GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PREPARATORY EXAMINATION

2021

10781

GEOGRAPHY

PAPER 1

TIME: 3 hours

MARKS: 150

12 pages + an annexure of 7 pages

GEOGRAPHY: Paper 1

10781E

X05

This question paper consists of 12 pages and an annexure of 7 pages is included as an insert in the question paper.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of THREE questions.
   - QUESTION 1: Climate and weather (60)
   - QUESTION 2: Geomorphology (60)
   - QUESTION 3: Mapwork (30)
2. Answer ALL THREE questions.
3. All diagrams are included in the ANNEXURE.
4. Illustrate your answers with labelled diagrams, where possible.
5. Leave a line open between sub-sections of questions answered.
6. Start EACH question at the top of a NEW page.
7. Number the answers correctly according to the numbering system used in this question paper. Number the answers in the CENTRE of the line.
8. Do NOT write in the margins of the ANSWER BOOK.
9. Write neatly and legibly.
10. You may use a non-programmable calculator and a magnifying glass.
11. The unit of measurement must be given in the final answer, where applicable, e.g. 10 km, 4°C, east.

SECTION B: MAPWORK AND APPLICATION

RESOURCE MATERIAL

1. An extract from topographic map **2931AB TUGELA**
2. Orthophoto map **2931AB 19 TUGELA**
3. NOTE: The resource material must be collected by schools for their own use.

INSTRUCTIONS, INFORMATION AND RESOURCE MATERIAL

1. You are provided with an extract from the 1 : 50 000 topographical map **2931AB TUGELA** and an orthophoto map **2931 AB 19 TUGELA** of a part of the mapped area.

2. You must hand the topographical map and the orthophoto map to the invigilator at the end of this examination session.

3. Show ALL calculations and use supplied formulae, where applicable. Marks will be allocated for these.

4. NO marks will be allocated for answers with incorrect units.

5. The area demarcated in RED on the topographical map represents the area covered by the orthophoto map.

6. You may use a magnifying glass.

7. The following English terms and their Afrikaans translations are shown on the topographical map:

ENGLISH	**AFRIKAANS**
Furrow	*Voor*
Golf course	*Gholfbaan*
River	*Rivier*
Sewage works	*Rioolwerke*
Weir	*Stuwal*

SECTION A: CLIMATE, WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1 Read the following statements and choose the appropriate word(s) in brackets to make the sentence TRUE. Write down only the question number (1.1.1 to 1.1.7) and the correct answer in the ANSWER BOOK, e.g., 1.1.8 Convection.

1.1.1 The climate of a small area such as valley climate is referred to as (micro-climate/macro-climate).

1.1.2 (Down-slope/up-slope) winds are also known as katabatic winds.

1.1.3 In (daytime/night-time), heating occurs, and warm air rises from the valley floor towards the crest causing anabatic winds.

1.1.4 The belt where the warm air accumulates midway up the valley, is called the (radiation belt/thermal belt).

1.1.5 A (frost pocket/fog pocket) forms on the valley floor when the temperature falls below freezing point.

1.1.6 Radiation fog in the valley is associated with (calm conditions/rapid winds).

1.1.7 Property values are usually (higher/lower) on the warmer middle slope than on the valley floor. (7 x 1) (7)

1.2 Refer to FIGURE 1.2, the Tropical Cyclone Edouard. 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 number (1.2.1–1.2.8) in the ANSWER BOOK, for example 1.2.9 A.

1.2.1 Tropical Cyclone Edouard was the… cyclone of the season.

A 2^{nd}
B 5^{th}
C 6^{th}
D 9^{th}

1.2.2 The movement of the air around the low pressure in the centre of the weather system is proof that this tropical cyclone occurred in the … hemisphere.

A southern
B northern
C western
D eastern

1.2.3 The centre of the weather system is known as the … of the tropical cyclone.

A cortex
B hurricane
C eye
D moisture front

1.2.4 The reason for the calm weather in the centre of the tropical cyclone is …

A subsiding air that warms adiabatically.
B subsiding air that cools adiabatically.
C ascending air that warms adiabatically.
D ascending air that cools adiabatically.

1.2.5 The path of the tropical cyclone is from …

A west to east.
B east to west.
C north to south.
D south to west.

1.2.6 The possible wind speed at approximately 24 hours is … km/h.

A 10
B 50
C 100
D 130

1.2.7 It took approximately … hours for the tropical cyclone to reach the mature stage

A 0
B 2
C 8
D 24

1.2.8 The mature stage occurs when …

A pressure begins to increase above 998 hPa.
B pressure begins to increase above 1 000 hPa.
C pressure decreases far below 1 000 hPa.
D pressure begins to decrease below 1 014 hPa.

