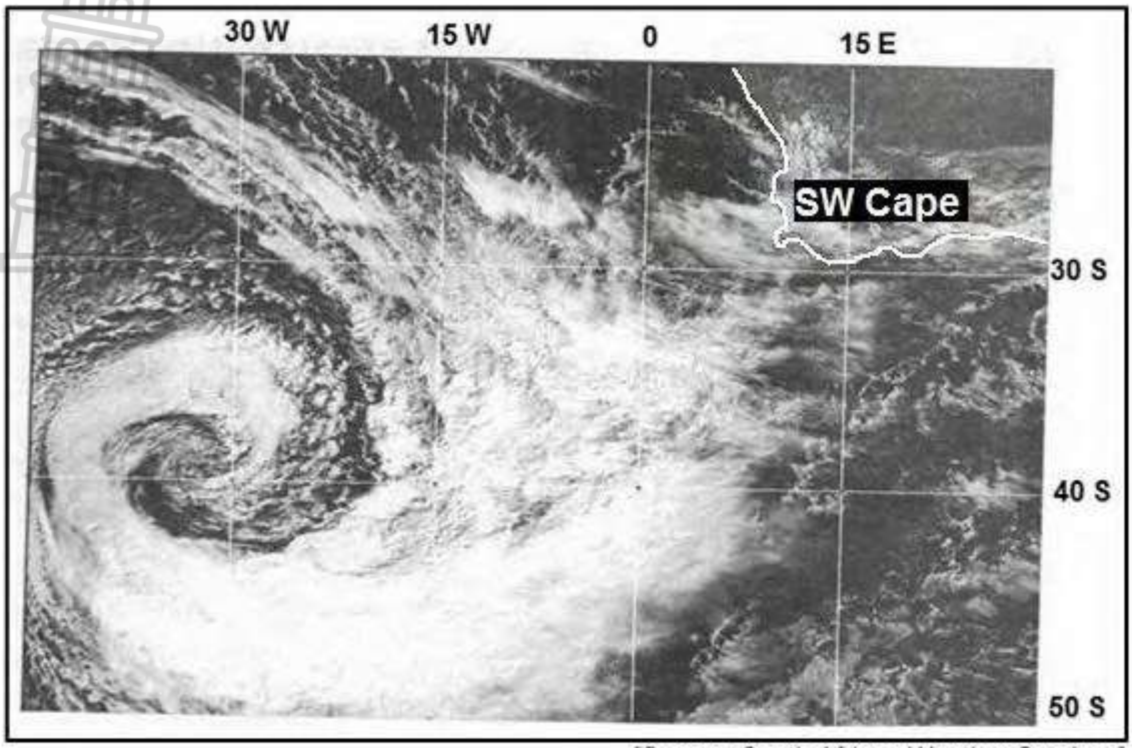
2.1.6. Explain the formation of the cloud cover mentioned in 1.3.5. (2 x 2) (4)

2.1.7. Identify the cloud cover associated with low pressure cell over the interior. (1 x 1) (1)

2.1.8. Explain the formation of the cloud cover mentioned in 1.3.7. (2 x 2) (4)

**[15]**

b) Refer **to FIGURE 2.2 based on a satellite image**.




[Source: South African Weather Services]

2.2.1. Identify the low-pressure weather system shown in the satellite image. (1 x 1) (1)

2.2.2. Give evidence from the satellite image to support your answer to QUESTION 2.41. (1 x 2) (2)

2.2.3. Identify the season in which this satellite image was taken. (1 x 1) (1)

2.2.4. Give a reason to support your answer in QUESTION 2.4.3 (1 x 2) (2)

2.2.5. In which hemisphere is this low-pressure system found? (1 x 1) (1)

2.2.6. Account for your answer in QUESTION 2.3.5. (1 x 2) (2)

2.2.7. Account for the direction in which this low-pressure weather system moves. (1 x 2) (2)

2.2.8. Why does this low-pressure weather system have a greater impact on South Africa in the winter? (1 x 2) (2)

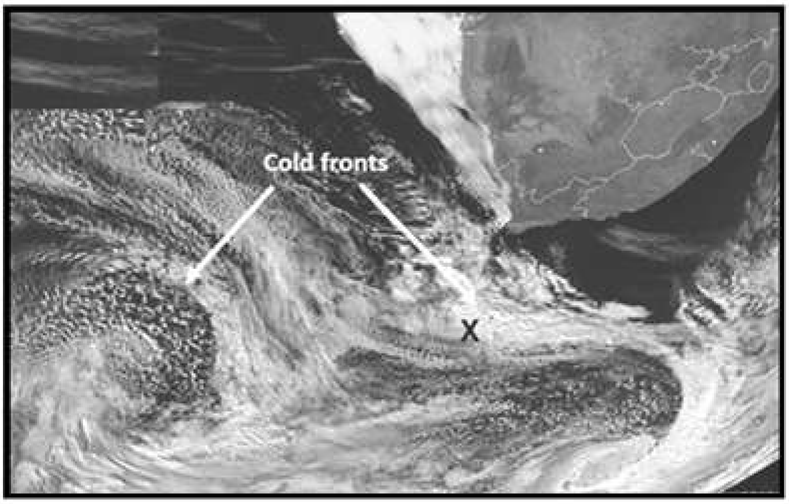
2.2.9. Explain the processes involved in the formation of clouds along the cold front. (3 x 2) (6)

2.2.10. Sketch a labelled cross-section of a cold front associated with this low-pressure weather system. (4 x 1) (4)

2.2.11. Explain how this low-pressure weather system has a positive impact on the economy of the South-western Cape. (2 x 2) (4)

**c) Refer to the extract and the satellite image of mid-latitude cyclones.**

COLD FRONTS MOVE OVER THE WESTERN CAPE: AUGUST 2021




Parts of the Western Cape are already in the grips of cold and rainy weather and this will continue as a series of cold fronts reach the province this weekend.

As the last and strongest cold front makes landfall on Sunday morning, widespread rain will start over the Peninsula, the Cape Winelands and the Overberg, where weather prediction models have currently indicated a further 20–30 mm of rain in Cape Town and more than 50 mm in the mountainous areas. With the area already becoming water-logged, this heavy rainfall may lead to localised flooding. Rainfall will spread along the south coast, west coast and Namakwa districts on Sunday.

Maximum temperatures will drop to 12 °C in the Western Cape. Snow will start falling on Sunday evening into Monday morning across the high ground of the Western and Northern Cape, reaching the Eastern Cape and Lesotho on Monday. Snowfalls will not be confined to the mountains of these provinces as some towns and mountain passes can expect light snowfall as well.

[Adapted from https://www.enca.com/weather/here-comes-the-cold]

2.3.1. Give the general direction of movement of the mid-latitude cyclones. (1 x 1) (1)

2.3.2. Give a reason for the direction of movement of the mid-latitude cyclones. (1 x 2) (2)

2.3.3. Quote evidence from the extract for the localised flooding. (1 x 2) (2)

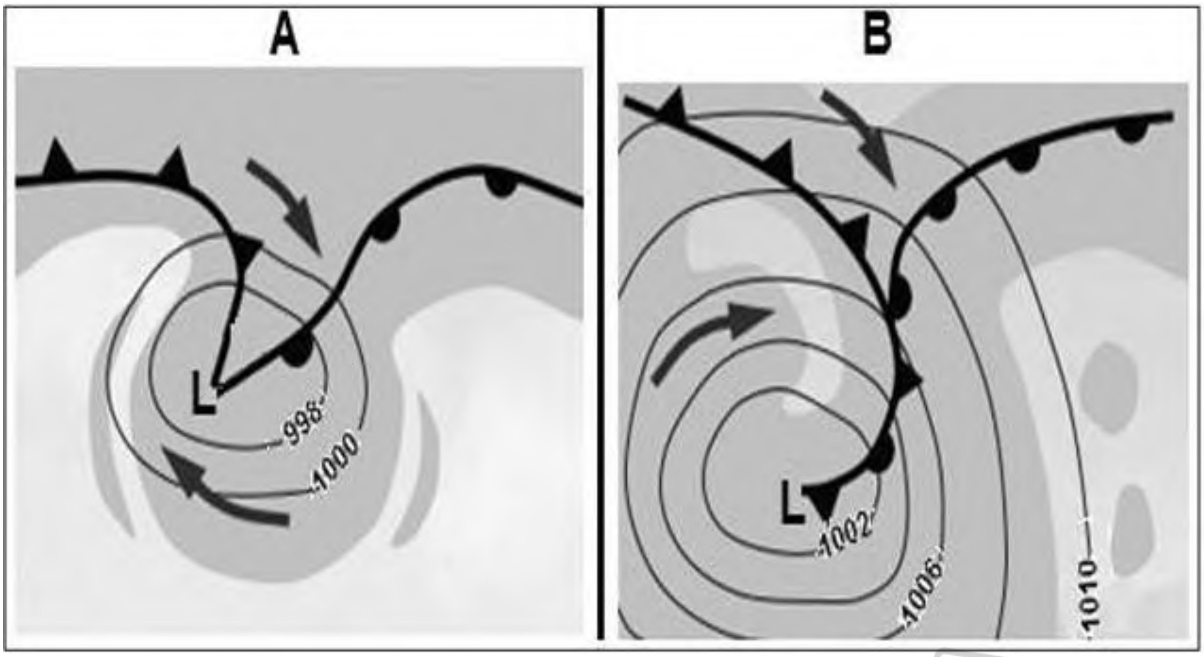
2.3.4. Why do cold fronts affect the Western Cape mainly in winter? 1 x 2) (2)

2.3.5. How will snowfall influence the water supply in the Western Cape? (1 x 2) (2)

2.3.6. Describe the processes that resulted in the formation of cumulonimbus clouds along the cold front at X. (3 x 2) (6)

**(15)**

d) **Refer to FIGURE 2.6 which illustrates two stages in the development of a mid-latitude cyclone.**




2.4.1. State the hemisphere (northern or southern) in which the mid-latitude cyclone developed. (1x1) (1)

2.4.2. Give a reason for your answer to QUESTION 2.3.1. (1x1) (1)

2.4.3. Along which front does a mid-latitude cyclone develop? (1x1) (1)

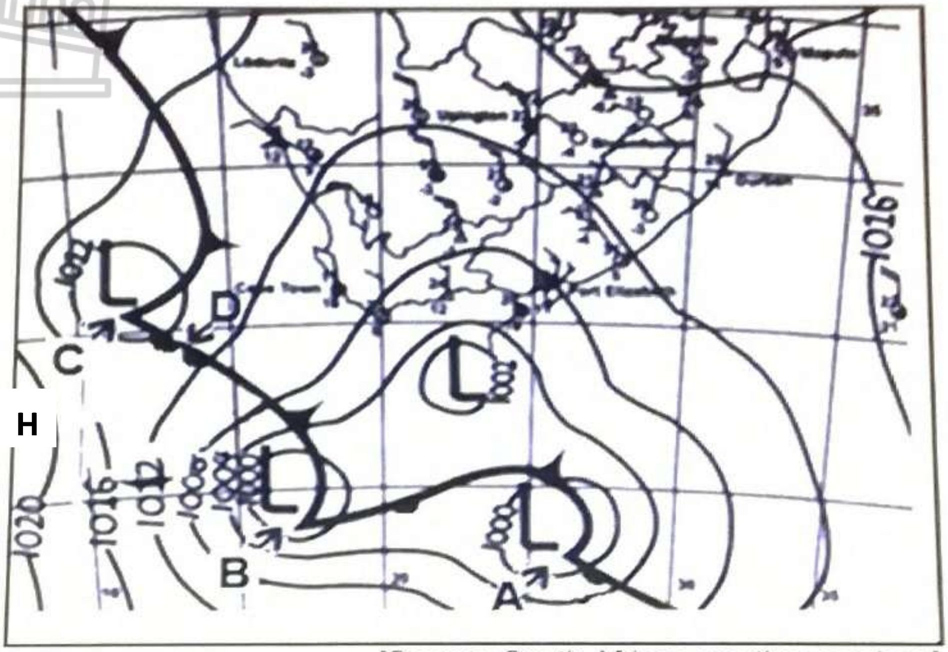
2.4.4. State ONE difference between the cold sector and the warm sector. (2x2) (4)

2.4.5. What weather conditions will people experience on the surface when the cold front passes. (2x2) (4)

2.4.6. Describe how an occlusion occurs. (2x2) (4)

**(15)**

**e) Study the diagram based on Mid-latitude cyclones.**




[Source: South African weather services]

2.5.1. Give the term used to describe the linked mid-latitude cyclones. (1 x 1) (1)

2.5.2. What evidence suggests that mid-latitude cyclone **A** is the oldest? (1 x 2) (2)

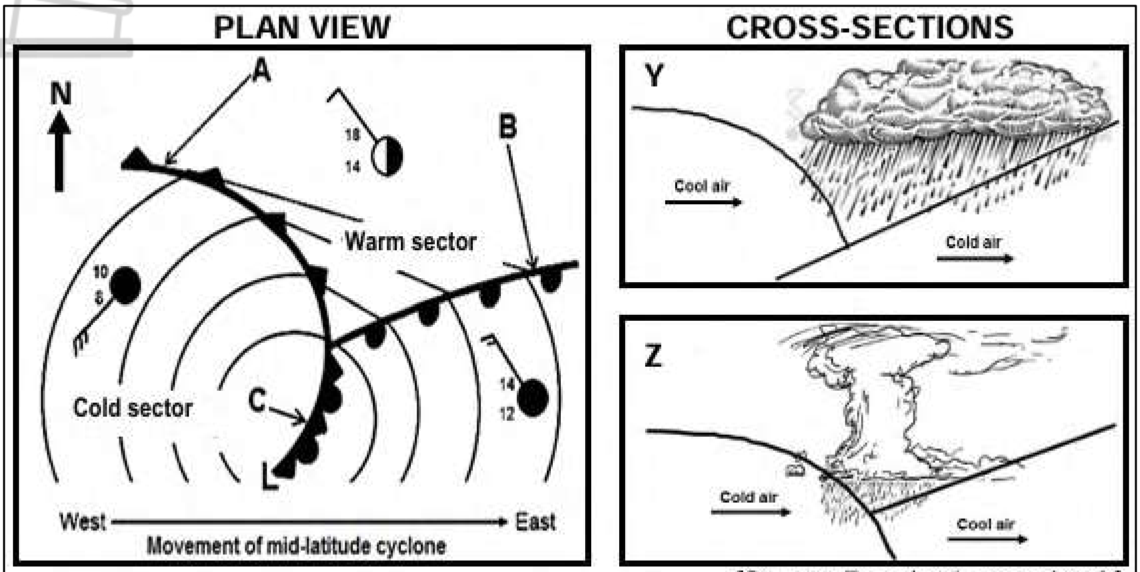
2.5.3. Why is front **D** NOT associated with heavy rain? (1 x 2) (2)

2.5.4. What causes the dissipation of mid-latitude cyclones? (1 x 2) (2)

2.5.5. In a paragraph of approximately Eight (8) lines Explain the impact of South Atlantic High-Pressure cell and South Indian High-pressure cell on the movement of mid-latitude cyclones. (4 x 2) (8)

[15]

f) Refer to the sketches below on a mid-latitude cyclone.



[Source: Examiner's own sketch]

2.6.1. Name the wind belt that causes the easterly movement of the mid-latitude cyclone. (1 x 1) (1)

**Refer to the plan view.**

2.6.2. Identify front A. (1 x 1) (1)

2.6.3. Which ONE of fronts A or B is moving faster? (1 x 1) (1)

2.6.4. Give a reason for your answer to QUESTION 2.8.3. (1 x 2) (2)

2.6.5. Give evidence from the sketch that the mid-latitude cyclone is found in the Southern Hemisphere. (1 x 2) (2)

**Refer to the cold front occlusion C and the cross-sections.**

a) Which ONE of the cross-sections Y or Z represents the cold front occlusion at C? (1 x 2) (2)

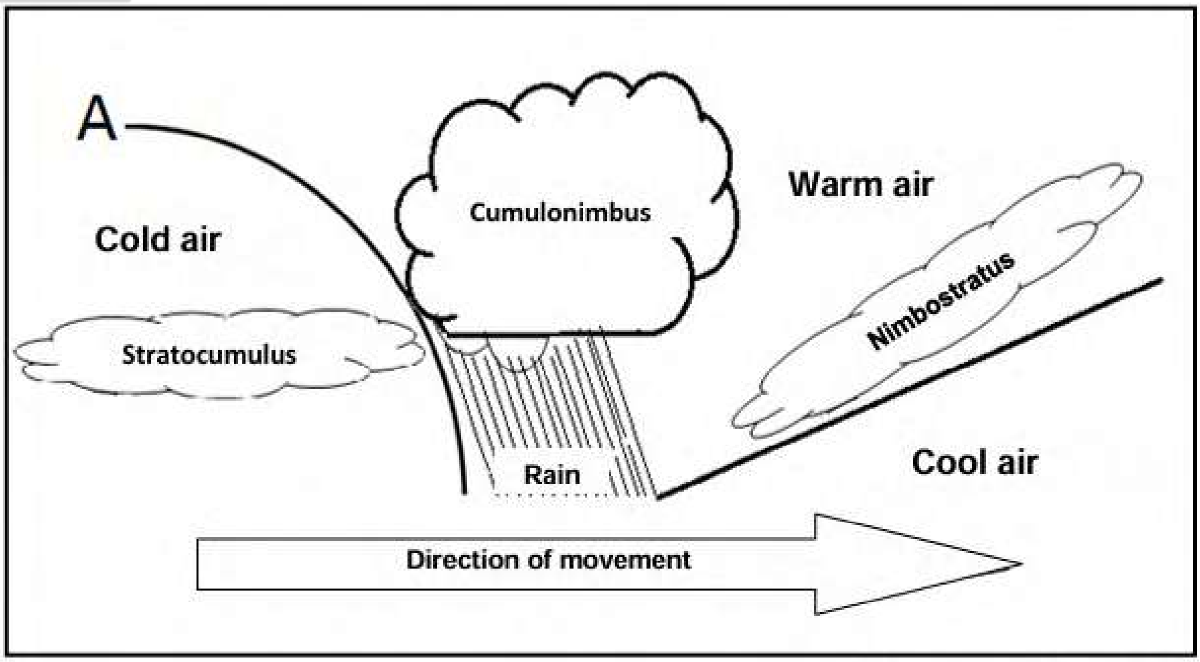
b) Give evidence that C is a cold front occlusion. (1 x 2) (2)

c) Explain how the cold front occlusion developed. (2 x 2) (4)

**[15]**

**2.7. Study FIGURE 2.9, which shows a cross-section of a cold front, and answer**

**the questions that follow.**




[Source: Examiner's own sketch]

2.7.1. Give ONE point of evidence that A shows a cross-section of a cold front. (1 x 1) (1)

2.7.2. Why do cumulonimbus clouds develop along front A? (1 x 2) (2)

2.7.3. Once the cold front passes over, air pressure will increase. Explain why this is the case. (2 x 2) (4)

2.7.4. With reference to the diagram in FIGURE 2.9, write a paragraph of approximately EIGHT lines in which you explain the development of a cold front occlusion. (4 x 2) (8)

**(15)**

TWO COLD FRONTS TO HIT WESTERN CAPE THIS WEEKEND – 'HEAVY RAINFALL' TO FOLLOW

Date: 10 June 2022

According to the South African Weather Service (SAWS), two cold fronts are expected to bring rain, strong winds, high waves and a significant drop in temperatures to South Africa.

The first cold front is expected to hit the Western Cape on Sunday evening 12 June. Ahead of this first cold front, strong north-westerly to westerly winds between 50–60 km/h, gusting up to 70–80 km/h, are expected over the southern parts of the Northern Cape and the interior of the Western and Eastern Cape from Sunday.

The second cold front is expected to reach the Western Cape by Monday evening 13 June, bringing continued high amounts of rainfall mainly to the south-western parts of the Western Cape, especially from Monday to Wednesday afternoon.

The wind direction associated with the cold front will change from north-west to south-west as the front moves over the Western Cape.

*[Adapted from http//www.First cold front to hit Western Cape this weekend – 'heavy rainfall' to follow (thesouthafrican.com)]*

2.8.1. In which season do the cold fronts mentioned in the extract influence the Western Cape? (1 x 1) (1)

2.8.2. Give evidence from the extract to support your answer to QUESTION 1 (1 x 1) (1)

2.10.3. Why do cold fronts have a greater impact on the Western Cape during this season (answer to QUESTION 1.3.1)? (1 x 2) (2)

2.8.3. The change in wind direction mentioned in the extract is known as (veering/backing) in the Southern Hemisphere. (1 x 1) (1)

2.8.4. Give a reason from the extract for your answer to QUESTION 1.3.4 (1 x 2) (2)

2.8.5. In a paragraph of approximately EIGHT lines, suggest positive and negative impacts of heavy rainfall associated with the cold fronts on the physical (natural) environment of the Western Cape. (4 x 2) (8)

**(15)**

2.9. Refer to an extract on mid-latitude cyclones.

| |
|---|
| MID-LATITUDE CYCLONES OVER THE WESTERN CAPE |
| South Africa is among a handful of countries that experience winter rainfall in some areas and summer rainfall in others. The south-western tip of the country has a Mediterranean climate, with hot dry summers and cool wet winters. This is because mid-latitude cyclones migrate further north during winter, allowing the edge of the cold front arm to sweep across the southernmost part of the country. This results in frontal winter rainfall over the Western Cape. The movement of the cold front over the Western Cape is generally associated with a variety of weather changes. These cyclones can have a positive or negative impact on tourism. |
| [Source: Examiner's extract] |

2.9.1. Name the type of climate that is found at the south-western tip of the country. (1 x 1) (1)

2.9.2. Describe the climate experienced at the south-western tip of the country during winter as indicated in the extract. (1 x 2) (2)

2.9.3. Why do mid-latitude cyclones migrate (move) further north in winter? (1 x 2) (2)

2.9.4. Describe the changes in the weather associated with the passing of a cold front over Cape Town. (2 x 2) (4)

2.9.5. In a paragraph of approximately EIGHT lines, explain the negative impact of cold fronts on tourism in Cape Town. (4 x 2) (8)

**(15)**

**2.10. Refer to the satellite image below on tropical cyclone Freddy.**

2.10.1. Define the term tropical cyclone. (1 x 2) (2)

2.10.2. Account for the general movement of the tropical cyclone. (1 x 2) (2)

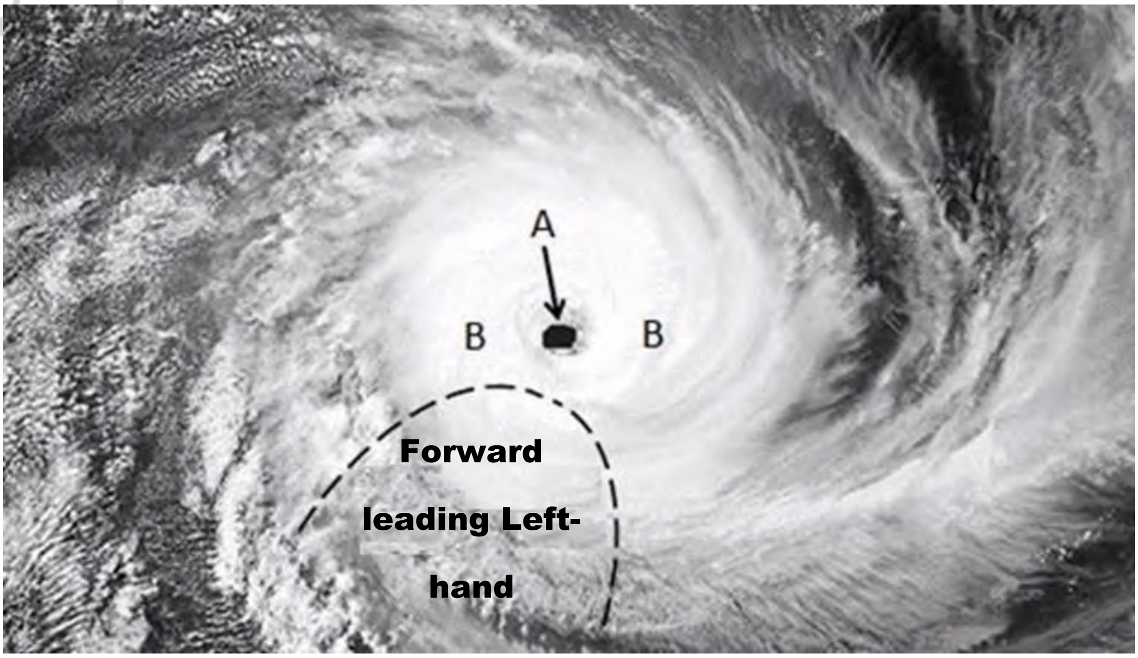
2.10.3. What evidence in the satellite image indicates that tropical cyclone George is in the mature stage of its development? (1 x2) (2)

Explain how tropical cyclone are named. (1 x 2) (2)

2.10.4. Why will the wind speed decrease when tropical cyclone moves to the land? (2 x 2) (4)

2.10.5. Draw a plan view of the cyclone as presented on the satellite image. (3 x 1) (3)

2.11. Refer to the satellite image of a tropical cyclone in the mature stage below




[Adapted fhttps://www.google.com/url?sa=i&url=https%3A%2F]

2.11.1. State ONE condition required for the development of the tropical cyclone. (1 x 1) (1)

2.11.2. In which hemisphere did this cyclone develop? (1 x 1) (1)

2.11.3. Give a reason for your answer in question 2.11.2. (1 x 2) (2)

Refer to **A** and **B** on the satellite image

2.11.4. Differentiate between the cloud cover at **A** and **B.** (2 x 1) (2)

2.11.5. Explain why there's a difference in the cloud cover at **A** and **B.** (2 x 2) (4)

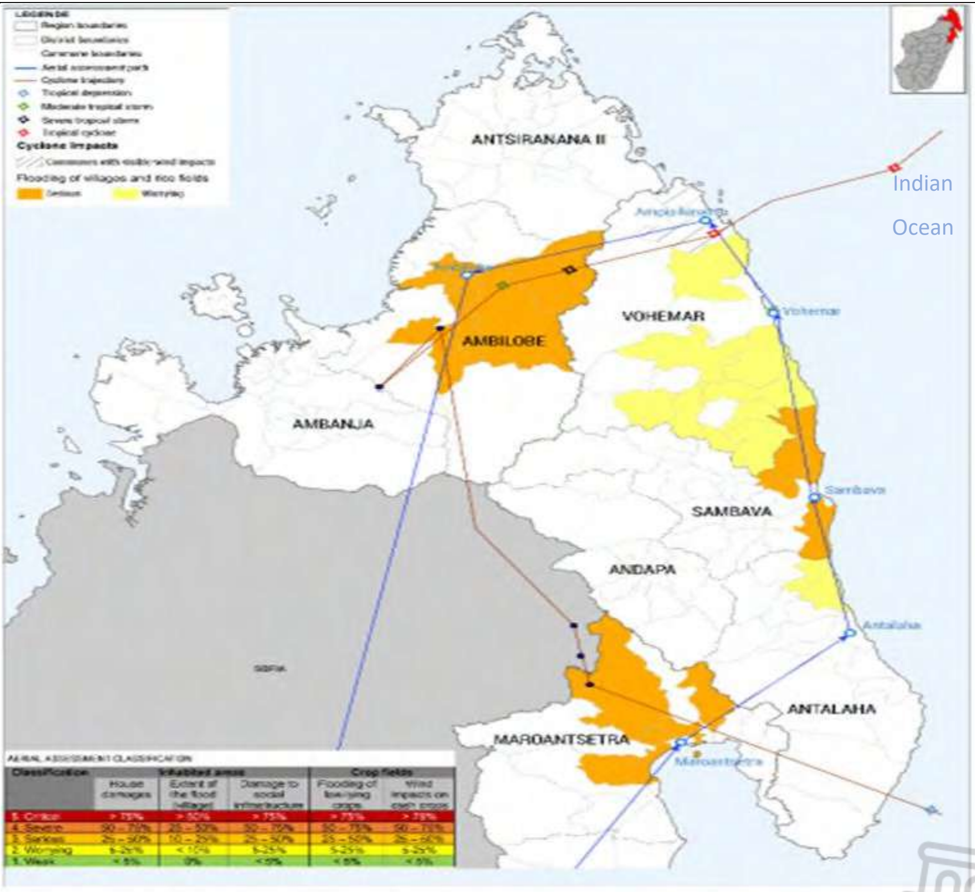
2.11.6. Why are the strongest winds found in the forward (leading) left-hand quadrant? (1 x 2) (2)

**2.11.7.** Draw a sketch of a tropical cyclone in its mature stage as represented on a synoptic weather map. Indicate the following on the sketch:

i. Air pressure reading at the centre of the tropical cyclone
ii. At least four isobars indicating the correct spacing

iii. Symbol to represent the tropical cyclone (3 x 1) (3)

2.12. Refer to the info graphic below on tropical cyclone Gamane.




A map shows the affected areas in the north and northeast of Madagascar following the passage of Tropical Cyclone Gamane on 27 March.

The Government declared a national emergency situation, on 3 April, following the passage of the Tropical Cyclone (TS) Gamane that hit the north and northeast of Madagascar on 27 March. It reportedly killed 18 people, injured three and left four people missing. About 535,000 people living in the 33 flooded communes have been affected including about 22,000 displaced, most of who were sheltered in temporary sites. Humanitarian partners aim to reach 165,000 people out 220,000 in need with urgent humanitarian assistance.

More than 18,830 houses have been flooded and more than 780 have been damaged or destroyed. About 22 health centres have been damaged and 165 classrooms have been affected, resulting in about 24,121 children having no access to schools

2.12.1. How many cyclones occurred before cyclone Gamane? (1 x 1) (1)

2.12.2. Cyclone Gamane is in the southern hemisphere. Provide evidence from the info graphic to support the statement. (1 x 2) (2)

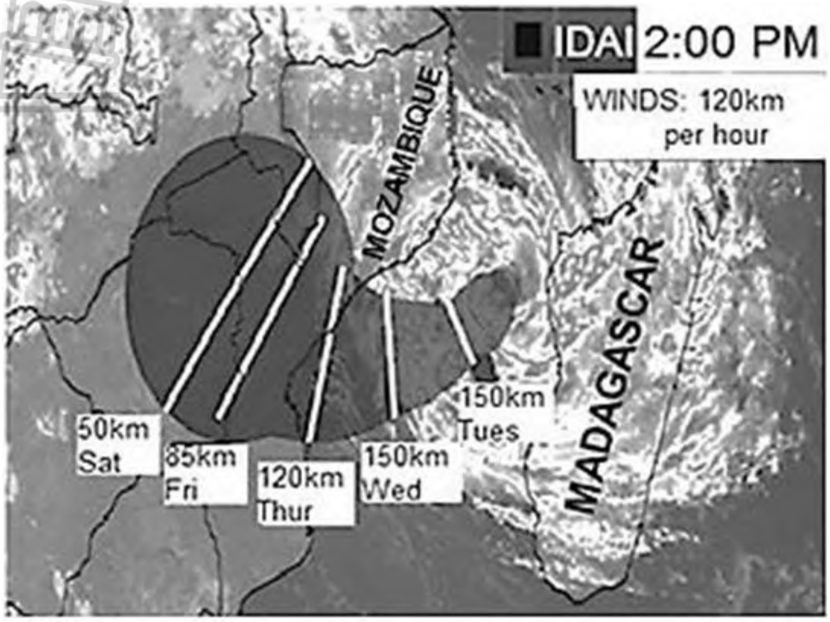
2.12.3. Tropical Gamane hit the north and northeast of Madagascar on 27 March; explain why it moved from Indian Ocean to Madagascar. (1 x 2) (2)

2.12.4. Why did tropical cyclone Gamane developed over the Indian Ocean? (2 X 2) (4)

2.12.5. Cyclone Gamane has impacted severely on Madagascar, killing about 18 people and destroying more than 780 houses. Suggest sustainable strategies that could be implemented to minimize the impacts of the cyclone.

(3 x 2) (8)

2.13. Tropical cyclone Idai.




Cyclone Idai has quickly strengthened into an intense tropical cyclone and has been fluctuating (changing) in intensity over the past 48 hours. An intense tropical cyclone is equivalent to category 3 hurricane. Idai is slowly moving in a westerly direction towards Mozambique with wind speeds exceeding 170 km/h closer to the eye. It is expected to reach the coastal area near Beira, Mozambique fourth largest city with 53 000 residents, before midnight on Thursday.

2.13.1. Refer to the article. With what can you compare this intense tropical cyclone? (1 x 1) (1)

2.13.2. Name ONE condition that was necessary for the formation of tropical cyclone Idai. (1 x 1) (1)

2.13.3. Refer to the image and determine the expected wind speed with which tropical cyclone Idai will reach the coast of Mozambique. (1 X 1) (1)

2.13.4. Why will the wind speed decrease as you move further from the eye? (1 x 2) (2)

2.13.5. .Explain how the dangerous semi-circle of tropical cyclone Idai originated (developed). (1 x 2) (2)

2.13.6. In a paragraph of approximately EIGHT lines, suggest the negative impact that high wind speeds will have on the coastal areas of Mozambique. (4 x 2) (8)

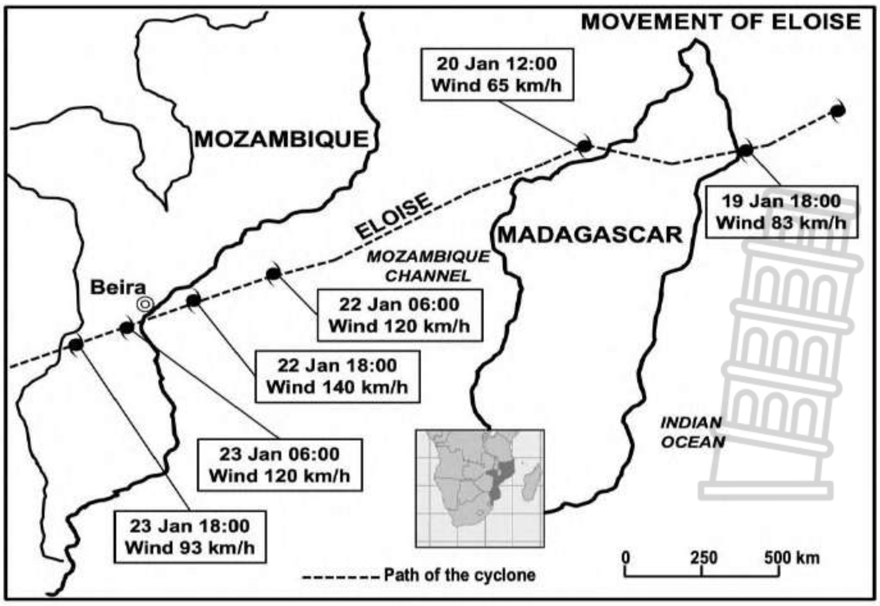
2.14. Refer to the diagram showing infographic on tropical cyclone Eloise

**DESCRIPTION OF THE DISASTER**

Tropical Cyclone Eloise made landfall on 23 January 2021, 20 km south of Beira in Mozambique, as a category 2 tropical cyclone. Wind speeds of up to 160 km/h were recorded. Tropical Cyclone Eloise also caused heavy rainfall with 250 mm of rain in 24 hours. Other areas were already flooded ahead of Eloise's landfall, resulting in thousands of displaced people.

**ELOISE IN NUMBERS**

| | |
|---|---|
| **Affected** | 441 686 people |
| **Displaced people** | 42 327 |
| **Deaths** | 7 |
| **Injured** | 15 |
| **Houses destroyed** | 20 798 |
| **Houses damaged** | 35 566 |
| **Houses flooded** | 27 127 |
| **Impassable roads** | 63 |
| **Flooded areas** | 219 124 ha |



2.14.1. Give ONE piece of evidence in the infographic that the tropical cyclone is in the Southern Hemisphere. (1 x 1) (1)

2.14.2. State TWO weather conditions associated with tropical cyclones indicated in the infographic. (2 x 1) (2)

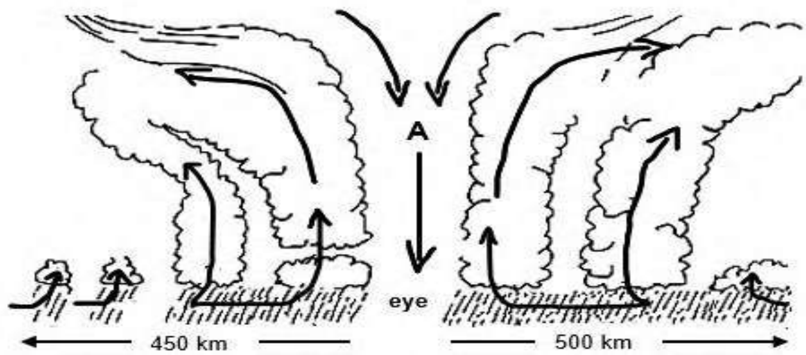
2.14.3. Give ONE reason for the decrease in wind speed from 19 January to 20 January 2021. (1 x 2) (2)

2.14.4. Account for the increase in wind speed of Tropical Cyclone Eloise from the 20 January to 22 January 2021. (2 x 2) (4)

2.14.5. According to the info graphic the negative impact of Tropical Cyclone Eloise was devastating. Suggest THREE strategies that could be put in place to reduce the impacts of cyclone Eloise. (3 X 2) (6)

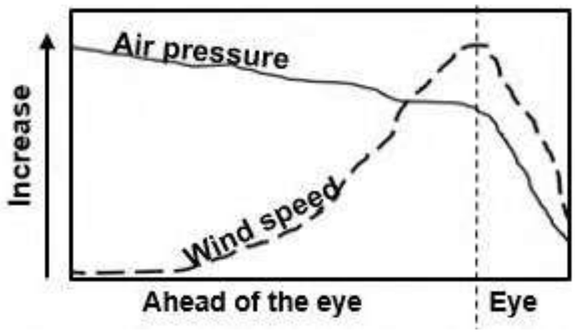
**2.15. Refer to the infographic below on tropical cyclones.**

**CROSS-SECTION OF A TROPICAL CYCLONE**



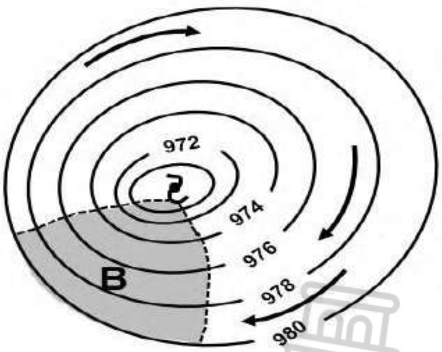

[Adapted from https://www.meteo.physik.unimuenchen.de/~roger/TCLecs/Tropical%20Cyclone]

**GRAPH ASSOCIATED WITH A TROPICAL CYCLONE**




[Source: Examiner's own drawing]

**ISOBARIC REPRESENTATION OF A TROPICAL CYCLONE**




[Source: https://www.google.com/search?q=isobars]

2.15.1. What evidence indicates that the tropical cyclone developed in the Southern Hemisphere? (1 x 1) (1)

2.15.2. Give TWO reasons from the infographic to indicate that the tropical cyclone is in its mature stage. (2 x 1) (2)

2.15.3. How will the descending air at **A** influence the cloud cover in the eye? (1 x 2) (2)

2.15.4. Give a reason for your answer to QUESTION 1.4.3. (1 x 2) (2)

2.15.5. What the relationship between the wind speed and air pressure is as indicated on the graph?

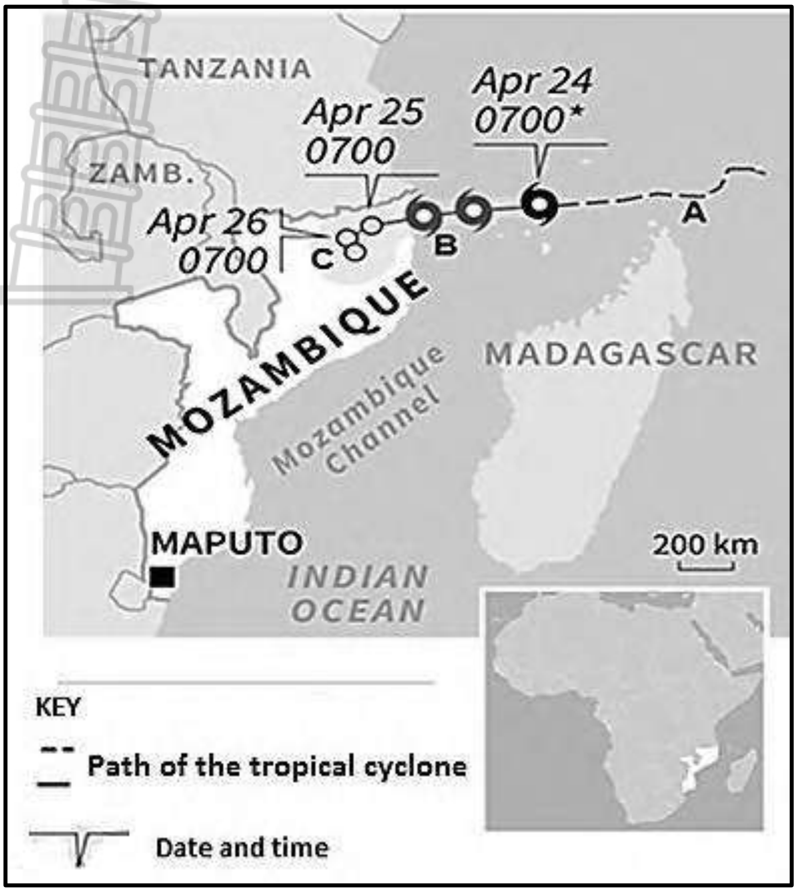
(a) Ahead of the eye (1 x 2) (2)

(b) Within the eye (1 x 2) (2)

2.15.6. Why is area **B** on the sketch of the isobaric representation referred to as the leading Left- hand quadrant (dangerous semicircle)? (1 X 2) (2)

2.15.7. How does the leading left quadrant (dangerous semicircle) develop in tropical cyclones? (1 x 2) (2)

2.16. Refer to FIGURE 2.3, which shows the path of a tropical cyclone.




[Source: Meteo France]

