



LIMPOPO
PROVINCIAL GOVERNMENT
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DEPARTMENT OF
EDUCATION

**DEPARTMENT OF EDUCATION
CAPRICORN NORTH DISTRICT
GEOGRAPHY GRADE 12
ACTIVITY BOOKLET
2024/25**

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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
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- 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. $(4 \times 2) = (8)$.

- 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.

SECTION A: Climate and Weather

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- Slope aspect:

- Definition
- Effect on the distribution of temperature in a valley
- Definition and development of:
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 - Definition
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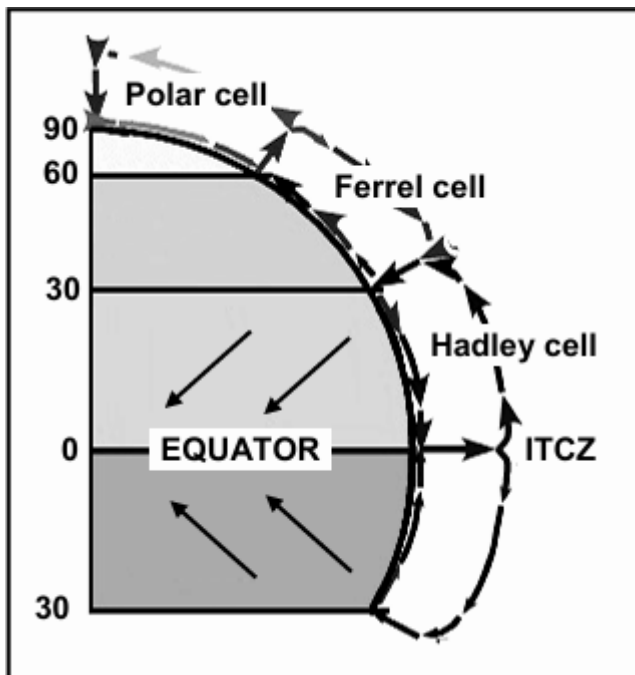
Interpretation of synoptic weather maps (integrate with the relevant content)

- Use of international symbols
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- Compare satellite images to synoptic weather maps

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 0°
 - B 30°
 - C 60°
 - D 90°
- 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 0°
 - B 30°

C 60°

D 90°

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°

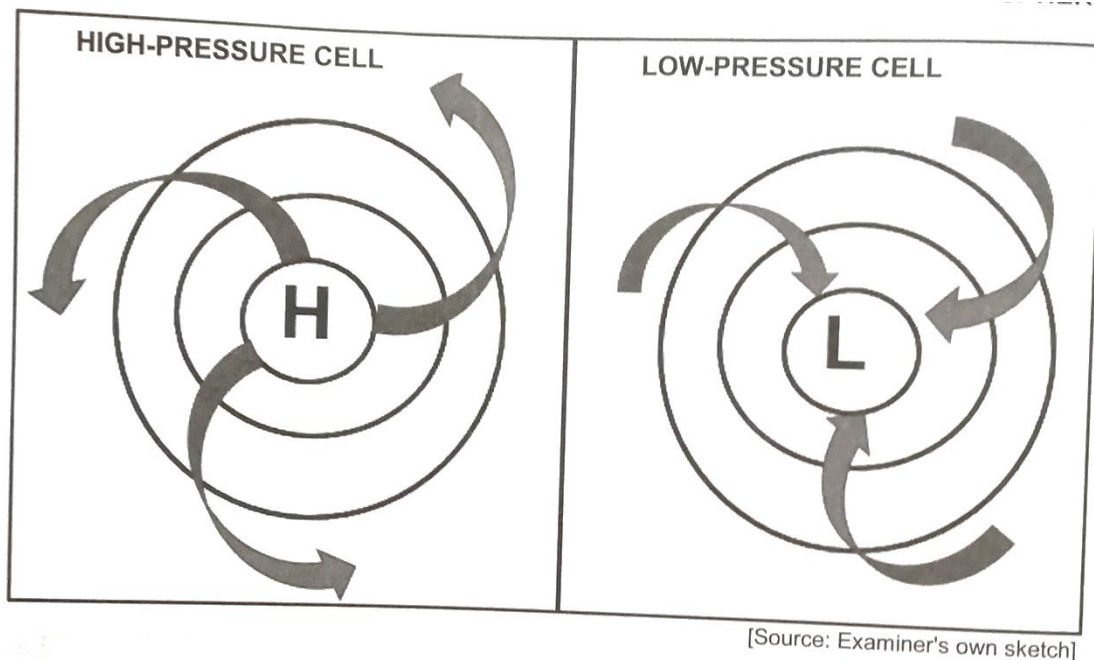
B. 30°

C. 60°

D. 90°

(1 x 1) (1)

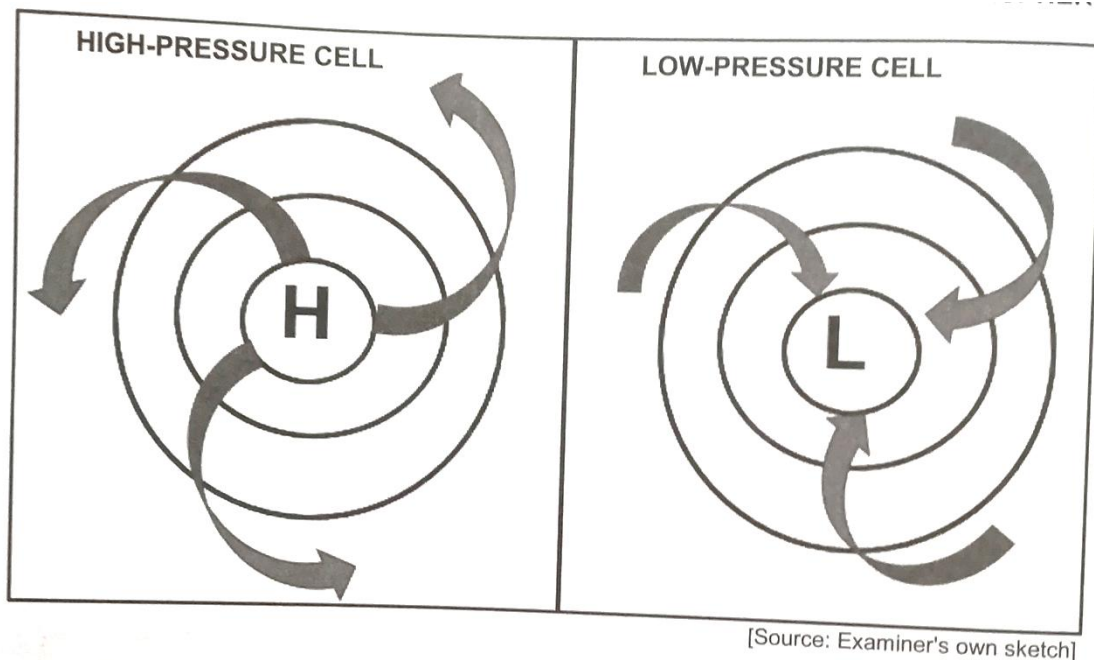
1.2 Refer to FIGURE 1.2 showing a high and a low-pressure cell in the Southern Hemisphere. Match the statements below with the **High-pressure cell** or **low-pressure cell**.



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

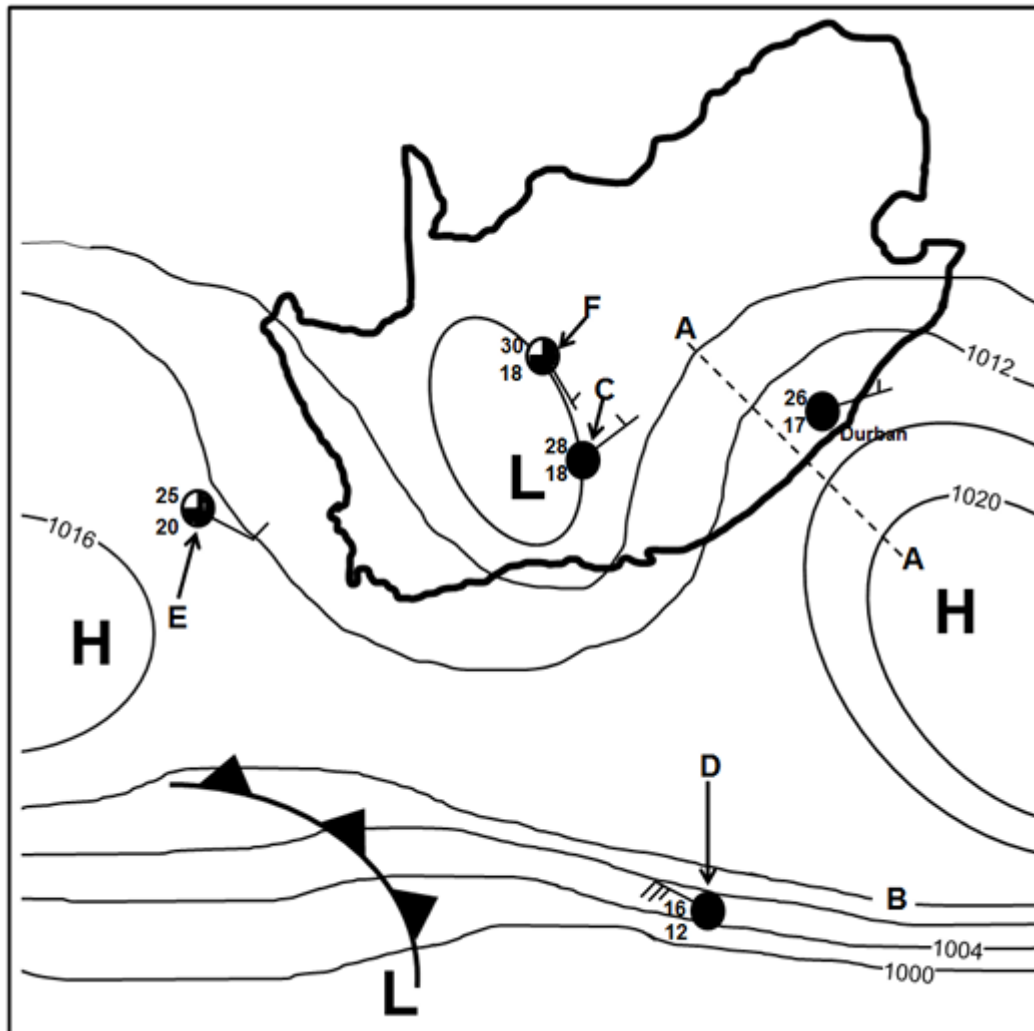
1 x 8 (8)

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**.



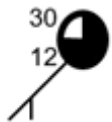

- 1.3.1 Develops mostly in summer.
- 1.3.2 Associated with convergence of air.
- 1.3.3 Associated with overcast cloud cover
- 1.3.4 Associated with clear sky
- 1.3.5 Stable weather conditions over the surface
- 1.3.6 Pressure readings decrease towards the centre.
- 1.3.7 Which pressure is also regarded 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.



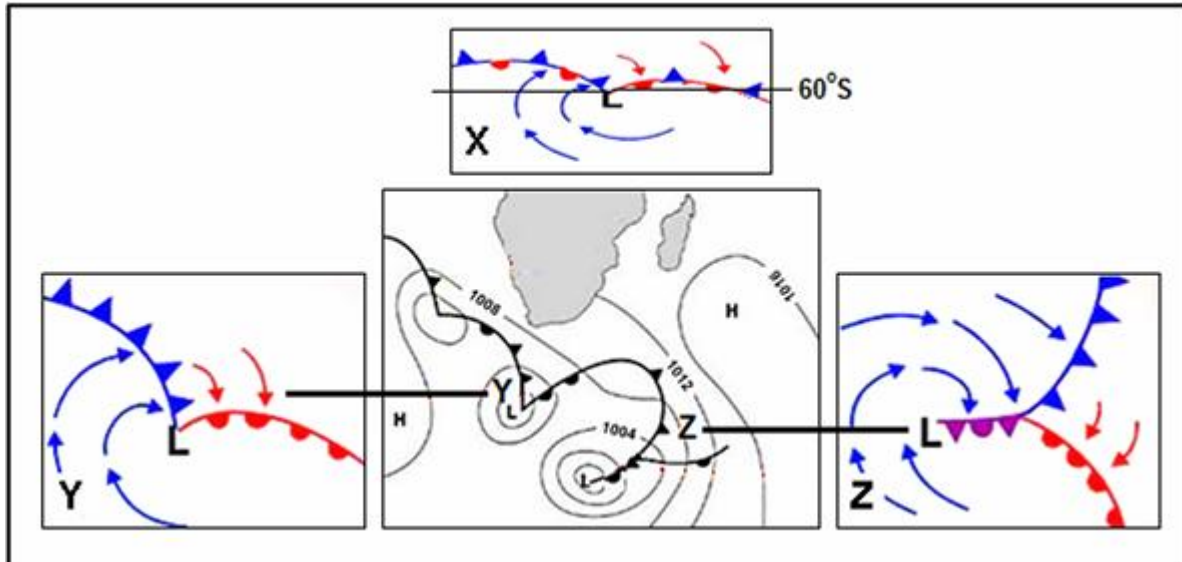
[Source: Examiner's own sketch]

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

1.4.4. The air pressure gradient is steeper around the weather station at	Y D Z E
1.4.5. The north easterly wind at Durban is influenced by the Circulation of air.	Y anticlockwise Z clockwise
1.4.6. The unstable weather conditions at weather station C are due to the development of a from.	Y cold Z moisture
1.4.7. Which weather station illustrate the following weather changes at F in the next 24 hours? <ul style="list-style-type: none"> The wind direction changes to south-west The air temperature decreases by 6 ° C 	Y  Z 

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

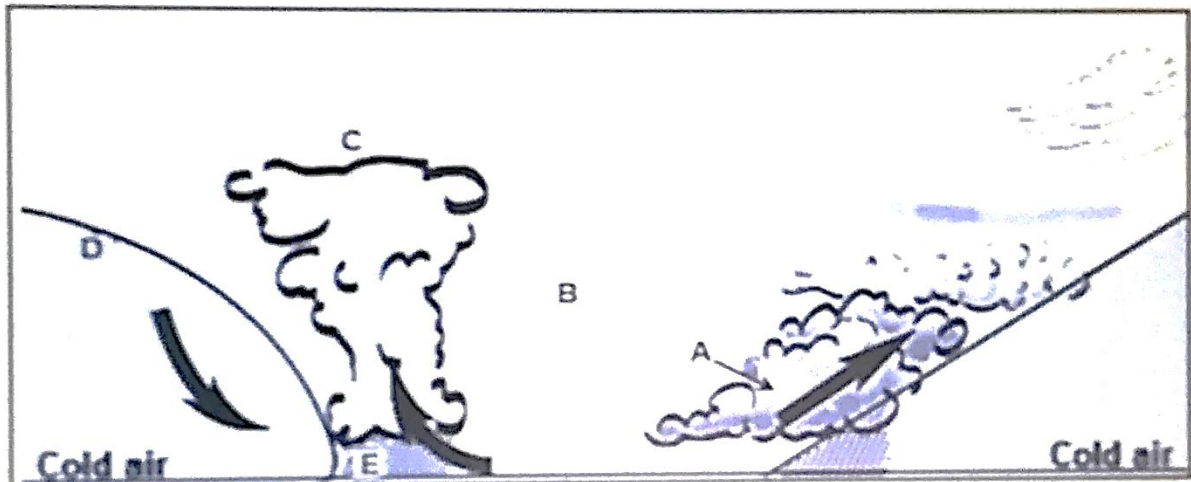
FIGURE 1.5: STAGES IN THE DEVELOPMENT OF MID-LATITUDE CYCLONES



- 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 ...

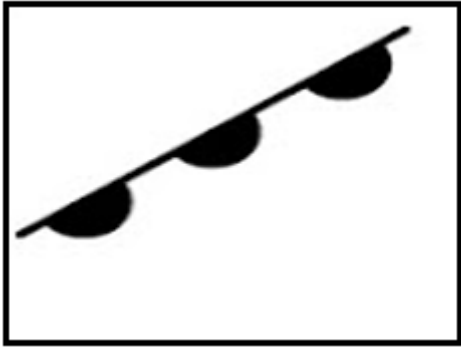
A veering.

B backing.

C rotating.

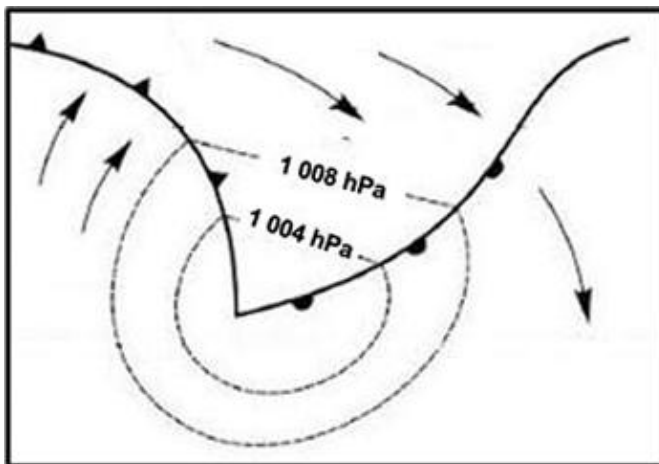
D converging.

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.



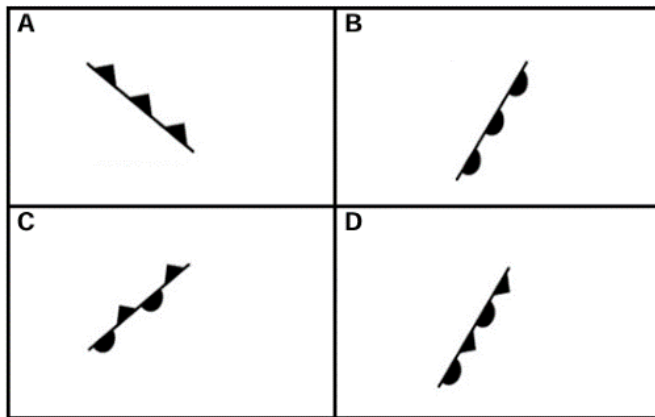
[Source: <https://www.google.com/search?q=mid-latitude>]

- A. initial
- B wave
- C mature
- D occluded

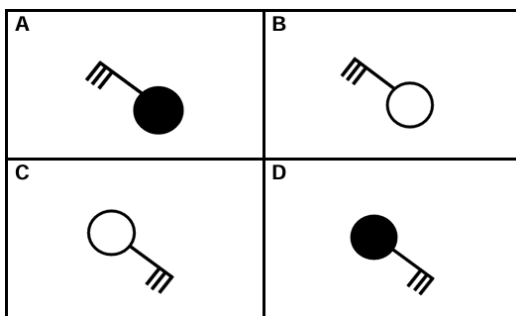
1.13.5. The conditions experienced behind a cold front are a/an ...

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

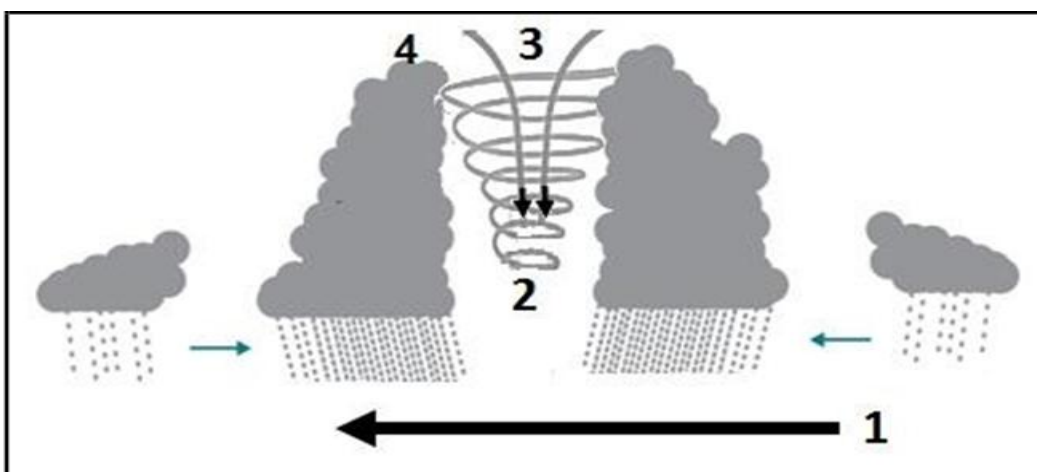
1.13.1. Provides energy that contributes to the formation of the tropical cyclone	A dissipating
1.13.2. Local name given to a tropical cyclone in South-east Asia	B eye wall
1.13.3. Cooler air sinks and there is no rain in this section of the tropical cyclone	C immature
1.13.4. The stage where cooler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

(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

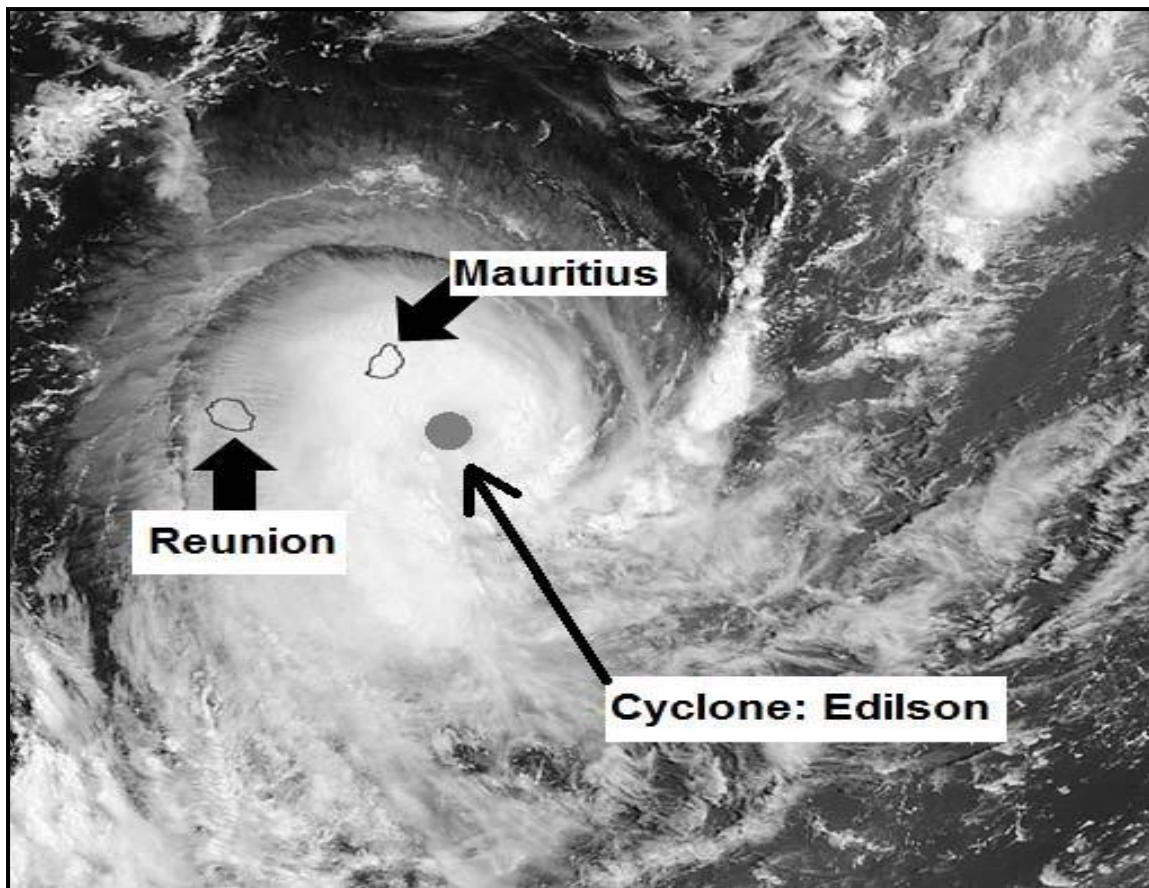


[Adapted from <https://maritimesa.org/grade-11/2016/09/23/influence-of-weather>]

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

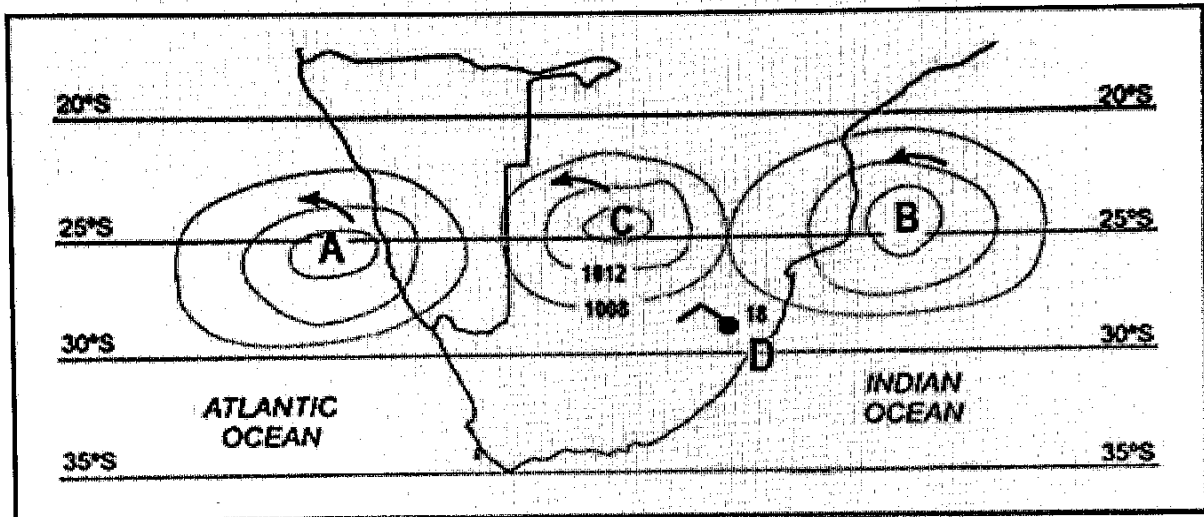


- 1.13.1. Identify the type of cyclone represented in the satellite image.
- 1.13.2. Is this a high- or low-pressure system?
- 1.13.3. In which season does this weather system occur?
- 1.13.4. Name the prevailing winds that drive this cyclone
- 1.13.5. Name the global air circulation cell in which this 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

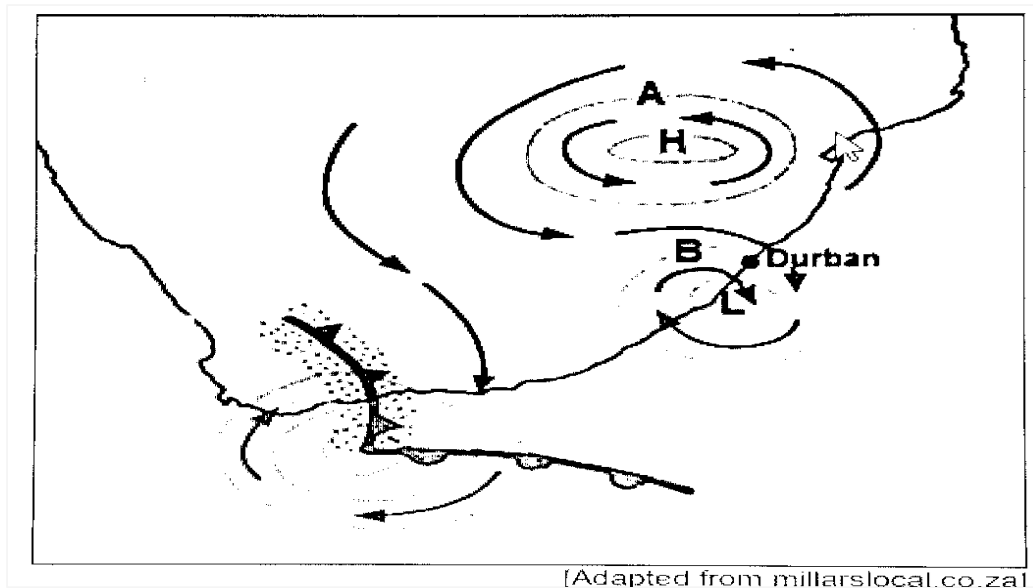


[Source: http://www.aelsnet.net/eportal/pluginfile.php/412/mod_imscp/content/2/influence_of_pressure_systems.htm]

- 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)

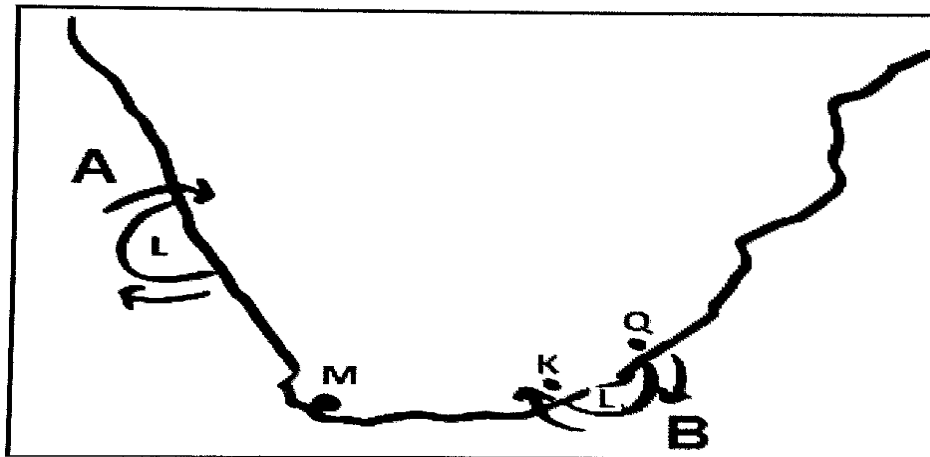
- 1.15. Refer to the diagram showing two pressure cells, A and B. Choose ONE term in brackets to make each of the following statements TRUE:



- 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

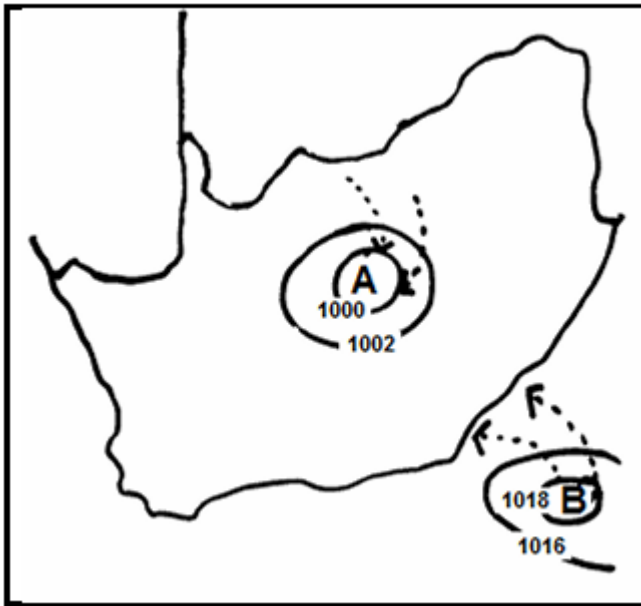


[Source: Examiner's own sketch]

- 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]

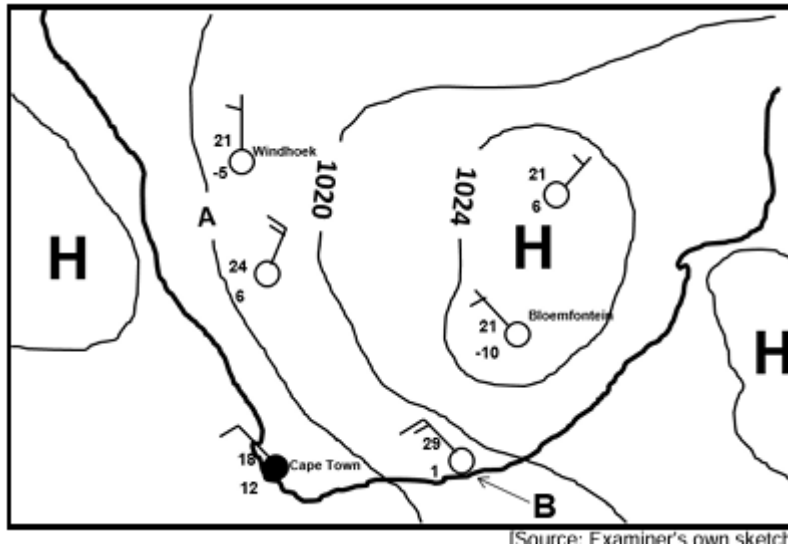
- 1.17.1. Known as the heat low pressure cell
 - 1.17.2. Also referred to as an anticyclone
 - 1.17.3. Associated with unstable weather conditions
 - 1.17.4. Causes south-easterly winds to blow over the east coast of South Africa
 - 1.17.5. Air diverges from this pressure cell
 - 1.17.6. Dominates the 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.