(8 x 1) (8)

1.3 Refer to FIGURE 1.3 which shows mid-latitude cyclones on a synoptic weather map.

1.3.1 Which season is represented on the synoptic weather map in FIGURE 1.3? (1 x 1) (1)

1.3.2 At what stage of development is mid-latitude cyclone **C**? (1 x 1) (1)

1.3.3 Give evidence from the synoptic map to support your answer to QUESTION 1.3.2. (1 x 2) (2)

1.3.4 (a) Which mid- latitude cyclone, **A**, **B** or **C** is the oldest? (1 x 1) (1)

(b) Give TWO reasons for your answer to QUESTION 1.3.4 a). (2 x 2) (4)

1.3.5 Refer to the extract of the station model of Cape Town. Explain the change in temperature, wind direction and cloud cover as the cold front of mid-latitude cyclone **A** approaches Cape Town. (3 x 2) (6)

(15)

1.4 FIGURE 1.4 shows a line thunderstorm.

1.4.1 In which season do line thunderstorms develop over South Africa? (1 x 1) (1)

1.4.2 Describe the air that flows from the:

(a) South Indian Anticyclone (1 x 2) (2)

(b) South Atlantic Anticyclone (1 x 2) (2)

1.4.3 On which side of the moisture front do line thunderstorms occur? (1 x 1) (1)

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

1.4.5 In a paragraph of approximately EIGHT lines, suggest the positive and negative impact that line thunderstorms have on the agricultural sector in the interior of South Africa. (4 x 2) (8)

(16)

PLEASE DETACH THIS ANNEXURE OF 7 PAGES.