2.16.1. Give evidence that this tropical cyclone is in the Southern Hemisphere. (1x 1) (1)

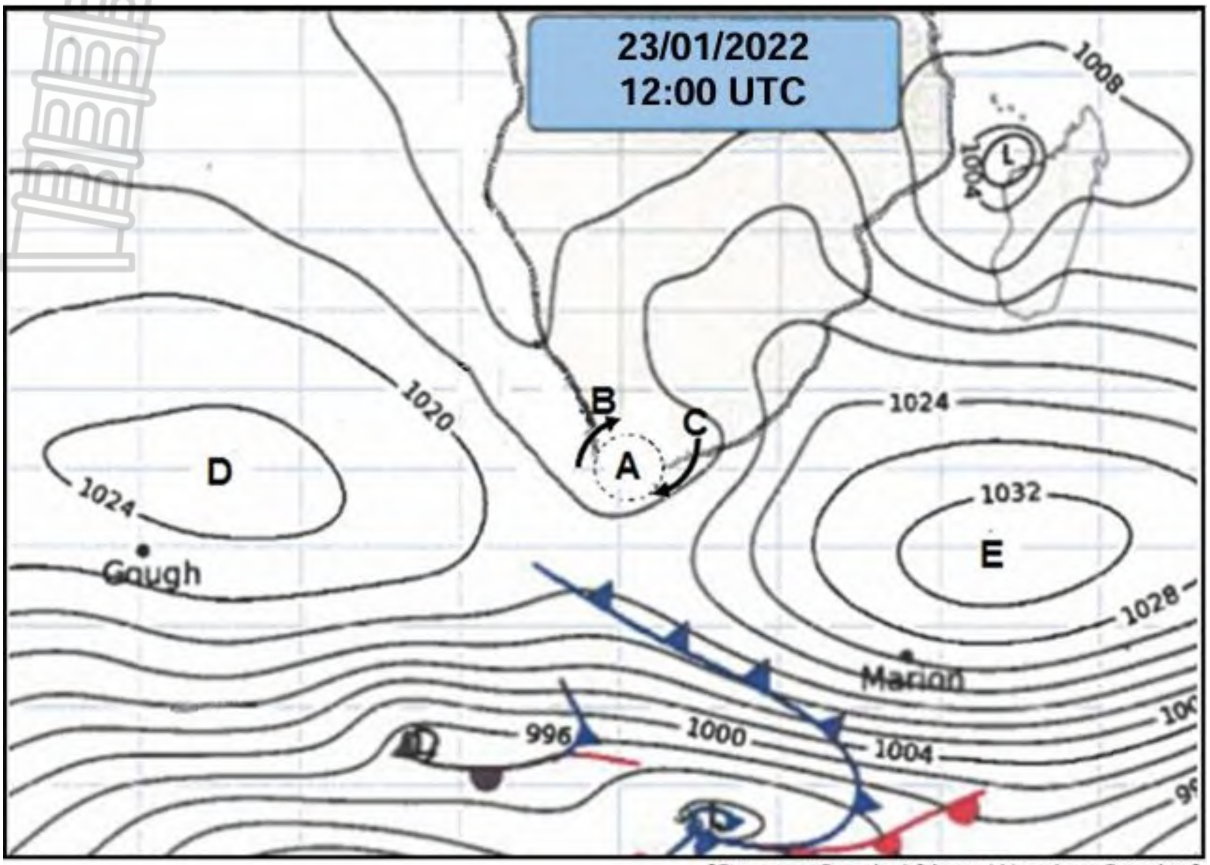
2.16.2. Why is the Mozambique Channel usually ideal for the increase in temperature within the tropical cyclone? (1 x 2) (2)

**2.16.3.** Explain how the intensity of the tropical cyclone increased as it moved from area **A** to area **B** (2 x 2) (4)

2.16.4. Discuss the conditions that could have caused the cyclone to weaken as it reached area **C**. (2 x 2) (4)

2.16.5. Evaluate the physical (natural) negative impact of tropical cyclones along the coastline of Mozambique. (2 x 2) (4)

**2.17. Refer to the South African synoptic weather map.**




[Source: South African Weather Service]

2.17.1. Name low-pressure cell A. (1 x 1) (1)

2.17.2. Why is pressure cell A known as a travelling disturbance? (1 x 2) (2)

2.17.3. Why is there a greater possibility of precipitation at B than at C? (2 x 2) (4)

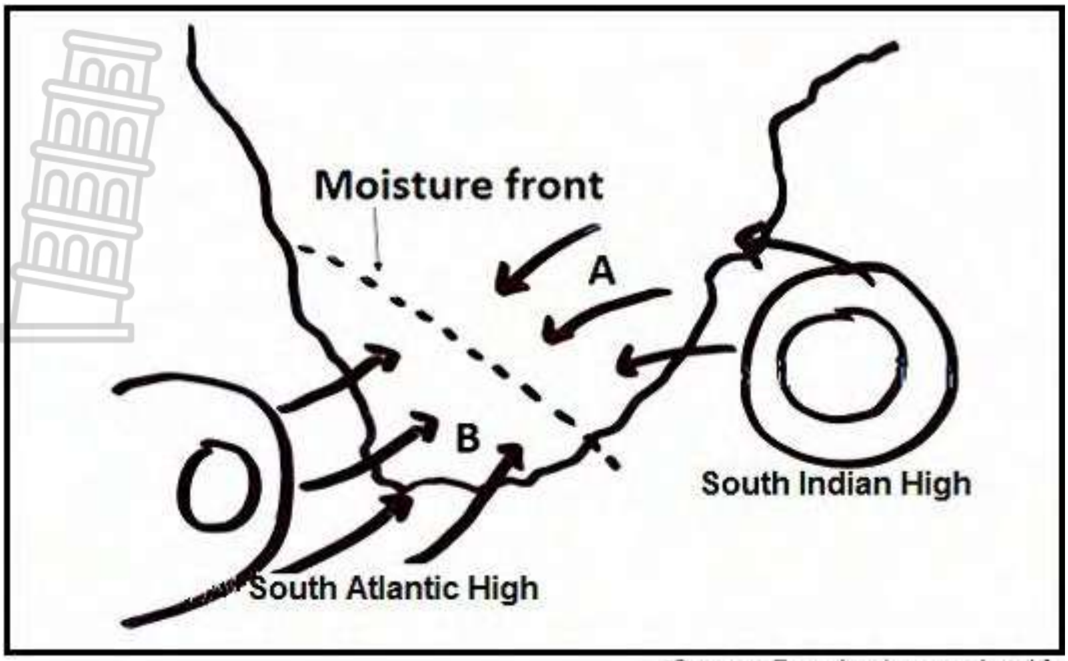
2.17.4. Give evidence that this synoptic weather map represents typical summer conditions. (2 x 2) (4)

(a) Which anticyclone, D or E, has a greater subsidence (descending) of air? (1 x 2) (2)

(b) Use the pressure readings on the synoptic weather map to support your answer to QUESTION 1.4.5(a). (1 x 2) (2)

(15)

**4.8 FIGURE 4.8 shows a moisture front across South Africa.**




[Source: Examiner's own sketch]

2.18.1. What is a moisture front? (1 x 1) (1)

2.18.2. Distinguish between the moisture contents of the winds at A and B. (2 x 1) (2)

2.18.3. Name the type of thunderstorm that occurs along the moisture front. (1 x 2) (2)

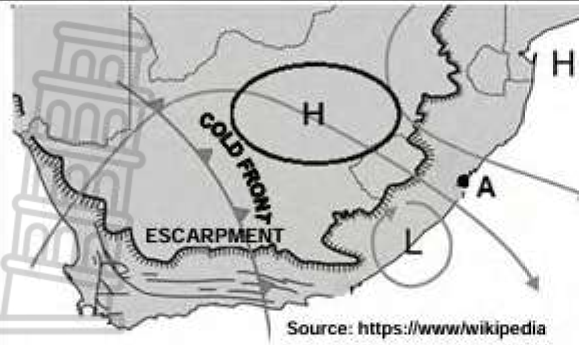
2.18.4. On which side of the moisture front do the thunderstorms form? (1 x 2) (2)

2.18.5. Explain your answer to QUESTION 2.4.4. (2 x 2) (4)

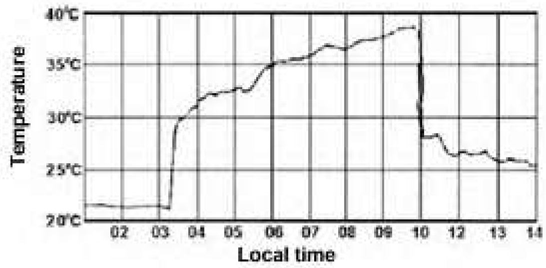
2.18.6. Describe the hazards/dangers associated with these thunderstorms for farmers in the interior. (2 x 2) (4)

(15)

**2.19. Refer to the infographic showing berg wind conditions over South Africa below.**




Source: https://www/wikipedia




**Automatic weather station recording of surface temperature at Durban during a berg wind from about 03:15 to 10:00 local time.**

**Fire warning for East Coast**

KwaZulu-Natal – Berg wind conditions that are favourable to runaway fires are expected across the East Coast on Tuesday, the South African Weather Services said.

Forecaster Quinton Jacobs said these conditions would persist until Thursday. "Berg wind conditions, with temperatures in the high 30s are expected for the next three days."

"A strong north-easterly flow is expected over the northern interior on Wednesday during the mid-morning and early afternoon, exceeding 40 km/h at times."

According to the weather bureau, with the recent fine weather and absence of rainfall, the already dry vegetation would further dry out and conditions favourable for the spread of runaway fires will develop.

[Source: https://www.news24.com/news24/fire-warning-for-eastern-cape-20080527]

2.19.1. Which season is being depicted in the diagram? (1 x 1) (1)

Provide evidence from the infographic to substantiate your answer to QUESTION 1.3.1. (1 x 2) (2)

2.19.2. State TWO atmospheric conditions evident in the infographic that have resulted in the formation of berg winds. (2 x 1) (2)

2.19.3. With reference to the temperature graph, explain the process of temperature change from 03:15 to 14:00 as berg winds blow from the interior to the coast.

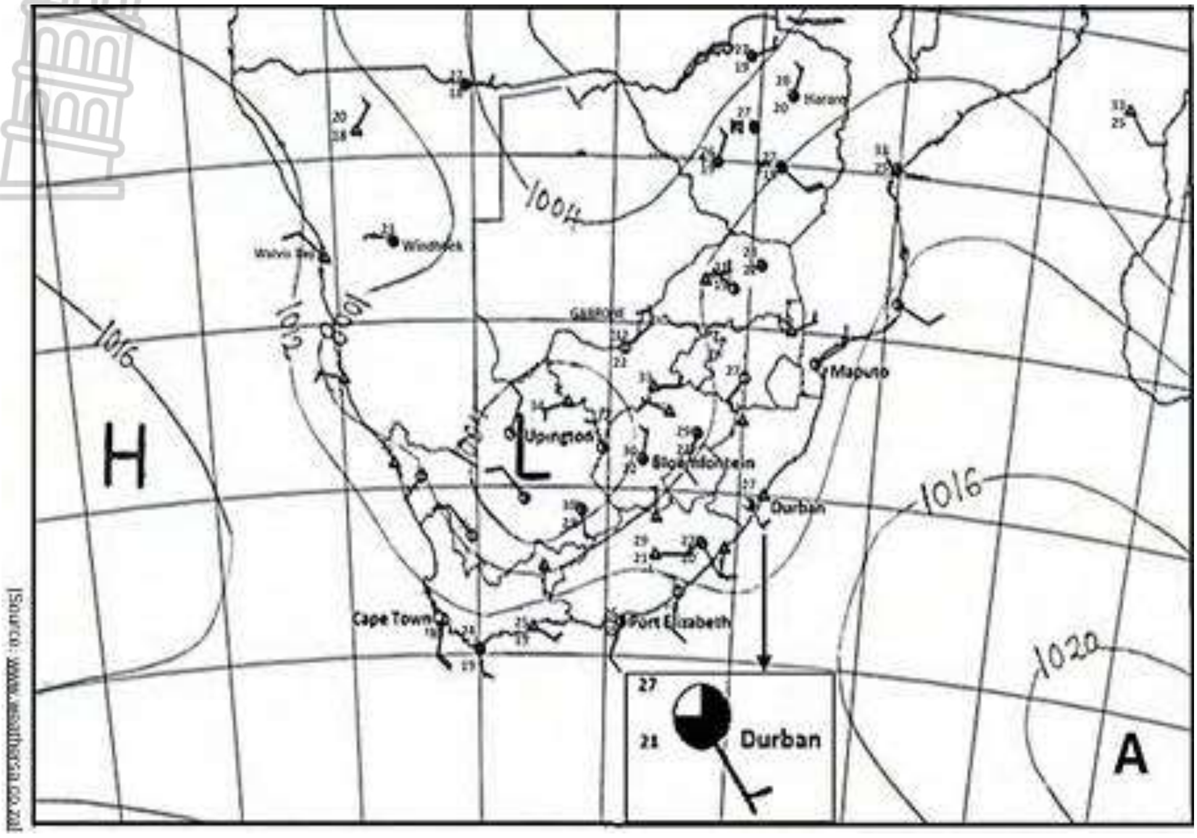
(1 x 2) (2)

2.19.4. A weather station located at A has reported clear skies. Account for this current condition. (2 x 2) (4)

2.19.5. Explain why city A, which is situated on the East Coast, will be affected by the release of the fire warning. (2 x 2) (4)

**(15)**

**2.20. Refer to FIGURE 2.3 showing a synoptic weather map of Southern Africa.**




2.20.1. Give evidence that the synoptic weather map represents a summer condition. (1 x 1) (1)

2.20.2. Determine the isobaric interval on the synoptic weather map. (1 x 1) (1)

2.20.3. Name the high-pressure cell A. (1 x 1) (1)

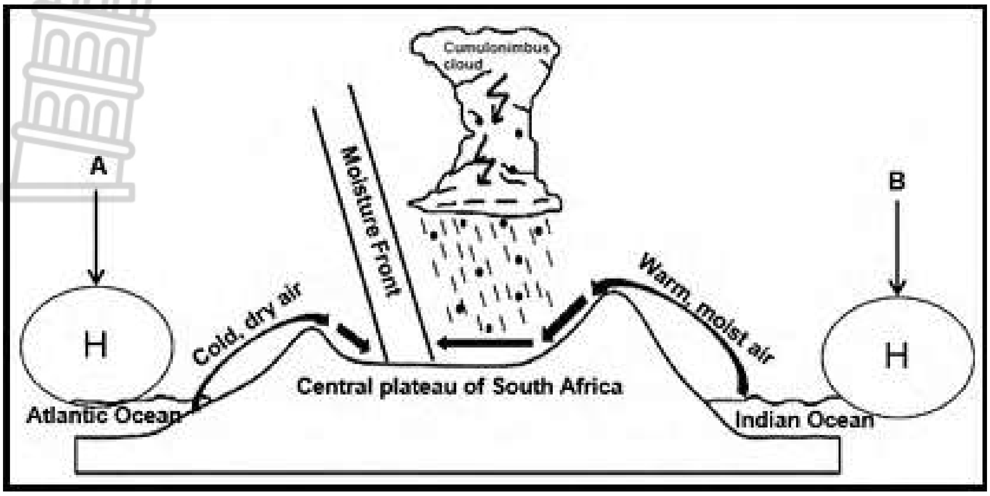
2.20.4. State the wind direction and wind speed of the weather station at Durban. (2 x 1) (2)

2.20.5. Comment on the relationship between wind speed and the arrangement of the isobars in the eastern half of the country. (1 x 2) (2)

2.20.6. In a paragraph of approximately EIGHT lines, explain how high- pressure cell A and the low-pressure cell in the interior of the country could contribute to increased rainfall in the eastern half of the country during summer. (4 x 2) (8)

**(15)**

**2.21. Refer to the sketch below on-line thunderstorms.**




[Source: Examiner's own sketch]

2.21.1. Identify high-pressure cells A and B. (2 x 1) (2)

2.21.2. Which season is represented by the sketch? (1 x 1) (1)

2.21.3. Give ONE reason from the sketch for your answer to QUESTION 1.5.2. (1 x 2) (2)

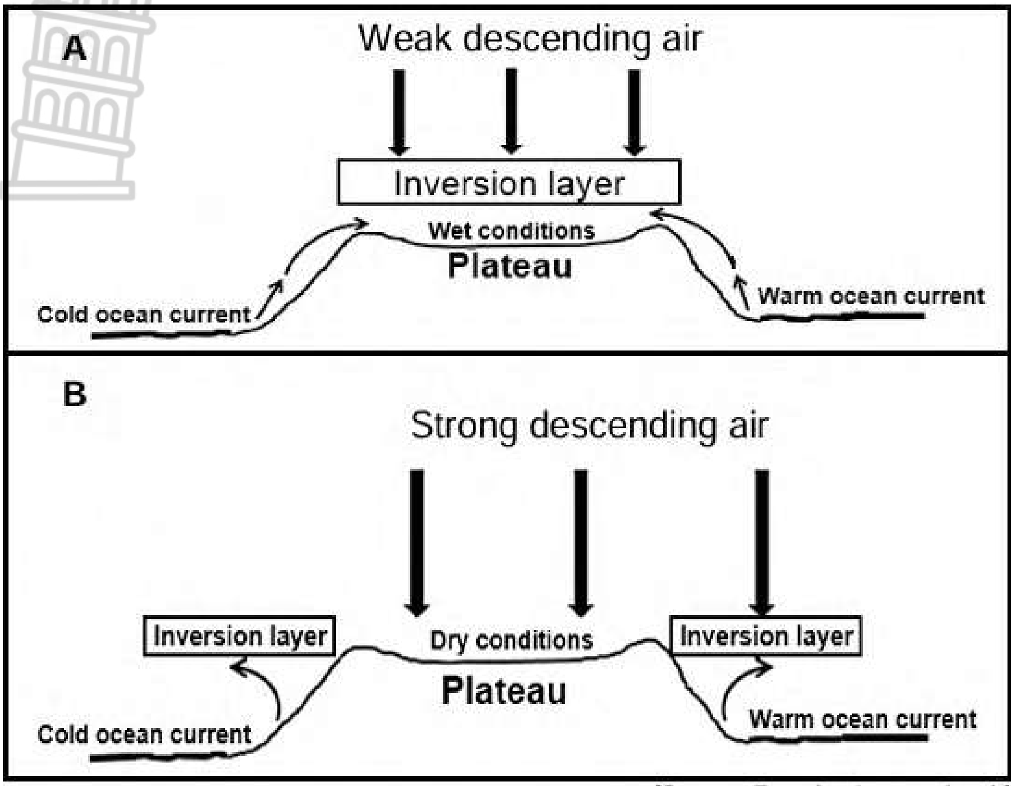
2.21.4. What is a moisture front? (1 x 2) (2)

2.21.5. Name TWO forms of precipitation associated with a line thunderstorm. (2 x 1) (2)

2.21.6. Describe the processes involved in the formation of line thunderstorms. (3 x 2) (6)

(15)

**2.22. Refer to the sketches below showing the changes in the position of the inversion layer over South Africa.**




[Source: Examiner's own sketch]

Refer to sketch A.

2.22.1. Identify the season illustrated in sketch A. (1 x 1) (1)

2.22.2. Give a reason for your answer to QUESTION 1.5.1. (1 x 2) (2)

Refer to sketch B.

2.22.3. Identify TWO factors, visible in the sketch, which influence the climate of South Africa. (2 x 1) (2)

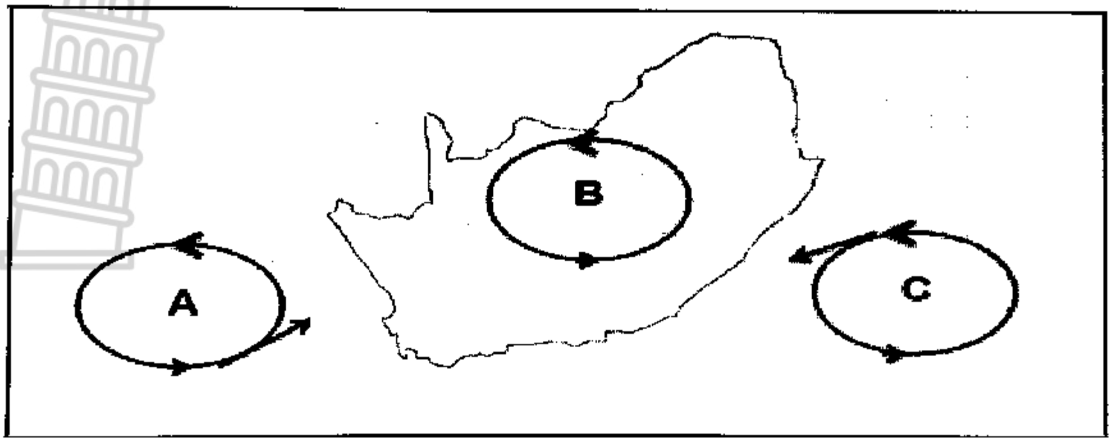
2.22.4. Explain the role played by descending air in the development of the inversion layer. (1 x 2) (2)

Refer to sketches A and B.

2.22.5. In a paragraph of approximately EIGHT lines, describe how the position of the inversion layer in sketches A and B influences the amount of rainfall in the interior of South Africa. (4 x 2) (8)

(15)

2.23. **Study the diagram showing anticyclones over South Africa.**




2.23.1. Name each of anticyclone's A, B and C. (3 x 1) (3)

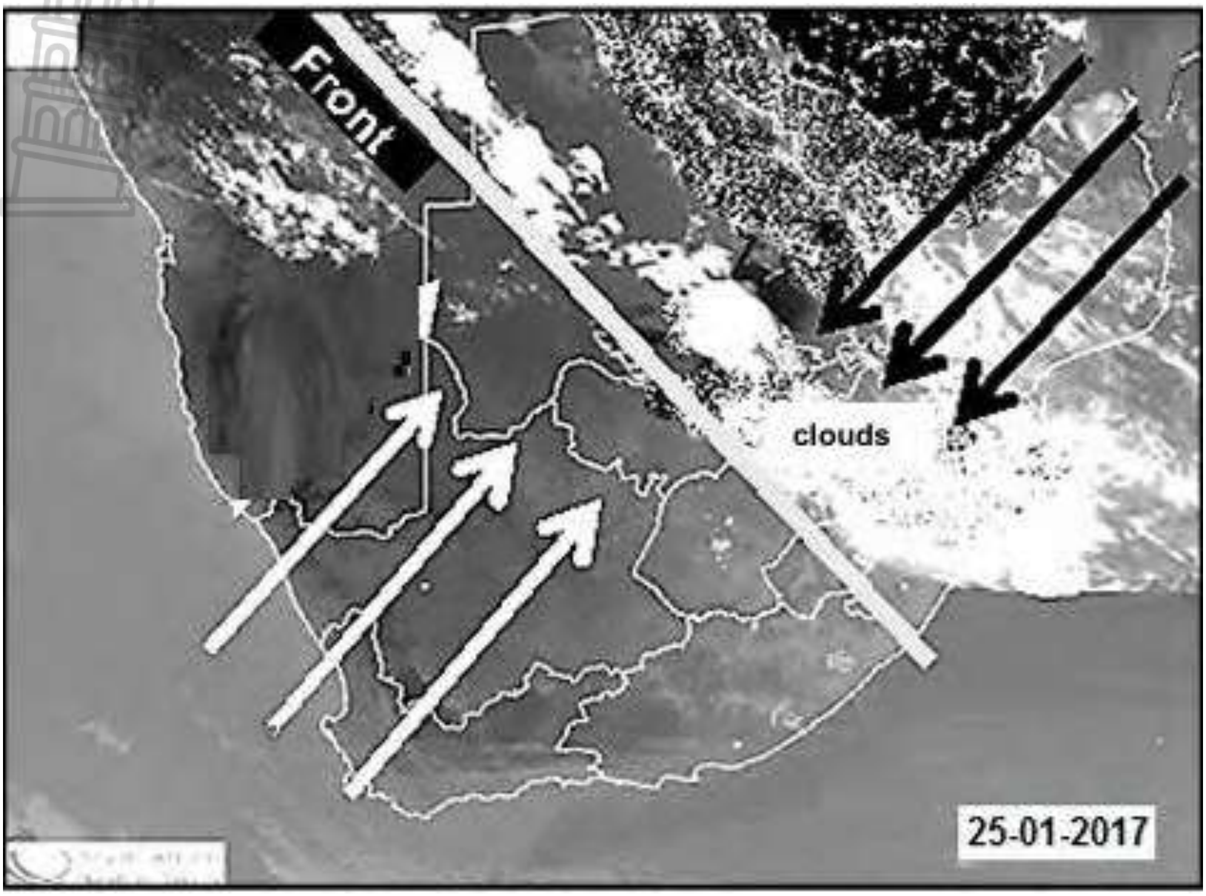
2.23.2. Anticyclones are associated with stable weather conditions over the interior of South Africa, particularly during winter. Draw a labelled sketch to illustrate the influence of the interior anticyclone on South Africa's weather. (4 x 1) (4)

2.23.3. In a paragraph of approximately EIGHT lines, explain the influence of the inter-tropical convergence zone (ITCZ) on the changing position of the three anticyclones, relative to South Africa. (4 x 2) (8)

**(15)**

**2.24. FIGURE 2.24. shows line thunderstorms over South Africa.**

**FIGURE 2.24. LINE THUNDERSTORMS OVER SOUTH AFRICA**




[Adaptedfromhttps://www.bing.com/images/search?ine+thunderstorms+in+south+africa&simid]

2.24.1. Name the front over the interior of the country where line thunderstorms originate. (1 x 1) (1)

2.24.2. What evidence suggests that line thunderstorms are illustrated (shown)? (1 x 2) (2)

2.24.3. Why are line thunderstorms generally associated with summer? (1 x 2) (2)

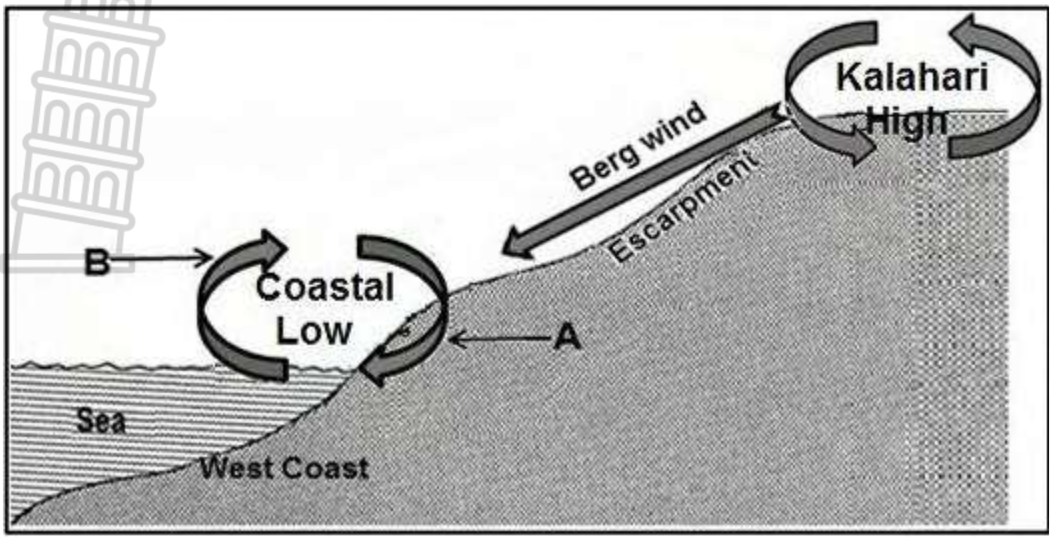
2.24.4. What is the source of moisture for the formation of line thunderstorms? (1 x 2) (2)

2.24.5. Why is there usually a thicker band of clouds to the east of the front? (2 x 2) (4)

**2.24.6.** Explain why the weather conditions associated with line thunderstorms are more severe than isolated (normal) thunderstorms. (2 x 2) (4)

**(15)**

**2.25. The diagram below is a representation of a coastal low and a berg wind.**




[Adapted from https://open.uct.ac.za/bitstream/handle/]

2.25.1. Name the season represented in the diagram. (1 x 1) (1)

2.25.2. Give ONE reason for your answer to QUESTION 1.2.1. (1 x 1) (1)

2.25.3. Why is the wind visible in FIGURE 1.2, known as a berg wind? (1 x 1) (1)

2.25.4. Refer to the air movement represented by the arrows at A and B.

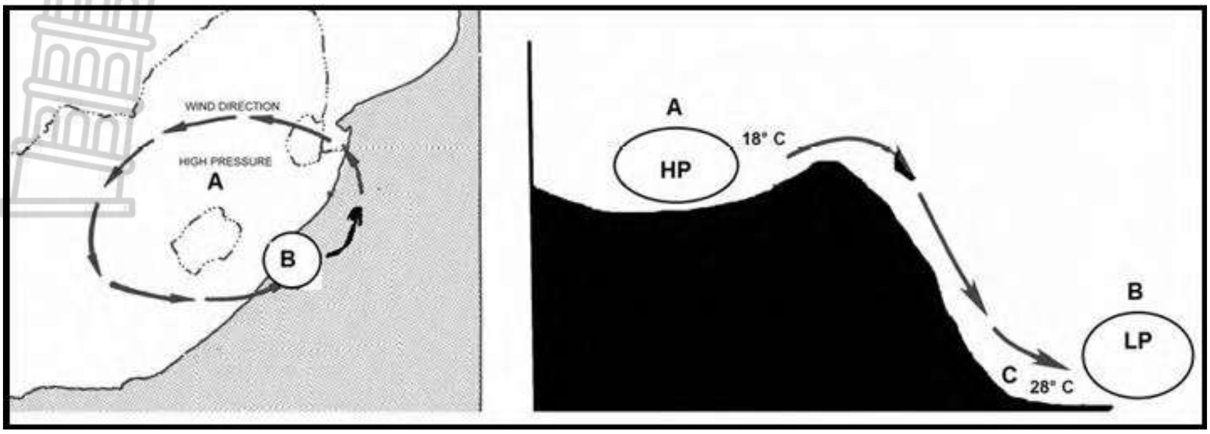
(a) (a) Name the resultant local winds associated with a coastal low at point A and at point B. (2 x 1) (2)

(b) (b) Why is the local wind at A associated with dry conditions? (1 x 2) (2)

(c) (c) In a paragraph of approximately EIGHT lines, discuss the impact of the air movement from the Kalahari High to the coastal low on the physical (natural) environment of the West Coast regions of South Africa. (4 x 2) (8)

**(15)**

**2.26. Refer to the diagram showing a plan view and cross section of a South African berg wind.**




2.26.1. Give TWO pieces of evidence from the sketch to support the statement that FIGURE 4.16 shows a berg wind. (2 x 1) (2)

2.26.2. Mention a hazard associated with berg wind conditions. (1 x 1) (1)

2.26.3. Why do berg winds mainly develop during winter? (1 x 2) (2)

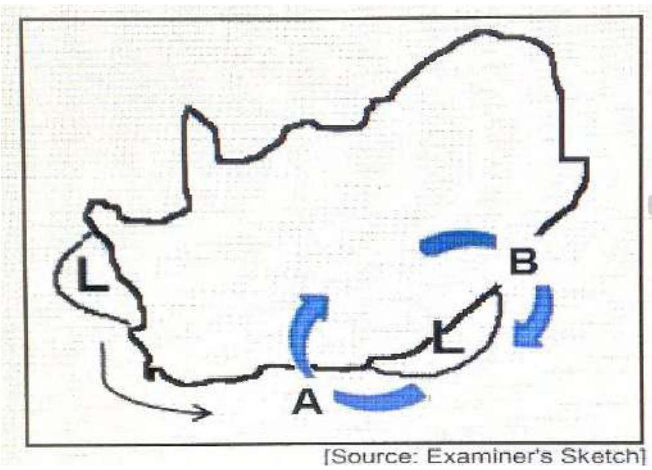
Give reasons for the high temperature and low humidity of a berg wind when it reaches the coast. (2 x 2) (4)

2.26.4. Explain why berg winds are viewed as having a negative influence on humans and farming. (3 x 2) (6)

(15)

**2.27. FIGURE 4.17 shows a coastal low pressure.**

**FUGURE 2.27. COASTAL LOW PRESSURE**



2.27.1. What is a coastal low pressure? (1 x 1) (1)

2.27.2. Describe the path that the coastal low pressure follows. (2 x 1) (2)

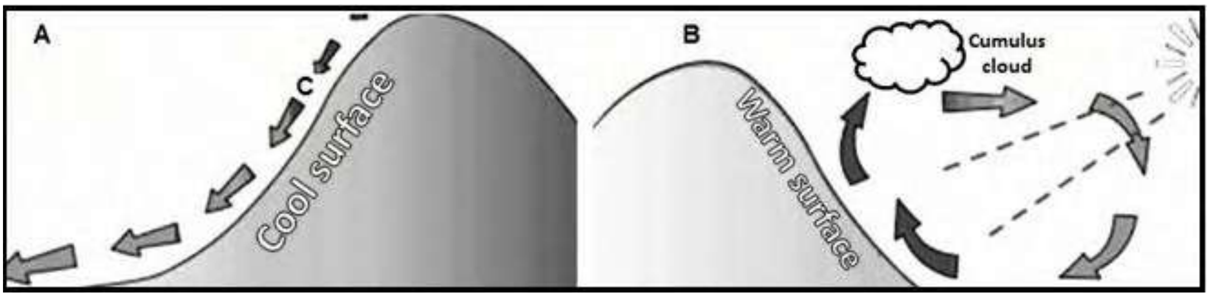
2.27.3. Why is the air ahead of the coastal low (B) drier than the air behind the coastal low (A)? (2 x 2) (4)

2.27.4. Explain why different types of precipitation are expected along the west and east coast as the coastal low passes by. (2 x 2) (4)

2.27.5. Why are these low-pressure systems usually associated with high temperatures along the coast in winter? (2 x 2) (4)

**(15)**

**2.28. Study the sketches based on local winds.**




*[Source: BBC Weather Centre]*

2.28.1. Name the wind labelled C. (1 x 1) (1)

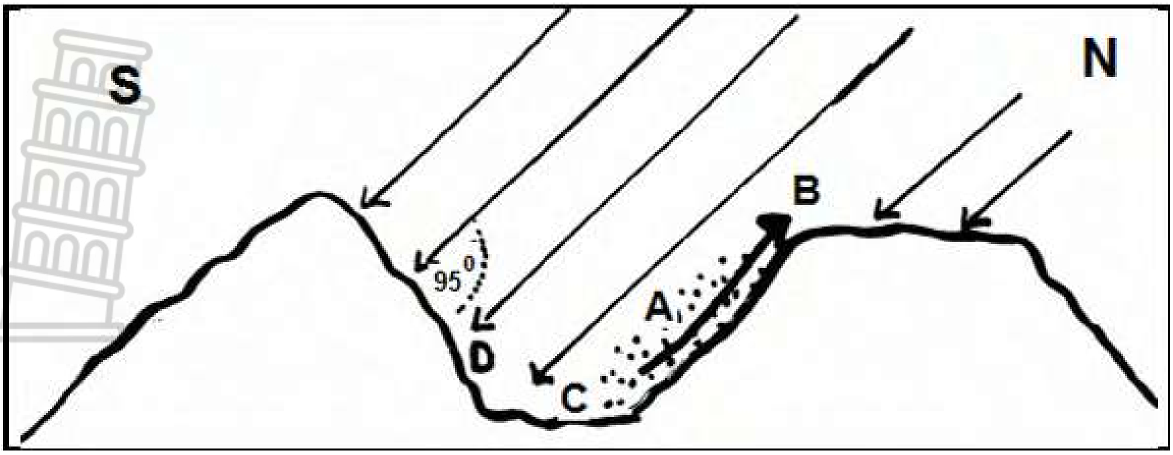
2.28.2. Describe the formation of wind C. (2 x 2) (4)

2.28.3. Why does the wind move up the valley slope in sketch B? (1 x 2) (2)

2.28.4. Write a paragraph of approximately EIGHT lines, explain the influence that wind C has on the location of settlements and farming activities. (4 x 2) (8)

(15)

**2.29. Refer to the sketch which shows aspect in a valley in the Southern Hemisphere and answer the questions that follow.**




[Source: Examiner's own sketch]

2.29.1. What evidence suggests that this valley is situated in the Southern Hemisphere? (1 x 1) (1)

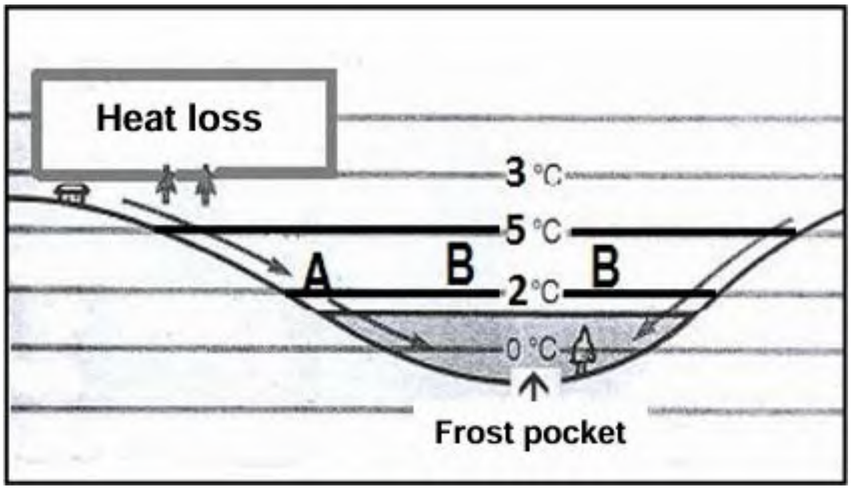
2.29.2. Explain why area A is referred to as the shadow zone. (1 x 2) (2)

2.29.3. Explain how wind B will develop during the day. (2 x 2) (4)

2.29.4. In a paragraph of approximately EIGHT lines, give advice to a farmer on how to plan the usage of the land at place C and place D effectively, taking into account the influence of aspect and resultant winds. (4 x 2) (8)

**(15)**

**2.30. The diagram below illustrates valley climates.**




[Source: http//www.educom/climates]

2.20.1. Identify wind A. (1 x 1) (1)

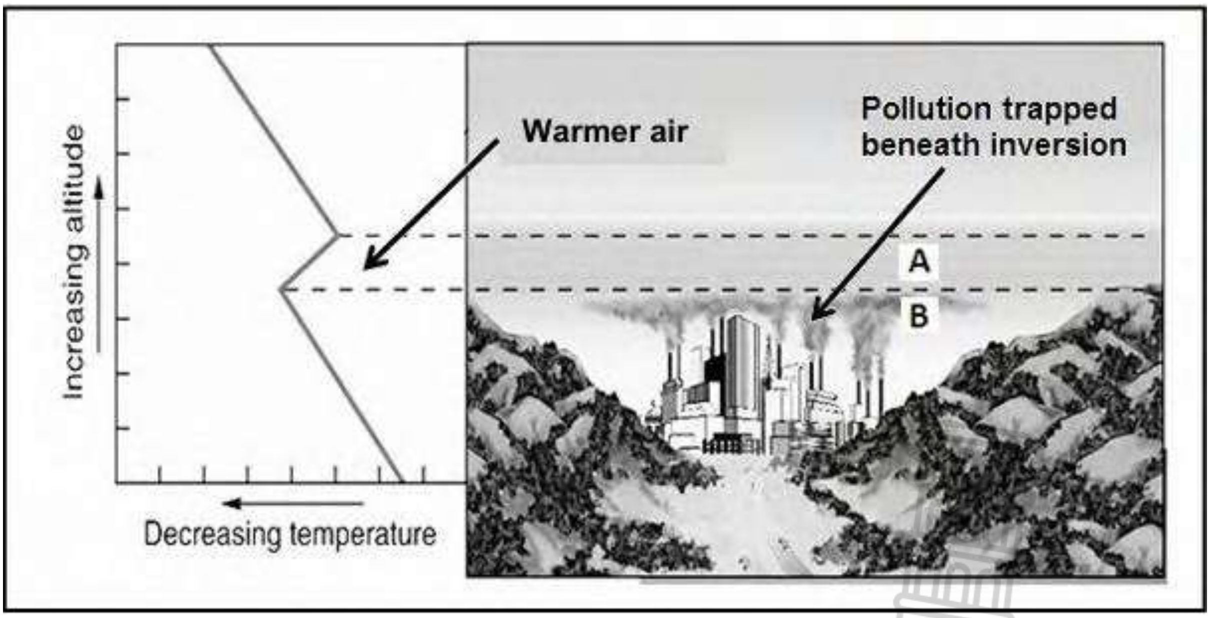
2.20.2. Explain why this wind occurs at night. (2 x 2) (4)

Give ONE reason why the layer of warm air at B is situated halfway up the slope. (1 x 2) (2)

2.20.3. In a paragraph of approximately EIGHT lines, explain the impact of the layer of warm air at B on human activities in the valley. (4 x 2) (8)

**(15)**

**2.31. FIGURE 1.4 shows a temperature inversion in a valley.**




[Adapted from http://www.asu.edu.co.za]

2.31.1. Identify the cause of air pollution in this valley. (1 x 1) (1)

2.31.2. Name ONE example of a type of pollutant that is emitted at point B. (1 x 1) (1)

2.31.3. Give a suitable term to describe area A. (1 x 1) (1)

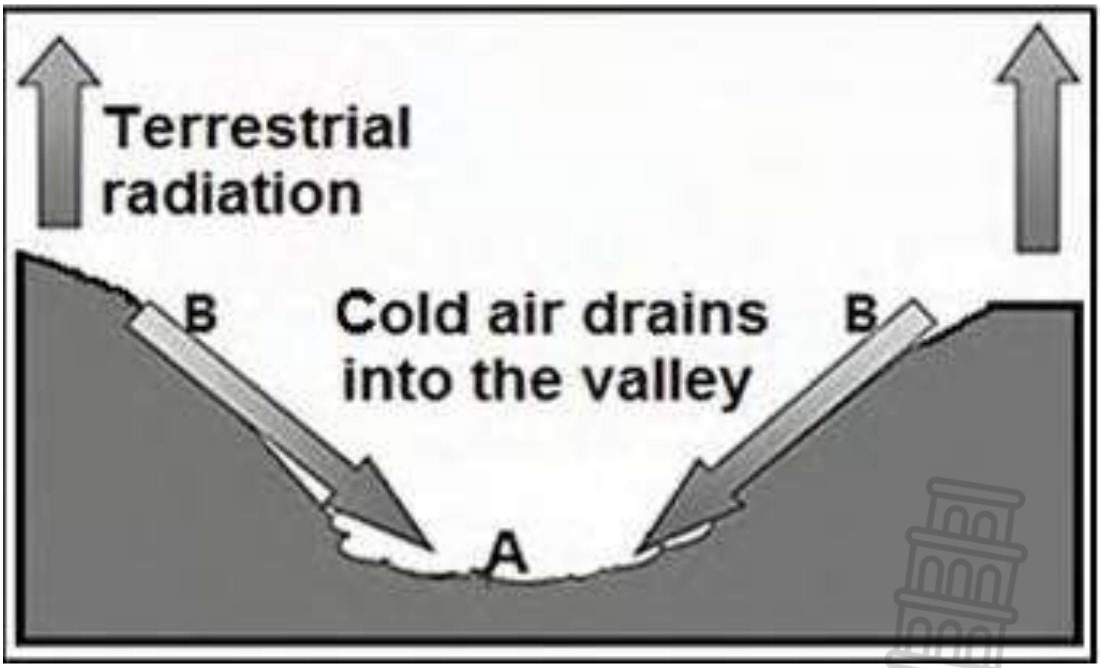
2.31.4. Describe the relationship between altitude and temperature as shown on the graph. (1 x 2) (2)

2.31.5. The amount of smoke on the valley floor could increase at night. Suggest TWO possible reasons for this increase. (2 x 2) (4)

2.31.6. Analyse the following statement: 'Temperature influences the location of settlements in a valley.' (3 x 2) (6)

**(15)**

**2.32. Study FIGURE 1.4 showing valley climates.**




[Source: https://www.google.com/search?q=radiation+fog+and+frost+in+a+valley&source]

2.32.1. Does wind B occur during the day or at night? (1 x 1) (1)

2.32.2. Match the types of precipitation (radiation fog and frost) with the statements below:

a) Formed when dew point temperature drops below freezing point on the valley floor. (1 x 1) (1)