- 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.

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- 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.



- 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

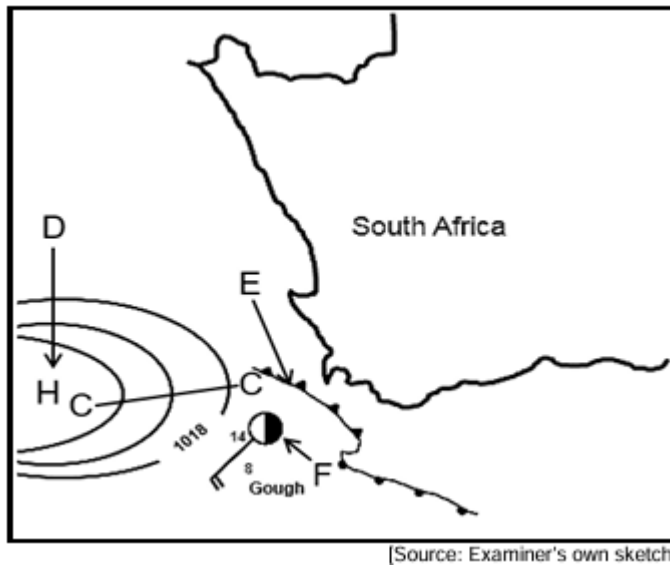
A (i) and (iii)

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.



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.

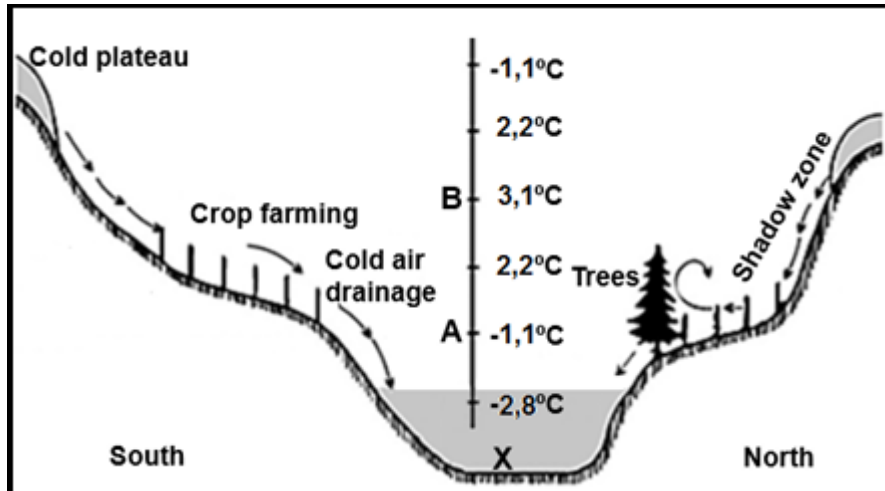


[Aspect (geography) – Wikipedia]

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

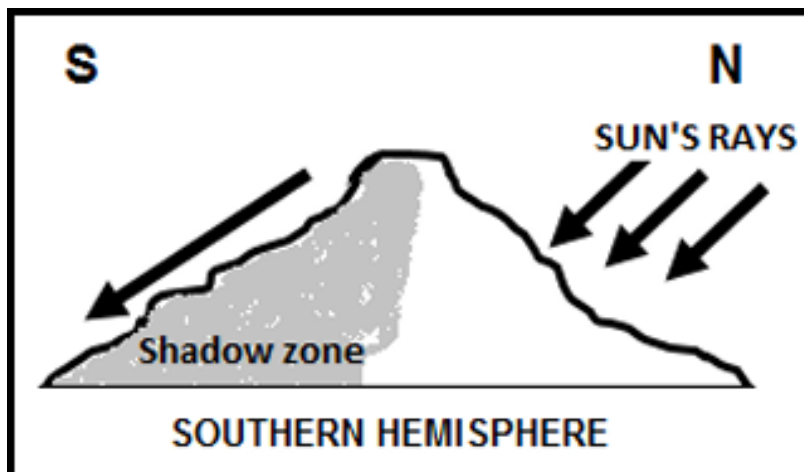
(1 x 7) (7)

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.



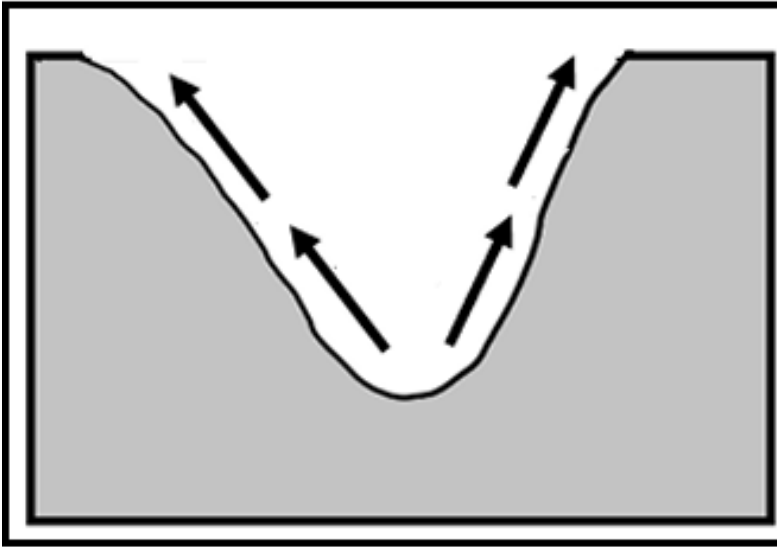
[Examiner's own sketch]

- 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

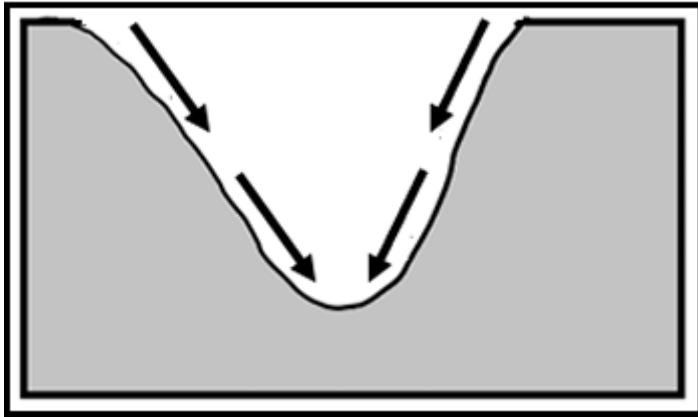
1.22.4. The air movement shown in the sketch can result in ...



[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)

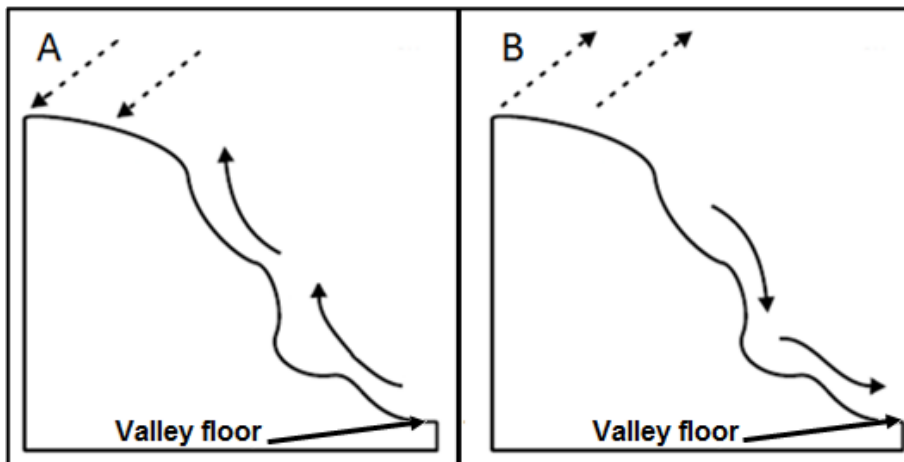
B (iv), (iii), (ii), (i)

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.

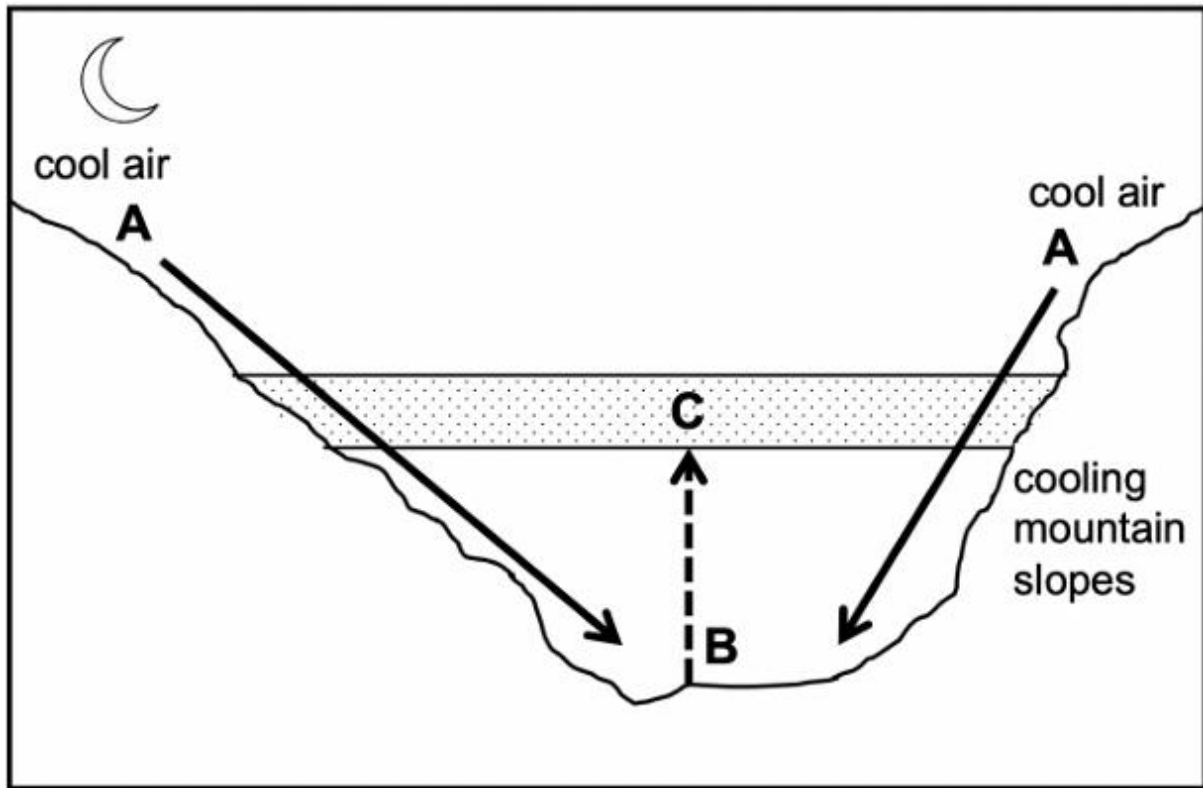
1.23.5. Air movement associated with the formation of frost on the valley floor.

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.



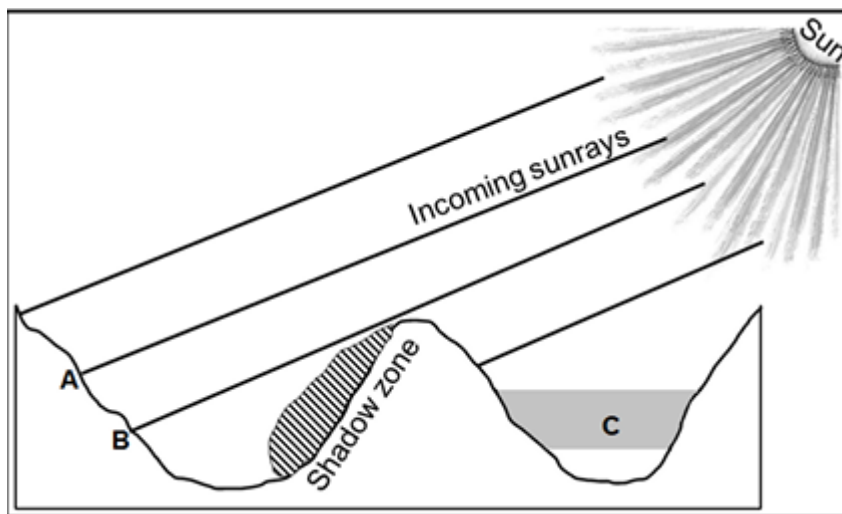
[Source: Examiner's own sketch]

- 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.

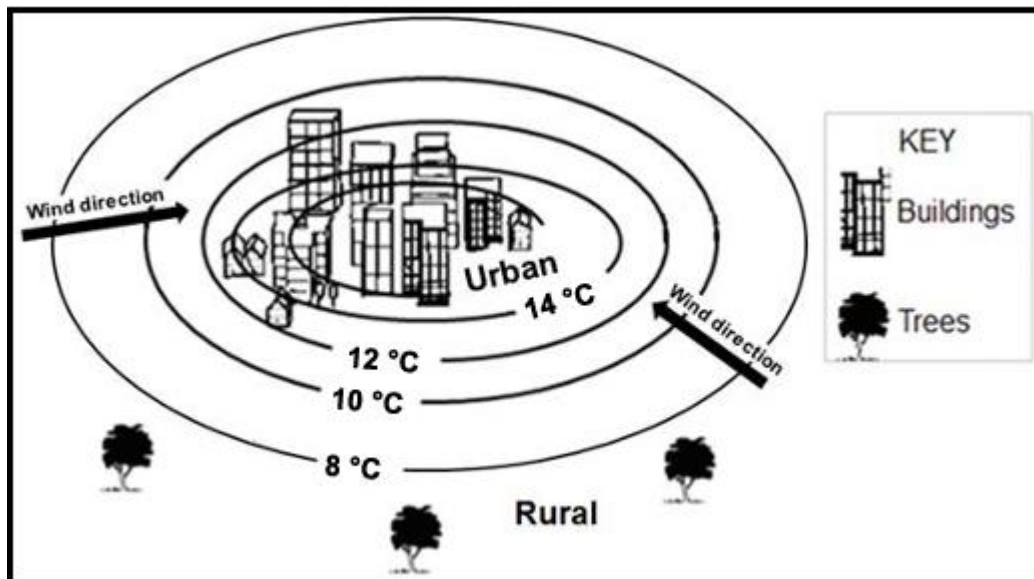
1.25.3. The climatological phenomenon occurring at C is ...

- 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.

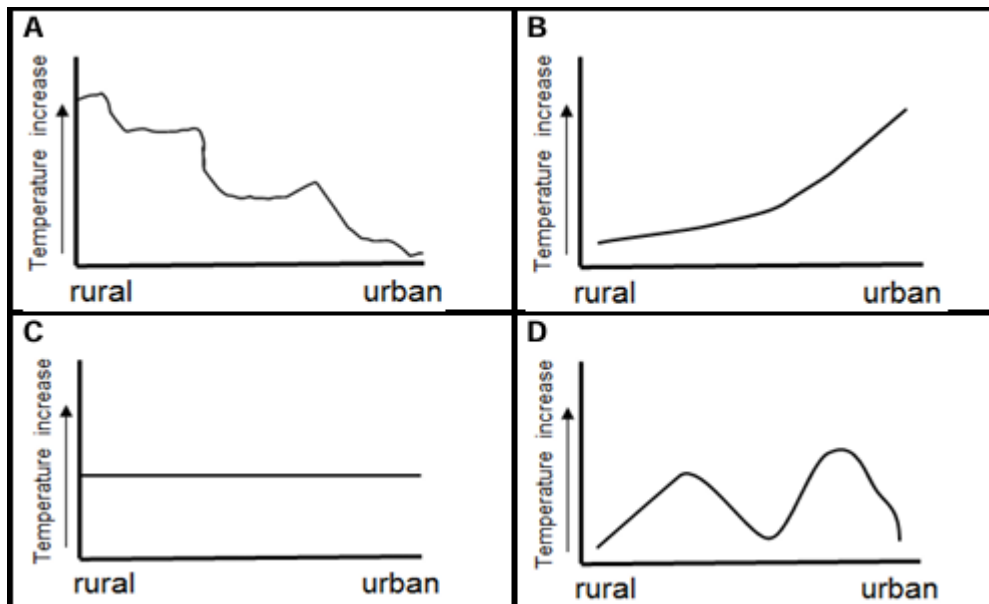
- A warm
- B dry
- C moist
- D windy

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

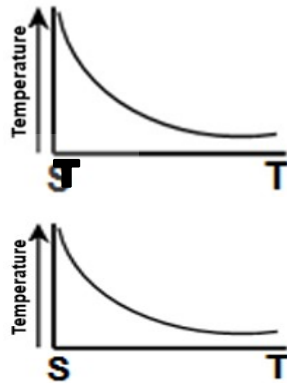
C more; decrease

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.

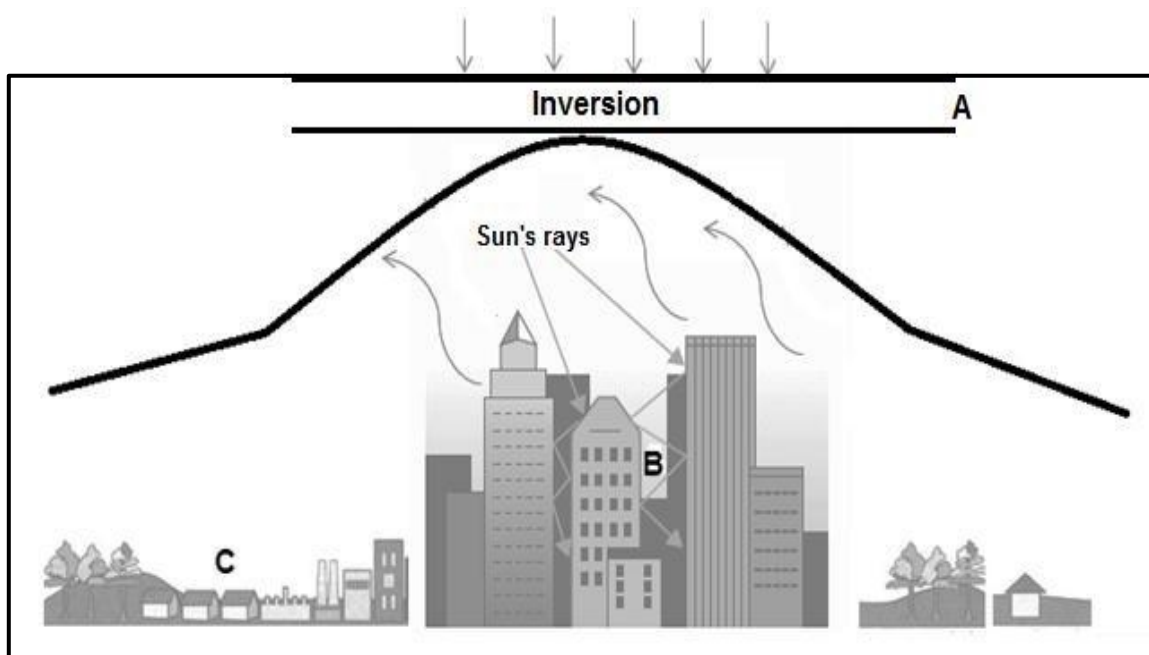
COLUMN A	COLUMN B	
1.26.1. Increased absorption of heat in urban areas is due to ... surfaces.	Y	natural
	Z	artificial
1.26.2. The intensity of multiple reflections of heat is increased due to the ... dimension of buildings.	Y	vertical
	Z	horizontal

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

(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]

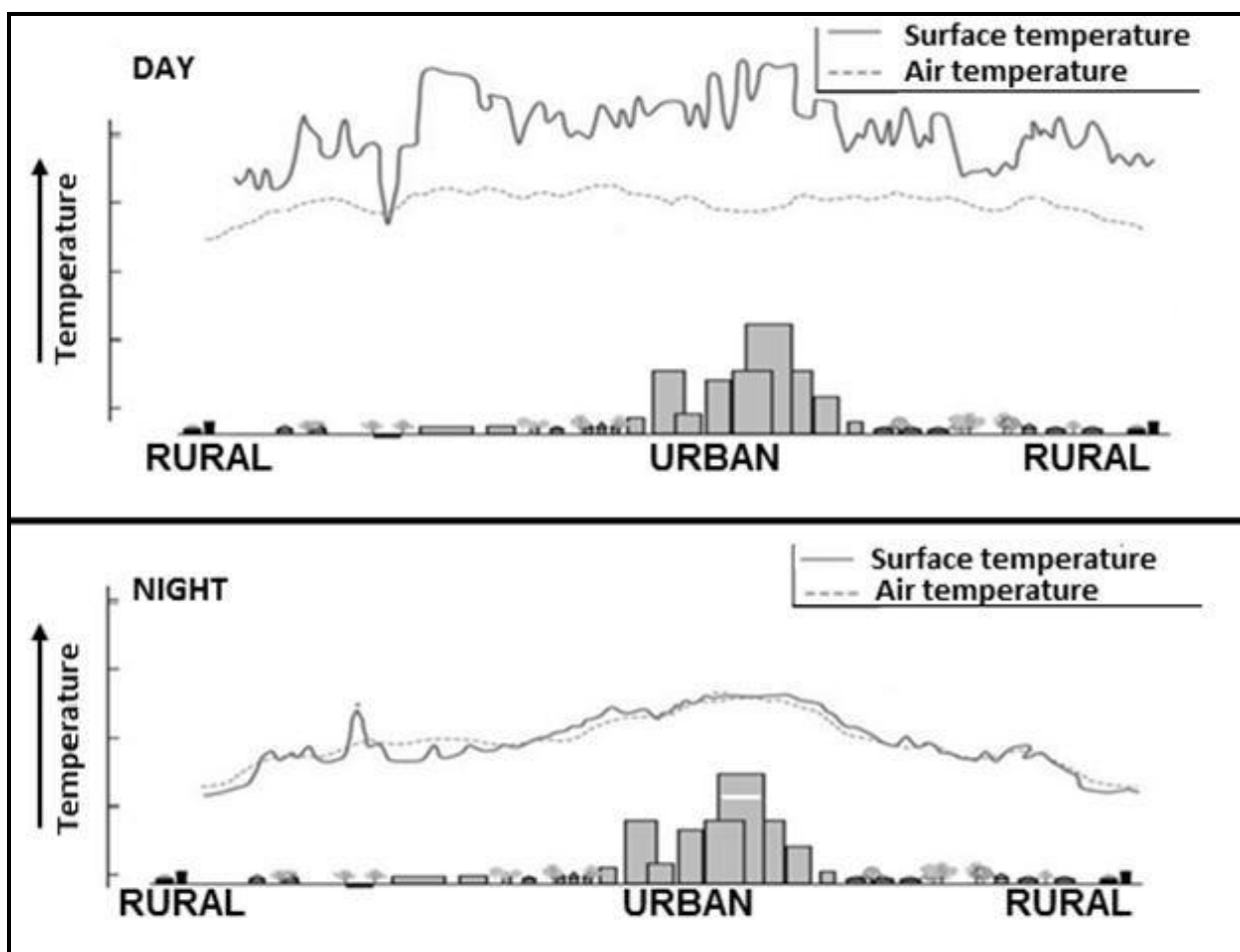
The sketch shows a (day/night) situation.

- 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

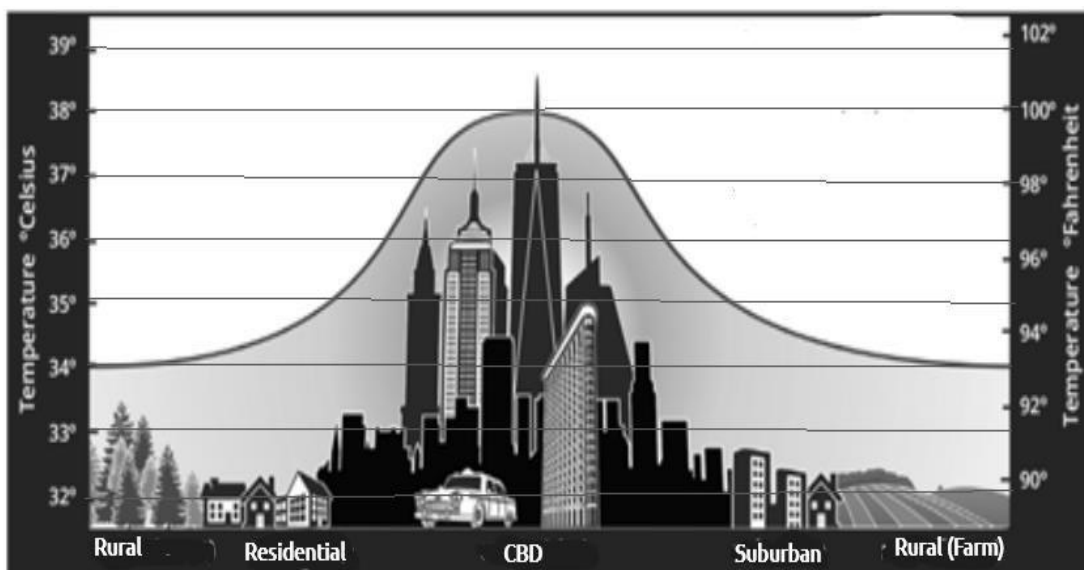
(7 x 1) (7)

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. 38⁰c
- B. 33⁰c
- C. 4⁰c
- D. 5⁰c

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

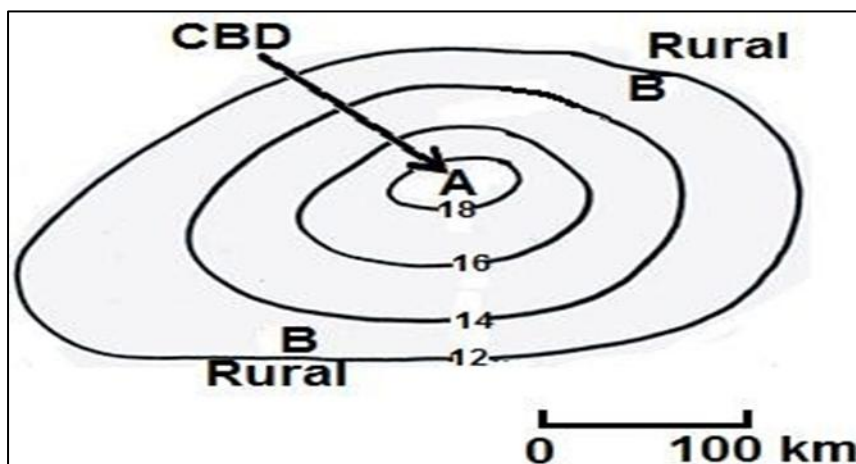
1.29.8. One of the strategies to reduce the urban heat island effect is through ...