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GEOGRAPHY

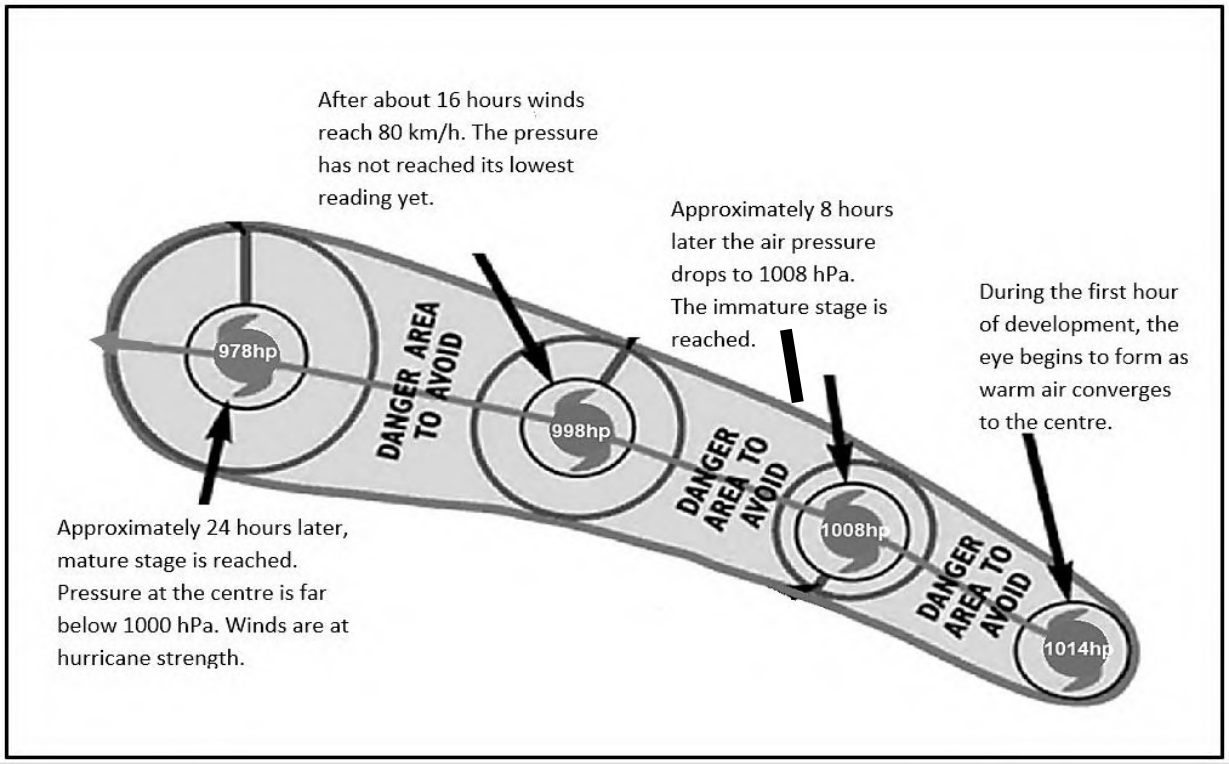
PAPER 1

ANNEXURE

7 pages

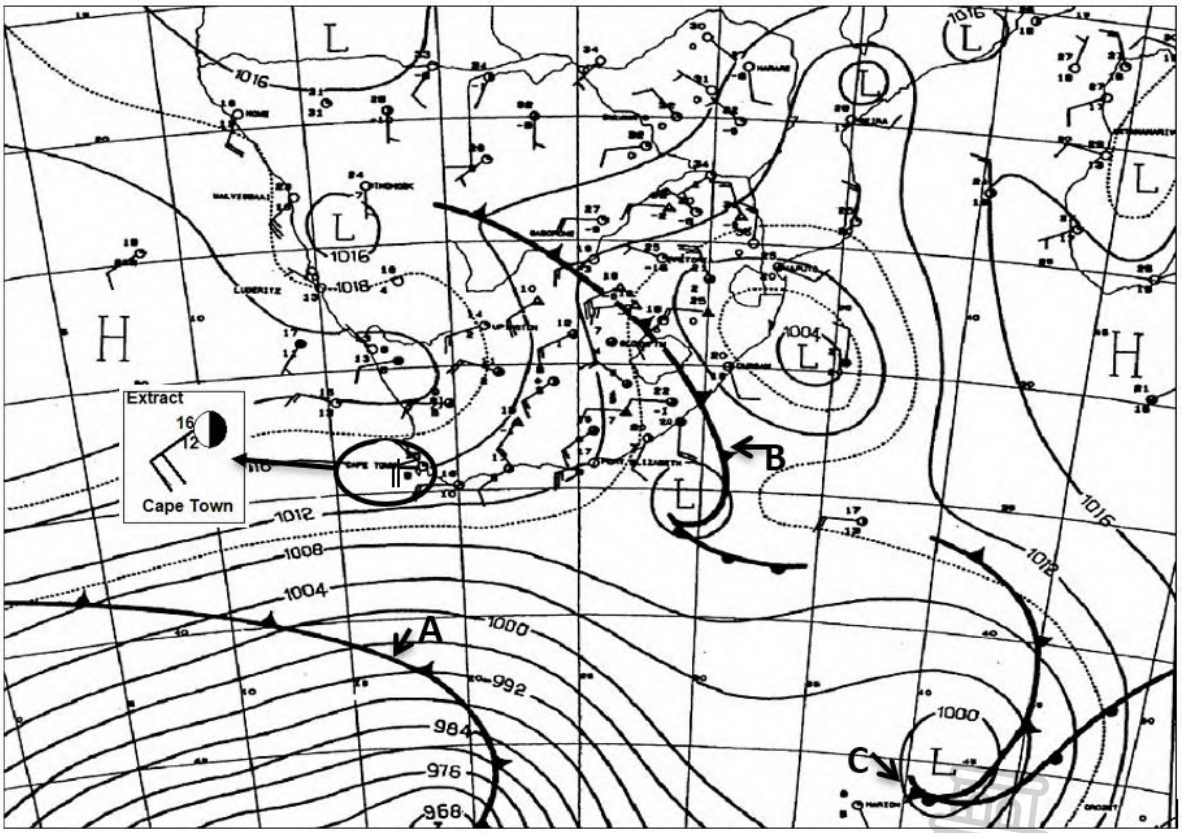
SECTION A: CLIMATE, WEATHER AND GEOMORPHOLOGY

FIGURE 1.2: TROPICAL CYCLONE EDOUARD



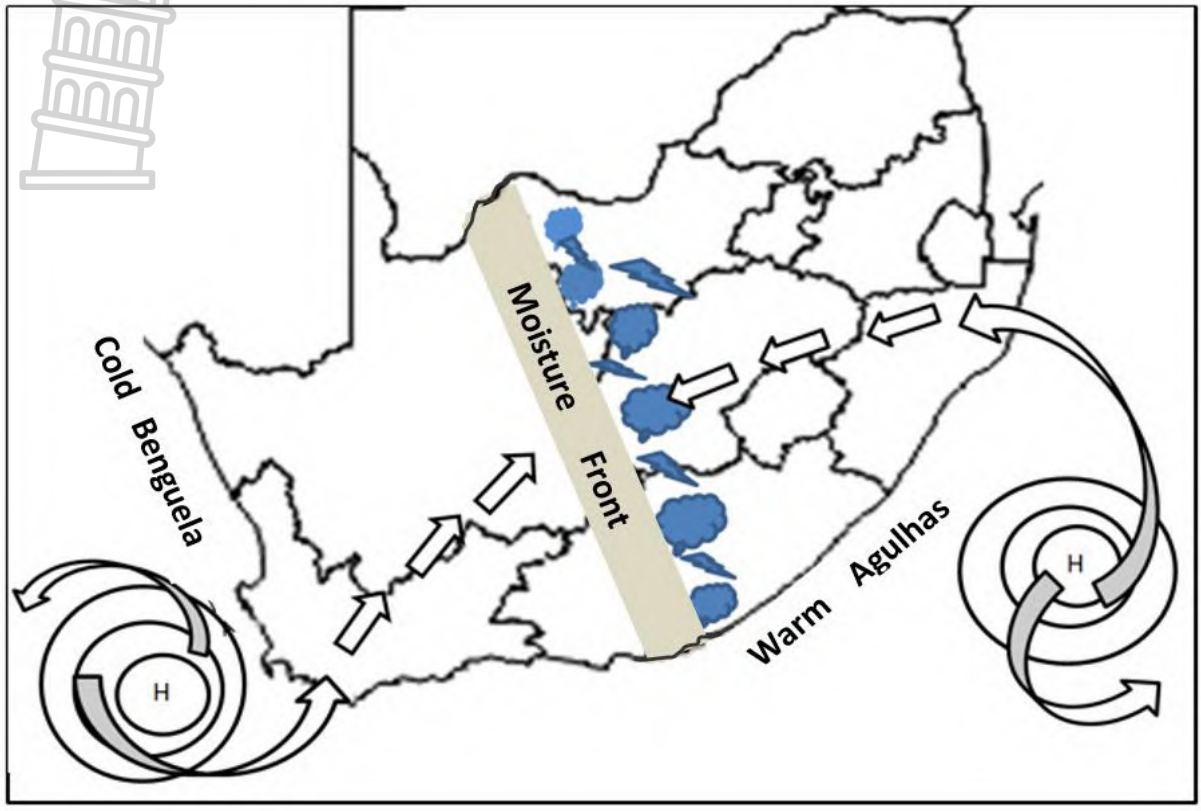
[Adapted from *https://nauticalclass.com/what-actions-vessel-should-take*]