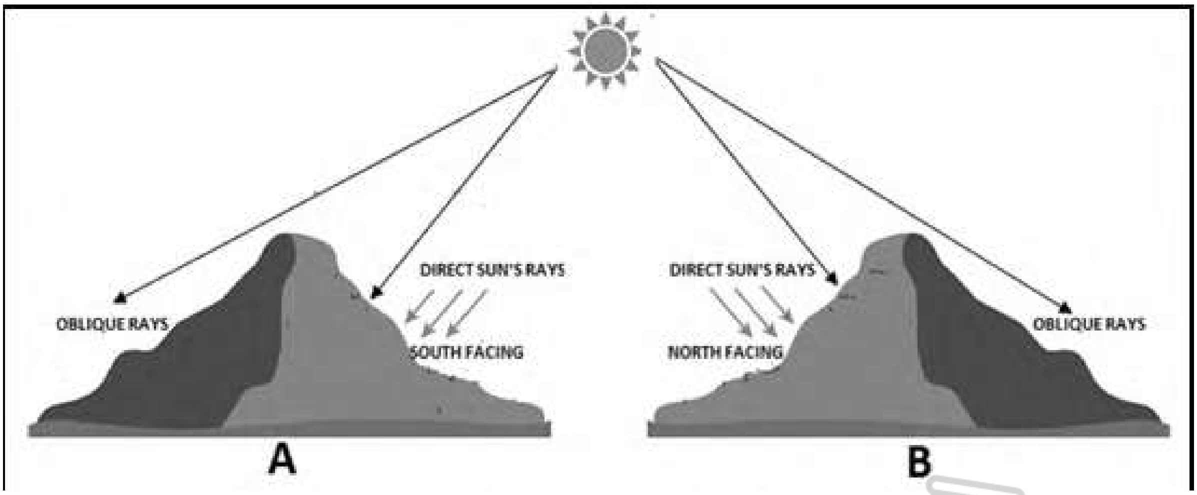
b) Formed when temperature drops below dew point in the lower section of the valley (1 x 1) (1)

2.32.3. How does wind B create an inversion in the valley? (2 x 2) (4)

2.32.4. In a paragraph of approximately EIGHT lines, outline the negative impact of these forms of precipitation (radiation fog or frost) on humans. (4 x 2) (8)

**(15)**

2.33. Refer to FIGURE 1.4 showing slope aspect.




[Adapted from https://www.pmfias.com/temperature-distribution-earth-heat-budget-heat-balance]

2.33.1. Define the concept slope aspect. (1 x 2) (2)

2.33.2. Does A or B represent the Southern Hemisphere? (1 x 1) (1)

2.33.3. Give a reason evident from the sketch for your answer to QUESTION 1.4.2. (1 x 2) (2)

2.33.4. How does slope aspect influence the microclimate of valley slopes with regard to:

(a) Temperature (1 x 2) (2)

(b) Evaporation (1 x 2) (2)

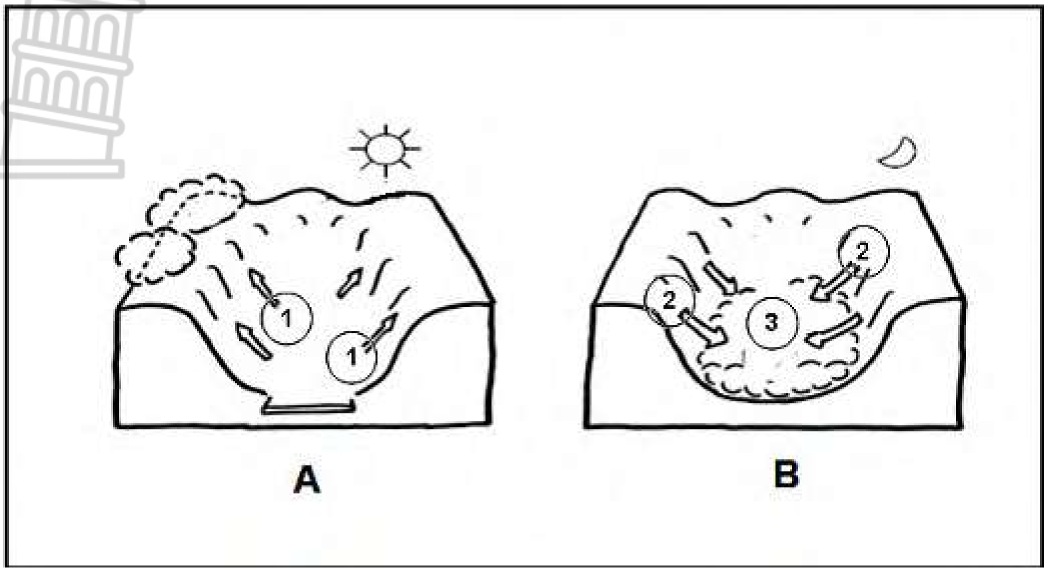
2.33.5. Explain the influence of slope aspect in the Southern Hemisphere on the following:

(a) Farming (1 x 2) (2)

(b) Human settlements (2 x 2) (4)

**(15)**

**2.34. Study FIGURE2.34. on valley climates and answer the questions that follow.**




[Adapted from www.ybw.com]

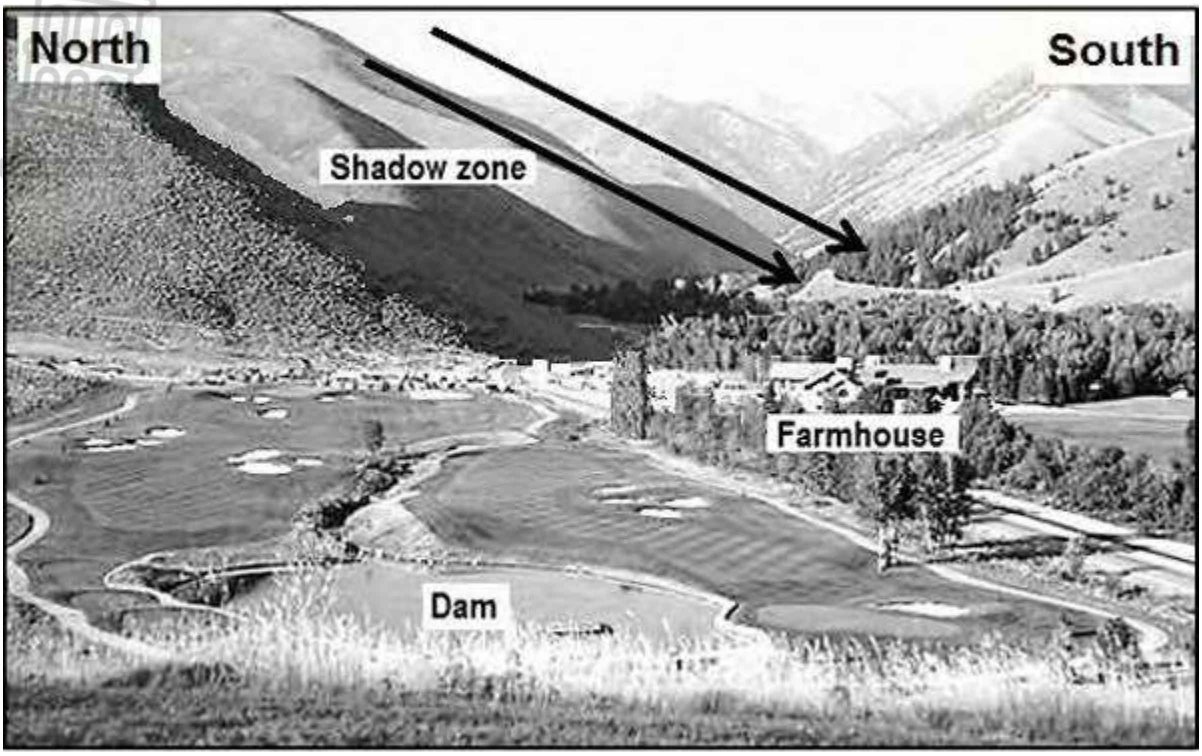
2.34.1. Name wind 1 in sketch A. (1 x 1) (1)

2.34.2. State ONE difference between winds 1 and 2. (1 x 2) (2)

2.34.3. Would wind 1 or wind 2 originate if a higher pressure occurred at the top of the valley slope? Give a reason for your answer. (2 x 2) (4)

2.34.4. Explain why visibility on the valley floor (3) is less on winter mornings. Draw a labelled diagram to support your answer. (4 x 2) (8)

**2.3 Study FIGURE 2.3, which shows the influence of slope aspect in a valley in the Southern Hemisphere (30°S).**




[Adapted from www.classicjetcharters.com]

2.35.1. Define the term slope aspect. (1 x 1) (1)

2.35.2. Which slope in FIGURE 2.3 receives direct rays of the sun? (1 x 1) (1)

2.35.3. Refer to the slope labelled 'shadow zone' in the picture.

a) Give a reason for the high moisture content of the soil on this slope. (1 x 2) (2)

b) Why is there a lack of human activity in the shadow zone, despite the high soil moisture content? (1 x 2) (2)

2.35.4. 2.3.4 Give a possible reason for the location of the farmhouse on the valley floor (1 x 2) (2)

2.35.5. In a paragraph of approximately EIGHT lines, explain, from a climatic point of view, why the location of the farmhouse and the surrounding farmland on the valley floor is not necessarily ideal. (4 x 2) (8)

(15)

**2.36.**


- Average building temperatures recorded between 12h00 and 14h00 for buildings A, B, C and D = 25,9°C
- Average air temperatures recorded between 12h00 and 14h00 = 25,5°C

- **Average temperature of buildings between 12:00 and 14:00 for buildings A, B, C and D = 25,9 °C**
- **Average air temperature recorded between 12:00 and 14:00 = 25,5 °C**

FIGURE 3.6 shows the average air temperature distribution in the Johannesburg CBD.

3.6.1. Give the average temperature of the buildings in the Johannesburg

1. CBD. (1 x 1) (1)

2. 3.6.2 Give a reason for the relatively high temperatures of buildings in the

1. Johannesburg CBD. (1 x 2) (2)

1. 3.6.3 Explain why the average air temperature between the buildings is slightly lower than that of the buildings.
(2 x 2) (4)

2. 3.6.4 Write a paragraph of approximately EIGHT lines, in which you suggest ways in which the Johannesburg CBD can be re-developed AND how alternative types of material can be used to reduce the amount of heat generated in the city.
(4 x 2) (8)

2.2 Refer to FIGURE 2.2, an extract based on urban heat islands.

**2.** FIGURE 2.2: URBAN HEAT ISLANDS

**CITY DWELLERS ARE BEARING THE BRUNT OF EXTREME TEMPERATURES**

Thanks to a phenomenon that makes urban areas hotter than their surroundings, cities such as Pretoria are as much as 6 °C hotter than they could be.

The heat comes from decades of poor planning. Since the 1950s, the global focus of city infrastructure planning has been on cars and on getting as many people as possible into tall buildings (skyscrapers).

In South Africa's six big cities, this means tarred roads crisscrossing what used to be fields, big cement slabs providing parking for the cars, high-rise apartments and office blocks overcrowding their occupants. This both creates and traps heat, which leads to an urban heat island. This effect is worse at night, with cities storing heat.

The World Health Organisation (WHO) says urban heat islands, which both raise temperatures and trap pollutants, will have to disappear in this century if future generations are to live healthy lives in cities. A possible way of addressing the issue of heat islands is introducing 'green' strategies. Green strategies are sustainable and do not harm the environment.

[Adapted from https://mg.co.za/article/2016-01-16-beyond-the-inferno-how-sa-cities-must-green]

2.2.1 Define the concept *urban heat island*. (1 x 1) (1)

2.2.2 Give TWO quotations from the extract that suggests that poor planning is responsible for increasing temperatures in cities. (2 x 1) (2)

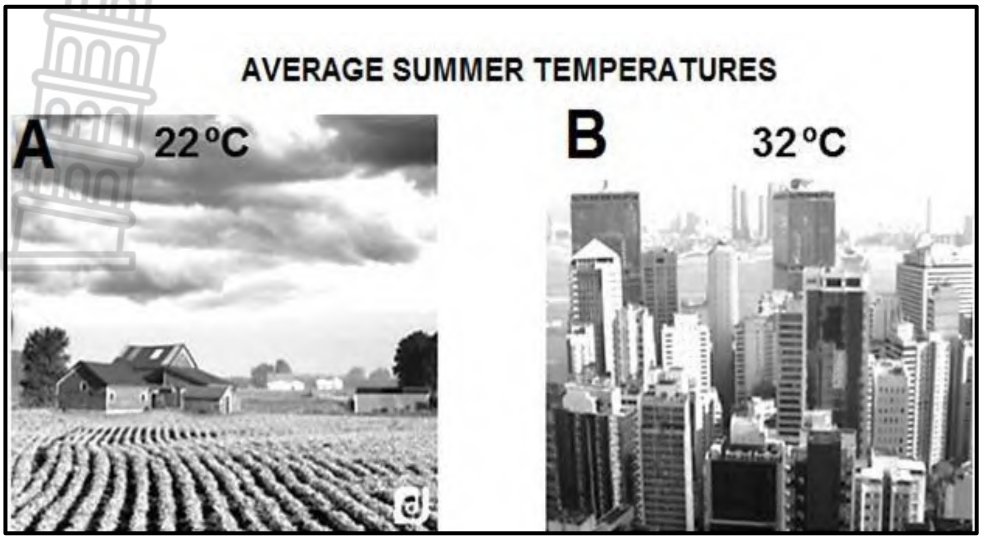
2.2.3 Why is the urban heat island effect more concentrated at night? (2 x 2) (4)

2.2.4 In a paragraph of approximately EIGHT lines, provide sustainable green strategies, as referred to in the extract, that can reduce the heat island effect. (4 x 2) (8)

**ACTIVITY 2.3**

2.3 Refer to FIGURE 2.3 based on the differences between rural and urban climates.

**3.** FIGURE 2.3: DIFFERENCES BETWEEN RURAL AND URBAN CLIMATES




[Adapted from www.slideshare.net/Nandini1810/difference-of-climate-conditions-between-urban-and-rural]

2.3.1. Will **A** or **B** generally experience lower wind speeds? (1 x 1) (1)

2.3.2. What evidence in the photograph indicates that **A** experiences higher evaporation rates than **B**? (1 x 2) (2)

2.3.3. Why does **B** experience more frequent rainfall than **A**? (1 x 2) (2)

2.3.4. Explain how the geometric shape of the buildings in the city causes a greater absorption of heat. (1 x 2) (2)

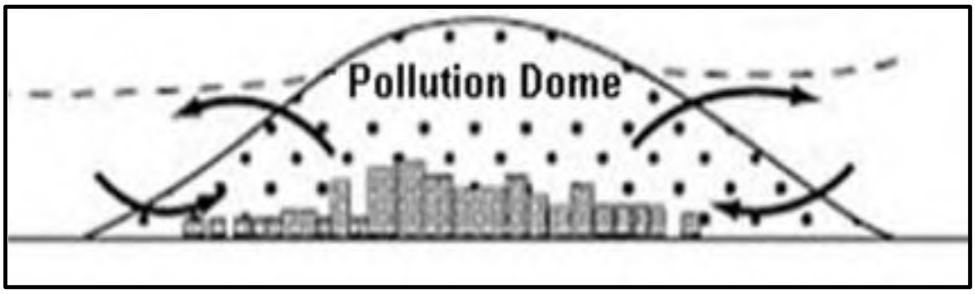
2.3.5. In a paragraph of approximately EIGHT lines, discuss how artificial surfaces and urban activities contribute to higher temperature recordings in **B**. (4 x 2) (8)

2.3.6 Explain why the weather conditions associated with line thunderstorms are more severe than isolated (normal) thunderstorms. (2 x 2) (4)

**ACTIVITY 2.4**

Refer to FIGURE 2.4 showing a pollution dome over a South African city.

4. FIGURE 2.4: POLLUTION DOME




[Source: http://www.metlink.org/secondary/key-stage-]

2.4.1 What is a *pollution dome*? (1 x 1) (1)

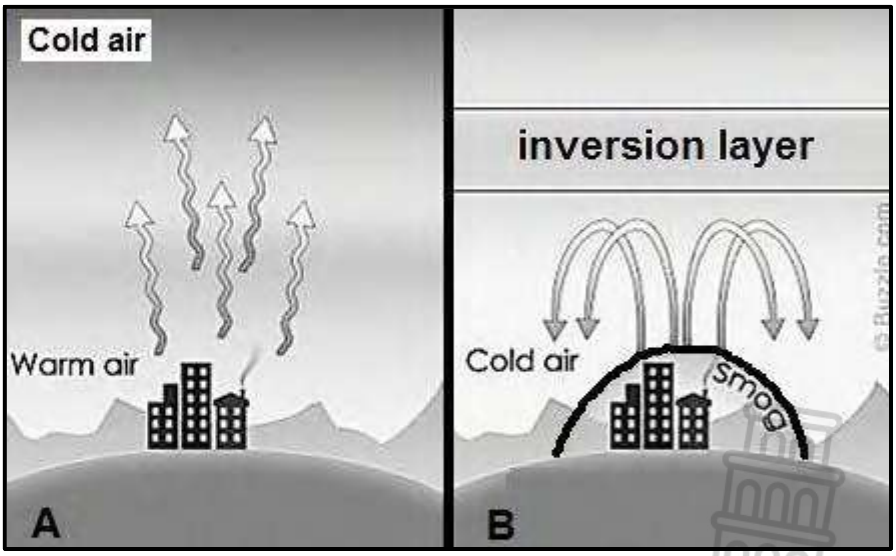
2.4.2 Why is a pollution dome associated with an urban area? (1 x 2) (2)

2.4.3. Explain why the pollution dome is more concentrated at night. (2 x 2) (4)

2.4.4. Write a paragraph of approximately EIGHT lines explaining how pollution domes increase the maintenance costs of the built environment for people living in the city. (4 x 2) (8)

2.5 FIGURE 2.5 is a representation of a city's climate.

**5.** FIGURE 2.5: CITY CLIMATE




[Adapted from http://www.buzzle.com/articles/causes-and-effects-oftemperature-inversion.html]

2.5.1 Which sketch, **A** or **B**, represents the daytime city climate? (1 x 1) (1)

2.5.2 Give ONE reason to support your answer to QUESTION 2.4.1. (1 x 2) (2)

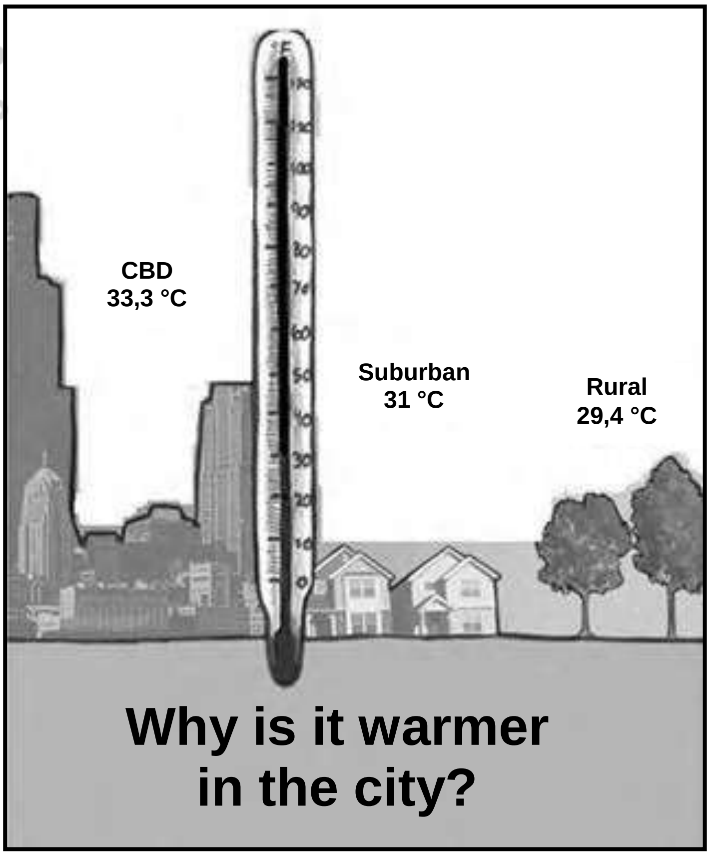
2.5.3 Give ONE reason for the occurrence of smog in sketch **B**. (1 x 2) (2)

2.5.4 Suggest ONE reason for the absence of smog in sketch **A**. (1 x 2) (2)

2.5.5 In a paragraph of approximately EIGHT lines, discuss various sustainable solutions to limit the formation of smog in a city. (4 x 2) (8)

**ACTIVITY 2.6**

2.6 Refer to FIGURE 2.6, showing the difference in temperature between the CBD and the surrounding rural area of a South African city, and answer the questions that follow.




[Adapted from thinkinginterms.scienceblog]

2.6.1 Calculate the difference in temperature between the CBD and the rural area. (1 x 1) (1)

2.6.2 Give a term that describes this difference in temperature between the CBD and the rural area. (1 x 1) (1)

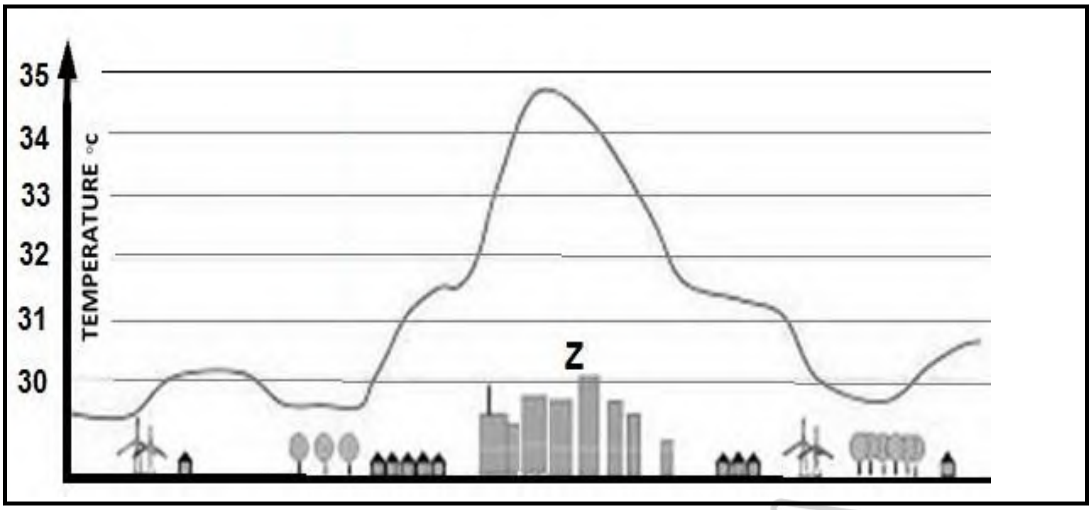
2.6.3 Discuss how building density contributes to the CBD having higher temperatures. (2 x 2) (4)

2.6.4 Draw a labelled diagram showing the structure of the urban heat island during the day for FIGURE 2.4.(2 x 2) (4)

2.6.5 Give TWO sustainable solutions to reduce the temperature in the CBD. (2 x 2) (4)

**ACTIVITY 2.7**

2.7 Refer to the graph showing the difference between rural and urban temperatures.




[Source: https://www.google.com/url?sa=i&url=https%3A%environment%2F2021-heat-island]

Define the concept *urban heat island*. (1 x 2) (2)

Give the highest temperature recorded. (1 x 1) (1)

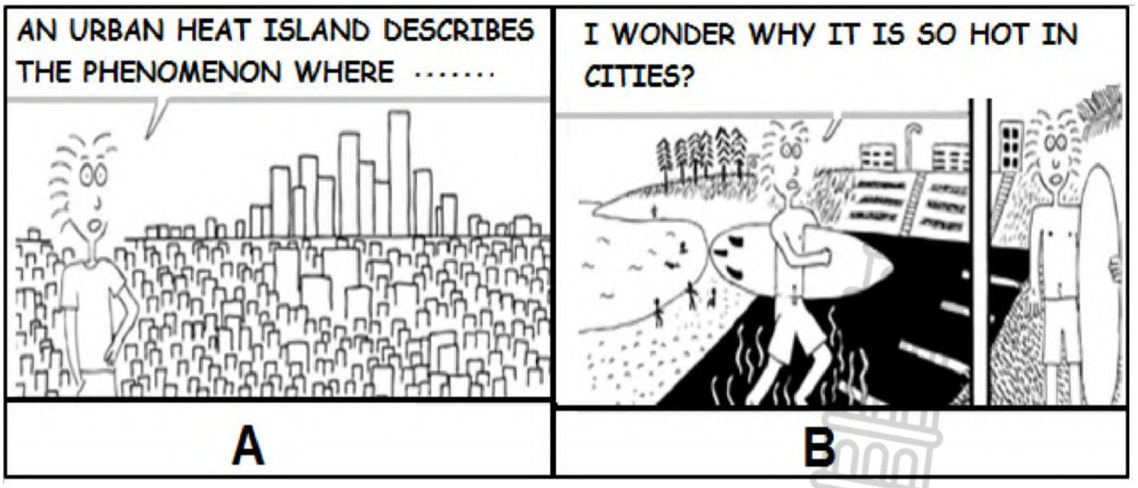
Explain TWO ways in which the buildings at **Z** contribute to the high temperatures. (2 x 2) (4)

In a paragraph of approximately EIGHT lines, suggest sustainable building strategies to reduce the urban heat island effect. (4 x 2) (8)

**ACTIVITY 2.8.**

Study FIGURE 2.8 showing a cartoon on an urban heat island.

**6.** FIGURE 2.8: URBAN HEAT ISLAND




[Adapted from Stuar McMillencartoons.recombinant. records]

Complete the statement describing an urban heat island in **A**:

An urban heat island describes the phenomenon where … (1 x 1) (1)

Refer to **B** and give TWO reasons for the heat generated in the city.(2 x 1) (2)

What impact will the increased temperatures have on people living in the city?

(2 x 2) (4)

In a paragraph of approximately EIGHT lines, provide sustainable

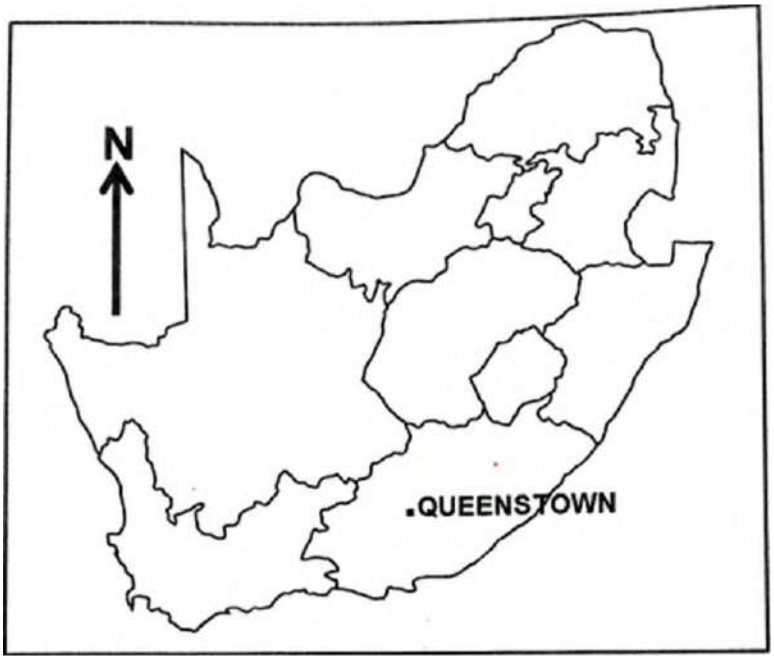
methods that can be implemented in an attempt to control the temperature in the city.

(4 x 2) (8)

## 3. GEOGRAPHICAL SKILLS AND TECHNIQUES

**Refer to the 1: 50 000 Topographical map Extract from 3126DD Queenstown and Orthophoto map extract 3126 DD 1 Queenstown to answer the following questions.**

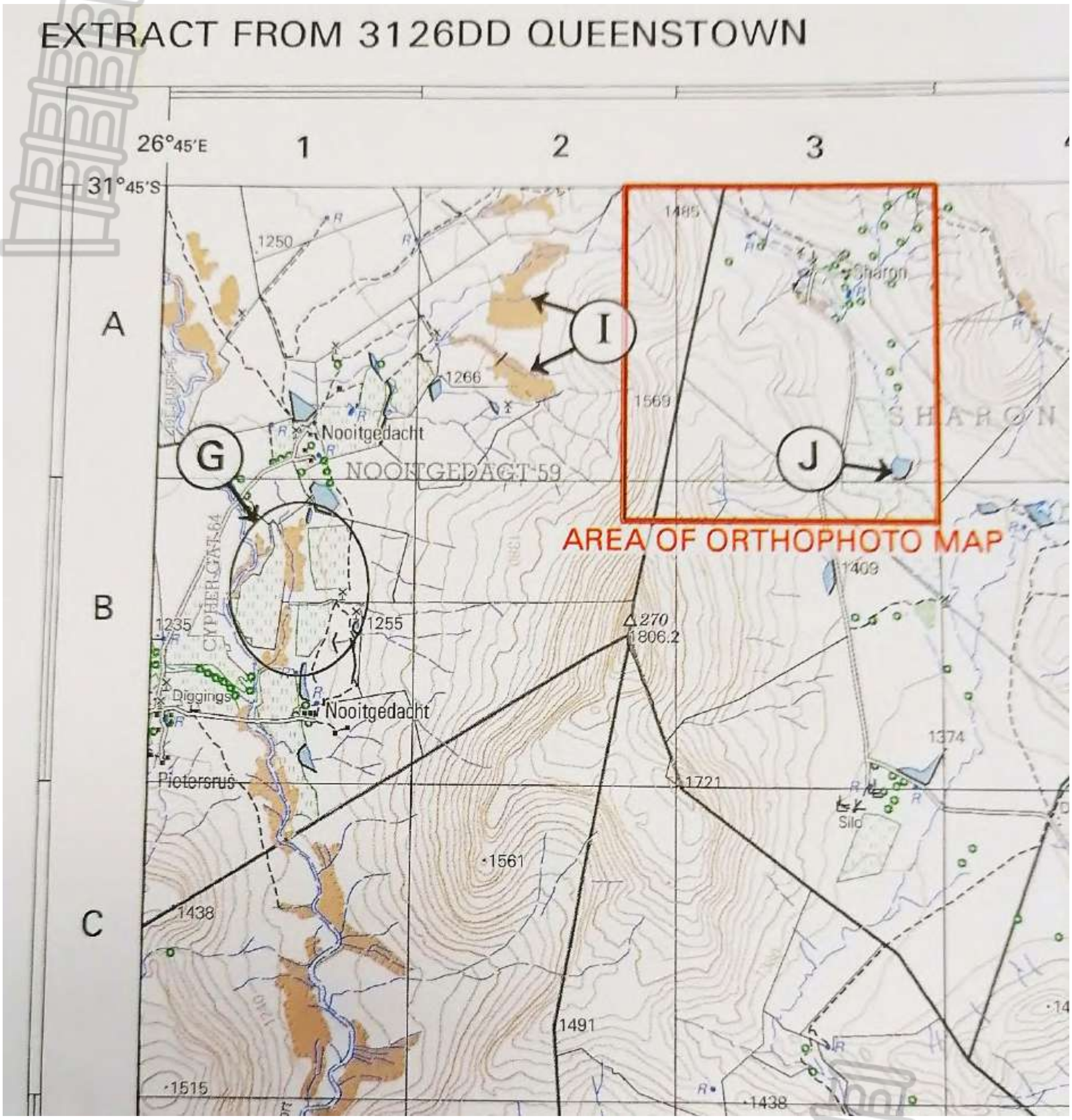
**BACKGROUND INFORMATION ON QUEENSTOWN**




Coordinates: 31°54'S; 26°53'E

Queenstown (officially known as Komani) is a town in the Eastern Cape in South Africa. The town lies on the banks of the Komani River which forms part of the Great Kei River system and has a refreshing climate and an abundant water supply from the surrounding rugged mountains.

The area's annual average temperature is 18,29 °C which is 2,93% lower than the



EXTRACT FROM 3126DD QUEENSTOWN
26°45'E
31°45'S
1
2
3
A
B
C
I
G
J
AREA OF ORTHOPHOTO MAP
Nooitgedacht
NOOITGEDAGT 59
SHARON
Sharon
Diggings
Nooitgedacht
Pietersrus
Silo
1250
1266
1485
1569
1409
1255
1235
270
1806.2
1721
1374
1561
1438
1491
1515
1438

**Refer to the area of orthophoto map on the topographic map.**

**3.1. Map Skill and Calculations**

3.1.1. The area of orthophoto map is smaller on the topographic map because ….

A. the orthophoto map scale is 5 times larger.

B. the topographic map scale is 5 times smaller.

C. the orthophoto map is 5 times smaller.

D. the topographic map is 5 times larger. (1 x 1) (1)

3.1.2. Which human-made feature is found at grid reference 31°49'41"S;26°45'35"E on the topographical map?

A. Trees

B. Spot height

C. Ruin

D. Building (1 x1) (1)

3.1.3. Queenstown is located in ……. Province.

A. Gauteng

B. Eastern Cape

C. Western Cape

D. KwaZulu Natal (1 x 1) (1)

3.1.4. Calculate the area of orthophoto map on the topographical map in $km_2$.

Formula: Area = Length x Breadth (3)

3.1.5. Calculate the current magnetic declination of the Topographic map if the difference in years is 7. (3)

3.1.6. 1orthophoto map. Name the type of slope responsible for this. (1 x 1) (1)

**(10)**

**3.2. Map interpretation**

**Refer to the slope around Trigonometric beacon 270 in Block B2 and the demarcated area labelled G in Block B1 on the topographical map.**

3.2.1. Mention the valley wind that is likely to occur along the slope at night.

(1 x 1) (1)

3.2.2. Describe how the wind mentioned in1.2.1 affect temperature in the area.

(1 x 1) (1)

3.2.3. Explain the impact of the valley wind mentioned in QUESTION 1.2.1 on farming in the demarcated area at G. (1 x 2) (2)

3.2.4. Advice farmers on how to adapt their farming methods in area G in view of the wind mentioned in QUESTION 1.2.1. (1 x 2) (2)

Refer to the orthophoto map.

3.2.5. Describe the topography between 6 in Block D4 and Spot height 1448 in Block C5. (1 x 2) (2)

3.2.6. Give evidence from the map to support your answer to QUESTION 1.2.5.

(1 x 2) (2)

3.2.7. Explain the valley wind that is likely to occur between 6 and Spot height 1449 on orthophoto map during the day. (1 x 2) (2)

(12)

**3.3. Geographical Information Systems (GIS)**

3.3.1. Define the concept data layering. (1 x 2) (2)

3.3.2. Mention ONE data layer that the farmer considered when establishing his farm in Block B1. (1 x 1) (1)

3.3.3. Suggest ONE possible cause of soil erosion in Block B1 on the topographic map. (1 x 1) (1)

3.3.4. Is the orthophoto map an example of vector data or raster data? (1 x 1) (1)

3.3.5. Explain your answer to QUESTION 1.3.4. (1 x 2) (2)

3.3.6. Mention a natural line feature in Block C3. (1 x 1) (1)

(8)

3.4. MAP INTERGRATION

LOCATION OF INDUSTRIES

You are provided with a map of VERULUM. EXTRACT FROM 2931 CA. ORTHOPHOTO MAP and TOPOGRAPHICAL MAP.

3.4.1. Refer to the topographic map and the orthophoto map to answer the following questions.

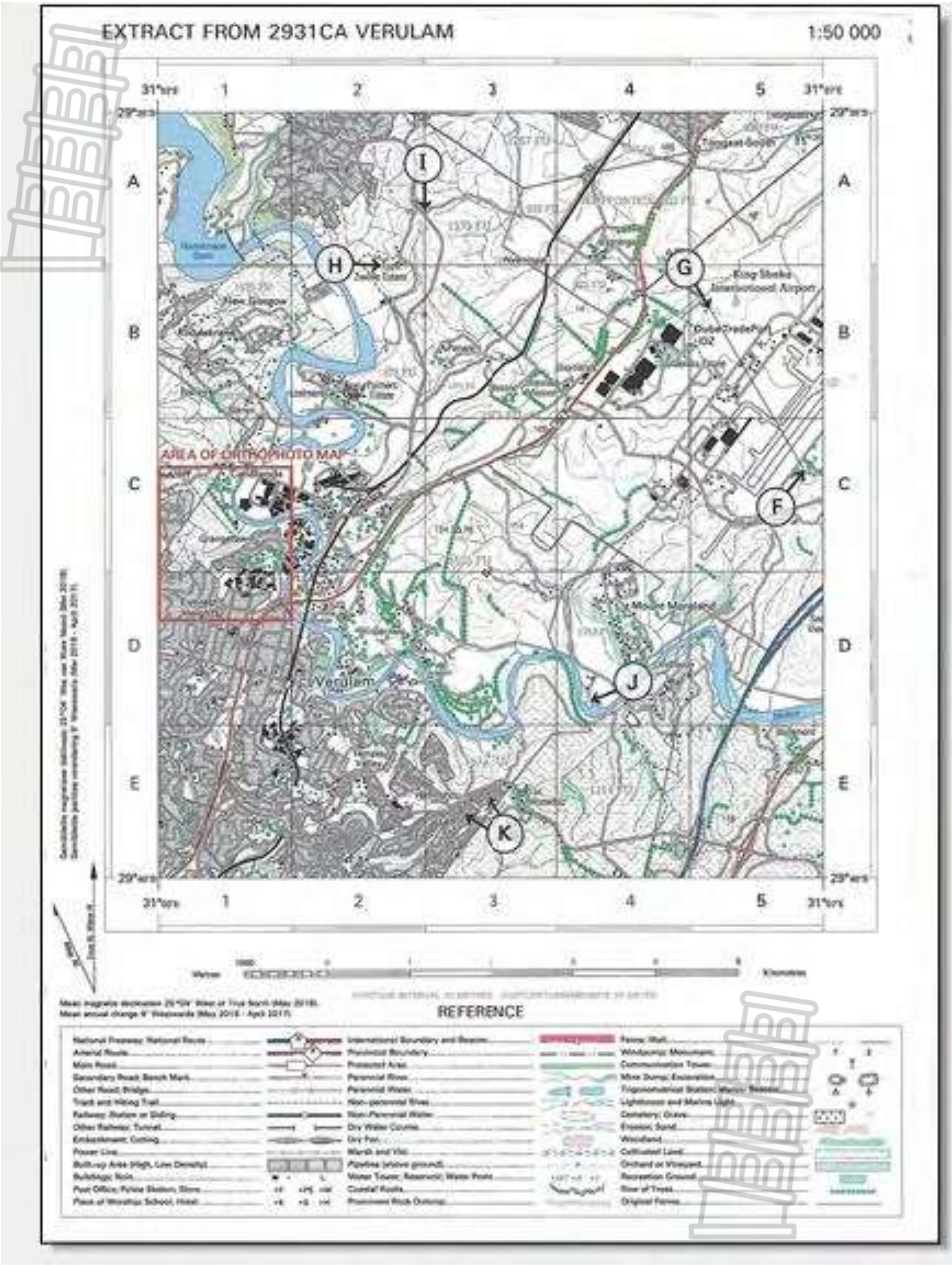
a. The contour Interval of orthophoto map is --------meters. 1x1=1
b. Mean annual change of the mapped area is ---- minutes West. 1x1= 1
c. Refer to block C 2.