- 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

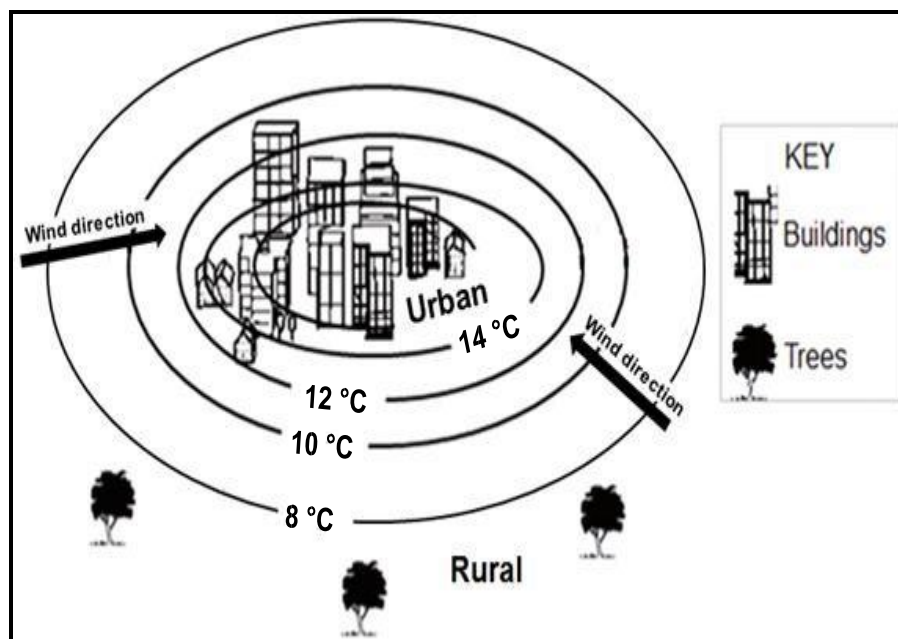
Refer to FIGURE 1.4 showing the distribution of temperature over an urban area. Choose the correct word(s) from those given in brackets to make each of the statements TRUE. Write only the word(s) next to the question numbers (1.30.1 to 1.30.8) in the ANSWER BOOK.



- 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.

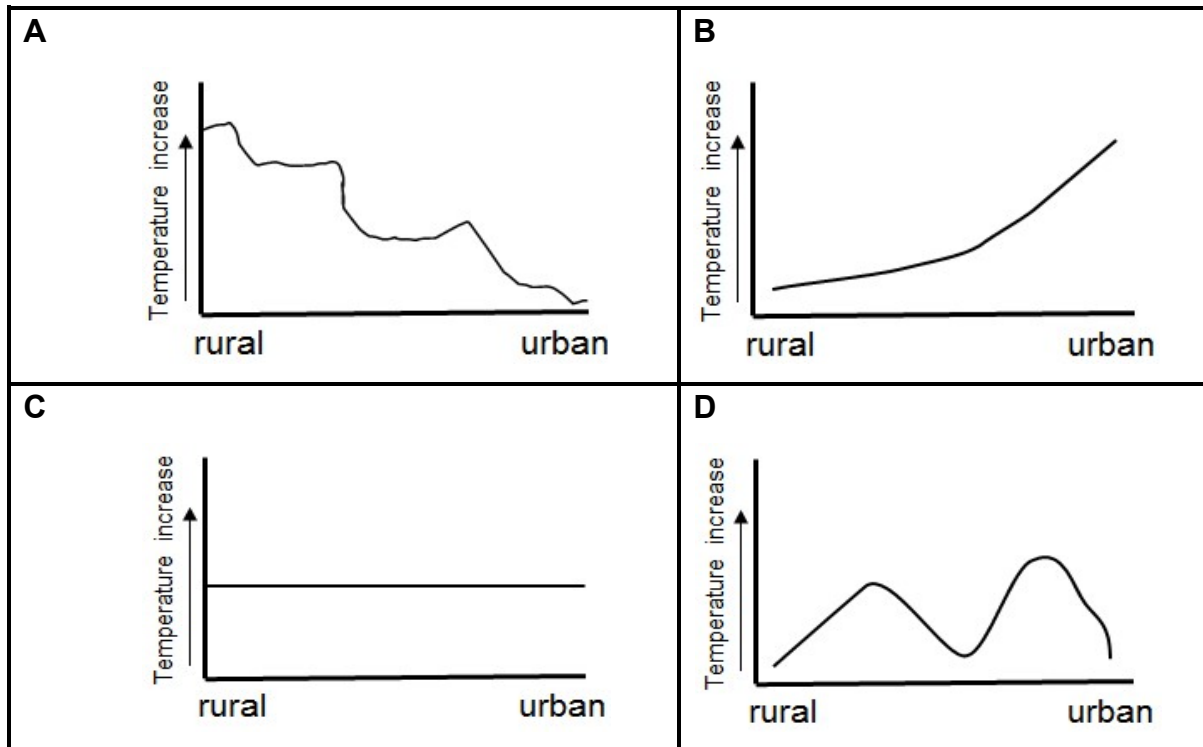
(8 x 1) (8)

- 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 tocloud 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 ofpollution.

- A. less; low
- B. more; high
- C. less; less

D. low; high

(7x1) 7

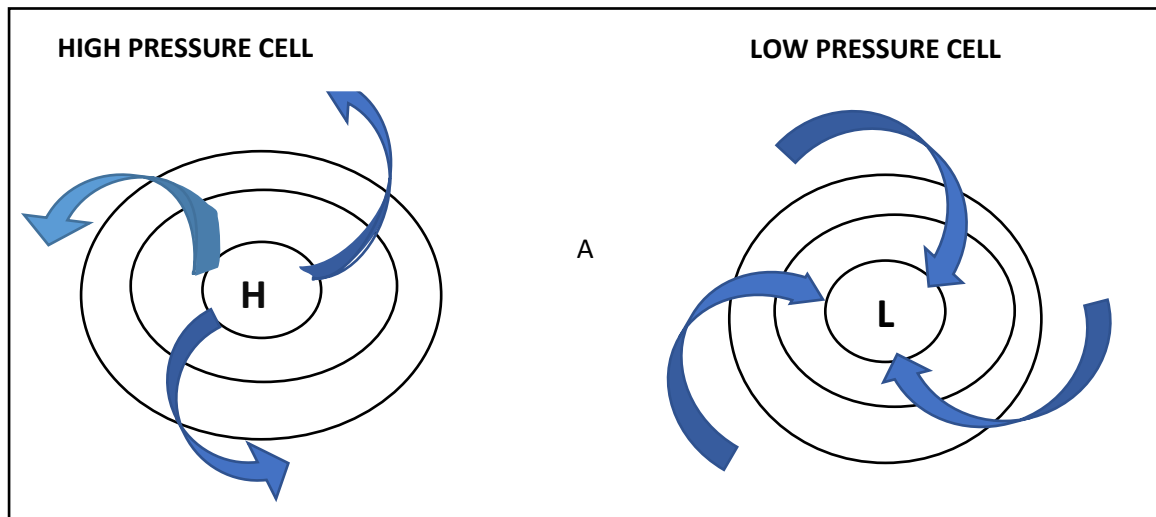
1.32. Choose the term/concept from COLUMN B that matches the description in COLUMN A. Write only the letter (A–H) next to the question numbers (1.32.1 to 1.32.7) in the ANSWER BOOK, e.g., 1.32.8 C.

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.

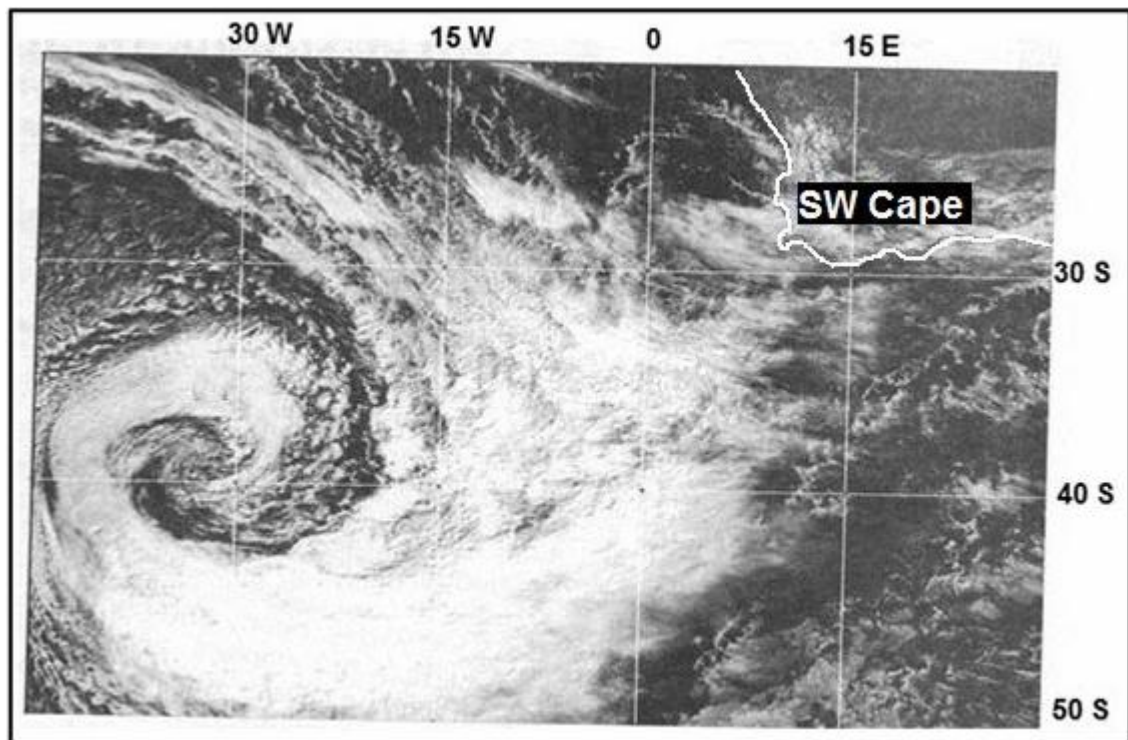
(1 x 1) (1)

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.**

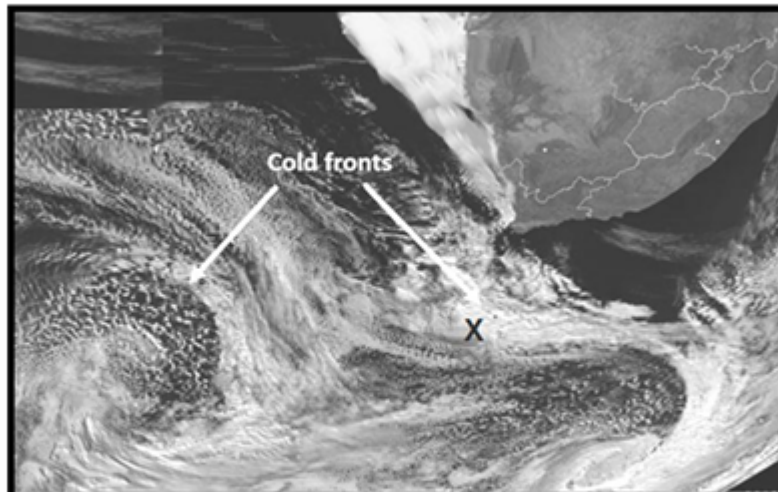


[Source: South African Weather Services]

- 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)

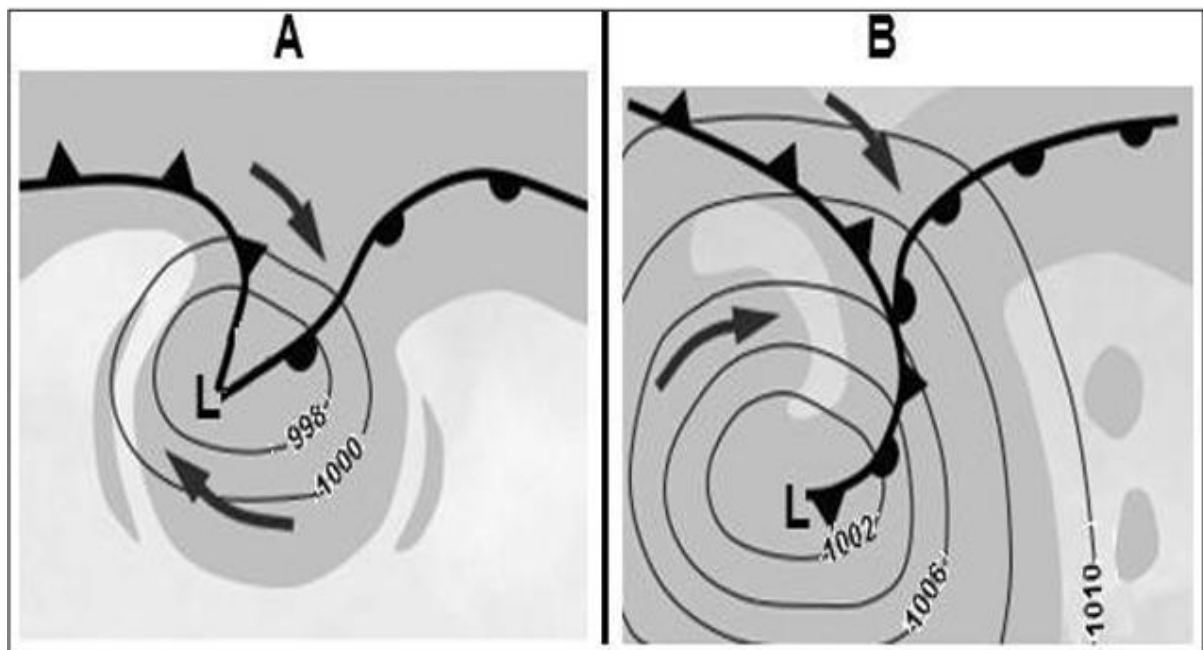
2.3.2. Give a reason for the direction of movement of the mid-latitude cyclones.

(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)

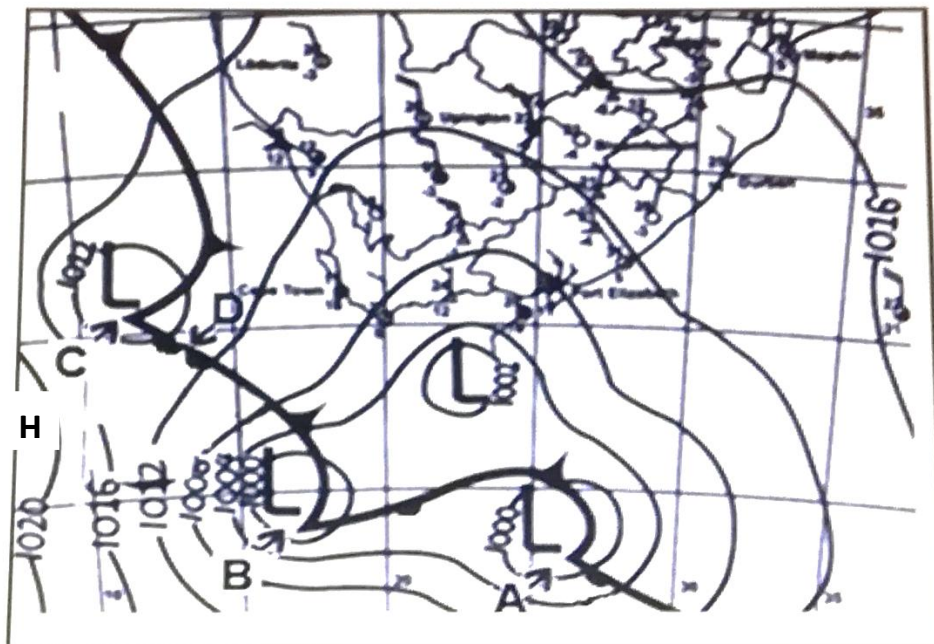
- d) **Refer to FIGURE 2.6 which illustrates two stages in the development of a mid-latitude cyclone.**



- 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.

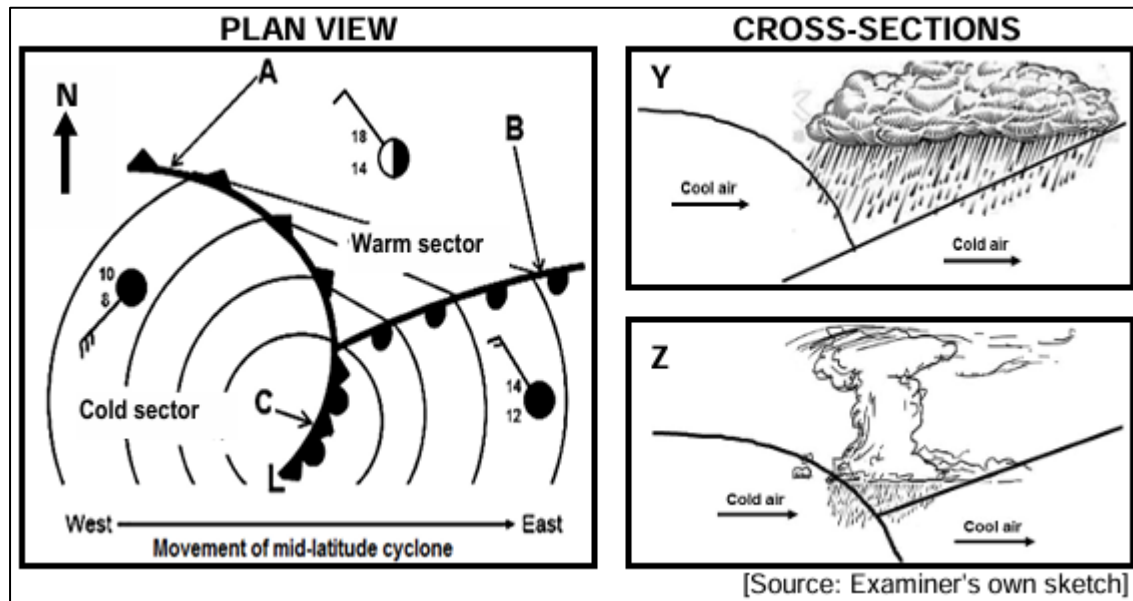


[Source: South African weather services]

- 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.



- 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.

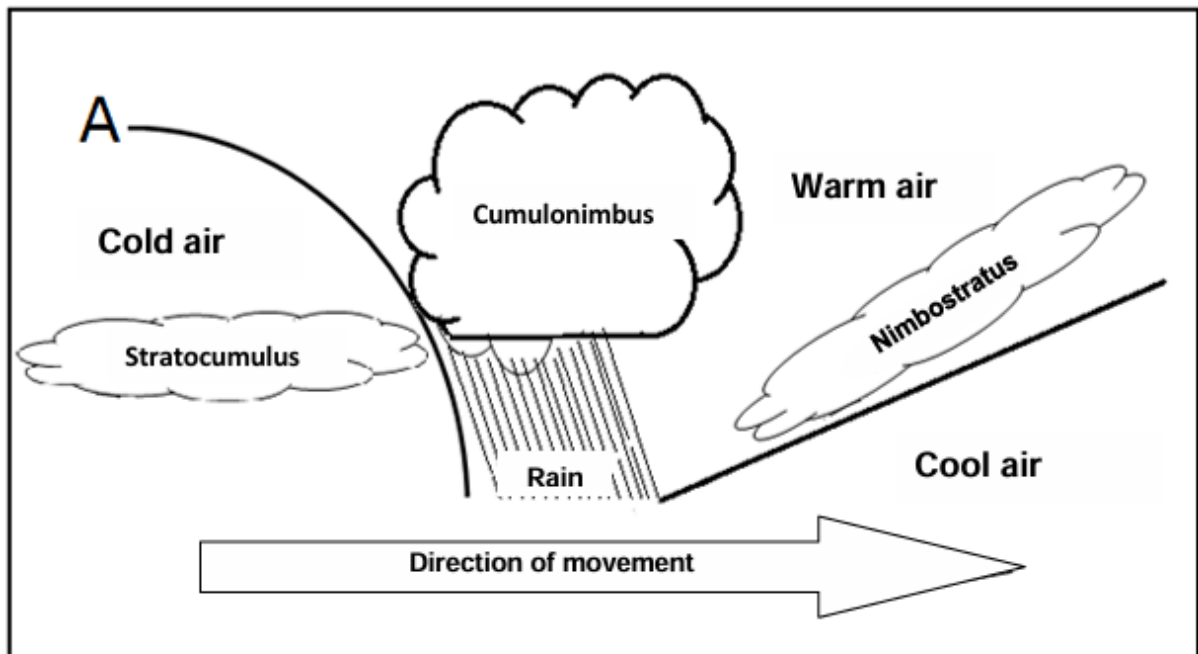
- 2.6.2. Identify front A. (1 x 1) (1)
- 2.6.3. Which ONE of fronts A or B is moving faster? (1 x 1) (1)
- 2.6.4. Give a reason for your answer to QUESTION 2.8.3. (1 x 2) (2)
- 2.6.5. Give evidence from the sketch that the mid-latitude cyclone is found in the Southern Hemisphere. (1 x 2) (2)

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

- 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)
- 2.2.3. 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)

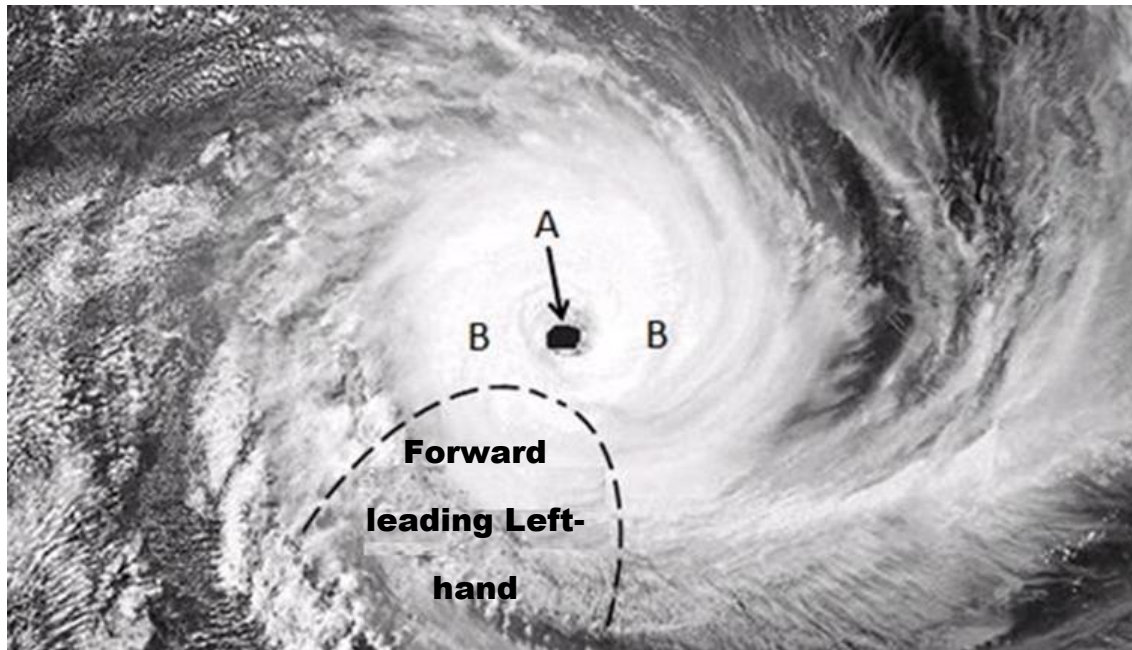
(15)

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 from <https://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:

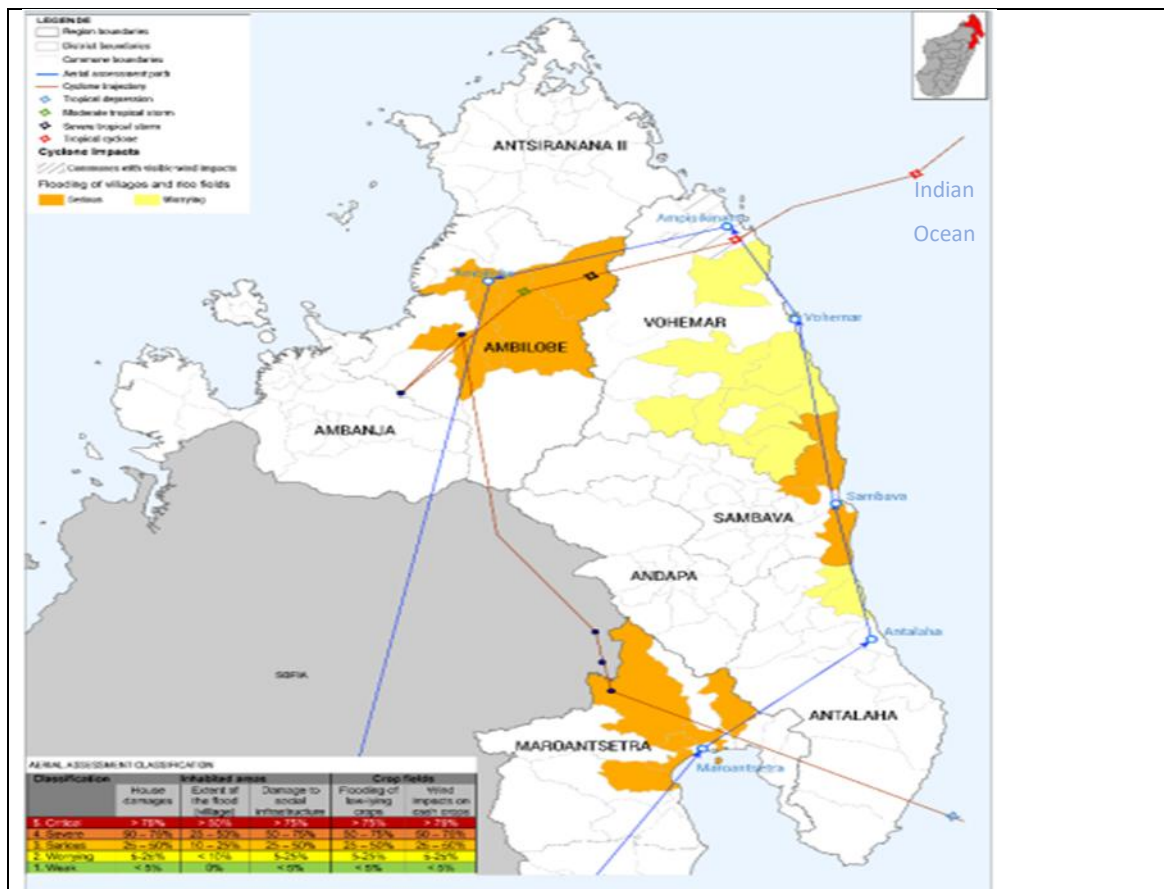
i. Air pressure reading at the centre of the tropical cyclone

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.

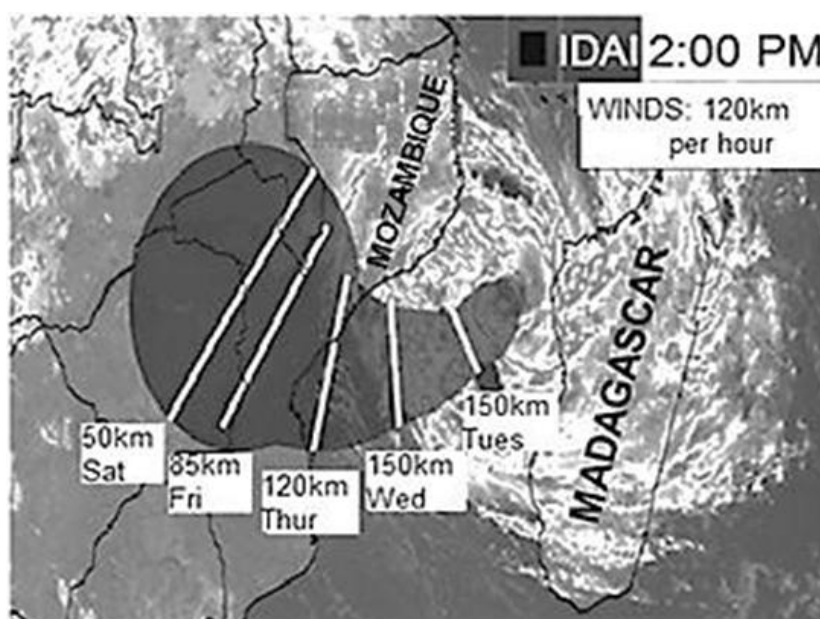


A map shows the affected areas in the north and northeast of Madagascar following the passage of Tropical Cyclone Gamane on 27 March.