FIGURE 1.3: MID-LATITUDE CYCLONES



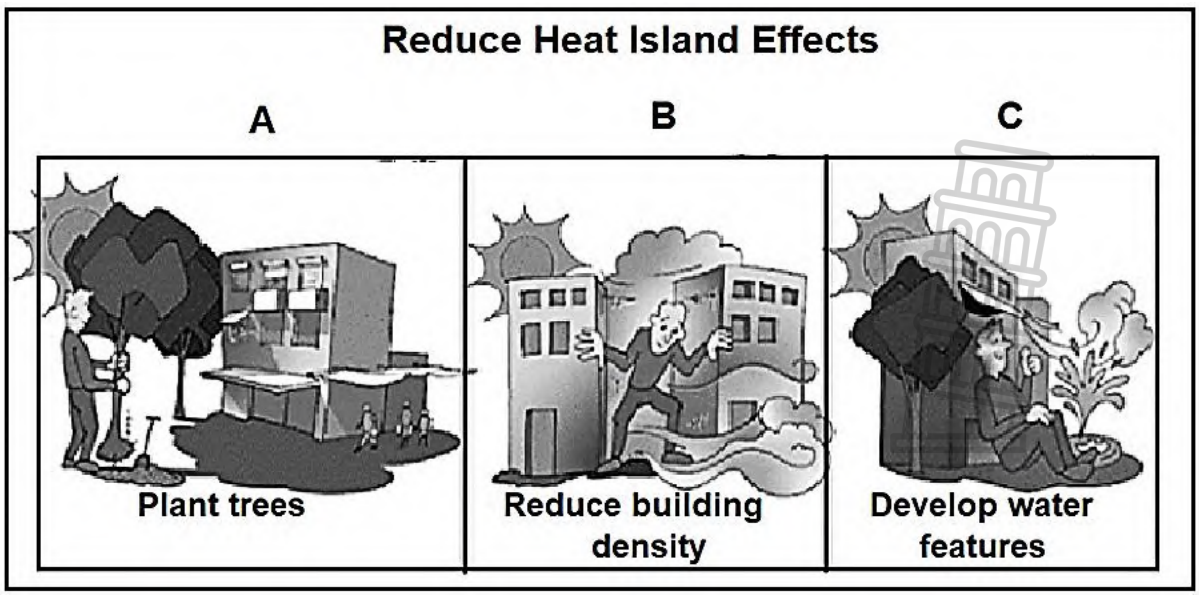
[Adapted from Surface-synoptic-weather-map]

FIGURE 1.4: LINE THUNDERSTORM



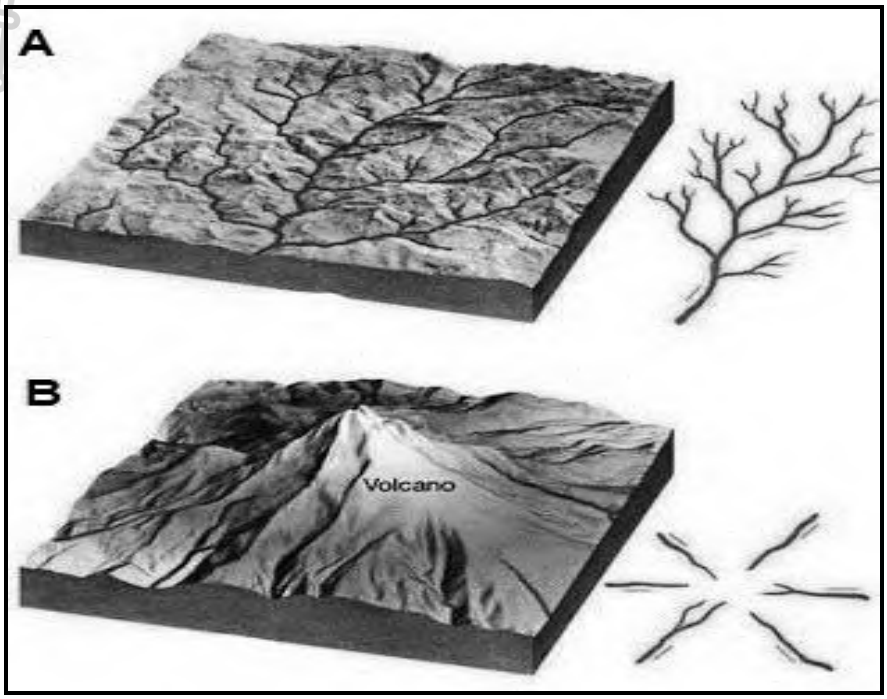
[Source: Examiner's own diagram]