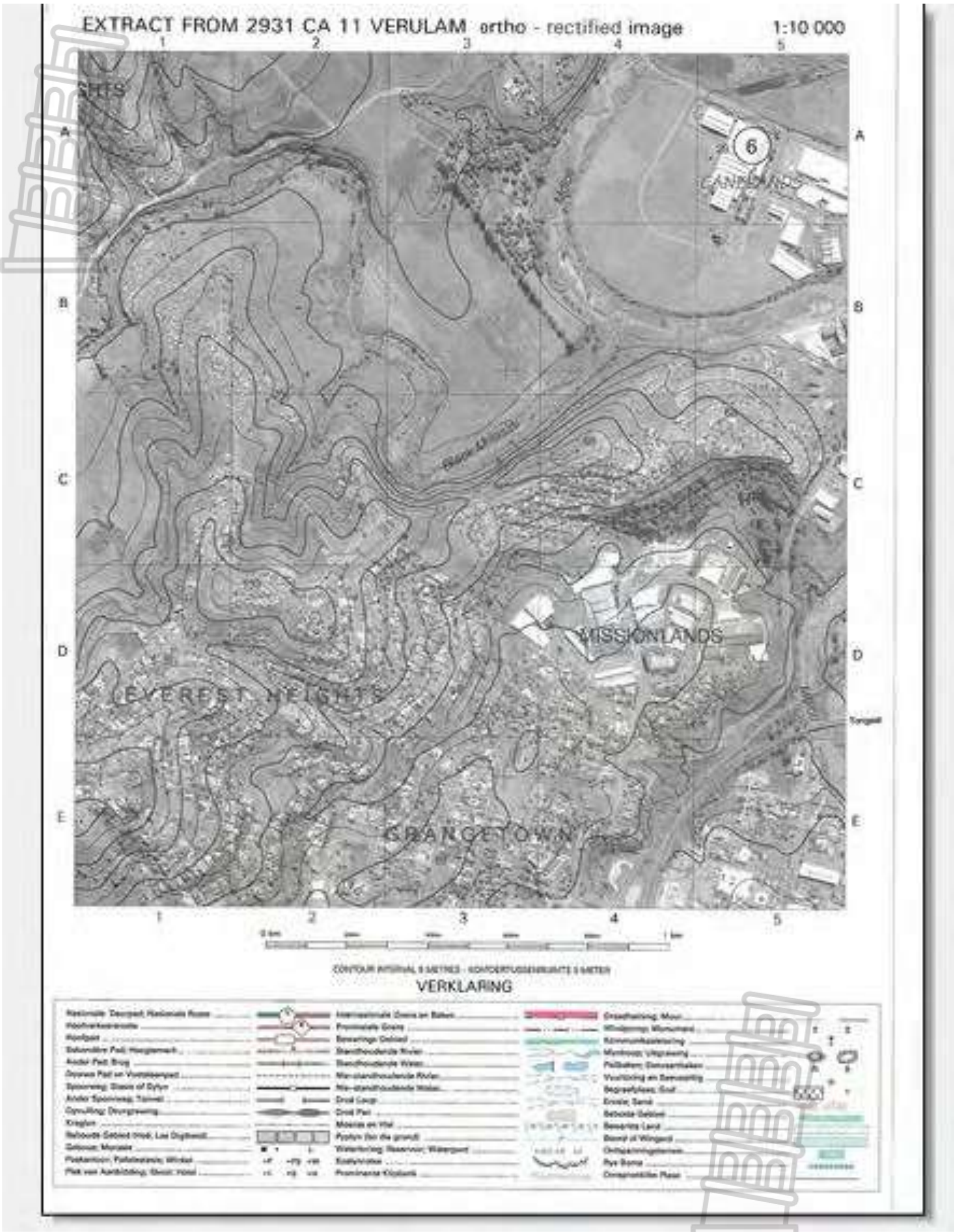
3.4.2. Are the Industries (heavy / light) 1x1=1 Discuss why the industries identified are in a suitable location. 2x2= 4 what are the environmental injustices that these types of industries can cause to human being. 1x2

3.4.1. Far from the CBD/On a flat land/ Next to the river/Next to the main road for easy transportation. Next to break of bulk point. (Railway station) 2x2= 4

polluted air can cause respiratory diseases. 1x2= 2

**<u>3.5.GEOGRAPHICAL SKILLS AND TECHNIQUES</u>**


EXTRACT FROM 2931CA VERULAM
1:50 000
A
B
C
D
E
1
2
3
4
5
I
H
G
F
J
K
AREA OF ORTHOPHOTO MAP
Verulam
King Shaka International Airport
Mount Moreland
REFERENCE




Use the 1:50 000 topographic map 2931CA VERULAM and the orthophoto map 2931 CA 11 VERULAM to answer the following questions:

MAP SKILLS AND CALCULATIONS

3.5.1. The contour interval of the orthophoto map is ……………….

A. 20m

B. 5m

C. 15m

D. 25m

3.5.2. The photo number of the orthophoto map is ……………….

A. 31

B. 29

C. 11

D. CA

3.5.3. The scale of the topographic map is……………… than that of the orthophoto map.

A. 5 times larger

B. 10 times larger

C. 5 times smaller

D. 10 times smaller (3 x 1) (3)

3.5.4. Calculate the area in km² of the area covered by the orthophoto map on the topographic map. Use this measurements length is 3.7cm and breadth is 3.1cm. Show all the calculations. (3)

Formula**: Length x Breadth**

3.5.5. Calculate the average gradient between spot height 141 in block B4 and contour line labelled G in block B5. Show all the calculations. (4)

Formula: $G = \frac{VI}{HE}$

3.6: Map interpretation

3.6.1. Compare the temperature difference between Everest heights in block D1 and Mount Moreland in block D4. (1 x 2) (2)

3.6.2. Explain reasons for temperature difference between Everest heights in block D1 and Mount Moreland in block D4. (2 x 2) (4)

3.6.3. (a) The mass of polluted air in and above the city is (urban heat island/pollution dome). (1 x 1) (1)

(b) Explain why Everest height in block D1 will experience high pollution levels compared to Mount Moreland in block D4. (1 x 2) (2)

3.6.4. Refer to the Orthophoto map

3.6.1.1. The orthophoto map was taken in the (morning/afternoon). (1 x 1) (1)

3.6.1.2. Provide a reason to support your answer. (1 x 2) (2)

(12)

3.7. Geographic Information System

3.7.1. The term that describes gathering of information about the earth's surface from a distance is……………….

A. Data sharing

B. Remote sensing

C. Attribute data

D. Data layering (1 x 1) (1)

3.7.2. Differentiate between vector data and raster data. (2 x 2) (4)

3.7.3. (a) Orthophoto map has a (low/high) reapproaches. (1 x 1) (1)

(b) Provide a reason for your answer. (1 x 2) (2)

(8)

**(30)**

| | **MID- LATITUDE** |
|---|---|
| **Definition** | |
| **Naming** | |
| **Area of formation** | |
| **Latitudinal origin** | |
| **Air circulation** | |
| **Air movement** | |
| **Wind belt origin** | |
| **Temperature associated** | |
| **Direction from SA** | |
| **Season associated** | |

| | | |
|---|---|---|
| **Duration** | | |
| **Isobars** | | |
| **Conditions necessary for formation** | | |
| **Stages of development** | | |
| **Weather conditions** | WARM SECTOR | COLD SECTOR |
| **Impacts – negative environmental (physical)** | | |
| **Negative social impact** | | |
| **Negative economic** | | |

| | |
|---|---|
| impact | |
| **Positive environmental (physical)** | |
| **positive social impact** | |
| **Positive economic** | |
| **Strategies / management/ precautionary measures to minimize the impacts** | |

**ACTIVITY 3: TROPICAL CYCLONE**

**TEACHING APPROACH**

**Educators are advised to use the following Worksheet for learner engagement during lessons. Learners should use their Textbooks to**

| | TROPICAL CYCLONE |
|---|---|
| Definition | |
| Naming | |
| Area of formation | |
| Latitudinal origin | |
| Air circulation | |
| Air movement | |
| Wind belt origin | |
| Temperature associated | |
| Direction from SA | |
| Season associated | |
| Duration | |
| Isobars | |
| Conditions necessary for formation | |
| Stages of | |

| | |
|---|---|
| **development** | |
| **Weather conditions** | |
| **Impacts – negative environmental (physical)** | |
| **Negative social impact** | |
| **Negative economic impact** | |
| **Positive environmental (physical)** | |
| **positive social impact** | |

| | |
|---|---|
| | |
| **Positive economic** | |
| **Strategies / management/ precautionary measures to minimize the impacts** | |

| **ANTICYCLONES** | | | |
|---|---|---|---|
| What is it? Definition | | | |
| | **SAH** | **SIH** | **KALAHARI HIGH** |
| **How does it look like?**<br>**Drawing** | | | |
| **Location** | | | |

| | | | |
|---|---|---|---|
| | | | |
| **Temperature** | | | |
| **Moisture content** | | | |
| **Reason for moisture content** | | | |
| **Low pressure associated** | | | |
| **Season associated** | | | |
| **Reason for season (position of inversion layer)** | | | |
| Travelling Disturbances | **MOISTURE FRONT** | **BERG WIND** | **COASTAL LOW** |
| **Process of development** | | | |
| **Negative Impacts associated with resulted weather (farmers) and natural** | | | |

| | | | |
|---|---|---|---|
| **environment** | | | |
| **Negative Impacts associated with resulted weather (farmers) and natural environment** | | | |
| **Management strategies associated with resulted weather** | | | |

**MICRO-CLIMATE**

**WORKSHEET**

| **Valley climate – study aspects** | | |
|---|---|---|
| | **ANABATIC** | **KATABATIC** |
| **DEFINITION** | | |
| **DIAGRAM** | **DAY** | **NIGHT** |
| **TEMPERATURE** | | |
| **PROCESSES FOR FORMATION** | | |
| **IMPACTS ON SETTLEMENTS** | | |

| | | |
|---|---|---|
| **IMPACTS ON FARMING** | | |
| **STRATEGIES** | | |

**GEOGRAPHY GEOMORPHOLOGY**

**PAPER 2 LEARNER ACTIVITIES**

**MISCONCEPTIONS IN GEOMORPHOLOGY**

- **Drainage basins in South Africa**

Learners are unable to define concepts

- Drainage basin
- Catchment area
- River system
- Tributary
- Confluence
- Watershed
- Interfluve
- Source
- River mouth
- Surface run-off
- Infiltration
- Groundwater
- Water table

**Approaches**

- Give learners diagrams/topographic maps to identify features of drainage basin
- Explain what learners see on the diagram
- Describe characteristic of features on diagrams (What do you see on diagram)
- Learners should come up with their own definition
- Interpretation features of drainage basin on a diagram

- **Types of rivers**

**Misconception:**

Learners are unable to identify and differentiate between the types of rivers

**Approaches:**

- Give learners diagrams of cross profile of river indicating water table in different seasons.
- Learners must identify and explain what they see on the diagram
- Explain the difference between different types of rivers
- Learners identify different types of rivers on topographic maps

- **Drainage patterns**

  Misconceptions:

  Section of Geomorphology on drainage patterns is often tested, learners struggled to unpack their knowledge and apply it to the questions specifically. In this instance a rectangular drainage pattern was tested with a dendritic drainage pattern. Many learners confused the rectangular drainage pattern with the trellis drainage pattern. Learners struggled to state the underlying rock structure and rock type and to explain how the underlying rock structure influenced the drainage pattern.

  Approaches

  Teachers should not only test the most common combination of trellis drainage patterns and dendritic drainage patterns, but also other drainage patterns so that learners are prepared for any combination. Learners should be able to relate various drainage patterns caused by the different underlying rock structures, e.g., a rectangular drainage pattern is formed due to joints and faults in the rock which causes rivers to flow in the joints creating 90°

bends. Teachers should always use sketches and topographical maps when teaching drainage patterns.

- Identification, underlying rock structure, development and characteristics of the following drainage patterns:
- Dendritic
- Trellis
- Rectangular
- Radial
- Centripetal
- Deranged
- Parallel

- Drainage density and stream orders

**Misconception**: Most learners found it challenging to explain the drainage density. And many struggled to explain how the slope and permeability of the underlying rock influenced the drainage density of a high order and difficult challenge as three factors had to be considered when responding. Many learners were not able to determine the stream order. Furthermore, they were not able to state the relationship between stream order and characteristics of stream segments.

**Approaches** Teachers are encouraged to not only teach the theory but practise the application of how slope (gradient) and permeability of the underlying rock influence the drainage density. A steeper gradient result in a greater runoff with more river channels and a higher drainage density. Underlying rocks that are impermeable also promote greater runoff and a higher drainage density. (Diagnostic report 2023)

Exam Guidelines

Definition and impact of factors influencing drainage density:(high/low drainage density):

- Precipitation
- Evaporation
- Soil moisture
- Vegetation

  - Slope/Gradient
  - Porosity
  - Permeability
  - NOTE: The above should be taught with the understanding of infiltration
- Discharge of a river

  Examination guideline
- Discharge of a river: (definition, identification and application)

  o Laminar flow

  o turbulent flow

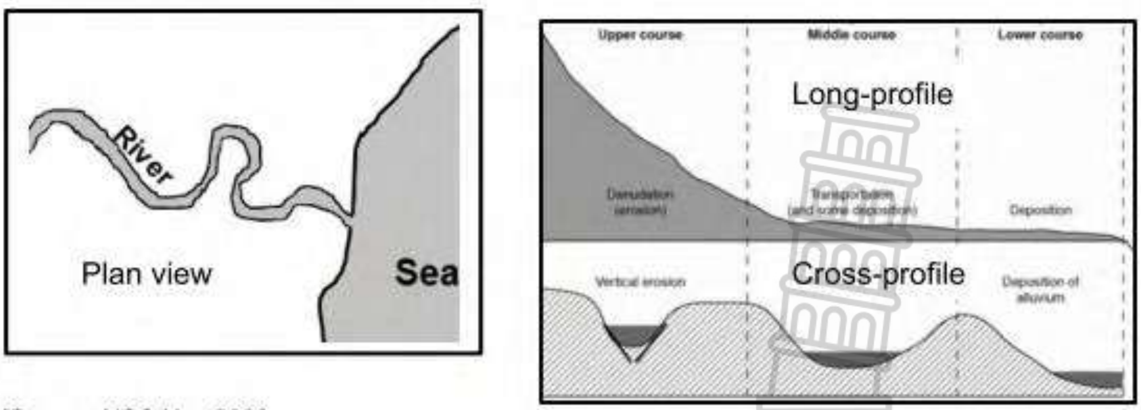
**Fluvial processes**

- River profiles

  Learners experienced challenges with the multiple-choice questions testing the concepts of longitudinal, plan view, cross profile, fluvial processes and fluvial landforms/features

  Approaches:

  Teachers need to expose their learners to the various views that are used in Geomorphology: longitudinal profile (view from source to mouth of a river), plan view (overhead view), cross-profile (view of a feature from bank to bank). When fluvial features/landforms are taught, teachers should have sketches to show learners the various views.




[Source: NSC Nov 2023
Source: https://www.google.com/search?q=long+profile+of+a+river]

Teachers must ensure that learners know all the geographical concepts and definitions required. Learners should compile a glossary of terms in their notebooks for easy reference. This will assist them when describing and defining these concepts and definitions and in extending their geographical vocabulary

Fluvial landforms

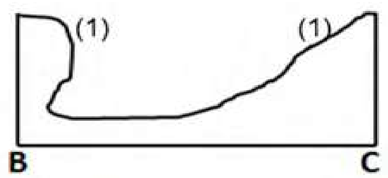
Meander and ox bow lake

**Misconception**

Learners could not draw the rough cross-section of a meander. Poor result attained in the paragraph question (8 marks). Learners had difficulty describing the processes that resulted in landform A (meander) becoming an ox-bow lake.

**Approaches**

A cross-section is the view of a feature from one riverbank to the other which in this case was shown from B-C on the sketch. Learners need to practise this sketch and must be able to draw the different slopes shape as taken from the marking guideline. Marks were awarded for the correct shape of the slopes as indicated below.




Teachers must practise the skill of teaching the geomorphological processes associated with the formation of fluvial landforms. Learners must be able to describe the processes that a meander undergoes to change into an ox-bow lake. Learners need to understand that erosion takes place on the outer bank due to the strong current and deposition on the inner bank due to the slow current. The neck narrows due to this and eventually breaks through allowing the river to straighten. Some water still flows around the meander, but deposition eventually blocks the path separating the river from the ox-bow lake. Using a series of sketches is the best way to teach this process.

Floodplain

**Misconception**

The concept of a floodplain is not foreign to the learners yet they struggled to apply their knowledge adequately. Most learners could not give deposition as the process that resulted in floodplains forming. The paragraph question was set as a higher-order question which required an explanation of the physical impacts of flooding on the floodplain. Here learners needed to refer to the impact on habitats, change in biodiversity,

**Approaches**

Teachers need to make the link between the flood plain and how it forms as a result of flooding. The flood plain is a fluvial depositional feature (landform) that develops in the lower course of some rivers due to the river overflowing its banks, regularly depositing alluvium. As this process continues, so a floodplain will increase in size over time. A floodplain is a habitat for plants and animals, the deposited alluvium improves soil fertility and it is a storage place for excess water. While there are many impacts on the floodplain a particular paragraph question required learners to refer only to the physical impact of flooding on the floodplain. Teachers should explain the difference between physical and human impacts when covering this section.

**River grading**

**Misconception**

In paragraph-type question candidates could not easily make the link between the fluvial processes occurring at various stages along a river for a river to become graded. The two topics of fluvial processes and characteristics of a graded river were tested together which seemed to be beyond the ability of many candidates.

**Approaches**

Teachers should always use explanatory diagrams when teaching this section so that learners can clearly make the connection between the change in the river profile and the fluvial processes responsible for the changes.

**River rejuvenation**

**Misconceptions**

Candidates could not identify changes in the river channel and meander after rejuvenation occurred. They had to make a comparison between the two diagrams which they found a challenge.

**Approaches**

River rejuvenation is a topic that is regularly tested and as such teachers need to cover this section thoroughly in class using as many different sources as possible. Usually there is a before and after diagram where one can see exactly what changes have taken place as the process occurs. Learners must be able to identify features like a knickpoint, the rejuvenated river with a valley within a valley, and possible terraces visible. They might also be asked to describe the changes visible in the river channel and meander from the before and after diagram.

**River capture**

**Misconceptions**

Candidates struggled with the concept of river capture (stream piracy) due to a lack of understanding of the processes involved. Many candidates correctly selected answers when choosing but could not give a reason from the sketches for their choice.

Candidates could not use the original diagram before river capture and redraw it to show the process of river capture having occurred. Many candidates drew diagrams that were not based on the original diagram.

**Approaches**

Learners need to master the interpretation of before and after diagrams, such as with the diagrams on river capture and be able to explain the geomorphological processes that resulted in the changes occurring. Teachers must practise the skill of redrawing diagrams with their learners in class consolidation exercises and informal tests. This will prepare the learners when having to answer a question. Teaching with the use of visual aids will definitely assist learners to conceptualise the process. It is suggested that teachers use a variety of examples of river capture from past papers and the internet to help learners become more confident with regards to identifying features of river capture and determining which river is the captor and captive.

**GEOGRAPHICAL SKILLS AND TECHNIQUES**

**Misconceptions**

Candidates did not take note or make use of the General Information given on the question paper.

**Approach**

Learners should be encouraged to read through the General Information and consider where the place being tested, is located. Questions can be set from the general information. There are also English terms and their Afrikaans translations provided as some topographical maps might use a combination of Afrikaans and English terms.

**Misconceptions**

Map skills and calculations continue to pose a challenge for many learners. Learners struggled to calculate the area of the farm at F in block E3 on the topographical map despite being given the measurements. A number of learners measured the distances for themselves, and others did not convert their final answer to m² as was instructed.

**Approaches**

Teachers must reiterate to learners that they should read the questions carefully before attempting a response. Certain measurements were given so that learners did not have to recalculate. Learners are reminded to present their final answer in m². Teachers must remind learners that they should convert the map measurements directly into metres by multiplying the length and the breadth by 500 m (map scale) before multiplying them together to obtain the final answer. If the unit of measurement is missing from the final answer, no marks are awarded for that step.

**Misconceptions**

**T**he average gradient calculation was not well answered. Many learners do not show the calculation of the VI to obtain the mark, others do not substitute correctly, and many did not represent their answer as a ratio.

**Approaches**

In order to calculate the average gradient, learners are given the formula into which they substitute the values

Formula: $\frac{\textbf{Vertical Interval (VI)}}{\textbf{Horizontal Equivalent (HE)}}$

The VI is calculated from the values of the spot height 1567 (given) and the height at 6 in block D4 which was 1 420 m. VI is the difference in height between the 6 and 7. In this calculation the HE (distance between 6 and 7) is given at 950m.

**MAP INTERPRETATION AND APPLICATION**

**Misconception**

On map interpretation candidates did not make full use the topographic map and the orthophoto map as was required. Many candidates were not able to integrate their Physical Geography knowledge to answer the questions asked in the map work section The following questions were problematic: Candidates could not give a reason for saying why the photograph was taking in the morning. Candidates continued to struggle with how to determine the use map evidence in their response. Candidates also struggled with giving direction of flow of a river and did not provide map evidence as requested. Many candidates did not describe the underlying rock structure in but gave an example of the type of rock instead.

**Approaches**

Teacher should make learners note that shadows cast by features on the orthophoto map are the most accurate way of determining whether the photograph was taken in the morning or afternoon. If the shadows are on the south west, then the photograph is taken in the morning. If the shadows lie on the east, south east or north east, then the photograph is taken in the afternoon. Teacher must demonstrate to learners on how to interpret topographic maps that climatological reason required in the answer is that rainfall is seasonal. If rainfall only occurs for a part of the year, there will be evidence of perennial water (dams) to store water, and furrows to move the water from the dams to where it is needed. Teachers must alert learners to this type of interpretation when practising map work skills.

The following types of evidence on maps should be drilled by teachers in this regard:

- V-shape of the contour lines point towards the high-lying area.
- Use contour heights, spot heights along the path of the river.

The following information can also be used to identify direction of river flow:

- Identify a dam wall as rivers flow out from these walls;
- The acute angle at which tributaries join the mainstream: confluence points in the direction of the mouth of the river

Teachers need to clearly differentiate between the underlying rock structure and rock type when teaching drainage patterns the underlying rock structure which results in a dendritic drainage pattern is that the rock is horizontal or layered and of equal resistance. The type of rock would be sedimentary or igneous rock.

**GEOGRAPHICAL INFORMATION SYSTEMS**

**Misconceptions**

Most candidates struggled to answer (8 marks) on GIS which resulted in this section recording an average of only 41%. Candidates struggled to identify the environmental issue labelled I in block A2 as a polygon feature. Candidates could not explain how remote sensing could be used to monitor the environmental issue identified. Practical application of concepts to real world scenarios remains a concern. Candidates struggled to use the same feature at on (topographical map) and (orthophoto map) to answer previous question

**Approaches**

GIS concepts and application thereof need to be well-taught. Learners must be familiar with examples of point, line and polygon feature on the topographical map as tested. Teachers should use questions on application of concepts like remote sensing, to stretch their learners and prepare them well for future examinations. Teachers are encouraged to include teaching the concepts of tone and texture associated with orthophoto maps.

**EXAMINATION GUIDELINE 2023**

**Geomorphology**

**Drainage basins in South Africa**

- Concepts (definition, identification and application) of:
  - Drainage basin o Catchment area o River system o Tributary of Confluence
  - Watershed
  - Interfluve o Source of River mouth o Surface run-off
  - Infiltration
  - Groundwater o Water table
- Types of rivers (definition, identification and application): o Permanent o Periodic o Episodic o Exotic
- Identification, underlying rock structure, development and characteristics of the following drainage patterns:
  - Dendritic o Trellis o rectangular o Radial
  - Centripetal o Deranged o Parallel
- Definition and impact of factors influencing drainage density:(high/low drainage density):
  - Precipitation o Evaporation of Soil moisture o Vegetation o Slope/Gradient o Porosity o Permeability

**NOTE:** The above should be taught with the understanding of infiltration

- Determining stream order (definition, identification and interpretation)

- Discharge of a river: (definition, identification and application) o Laminar flow
  - Turbulent flow

**Fluvial processes**

- River profiles:
  - Definition, description and associated characteristics including stream load o Cross/Transverse profile of Longitudinal profile o Plan view of both profiles
  - Relationship of both profiles to the stages of a river (upper, middle, lower course)
- Identification, description, formation ~~and~~ significance and impact of fluvial landforms/features: o Meander
  - Undercut slope
  - Slip-off slope o Oxbow Lake o Braided stream o Flood plain o Natural levee o Waterfall o Rapid o Delta
- River grading:
  - Definition (graded and ungraded rivers)
  - Processes involved in a river becoming graded
  - Distinguish between graded and ungraded streams
  - Base level of erosion
  - Temporary base level of erosion
  - Permanent base level of erosion
  - River rejuvenation:
  - Definition of Reasons for rejuvenation o Features of rejuvenation
    - Knickpoint
    - Terraces
    - Valley in a valley

- Incised/Entrenched meanders o Significance of rejuvenated landscapes (economic, social and environmental)  River capture/Stream piracy:
  - Concepts (definition, identification and application) of:
    - River capture/stream piracy
    - Abstraction
    - Headward erosion
  - Features associated with river capture (identification, description and application):
    - Captor stream
    - Captured stream
    - Misfit stream
    - Elbow of capture
    - Wind gap
  - Impact of river capture on captor stream and captured stream
  - Implications of river capture for human activities, settlements, recreation, agriculture and ecosystems
  - Identification of features associated with river capture on topographic maps
- Superimposed and antecedent drainage patterns (definition, description and causes) **Catchment and river management**
- Definition of river management
- Causes of poor river management
- Importance of managing drainage basins and catchment areas  Impact of people on drainage basins and catchment areas:
  - River pollution (e.g., eutrophication)
  - Overgrazing o Deforestation o Human settlement
- Strategies to manage drainage basins/catchment areas
- Case study of one catchment management strategy in South Africa

**Geographical Skills and Techniques**

**(Topographic map and orthophoto map reading and interpretation)**

**Mapwork Techniques**

- Contour lines, contour interval and height and conventional signs
- Compass direction
- True bearing
- Magnetic declination and magnetic bearing
- Map scale – types of scales and comparing the scales of topographic maps, orthophoto maps and aerial photographs
- Calculating straight-line distance in reality
- Calculating area of regular features
- Map reference numbers/Map index
- Alphanumeric reference/Grid reference
- Map coordinates/Fixing position – stating the coordinates
- Calculation and interpretation of average gradient
- Cross-sections – drawing of cross-sections, indicating position of features on cross-sections and identifying features represented by cross-sections
- Intervisibility
- Calculating vertical exaggeration

**Topographic Maps**

- Use of 1: 50 000 topographic maps:
    - To identify and interpret physical features, e.g., relief, drainage, climate and vegetation
- Application of the Grade 12 Paper 1 content on Climate and Weather and Geomorphology to mapwork

- Interpreting of temperature, rainfall, climate zones and biomes, graphs and tables that are related to the 1: 50 000 topographic map and the 1: 10 000 orthophoto map being assessed
- Identification of different types of rivers, drainage patterns, determining of stream order and drainage density on 1:50 000 topographic map and the 1: 10 000 orthophoto map being assessed.
- Identification and interpretation of structural landforms and slope elements on 1: 50 000 topographic map and the 1: 10 000 orthophoto map being assessed.

**Aerial Photographs and Orthophoto Maps**

- Oblique and vertical aerial photographs – identifying landforms and features
- Use of size, shape, tone, texture, shadow and patterns to identify features, landforms and activities on photographs and orthophoto maps
- Orientation of orthophoto map with topographic map
- Compare orthophoto map to topographic map

**Geographic Information Systems (GIS)**

- GIS (definition)
- Components of GIS
- Sources of information for GIS
- Concepts (definition, identification and application) of:
    - Remote sensing
        - Reapproaches
        - Pixels o Spatial reapproaches o Spatial and attribute data o Vector and raster data o Spatial objects
        - Points/Nodes
        - Lines

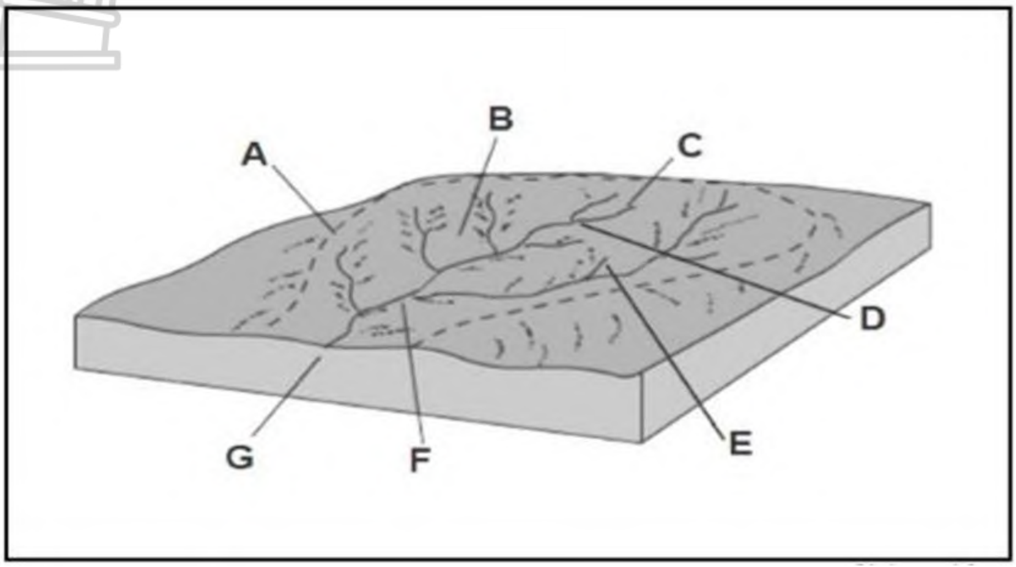
- Area/Polygons

- Data layering/thematic layering of information  Data layers (identification and interpretation)  Data manipulation and analysis:
  - Data manipulation
  - Data integration
  - Buffering
  - Querying
  - Statistical analysis
- Data standardisation
- Data sharing
- Data security
- Application of GIS by the:
  - Government
  - Private sector
- Developing a 'paper GIS' from existing maps, photographs and other sources of information on layers of tracing paper
- Identifying and interpreting concepts using given data such as satellite images, topographic maps, orthophoto maps, aerial photographs, pictures and statistics indicated on graphs and tables

**Activities**

Multiple choice questions

1.1 Refer to figure 1.1 based on drainage basins in SA and answer the questions below. Match the statement (1.1.1 – 1.1.7) with the letters in the diagram.




1.1.1. Point where two rivers meet

1.1.2. High lying area separating two streams

1.1.3. Point where river starts

1.1.4. Small stream that joins the main the river

1.1.5. Point where river enters the sea

1.1.6. High lying area separating two drainage basins

1.1.7. The lower course of the river

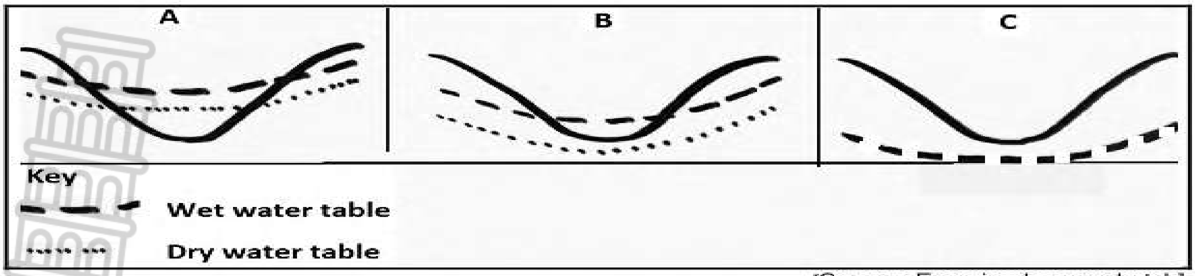
(7x1) **(7)**

1.2 Match the statement in column A with the concepts in column B. Write only the letter next (X or Y) next to the question number (1.2.1 – 1.2.8)

| Column A | Column B |
|---|---|
| 1.2.1. A/an… which is a mountain range that separates one catchment area from another catchment area. | X: Watershed<br>Y: Interfluve |
| 1.2.2. A/an … which is a high-lying area within catchment area, which separates tributaries. | X: Drainage Basin<br>Y: Interfluve |
| 1.2.3. Is the …… which shows the origin of a river system in mountainous high-lying areas. | X: Source<br>Y: Mouth |
| 1.2.4. Is the … where two or more streams join. | X: Tributary<br>Y: Confluence |
| 1.2.5. Is a/an …, which provides water to the main river. | X: Tributary<br>Y: Surface runoff |
| 1.2.6. The main river and its tributaries | X: Water table<br>Y: River System |
| 1.2.7. Is the … where the river flows into the sea. | X: River mouth<br>Y: River rejuvenation |
| 1.2.8. The area from where a river gets its water | X: Catchment<br>Y: Drainage Basin |

(8x1) (8)

Refer to **FIGURE 2.1** showing three different types of rivers and answer the following questions. Choose the correct letter in the brackets that match the diagram




[Source: Examiner's own sketch]

2.1.1. Which river (A, B or C) is an episodic river?

2.1.2. Which river (A, B or C) is periodic?

2.1.3. Which river (A, B or C) is exotic in its lower course?

2.1.4. In which picture (A, B or C) is the river bed always below the water table?

2.1.5. Which picture (A, B or C) does the groundwater never contribute to stream flow?

2.1.6. In which picture (A, B or C) does the river flow only during the rainy season?

2.1.7. In which picture (A, B or C) does the heavy showers?

2.1.8. In which (A, B or C) does the river always intersect the water table?

(8x1) (8)

2.2. Answer the questions that follow using the following words in the rectangular block:

| |
|---|
| ***Periodic, Permanent, Episodic and Exotic*** |

2.2.1. The river that flows throughout the year

2.2.2. The river that flows through desert but has its source at a higher rainfall area

2.2.3. This river never receive contribution from the water table

2.2.4. The river that flows only after heavy rainfall

2.2.5. Water table is above the river bed during *winter* and *summer* season

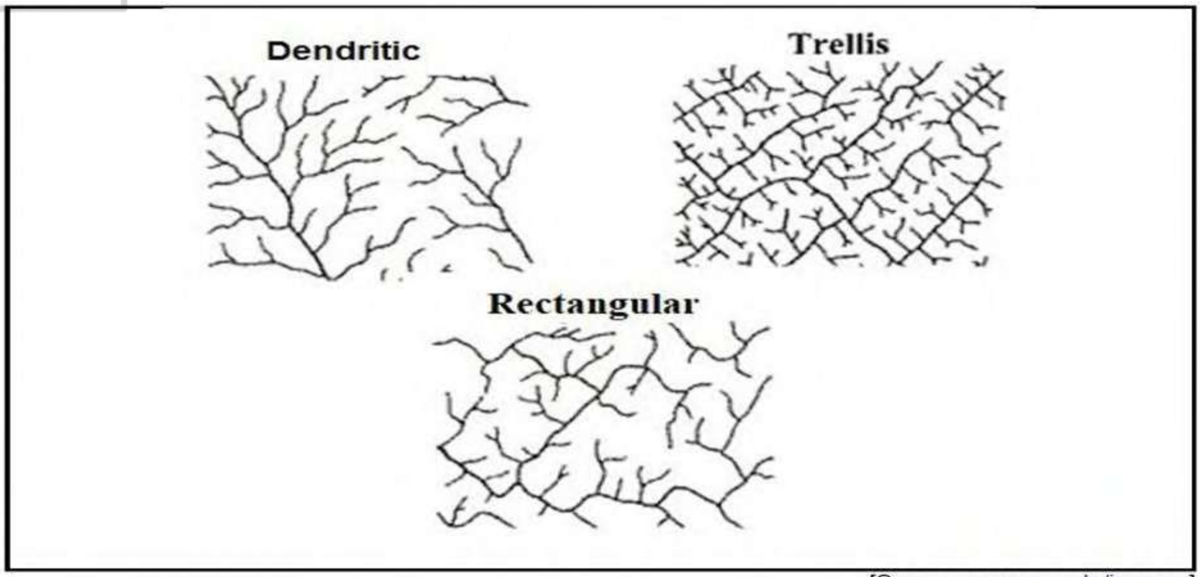
2.2.6. River that receives contribution from the saturated zone during dry season.

2.2.7. River that does not show climatic characteristics of its surrounding.

(7x1) **(7)**

3.1 Refer to **figure 3.1** on different drainage patterns. Match each of the descriptions below with one of the drainage patterns. Write **ONLY ONE** pattern next to the question number (3.1.1 – 3.1.5) in the ANSWER BOOK. You may choose the same drainage pattern more than ONCE.

**FIGURE 3.1**




[Source: www.google/images]

3.1.1. Will develop on well jointed igneous rocks

3.1.2. Develops on rocks that are of equal resistance to erosion

3.1.3. . Tributaries join the main stream at right-angles from anticlines

3.1.4. There are right-angle bends in the individual stream

3.1.5. It is dependent on both the geology and topography of a landscape

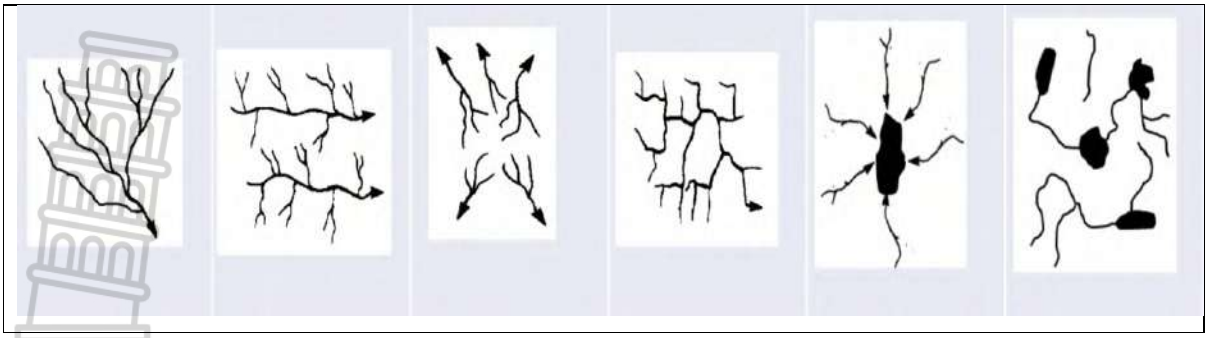
3.1.6. Follows the slopes of the terrain

3.1.7. The rivers cut gaps into the landscape

(7x1) **(7)**

3.4. **Figure 3.4**. Choose the letter that best describes the statements below.

| | | | | | |
|---|---|---|---|---|---|
| A | B | C | D | E | F |



3.4.1. Streams radiate outwards from the central point.

3.4.2. Stream that has no specific direction.

3.4.3. It resembles the tree branches.

3.4.4. The main streams have 90° bends along its course.

3.4.5. River flow towards a central point.

3.4.6. Occurs on a rock that have uniform resistance to erosion.

3.4.7. It has haphazard pattern.

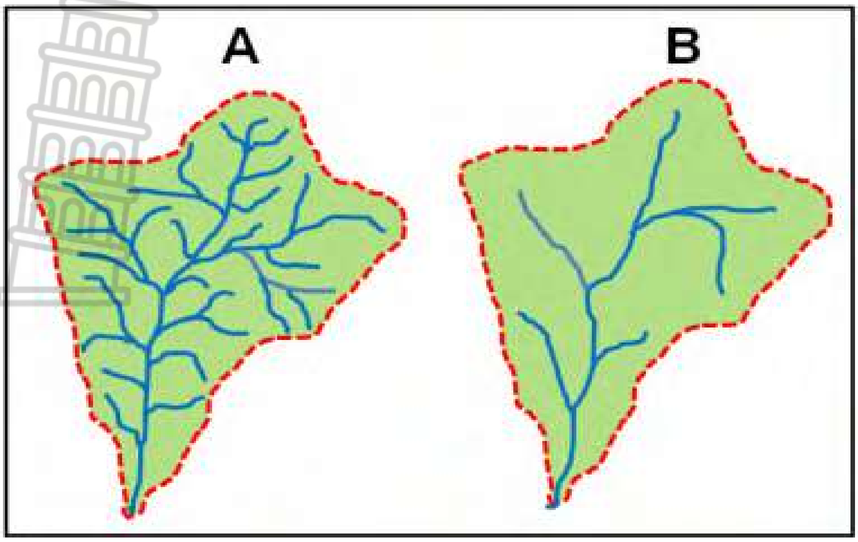
3.4.8. . Shorter tributaries that join the main stream at right angle.

3.5. Match the description in Column A with the concept in Column B. Write only the letter **X** or **Y** next to the number (3.5.1 – 3.5.7)

| Column A | Column B |
|---|---|
| 3.5.1. Tributaries join the main river at acute angle | X: Trellis<br>Y: Dendritic |
| 3.5.2. Forms on igneous rocks that have many joints | X: Rectangular<br>Y: Radial |
| 3.5.3. It forms in an area where domes and volcanoes occur. | X: Centripetal<br>Y: Centrifugal |
| 3.5.4. It occurs on a rock that have uniform resistance to erosion | X: Parallel<br>Y: Dendritic |
| 3.5.5. It forms in areas that have been recently exposed or formed | X: Deranged<br>Y: Rectangular |
| 3.5.6. It occurs in basin-shaped areas e.g., lake | X: Centripetal<br>Y: Centrifugal |
| 3.5.7. Forms on rocks which has varying resistance to erosion. | X: Dendritic<br>Y: Trellis |

(7x1) **(7)**

3.7. Refer and indicate whether each of the descriptions below refers to drainage basin A or drainage basin B




3.7.1. Dense vegetation cover that prevents surface run-off.

3.7.2. A drainage basin that experiences high rainfall.

3.7.3. A drainage basin that has many clays soil.

3.7.4. A drainage basin that has mainly permeable rock.

3.7.5. A river that flows through hilly areas.

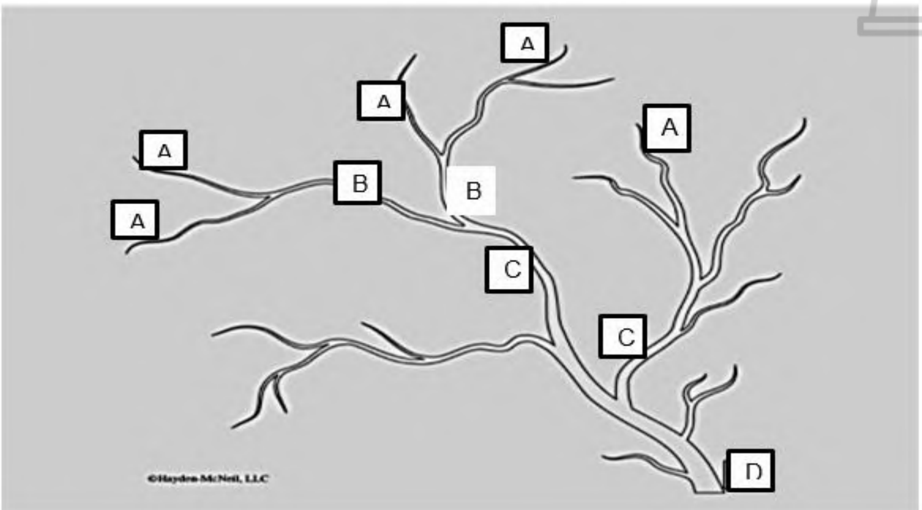
3.7.6. A drainage basin that has porous rock with sandy soil.

3.7.7. A river that flows through gently sloping land. (7x1) (7)

3.8. Match column A and B

| COLUMN A | COLUMN B |
|---|---|
| 3.8.1. A is associated with_____ dip slope | X: Steeps<br>Y: Gentle |
| 3.8.2. B is associated with______ density | X: High<br>Y: Low |
| 3.8.3. A is associated with _____ infiltration | X: High<br>Y: Low |
| 3.8.4. B is associated with____ run off | X: high<br>Y: low |
| 3.8.5. A is associated with _____ density | X: High<br>Y: Low |
| 3.8.6. B is associated with_____ slope | X: High<br>Y: Low |
| 3.8.7. A is associated with _____ run off | X: High<br>Y: Low |
| 3.8.8. . B is associated with ____rainfall | X: High<br>Y: Low |

(8x1) (8)




3.9. Stream Order

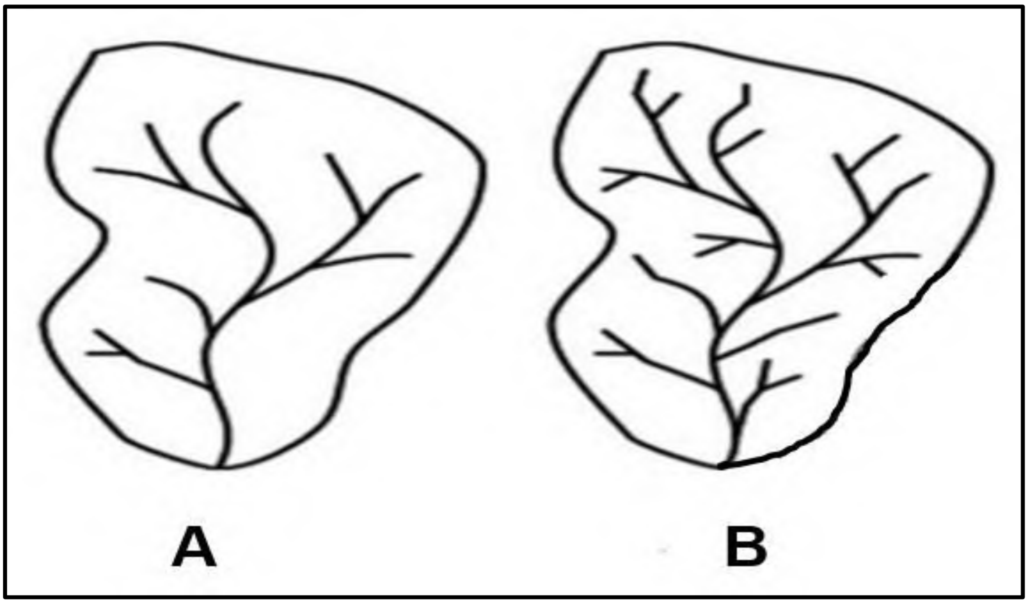
3.9.1. **B** $_{+ B =}$ (1 X 2) (2)

3.9.2. Name the stream orders labelled A – D. (1 X 4) (4)

3.9.3. Which stream order is formed where 1st order stream meet. (1 X1) (1)

[7]

3.6. Refer to figure 1.10, drainage density




3.6.1. Define the term *Drainage Basin.* (1x2) (2)

3.6.2. Which ONE of the drainage basins, A or B, shows the drainage density during the dry season and rainy season respectively? (1x1) (1)

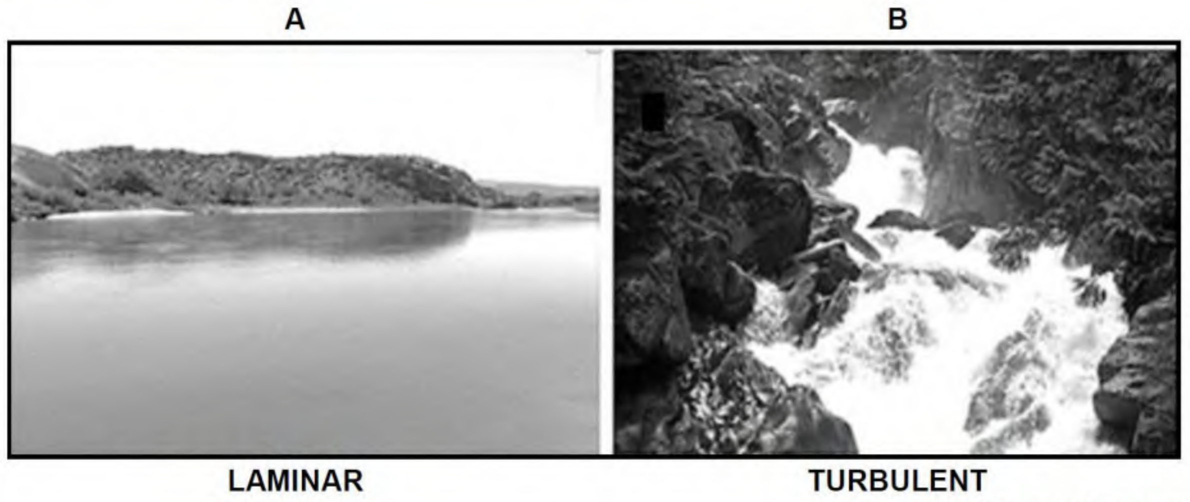
3.6.3. Explain why the drainage density of the drainage basins changes during the course of the year. (2x2) (4)

3.6.4. The change in drainage density changes the stream order of the drainage basin over the course of the year. In a paragraph of approximately EIGHT lines, explain why this is the case.