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

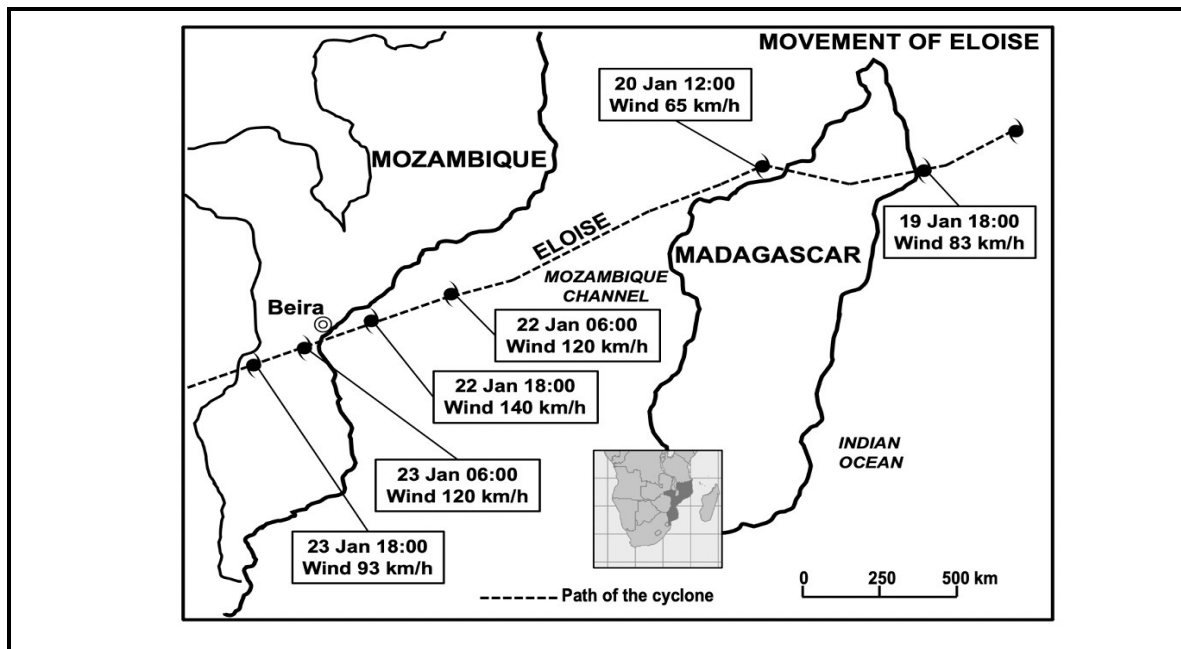
- 2.12.1. How many cyclones occurred before cyclone Gamane? (1 x 1) (1)
- 2.12.2. Cyclone Gamane is in the southern hemisphere. Provide evidence from the info graphic to support the statement. (1 x 2) (2)
- 2.12.3. Tropical Gamane hit the north and northeast of Madagascar on 27 March; explain why it 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	ELOISE IN NUMBERS	
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.	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)

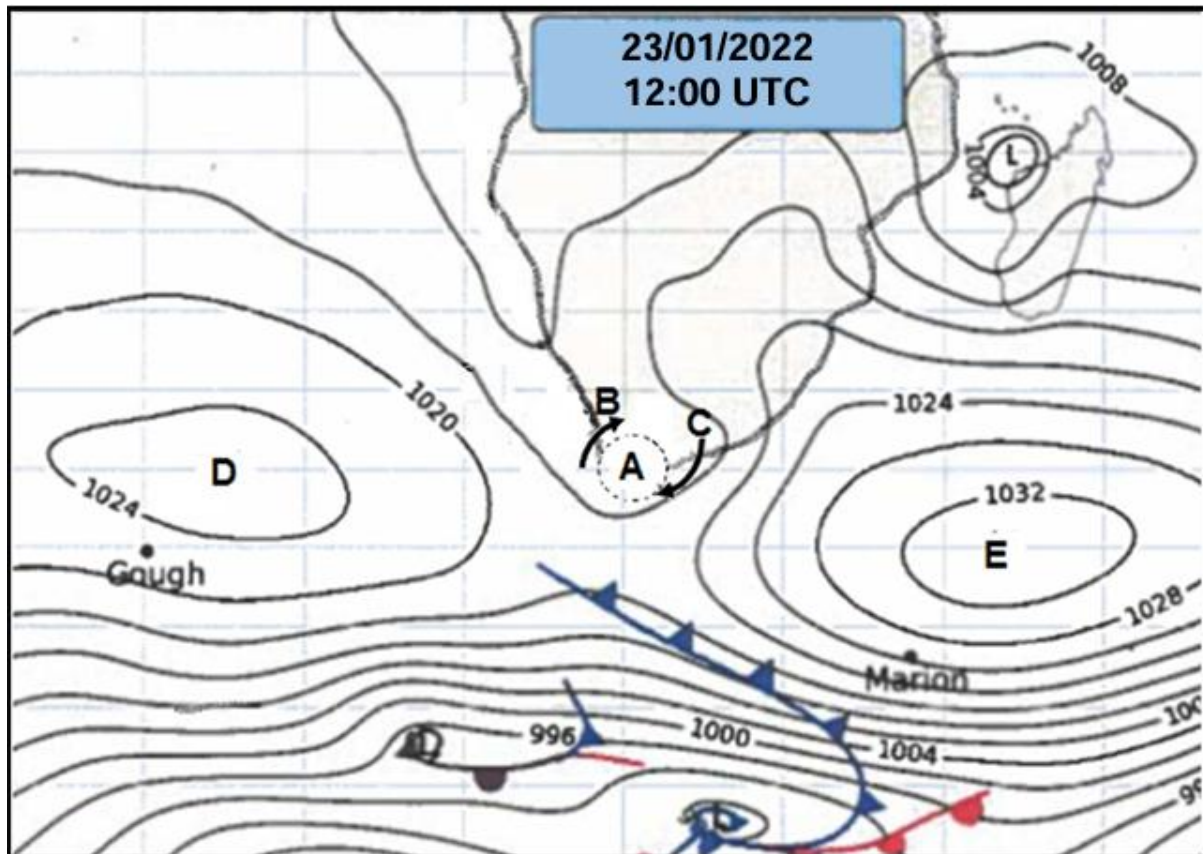
2.14.4. Account for the increase in wind speed of Tropical Cyclone Eloise from the 20 January to 22 January 2021.

(2 x 2) (4)

2.14.5. According to the infographic 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)

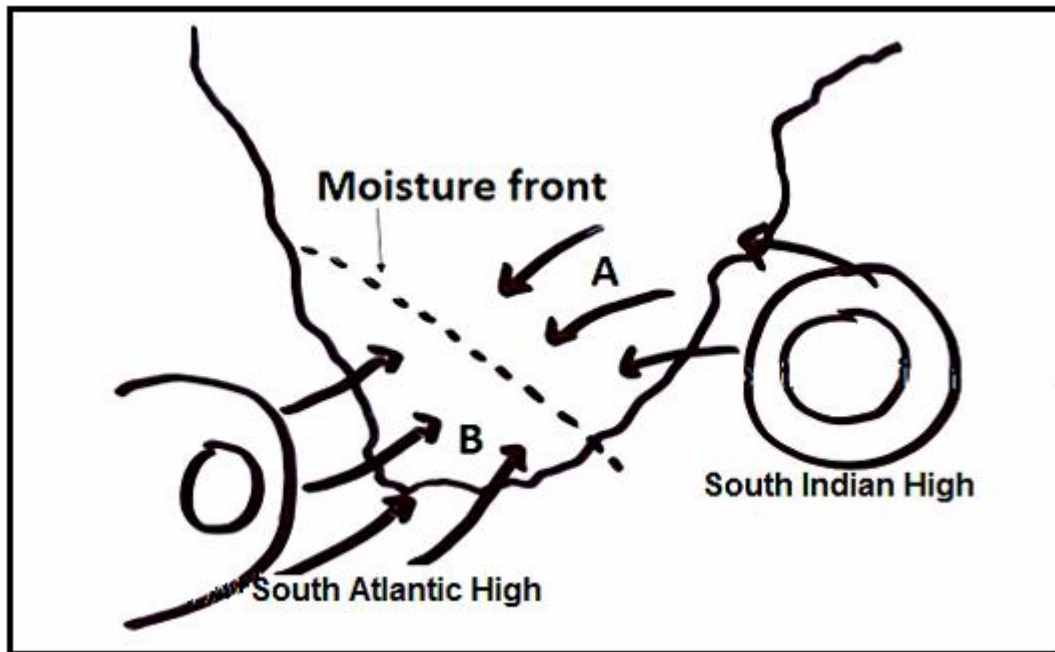
2.15. Refer to the South African synoptic weather map.



[Source: South African Weather Service]

- 2.15.1. Name low-pressure cell A. (1 x 1) (1)
 - 2.15.2. Why is pressure cell A known as a travelling disturbance? (1 x 2) (2)
 - 2.15.3. Why is there a greater possibility of precipitation at B than at C? (2 x 2) (4)
 - 2.15.4. 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 2.15.4 (a). (1 x 2) (2)
- (15)

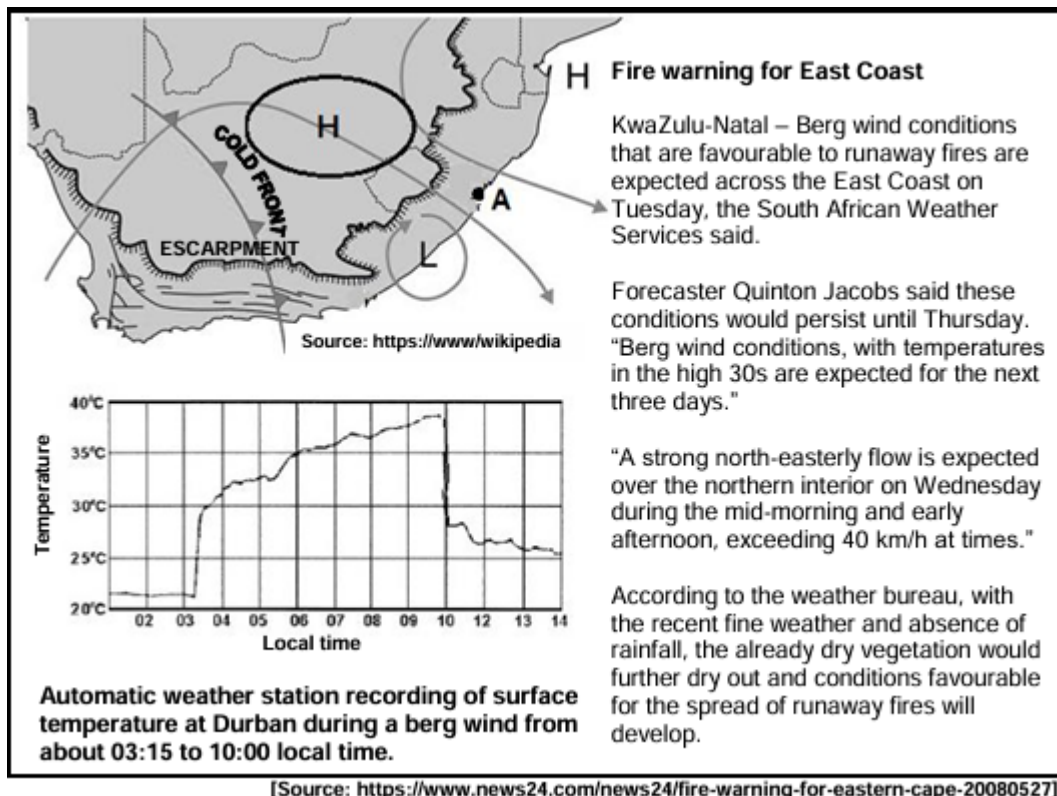
2.16 FIGURE 2.16 shows a moisture front across South Africa.



[Source: Examiner's own sketch]

- 2.16.1. What is a moisture front? (1 x 1) (1)
- 2.16.2. Distinguish between the moisture contents of the winds at A and B. (2 x 1) (2)
- 2.16.3. Name the type of thunderstorm that occurs along the moisture front. (1 x 2) (2)
- 2.16.4. On which side of the moisture front do the thunderstorms form? (1 x 2) (2)
- 2.16.5. Explain your answer to QUESTION 2.4.4. (2 x 2) (4)
- 2.16.6. Describe the hazards/dangers associated with these thunderstorms for farmers in the interior. (2 x 2) (4)
- (15)

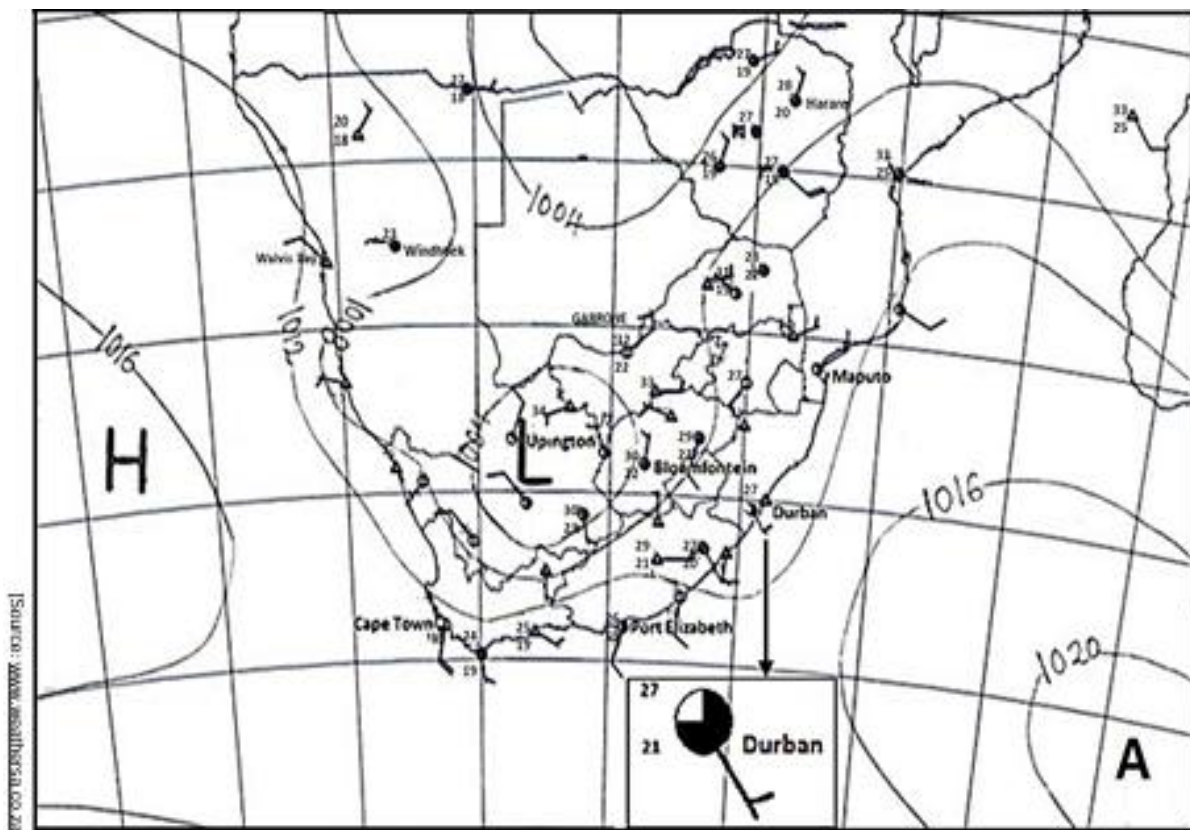
2.17. Refer to the infographic showing berg wind conditions over South Africa below.



- 2.17.1. 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)
- 2.17.2. State TWO atmospheric conditions evident in the infographic that have resulted in the formation of berg winds. (2 x 1) (2)
- 2.17.3. 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)
- 2.17.4. A weather station located at A has reported clear skies. Account for this current condition. (2 x 2) (4)
- 2.17.5. 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)

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



2.18.1. Give evidence that the synoptic weather map represents a summer condition.

(1 x 1) (1)

2.18.2. Determine the isobaric interval on the synoptic weather map.

(1 x 1) (1)

2.18.3. Name the high-pressure cell A.

(1 x 1) (1)

2.18.4. State the wind direction and wind speed of the weather station at Durban.

(2 x 1) (2)

2.18.5. Comment on the relationship between wind speed and the arrangement of the isobars in the eastern half of the country.

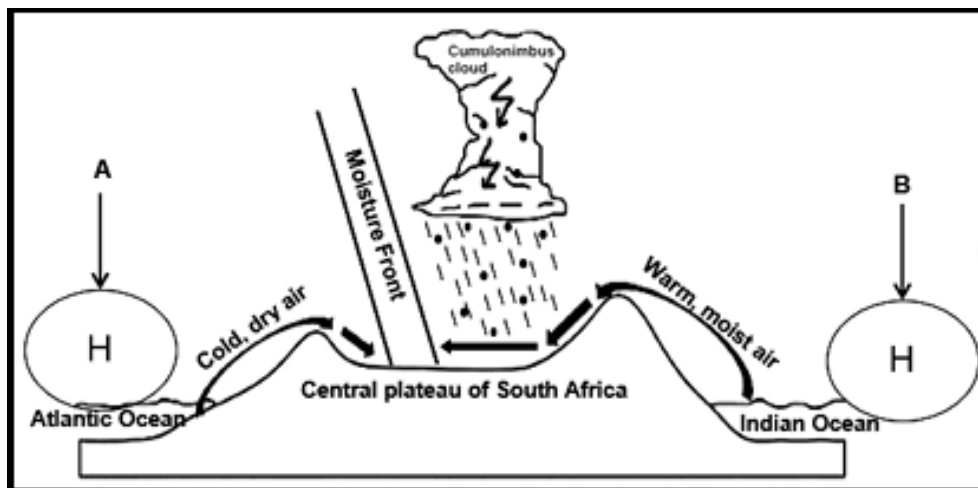
(1 x 2) (2)

2.18.6. 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)

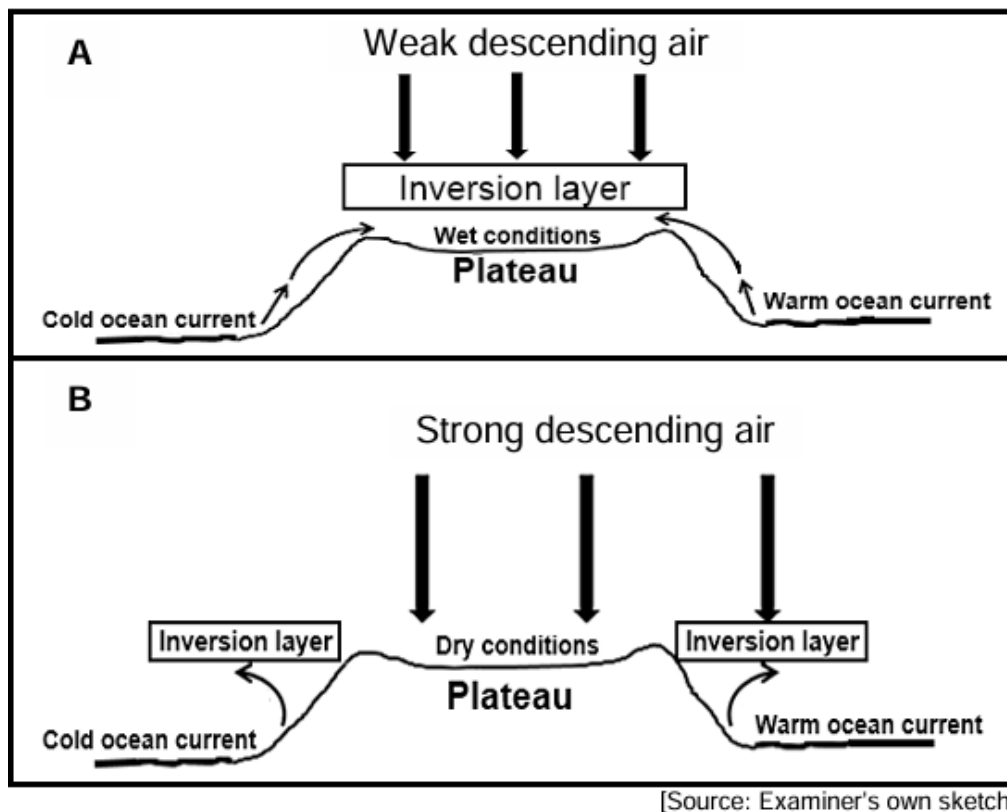
2.19. Refer to the sketch below on-line thunderstorms.



[Source: Examiner's own sketch]

- 2.19.1. Identify high-pressure cells A and B. (2 x 1) (2)
- 2.19.2. Which season is represented by the sketch? (1 x 1) (1)
- 2.19.3. Give ONE reason from the sketch for your answer to QUESTION 1.5.2. (1 x 2) (2)
- 2.19.4. What is a moisture front? (1 x 2) (2)
- 2.19.5. Name TWO forms of precipitation associated with a line thunderstorm. (2 x 1) (2)
- 2.19.6. Describe the processes involved in the formation of line thunderstorms. (3 x 2) (6)
- (15)

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



Refer to sketch A.

- 2.20.1. Identify the season illustrated in sketch A. (1 x 1) (1)
- 2.20.2. Give a reason for your answer to QUESTION 1.5.1. (1 x 2) (2)

Refer to sketch B.

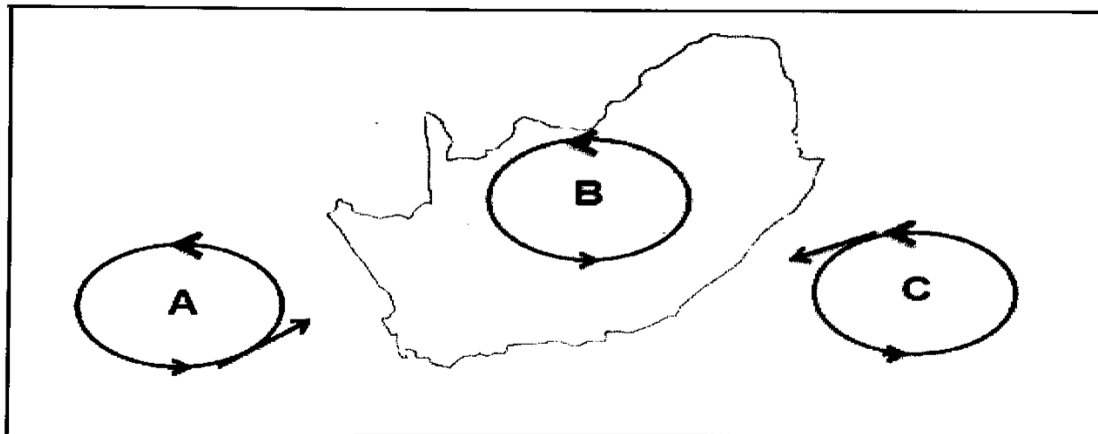
- 2.20.3. Identify TWO factors, visible in the sketch, which influence the climate of South Africa. (2 x 1) (2)
- 2.20.4. Explain the role played by descending air in the development of the inversion layer. (1 x 2) (2)

Refer to sketches A and B.

- 2.20.5. 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)

2.21. Study the diagram showing anticyclones over South Africa.

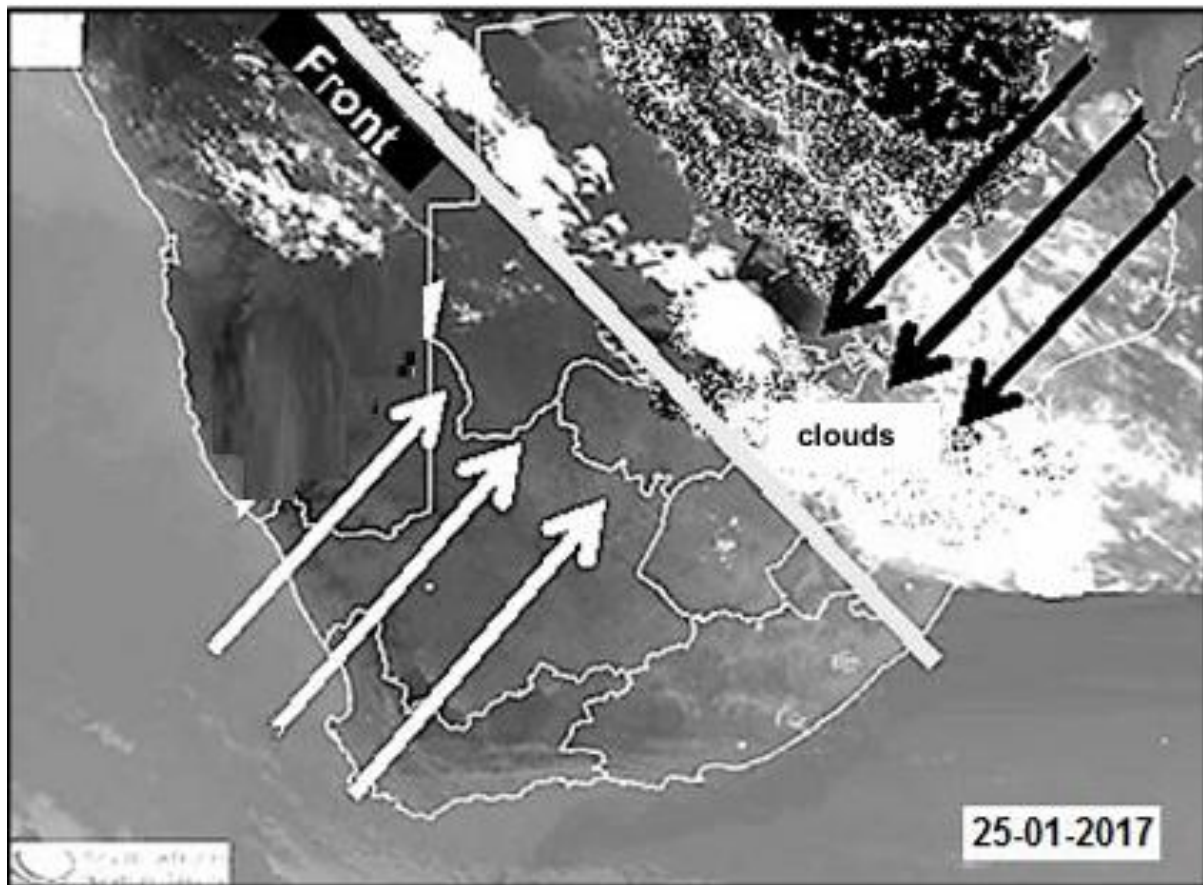


- 2.21.1. Name each of anticyclone's A, B and C. (3 x 1) (3)
- 2.21.2. Anticyclones are associated with stable weather conditions over the interior of South Africa, particularly during winter. Draw a labelled sketch to illustrate the influence of the interior anticyclone on South Africa's weather. (4 x 1) (4)
- 2.21.3. 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)

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

FIGURE 2.24. LINE THUNDERSTORMS OVER SOUTH AFRICA



[Adapted from <https://www.bing.com/images/search?ine+thunderstorms+in+south+africa&simid>]

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

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

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

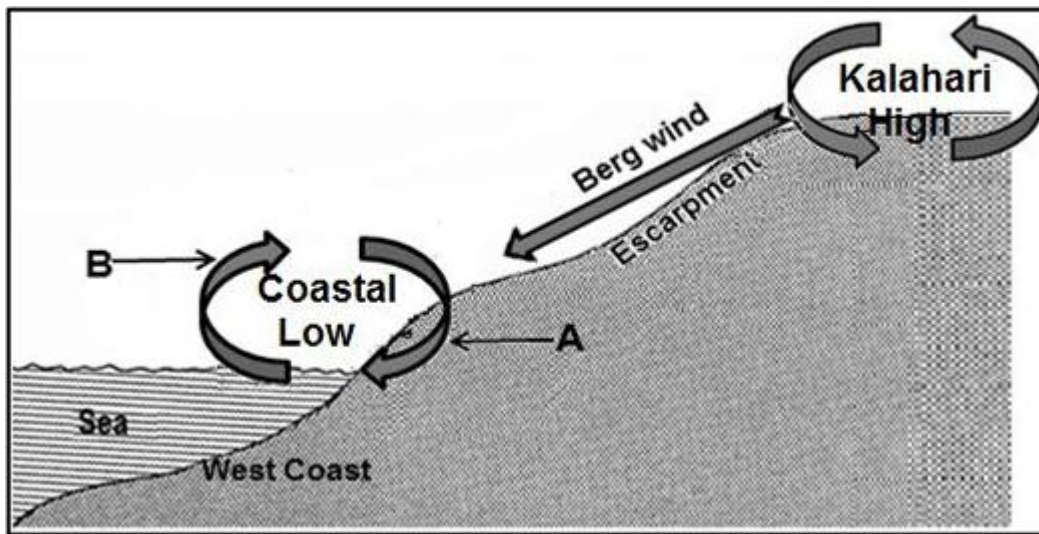
2.22.4. What is the source of moisture for the formation of line thunderstorms? (1 x 2) (2)

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

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

(15)

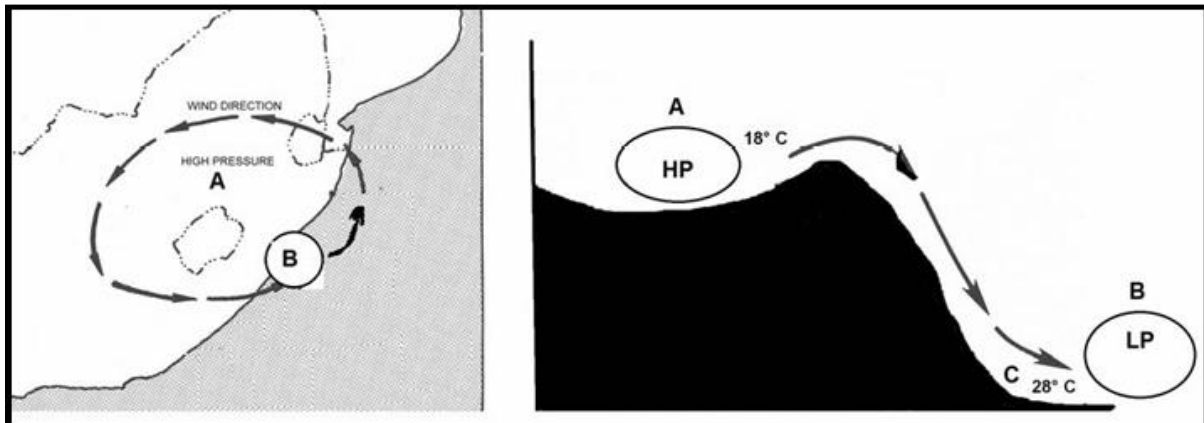
2.23. The diagram below is a representation of a coastal low and a berg wind.