FIGURE 1.5: HEAT ISLAND EFFECTS



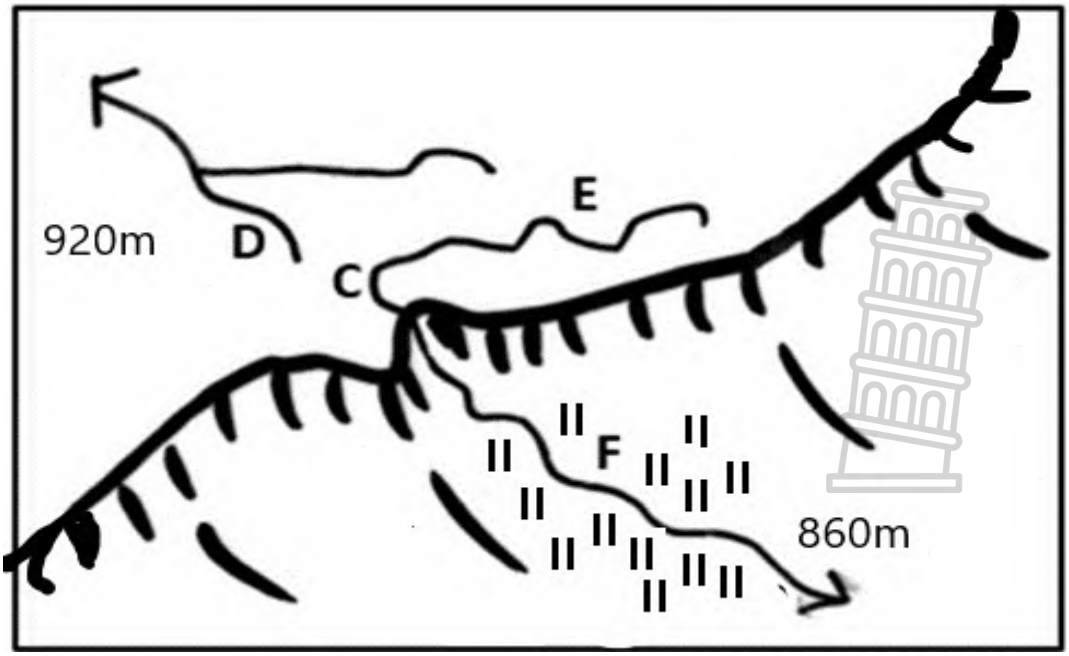
[Adapted source: *https://www.google.com/search?q=hitte+eiland&safe=strict&rlz=1C1GCEU*]

FIGURE 2.3: DRAINAGE PATTERNS



[Source: Adapted from *http: www.geologyin.com/2014/03/drainage-pattern.html?m=3*]

FIGURE 2.4: RIVER CAPTURE



[Source: Examiner's own sketch]

FIGURE 2.5: GAUTENG RIVER CATCHMENT MANAGEMENT

Gauteng is located on the continental divide with some rivers flowing towards the Indian Ocean and others to the Atlantic Ocean. It contains the headwaters of a number of important river systems in an urban environment.

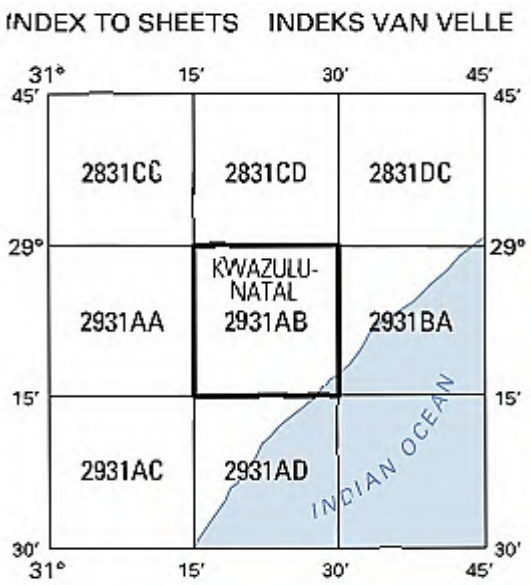
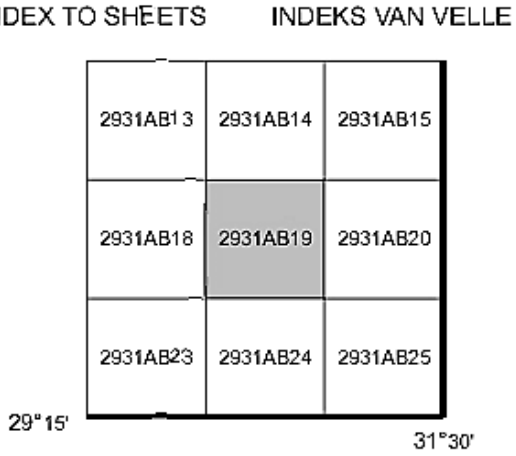
The high flow velocity of the river causes erosion especially where vegetation cover is removed, or the banks of rivers and streams are modified. Seasonal flooding is a real danger in several extensive areas in Gauteng. Canalisations of several rivers in urban as well as rural areas have further negative effects.

Healthy riverbanks maintain the form of the river channel, provide habitat for species (aquatic and terrestrial) and filter sediment, minerals and light. Water quality includes the chemical, physical and bacteriological properties of water which determine its suitability for use.

The urban nature of Gauteng (especially the central part) as well as road networks across the province seals natural surfaces in a manner that does not allow natural infiltration of rainwater into the ground. This high runoff scenario during rainfall events coupled to pollution emanating from the urban environment puts a high level of stress on the river system of Gauteng.