(4x2) (8)

**[15]**

3.10. **Figure 1.10** Laminar and Turbulent flow of a river.




[Source: bing.com]

3.10.1. Rapids are characteristics of this type of flow.

3.10.2. Is associated with an increased volume of water in the lower course.

3.10.3. Associated with a higher rate of erosion.

3.10.4. Occurs mostly in the upper course of the river.

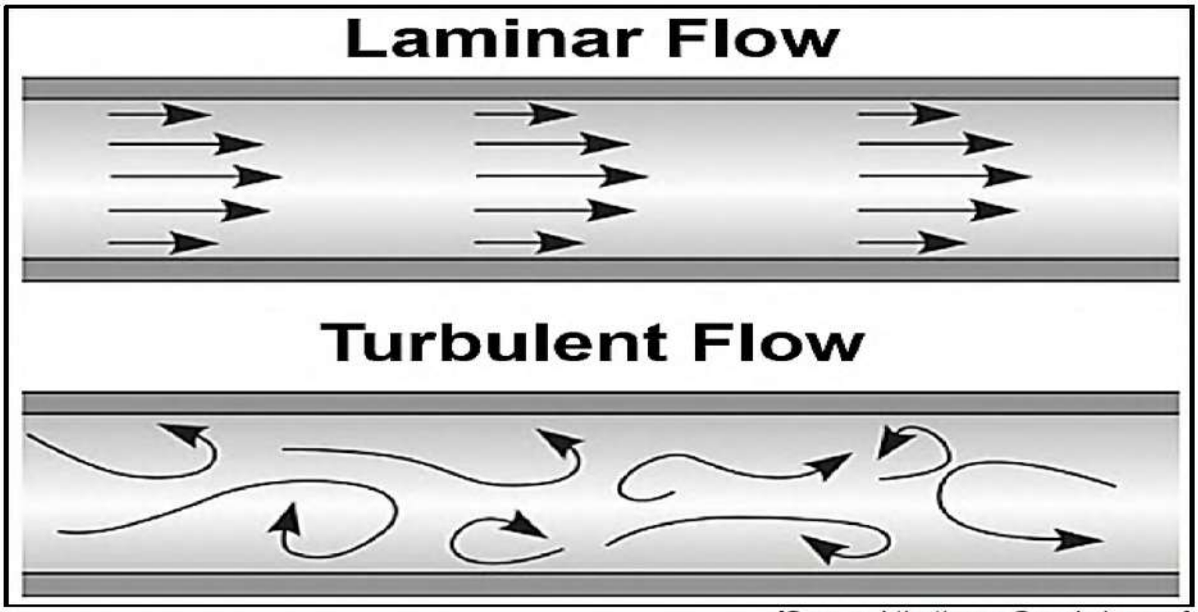
3.10.5. Promotes the formation of flood plains and levees.

3.10.6. A level river bed causes water to move in layers.

3.10.7. Surface friction causes water to form eddies (swirls).

(7x1) (7)

3.11 Figure 3.11




[Source: http://www.Google images]

3.11.1. This type of flow generally dominates the lower course of a river

3.11.2. Erosion is the main geomorphological process

3.11.3. This type of flow will promote the development of floodplains

3.11.4. This type of flow usually occurs in the upper course

3.11.5. The outer bank of a river experiences this type of flow

3.11.6. The water flow as sheet

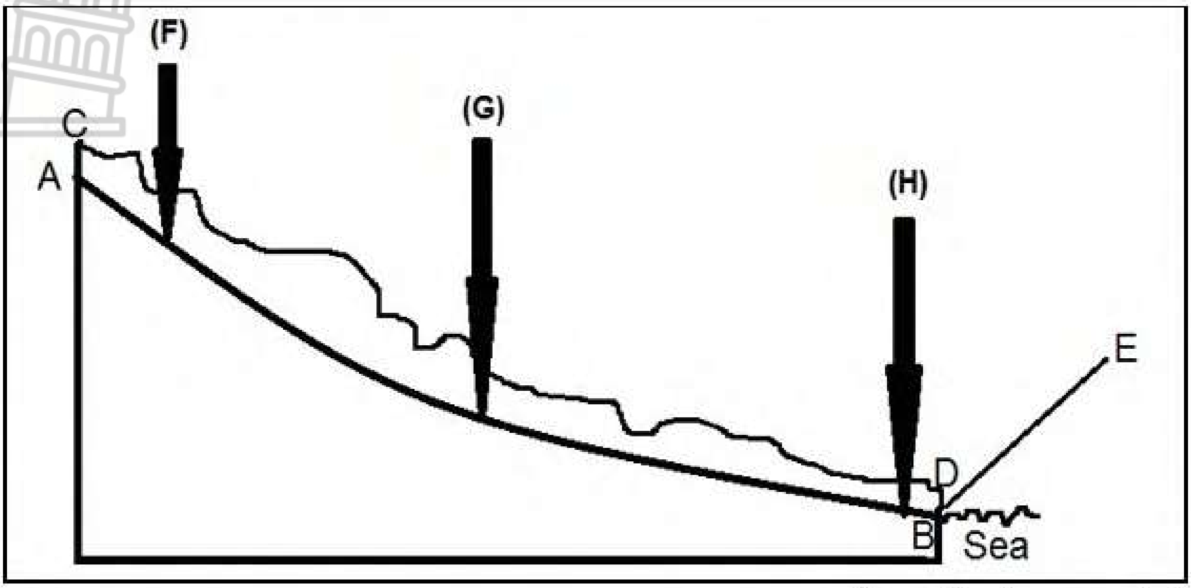
3.11.7. The water flows as bubbles

3.11.8. Occurs where rapids and waterfall are found (8 x 1) (8)

**River Profiles**

4.1. Figure 4.1 shows two river profiles; A-B and C-D. Choose the correct answer from the options given between brackets to make each statement TRUE.

Figure 4.1




4.1.1. (A-B/C-D) represents a river profile where erosion is generally more of erosion.

4.1.2. The (water/sea) represents the ultimate/ permanent base level of erosion.

4.1.3. Laminar flow dominates in the course (F/H) of the river.

4.1.4. In the course (G/H) one will find a U-shaped River valley.

4.1.5. Generally, rapids are found in the (F/H) course of the river.

4.1.6. The longitudinal profile (A-B/C-D) shows a river in equilibrium.

4.1.7. Under favourable conditions (alluvial fans/deltas) will develop at E.

(1 X 7) (7)

4.2. Various options are provided as possible answers to the following questions

Choose the answer and write only the letter (A-D) next to the question numbers (4.2.1 to 4.2.8) in the ANSWER BOOK

4.2.1. The cross-profile of a river shows the shape of the river valley from…

A. Source to mouth

B. Concave to convex

C. Bank to bank

D. Width to depth

4.2.2. Deposition is the dominant process in the… of the river.

A. Upper course

B. Middle course

C. Lower course

D. Young course

4.2.3. The shape of the valley in the upper course of a river…

A. V-shaped

B. Wide

C. Gentle

D. U-shaped

4.2.4. The volume of water in the middle course of the river is likely to increase because of

A. lateral erosion

B. tributaries joining the river.

C. downward erosion.

D. no tributaries joining the river.

4.2.5. Rapids are mostly likely to develop in the…

A. lower course.

B. middle course and lower course.

C. Upper course.

D. Upper course and lower course.

4.2.6. The stream flow (discharge) of a river in the upper course is generally a …flow.

A. layered.

B. Laminar.

C. Smooth.

D. Turbulent.

4.2.7. An ox-bow lake can be formed from a… in the lower course of the river.

A. slip-off slope.

B. cut-off slope.

C. meander loop.

D. meander scar.

4.2.8. The processes that a river undergoes from the upper course to the lower course are…

A. erosion, transport and deposition.

B. transportation, erosion and deposition.

C. erosion, deposition and transportation.

D. deposition, erosion and transportation.

**[8]**

**3.12. LAMINAR AND TURBULENT FLOW OF A RIVER.**

FIGURE 3.12. Study figure 3.12 and answer the question that follow

| | |
|---|---|
| 5.1.1. A meander loop that is cut off from the main river.<br>5.1.2. The naturally raised banks of a river.<br>5.1.3. Forms when a river deposits its load and blocks its own path.<br>5.1.4. Creates rough, turbulent water because of an uneven river bed.<br>5.1.5. Develops at the river mouth where deposition takes place.<br>5.1.6. Vertical cliff where underlying soft rock is eroded by plunging water.<br>5.1.7. Type of slope that forms on the outer bank of a meander.<br>5.1.8. Refers to a curve or bend along the course of a river. | A braided stream<br>B delta<br>C undercut slope<br>D meander<br>E levee<br>F waterfall<br>G oxbow lake<br>H rapids<br>I slip-off slope |


3.12.1. Identify stream flow A and B. (1x2) (2)

3.12.2. Define river discharge. (1x2) (2)

3.12.3. Stream flow A usually occurs at (upper course/lower course) (1x1) (1)

3.12.4. This river flow is associated with an uneven river bed (A/B) (1x1) (1)

3.12.5. Water flows in layers (A/B) (1X1) (1)

3.12.6. Differentiate between the river flows A and B (2X2) (4)

3.12.7. Discuss two factors that lead the velocity taking place in river flow (2X2) (4)

**[15]**

5.1. Choose a term from COLUMN B that matches the description of a fluvial landform in COLUMN A. Write only the letter (A-I) next to the question numbers (5.1.1.-5.1.8) in the ANSWER BOOK, e.g., 5.1.9 J

8X
1
(8)

5.2. Complete the statement from COLUMN A with the options in COLUMN B. Write only **Y** or **Z** next to the question numbers (5.2.1.-5.2.7) in the ANSWER BOOK, e.g., 5.1.8 **Y**

| COLUMN A | COLUMN B |
|---|---|
| 5.2.1. Flat, natural feature next to a river | **Y gentle** slope<br>**Z floodplain** |
| 5.2.2. An embankment along the river where coarse material is deposited first. | **Y cut**-off slope<br>**Z levee** |
| 5.2.3. Curves or bends found along the course of a river. | **Y meander**<br>**Z river** flow |
| 5.2.4. When a meander loop becomes separated from the river. | **Y river** bed<br>**Z oxbow** lake |
| 5.2.5. Streams with multiple channels and island of sediments between the channels. | **Y misfit** stream<br>**Z braided** stream |
| 5.2.6. A vertical drop in the course of a river as a result of softer rock eroding faster than hard rock | **Y waterfall**<br>**Z Knick** point |

| | |
|---|---|
| 5.2.7. A depositional landform that occurs when a river flows into ocean. | **Y delta**<br>**Z river** mouth |

7x1 (7)

6.1. Complete the statements in **COLUMN A** with the options in **COLUMN B**. Write down only Y or Z next to the question numbers (6.1.1 to 6.1.7) in the ANSWER BOOK, e.g., 6.1.8 Y.

| **COLUMN A** | **COLUMN B** |
|---|---|
| 6.1.1. The reduction of vegetation by humans that increases silt deposition | Y: afforestation<br>Z: deforestation |
| 6.1.2. The stream is younger than the rock structure it flows on | Y: superimposed drainage<br>Z: antecedent drainage |
| 6.1.3. A stream that is too small to have eroded the valley in which it flows | Y: captor stream<br>Z: misfit stream |
| 6.1.4. When the stream is lengthening its course steam up | Y: Headward erosion<br>Z: abstraction |
| 6.1.5. The point where river capture takes place | Y: wind gap<br>Z: elbow of capture |
| 6.1.6. A dry river valley with river gravel | Y: misfit river<br>Z: wind gap |
| 6.1.7. River that intercepts the water of another river | Y: captor stream<br>Z: captured stream |

(7 x 1) (7)

6.2. Various options are provided as possible answers to the following questions, choose the answer and write only the letter (A-D) B next to the question numbers (6.2.1 to 6.2.8) in the ANSWER BOOK.

6.2.1. Erosion that occurs at the source of the river.

A. Lateral

B. Headward

C. Deposition

D. Grading

6.2.2. 6.2.2. The most energetic river that steals water from another stream.

A. Misfit

B. Captor

C. Captured

D. Permanent

6.2.3. _______ is a smooth concave profile.

A. Graded

B. Ungraded

C. Longitudinal

D. Transverse

6.2.4. It is the course of the river where deposition takes place.

A. Middle

B. Upper

C. Youth

D. Lower

6.2.5. This landform is indicated by the knickpoint along the river course.

A. levee

B. rapids

C. waterfall

D. delta

6.2.6. _______ is a bend where the river capture occurs.

A. Elbow of capture

B. Misfit stream

C. Wind gap

D. Captor stream

6.2.7. The stream that has lost its source of water.

A. Misfit

B. Mind gap

C. Elbow of capture

D. Captured stream

6.2.8. It is the lowest level to which a river can erode.

A. Waterfall

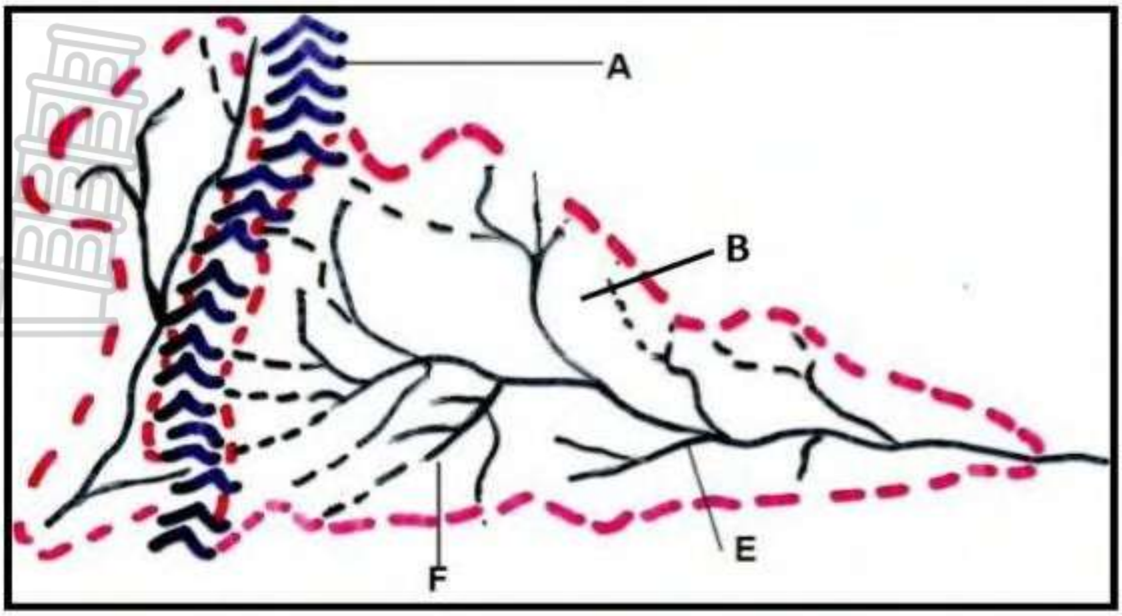
B. Lake

C. Sea

D. Rapid (8 x1) (8)

# DATA RESPONSE

3.2. **Study the drainage basins in FIGURE 3.2 and answer the questions that follow**




3.2.1. Define the concept *Drainage basin* (1x2) (2)

3.2.2. Identify the feature labelled A (1x1) (1)

3.2.3. (a) State the stream order at B (1x2) (2)

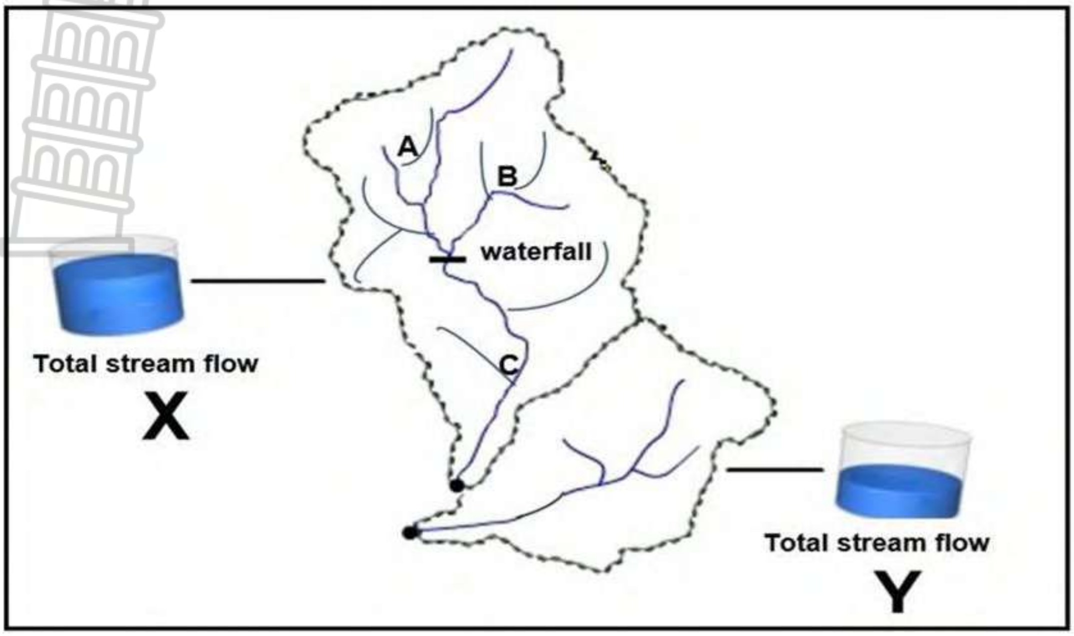
(b) Give a reason for your answer (1x2) (2)

3.2.4. A drainage basin that experiences periodic rainfall and little vegetation could experience a higher drainage density when compared to areas that experience higher rainfall and more vegetation. Explain this statement.

(4x2) (8)

**[15]**

3.3. **Figure 3.3 illustrates two drainage basins**




3.3.1. Define the term drainage basin (1x2) (2)

3.3.2. Which drainage, X or Y, has a greater drainage density? (1x1) (1)

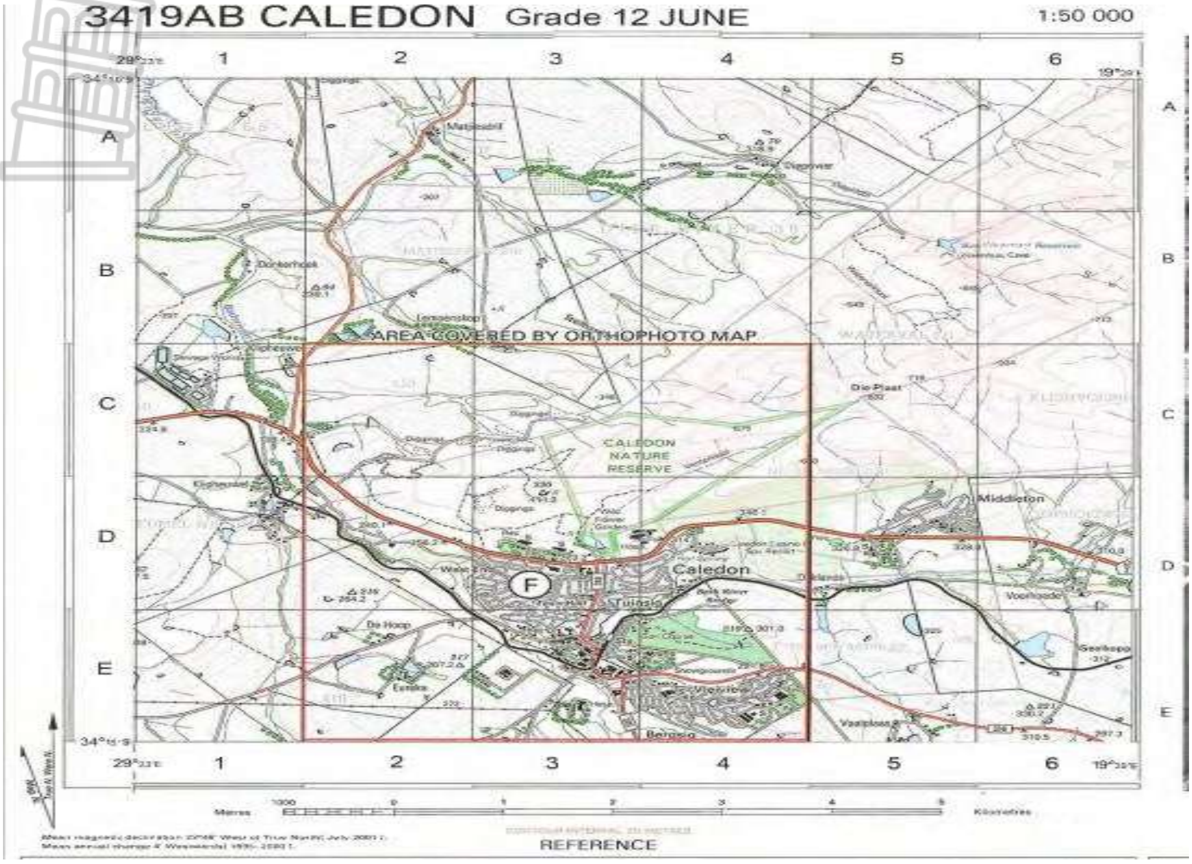
3.3.3. Give ONE reason for your answer to QUESTION 1.7.2 (1x2) (2)

3.3.4. Discuss THREE factors that could results in a drainage basin having a high drainage density. (3x2) (6)

3.3.5. Explain the impact of urban development at points A, B and C on the drainage density of drainage basin X (2x2) (4)

Map interpretation and techniques

3.13. Refer to the topographic map 3419 AB CALEDON




3.13.1. What type of river is Badsrivier in block B1? (1x1) (1)

3.13.2. Give a reason for your answer in question 5.1.1. (1x2) (2)

3.13.3. Identify the general direction of the flow of the Badsrivier in block B 1 (1x2) (2)

3.13.4. Provide evidence to support your answer in question 5.1.3. (1x2) (2)

3.13.5. Define the concepts Vector data. (1x2) (2)

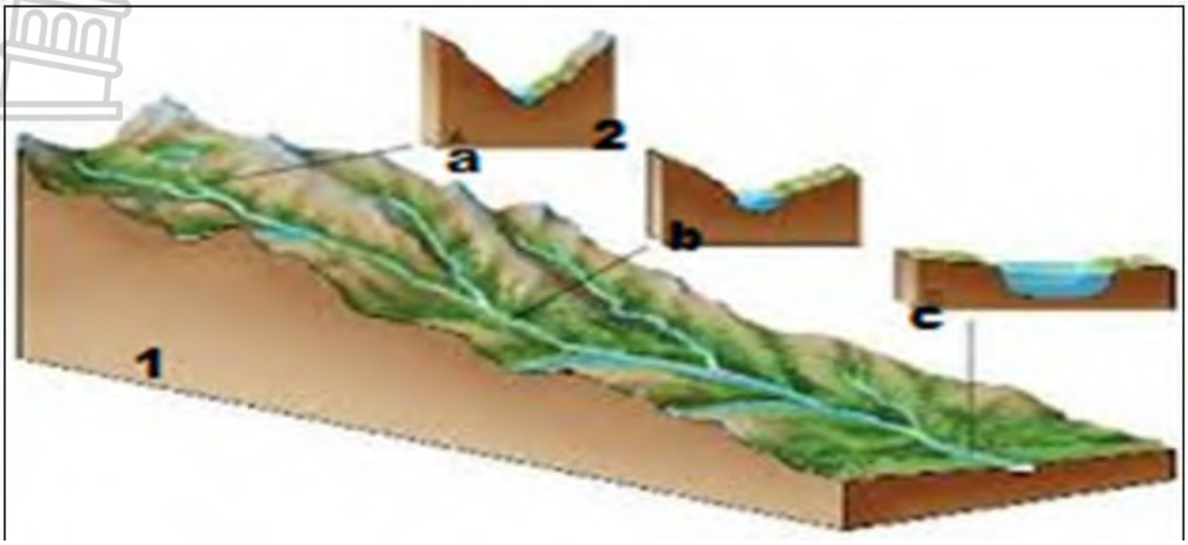
3.13.6. Identify two Vector data in block A. (2x1) (2)

3.13.7. Discuss two significances of Badsrivier in block B1 on farming. (2x2) (4)

**[15]**

4.3. RIVER PROFILES

Refer to figure 4.3 that shows river profiles.




4.3.1. Identify the river profile at A.
(1x1) (1)

4.3.2. Mention TWO fluvial landforms likely to develop at C. (2x1) (2)

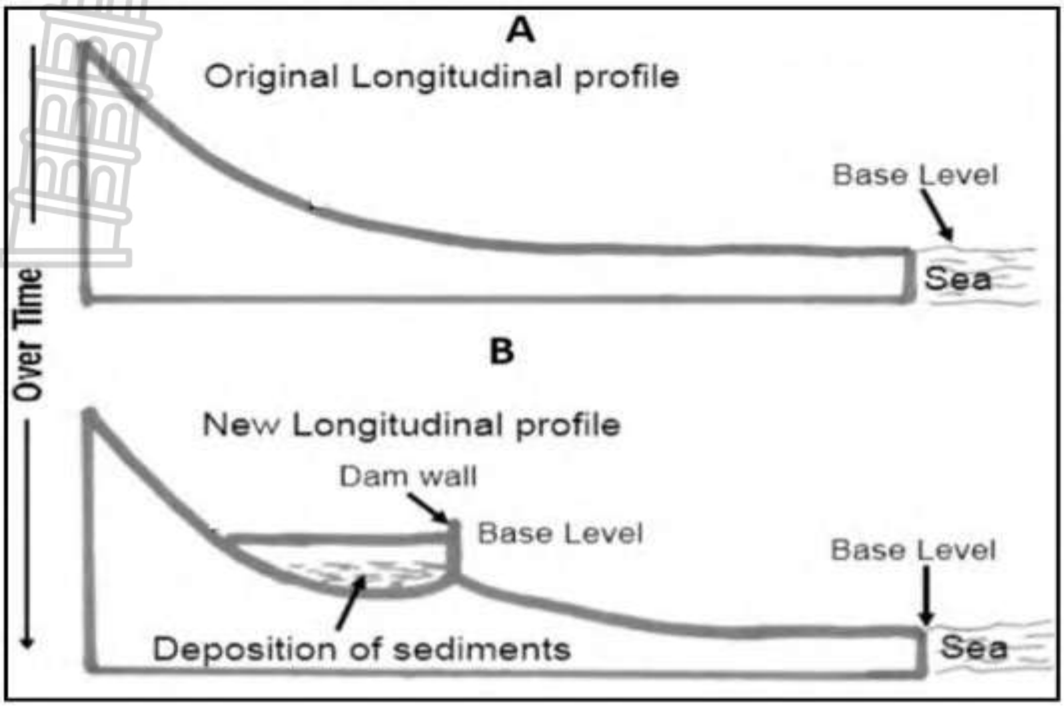
4.3.3. Suggest TWO reasons why the shape of the valley of the cross sections at A and C differs respectively. (2x2) (4)

4.3.4. Account because it is likely for flooding to occur at C (2x2) (4)

4.3.5. Discuss the influence of floods on the lives of people living next to the river in the area of C (2x2) (4)

**[15]**

4.4. Refer to FIGURE 4.4 showing a river profile




4.4.1. Define the term *longitudinal profile.*

(1x2) (2)

4.4.2. Describe the shape of longitudinal profile A.

(1x2) (2)

4.4.3. Identify an ultimate (permanent) base level of erosion in the diagram.

(1x1) (1)

4.4.4. How will the deposition of sediment influence the capacity of the dam?

(1x2) (2)

4.4.5. Describe the difference in the grade between the new longitudinal profile and the original profile.

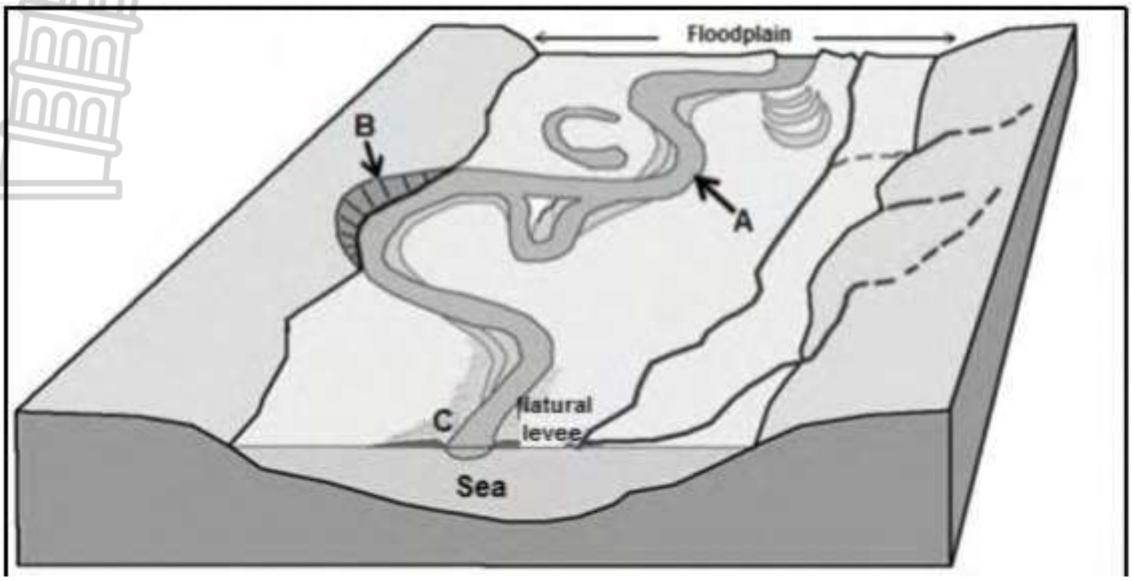
(2x2) (4)

4.4.6. Explain the impact of the presence of the dam on erosion and deposition processes.

(2x2) (4)

Figure 4.5: FLUVIAL LANDFORMS

Study FIGURE 4.5 based on fluvial landforms in the lower course of the river.




4.5.1. Name fluvial feature A

(1x1) (1)

4.5.2. Give a reason for the formation of feature A

(1x2) (2)

4.5.3. Explain why the undercut slope at B is steep

(1x2) (2)

4.5.4. Feature C is a natural levee. Why is this fluvial landform, commonly found in the lower course of the river?

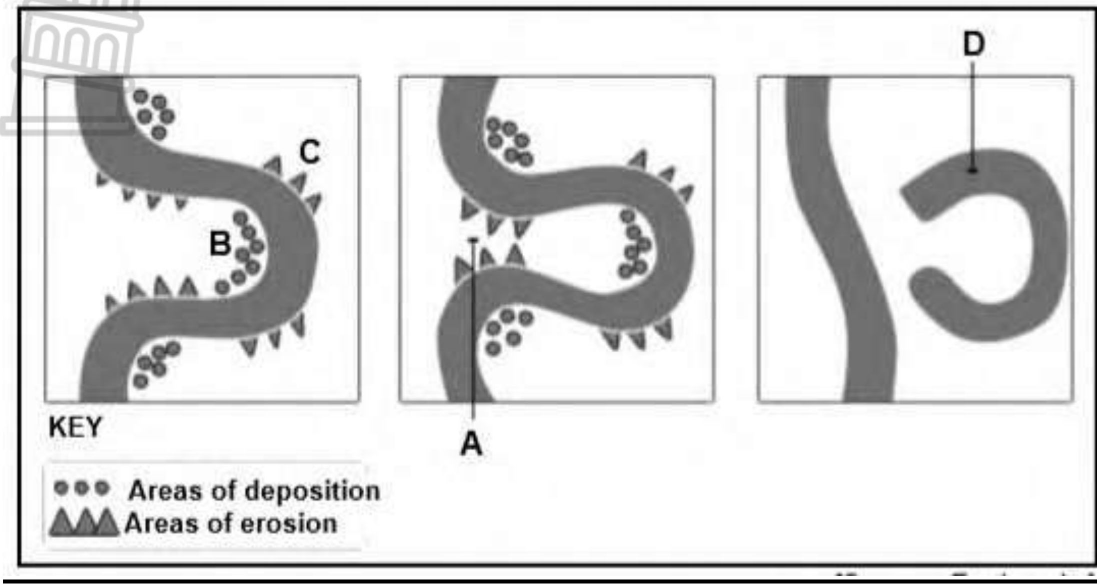
(1x2) (2)

4.5.5. in a paragraph of approximately EIGHT lines, explain the positive and negative impact of levee on farming on the floodplain

(4x2) (8)

**5.3. REFER TO FIGURE 5.3 (ATTACHED) THAT SHOWS THE STAGES OF DEVELOPMENT OF A FLUVIL FEATURES.**

**FIGURE 5.3. DEVELOPMENT OF FLUVIAL LANDFORMS**




5.3.1. Name the fluvial feature illustrated in the FIRST TWO sketches.
1x2 (2)

5.3.2. Name the process responsible for the narrowing of the meander neck at **A.**

1x2 (2)

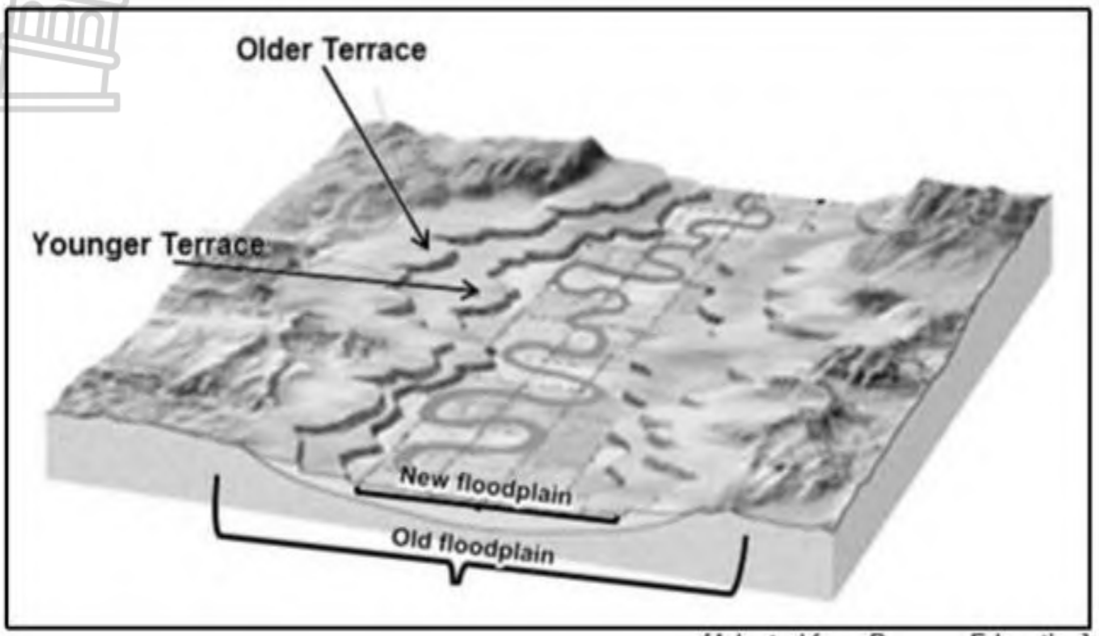
5.3.3. Give reasons for the process of deposition taking place at point **B.**
2x2 (4)

5.3.4. Explain why feature **D** dries up.
2x2 (4)

5.3.5. Explain what promotes the formation of features **B** and **D** in the lower course of a river. 2x2 (4)

5.4. Refer to FIGURE 5.3 which shows a floodplain after rejuvenation.

**FLOODPLAIN AFTER REJUVINATION.**




5.4.1. What is a floodplain? (1 x 1) (1)

5.4.2. What evidence suggest that rejuvenation has taken place? (1 x 1) (1)

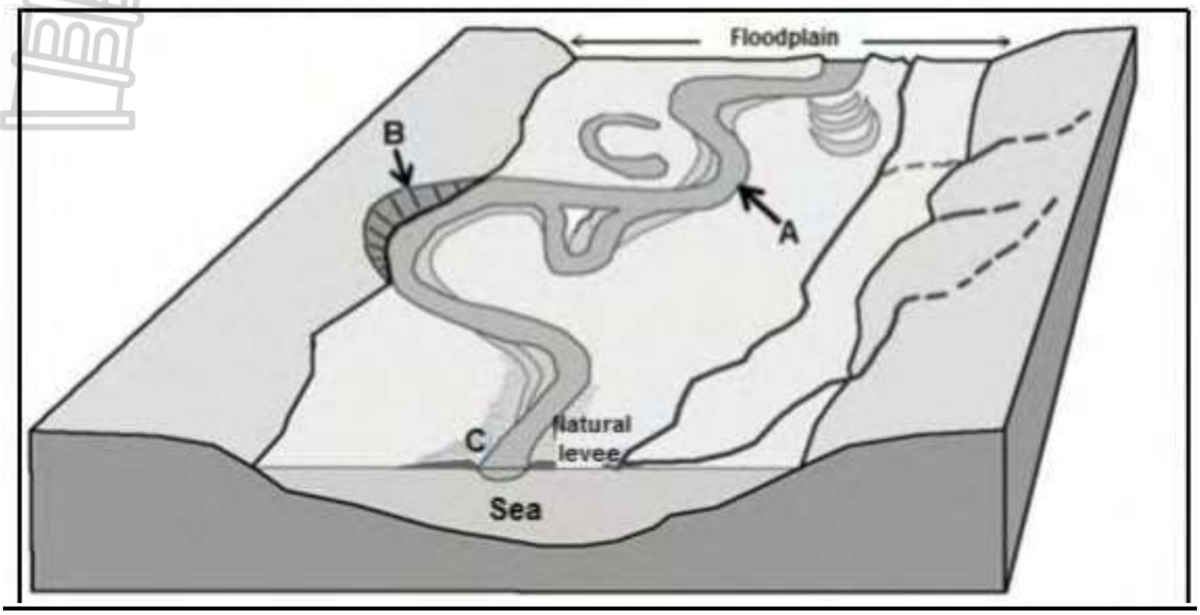
5.4.3. In which course of the river is the floodplain located in the sketch? (1 x 1) (1)

5.4.4. Floodplains are generally suitable for the cultivation of crops? (2 x 2) (4)

(a). Why are floodplains suitable areas for the cultivation of crops? (2 x 2) (4)

(b). Explain, in a paragraph of approximately EIGHT lines, the negative impact of rejuvenation on farming activities in the illustrated landscape. (4 x 2) (8)

5.5. figure 5.5




5.5.1. Name fluvial feature **A.** (1 x 2) (2)

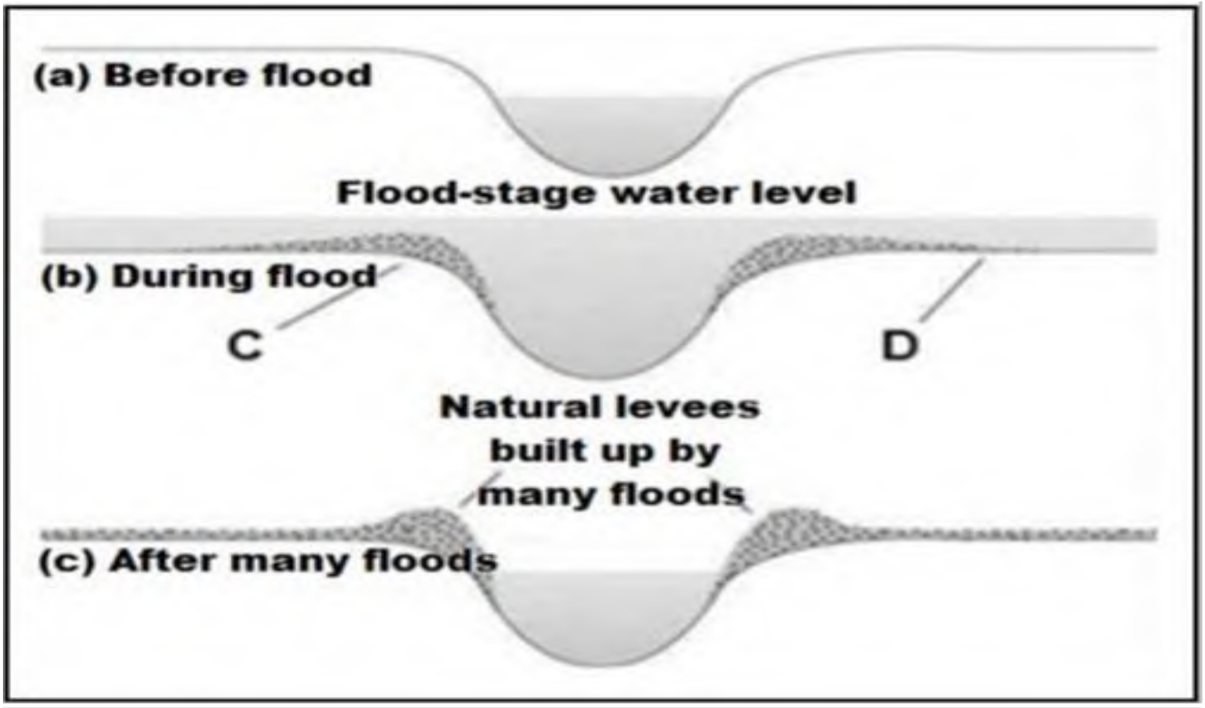
5.5.2. Give reasons for the formation of feature **A.** (1 x 2) (2)

5.5.3. Explain why the undercut slope at **B** is steep. (1 x 2) (2)

5.5.4. Feature **C** is a natural levee. Why this fluvial landform is commonly found in the lower course of the river? (1 x 2) (2)

5.5.5. In a paragraph of approximately EIGHT lines, explain the positive and negative impact of levees on farming on the floodplain. (4 x 2) (8)

## 5.6. FORMATION OF A LEVEE




5.6.1. Refer to the formation of a levee in FIGURE 5.6.

a) What is *levee*? (1 x 1) (1)

b) Give reasons for the difference in size between the sediment deposited at **C** and the sediment deposited at **D** in the FIGURE 5.6. (2 x 2) (4)

c) Explain why levees can be both advantageous and disadvantageous to farming on the adjacent flood plain. (2 x 2) (4)

5.6.2. The following questions refer to deltas.

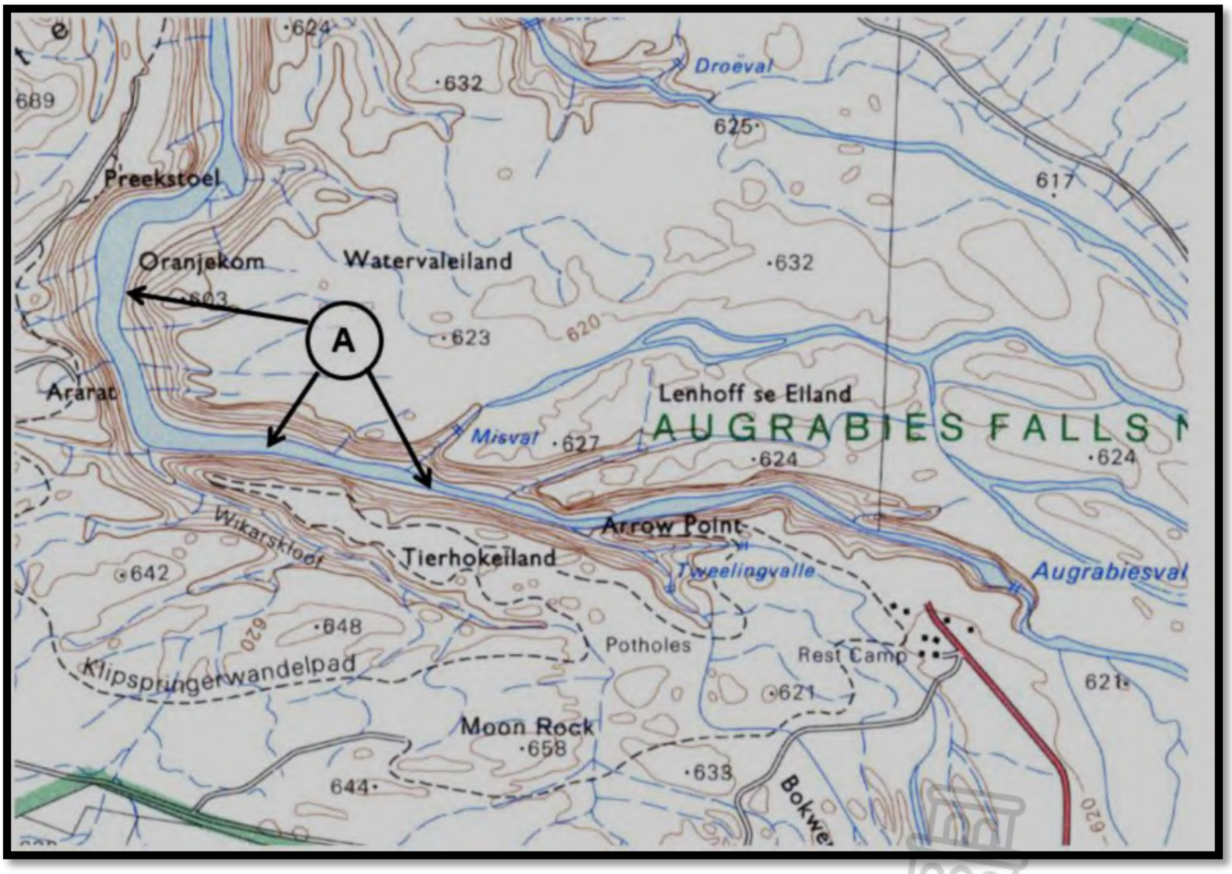
a) Where are the deltas found in a river? (1 x 2) (2)

b) Give a reason for the large quantities of the deposited material found where a delta is formed. (1 x 2) (2)

c) Why are deltas being rare I n South African rivers? (1 x 2) (2)

FIGURE 5.7.