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

- 2.23.1. Name the season represented in the diagram. (1 x 1) (1)
- 2.23.2. Give ONE reason for your answer to QUESTION 1.2.1. (1 x 1) (1)
- 2.23.3. Why is the wind visible in FIGURE 1.2, known as a berg wind? (1 x 1) (1)
- 2.23.4. 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)**

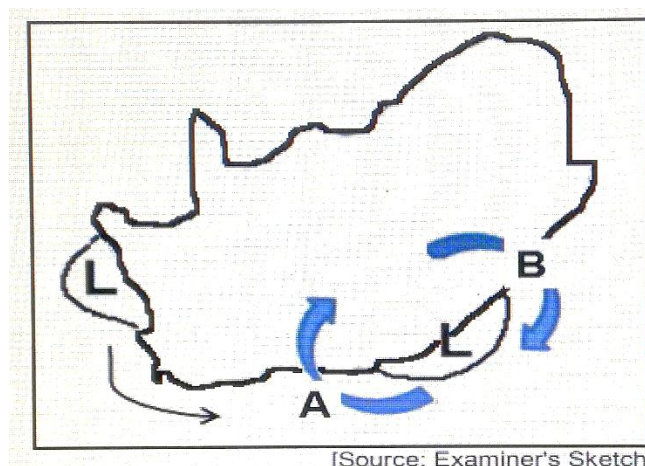
2.24. Refer to the diagram showing a plan view and cross section of a South African berg wind.



- 2.24.1. Give TWO pieces of evidence from the sketch to support the statement that FIGURE 4.16 shows a berg wind. (2 x 1) (2)
- 2.24.2. Mention a hazard associated with berg wind conditions. (1 x 1) (1)
- 2.24.3. 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)
- 2.24.4. Explain why berg winds are viewed as having a negative influence on humans and farming. (3 x 2) (6)
- (15)

2.24. FIGURE 2.25 shows a coastal low pressure.

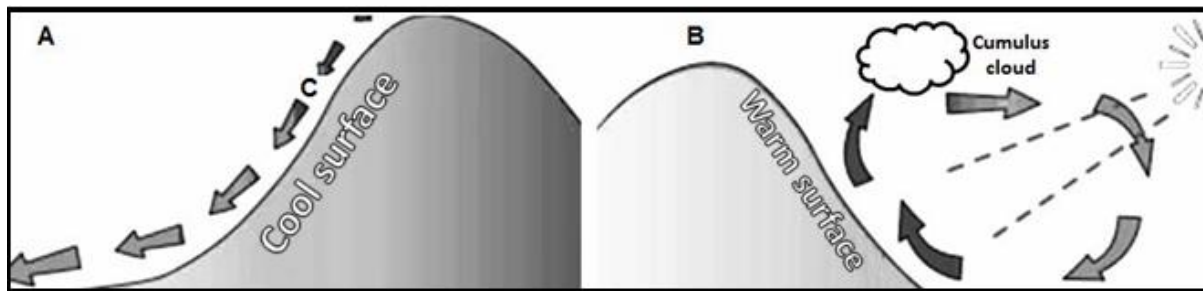
FIGURE 2.25. COASTAL LOW PRESSURE



- 2.25.1. What is a coastal low pressure? (1 x 1) (1)
- 2.25.2. Describe the path that the coastal low pressure follows. (2 x 1) (2)

- 2.25.3. Why is the air ahead of the coastal low (B) drier than the air behind the coastal low (A)? (2 x 2) (4)
- 2.25.4. Explain why different types of precipitation are expected along the west and east coast as the coastal low passes by. (2 x 2) (4)
- 2.25.5. Why are these low-pressure systems usually associated with high temperatures along the coast in winter? (2 x 2) (4)
- (15)**

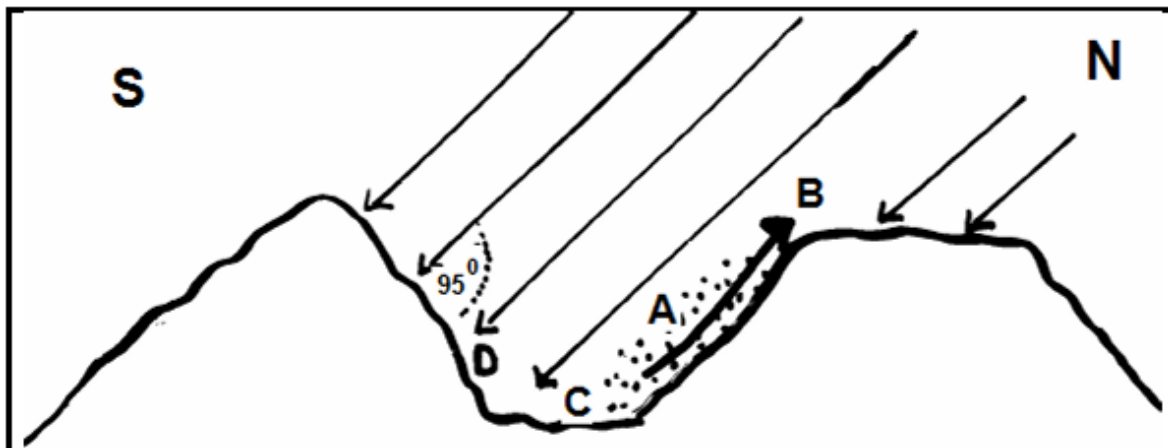
2.26. Study the sketches based on local winds.



[Source: BBC Weather Centre]

- 2.26.1. Name the wind labelled C. (1 x 1) (1)
- 2.26.2. Describe the formation of wind C. (2 x 2) (4)
- 2.26.3. Why does the wind move up the valley slope in sketch B? (1 x 2) (2)
- 2.26.4. 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)**

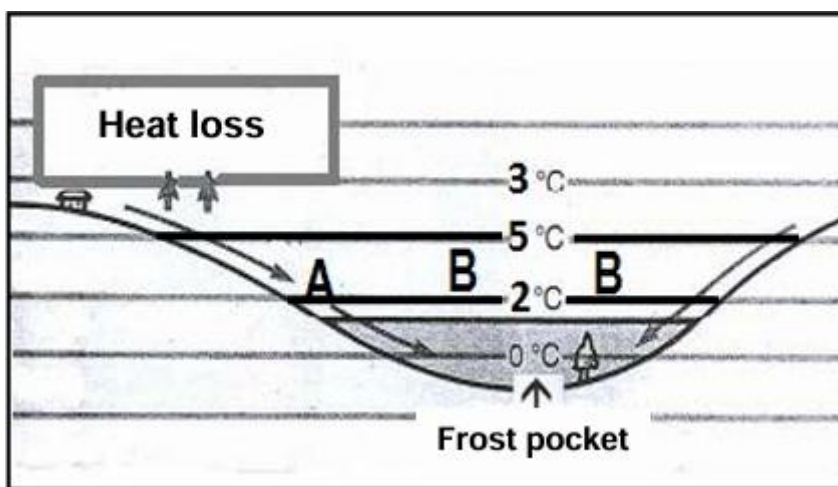
2.27. Refer to the sketch which shows aspect in a valley in the Southern Hemisphere and answer the questions that follow.



[Source: Examiner's own sketch]

- 2.27.1. What evidence suggests that this valley is situated in the Southern Hemisphere? (1 x 1) (1)
- 2.27.2. Explain why area A is referred to as the shadow zone. (1 x 2) (2)
- 2.27.3. Explain how wind B will develop during the day. (2 x 2) (4)
- 2.27.4. 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)**

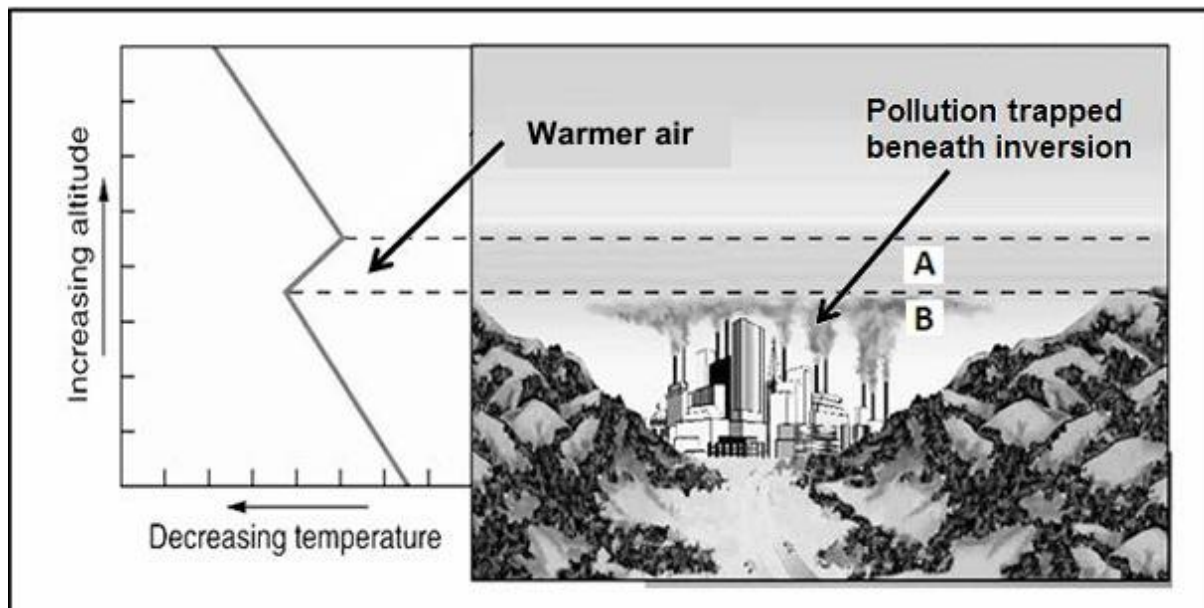
2.28. The diagram below illustrates valley climates.



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

- 2.28.1. Identify wind A. (1 x 1) (1)
- 2.28.2. 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)
- 2.28.3. 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)**

2.29. FIGURE 1.4 shows a temperature inversion in a valley.

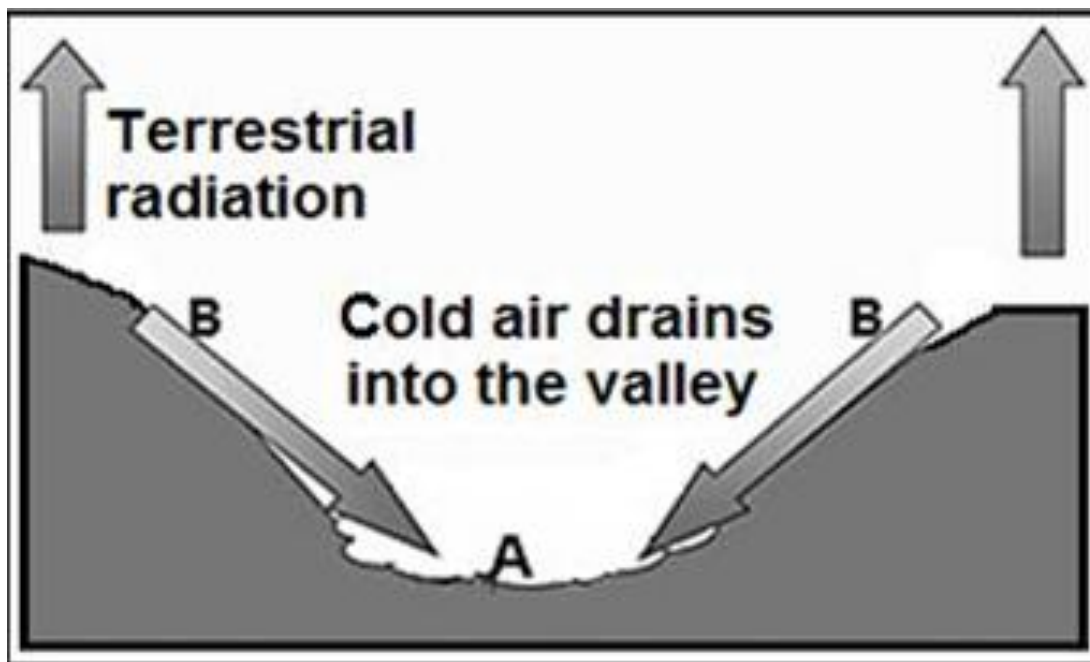


[Adapted from <http://www.asu.edu.co.za>]

- 2.29.1. Identify the cause of air pollution in this valley. (1 x 1) (1)
- 2.29.2. Name ONE example of a type of pollutant that is emitted at point B. (1 x 1) (1)
- 2.29.3. Give a suitable term to describe area A. (1 x 1) (1)
- 2.29.4. Describe the relationship between altitude and temperature as shown on the graph. (1 x 2) (2)
- 2.29.5. The amount of smoke on the valley floor could increase at night. Suggest TWO possible reasons for this increase. (2 x 2) (4)
- 2.29.6. Analyse the following statement: 'Temperature influences the location of settlements in a valley.' (3 x 2) (6)

(15)

2.30. Study FIGURE 1.4 showing valley climates.



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

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

2.30.2. 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)

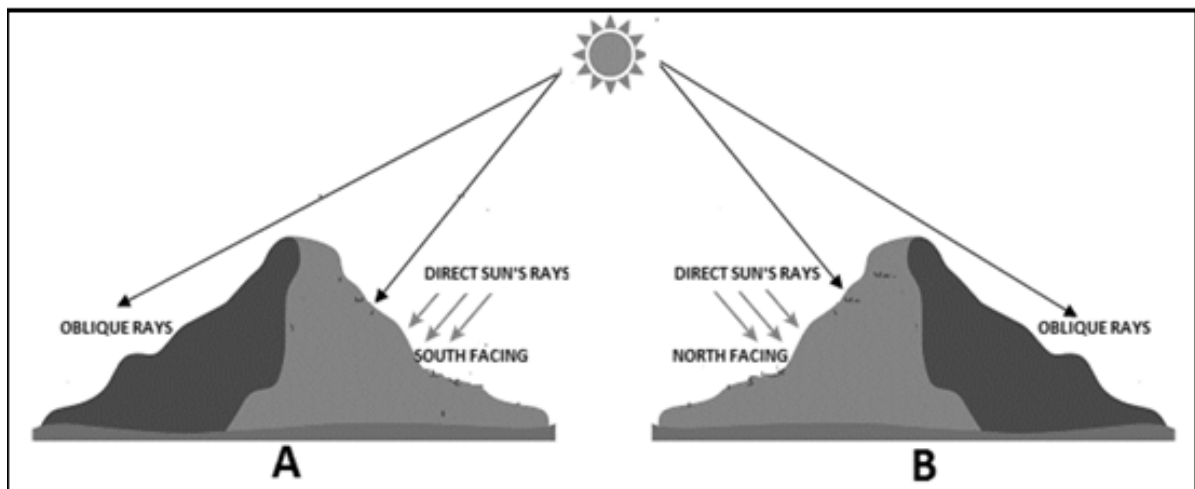
b) Formed when temperature drops below dew point in the lower section of the valley (1 x 1) (1)

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

2.30.4. 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)

2.31. Refer to FIGURE 1.4 showing slope aspect.

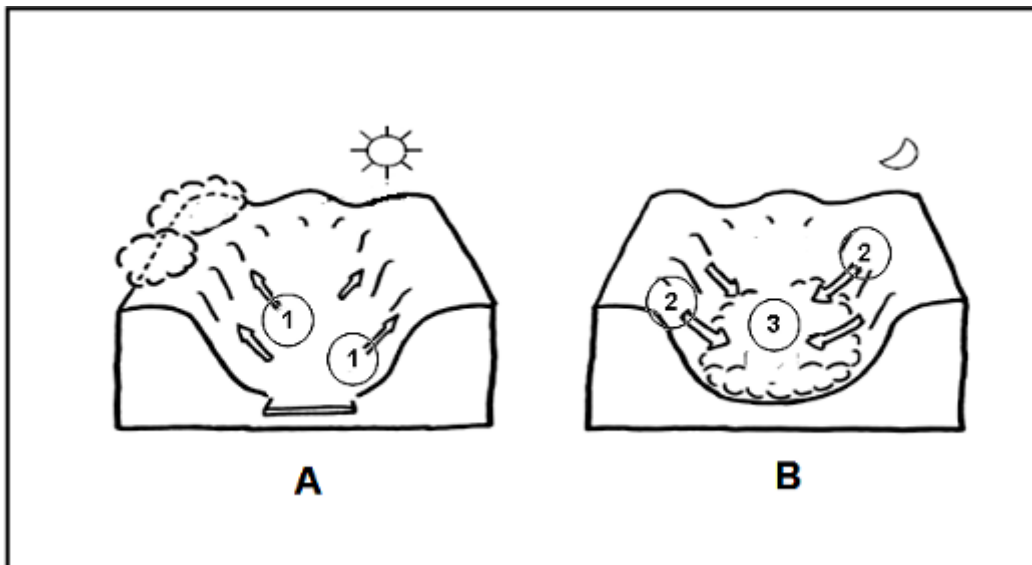


[Adapted from <https://www.pmfias.com/temperature-distribution-earth-heat-budget-heat-balance>]

- 2.31.1. Define the concept slope aspect. (1 x 2) (2)
- 2.31.2. Does A or B represent the Southern Hemisphere? (1 x 1) (1)
- 2.31.3. Give a reason evident from the sketch for your answer to QUESTION 1.4.2. (1 x 2) (2)
- 2.31.4. 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)
- 2.31.5. 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)

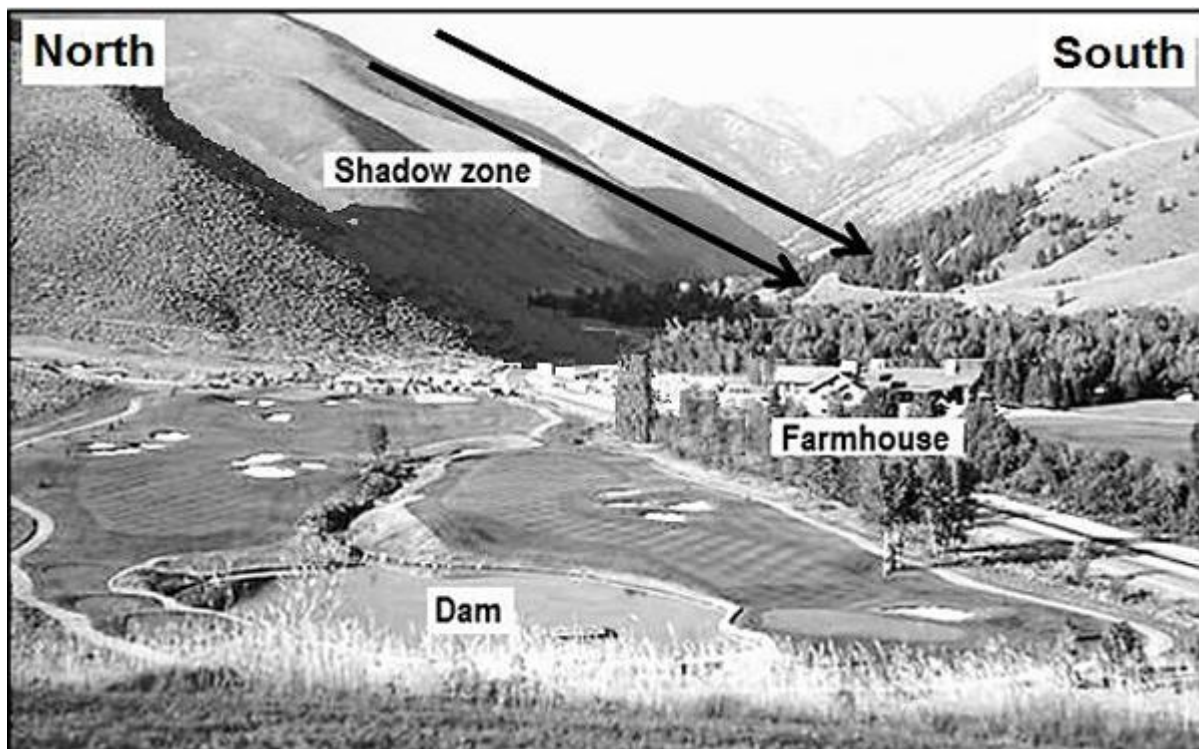
2.32. Study FIGURE 2.34. on valley climates and answer the questions that follow.



[Adapted from www.ybw.com]

- 2.32.1. Name wind 1 in sketch A. (1 x 1) (1)
- 2.32.2. State ONE difference between winds 1 and 2. (1 x 2) (2)
- 2.32.3. 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)
- 2.32.4. 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)

2.33. 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]

- 2.33.1. Define the term slope aspect. (1 x 1) (1)
 - 2.33.2. Which slope in FIGURE 2.3 receives direct rays of the sun? (1 x 1) (1)
 - 2.33.3. 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)
 - 2.33.4. 2.3.4 Give a possible reason for the location of the farmhouse on the valley floor. (1 x 2) (2)
 - 2.33.5. 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.

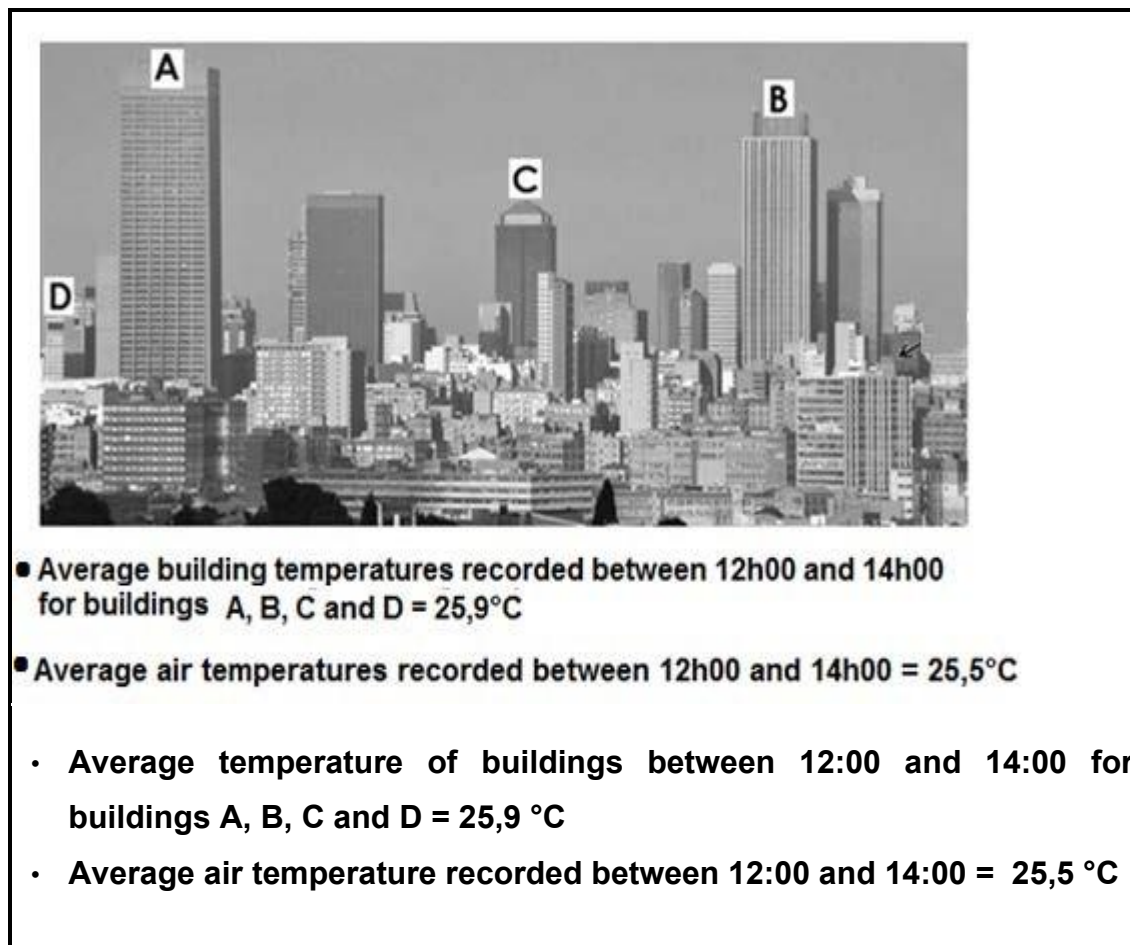


FIGURE 3.6 shows the average air temperature distribution in the Johannesburg CBD.

2.34.1. Give the average temperature of the buildings in the Johannesburg CBD. (1 x 1) (1)

2.34.2. Give a reason for the relatively high temperatures of buildings in the Johannesburg CBD. (1 x 2) (2)

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

2.34.4. 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.