[Source*: https://armour.org.za/wp/about-us/armour-a-voice-for-water/*]

INDEX TO SHEET

TOPOGRAPHIC MAP	ORTHOPHOTO MAP
CONTOUR INTERVAL 20 METERS	CONTOUR INTERVAL 5 METERS
	

END

PLEASE DETACH THIS ANNEXURE.

1.5 Refer to FIGURE 1.5 that shows methods to reduce the effects of an Urban Heat Island.

1.5.1 Define the term *Urban Heat Island.* (1 x 2) (2)

1.5.2 Describe how the glass windows in FIGURE 1.5, will result in the increase in temperature in the urban area. (1 x 2) (2)

1.5.3 Explain TWO possible negative effects that Urban Heat Islands have on the health of human beings. (2 x 2) (4)

1.5.4 Explain how the THREE strategies (**A**, **B** and **C**), evident in FIGURE 1.5, contributed to the reduction of the Heat Island Effect. (3 x 2) (6)

(14)
[60]

QUESTION 2: GEOMORPHOLOGY

2.1 Read the following statements on the characteristics of a drainage basin and choose the appropriate word(s) in brackets which will make the statement TRUE. Write down only the question number (2.1.1 to 2.1.7) and the answer in your ANSWER BOOK, e.g. 2.1.8 Dendritic.

2.1.1 The point where the tributary joins the main river is known as the (source/confluence).

2.1.2 The total area of land drained by the river and its tributaries is known as the (drainage basin/catchment area).

2.1.3 A (river system/drainage pattern) is the main river with all its tributaries.

2.1.4 The surface area that captures rainfall is known as the (drainage basin/catchment area).

2.1.5 The tributary of a river is a result of (surface runoff/infiltration).

2.1.6 The (watershed/interfluve) is a spur that separates two tributaries of the same river system.

2.1.7 The upper layer of underground saturated rock is referred to as the (ground water/water table)

(7 x 1) (7)

2.2 Choose a term from COLUMN B that matches the geomorphologic description of fluvial landforms in COLUMN A. Write only the letter (A–I) next to the question number (2.2.1 to 2.2.8) in the ANSWER BOOK, e.g. 2.2.9 J.

COLUMN A		COLUMN B	
2.2.1	The splitting of a river into different streams due to a slow-moving river depositing alluvium at the mouth	A	Levees
2.2.2	Low-lying ground adjacent to a river in the lower course	B	Terraces
2.2.3	This fluvial landform forms due to a knickpoint	C	Delta
2.2.4	Steps on the sides of a river as it erodes its own floodplain through rejuvenation	D	Distributaries
2.2.5	A fluvial landform resulting from a slow moving river depositing alluvium before it enters the sea	E	Floodplain
2.2.6	This feature forms when an ox-bow lake dries up	F	Waterfall
2.2.7	A very steep sided valley where a river flows at the bottom	G	Meander
2.2.8	The winding pattern of a river that results in lateral erosion	H	Gorge
		I	Meander scar

(8 x 1) (8)

2.3 Refer to FIGURE. 2.3 that shows the different types of drainage patterns.

2.3.1 Identify drainage patterns **A** and **B**. (2 x 1) (2)

2.3.2 What is the dominant physical factor that determines the development of different types of drainage patterns? (1 x 1) (1)

2.3.3 Give TWO visible characteristics of drainage pattern **A** in FIGURE 2.3. (2 x 1) (2)

2.3.4 Why would farming be more suitable in an area with drainage pattern **A**? (2 x 2) (4)

2.3.5 Explain how physical factors limit the effective use of water in drainage pattern **B**. (3 x 2) (6)

(15)

2.4 Refer to FIGURE 2.4 that shows river capture.

2.4.1 Define the concept *river capture.* (1 x 2) (2)

2.4.2 Name the main physical factor (natural factor) visible in FIGURE 2.4 that resulted in river capture taking place. (1 x 1) (1)

2.4.3 Identify the features of river capture labelled **C** and **D** in FIGURE 2.4. (2 x 1) (2)

2.4.4 State the impact that river capture will have on the volume of water in rivers **D** and **F**. (1 x 1) (1)

2.4.5 Discuss how the process of river capture has led to the rejuvenation of river **F**. (2 x 2) (4)

2.4.6 Explain the negative impact that rejuvenation will have on the economic activity visible next to river **F** on FIGURE 2.4. (2 x 2) (4)

(14)

2.5 Study the extract on Gauteng River Catchment Management in FIGURE 2.5.

2.5.1 Define the concept *river management*. (1 x 2) (2)

2.5.2 Give evidence from the extract that shows the importance of catchment management in Gauteng. (2 x 1) (2)

2.5.3 Identify TWO issues from the article that pose a challenge to effective river management. (2 x 1) (2)

2.5.4 Explain why aquatic life is affected by poor river management in Gauteng. (1 x 2) (2)

2.5.5 In a paragraph of approximately EIGHT lines, provide sustainable strategies that can be implemented to deal with problems associated with poor river management systems. (4 x 2) (8)

(16)
[60]

TOTAL SECTION A: 120

SECTION B: MAPWORK AND APPLICATION

QUESTION 3

The questions below are based on the 1 : 50 000 topographic map **2931AB TUGELA** as well as the orthophoto map **2931 AB 19 TUGELA** of a part of the mapped area. Refer to the general information on Tugela below, as well as the contour interval and index to sheet (page 7) in the ANNEXURE.