Refer to an extract of topographical map **2820CB AUGRABIES**




5.7.1. In which direction does the river at A flows. (1x1) (1)

5.7.2. Provide TWO map evidences to support your answer to QUESTION 5.8.1. (2x1) (2)

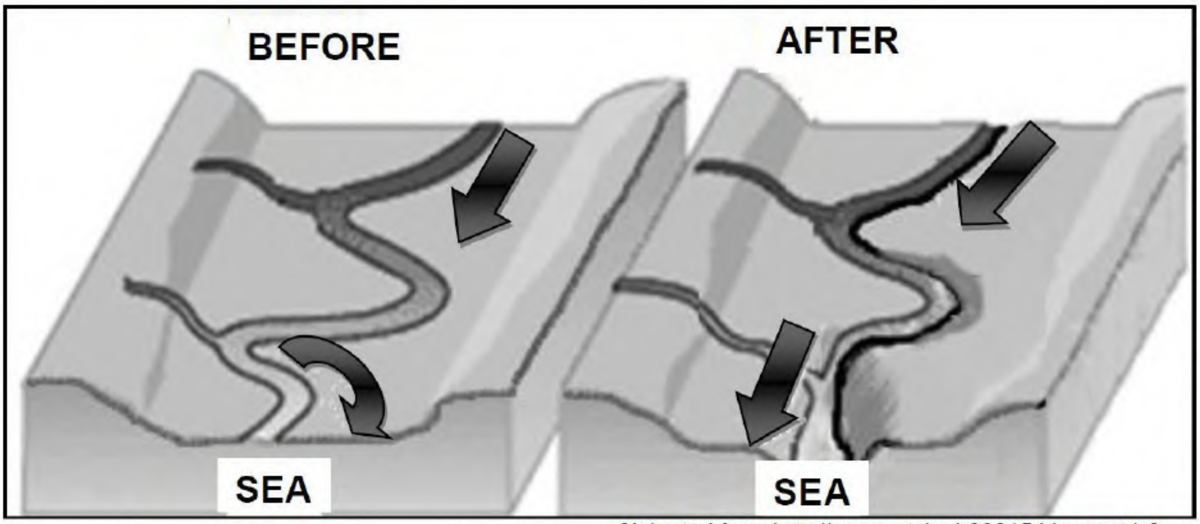
5.7.3. Name ONE temporary base level of erosion on the topographical map. (1x1) (1)

5.7.4. Explain why the Augrabies waterfall can be seen as a Knick point in the longitudinal profile of the river (1x2) (2)

5.7.5. 5.7.5. The river at **A** underwent rejuvenation. Provide map evidence to substantiate the statement (1x2) (2)

5.7.6. 5.7.6. What challenges does rejuvenation of the river poses for agricultural and road development in the area.
(2x2) (4)

6.3. River capture




[Adapted from http://navneetsingh00215.blogspot.in]

6.3.1. What is river rejuvenation? (1 x 1) (1)

6.3.2. Which stage (course) of the river is illustrated in the sketches? (1 X 1) (1)

6.3.3. Give evidence from sketches to support your answer to QUESTION 1.2.2. (1 x 1) (1)

6.3.4. Why is there an increase in the rate of erosion in the river after rejuvenation? (2 x 2) (4)

6.3.5. Identify the changes to the following features after river rejuvenation took place:

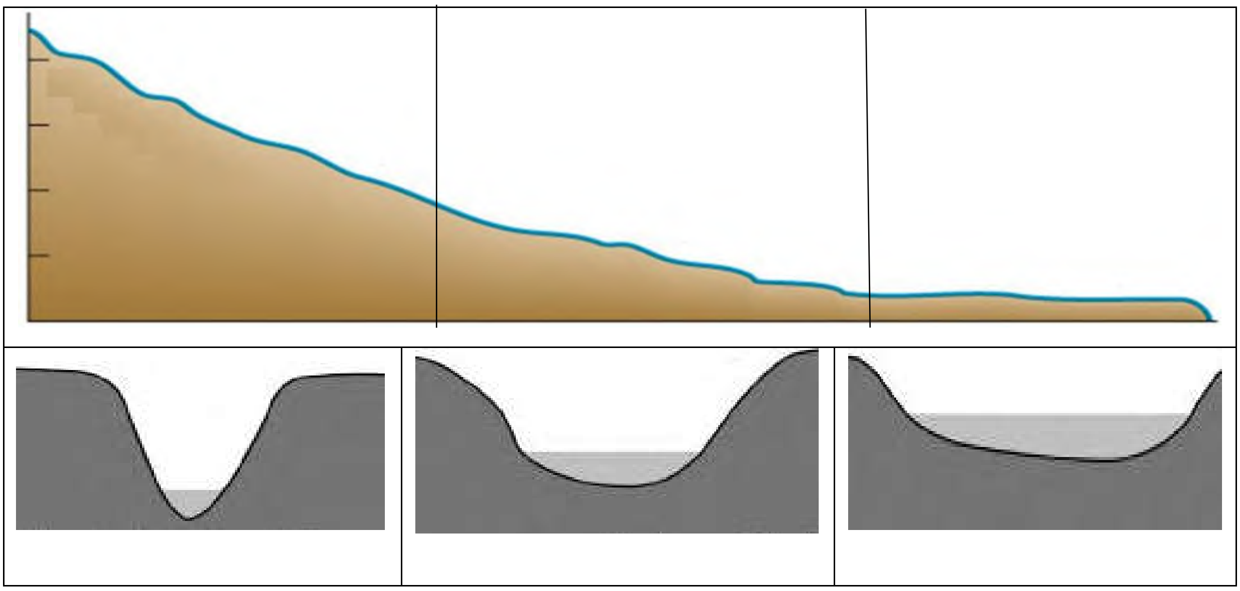
a) River channel. (1x 2) (2)

b) Meander (1 x 2) (2)

6.3.6. Discuss the possible negative impact of river rejuvenation on storage dams in the lower course after the point of rejuvenation (knickpoint). (2 x 2) (4)

[15]

6.4. **RIVER PROFILE**

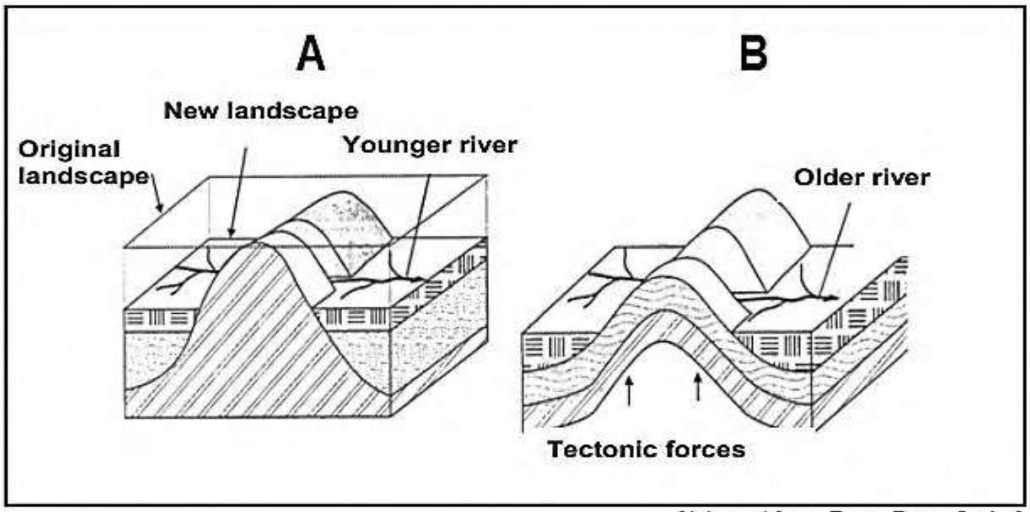


6.4.1. Complete the table below using diagram figure 6.4.

| ELEMENT | UPPER COURSE | MIDDLE COURSE | LOWER COURSE |
|---|---|---|---|
| Slope | | | |
| Processes | | | |
| Velocity | | | |
| Channel | | | |

| | | | |
|---|---|---|---|
| Flow type | | | |
| Stream volume | | | |
| Landforms | | | |

6.5. Study the **FIGURE 6.5** below based on SUPERIMPOSED AND ANTECEDENT DRAINAGE




[Adapted from *Exam Fever Series*]

6.5.1. Define the term antecedent drainage. (2x1) (2)

6.5.2. Identify drainage A and B (1x2) (2)

6.5.3. Name ONE unique feature associated with the flow patterns of superimposed and antecedent drainage. (1x1) (1)

6.5.4. 6.5.4. Identify the tectonic force associated with the uplift of the surface evident in diagram B.
(1x2) (2)

6.5.5. Give the relationship between the rate of down cutting and tectonic uplift in antecedent drainage. (2x2) (4)

6.5.6. Explain why the illustrated landscapes are not suitable for human habitation.
(2x2) (4)

**[15]**

## 7. CATCHMENT AND RIVER MANAGEMENT

7.1. Read the case study on the Umgeni River in FIGURE 7.1 to answer the following questions.

**UMGENI RIVER ONE OF DIRTIEST IN SA**

7 June 2013

By tony carnie

Durban- the Umgeni River is one of the dirtiest rivers in the country, with recent studies showing proof of cholera, shigella, salmonella and other harmful viruses and bacteria at every sampling point between the Inanda Dam and Blue Lagoon in Durban.

The release of the study comes after the city's health unit has raised the alarm over a suspected outbreak of diarrhoea in Durban after two children died and more than 150 people were hospitalised in the past three months.

Though they do not pinpoint the exact pollution sources, the researchers suggest that the most likely source of the viruses and bacteria in the Umgeni are inadequate municipal sewage treatment and run-off from informal houses close to the river.

'No wastewater treatment is provided, and raw sewage enter the rivers and streams directly. Because of a lack of infrastructure in some settlements, the residents are often forced to inhabit riverbanks…. people living in these areas utilise the contaminated surface water for crop irrigation, recreation, and domestic and personal use such as for washing, drinking water and cooking without prior treatment.'

The 230 km Umgeni River had been chosen for the study because it is the primary source of water for more than 3,5 million people in an area which generates almost 65 per cent of the provincial gross domestic product.

7.1.1. Name the human activity that is polluting the Umgeni River.

1x1 (1)

7.1.2. What evidence suggests that the Umgeni River is dirty?

1x2 (2)

7.1.3. State the negative impact of the dirty water on the quality of life of people living in the area.

2x2 (4)

7.1.4. In a paragraph of approximately 8 lines, suggest strategies that could be in place to reduce the negative impact of humans on the Umgeni River.

4x2 (8)

# WORKSHEET

# WORKSHEET P1

# WORKSHEET P2

7.2. Define the following concepts

7.2.1. Drainage basin:

______________________________________________________________________

_________________________________________________________________

(1 x2) (2)

7.2.2. Confluence:

______________________________________________________________________

_____________________________________________________________________

(1 x 2) (2)

7.2.3. Interfluve:

______________________________________________________________________

______________________________________________________________________

(1 x 2) (2)

7.2.4. Base flow:

______________________________________________________________________

______________________________________________________________________

(1 x 2) (2)

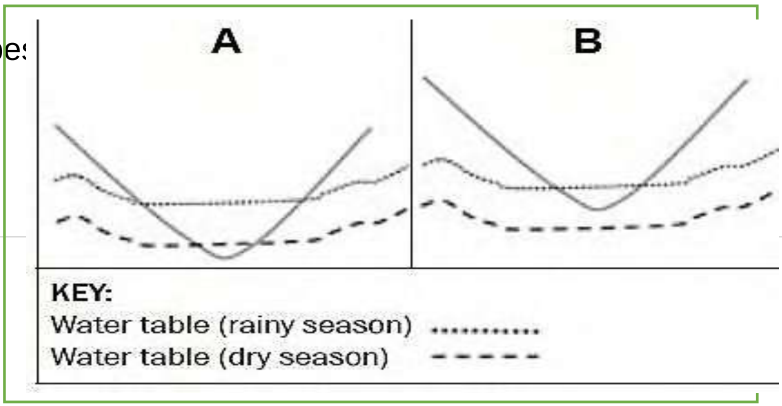
7.2.5. Watershed

_____________________________________________________________________

(1 x2) (2)

[10]

7.3 Types



**7.3.1.** Identify the types of rivers marked by A and B

A: ______________________________

(1x1) (1)

B: ______________________________

(1x1) (1)

**7.3.2.** Explain both rivers in relation to water table.

A:

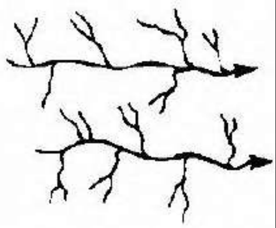
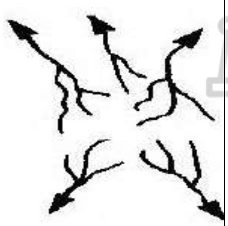
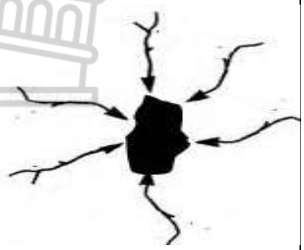
______________________________________________________________________

B:

______________________________________________________________________

[6]

7.4. Identify the following drainage patterns and for each give the underlying rock and TWO characteristics

| A | B | C | D |
|---|---|---|---|
|  |  |  |  |
| Rock structure | Rock structure | Rock structure | Rock structure |

| 7.4.1. | 7.4.2. | 7.4.3. | 7.4.4. |
|---|---|---|---|
| Descriptions | | | |
| A. | | | |
| B. | | | |
| C. | | | |
| D. | | | |

[20]

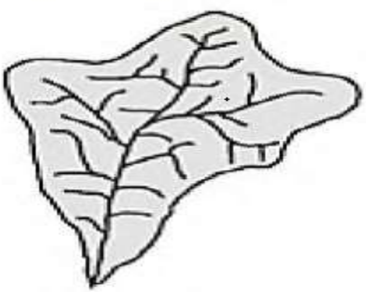
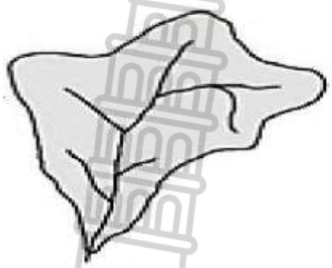
7.5. drainage density

7.5.1. What is drainage density?

---

(1x2) (2)

7.5.2. Identify drainage density A with B.

| A  | B  |
|---|---|
| A- | B- |

7.5.3. Discuss how the difference in gradient and vegetation as influenced the drainage density of A and B respectively.

a. Gradient:

______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
__________________________________________________ (2x2)(4)

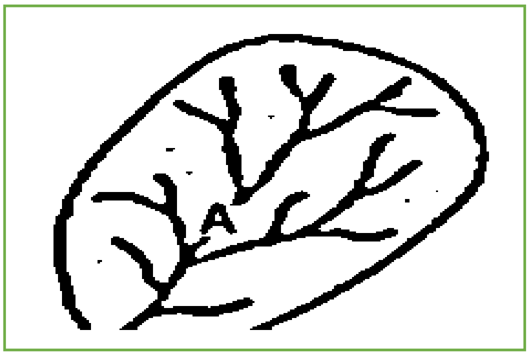
b. Vegetation:

______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
__________________________________________________ (2x2) (4)

7.5.3. An urban area is set to be built near the drainage area A. Discuss how this new development is going to affect the drainage density around this area.

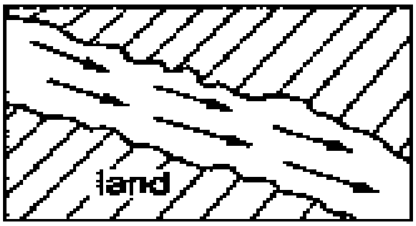
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________ (4x2) (8)

7.6. Stream Order




7.6.1. Identify the stream order at A: ____________________ (1x1) (1)

7.6.2. Identify the following stream flow/Discharge and give the course of the river where they are most likely to occur

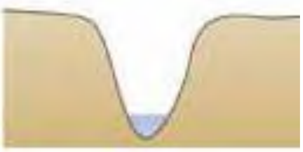
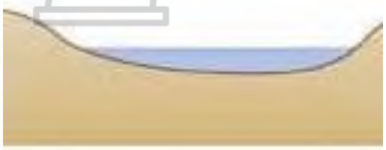
| A | B |
| --- | --- |
|  |  |
| Flow A: | Flow B: |
| River course: | River course: |

7.7. River profile

7.7.1. Define the term cross/transverse profile of the river.

______________________________________________________________________

______________________________________________________________ (1x2) (2)

| A- | B- | C- |
| --- | --- | --- |
|  |  |  |
| Process responsible/Type of erosion | process responsible/ Type of erosion | process responsible |

| | | |
|---|---|---|
| | | |

7.7.2. Identify the river course represented by the following cross sections and f. explain the processes responsible for their different shapes.

(2x3) (6)

7.8. River grading

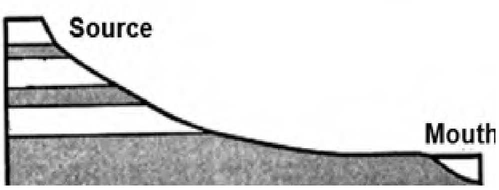
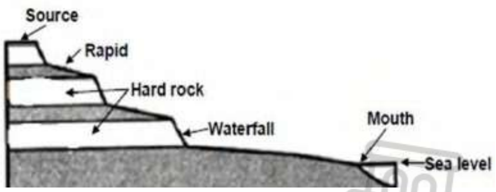
7.8.1. Define the longitudinal profile:

______________________________________________________________________

______________________________________________________________________

___________ (1x2) (2)

7.8.2. Identify and describe the longitudinal profile A and B

| | |
|---|---|
| A   | B   |
| Identify: (1) | Identify: (1) |
| Description: (2) | Description: (2) |

7.8.3. Differentiate under graded river and over graded rivers

| | |
|---|---|
| Under graded: (2) | An over-graded: (2) |

7.9. FLUVIAL LANDFORMS OF THE UPPER COURSE

7.9.1. Identify and describe the fluvial lands forms A and B of the upper course

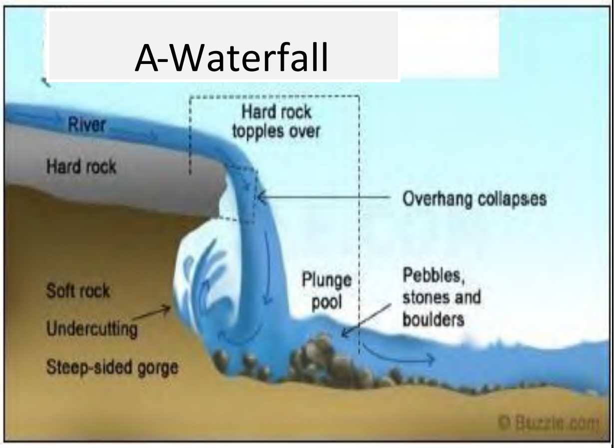
______________________________________________

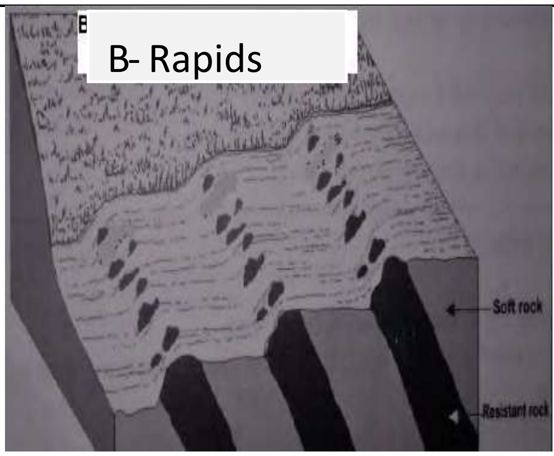
______________________________________________

______________________________________________

______________________________________________

(2x2) (4)




7.9.2. State ONE way in which feature A can be eliminated:

______________________________________________

(1x1) (1)

7.9.3. What are the benefits of fluvial land form A?

______________________________________________

______________________________________________

______________________________________________ (2x2) (4)

7.10. FLUVIAL LAND FORMS OF THE MIDDLE AND LOWER COURSE


7.10.1. Identify the stream channel pattern above:

______________________________________________________________

__________________________________________________ (1x1) (1)

7.10.2. In which course/s of the river is this channel pattern found.

______________________________________________________________

(1x1) (1)

7.10.3. Draw a fully labelled cross section between A and B

7.10.4. State ONE characteristic of the slip-off slope.

________________________________________________________

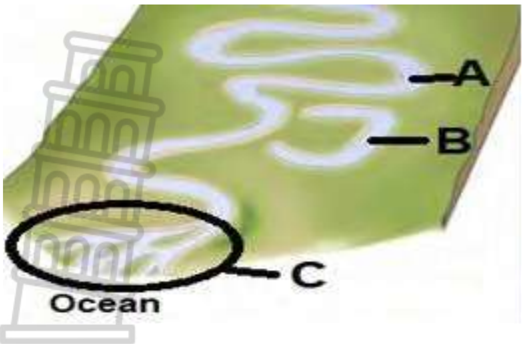
(1x1) (1)

7.10.5. State ONE characteristic of the undercut slope.

______________________________________________________

(1x1) (1)

7.11. FLUVIAL LAND FORMS OF THE LOWER COURSE




7.11.1. Identify the fluvial land form B in the diagram above.

_______________________________________

(1x1) (1)

7.11.2. In which course of the river is the fluvial land form above more likely to form?

_______________________________________

(1x1) (1)

7.11.3. Briefly describe the formation of feature B

_______________________________________

_______________________________________

_______________________________________

(3x2) (6)

7.11.4. Provide suitable terms to describe A when it dries up?

_______________________________________

______ (1x1) (1)

7.11.5. Identify the fluvial feature C.

_______________________________________ (1x1) (1)

7.11.6. What term is given to the river channels (branches)?

______________________ (1x1) (1)

7.11.7. Explain TWO conditions necessary for the formation of deltas

_______________________________________

_______________________________________

(2X2) (4)

7.12. River rejuvenation

7.12.1. Define River rejuvenation:

(1x2) (2)

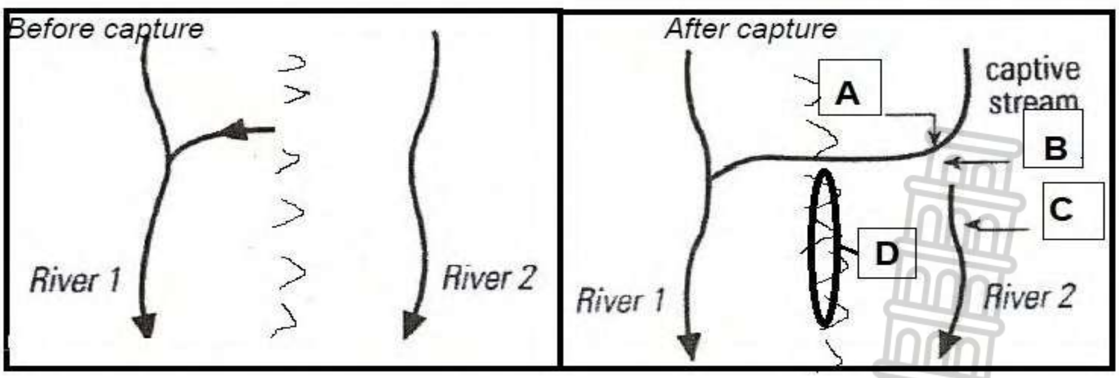
7.12.2. Mention two causes of river rejuvenation.

(2x2) (4)

7.12.3. Give TWO evidences/features of rejuvenation

(2x2) (4)

7.13. RIVER CAPTURE




7.13.1. 6.5.1

Define the concept river capture:

(1x2) (2)

| A; | B; | C; | D; |
|---|---|---|---|

7.13.2. Identify the features marked A, B, C and D

(1x4) (4)

7.13.3. Explain the changes that will happen in river 1 after capturing of the river

______________________________________________________________

______________________________________________________________

______________________________________________________ (1x2) (2)

7.13.4. Discuss measures that can be taken to protect our catchment areas

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

(4x2) (8)

**Worksheet**

1. Complete this worksheet that is based on factors influencing infiltration and drainage density.

| CONCEPTS | |
|---|---|
| Drainage density | |

| | |
|---|---|
| Infiltration | |
| Surface run-off | |

**TYPES OF DRAINAGE DENSITY**

| | | |
|---|---|---|
| How does it look like |  |  |
| IDENTIFICATION | | |
| DESCRIPTION (CHARACTERISTICS) | | |

**FACTORS INFLUENCING INFILTRATION AND RUN-OFF**

| FACTOR | EFFECT ON INFILTRATION | EFFECT ON RUN-OFF |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |

**FACTORS INFLUENCING DRAINAGE DENSITY**

| FACTOR | EFFECT – LOW DRAINAGE DENSITY | EFFECT – HIGH DRAINAGE DENSITY |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |

2. Complete the table below based on river rejuvenation.

| | River rejuvenation | River capture |
|---|---|---|
| Definition | (2) | (2) |
| Reasons for formation or causes | (3) | (3) |
| Three features associated | (3) | (3) |
| Human impacts (positive or negative) three each. | | |

| | | |
|---|---|---|
| | (6) | (6) |

# CAPRICORN NORTH DISTRICT

# GEOGRAPHY ACTIVITY BOOKLET

# PAPER 1

# CLIMATE AND WEATHER

# AND

# GEOMORMOPHOLOGY

# SOLUTIONS

# 2024/5

**TABLE OF CONTENTS**

**SOLUTIONS**

**1. SHORT OBJECTIVES**

**1.1. Global air circulation**

1.1.1. D √

1.1.2. B √

1.1.3. A √

1.1.4. B √

1.1.5. C √

1.1.6. B √

1.1.7. B √ (7x1) (7)

**1.2. (Low pressure and high pressure cells)**

1.2.1 Low pressure cell √

1.2.2 High pressure cell √

1.2.3 Low pressure cell √

1.2.4 Low pressure cell √

1.2.5 High pressure cell √

1.2.6 Low pressure cell √

1.2.7 High pressure cell √

1.2.8 High pressure cell √ (8x1) (8)

1.3.

1.3.1. Low pressure cell √

1.3.2. Low pressure cell √

1.3.3. Low pressure cell √

1.3.4. High pressure cell √

1.3.5. High pressure cell √

1.3.6. Low pressure cell √

1.3.7. High pressure cell √ (7x1) (7)

1.4

1.4.1. Y/Summer √

1.4.2. Y/ridge √

1.4.3. Y/1012 √

1.4.4. Y/D √

1.4.5. Y/ anticlockwise √

1.4.6. Z/ moisture √

1.4.7. Z/ √ (7x1) (7)

**1.5. Mid-latitude Cyclones**

1.5.1. Polar front √

1.5.2. Wave/Formative stage √

1.5.3. 1 000 hPa/mb √

1.5.4. Z √

1.5.5. Occlusion/Occluded stage √

Clockwise rotation of air √Subcontinent of southern Africa is visible on the map

1.5.6. Warm sector facing northwards √ Cold sector facing southwards √ 60°S line of latitude shown √ [ANY ONE]

1.5.7. Family of cyclones/Cyclone families/Family of depressions √

(7 x 1) (7)

**1.6.**

1.6.1. C √

1.6.2. C √

1.6.3. A √

1.6.4. C √

1.6.5. A √

1.6.6. B √

1.6.7. B √

1.6.8. B √ (8x1) (8)

**1.7.**

1.7.1. B √

1.7.2. D √

1.7.3. B √

1.7.4. C √

1.7.5. C √

1.7.6. A √

1.7.7. D √

1.7.8. A √ (8 x1)(8)

1.8.

1.8.1. Low. √

1.8.2. East to west. √

1.8.3. 5°- 30° √

1.8.4. Converges √

1.8.5. Southern √

1.8.6. 300-600km √

1.8.7. Mature √ (7 x 1) (7)

1.9.

1.9.1. X/6 √

1.9.2. Y/clockwise √

1.9.3. Y/eye √

1.9.4. Y/cumulonimbus √

1.9.5. X/heavy √

1.9.6. Y/calm √

1.9.7 X/latent heat √

1.9.8 Y/decrease √ (8 x 1) (8)

1.10.

1.10.1. .E √
1.10.1. G √
1.10.2. H √
1.10.3. F √
1.10.4. B √
1.10.5. A √
1.10.6. C √ (7 x 1) (7)

1.11

1.11.1. North √
1.11.2. South Indian √
1.11.3. Ridge √
1.11.4 1016 hPa √
1.11.5 10 knots √
111.6 North west √
1.11.7 Subtropical High √ (7 x 1) (7)

1.12

1.12.1. Z √

1.12.2. Y √

1.12.3. Y √

1.12.4. Z √

1.12.5. Z √

1.12.6. Y √

1.12.7. Z √ (7 x 1) (7)

1.13.

1.13.1. Tropical cyclone √

1.13.2. Low √

1.13.3. Summer √

1.13.4. Easterlies √

1.13.5. Hadley √

1.13.6. Reunion √

1.13.7. 5th √

1.13.8. Cumulonimbus √ (8x1) (8)

1.14

1.14.1. North √

1.14.2 South Indian √

1.14.3 Ridge √

1.14.4 1016 √

1.14.5 10 knots √

1.14.6 North-west √

1.14.7 Sub-tropical high √ (7 x 1) (7)

1.15

1.15.1 winter √

1.15.2 Kalahari √

1.15.3 coastal √

1.15.4 Eastwards √

1.15.5 Offshore √

1.15.6 Clear √

1.15.7 Onshore √

1.15.8 Increases √ (8 x 1) (8)

1.16

1.16.1 Clockwise √

1.16.2. Converges √

1.16.3. Lower √

1.16.4. Fog √

1.16.5. Lower √

1.16.6. A √

1.16.7. Q √ (7 x 1) (7)

**1.17**

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1.17.3 A (1)

1.17.4 B (1)

1.17.5 B (1)

1.17.6 A (1)

1.17.7 A (1) (7 x 1) (7)

**1.18**

1.18.1 14h00 (1)

1.18.2 Summer (1)

1.18.3 Trough (1)

1.18.4 Unstable (1)

1.18.5 NNE (1)

1.18.6 20 (1)

1.18.7 Higher (1) (7 x 1) (7)

**1.19**

1.19.1 D (1)

1.19.2 B (1)

1.19.3 A (1)

1.19.4 C (1)

1.19.5 B (1)

1.19.6 A (1)

1.19.7 B (1)

1.19.8 B (1) (8 x 1) (8)

1.20.

1.20.1. Winter (1)
1.20.2. X (1)
1.20.3. Y (1)
1.20.4. X (1)
1.20.5. Y (1)
1.20.6. B (1)

1.20.7. Less (1)

1.20.8. Y (1) (8 x 1) (8)

1.21.

1.21.1. Z (1)

1.21.2 Y (1)

1.21.3 Y (1)

1.21.4 Z (1)

1.21.5 Z (1)

1.21.6 Y (1)

1.21.7 Z (1) (7 x 1) (7)

1.22.1.B (1)

1.22.2.C (1)

1.22.3.B (1)

1.22.4.B (1)

1.22.5.C (1)

1.22.6.A (1)

1.22.7.D (1)

1.22.8.C (1) (8 x 1) (8)

1.23.

1.23.1. A (1)

1.23.2. B (1)

1.23.3. A (1)

1.23.4. A (1)

1.23.5. B (1)

1.23.6. B (1)

1.23.7. B (1) (7 x 1) (7)

1.24.1.terrestrial √

1.24.2.night √

1.24.3.katabatic √

1.24.4.B √

1.24.5.frost √

1.24.6.thermal belt (accept inversion layer) √

1.24.7.night √ (7 x 1) (7)

1.25.

1.25.1. B √

1.25.2.C √

1.25.3.A √

1.25.4.C √

1.25.5.B √

1.25.6.C √

1.25.7.B √

1.25.8.A √ (8 x 1) (8)

1.26.

1.26.1. Z √

1.26.2. Y √

1.26.3. Y √

1.26.4. Z √

1.26.5. Z √

1.26.6. Y √

1.26.7. Z √ (8x1) (8)’

1.27.

1.27.1. Day √ (1)

1.27.2. lower √ (1)

127.3. increases √(1)

1.27.4. multiple reflections of heat √ (1)

1.27.5. increases √ (1)

1.27.6.decreases √ (1)

1.27.7. less √ (1)

1.27.8. more √ (1) (8 x 1) (8)

1.28.

1.28.1. Day √ (1)

1.28.2. Day √ (1)

1.28.3. Night √ (1)

1.28.4. Day √ (1)

1.28.5. Day √ (1)

1.28.6. Night √ (1)

1.28.7. Night √ (1) (7 x 1) (7)

1.29..

1.29.1. B √ (1)

1.29.2. C √ (1)

1.29.3. B √ (1)

1.29.4. D √ (1)

1.29.5. B √ (1)

1.29.6. C √ (1)

1.29.7. A √ (1)

1.29.8. D √ (1) (8 X1) 8

1.30.

1.30.1. Isotherms √ (1)

1.30.2. A √ (1)

1.30.3. A to B √(1)

1.30.4. B to A √ (1)

1.30.5. B √ (1)

1.30.6. A √ (1)

1.30.7. B √ (1)

1.30.8. A √(1) (8 x 1) (8)

1.31.

1.31.1.B √ (1)

1.31.2.C √(1)

1.31.3.B √(1)

1.31.4.A √ (1)

1.31.5.A √ (1)

1.31.6.D √ (1)

1.31.7.B √ (1) (8 x 1) (8)

1.32.

1.32.1.E √

1.32.2.G √

1.32.3.H √

1.32.4.F √

1.32.5.B √

1.32.6.A √

1.32.7.C √ (7x1) (7)

2. **DATA RESPONSE**

**2. 1.**

2.1.1. Winter √

2.1.2. During winter air becomes cold, dense and it starts to sink/subside/descend which increases the pressure.√√ (2)

2.1.3. Summer √

2.1.4. In summer the air is heated, becomes less dense and starts to rise and decrease the pressure.√√ (2)

2.1.5. Clear skies. √ (1)

2.1.6. During winter air becomes cold, dense and it starts to sink/subside/descend. √√
Sinking air warms up adiabatically and becomes dry√√.
There is no moisture to condense. √√ (4) (2x2) (4)

2.1.7. Overcast/cloudy.√ (1) (1x1) (1)

2.1.8. In summer warm, moist air is less dense and starts to rise.√√
Rising air cools down, condense to form clouds.√√ (2x2) (4)

**2.2**

2.2.1. Mid-latitude cyclone/Frontal Depression (1)

ACCEPT: mid-latitude depression/extra tropical cyclone/temperate cyclone (1 x 1)(1)

2.2.2. Position: found between 30°S and 50°S (2)

Situated W/WSW of South Africa (2)

Presence of the cold front (2)

The shape of the cloud formation (2) [ANY ONE] (1 x 2) (2)

2.2.3. Summer √

2.2.4. Mid-latitude cyclone/ cold front moves further south in summer √√

2.2.5. Southern hemisphere

2.2.6. Air movement is clockwise √√

Found at the edge of south Africa/ presence of south Africa √√

Found between 30° and 60 ° south √√ [ANY ONE] (1x2) (2)

2.2.7. Driven by the westerlies (westerly wind belt) therefore moves from west to east /eastwards √√ (1 x 2) (2)

2.2.8. Northward migration of pressure belts during South African winter √√

Northward migration of westerly wind belt during South African winter√√

Mid-latitude cyclone drawn northwards during South African winter and passes over country/inland/close to the land √√

Mid-latitude cyclone moves northwards due to the apparent northward movement of the sun and passes over the country/inland/close to the land √√

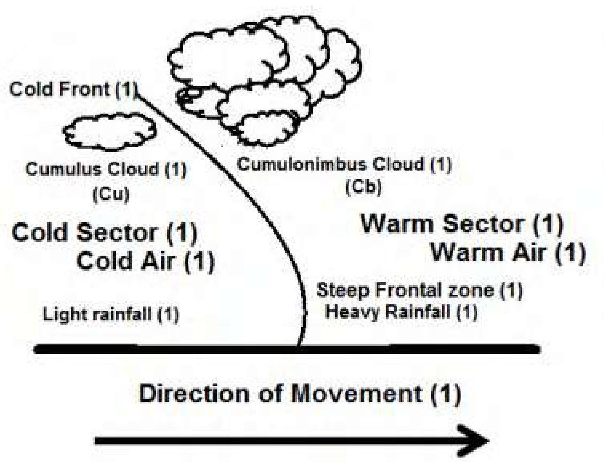
[ANY ONE] (1 x 2) (2)

2.2.9. Cold air undercuts/pushes warm air √√

Warm air rise rapidly along cold front √√

Warm rising air cools down and condenses to form clouds known as cumulonimbus cloud √√ (3x2) (6)

2.210.




[1 mark for diagram showing steep cold front and any 3 labels] √√√√ (4 x 1) (4)

2.2.11. Increased rainfall improves crop yields √√

Increasing the growth of trading produce for both large-scale and small-scale

Farmers in winter √√

Increased rainfall improves dam water levels allowing for more water to be made

Available to the agriculture/farming in South-Western Cape √√

Greater variety of crops √√

Water provided for irrigation can decrease production costs √√

Snow-capped mountains attracts tourists √√

Water can be stored to be used during the drier summer months to keep the economy going √√

More water is available for industrial purposes √√

More water is available for the of Hydro-electric power and reduces costs of electricity generation √√

Lower temperatures reduce production costs √√

Increases the level of food security√√

[ANY TWO MUST BE A LINK BETWEEN THE LOW PRESSURE SYSTEM AND THE ECONOMY] (2 x 2) (4)

2.3..

2.3.1. West to east/eastwards √ (1 x 1) (1)

2.3.2. Driven by the westerlies √√ (1 x 2) (2)

2.3.3. 'series of cold fronts' √√

'widespread rain' √√

'20-30 mm of rain' √√

'more than 50 mm' √√

'waterlogged' √√

'heavy rainfall' √√

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

2.3.4. Shifting of the ITCZ to the north √√

South Atlantic High has migrated northwards √√

Mid-latitude cyclones migrate further north √√

Pressure belts follow the perpendicular sunrays northwards √√

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

2.3.5. Increases√√ (1 x 2) (2)

2.3.6. The cold air undercuts the warm air √√

Rapid upliftment of warm air occurs √√

Rising warm air cools and condenses √√

Condensation results in cumulonimbus clouds √√

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

2.4.

2.4.1. Southern √ (1x1) (1)

2.4.2. Air movement is clockwise indicated by the arrows √

Symbol in this diagram implies clockwise circulation √

Warm front located east of the cold front (in the Southern Hemisphere) √

The warm sector lies to the north of the cold sector (in the Southern Hemisphere) √

The V of the warm sector points southwards (in the Southern Hemisphere) √

[ANY ONE] (1x1) (1)

2.4.3. Polar front √ (1x1) (1)

2.4.4. **Cold sector**

Dry air √√ Dense, heavy air √√ Low temperature√√ High pressure√√ South-westerly/ south-easterly wind √√ Behind the cold front√√ In the cold sector √√ the air is drier√√ In the cold sector√√ the air is denser and heavier √√ In the cold sector√√ the temperature is lower √√ In the cold sector √√ the pressure is higher √√ In the cold sector √√ south-easterly/south-westerly winds occur√√ The cold sector √√ is behind the cold front √√

**Warm sector**

Humid air √√ Light, less dense √√ High temperature √√ Low pressure √√ North-westerly wind √√ Behind the warm front √√ In the warm sector √√ the air is more moist√√ In the warm sector √√ the air is lighter and less dense√√ In the warm sector√√ the temperature is higher√√ In the warm sector √√ the pressure is lower √√ In the warm sector √√ north-westerly winds occur√√ The warm sector√√ is behind the warm front√√

[ANY ONE DIFFERENCE] (2X2) (4)

2.4.5. Temperature drops √√

Air pressure increases √√

Wind changes from NW to SW √√

Cloud cover increases. √√

Heavy rainfall √√

(ANY TWO) (2x2) (4)

2.4.6. The leading edge of the cold front catches up with warm front at the apex √√

Cold air undercuts the warm air and it is displaced and uplifted √√

Cold and warm front merges/joins √√

[ANY TWO] (2x2) (4)

2.5.