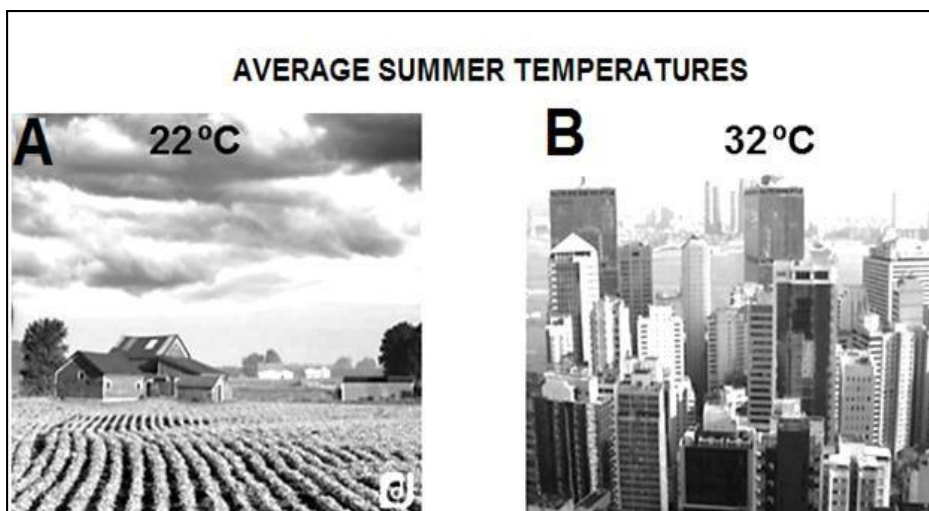
The World Health Organisation (WHO) says urban heat islands, which both raise temperatures and trap pollutants, will have to disappear in this century if future generations are to live healthy lives in cities. A possible way of addressing the issue of heat islands is introducing 'green' strategies. Green 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>]

- 2.35.1. Define the concept *urban heat island*. (1 x 1) (1)
- 2.35.2. Give TWO quotations from the extract that suggests that poor planning is responsible for increasing temperatures in cities. (2 x 1) (2)
- 2.35.3. Why is the urban heat island effect more concentrated at night? (2 x 2) (2)
- 2.35.4. 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)

2.36. Refer to FIGURE 2.36 based on the differences between rural and urban climates.

FIGURE 2.36: DIFFERENCES BETWEEN RURAL AND URBAN CLIMATES



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

- 2.36.1. Will **A** or **B** generally experience lower wind speeds? (1 x 1) (1)
- 2.36.2. What evidence in the photograph indicates that **A** experiences higher evaporation rates than **B**? (1 x 2) (2)

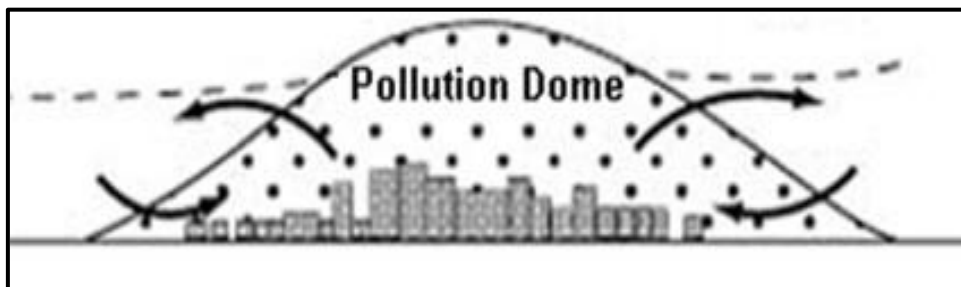
2.36.3. Why does **B** experience more frequent rainfall than **A**? (1 x 2) (2)

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

2.36.5. 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)

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

FIGURE 2.4: POLLUTION DOME



[Source:

<http://www.metlink.org/secondary/key-stage->

2.37.1. What is a *pollution dome*? (1 x 1) (1)

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

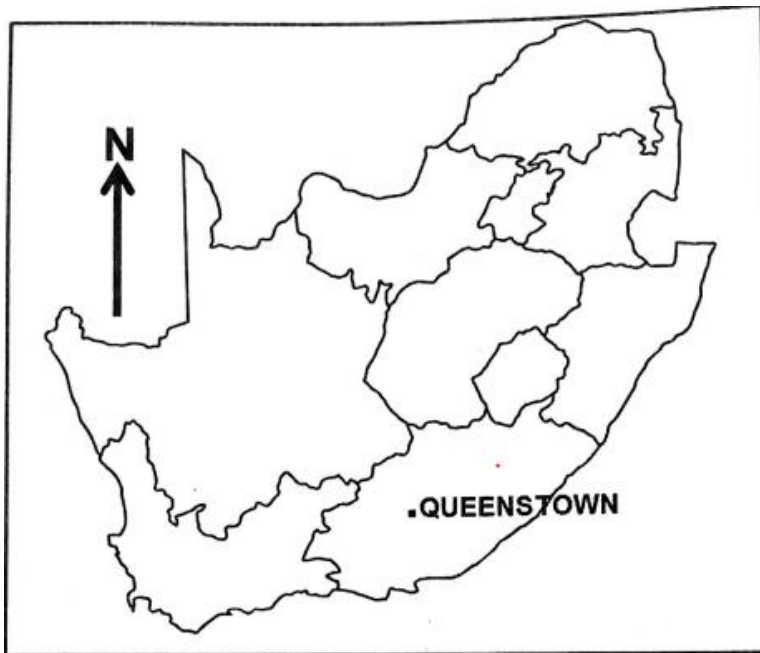
2.37.3. Explain why the pollution dome is more concentrated at night. (2 x 2) (4)

2.37.4. 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)

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

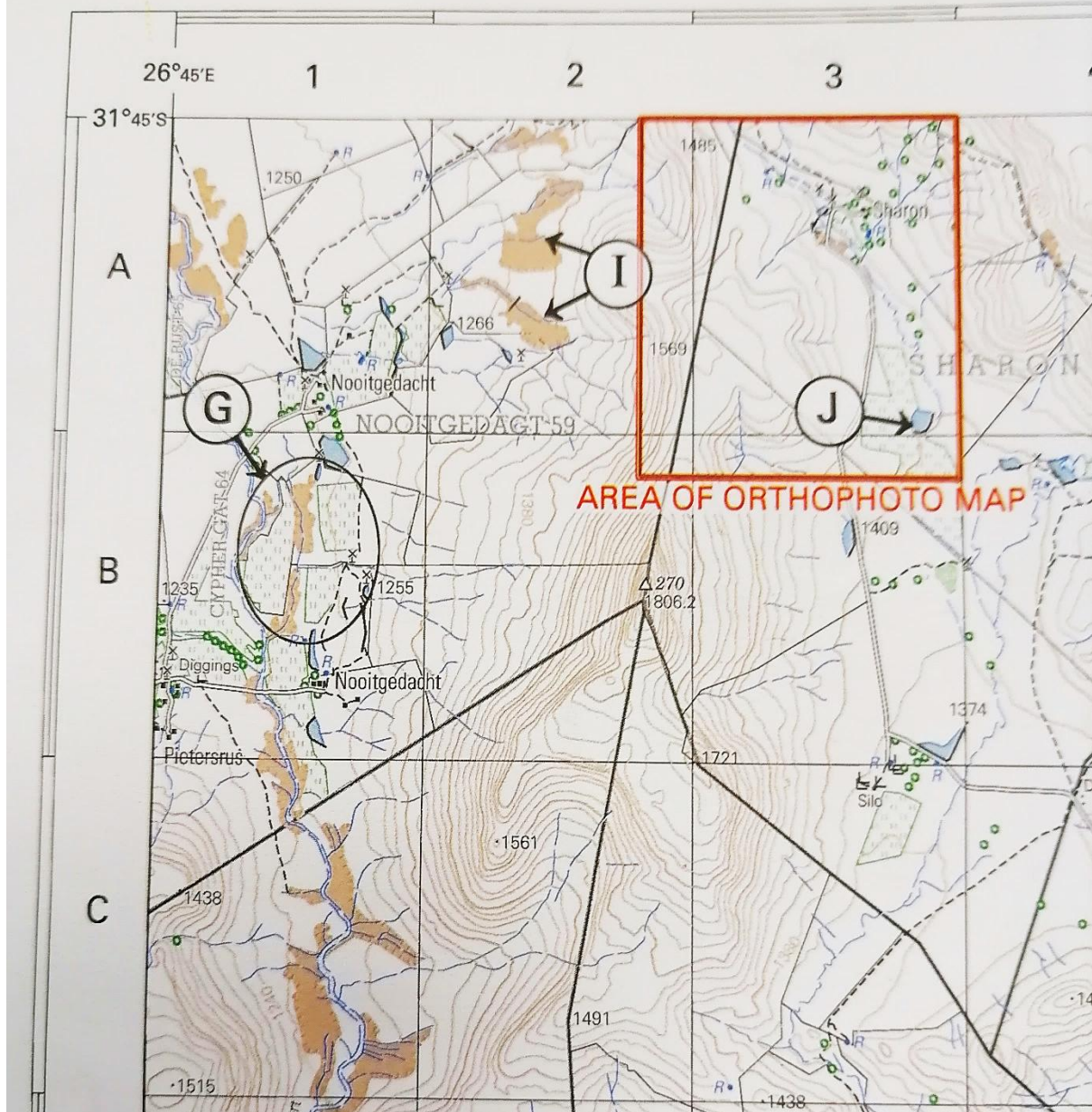


Coordinates: 31°54'S; 26°53'E

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



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 x 1) (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 km₂.

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 in 1.2.1 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. Advise 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.

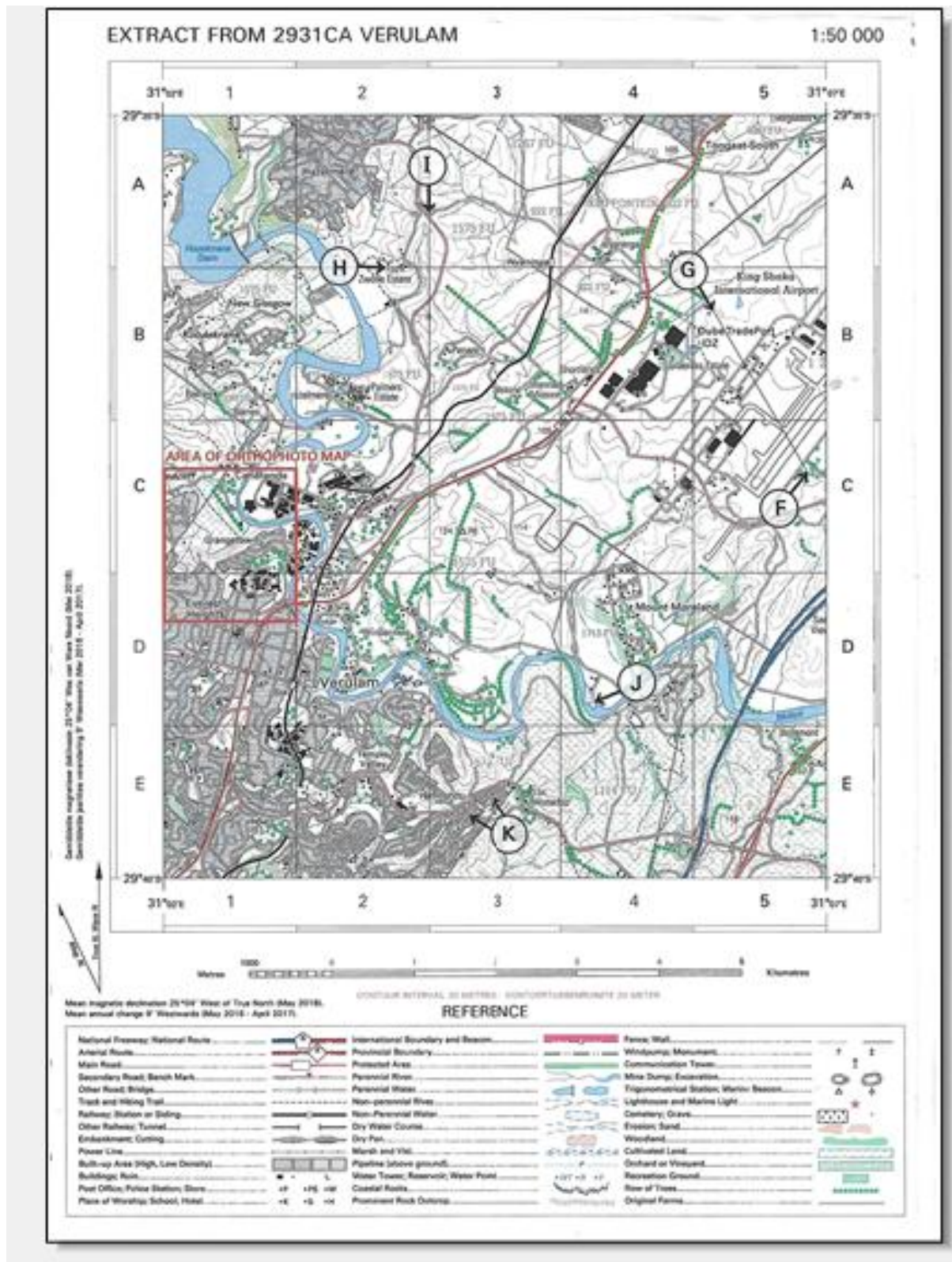
3.4.2. Are the Industries (heavy / light) 1x1=1

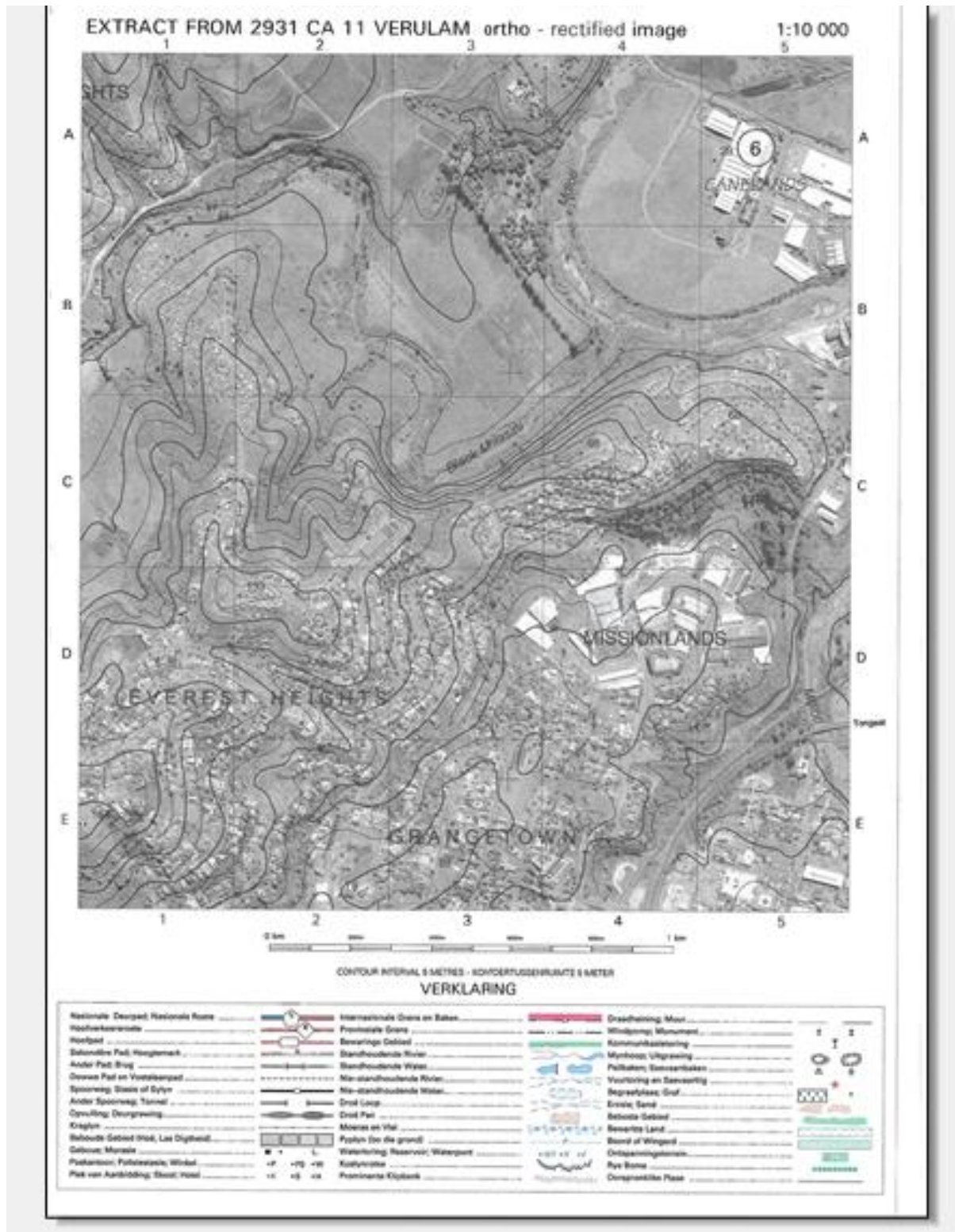
Discuss why the industries identified are in a suitable location. 2x2= 4
what are the environmental injustices that these types of industries can cause to human being. 1x2

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

3.5.GEOGRAPHICAL SKILLS AND TECHNIQUES





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 = 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? 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)
 - Laminar flow
 - turbulent flow

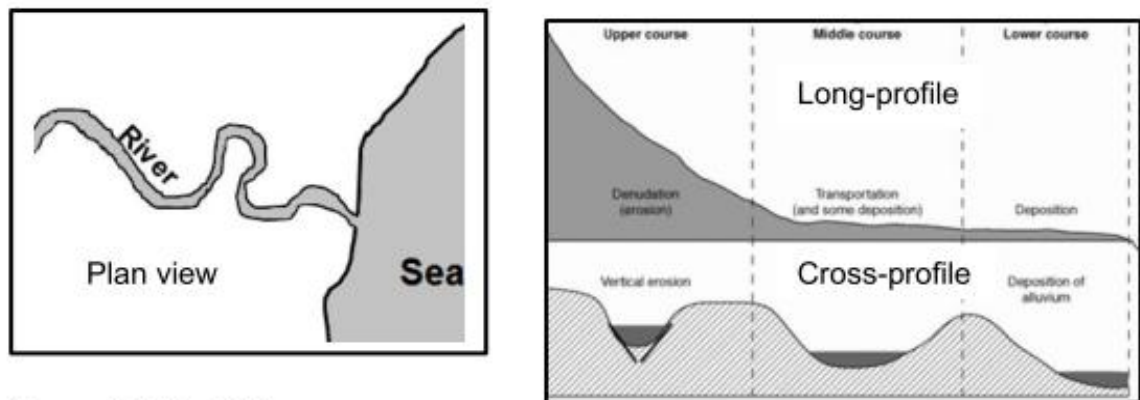
Fluvial processes

- 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

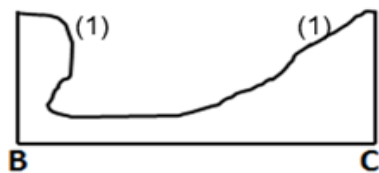
Meander and ox bow lake

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 m^2 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 m^2 . 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

The 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: **Vertical Interval (VI)**

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
 - Catchment area
 - River system
 - Tributary of Confluence
 - Watershed
 - Interfluvium
 - Source of River mouth
 - Surface run-off
 - Infiltration
 - Groundwater
 - Water table
 - Types of rivers (definition, identification and application):
 - Permanent
 - Periodic
 - Episodic
 - Exotic
 - Identification, underlying rock structure, development and characteristics of the following drainage patterns:
 - Dendritic
 - Trellis
 - rectangular
 - Radial
 - Centripetal
 - Deranged
 - Parallel
 - Definition and impact of factors influencing drainage density:(high/low drainage density):
 - Precipitation
 - Evaporation of Soil moisture
 - Vegetation
 - Slope/Gradient
 - Porosity
 - 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
 - Cross/Transverse profile of Longitudinal profile
 - 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:
 - Meander
 - Undercut slope
 - Slip-off slope
 - Oxbow Lake
 - Braided stream
 - Flood plain
 - Natural levee
 - Waterfall
 - Rapid
 - 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
 - Features of rejuvenation
 - Knickpoint
 - Terraces
 - Valley in a valley
 - Incised/Entrenched meanders
 - 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 ○ Deforestation ○ 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)

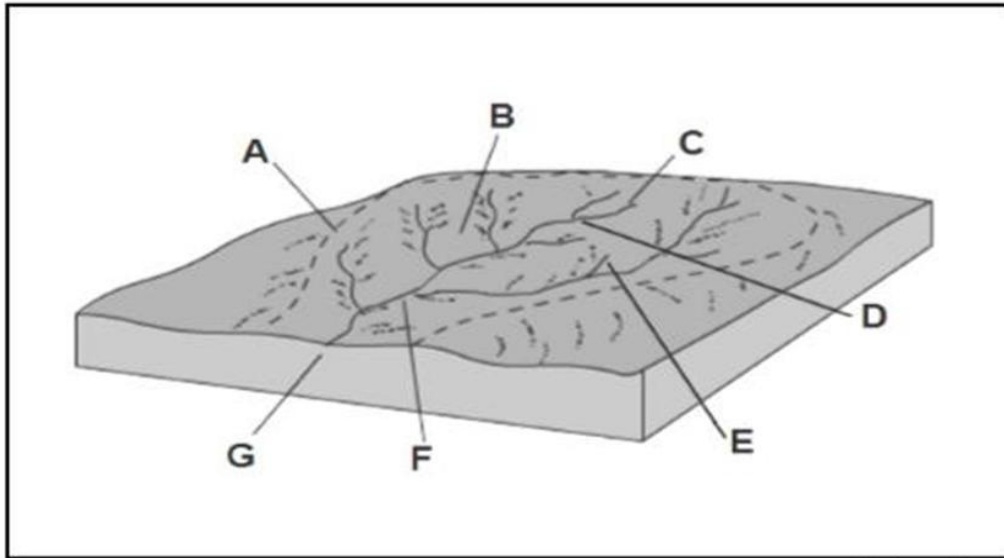
- GIS (definition)
- Components of GIS
- Sources of information for GIS
- Concepts (definition, identification and application) of:
 - Remote sensing
 - Reapproaches
 - Pixels o Spatial reapproaches o Spatial and attribute data o Vector and raster data o Spatial objects
 - Points/Nodes
 - Lines
 - Area/Polygons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

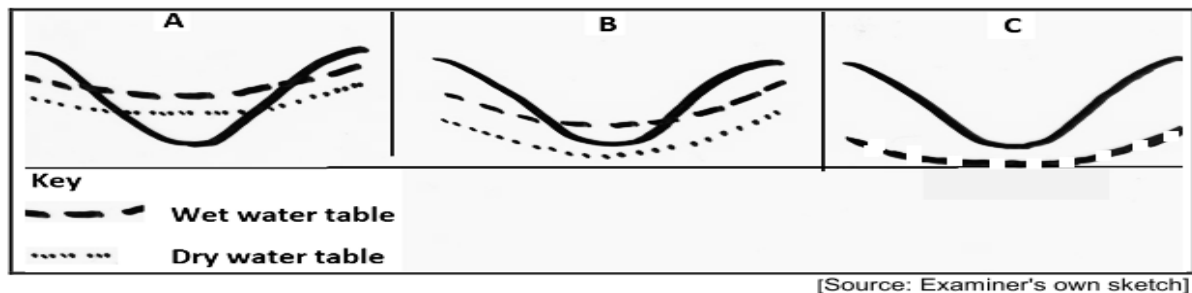
(7x1) (7)

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

(8x1) (8)

- 1.3. Refer to **FIGURE 1.3** showing three different types of rivers and answer the following questions. Choose the correct letter in the brackets that match the diagram



- 1.3.1. Which river (A, B or C) is an episodic river?
- 1.3.2. Which river (A, B or C) is periodic?
- 1.3.3. Which river (A, B or C) is exotic in its lower course?
- 1.3.4. In which picture (A, B or C) is the river bed always below the water table?
- 1.3.5. Which picture (A, B or C) does the groundwater never contribute to stream flow?
- 1.3.6. In which picture (A, B or C) does the river flow only during the rainy season?
- 1.3.7. In which picture (A, B or C) does the heavy showers?
- 1.3.8. In which (A, B or C) does the river always intersect the water table?

(8x1) (8)

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

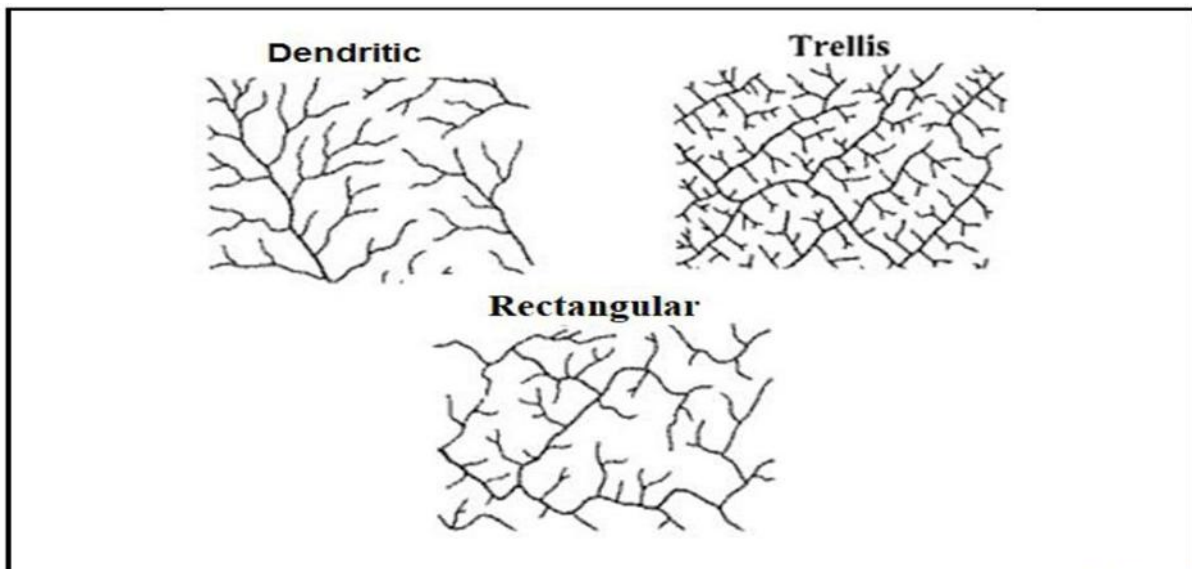
<i>Periodic, Permanent, Episodic and Exotic</i>
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- 1.4.1. The river that flows throughout the year
- 1.4.2. The river that flows through desert but has its source at a higher rainfall area
- 1.4.3. This river never receive contribution from the water table
- 1.4.4. The river that flows only after heavy rainfall
- 1.4.5. Water table is above the river bed during *winter* and *summer* season
- 1.4.6. River that receives contribution from the saturated zone during dry season.
- 1.4.7. River that does not show climatic characteristics of its surrounding.

(7x1) (7)

- 1.5. Refer to **figure 1.5** 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 (1.5.1 – 1.5.5) in the ANSWER BOOK. You may choose the same drainage pattern more than ONCE.

FIGURE 1.5

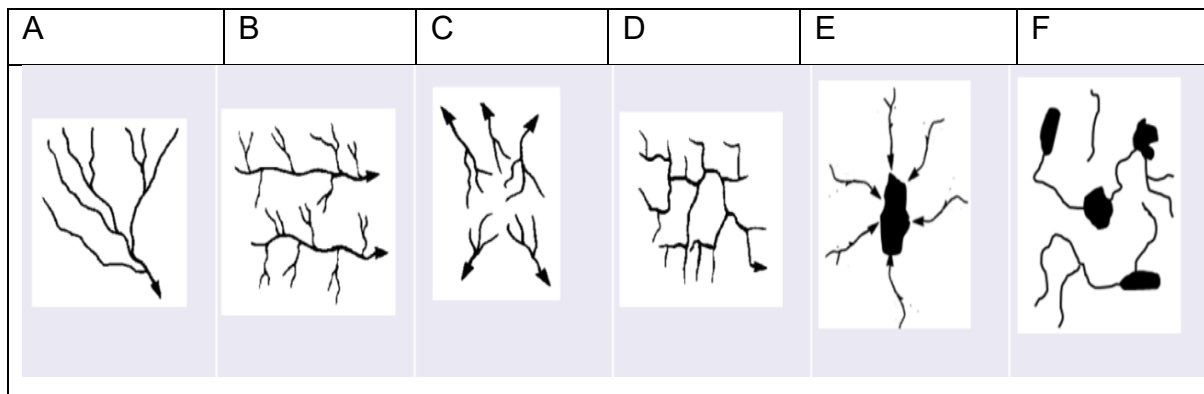


[Source: www.google/images]

- 1.5.1. Will develop on well jointed igneous rocks
- 1.5.2. Develops on rocks that are of equal resistance to erosion
- 1.5.3. . Tributaries join the main stream at right-angles from anticlines
- 1.5.4. There are right-angle bends in the individual stream
- 1.5.5. It is dependent on both the geology and topography of a landscape
- 1.5.6. Follows the slopes of the terrain
- 1.5.7. The rivers cut gaps into the landscape

(7x1) (7)

1.6. **Figure 1.6.** Choose the letter that best describes the statements below.



1.6.1. Streams radiate outwards from the central point.

1.6.2. Stream that has no specific direction.

1.6.3. It resembles the tree branches.

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

1.6.5. River flow towards a central point.

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

1.6.7. It has haphazard pattern.

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

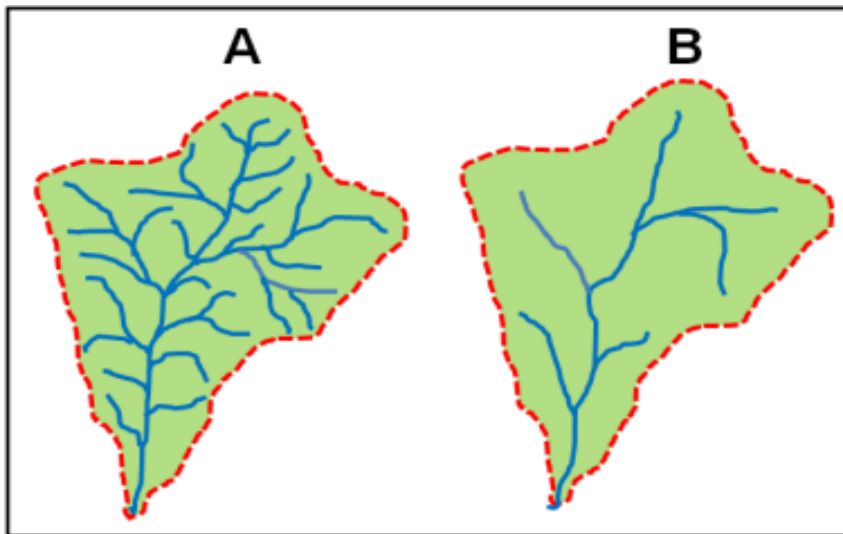
1X8 (8)

- 1.7. Match the description in Column A with the concept in Column B. Write only the letter **X** or **Y** next to the number (1.7.1 – 1.7.7)

Column A	Column B
1.7.1. Tributaries join the main river at acute angle	X: Trellis Y: Dendritic
1.7.2. Forms on igneous rocks that have many joints	X: Rectangular Y: Radial
1.7.3. It forms in an area where domes and volcanoes occur.	X: Centripetal Y: Centrifugal
1.7.4. It occurs on a rock that have uniform resistance to erosion	X: Parallel Y: Dendritic
1.7.5. It forms in areas that have been recently exposed or formed	X: Deranged Y: Rectangular
1.7.6. It occurs in basin-shaped areas e.g., lake	X: Centripetal Y: Centrifugal
1.7.7. Forms on rocks which has varying resistance to erosion.	X: Dendritic Y: Trellis

(7x1) (7)

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



- 1.8.1. Dense vegetation cover that prevents surface run-off.
- 1.8.2. A drainage basin that experiences high rainfall.
- 1.8.3. A drainage basin that has many clays soil.
- 1.8.4. A drainage basin that has mainly permeable rock.
- 1.8.5. A river that flows through hilly areas.
- 1.8.6. A drainage basin that has porous rock with sandy soil.
- 1.8.7. A river that flows through gently sloping land.