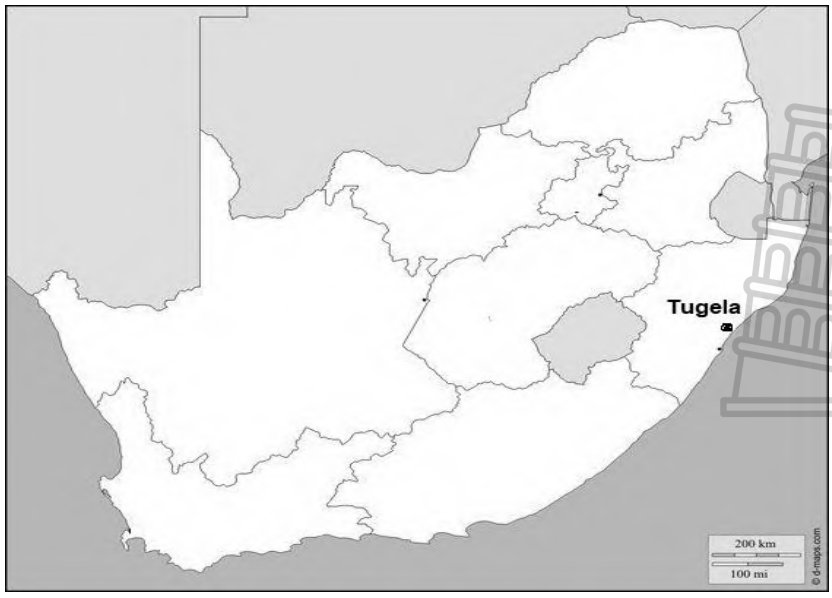
GENERAL INFORMATION ON TUGELA

INFORMATION: TUGELA

The uThukela River originates as a stream on the 3 050m high Mont-aux-Sources plateau near the merger point of the Lesotho–Free State provincial borders. Its upper course, which lies within Royal Natal National Park, flows through the Drakensberg range before coming down fast through a series of waterfalls having a total drop of 948 m. The river cuts through the Tugela Gorge at the foot of the escarpment (about 1,500 m above sea level) and is quickly joined by many tributaries.

The uThukela River ends its course of 502 km at the Indian Ocean, about 84 km north of Durban. The mouth almost completely blocked in times of normal flow by a sandbar. Its narrow valley and alluvial deposits restrict irrigation.

The climate in this area is mild, and generally warm and temperate. The summers have a good deal of rainfall, while the winters have very little. The average annual temperature is 19,4°C at the Tugela Mouth resort and the average annual rainfall is 679 mm.



[Source: *https://www.britannica.com/place/Tugela-River*]

QUESTION 3: TOPOGRAPHIC AND ORTHOPHOTO MAP TECHNIQUES

3.1 Refer to the topographical map and the orthophoto map.

3.1.1 Four options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1.1) in the ANSWER BOOK.

The length of the railway tunnel at **F** in block **E3** is … metres.

A 0,3 m
B 30 m
C 300 m
D 3 000 m (1 x 1) (1)

3.1.2 Four options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1.2) in the ANSWER BOOK

The map reference for the map northeast of 2931AB is …

A 2831 CC.
B 2831 DC.
C 2931 BA.
D 2931 DC. (1 x 1) (1)

3.1.3 Use the following formula and steps to determine the magnetic bearing from the benchmark, **G** in block **D5** to trigonometrical beacon 93, **H** in block **C4.**

Formula: magnetic declination + true bearing

(a) Difference in years

(b) Mean annual change

(c) Total annual change

(d) Magnetic declination

(e) True bearing

(f) Magnetic bearing (7 x 1) (7)

3.1.4 Why is it important to calculate the current magnetic declination? (1 x 1) (1)

(10)

3.2 TOPOGRAPHIC AND ORTHOPHOTO MAP APPLICATION

Refer to the valley **I − J** on the topographical map.

3.2.1 (a) The wind that blows at night in the valley is a/an (anabatic/katabatic) wind? (1 x 1) (1)

(b) Describe the flow of the wind identified in QUESTION 3.2.1 (a). (1 x 2) (2)

(c) Identify the type of vegetation at **K**. (1 x 1) (1)

(d) Explain the climatological factor that determined the location of the vegetation type at **K**. (1 x 2) (2)

3.2.2 Refer to the uThukela River on the orthophoto map.

(a) Identify the fluvial landform created by the uThukela River on the orthophoto map. (1 x 1) (1)

(b) Identify slope **5** and give a reason for your answer. (1 + 1) (2)

(c) (Grass/Trees) are found at **6** on the orthophoto map. (1 x 1) (1)

(d) Explain the positive impact that the vegetation at **6** will have on the cultivated land at **7**. (1 x 2) (2)

(12)

3.3 GIS APPLICATION

Refer to both the topographical map and the orthophoto map.