2.5.1. Family of cyclones/depressions √ (1 x 1) (1)

2.5.2. It is further east/south/south-east √√ Movement is eastwards, therefore A is ahead of B and C √√ [ANY ONE] (1 x 2) (2)

2.5.3. Less moisture causes less/no rainfall √√ Warm air from the warm sector is uplifted slowly and more gently (gentle gradient) (creating stratus/altostratus/cirrus and cirrostratus clouds, and causes no rain) √√ Softer rainfall from nimbostratus clouds √√

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

2.5.4. The cold front catches up to the warm front/two fronts merge √√ Warm air is displaced off the earth's surface (occluded)/Occlusion has taken place√√ Warm and cold air masses move horizontally past one another again √√

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

2.5.5. South Antlantic anticyclone causes mid-latitude to move in a north easterly direction √√ It causes the weather along the cold front to intensify √√South indian anticyclone blocks the path of mid latitude cyclone √√ It causes mid-latitude to move in a southerly direction √√ (4x2) (8)

**2.6.**

2.6.1. Westerlies √ (1 x 1) (1)

2.6.2. Cold front √ (1 x 1) (1)

2.6.3. A √ (1 x 1) (1)

2.6.4. The wind speed behind the cold front is faster (30 knots) √√

The wind speed behind the warm front is slower (10 knots) √√

Ahead of the cold front the air is warmer/less dense/lighter √√

Ahead of the warm front the air is colder/denser/heavier √√

Warm front use energy to move forward and rise √√

The pressure gradient associated with the cold front is steeper √√

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

2.6.5. Clockwise circulation of air √√

Position of the low pressure is south of the system √√

Warm sector / Cold front is to the north√√

Cold sector / Warm front is to the south √√

Backing of the wind occurs (2)

Apex is to the south (2).

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

2.6.6.

(a) Z √√ (1 x 2) (2)

(b) The air behind the cold front is colder (10˚C) than the cool air in front of the warm front (14˚C) √√

The cold front symbol is at the apex of the mid-latitude cyclone √√

Cold front touches the surface (2)

Cold front has uplifted the warm front (2)

Cumulonimbus clouds evident (2)

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

(c) The cold front which is moving faster undercuts/overtakes (√√) the warm front (2)

The warm air is forced to rise (√√), resulting in the narrowing of the warm sector √√

The cool air (in front of the warm front) (√√) is completely uplifted (2)

**[ANY TWO** **(2 x 2) (4)**

Reduced income of tourism sector due to poor weather conditions (cancellation of bookings) (2)

2.7. .

2.7.1. Shape of front/convex (1)

Steep gradient of front (1)

Cloud – cumulonimbus (1)

Cold air behind the cold front (1) [ANY ONE] (1 x 1) (1)

2.7.2. Cold air undercuts the warm air (2)

Warm air is forced to rise very high (2)

Large scale condensation takes place (2)

Steep gradient causes rapid/strong upliftment of air (2)

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

2.7.3. Cold air/drop in temperature behind the cold front (2)

Cold air heavy and dense thus increasing air pressure (2) (2 x 2) (4)

2.7.4. Air behind the cold front is colder than the air in front (2)

Cold air moves faster than warm air (2)

Cold front catches up with the warm front (2)

Catches up at the apex, because it is the shortest distance between the fronts (2)

Cold front undercuts the warm front (2)

Warm sector is lifted off the surface (2) [ANY FOUR] (4 x 2) (8)

2.8.

2.8.1. Winter (1) (1 x 1) (1)

2.8.2. (10/12/13) June /Date (1)

Cold fronts in the interior of Western/Eastern Cape (1)

High amounts of rainfall (1)

Significant drop in temperature (1)

[ANY ONE] (1 x 1) (1)

2.8.3. Northward movement of the high pressure belts (anticyclones)/ITCZ (2) (1 x 2) (2)

2.8.4. Backing (1) (1 x 1) (1)

2.8.5. (The wind direction associated with the cold front will) change from north-west to south-west as the front moves over the Western Cape (2) (1 x 2) (2)

2.8.6. SUGGEST POSITIVE AND NEGATIVE IMPACTS OF HEAVY RAINFALL ON PHYSICAL (NATURAL) ENVIRONMENT

Positive:

Brings much needed moisture to the soil (2)

Revival of biodiversity/ecosystem/habitat (2)

Water available for wildlife (2)

Water available for growth of natural vegetation (2)

Water allows for more grazing land/veld (2)

Fill up (by infiltration) natural aquifers/springs/groundwater (2)

Fill up (via surface runoff) rivers (2)

Negative:

(Low-lying) areas are flooded (2)

Soil erosion will increase (2)

Destruction of biodiversity/ecosystem/habitat (2)

Damage to natural vegetation (2)

Loss of wildlife (2)

Increase salination of rivers (2)

Saturation of soil (waterlogged conditions) (2)

Rock falls/mass movements on steeper slopes (2)

**2.9.**

2.9.1. Mediterranean (1) (1 x 1) (1)

2.9.2. Cool wet (winters) (1) (1 x 1) (1)

2.9.3. The shifting of the ITCZ (2)

Sun is now overhead of the Tropic of Cancer/follow the shifting of rays sun/apparent movement of the sun (2)

2.9.4. Decrease in temperature (2)

Pressure decreases (but increases with cold sector) (2)

Cloud cover increases/cumulonimbus clouds form (2)

More precipitation/heavy rain/snow/hail/thunderstorms (2)

Humidity decreases (2)

Wind direction changes (backs northwest to southwest) (2)

Increase in wind speed/sudden gusty winds (2)

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

2.9.5. Heavy rainfall will make tourist destinations inaccessible (2)

Rock falls and landslides decrease accessibility (2)

Strong winds decrease accessibility (2)

Rough seas and high waves decrease accessibility (2)

Rough seas decrease business for tour operators (2)

Snow on the mountains makes hiking trails inaccessible (2)

Outdoor activities will be affected by the poor weather/dangerous conditions (can give examples rain, wind, cold and hail) (2)

Travel arrangements of tourists will be affected by poor weather conditions (examples flights, tour buses, sea travel) (2)

The aesthetical appeal of the tourist attraction may be diminished by poor weather conditions (example debris on the beaches) (2)

Reduced income of tourism sector due to poor weather conditions (cancellation of bookings) (2) [ANY FOUR] (4 x 2) (8)

**2.10.**

2.10.1. Severe storm that is characterised by torrential rainfall accompanied by strong winds

2.10.2. Driven/steered/powered by tropical easterlies

2.10.3. Well-developed eye

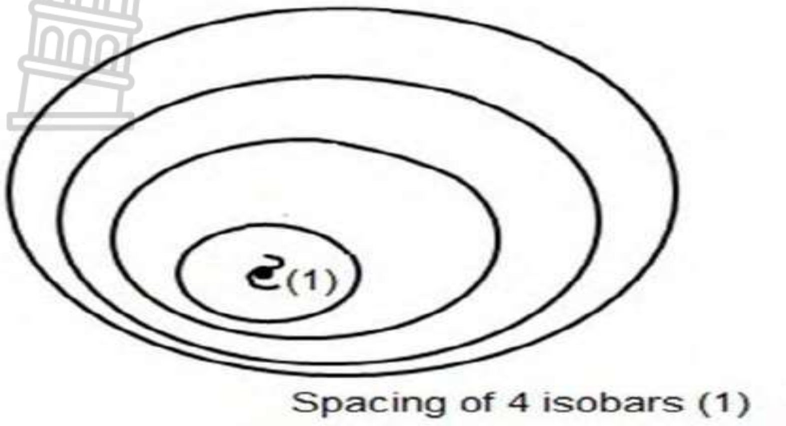
2.10.4. Tropical cyclones are named alphabetically

2.10.5. More friction over the land reduces wind speed

Latent heat is reduced

Moisture is reduced

2.10.6.




INSTRUCTIONS FOR MARKING

(i) Pressure reading at centre of eye must not be more than 996

(range 950-996) (1)

(ii) 4 isobars indicating the correct spacing (1)

(iii) correct symbol showing the southern hemisphere (1)

(3 x1) (3)

2.11.

2.11.1. Presence of Coriolis force (1)

Ocean surface temperature of at least 26,5 °C (1)

Calm (surface) conditions for several days/less friction (1)

Presence of low (air) pressure (1)

Unstable atmospheric conditions (1)

Evaporation from the sea surface / rising of warm moist air (1)

Upper air divergence (1)

Latent heat (1) [ANY ONE (1)

2.11.2 Southern (1) hemisphere (1 x 1)

Air circulation around the low- pressure cell is clockwise (2)

Forward (leading) left-hand quadrant/dangerous semi-circle is located on the south-west of the tropical cyclone (2) [ANY ONE] (1 x 2) (2)

2.11.3 A- has clear skies (1)

B- dense (cumulonimbus) cloud cover (1) (2 x 1) (2)

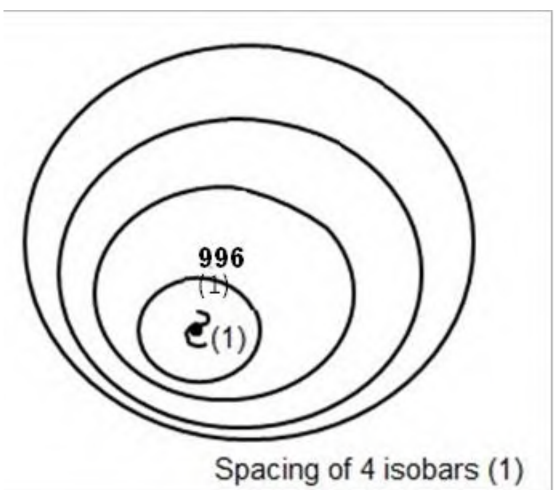
2.11.4 At A (eye) - air is descending (heating) results in no condensation (no formation of clouds) (2)

At B (eye wall) - air is rising (cooling) and results in condensation (the formation of clouds) (2) (2 x 2) (4)

2.11.5 INSTRUCTION FOR PART MARKING- MAXIMUM OF TWO

At A (eye) - air is descending (1)

At B (eye wall) - air is rising (1)

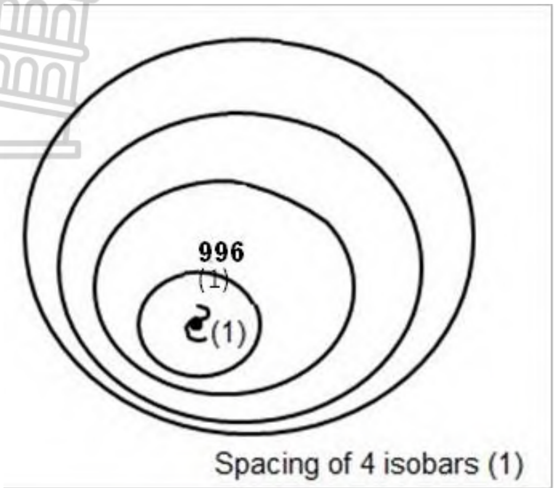



(4)

2.11.6 Combination of the forward movement and rotation of the system (2)

It has a steep pressure gradient (2) [ANY ONE] (1 x 2) (2)

2.11.7.




Pressure reading at center of eye must not be more than 996 (range 950-996) √

4 isobars indicating the correct spacing √

correct symbol showing the southern hemisphere √ (3x1) (3)

2.12

2.12.1. Six (1x1) (1)

2.12.2. Madagascar is present on the map.

The cyclone is moving from east to west, away from the equator, which is south westerly. (2x2) (4)

2.12.3. It is steered by the tropical easterlies. (1x2) (2)

2.12.4. Indian ocean has warm surface temperature of at least 26,5 °C (1)

Evaporation from the sea surface / rising of warm moist air (1)

2.12.5. Putting evacuation plans in place for getting people out of danger areas (2)

There must be rescue teams to rescue people from flooded areas (2)

A good forecasting system is essential to track and predict the path of a tropical cyclone and to issue warnings (2)

Organization of a first aid kit and batteries for radios, lamps and torches (2) Stock up on canned food and water supplies (2)

Place sand bags along rivers and coastal areas to reduce the impact of flooding (2)

Erect wooden shutters on windows and educate people to stay away from windows and doors during the storm (2) (4x2) (8)

2.13.

2.13.1 A category 3 hurricane

2.13.2. Sea surface temperature of 26,5°C and above (1)

Unstable atmospheric conditions (1)

Originates between 5º and 25º north and south (1)

Coriolis force (1)

Calm conditions (light variable winds) over the ocean surface (1)

Little surface friction (1)

Surface air convergence (1)

Extensive upper air divergence of winds aloft (1)

Rapid large scale evaporation of moisture over ocean/High humidity (1)

Release of latent heat (1)

[ANY ONE] (1 x 1) (1)

2.13.3. 120 (km/h) (1)

(Accept 120km/h to 149km/h) (1 x 1) (1)

2.13.4. Pressure gradient decreases when you move away from the eye (2)

Isobars are further apart as you move away from the eye (2)

Pull of the vortex becomes weaker (2)

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

2.13.5. Circulation and forward movement in the same direction (2)

Intense winds in the cyclone combines with the force of the entire cyclone moving forward/westwards into the left-hand quadrant (2)

Wind shear (a sudden change in wind direction) at lower altitudes intensifies this quadrant (2)

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

2.13.6. Storm surges due to strong winds will cause floods (2)

Damage to property because of flooding/strong winds (2)

Loss of life (2)

It causes injury to people/animals (2)

It will cause coastal erosion (2)

Destruction of infrastructure (accept examples) (2)

Ecosystems are disrupted (2)

Loss of biodiversity (2)

Negative impact on tourism/Outdoor activities (2)

Negative impact on the fishing industry (2)

Loss of agricultural production/Food insecurity (2)

Costly to repair damages/medical and insurance claims (2)

Contamination of water/Water borne diseases (2)

Aesthetic beauty of coastal area destroyed (2)

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

2.14.

2.14.1 Date /January indicates summer (1)

Mozambique (1)

Madagascar (1)

Beira (in Mozambique) (1)

South-westerly movement (1)

Clockwise circulation symbol (1)

Located over the South Indian Ocean (1)

Mozambique channel (1)

Tropical Cyclone (Eloise) (1)

Map of Southern Africa (1)

[ANY ONE] (1 x 1) (1)

2.14.2. Heavy rainfall / Rainfall of 250mm in 24 hours (1)

Wind speeds up to 140-160 km/hr (1) (2 x 1) (2)

Increased frictional drag (2)

System moves over land (2)

Decrease in latent heat (2)

Decrease in moisture levels (2)

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

2.14.3. .Movement over the warm Mozambique channel (2)

Less friction over Warm Mozambique channel/ ocean (2)

High temperatures/warm ocean results in increased evaporation (2)

Increased condensation results in the release of latent heat (2)

Latent heat drives the system and increases the wind speed (2)

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

2.14.4 PRECAUTIONARY MEASURES AND MANAGEMENT STRATEGIES

Early warning systems put in place (2)

Sandbags to reduce flooding (2)

Reinforcing existing infrastructure (2)

Awareness and education programmes (2)

Evacuation protocols and drills (2)

Stocking up of emergency supplies and necessities (2)

Identify high lying areas to evacuate people (2)

Build above flood lines/ coastal zoning (2)

Tracking the movement of the tropical cyclone

Good forecasting/ Use of media to update regularly (2)

Improve accessibility to evacuate people (2)

Move people to higher ground (2)

Development of good rescue and emergency services (2)

Storage/ provision of clean water and food supplies (2)

Rescue personnel, police, medical personnel on standby (2)

Maintain coastal vegetation to act as a buffer against storm surges (2)

Request National and international aid if necessary (2)

[ANY THREE- ACCEPT EXAMPLES] (3 x 2) (6)

**2.15.**

2.15.1. Coastal Low (1) (1 x 1) (1)

2.15.2 It is a moving system (2) (1 x 2) (2)

2.15.3 Moist air is carried over the land at B (2)

Onshore winds at B (2)

Dry air is moving from land to sea at C (2)

Offshore winds at C (2)

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

2.15.4. 23.01.2022 (Date) (2)

The high pressure cells are in a Southerly position (2)

Cold fronts/mid-latitude cyclones are further south (2)

A tropical depression is evident (2)

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

2.15.5.

(a) E (2) (1 x 2) (2)

(b) E has a higher pressure (1032hPa) reading than D (1024hPa) (2)

D has a lower pressure (1024hPa) reading than E (1032hPa) (2)

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

**2.16**

2.16.1. A zone between the warm moist air from the Indian Ocean and the cold dry air from the Atlantic Ocean/A zone between two air masses with different moisture content (1) [CONCEPT] [ANY ONE] (1 x 1) (1)

2.16.2. A – Warm, moist air – onshore flow from Indian (warmer) Ocean where levels of evaporation are higher (1)

B – Cold, less moist air – onshore flow from the Atlantic (colder) Ocean where level of evaporation are lower (1) (2 x 1) (2)

2.16.3. Line Thunderstorm/ Squall (2) (1 x 2) (2)

2.16.4. Eastern side (2) (1 x 2) (2)

2.16.5. Warm, less dense and moist air comes from the northeast (A) (2)

Collides with cold, dry air mass from the southwest (B) (2)

Warm, moist air east of the moisture front rises (2)

Condensation of warm, moist air east of the moisture front (2)

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

2.16.6. Hail (damage to crops) (2)

Lightning (start fires) (2)

Heavy rainfall (2)

Flooding (2)

Soil oversaturated (2)

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

2.17.

2.17.1. Winter √

2.17.2. Kalahari HP is dominant √

Approaching cold front √

2.17.3. High temperatures √

High pressure

2.17.4. The sinking air warms up adiabatically. (2)

2.17.5. Descending air compresses and warms up adiabatically (2)

No condensation due to lack of moisture. (2)

2.17.6. It will be affected by Berg winds which dries up vegetation which increases the risk of veld fires. (2)

Berg winds increases temperature and promotes ignition of veld fires. (2)

[ACCEPT ANY OTHER RELEVANT ANSWER]

2.18.

2.18.1.Thermal low (1) heat low (1)

High temperatures (1)

Overcast conditions (1)

South Indian- and South Atlantic high are in a southerly position (1)

Dominant low (1) [ANY ONE] (1 x 1) (1)

2.18.2.4 hPa/mb (1) (1 x 1) (1)

2.18.3.South Indian (1)

Mauritius Anticyclone (1) [ANY ONE] (1 x 1) (1)

2.18.4.South east South easterly (1) [ANY ONE]

5 knots (1)

2.18.5.The isobars are far apart/gentle pressure gradient indicating low wind speeds (2) (1 x 2) (2)

2.18.6.The South Indian high pressure is further south and away from the land in summer (2)

On-shore winds from the South Indian high have a larger fetch as they are located further south in summer (2)

More water is evaporated over the warm Indian Ocean (2)

Moisture laden air from the South Indian high rises (adverts) towards the low pressure in the interior (2)

Intense heating over the land in summer causes thermal/heat low pressures to develop (2)

Unstable air causes convectional rainfall/thunderstorms (2)

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

2.19.

2.19.1. A South Atlantic (1)

B South Indian (1) (2 x 1) (2)

2.19.2. Summer (1) (1 x 1) (1)

2.19.3. Line thunderstorms (heavy rainfall) occur in the interior (2)

Cumulonimbus clouds/lightning/hail (2)

Moisture front developed (2)

Air from the east/west reaches the interior (2)

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

2.19.4. The boundary (dry line) between two air masses of different moisture content (2)

The boundary (dry line) between two air masses (2)

2.19.5. (Heavy) Rainfall (1)

Hail (1)

Thunderstorms (1) [ANY TWO] (2 x 1) (2)

2.19.6. Convergence of warm moist air and cold dry air (2)

Moisture front develops (2)

Cold dry air undercuts warm moist air (2)

Warm moist air rises (2)

Condensation occurs in the eastern side of the moisture front (2)

Cumulonimbus clouds develops (2)

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

2.20

2.20.1 Summer (1) (1 x 1) (1)

2.20.2 Weak descending air (2)

The inversion layer is above the escarpment/plateau (2)

Moist (onshore) winds will reach the interior (2)

Wet conditions over the interior (2 [ANY ONE] (1 x 2) (2)

2.20.3 Plateau (1)

Height above sea level (1)

Ocean currents (1)

Inversion layer (1)

Descending air/Kalahari HP (Anticyclonic movement) (1)

Distance from the ocean (1) [ANY TWO] (2 x 1) (2)

2.20.4 As air subsides it compresses and heats up (2)

Adiabatic heating due to subsiding air (2) [ANY ONE] (1 x 2) (2)

2.20.5 Sketch (A)

Inversion layer is above the level of the plateau/escarpment (2)

Moist air flows into the interior (2)

Unstable conditions cause air to rise (2)

Condensation occurs and clouds form (2)

Results in more rainfall (2)

Sketch (B)

Inversion layer below the level of the plateau/escarpment (2)

Moist air cannot reach the interior (2)

Stable conditions cause clear skies (2)

Less/No condensation occurs (2)

Results in less/no rainfall (2)

[ANY FOUR – MUST INCLUDE CONDITIONS OF SKETCH A AND SKETCH B] (4 x 2) (8)

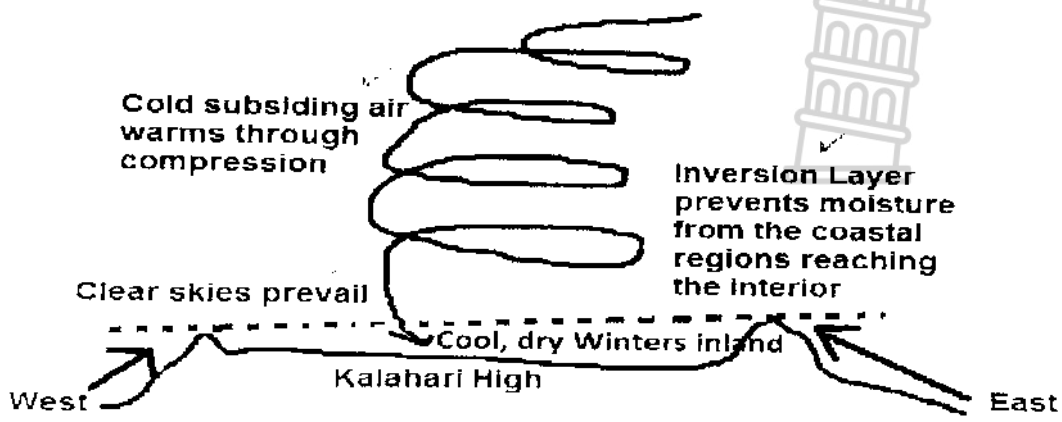
2.21

2.21.1.A: South Atlantic Anticyclone (1) or St Helena High (1)

B: Kalahari Anticyclone (1) or Continental High (1)

C: South Indian Anticyclone (1) or Mauritius High (1) (3 x 1) (3)

2.21.2.



(4 x1) (4)

2.21.3. THE IMPACT OF ITCZ ON ANTICYCLONES

The Earth is tilted 23½° to the vertical, as it faces the sun. (2)

This causes the ITCZ to shift north and south of the equator from season to season. (2)

Pressure belts follow the apparent migration of the sun. (2)

In summer the 3 anticyclones are located further south. (2)

In winter the 3 anticyclones are located further north. (2)

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

[15]

2.22.

2.22.1. Moisture front (1) (1 x 1) (1)

2.22.2. Band of cloud stretching from the NW to the SE of the country (2)

(Cumulonimbus) clouds arranged in a line from the NW to the SE (2)

Converging air masses over the interior of the country (2)

Presence of the moisture front (2)[ANY ONE] (1 x 2) (2)

2.22.3. Low pressures over the land during summer, draw in moisture off the oceans onto the land (2)

Inversion layer above escarpment in summer allows inflow of moist air (2)

Increased convergence of air masses from well-developed high-pressure cells along the coast (2)

Weakened Kalahari High Pressure Cell facilitates greater vertical rising of air above the interior (2)

Presence of trough over the interior during summer (2)[ANY ONE] (1 x 2) (2)

2.22.4. Warm moist air from above the Indian Ocean/Warm Mozambique/Warm Agulhas Current (2)

Warm moist tropical air diverging from the South Indian High Pressure Cell (2)

Warm moist air from the North-easterly winds (2) [ANY ONE] (1 x 2) (2)

2.22.5. Warm moist air from the east (more moisture) reaches the interior (2)

Cold dry dense air from the west forces warm moist less dense air to rise (2)

Air on the eastern side is more unstable (2)

Large scale condensation results in dense cloud formation (2)

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

2.22.6. Has a longer duration (2)

They cover a greater/widespread area (2)

Damage is more widespread (2)

Continuous feeding of moisture from the ocean (2)

Constant formation of cumulonimbus clouds along the moisture front (2)

Stronger upliftment/rapid rising and condensation along the moisture front (2)

Torrential or heavy rainfall and/or hail (2)

Occurs any time of day (2)

OR

Has a much shorter duration (2)

Isolated thunderstorms are over a small area (2)

Isolated thunderstorms will result in damage that is not widespread (2)

Isolated thunderstorms do not have a continuous source of moisture (2)

Only occurs during late afternoon (2)

[ANY TWO. CANNOT REFER TO THE SAME FACTOR ON BOTH SIDES]

(2 x 2) (4)

[15]

2.23.

2.23.1. Winter (1) (1 x 1) (1)

2.23.2. The presence of the Kalahari High Pressure Cell (in the interior) (1)

The presence of berg winds (1)

Kalahari High is close to the surface (1)[ANY ONE] (1 x 1) (1)

2.23.3. Blows from the Kalahari High Pressure to coastal low (1)

Blows down the escarpment to coastal low (1)

Blows down the mountain to the ocean (1)[ANY ONE] (1 x 1) (1)

2.23.4. (a). A. Offshore (1)

B - Onshore (1) (2 x 1) (2)

(b) Lack of moisture because air blows from the land to the sea (2)

Air subsides therefore no condensation (2) [ANY ONE] (1 x 2) (2)

(c) NEGATIVE

Warm, dry wind increases surface water evaporation (2)

Warm winds dry out the vegetation (2)

Dry vegetation could result/facilitate veld fires (2)

The gusty winds could fan and spread the fire (2)

Veld fires destroy ecosystems/habitats (2)

Biodiversity is reduced (2)

Food chains are disrupted (2)

Destruction of vegetation can result in bare soil and soil erosion (2)

Soil erosion will decrease soil fertility (2)

POSITIVE

Raises the temperature of coastal areas in winter (2)

Veld fires encourage regrowth and regeneration of natural vegetation (2)

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

2.24

2.24.1. The Kalahari High Pressure can be seen over South Africa (1) and the coastal low along the east coast (1)

2.24.2. Veld fires (1) (1 x 1) (1)

2.24.3. The Kalahari High is more dominant over South Africa in winter (1)

The coastal low moves easier along the coast during winter (1)

A steep pressure gradient exists between the interior and the coast (1)

[ANY TWO] (2 x 1) (2)

2.24.4. The air has heated by 1°C/100m of descent – according to the dry adiabatic lapse rate – and increased the air temperature (2)

Any moisture is evaporated as the air heats up through descent lowering the humidity (2) (2 x 2) (4)

2.24.5. Winter in South Africa is generally dry (as a result of little or no rain), so this warm, dry wind can cause veld fires (2)

People are susceptible to the risk of runaway fires – putting people's lives in danger (2)

Farmers lose crops and suffer financially as a result of this environmental hazard (2)

Urban settlements on mountain slopes are threatened (2)

People suffer from the hot conditions (2)

During berg winds people suffer from discomfort and skin irritations (2)

[ANY THREE ACCEPT ANY OTHER REASONABLE ANSWERS] (3 x 2) (6)

2.25

2.25.1 A weak low pressure system that develops along the west coast. (1)(1 x 1) (1)

2.25.2. It moves southwards along the west coast (1) and eastwards along the south coast. (1) (2 x 1) (2)

Ahead of the low, offshore winds occur blowing dry air off the land. (2)

Behind the low, onshore winds feed moisture onto the land. (2) (2 x 2) (4)

2.25.3. West coast: cold air is fed onto the land which causes (advection) fog. (2)

East coast: warm/moist air is fed onto the land causing drizzle. (2)

(2 x 2) (4)

2.25.4 Air descends from the Kalahari High towards the coast and it warms adiabatically (2)

The formation of warm/berg winds increases temperature along the coast. (2)

Clockwise air circulation brings warm, dry conditions towards the coast. (2)

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

[15]

ACTIVITY 5 VALLEY CLIMATES

2.26

2.26.1 Katabatic/Downslope wind (2) 1x2 (2)

2.26.2. C is formed during the night when the land surface cools rapidly due to terrestrial radiation (2)

Air in contact with land also cools down (2)

Cold air becomes heavy and dense (2)

The cold wind will sink down the sides of the valley (2) [ANY THREE] 3x2 (6)

2.26.3. The wind is warm because it is in contact with the valley that is warm (2)

Warm air is light and less dense (2)

Warm wind will move upslope (2)

[Any TWO] 2x2 (4)

2.26.4. LOCATION OF SETTLEMENT

Wind C causes temperature inversion (2)

Thus temperatures at the bottom of the valley are much colder in winter (2)

This will result in the formation of frost on the valley floor (2)

Houses will also be built away from the valley floor to avoid lower temperatures during the night in winter (2)

Houses will then be built on the thermal belt (2)

Formation of fog will prevent houses being built on valley floor (2)

Damp condition not good for human health (2)

Industries will also be built away from this area (2)

Industries can cause serious pollution in the valley because air cannot rise when the valley is cold (2)

FARMING ACTIVITIES

Frost will limit farmers from planting crops in the valley (2)

Frost damages crops, therefore only frost resistant crops will be planted (2)

Farming activities will take place on middle slopes (2)

[ANY FOUR must refer to both aspects] (4x2) (8)

2.27

2.27.1. The direction in which a slope faces/The angle at which the sun's rays strike a Slope (1)[CONCEPT] (1 x 1) (1)

2.27.2. The north-facing facing slope is receiving the direct rays of sunlight, in the Southern Hemisphere (1) (1 x 1) (1)

2.27.3. The area at A does not receive direct sunlight (2)

Area A is facing away from the sun's rays (2)

High lying area casts a shadow over slope A (2)

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

2.27.4. Air in contact with slopes heated (2)

Air becomes light/less dense (2)

Air rises along the slope (2) [ANY TWO] (2 x 2) (4)

2.27.5. North-facing slopes in the southern hemisphere receive more sunlight throughout the year(2)

Crops that require direct sunlight would be more well suited at area D (2)

Descending cold air forms frost pockets on the valley floor (2)

Crops that are sensitive to frost should not be planted in the frost pocket (C) (2)

Frost resistant crops to be planted at C (2)

Soils on the north-facing slope is also drier as a result of higher levels of

evaporation (2)

Farmers will have to irrigate the north-facing slope, to successfully plant crops here (2)

The farmstead can be located on a higher slope as it is warmer/in the thermal belt

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

2.28

2.28.1. Katabatic/downslope/gravity (1) (1 x 1) (1)

2.28.2. Mountain slopes cool at night (2)

Winds in contact with the slopes cool down (2)

Lower temperatures increase the density of the air and it is forced to sink to the valley floor (2)

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

As cold air sinks into the valley during night time it displaces the warm air upwards (2) (1 x 2) (2)

2.28.3. WARM THERMAL BELT

Suitable for human habitation (2)

Creates stable warm weather conditions (2)

Reduces costs of heating households during cold winter night (2)

Suitable for the cultivation of crops that do not withstand frost (2)

VALLEY FLOOR

Plant frost resistant crops only (2)

Traps the cold air, fog and smoke (2)

Causes pollution problems in the valley (2)

[ANY FOUR - ACCEPT OTHER REASONABLE ANSWERS] (4 x 2) (8)

2.29

2.29.1. Industry/factory (1)

Smoke (1)

Carbon dioxide (1)

Sulphur dioxide (1)

Nitrogen oxide (1)

Soot (1) [ANY ONE] (1 x 1) (1)

2.29.2. Thermal belt (1)

Inversion layer (1) [ANY ONE] (1 x 1) (1)

2.29.3. Temperature decreases with altitude, except in the thermal belt where it increases with altitude, thereafter it continues to decrease (2) (1 x 2) (2)

2.29.4. Katabatic/downslope winds push smoke particles downward (2)

The inversion layer is lower down the valley slopes which traps smoke (2)

Mountain breeze blowing in the valley at night (2)

Low cloud cover to trap the pollutants (2)

Strong subsidence prevents pollution from rising/pushes pollutants further down (2)

Weak convection currents prevents the rising of pollutants (2) (2 x 2) (4)

2.29.5. Settlements locate along middle slopes because it is warmer in winter (2)

Generally settlements do not occur on the valley floor because of frost and low temperatures (2)

Most settlements in the Southern Hemisphere prefer the north-facing slopes where they receive direct sunlight (2)

Most settlements in the Northern Hemisphere prefer the south-facing slopes where they receive direct sunlight (2)

Settlements that locate in a warmer zone save on electricity, therefore they prefer this location (2)

High lying slopes are avoided as they are colder (2) [ANY THREE]

(3 x 2) (6)

2.30

2.30.1. night (1) (1 x 1) (1)

(a)frost (1) (1 x 1) (1)

(b) radiation fog (1) (1 x 1) (1)

2.30.2. Wind B is cold air that is heavy and drains onto the valley floor (2)

This cold air converges on the valley floor and displaces the warm air in the valley and forces it to rise (2)

This warm air causes an increase in temperature with height which is an inversion (2) [ANY TWO] (2 x 2) (4)

2.30.3. RADIATION FOG

Affects visibility for motorists and other activities (2)

Slows traffic and people are late for work/higher fuel costs (2)

Risk of accidents increase (2)

Constant dampness makes/creates uncomfortable conditions for people (2)

Combines with pollutants to form smog which causes health issues (2)

AND/OR

FROST

Farmers are only able to plant frost resistant crops on the valley floor (2)

Difficult to live on the valley floor because the temperature is low (2)

It is more expensive because it will require artificial heating (2)

People can fall ill due to cold conditions (2)

Reduction in income as farming activities are reduced (2)

[ANY FOUR] (4x2)(8)

2.31

2.31.1. Direction in which slopes face in relation to sun's rays (1)/

Angle at which the sun's rays strike the slope (1) [CONCEPT] (1 x 1) (1)

2.31.2. B (1) (1 x 1) (1)

2.31.3. In the southern hemisphere (B) the north facing slopes receive direct rays of the sun (2)

In the northern hemisphere (A) the south facing slopes receive direct rays of the sun (2)

In the southern hemisphere (B) south facing slopes receive oblique rays of the sun (2)

In the northern hemisphere (A) north facing slopes receive oblique rays of the sun (2) [ANY ONE] (1 x 2) (2)

a. Difference in temperature on the different slopes in the valley (2)

The slope that faces the sun will have a higher temperature (2)

The slope that faces away from the sun will have a lower temperature (2)

(Accept responses to specific slopes)

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

(b) Evaporation rates differ on each slope (2)

The slope that faces the sun will have a higher evaporation/will be drier (2)

The slope that faces away from the sun will have a lower evaporation/will have a higher moisture content (2) [ANY ONE] (1 x 2) (2)

b. Different types of crops have to be grown on the north and south facing slopes (accept examples - deciduous fruit) (2)

North facing slopes favour the growth of crops that require more sunlight/less moisture (accept examples - citrus fruit/thick skinned fruit) (2)

South facing slope encourage the growth of products that require cooler conditions with more moisture (accept examples) (2) [ANY ONE] (1 x 2) (2)

(b) People prefer to settle on the warmer north facing slopes (2)

Save on energy costs on north facing slopes (2)

South facing slopes require more and expensive heating methods of settlements (2)

Cooler south facing slopes are not favourable for human settlements (2)

South facing slopes will be colder and not ideal for settlement (2)

South facing slopes receive more precipitation and fog and not favourable for settlement (2)

[ANY TWO-MUST REFER TO SPECIFIC SLOPE] (2 x 2) (4)

2.32

2.32.1. Anabatic/upslope wind (1) (1 x 1) (1)

2.32.2. occurs during the day while 2 occurs at night (2)

At 1 there is upslope movement of air while there is down slope movement of air at 2 (2)

At 1 wind originates when slopes are heated and at 2 there is cooling of slopes (2)

Density of air at 1 is low while density of air at 2 is high (2)

[ANY ONE DIFFERENCE] (1 x 2) (2)

2.32.3. Wind 2 (2)

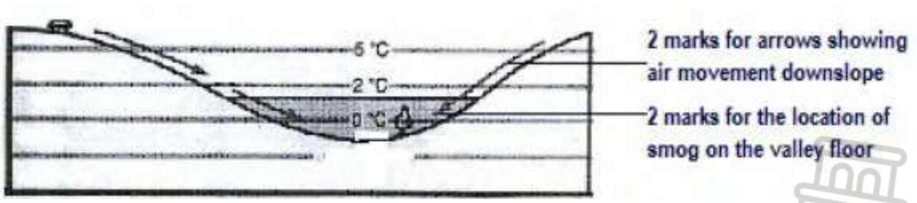
Air moves down slope from high pressure to low pressure (2) (2 x 2) (4)

Cold air rolls into the valley and forms an inversion (trap pollutants) (2)

This forms smog (2)

Radiation fog/mist/haze also forms(2)

In winter more artificial heating also results in higher pollution levels (2)




2.33

2.33.1. The direction which the slope faces in relation to the sun rays (1)

The orientation of the slope with regard to the sun rays (1)

[CONCEPT] (1 x 1) (1)

2.33.2. North-facing slope/southern slope (1) (1 x 1) (1)

2.33.3. (a) Being in the shadow zone it experiences lower temperatures (2)

It is subjected to lower evaporation rates (2)

It does not receive direct sunlight (2) [ANY ONE] (1 x 2) (2)

(b) The slope does not receive any sun's rays as it is a south-facing slope and would have lower average temperatures/cooler temperatures (2)

The slope has a relatively steeper gradient (2)

The dampness of the slope (2)

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

2.33.4. The slope is gentle and therefore easier to build on flat land (2)

Close to fertile soil (2)

Close to water/dam (2)

Farmer wants to be closer to the crops (2)

Close to roads for easier access (2)

Farm house is close to the golf course (2)

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

2.33.5. Katabatic winds form at night/cooler air sinks to the bottom at night (2)

Cold air collects on the valley floor (2)

The temperature of the cold air on the valley bottom can result in frost /frost pockets form (2)

Crops that are not frost resistant could die (2)

Might experience radiation fog (2)

Reduces visibility (2)

Cold conditions and fog impact negatively on health (2)

No advantage of thermal belt (2) [ANY FOUR] (4 x 2) (8)

2.34.