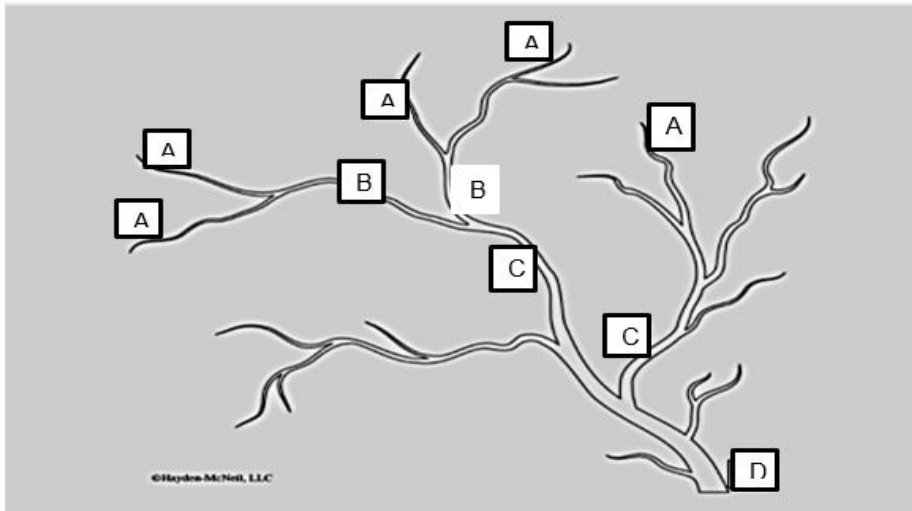
(7x1) (7)

1.9. Match column A and B

COLUMN A	COLUMN B
1.9.1. A is associated with _____ dip slope	X: Steeps Y: Gentle
1.9.2. B is associated with _____ density	X: High Y: Low
1.9.3. A is associated with _____ infiltration	X: High Y: Low
1.9.4. B is associated with _____ run off	X: high Y: low
1.9.5. A is associated with _____ density	X: High Y: Low
1.9.6. B is associated with _____ slope	X: High Y: Low
1.9.7. A is associated with _____ run off	X: High Y: Low
1.9.8. . B is associated with _____ rainfall	X: High Y: Low

(8x1) (8)

1.10. Stream Order



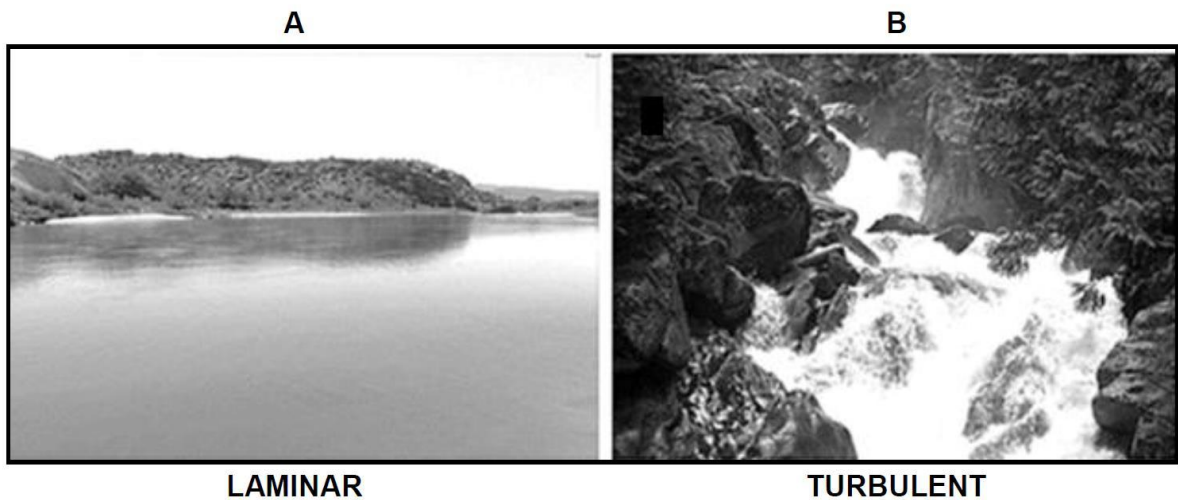
1.10.1. **B + B =** (1 X 2) (2)

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

1.10.3. Which stream order is formed where 1st order stream meet. (1 X 1) (1)

[7]

1.11. **Figure 1.11.** Laminar and Turbulent flow of a river.

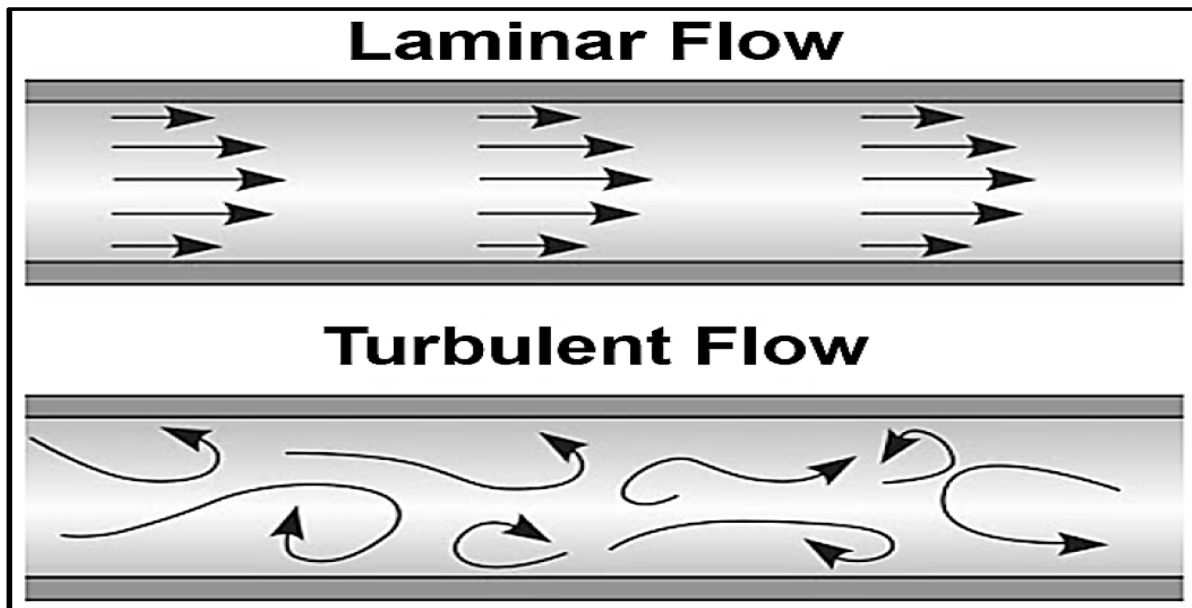


[Source: bing.com]

- 1.11.1. Rapids are characteristics of this type of flow.
- 1.11.2. Is associated with an increased volume of water in the lower course.
- 1.11.3. Associated with a higher rate of erosion.
- 1.11.4. Occurs mostly in the upper course of the river.
- 1.11.5. Promotes the formation of flood plains and levees.
- 1.11.6. A level river bed causes water to move in layers.
- 1.11.7. Surface friction causes water to form eddies (swirls).

(7x1) (7)

1.12 Figure 1.12

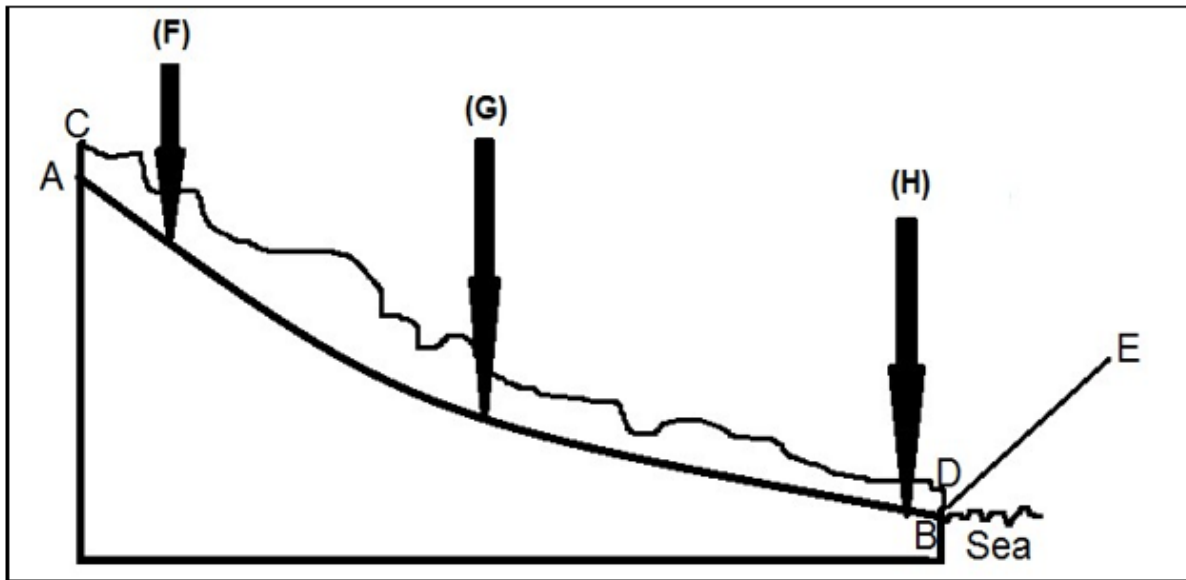


[Source: <http://www.Google images>]

- 1.12.1. This type of flow generally dominates the lower course of a river
- 1.12.2. Erosion is the main geomorphological process
- 1.12.3. This type of flow will promote the development of floodplains
- 1.12.4. This type of flow usually occurs in the upper course
- 1.12.5. The outer bank of a river experiences this type of flow
- 1.12.6. The water flow as sheet
- 1.12.7. The water flows as bubbles
- 1.12.8. Occurs where rapids and waterfall are found (8 x 1) (8)

1.13. Figure 1.14 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 1.14



- 1.13.1. (A-B/C-D) represents a river profile where erosion is generally more of erosion.
- 1.13.2. The (water/sea) represents the ultimate/ permanent base level of erosion.
- 1.13.3. Laminar flow dominates in the course (F/H) of the river.
- 1.13.4. In the course (G/H) one will find a U-shaped River valley.
- 1.13.5. Generally, rapids are found in the (F/H) course of the river.
- 1.13.6. The longitudinal profile (A-B/C-D) shows a river in equilibrium.
- 1.13.7. Under favourable conditions (alluvial fans/deltas) will develop at E.

(1 X 7) (7)

1.14. 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 (1.14.1 to 1.14.8) in the ANSWER BOOK

1.14.1. . 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

1.14.2. Deposition is the dominant process in the... of the river.

- A. Upper course
- B. Middle course
- C. Lower course
- D. Young course

1.14.3. The shape of the valley in the upper course of a river...

- A. V-shaped
- B. Wide
- C. Gentle
- D. U-shaped

1.14.4. . 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.

1.14.5. . 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.
- 1.14.6. The stream flow (discharge) of a river in the upper course is generally a ...flow.
- A. layered.
 - B. Laminar.
 - C. Smooth.
 - D. Turbulent.
- 1.14.7. . 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.
- 1.14.8. 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.

(1X8) (8)

- 1.15. 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 (1.17.1-1.17.8.) in the ANSWER BOOK, e.g., 1.17.8. J

1.15.1. A meander loop that is cut off from the main river.	A braided stream
1.15.2. The naturally raised banks of a river.	B delta
1.15.3. Forms when a river deposits its load and blocks its own path.	C undercut slope
1.15.4. Creates rough, turbulent water because of an uneven river bed.	D meander
1.15.5. Develops at the river mouth where deposition takes place.	E levee
1.15.6. Vertical cliff where underlying soft rock is eroded by plunging water.	F waterfall
1.15.7. Type of slope that forms on the outer bank of a meander.	G oxbow lake
1.15.8. Refers to a curve or bend along the course of a river.	H rapids
	I slip-off slope

(8 X 1) (8)

1.16. Complete the statement from COLUMN A with the options in COLUMN B. Write only **Y** or **Z** next to the question numbers (1.16.1.-1.16.7) in the ANSWER BOOK, e.g., 1.16.8 **Y**

COLUMN A	COLUMN B
1.16.1. Flat, natural feature next to a river	Y gentle slope Z floodplain
1.16.2. . An embankment along the river where coarse material is deposited first.	Y cut-off slope Z levee
1.16.3. Curves or bends found along the course of a river.	Y meander Z river flow
1.16.4. When a meander loop becomes separated from the river.	Y river bed Z oxbow lake
1.16.5. Streams with multiple channels and island of sediments between the channels.	Y misfit stream Z braided stream
1.16.6. . A vertical drop in the course of a river as a result of softer rock eroding faster than hard rock	Y waterfall Z Knick point
1.16.7. A depositional landform that occurs when a river flows into ocean.	Y delta Z river mouth

7x1 (7)

1.17. Complete the statements in **COLUMN A** with the options in **COLUMN B**. Write down only Y or Z next to the question numbers (1.17.1 to 1.17.7) in the ANSWER BOOK, e.g., 6.1.8 Y.

COLUMN A	COLUMN B
1.17.1. The reduction of vegetation by humans that increases silt deposition	Y: afforestation Z: deforestation
1.17.2. The stream is younger than the rock structure it flows on	Y: superimposed drainage Z: antecedent drainage
1.17.3. A stream that is too small to have eroded the valley in which it flows	Y: captor stream Z: misfit stream
1.17.4. When the stream is lengthening its course steam up	Y: Headward erosion Z: abstraction
1.17.5. The point where river capture takes place	Y: wind gap Z: elbow of capture
1.17.6. A dry river valley with river gravel	Y: misfit river Z: wind gap
1.17.7. River that intercepts the water of another river	Y: captor stream Z: captured stream

(7 x 1) (7)

1.20. 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 (1.20.1 to 1.20.8) in the ANSWER BOOK.

1.18.1. Erosion that occurs at the source of the river.

- A. Lateral
- B. Headward
- C. Deposition
- D. Grading

1.18.2. The most energetic river that steals water from another stream.

- A. Misfit
- B. Captor
- C. Captured
- D. Permanent

1.18.3. _____ is a smooth concave profile.

- A. Graded
- B. Ungraded
- C. Longitudinal
- D. Transverse

1.18.4. It is the course of the river where deposition takes place.

- A. Middle
- B. Upper
- C. Youth
- D. Lower

1.18.5. This landform is indicated by the Knickpoint along the river course.

- A. levee
- B. rapids
- C. waterfall

D. delta

1.18.6. _____ is a bend where the river capture occurs.

A. Elbow of capture

B. Misfit stream

C. Wind gap

D. Captor stream

1.18.7. The stream that has lost its source of water.

A. Misfit

B. Mind gap

C. Elbow of capture

D. Captured stream

1.18.8. It is the lowest level to which a river can erode.

A. Waterfall

B. Lake

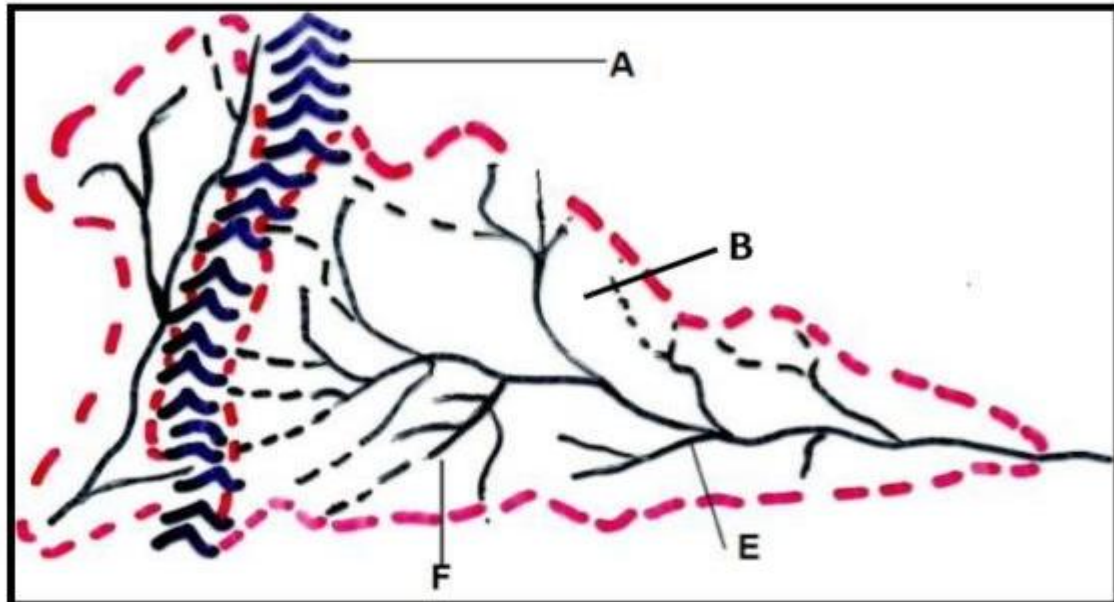
C. Sea

D. Rapid

(8 x1) (8)

2. DATA RESPONSE QUESTIONS

2.1. Study the drainage basins in FIGURE 3.2 and answer the questions that follow



2.1.1. Define the concept *Drainage basin* (1x2) (2)

2.1.2. Identify the feature labelled A (1x1) (1)

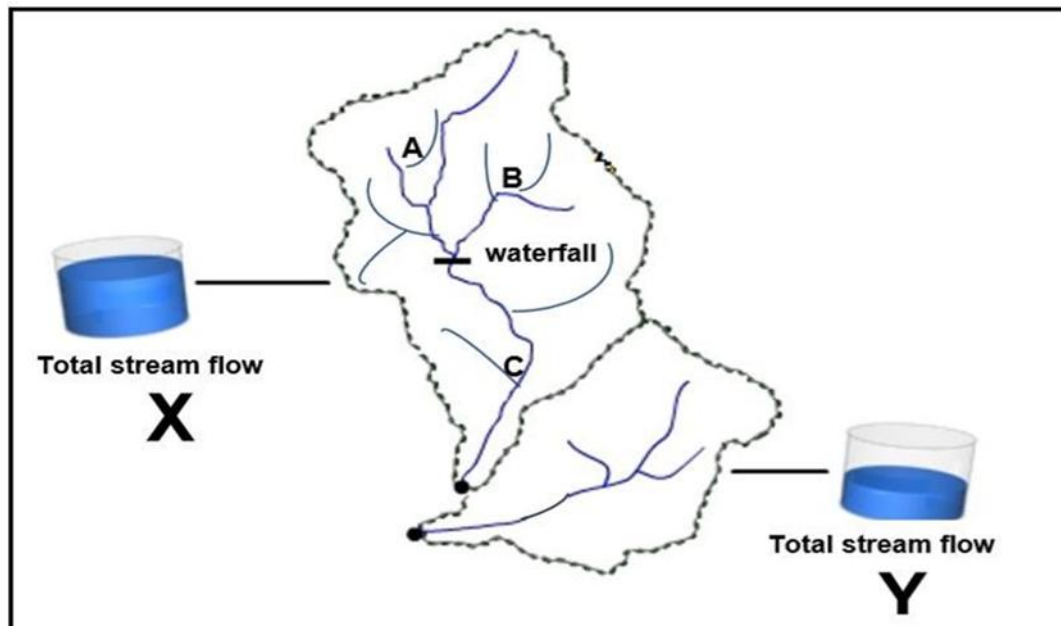
2.1.3. (a) State the stream order at B (1x2) (2)

(b) Give a reason for your answer (1x2) (2)

2.1.4. 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)

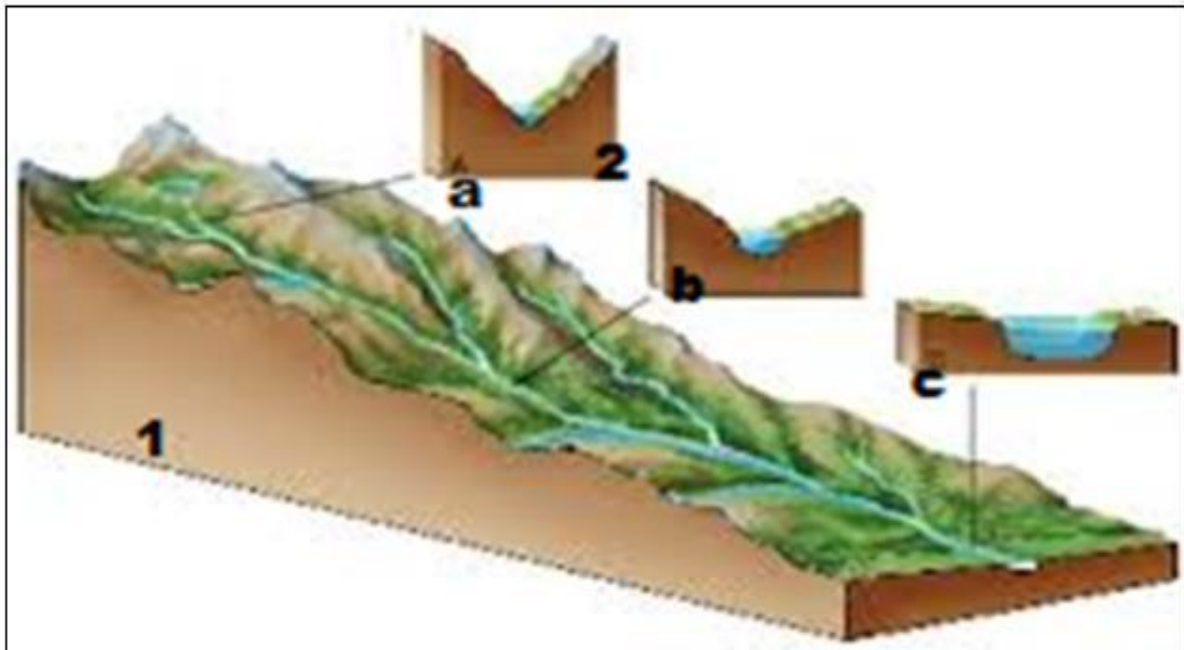
[15]

2.2. Figure 2.2 illustrates two drainage basins



- 2.2.1. Define the term drainage basin (1x2) (2)
- 2.2.2. Which drainage, X or Y, has a greater drainage density? (1x1) (1)
- 2.2.3. Give ONE reason for your answer to QUESTION 2.2.2. (1x2) (2)
- 2.2.4. Discuss THREE factors that could results in a drainage basin having a high drainage density. (3x2) (6)
- 2.2.5. Explain the impact of urban development at points A, B and C on the drainage density of drainage basin X (2x2) (4)

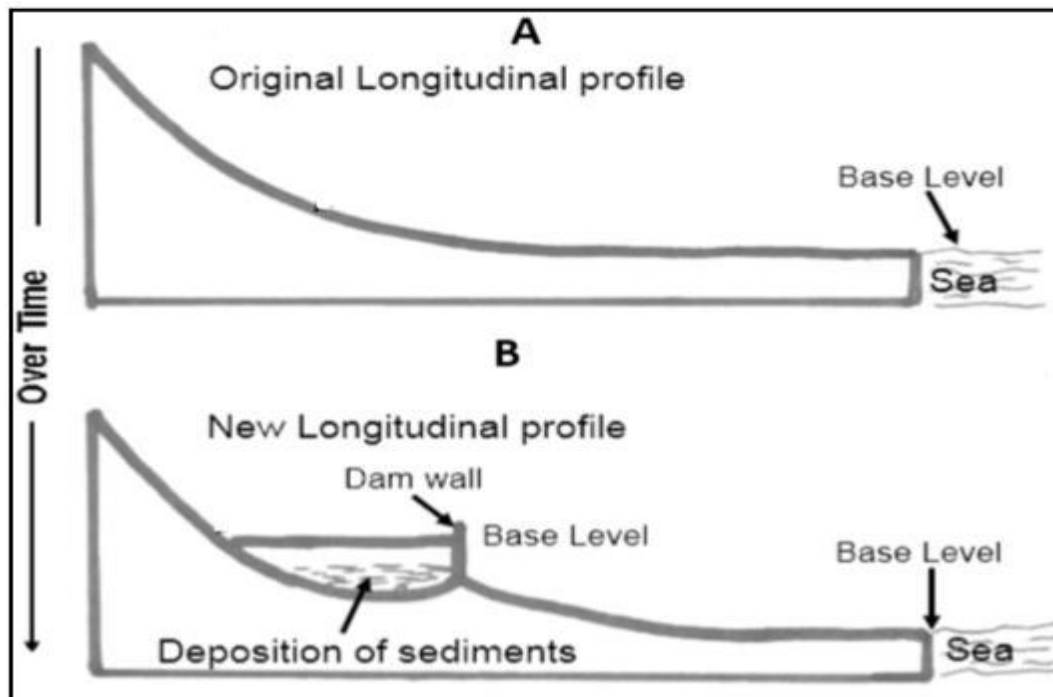
2.3. Refer to figure 2.4 that shows river profiles.



- 2.3.1. Identify the river profile at 1. (1x1) (1)
- 2.3.2. Mention TWO fluvial landforms likely to develop at C. (2x1) (2)
- 2.3.3. Suggest TWO reasons why the shape of the valley of the cross sections at A and C differs respectively. (2x2) (4)
- 2.3.4. Account because it is likely for flooding to occur at C (2x2) (4)
- 2.3.5. Discuss the influence of floods on the lives of people living next to the river in the area of C (2x2) (4)

[15]

2.4. Refer to FIGURE 2.5 showing a river profile



2.4.1. Define the term *longitudinal profile*. (1x2) (2)

2.4.2. Describe the shape of longitudinal profile A. (1x2) (2)

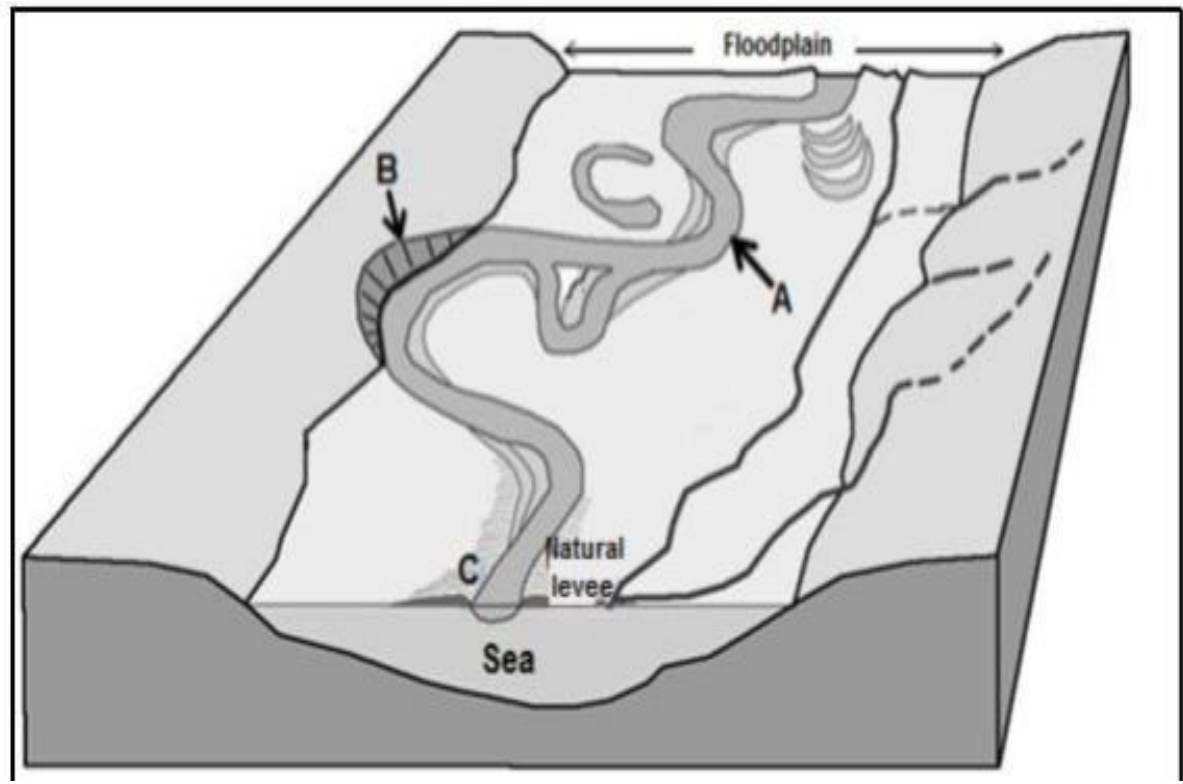
2.4.3. Identify an ultimate (permanent) base level of erosion in the diagram. (1x1) (1)

2.4.4. How will the deposition of sediment influence the capacity of the dam? (1x2) (2)

2.4.5. Describe the difference in the grade between the new longitudinal profile and the original profile. (2x2) (4)

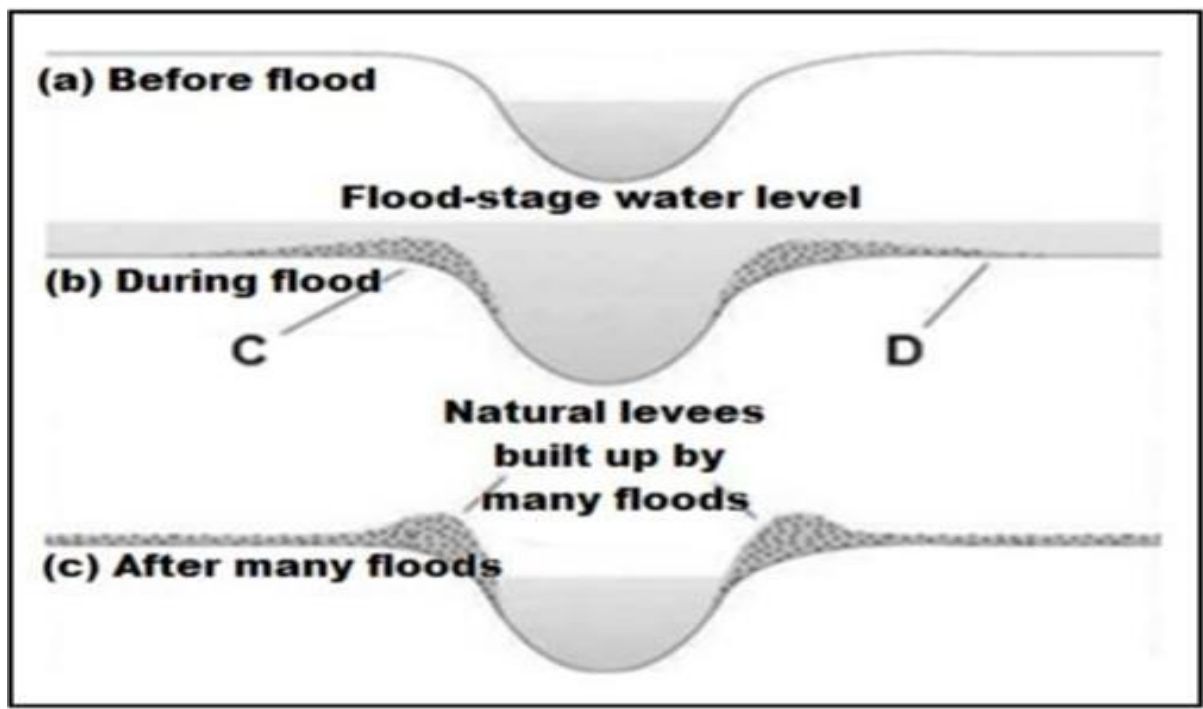
2.4.6. Explain the impact of the presence of the dam on erosion and deposition processes. (2x2) (4)

2.5. Study figure 2.9 and answer the questions that follows:



- 2.5.1. Name fluvial feature **A**. (1 x 2) (2)
- 2.5.2. Give reasons for the formation of feature **A**. (1 x 2) (2)
- 2.5.3. Explain why the undercut slope at **B** is steep. (1 x 2) (2)
- 2.5.4. Feature **C** is a natural levee. Why this fluvial landform is commonly found in the lower course of the river? (1 x 2) (2)
- 2.5.5. In a paragraph of approximately EIGHT lines, explain the positive and negative impact of levees on farming on the floodplain. (4 x 2) (8)

2.6. study the diagram on formation of a levee and answer the questions that follow:



2.6.1. Refer to the formation of a levee in FIGURE 5.6.

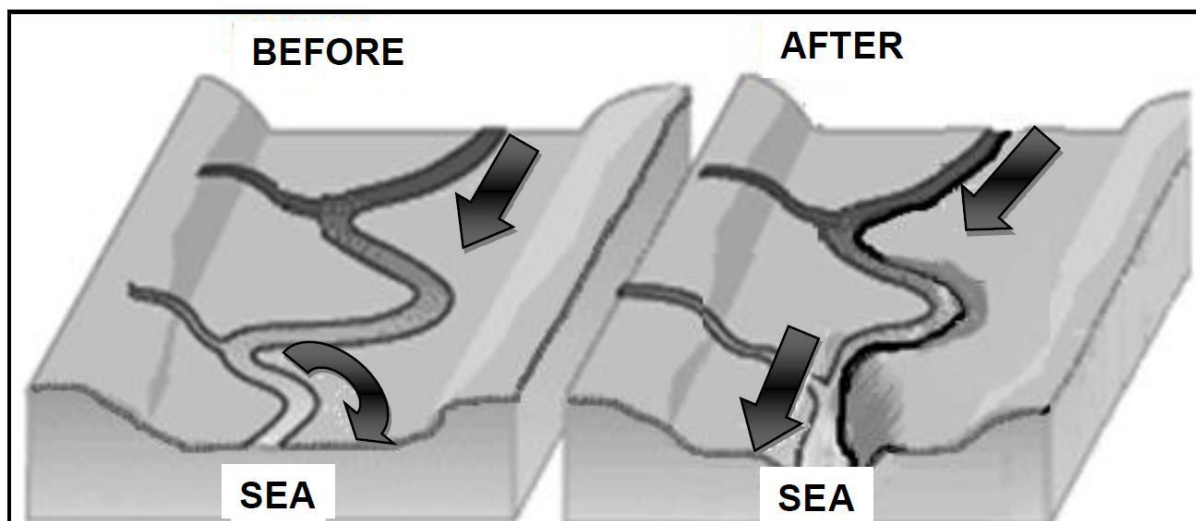
- What is *levee*? (1 x 1) (1)
- Give reasons for the difference in size between the sediment deposited at **C** and the sediment deposited at **D** in the FIGURE 5.6. (2 x 2) (4)
- Explain why levees can be both advantageous and disadvantageous to farming on the adjacent flood plain. (2 x 2) (4)

2.6.2. The following questions refer to deltas.

- Where are the deltas found in a river? (1 x 2) (2)
- Give a reason for the large quantities of the deposited material found where a delta is formed. (1x 2) (2)
- Why are deltas being rare I n South African rivers? (1 x 2) (2)

[15]

2.7. Refer to figure 2.12 (River capture)



[Adapted from <http://navneetsingh00215.blogspot.in>]

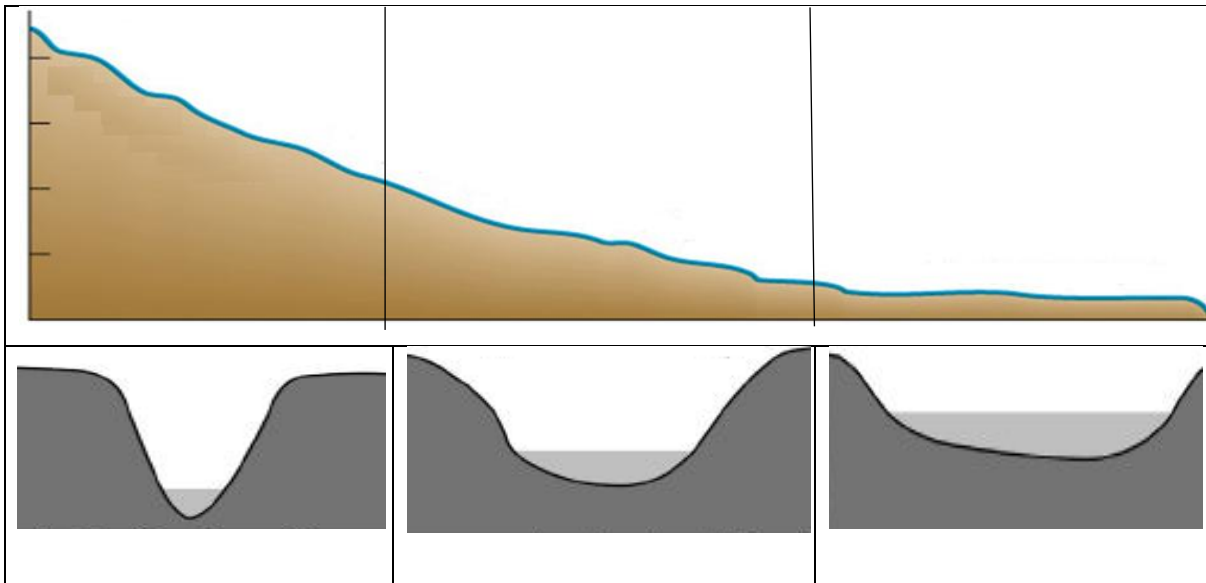
- 2.7.1. What is river rejuvenation? (1 x 1) (1)
- 2.7.2. Which stage (course) of the river is illustrated in the sketches? (1 X 1) (1)
- 2.7.3. Give evidence from sketches to support your answer to QUESTION 1.2.2. (1 x 1) (1)
- 2.7.4. Why is there an increase in the rate of erosion in the river after rejuvenation? (2 x 2) (4)
- 2.7.5. Identify the changes to the following features after river rejuvenation took place:
- River channel. (1x 2) (2)
 - Meander (1 x 2) (2)
- 2.7.6. 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]

2.8. Refer to sketch bellow and answer all questions

FIGURE 2.13 RIVER PROFILE

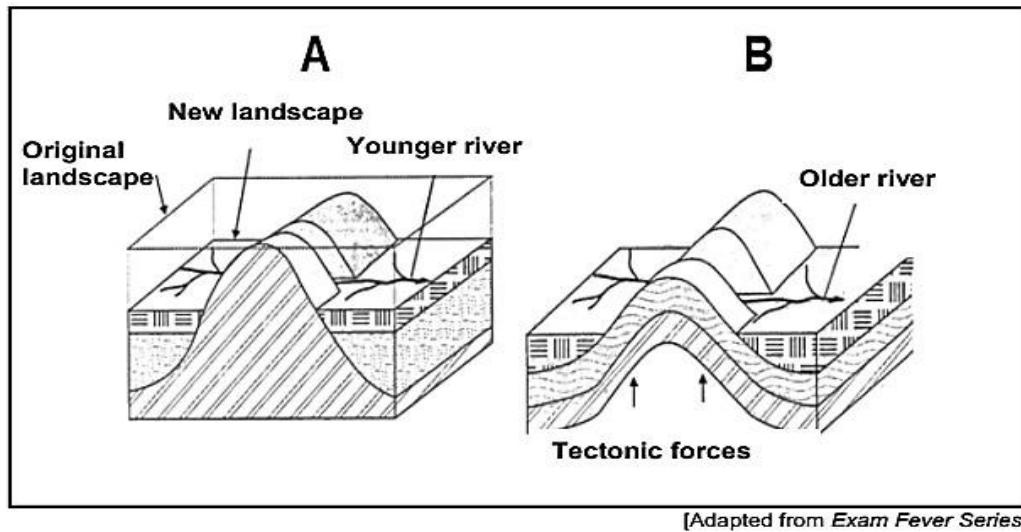


2.8.1. Complete the table below using diagram figure 2.11.

ELEMENT	UPPER COURSE	MIDDLE COURSE	LOWER COURSE
Slope			
Processes			
Velocity			
Channel			
Flow type			
Stream volume			
Landforms			

(1x21) (21)

2.9. Study the **FIGURE 2.13** below based on SUPERIMPOSED AND ANTECEDENT DRAINAGE



- 2.9.1. Define the term antecedent drainage. (2x1) (2)
- 2.9.2. Identify drainage A and B (1x2) (2)
- 2.9.3. Name ONE unique feature associated with the flow patterns of superimposed and antecedent drainage. (1x1) (1)
- 2.9.4. Identify the tectonic force associated with the uplift of the surface evident in diagram B. (1x2) (2)
- 2.9.5. Give the relationship between the rate of down cutting and tectonic uplift in antecedent drainage. (2x2) (4)
- 2.9.6. Explain why the illustrated landscapes are not suitable for human habitation. (2x2) (4)

[15]

2.10. CATCHMENT AND RIVER MANAGEMENT

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.

- 2.10.1. Name the human activity that is polluting the Umgeni River. (1 x 1) (1)
- 2.10.2. What evidence suggests that the Umgeni River is dirty? (1 x 2) (2)
- 2.10.3. State the negative impact of the dirty water on the quality of life of people living in the area. (2 x 2) (4)
- 2.10.4. In a paragraph of approximately 8 lines, suggest strategies that could be put place to reduce the negative impact of humans on the Umgeni River.

4x2 (8)

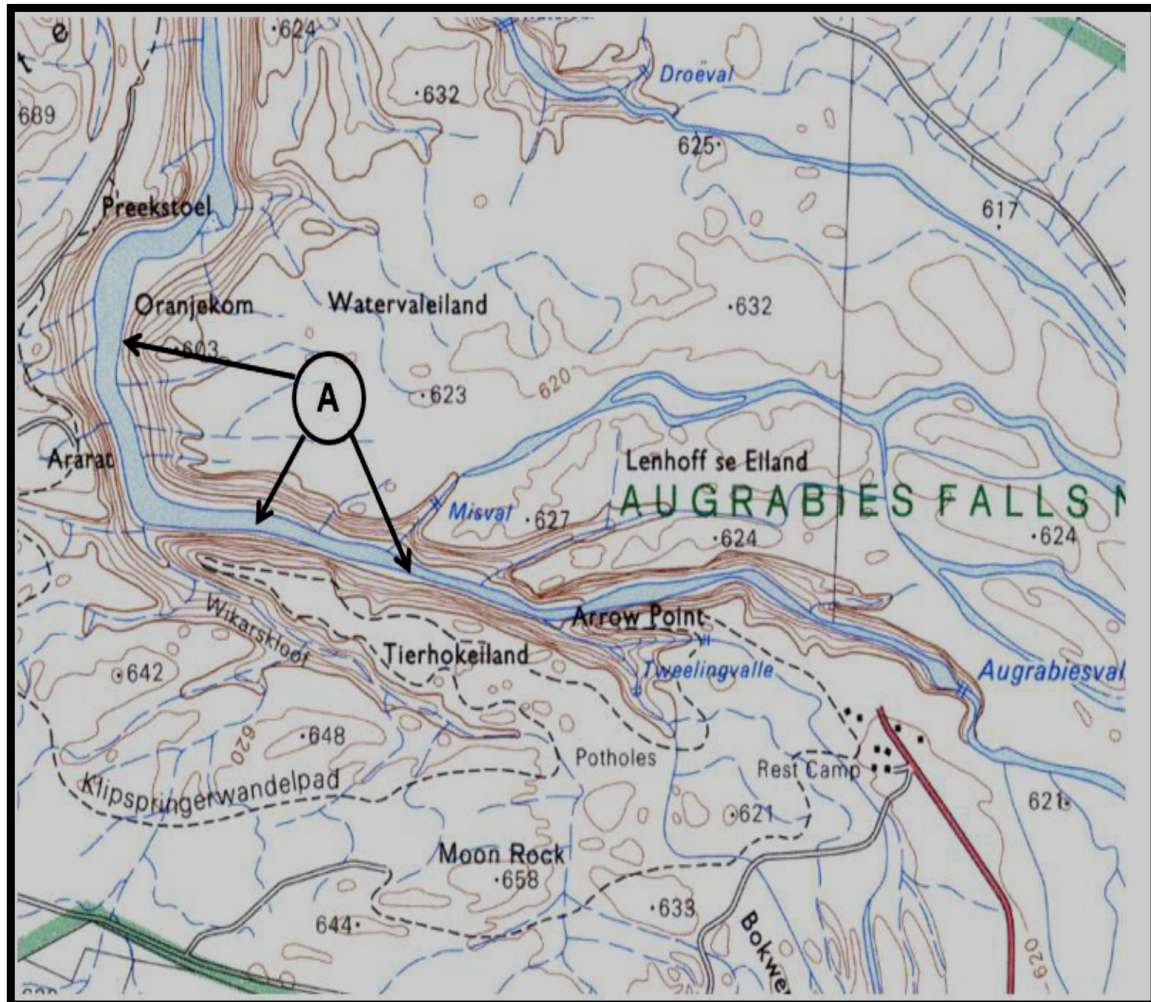
[15]

[15]

3.2. Refer to an extract of topographical map **2820CB AUGRABIES**

3.2.1. In which direction does the river at A flows.

(1x1) (1)



3.2.2. Provide TWO map evidences to support your answer to QUESTION 2.11.1.

(2x1) (2)

3.2.3. Name ONE temporary base level of erosion on the topographical map.

(1x1) (1)

3.2.4. Explain why the Augrabies waterfall can be seen as a Knick point in the longitudinal profile of the river

(1x2) (2)

3.2.5. The river at **A** underwent rejuvenation. Provide map evidence to substantiate the statement

(1x2) (2)

3.2.6. What challenges does rejuvenation of the river poses for agricultural and road development in the area?

(2x2) (

WORKSHEET

WORKSHEET P1

WORKSHEET P2

i. 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:

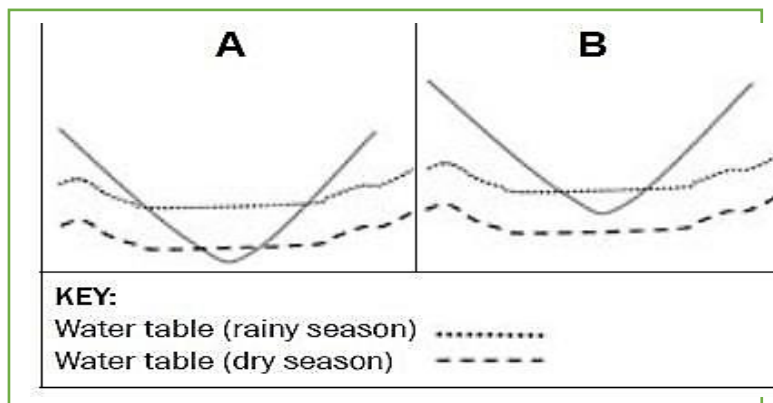
(1 x 2) (2)

7.2.5. Watershed

(1 x2) (2)

[10]

2. Types of rivers



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:

(1x2) (2)


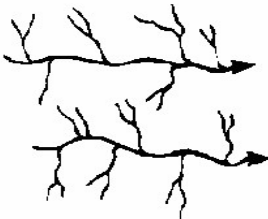

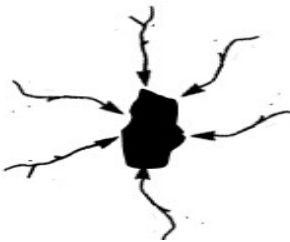
B:

(1x2) (2)

[6]

3. 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.			

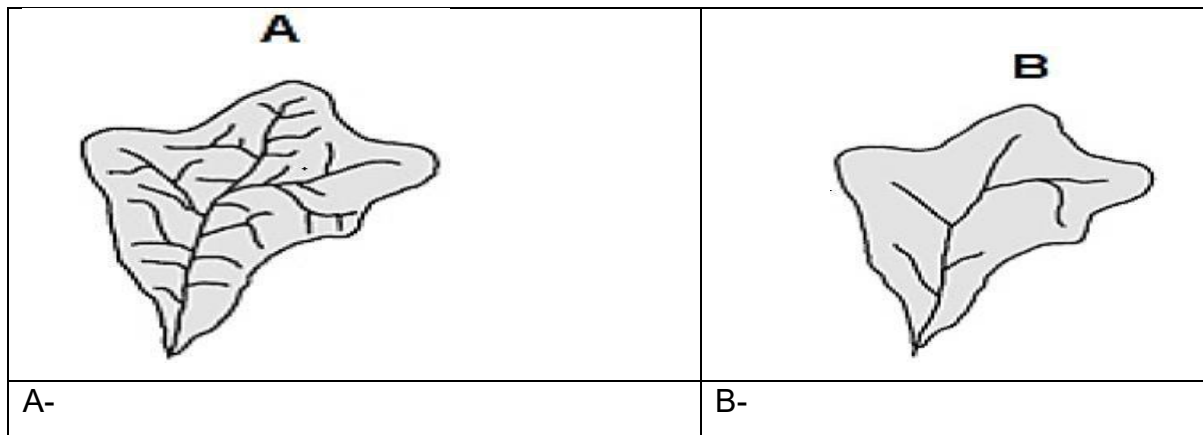
[20]

4. drainage density

7.5.1. What is drainage density?

(1x2) (2)

7.5.2. Identify drainage density A with B.



4.3. 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)



5. 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

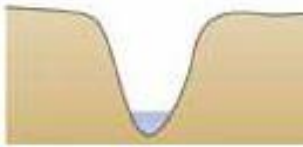


A	B
	
Flow A:	Flow B:
River course:	River course:

6. River profile

7.7.1. Define the term cross/transverse profile of the river.

(1x2) (2)

7.7.2. Identify the river course represented by the following cross sections and f. explain the processes responsible for their different shapes.

A-	B-	C-
		
Process responsible/Type of erosion	process responsible/ Type of erosion	process responsible


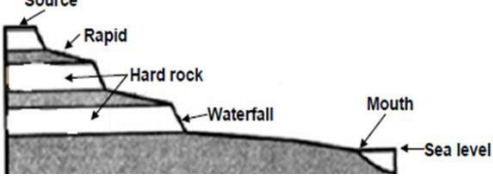
(2x3) (6)

7. River grading

7.8.1. Define the longitudinal profile:

_____ (1x2) (2)

7.8.2. Identify and describe the longitudinal profile A and B

<p>A</p> 	<p>B</p> 
Identify: (1)	Identify: (1)
Description: (2)	Description: (2)

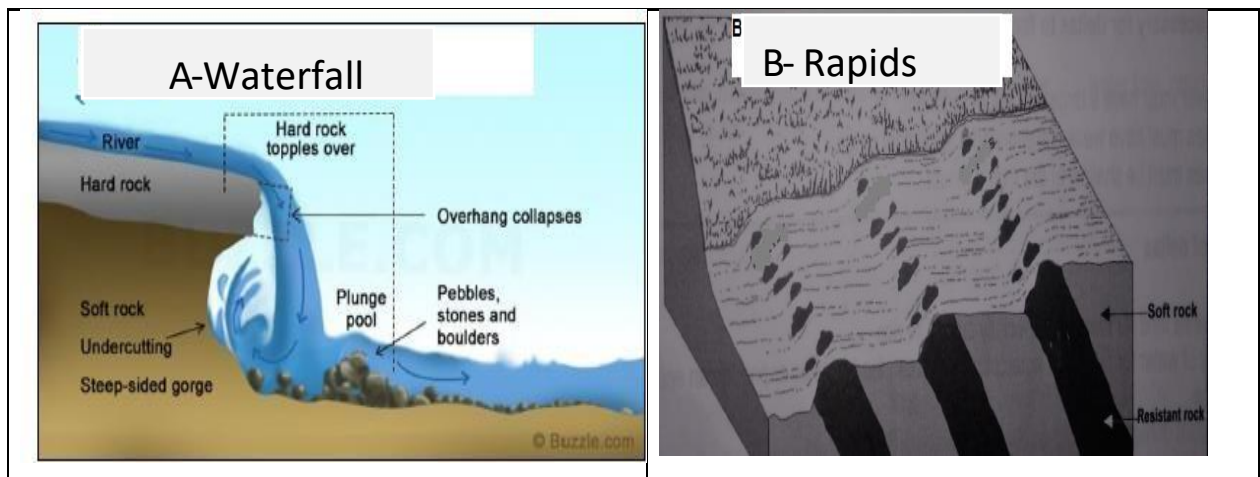
7.8.3. Differentiate under graded river and over graded rivers

Under graded: (2)	An over-graded: (2)
-------------------	---------------------

8. FLUVIAL LANDFORMS OF THE UPPER COURSE

7.9.1. Identify and describe the fluvial land 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)

9. FLUVIAL LAND FORMS OF THE MIDDLE AND LOWER COURSE



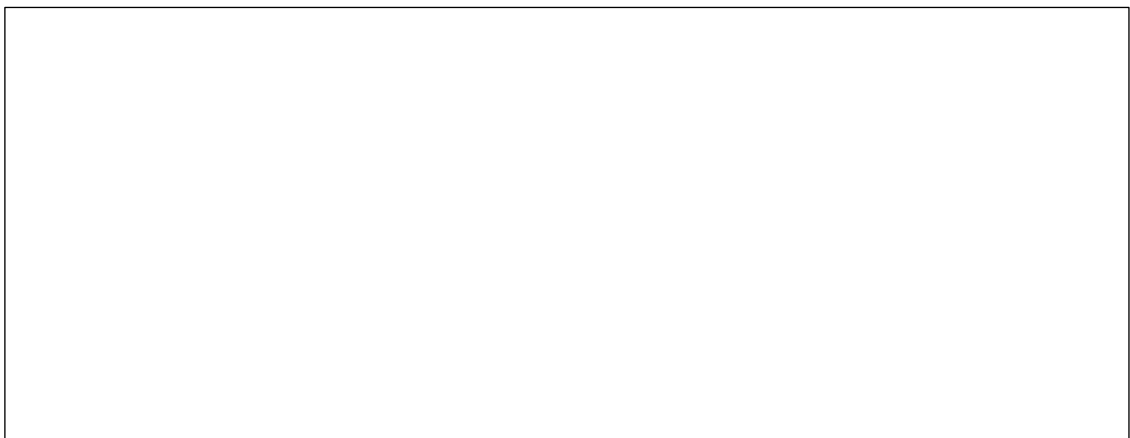
7.10.1. Identify the stream channel pattern above:

(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



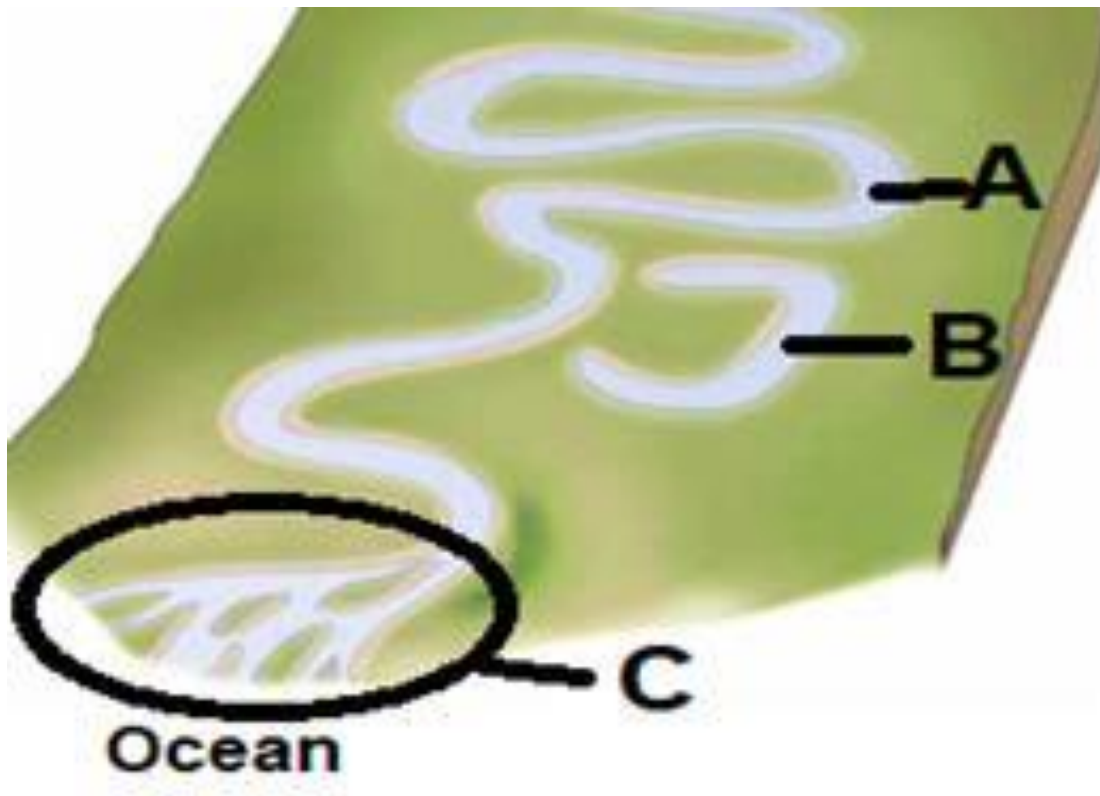
7.10.4. State ONE characteristic of the slip-off slope.

(1x1) (1)

7.10.5. State ONE characteristic of the undercut slope.

(1x1) (1)

10. 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)

11. River rejuvenation

7.12.1. Define River rejuvenation:

(1x2) (2)

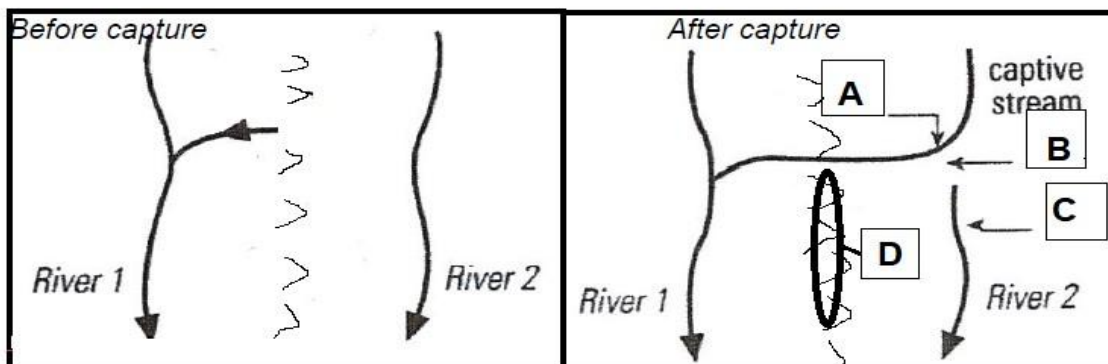
7.12.2. Mention two causes of river rejuvenation.

(2x2) (4)

7.12.3. Give TWO evidences/features of rejuvenation

(2x2) (4)

12. RIVER CAPTURE



7.13.1.

6.5.1

Define the concept river capture:

(1x2) (2)

7.13.2. Identify the features marked A, B, C and D

A;	B;	C;	D;
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(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


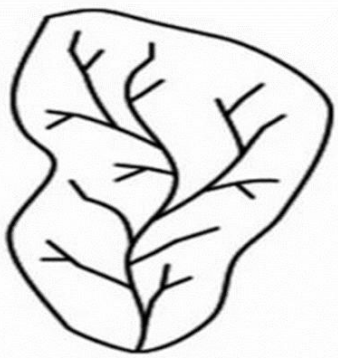
(4x2) (8)

13. Worksheet

13.1. Complete this worksheet that is based on factors influencing infiltration and drainage density.

CONCEPTS	
Drainage density	
Infiltration	
Surface run-off	

14. 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.		

15. 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)
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