2.34.1. 25,9 °C (1) (1 x 1) (1)

2.34.2. The materials used (concrete, glass, steel) to construct buildings in the CBD retain more heat (2)

Artificial conditioning (climatic controls) of air creates a microclimate within each building (2)

Use of non-reflective paints (2)

Tall buildings create a larger surface area that is heated (2)

Tall buildings reflect greater heat between buildings due to a larger surface area being heated (2)

Early morning and late afternoon sun's rays hit sides of tall buildings at right angles concentrating heat on tall buildings (2)

The high building density retains more heat from multiple reflection of heat (2)

The flat closed roofing traps heat within taller buildings (2)

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

2.34.3. The air temperatures between the buildings are slightly cooler due to the channelling of air/wind between buildings (2)

More shadows between buildings (2)

Vegetation between buildings promotes transpiration and therefore evaporation and cooling of air (2)

Air between the buildings is cooled by upliftment (2)

At night time, the atmosphere cools down quicker while the buildings retain heat (2) [ANY TWO] (2 x 2) (4)

2.34.4. CBD Redevelopment

Create more green belts around the CBD in open spaces e.g. parks/gardens (2)

Taller building should be encouraged to have roof top gardens (2)

Large pot plants/trees at intersections between taller buildings (2)

Use of paved surfaces (paving blocks) rather than tarred surfaces (2)

Reduction of transport routes within the core of the CBD (2)

Rapid Transport Systems (alternate transport systems) to decrease vehicular traffic (2)

The development of ring roads to reduce vehicular traffic in the CBD (2)

Water features to increase evaporation cooling (2)

Reduction/Removal of trading with open fire cooking in the core of the CBD (2)

Encourage buildings with underground parking (2)

Rezoning of the CBD to encourage industries to locate outside the city limits

(industrial decentralisation) (2)

Commercial decentralisation (2) (4X2) (8)

2.35

2.35.1. An area of high temperature over the city that decreases towards the rural area/phenomenon that makes urban areas hotter than their surroundings (1)

[CONCEPT] (1 x 1) (1)

2.35.2. the global focus of city infrastructure planning has been on cars' (1)

'getting as many people as possible into tall buildings' (1)

‘Heat comes from decades of poor planning’ (1)

‘office blocks overcrowding their occupants’ (1) 'tarred roads criss-crossing' (1)

'big cement slabs' (1) [ANY TWO] (2 x 1) (2)

2.35.3. Subsiding air at night pushes the warm air closer to buildings in the city which results in more heat being concentrated (in a smaller area) (2)

Weaker convection currents at night concentrates the heat island effect (2)

Subsiding air traps the heat between buildings (2)

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

2.35.4. Plant more trees to absorb more carbon dioxide (2)

Establish roof gardens/vertical gardens on high rise buildings (2)

Create parks/greenbelts in the urban area (2)

Reduce carbon emissions in urban areas by making use of solar energy (2)

Reduce carbon emissions in urban areas by making use of wind energy (2) Replace concrete/tar surfaces with cobble stones which allow infiltration of water and cooling through evaporation (2)

Promote urban farming that will result in more evapotranspiration and cooling of temperatures (2)

Use of public transport/cycling to reduce the number of vehicles on the roads (2)

Reduce the number or vehicles on the road (accept examples) (2)

Use of reflective paint on buildings and roofs (2)

Reducing our carbon footprint through recycling and re-using of products (2)

Modernisation of buildings with greener materials (accept examples) (2)

Implementing energy saving strategies (accept examples) (2)

Encourage the use of hybrid cars which produce no pollution (2)

Use of catalytic converters in motor vehicles (2)

Creation of water features (accept examples) (2)

Green policy to be included in all legislation (2)

Awareness/education campaigns on green policies (2)

Incentives for going green/eco-friendly products (accept examples) (2)

(4 x 2) (8)

6.13

2.36.1. A (1) (1 x 1) (1)

2.36.2. Rising warm air (convection currents) has a greater vertical dimension in A (2)

No evidence of subsiding air (2)

Inversion layer not visible in A (2) Cold air is high above city (2)

A low lying inversion layer is evident at B (2)

Warm air is blocked from rising at B (2)

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

2.36.3. Higher concentration of pollution trapped close to the earth's surface (2) Pollution trapped close to the ground mixes with fog/ground based cloud (2) (1 x 2) (2)

2.36.4. Convection/rising air disperses pollution to upper levels of the atmosphere No inversion layer close to surface to trap pollution (2)[ANY ONE] (1 x 2) (2)

2.36.5. SUSTAINABLE SOLUTIONS TO LIMIT SMOG FORMATION IN CITY

Roof top gardens/green lungs (2)

More natural environments e.g. green belts within the city limits (2)

Taller chimneys to release pollution higher in the atmosphere (2)

Regulate industrial activity at night to reduce the concentration of emissions within the CDB (2)

Bylaws/restrictions to carbon emissions by various pollution producing industries in the city (2)

Penalties/Fines for exceeding smog restrictions by industries located closer to the city (2)

More decentralised industrial growth points away from the CBD (2)

Filters on chimneys to reduce toxicity of emissions (2)

Use of green/clean source of energy (2)

Car-pooling/lift clubs (2)

Filters/catalytic converters on motor vehicle exhaust pipes (2)

Hybrid/solar powered/electric/battery-operated vehicles (2)

Improved public transport/dedicated bus lanes will result in less private vehicles within the limits of the CBD (2) Park-and-ride facilities (2)

Promote use of bicycles in city centre (2)

Pedestrians the city centre (2)

Increased public awareness/education (2) [ANY FOUR](4 x 2) (8)

2.37

2.37.1. An accumulation of dust, soot and smoke (pollution) particles over the city (1)

2.37.2. Urban areas produce more pollution/combustion released by cars, industries and other activities/More human activities (2) (1 x 2) (2)

2.37.3. During the night subsidence is stronger/trapped closer to the ground/

inversion layer is closer to the surface at night (2)

Less activity resulting in heat generation to lift pollution dome (2)

Pollution covers a smaller area (2)

Less convection/thermal currents to distribute pollution at night (2)

2.37.4. Soot accumulation on buildings results in more cleaning services needed (2) Results in acid rain which results in peeling of paint of buildings (2) Buildings must be painted more often (2)

Concrete surfaces become pitted (holes) and must be maintained/renovate more frequently (2)

Metal structures such as metal window frames/air conditioners become corroded because of the acid rain/renovated more often (2)

Replacing damaged material with good quality/durable material is costly (2)

Regular replacement/purchase of air conditioner filters (2)

More regular painting of road markings as acid rain makes it peel easier (2)

High pollution results in higher rainfall and can cause flood damage (2)

Damaged plants in gardens to be replaced (2)

Water reservoirs/dams become polluted and money spent to purify water (2)

3. MAPWORK

3.1. Map Skills and Calculations

3.1.1. B (1)

3.1.2. C (1)

3.1.3. B (1)

3.1.4. Area = Length x Breadth

Breadth = 3.7√cm x 0.5km

= 1.85km√

= 2.1km x 1.85km

= 3.9km²√ (3)

3.1.5. Total change = 7' x 10

= 70'W (1°10'W)√

MD for 2024 = 28°25'West of True North

+√ 1°10'W

= 29°35' West of True North√ (3)

3.1.6. Convex slope (1)

**3.2 Map interpretation**

3.2.1. Katabatic wind (1) (1 x 1) (1)

3.2.2. Katabatic wind reduces the temperature in area G. (1 x 2) (2)

3.2.3. Reduced/lower temperatures promote the formation of frost which destroys/damages crops.

(1 x 2) (2)

3.2.4. Plant crops in greenhouses (2)

Plant frost resistant crops (2)

Use mulch to retain heat in the soil. (2)

Plant rows of trees to block sinking cold air at night. (2) (1 x 2) (2)

3.2.5. River valley (1) (1 x 1) (1)

3.2.6. Contours point upstream. (2) (1 x 2) (2)

3.2.7. Anabatic wind blows upslope. (2) (1 x 2) (2)

**3.3 Geographical Information Systems (GIS)**

3.3.1. Putting one data layer on top of another to show the relationship/enable comparison between features. (2)

(1 x 2) (2)

3.3.2. Topography (1)

Drainage (1)

Soil type (1) (1 x 1) (1)

3.3.3. Poor farming methods (2)

Deforestation/ removal of vegetation around the river (2)

Over-cultivation (2) (1 x 2) (2)

3.3.4. Raster data (1) (1 x 1) (1)

3.3.5. Features are displayed in the form of pixels. (2) (1 x 2) (1)

3.3.6. Non-perennial river. (1) (1 x 1) (1)

(8)

**GEOMORPHOLOGY SOLUTIONS**

1.1. DRAINAGE BASIN

1.1.1. D√

1.1.2. B √

1.1.3. C√

1.1.4. E√

1.1.5. G √

1.1.6. A√

1.1.7. F √ (7x1) (7)

1.2. COLUMN A & COLUMN B

1.2.1. X √

1.2.2. Y √

1.2.3. X √

1.2.4 Y √

1.2.5. X√

1.2.6. Y√

1.2.7. X √

1.2.8. X √ (7x1) (7)

1.3. TYPES OF RIVERS

1.3.1. C
1.3.2. B
1.3.3. C
1.3.4. A
1.3.5. C
1.3.6. B
1.3.7. C
1.3.8. A (8x1) (8)

1.4. TYPES OF RIVERS

1.4.1. Permanent River√
1.4.2. Exotic River√
1.4.3. Episodic River√
1.4.4. Period River√
1.4.5. Permanent River√
1.4.6. Permanent River√
1.4.7. Episodic River √ (7x1) (7)

1.5. DRAINAGE PATTERN

1.5.1. Rectangular √
1.5.2. Dendritic √
1.5.3. Trellis √
1.5.4. Rectangular√
1.5.5. Trellis √
1.5.6. Dendritic √
1.5.7. Trellis √ (7x1) (7)

1.6. DRAINAGE PATTERN

1.6.1. C √
1.6.2. F√
1.6.3. A√
1.6.4. D√
1.6.5. E√
1.6.6. A√
1.6.7. F√
1.6.8. B √ (8x1) (8)

1.7. COLUMN A & COLUMN B

1.7.1. Y √
1.7.2. X√
1.7.3. Y√
1.7.4. Y√
1.7.5. X√
1.7.6. X√
1.7.7. Y√

(7x1) (7)

1.8. DRAINAGE DENSITY COLUMN A & COLUMN B

1.8.1. B √
1.8.2. A√
1.8.3. A√
1.8.4. B√
1.8.5. A√
1.8.6. B√
1.8.7. B√ (7X1) (7)

1.9. DRAINAGE DENSITY COLUMN A & COLUMN B

1.9.1. X√
1.9.2. Y√
1.9.3. Y√
1.9.4. Y√
1.9.5. X√
1.9.6. Y√
1.9.7. X√
1.9.8. Y √ (8 x1) (8)

1.10. Stream order.

1.10.1. C
1.10.2. A-1
B-2
C-3
D-4

1.10.3. B

1.11. TURBULENT & LAMINAR FLOW OF RIVER

1.11.1. B - Turbulent√
1.11.2. A -Laminar√
1.11.3. B-Turbulent √
1.11.4. B - Turbulent √
1.11.5. A - Laminar√
1.11.6. A - Laminar√
1.11.7. B- Turbulent √ (7x1) (7)

1.12. TURBULENT & LAMINAR FLOW OF RIVER

1.12.1. Laminar√
1.12.2. turbulent √
1.12.3. laminar √
1.12.4. turbulent√
1.12.5. turbulent √
1.12.6. laminar√
1.12.7. turbulent √
1.12.8. turbulent √ (8x1) (8)

1.13. LONGITUDINAL PROFILE OF A GRADED RIVER

1.13.1. C-D√
1.13.2. Sea √
1.13.3. H√
1.13.4. G√
1.13.5. F√
1.13.6. A-B√
1.13.7. Deltas√ (7x1) (7)

1.14. MULTIPLE CHOICE

1.14.1. C√
1.14.2. C√
1.14.3. A√
1.14.4. B√
1.14.5. C√
1.14.6. A√
1.14.7. C√
1.14.8. A √ (8x1) (8)

1.15 COLUMN A & B

1.15.1. G – Oxbow Lake√
1.15.2. E – Levee √
1.15.3. A – Braided Stream √
1.15.4. H – Rapids √
1.15.5. B – Delta √
1.15.6. F – Waterfall√
1.15.7. C – Undercut √
1.15.8. D – Meander √ (8x1) (8)

1.16 COLUMN A&B

1.16.1. Z√
1.16.2. Y√
1.16.3. Z√
1.16.4. Y√
1.16.5. Z√
1.16.6. Z√
1.16.7. Y√ (7X1) (7)

1.17 COLUMN A & B

1.17.1. Z√
1.17.2. Z√
1.17.3. Y √
1.17.4. Z √
1.17.5. Z√
1.17.6. Y√
1.17.7. Y√ (7x1) (7)

1.18._MULTIPLE CHOICE

1.18.1. B√

1.18.2. B√

1.18.3. A√

1.18.4. D√

1.18.5. C√

1.18.6. A√

1.18.7. A√

1.18.8. C √ (8X1) (8)

# 2. DATA RESPONSE QUESTIONS

## 2.1 DRAINAGE BASIN

2.1.1. The area of land drained by a river and its tributaries √√ (1x2) (2)

2.1.2. Watershed √ (1x1) (1)

2.1.3. (a) 2nd order √√ (1x2) (2)

(b) it has more tributaries√√ (1x2) (2)

2.1.4. **Low density**

- Density is usually lower in places that experience a dry climate√√ (2)
- Gentle slope increases the amount of infiltration into the ground√√ (2)

**High density**

- Density is usually higher in places that experience heavier rainfall √√ (2)
- Steeper slope increases the amount of run-off into streams causing higher density √√ (2) ANY TWO (2x2) (4)

## 2.2. DRAINAGE BASIN

2.2.1. The total area drained by a river and its tributaries √√ (2) (1x2) (2)

2.2.2. X √ (1) (1x1) (1)

2.2.3. Many streams to cover the greater part of the drainage basin √√ (1x2) (2)

2.2.4. An increase in precipitation will increase the number of streams √√ (2)

Saturated soil increases run-off, forming more streams√√ (2)

Low permeability results in run-off and more streams form√√ (2)

Sparse vegetation increases run-off and more streams form √√ (2)

Steep gradients increase run-off and more streams develop √√ (2)

ANY TWO (2x2) (4)

2.2.5. Drainage density will increase √√ (2)

More artificial surface and storm water drainage increase run-off outside urban development √√ (2)

Many small stream develops √√ (2) (3x2) (6)

**2.3 RIVER PROFILE**

2.3.1. Longitudinal profile√ (1x1) (1)

2.3.2. Meander √ (1)

Floodplains √ (1)

Oxbow lake √ (1)

Braided stream√ (1)

Levee/natural dykes√ (1) ANY ONE (2x1) (2)

2.3.3. A is V-shaped because of vertical erosion√√ (2)

C is wide with a gentle slope due to lateral (sideward) erosion

dominating. √√ (2) (2x2) (2)

2.3.4. Gradient is gentle√ √ (2)

Deposition is dominant√ √ (2)

More water has accumulated in the river√√ (2) ANY TWO (2x2) (4)

Flooding may drown people √ √ (2)

House closer to the river might be destroyed√√ (2)

Vegetation may be destroyed √ √ (2)

Flood deposits fertile soil for cultivation √√ (2) (2x2) (4)

2.4. **RIVER PROFILE**

2.4.1. Side view of a river from source to mouth √√ (2)

(1x2) (2)

2.4.2. It has concave shape√ √ (2)

2.4.3. It is steep in the upper course, less steep in the middle course and gradual in the lower course. √ √ (2) (1x2) (2)

2.4.4. Ultimate (permanent) – sea√ (1) (1x1) (1)

2.4.5. It will decrease the capacity/reduce the volume of water. √ √ (2) (1x2) (2)

2.4.6. Original longitudinal profile is graded/concave shaped with no temporary based level. √√ (2)

New longitudinal profile is ungraded/multi-concave has temporary based levels of erosion √ √ (2) (2x2) (4)

4.5.6. **Erosion**

More erosion upstream of dam due to greater water volumes. √√ (2)

Erosion temporarily stops at the dam. √ √ (2)

Rate of erosion decreases downstream of the dam due to less water√ √ (2)

**Deposition**

Deposition of silt in the dam results in less deposition downstream √√

The rate of deposition increases as the velocity of the water is reduced downstream. √√

**[must refer to both erosion and deposition]** ANY TWO (2x2) (2)

## 2.5 DEVELOPMENT OF FLUVIAL FEATURE

2.5.1. Meander √ √ (2) (1x2) (2)

2.5.2. Erosion √ √ (2) (1x2) (2)

2.5.3. water moves slower√ √ (2)

River loses energy√ √ (2)

River load thus deposited√ √ (2)

ANY TWO (2x2) (4)

2.5.4. deposition occurs in the meander neck√ √ (2)

It is cut out of the main stream√ √ (2)

It does not have supply of water from the river any more √ √ (2)

ANY TWO (2x2)(4)

2.5.5. The lower course of the river has a horizontal or flat gradient√ √ (2)

Velocity of the river decreases √ √ (2)

River has a large volume of water√ √ (2)

To overcome gentle gradient, the river starts to meander √ √ (2)

Deposition takes place as the gradient is minimal √ √ (2)

River erode the outer bank and deposition takes place along the inner bank √ √ (2)

River erode through the neck√ √ (2)

Oxbow lake remains behind and can dry to form meander scar √ √ (2)

ANY TWO (2x2)(4)

**2.6 FORMATION OF LEVEE**

2.6.1. (a) A raised bank of the river due to deposition √ √ (2) (1x2)(2)

(b) At C the sediments are heavier particles that are deposited first next to the river and are coarser and larger in size √ √ (2)

At D has finer particles/smaller materials are lighter and easily pushed away from water √ √ (2) (2x2)(4)

(c**) Advantages**

Protects farmland from flooding √ √ (2)

Traps fertile soil and prevents soil from re-entering the river √ √ (2)

Increases the carrying capacity of the river and allows for more water for

irrigation. √ √(2)

**Disadvantages**

Raised banks that restrict the deposition of silt in future √ √ (2)

It hampers irrigation as a raised bank would increase the costs of implementing irrigation √ √ (2)

Levee may trap flood water on the floodplain√ √ (2)

During the time of repeated flooding, the levee may break and damage the crops √ √

**[any 2, must refer to both advantages and disadvantages]** (2x2) (4)

2.6.2.

a. at the mouth/river mouth √ √ (2)

Along an inland lake√ √ (2)

In the lower course of the river √ √ (2)

At a temporary base level √ √ (2) (1x2) (2)

(b) river slows down as it reaches the sea and deposition occurs√ √ (2)

A gentle gradient when the river is entering into the sea√ √ (2)

(c) most rivers have steep gradients when entering the sea √ √ (2)

Reduce deposition (√ √ 2)

Rough seas at the mouth of the rivers do not allow the accumulation of

sediments√ √ (2)

Strong ocean current along south African coastline √ √ (2)

[ANY ONE] (1x2) (2)

**2.7 RIVER REJUVENATION**

2.7.1. When a river erodes (downwards) again because it is re-energised √ (1x 1) (1)

2.7.2. Lower course√ (1) (1x 1) (1)

2.7.3. Wide floodplain (almost flat) √ (1)

Wide river valley √ (1)

Meanders are visible √ (1)

River enters the sea/river mouth √ (1)

Presence of terraces √ (1)

Evidence of lateral erosion (1)

At the sea/ocean (label) √ (1)

Entrenched meanders √ (1)

Shading shows a deepening of the river channel √ (1)

[**ANY ONE]** (1 x 2) (2)

2.7.4. Gradient is steeper (river flows down a slope) √ √ (2)

Turbulent flow (fast flowing river has more energy) after rejuvenation √ √ (2)

Increase in volume of water √ √ (2)

Results in a higher velocity after rejuvenation√ √ (2)

**[ANY TWO]** (2 x 2) (4)

a. River channel has become deeper√ √ (2)

River channel has become wider √ √ (2)

River channel has become straighter (fewer meanders/curves/bends) √ √ (2)

River channel has steeper sides√ √ (2)

[**ANY ONE]** (1 x 2) (2)

(b) Meander loop has moved further downstream √ √ (2)

Meander downstream has disappeared √ √ (2)

Meander neck has become narrower (length and width of meander decreased) √ √ (2)

Meander is entrenched/incised/deepens√ √ (2)

**[ANY ONE]** (1x2) (2)

2.7.5. Increases the amount of silt in the dam √ √ (2)

Increased silt may damage the dam wall and cause it to collapse √ √ (2)

Silting negatively impacts on the biodiversity of dams √ √ (2)

Water holding capacity of dam reduced √ √ (2)

Less effective in controlling flood waters √ √ (2)

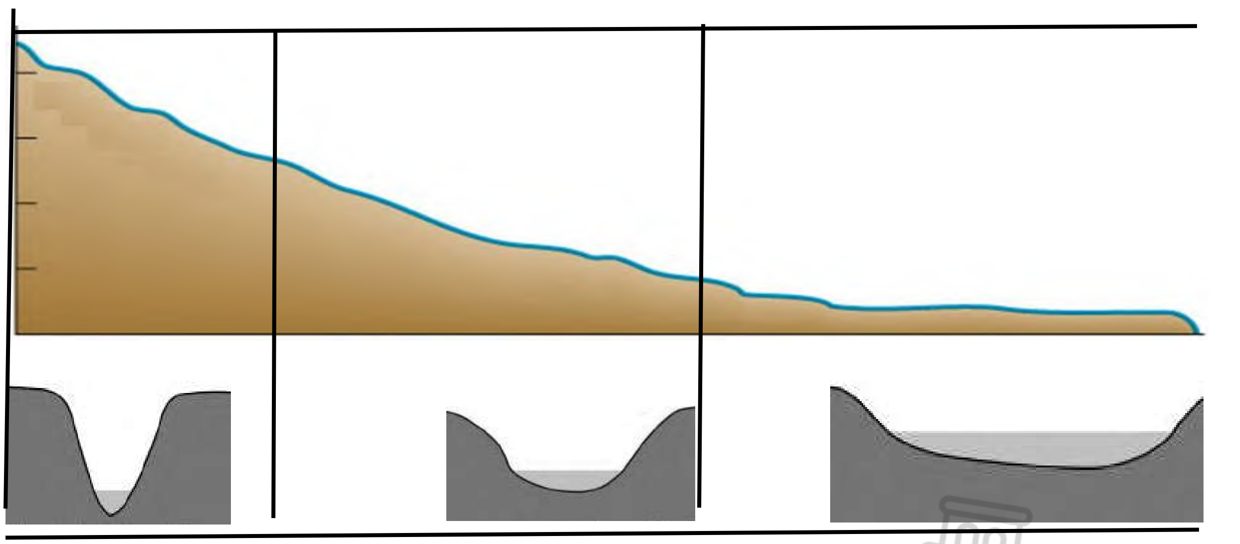
The increased volume and velocity of water may break the dam walls √ √ (2)

Increased in the cost of maintenance√ √ (2)

Water quality decreases when sediments are deposited √ √ (2)

**[ANY TWO]** (2x2) (4)

**2.8 RIVER PROFILE**



**2.8 Complete the table below using diagram figure 6.4**

| ELEMENT | UPPER COURSE | MIDDLE COURSE | LOWER COURSE |
|---|---|---|---|
| **Slope** | Steep slope√ | Gradual slope√ | Gentle slope√ |
| **Processes** | Downward/vertical erosion√ | Lateral erosion√ | deposition√ |
| **Velocity** | High velocity/speed√ | Gradually slow√ | Very slow√ |

| | | | |
|---|---|---|---|
| **Channel** | Narrow v shaped√ | U shaped√ | Wide open√ |
| **Flow type** | turbulent√ | laminar√ | laminar√ |
| **Stream volume** | Low √ | high√ | high√ |
| **Landforms** | Waterfall, rapids, plunge pool√ | Rapids, levees√ | Floodplains, deltas alluvial fans, sand dunes√ |

## 2.9 SUPERIMPOSED AND ANTECEDENT DRAINAGE

2.9.1. **Antecedent drainage** River flows on a younger landscape which is altered by tectonic forces√ (1) River is older than the landscape over which it flows √ (1)

2.9.2. A Antecedent

B Superimposed

2.9.3. Both rivers maintain their original course √ √ (2)

2.9.4. Folding √ √ (2)

2.9.5. The rate of down cutting by the river is equal to the rate of upliftment/ there is a balance between the two processes√ √ (2)

2.9.6. High lying ridge form infrastructure obstructions √ √ (2)

Building roads and railways would be more expensive√ √ (2)

The landscape is hilly and it is difficult to use machinery√ √ (2)

The building costs of houses will be higher √ √ (2)

[any TWO] (2x2) (4)

**2.10 CATCHMENT AND RIVER MANAGEMENT**

2.10.1. Inadequate municipal sewage treatment (1)

2.10.2. Studies show the presence of harmful viruses in the river√ √ (2)

2.10.3. An outbreak of diarrhea in Durban √ √ (2)

Two children died√ √ (2)

People are hospitalized √ √ (2)

It could cause an outbreak of cholera √ √ (2)

People cannot go to work √ √ (2)

Loss of income √ √ (2)

People cannot afford high cost of health care √ √ (2)

**[Any TWO]** (2x2)(4)

2.10.4. Stricter control and enforcement of legislation which monitors effluents from factories √ √ (2)

Heftier fines to punish polluters √ √ (2)

Improved waste treatment facilities √ √ (2)

Have a buffer so that people cannot live close the rivers√ √ (2)

Provide running water in or close to homes √ √ (2)

Regular testing of water quality √ √ (2)

Increased awareness of and education on the problem which people cause by living so close to river √ √ (2)

**[ANY FOUR]** (4x2) (8)

## 3. MAP INTERPRETATION AND ANALYSIS

3.1.1. Perennial river√ (1x1) (1)

3.1.2. Perennial rivers are visible with a blue solid line √ √ (1x2) (2)

3.1.3. North √√ (1x2) (2)

3.1.4. The tributaries join the main stream in the north direction √ √ (2)

The position of the dam wall - water accumulates on the direction from where the river comes√√ (2)

3.1.5. Vector – use of point, line and polygon to identify geographic features √√ (2)

3.1.6. Lines – non perennial river, contour lines √ (1)

Polygon – cultivated land√ (1) (2x1) (2)

3.1.7. It provides enough water for irrigation√√ (2)

Farmers will have sustainable water for their stock-farming√√ (2) (2x2) (2)

## 3.2 MAP INTEGRATION

3.2.1. Northwest turning north (1)

(1x1) (1)

3.2.2. Tributaries joining at acute angles from the northeast and southeast (1)

Waterfall retreats upstream (1)

The waterfall retreats in a north-westerly direction (1)

**[ANY TWO]** **(2 x 1) (2)**

3.2.3. Augrabies waterfall (1) (1 x 1) (1)

3.2.4. It causes the profile to ungraded or multi concave √ √ (2) (1 x 2) (2)

3.2.5. Incised meander is evident √ √ (2) (1 x 2) (2)

3.2.6. Water is deeper and make extraction difficult and more expensive for agriculture √ √ (2)

The steep slopes make the construction of roads impossible√ √ (2)

Bridges have to be built in order to have access over the river, which is expensive √ √ (2)

**[ANY TWO - MARKS WILL BE AWARDED FOR AGRICULTURE AND ROAD DEVELOPMENT] (2 x 2) (4)**

**Worksheet**

**1.1. Define the following concepts**

**1.1.1. Drainage basin is an a**rea drained by a river and its tributaries √ √

**1.1.2. Confluence is a** point where two rivers/streams meet √ √

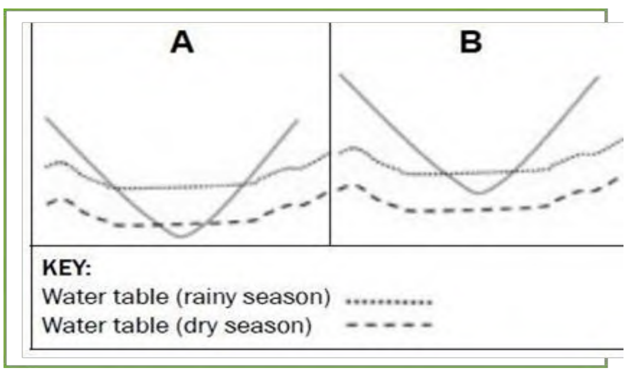
**1.1.3 Interfluves is a** High lying areas which separate tributaries within the same drainage basin√ √

**1.1.4. Base flow** Refers to the movement of groundwater that seeps into streams. √ √

**1.1.5. Watershed** is high lying areas separating different drainage basins. √ √

[10]

**1.2.1. Identify the types of rivers marked by A and B**




**A**- Permanent river √

**B**- Periodic River√

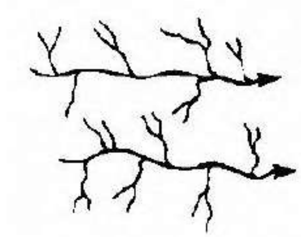
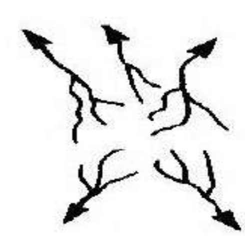
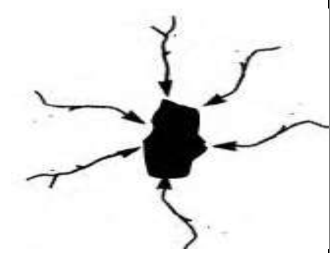
1.2.2 Explain both rivers in relation to water table.

**A Permanent** rivers flow all year round because the river water table always above the river bad throughout the year. √ √

B **Periodic Rivers** only flow during the rainy season, because the water table is above the river bed only in the rainy season. √ √

**[6]**

1.3. Identify the following drainage patterns and for each give the underlying rock and TWO characteristics

<table>
<tr><td>A -Dendritic√</td><td>B-Trellis √</td><td>C -Radial / Centrifugal√</td><td>D -Radial Centripetal √ (4)</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Rock structure</td><td>Rock structure</td><td>Rock structure</td><td>Rock structure</td></tr>
<tr><td>3.2 -rocks of uniform resistance to erosion√ √ - massive igneous rocks and horizontal sedimentary Rocks√ √</td><td>3.3 Alternating layers of hard and soft rock. √ √</td><td>3.4 It forms in areas where domes and volcanoes occur. √ √ - Associated with massive igneous rocks. √ √</td><td>3.5 Associated with massive igneous rocks. √ √</td></tr>
<tr><td colspan="4">Description</td></tr>
<tr><td colspan="4">A- Dendritic drainage patterns Looks like branches of a tree and Tributaries join the main river at acute angles or less than 90˚√ √</td></tr>
<tr><td colspan="4">B- The trellis Strong drainage patterns, main river is joined by short tributaries at right angles/90˚and The main streams are parallel to each other. √ √</td></tr>
<tr><td colspan="4">C- Radial / Centrifugal Rivers flow away from a high central point such as a mountain or</td></tr>
</table>

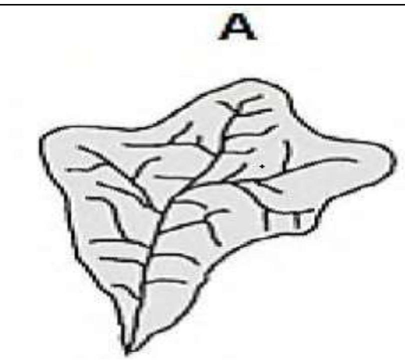
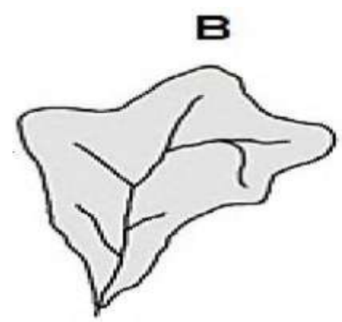
| |
|---|
| volcanic mountain √ √ |
| **D Radial Centripetal-** Streams flow towards a central basin such as a marsh or lake. √ √ |

[20]

**4.1 What is drainage density?**

Drainage density is the ratio between the total length of all the stream channels in the drainage basin and the area of the drainage basin. √ √

**4.2** Identify drainage density **A with B.**

| | |
|---|---|
|  |  |
| **A-**High drainage density√ | **B-** Low drainage density √ |

**4.3 Discuss how the difference in gradient and vegetation as influenced the drainage density of A and B respectively.**

4.3.1 **Gradient:**

**In drainage basin A the gradient is steep,** which increases run-off and more streams are created which results in a high drainage density. √ √

**In drainage basin B the gradient is gentle,** which increases infiltration and fewer streams will be created which result in a low drainage density. √ √

4**.3.2 Vegetation**

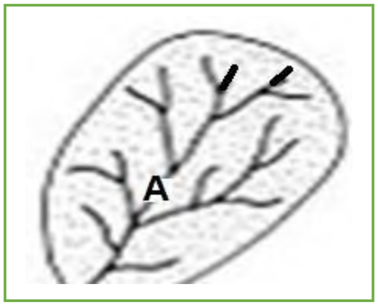
**Drainage basin A has less vegetation cover,** therefore run-off is not slowed down and more streams will have created resulting in a high drainage density√ √

Drainage basin B has more vegetation cover therefore there is more infiltration and fewer streams will be created resulting in a low drainage density √ √

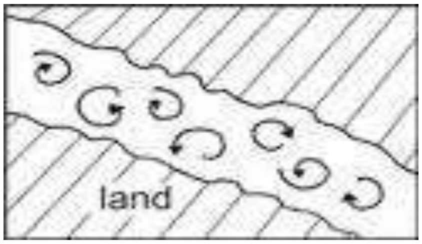
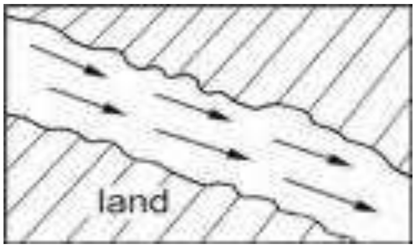
**4.3.3 An urban area is set to be built near the drainage area B. Discuss how these new development is going to affect the drainage density around these areas.**

- Removal of vegetation for urban development will increase the drainage density as will be less infiltration√ √
- There will be more surface run-off and thus more streams √ √
- Removal of vegetation will increase surface run-off. √ √
- Concrete surface will promote run-off

4.4 Identify the stream order at **A: 3rd stream order**√

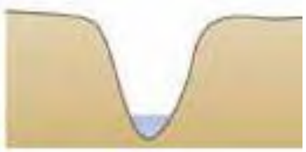
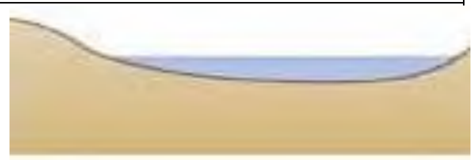



**5.1 Identify the following stream flow/Discharge and give the course of the river where they are most likely to occur**

| A | B |
|---|---|
|  |  |
| **Flow A:** Turbulent flow √ | **Flow B:** Laminar flow √ |
| **River course:** Upper course √ | **River course:** Lower course √ |

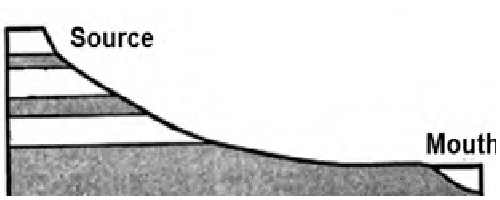
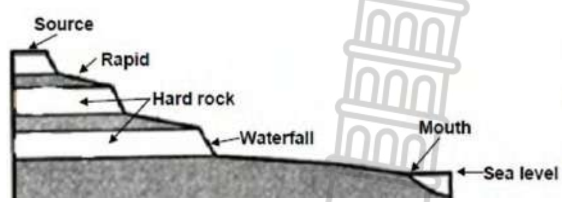
**5.1.1. Define the term cross/transverse profile of the river.** Side view of the river from bank to bank√ √

**5.1.2.Identify the river course represented by the following cross sections and f explain the processes responsible for their different shapes.**

| **A**- Upper course√ | **B-** middle course√ | **C**-Lower course √ |
|---|---|---|
|  |  |  |
| **Process responsible/Type of erosion** | **process responsible/ Type of erosion** | **process responsible 2** |
| Vertical/Downwards erosion√ | Lateral erosion√ | Deposition (also lateral) √ |

5.1.3. **Define the longitudinal profile-** Side view of the river from the source to the mouth √ √

**5.1.4 Identify and describe the longitudinal profile A and B**

| | |
|---|---|
| A<br><br> | B<br><br> |
| **Identify:** Graded profile√ | **Identify:** Ungraded profile√ |
| **Description:** It is a smooth concave profile from source to mouth√ √ | **Description:** It is uneven and has many obstacles along the course of the river, e.g. waterfalls, rapids, lakes. √ √ |

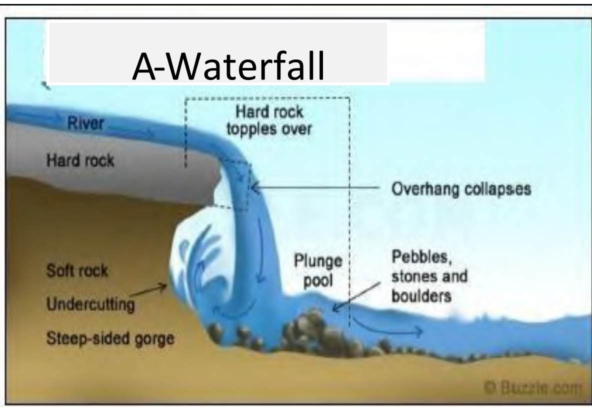
**5.1.5 Differentiate under graded river and over graded rivers**

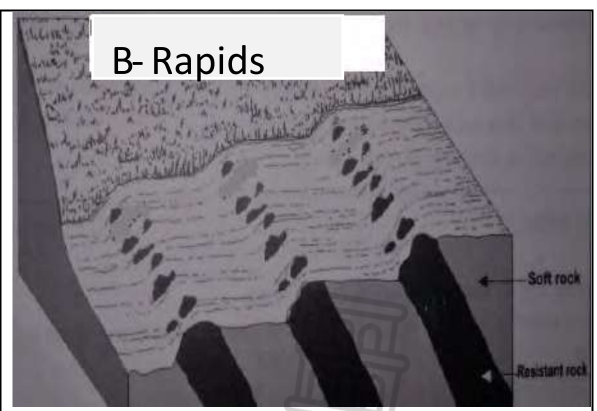
| | |
|---|---|
| **Under graded** If a river does not have enough energy to carry its load, deposition will take place. √ √ | **An over-graded** river has more energy than is required to move its water and its load and thus it will be able to erode its channels. √ √ |

**FLUVIAL LANDFORMS**

**6.1. FLUVIAL LANDFORMS OF THE UPPER COURSE**

**6.1.1 Identify and describe the fluvial lands forms A and B of the upper course**




**6.1.2 State ONE way in which feature A can be eliminated**

Backward retreat√

**6.1.3 What are the benefits of fluvial land form A?**

They attract tourists to the area. √ √

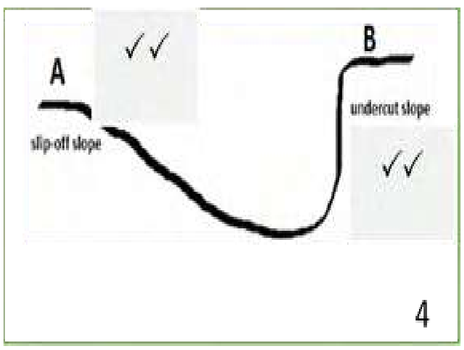
Water can be used to generate electricity√ √

**6.2 FLUVIAL LAND FORMS OF THE MIDDLE AND LOWER COURSE**


**6.2.1 Identify the stream channel pattern above**: meander√

**6.2.2 In which course/s of the river is this channel pattern found**. Middle and lower course√

**6.2.4 Draw a fully labelled cross section between A and B of the slip-off slope**



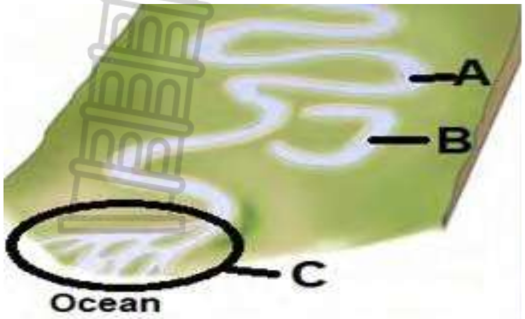

**6.2.5. State ONE characteristic of the slip-off slope**

Deposition takes place /it is a shallow slope/ convex slop √

**6.2.6 State ONE characteristic of the undercut slope**

Erosion takes place/ Deep slope/concave slope√

**6.3 FLUVIAL LAND FORMS OF THE LOWER COURSE**




**6.3.1 Identify the fluvial land form B in the diagram above.** Oxbow lake √

**6.3.2 In which course of the river is the fluvial land form above more likely to form?** Lower course√

**6.3.3 Briefly describe the formation of feature B**

Ox-Bow lakes form from a meander that is cut off from the main stream. √ √

Erosion is takes place leading to the formation of the meander neck. √ √

As times goes on, the meander neck reduces in size or narrows and cut off. √ √

Water will flow straight, no longer following the meander. √ √

Where deposition was takes place therefore separating the meander loop from the main stream. √ √

**6.3.4 Provide suitable terms to describe A when it dries up?** Meander scare√

**6.3.5 Identify the fluvial feature C.** deltas√

**6.3.6 What term is given to the river channels (branches)?** Distributaries√

**6.3.7 Explain TWO conditions necessary for the formation of deltas**

The river must have a large amount of sediments. √ √

The sea must have weak currents and a small tidal range. √ √

The sea must be shallow at the river mouth. √ √ (2X2) (4)

**6.4. River rejuvenation**

6.4.1 **Define River rejuvenation:** It's a process where the river regains and renews its erosive power and begins to erode vertically. √ √

**6.4.2. Mention two causes of river rejuvenation.**

High rainfall increases the erosive potential of the river. √ √

Sea level drops and the river tries to erode to a lower level. √ √
Uplift of the land/ isostatic uplift (crustal movement). √ √

Increased volume of water as a result of river capture. √ √

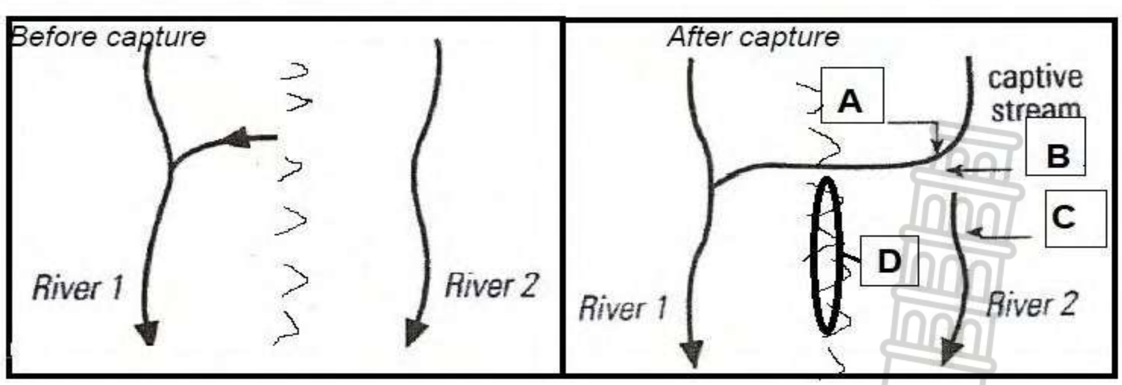
**6.4.3. Give TWO evidences/features of rejuvenation**

Knick point (waterfall) √

Terraces/ Valley in a valley√

Incised meanders √

**6.5 RIVER CAPTURE**



**6.5.1 Explain river capture: **One river capturing /stealing/robbing/water of another river√ √

**6.5.2 Identify the features marked A, B, C and D**

| | | | |
|---|---|---|---|
| A; Elbow of capture□ | B; Wind gap□ | C; Misfit stream□ | D; Water shared □ |

**6.5.3 Explain the changes that will happen in river 1 after capturing of the river**

Increased volume of water in the river (wider river channel) √ √

Increased velocity of stream flow of water √ √

Increase in vertical erosion due to increased flow√ √

Results in rejuvenation of the river √ √

Increase in carrying capacity √ √

Incised meanders/Valley in a valley/Terraces develop because of increase in erosive power. √ √

Formation of Knick point waterfall at point of capture√ √

Increase in size of drainage basin √ √

**6.5.4. Discuss measures that can be taken to protect our catchment areas**

Reuse, recycle before disposing of waste√ √

Educate people on environmental awareness. √ √

Repair broken sewerage without delay. √ √

Introduce by-laws to curb water and land pollution. √ √

Cleaning campaigns to clear waste√ √

Awareness programmes using all forms of the media. √ √

Policing catchment areas to deal with by-law violators √ √

Spot checks on companies to ensure compliance with the law √ √

Improve general waste management. √ √

Implement buffer areas close to the rivers. √ √

Effective sewerage management √ √

Plant trees near water sources. √ √

Incentives for community clean-up programmes √ √

1. Complete this worksheet that is based on factors influencing infiltration and drainage density.

| CONCEPTS | |
|---|---|
| Drainage density | The drainage density is the measure of the total length of stream channels in a drainage basin per unit area of drainage basin. |
| Infiltration | Water soaks or filters into the soil |
| Surface run-off | Water moves across the surface of the earth becoming a stream, tributary or river |

**TYPES OF DRAINAGE DENSITY**

| | | |
|---|---|---|
| How does it look like |  |  |
| IDENTIFICATION | Low drainage density | High drainage density |
| DESCRIPTION (CHARACTERISTICS) | Few stream channel per unit area of drainage basin. | high stream channel per unit area of drainage basin |

**FACTORS INFLUENCING INFILTRATION AND RUN-OFF**

| FACTOR | EFFECT ON INFILTRATION | EFFECT ON RUN-OFF |
|---|---|---|
| 1.Precipitation | Less rainfall can be easily absorbed by soil and result in high infiltration and low drainage basin. | High rainfall cause water to quickly flow on top of the surface as surface run-off which increase the drainage. |
| 2. Evaporation | High evaporation rate will lead to reduced run-off resulting in fewer number of streams. | Low evaporation rate will lead to increased run-off resulting in a high number of streams. |
| 3.Soil moisture | Dry can quickly absorbs water hence high infiltration rate can be experienced resulting in low drainage density. | Wet soil promotes more surface run-off leading to a high drainage density. |
| 4.Vegetation | Thick forest reduce high runoff and promote high infiltration resulting in low drainage density. | Un-vegetated areas or bare land will experience high surface run-off and high drainage density. |
| 5.Slope/Gradient | Gentler slopes promotes more infiltration and low drainage density. | Steep slope generally does not allow water to sink, hence they promote high surface run-off which and high drainage density. |
| 6.Porosity | Porous rocks or soil allows | Clay soil do not allow water to |

| | | |
|---|---|---|
| | water to easily infiltrate leading to low density. | pass through easily, resulting in high surface run-off which lead to high drainage density. |
| 7.Permeability | Permeable rocks such as limestone absorbs water easily leading to more infiltration and low drainage density. | Impermeable rocks such as Granite and basaltic rocks promote run-off resulting in high drainage density. |

**FACTORS INFLUENCING DRAINAGE DENSITY**

| FACTOR | EFFECT – LOW DRAINAGE DENSITY | EFFECT – HIGH DRAINAGE DENSITY |
|---|---|---|
| 1.Precipitation | A decrease in precipitation in arid areas lower drainage density | Increase in precipitation results in high run-off and a high density |
| 2.Evaporation | High evaporation will lead to fewer number of streams | Low evaporation rate lead to high number of streams |
| 3.Soil Moisture | Soil with little moisture will results in high infiltration and less streams | Soil with high moisture will results in low infiltration and high run-off |
| 4.Vegetation | Areas with high vegetation cover will have high infiltration and less streams | Areas with little vegetation will promote high run-off and less infiltration |
| 5.Slope/Gradient | Gentle slope will promote high infiltration and less streams | Steep slope will promote high run-off and less infiltration |
| 6.Porosity/Permeability | High porosity and high permeability will lead to high infiltration and less streams | Low porosity and low permeability will lead to high run-off. |

Worksheet

2. Complete the table below based on river rejuvenation.

| | River rejuvenation | River capture |
|---|---|---|
| Definition | The process where a river regains its energy and start to erode vertically<br><br>(2) | Where a river robs the headwaters of another river and increases the size of its drainage basin<br><br>(2) |
| Reasons for formation or causes | Upliftment of the land<br>Volume of water<br>Higher rainfall<br>Sea drops | Steeper gradient<br>High volume of water<br>High rainfall<br>River rejuvenation<br>Softer rock |

| | | |
|---|---|---|
| | (3) | (3) |
| Three features associated | Knick point<br>Paired Terrance's<br>Valley within a valley<br>Entrenched/incised meander<br><br>(3) | Misfit<br>Headed stream<br>Wind gap<br>Elbow of capture<br>River gravel<br><br>(3) |
| Human impacts (positive or negative) three each. | Its associated with steep slope and deep gorge that will not be suitable for human activities | People who are along the lower course of captured river will be disadvantaged.<br>There will be less water available for agriculture, domestic use and industrial used.<br>The captor stream will have enough water for hydro-electricity, irrigation, industrial and household use. |

| | | |
|---|---|---|
| | (6) | The captor stream may experience flooding during rainy seasons because it has more water. (6) |