3.3.1 (a) Does an orthophoto map consist of raster or vector data? (1 x 1) (1)

(b) Motivate your answer to QUESTION 3.3.1 (a). (1 x 2) (2)

3.3.2 There is clear evidence of the application of buffering on both the topographic and orthophoto maps.

(a) Define the term *buffering.* (1 x 2) (2)

(b) Provide evidence of how buffering was applied in block **D3** on the topographic map. (1 x 2) (2)

(c) Name ONE data layer that would have been consulted in the application of buffering in block **D3**. (1 x 1) (1)

(8)

TOTAL SECTION B: 30

TOTAL: 150

END

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2021

MARKING GUIDELINES

GEOGRAPHY (PAPER 1) (10781)

13 pages

INFORMATION BEFORE COMMENCEMENT OF MARKING FOR INTERNAL AND EXTERNAL MODERATION PURPOSES.

1. Use a single tick for the allocation of ONE (1) mark. ✓
2. Use TWO ticks for the allocation of TWO (2) marks. ✓✓
3. Ticks MUST be placed on/on top of/at the end of, the correct response in the sentence.
4. A cross (X) MUST be placed at the end of each incorrect/invalid sentence or response.
5. All paragraph questions must include the use of the symbol:
   M … when a candidate has achieved 8 marks.
6. DO NOT allocate marks to candidates where paragraphs are not completed in full sentences.
7. DO NOT allocate marks where vague responses are given in paragraph responses that do not include an appropriate link to the responses in the Marking Guideline.
8. Each sub-section MUST have a total reflected on the right-hand margin e.g.1.1 should be a total out of (7) and 1.2 should be a total out of (8) and 1.3 should be a total out of (15).
9. The subtotals for each sub-section must be CORRECTLY added to give you a TOTAL for the question, which must be written on the top left-hand margin at the beginning of the answered question.
10. The subtotals for each completed question MUST be written on the FRONT page with a TOTAL out of 150.
11. Marking MUST be completed in RED pen.
12. First level Moderation (HOD/Senior Teacher) MUST be completed in BLACK pen.
13. Second level Moderation (Cluster/Circuit) MUST be completed in GREEN pen.
14. You are encouraged to engage with the Marking Guidelines and ADD appropriate (valid) responses that may have been omitted during the completion of this marking guideline. For moderation purposes you are required to write these additions on your marking guidelines in RED and include the amended marking guidelines as part of an educator portfolio of evidence for external moderation purposes.

SECTION A: CLIMATE, WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1 1.1.1 ***Micro-climate (1)***

1.1.2 ***Down-slope (1)***

1.1.3 ***daytime (1)***

1.1.4 ***thermal belt (1)***

1.1.5 ***Frost pocket (1)***

1.1.6 ***calm conditions (1)***

1.1.7 ***Higher (1)***

(7 x 1) (7)

1.2 1.2.1 ***B (1)***

1.2.2 ***B (1)***

1.2.3 ***C (1)***

1.2.4 ***A (1)***

1.2.5 ***B (1)***

1.2.6 ***D (1)***

1.2.7 ***D (1)***

1.2.8 ***C (1)***

(8 x 1) (8)

1.3 Refer to FIGURE 1.3 showing mid-latitude cyclones on a synoptic weather map.

1.3.1 Which season is represented on the synoptic weather map in FIGURE 1.3?

Winter (1) (1 x 1) (1)

1.3.2 What stage of development is mid-latitude cyclone **C**?

Occluded (stage) (1) (1 x 1) (1)

1.3.3 Give evidence from the synoptic map to support your answer to QUESTION 1.3.2.

The cold front has "caught up" with the warm front. (2)
The occlusion occurs (at the apex)/Cold front overtakes the warm front. (2)
[Any ONE] (1 x 2) (2)

1.3.4 (a) Which mid-latitude cyclone, **A**, **B** or **C** is the oldest?

C (1) (1 x 1) (1)

(b) Give TWO reasons for your answer to QUESTION 1.3.4 (a).

Mid-latitude cyclones move from west to east/C lies furthest to the east/they are steered by the westerlies to move eastwards. (2)
The occluded front has developed at C. (2)
The warm sector has narrowed at C/warm sector at B not as narrow as C. (2)
[Any TWO] (2 x 2) (4)

1.3.5 Refer to the extract of the station model of Cape Town. Account for the change in temperature, wind direction and cloud cover as the cold front of mid-latitude **A** approaches Cape Town.

Temperature decreases due to upliftment of warm air by the cold front. (2)
Wind direction will change due to backing of winds (caused by the cold front. (2)
Cloud cover increases/cumulonimbus clouds due to rapid upliftment of air caused by steep pressure gradient of the cold front. (2)
[Learner must indicate the difference and account for why it occurred.] (3 x 2) (6)
(15)

1.4 FIGURE 1.4 shows a line thunderstorm.

1.4.1 In which season does the line thunderstorm develop over South Africa?

Summer (1) (1 x 1) (1)

1.4.2 Describe the air that flows from the:

(a) South Indian Anticyclone

The warmer, moister and less dense air (2) (1 x 2) (2)

(b) South Atlantic Anticyclone

Colder, drier and denser air (2) (1 x 2) (2)

1.4.3 On which side of the moisture front do line thunderstorms occur?

East (1) (1 x 1) (1)

1.4.4 Give a reason for your answer to QUESTION 1.4.3.

The cold air from the west uplifts the warm, moist air on the east of the moisture front. (Rising air cools and condenses and forms clouds.) (2) (1 x 2) (2)

1.4.5 In a paragraph of approximately EIGHT lines, suggest the positive and negative impact that line thunderstorms have on the agricultural sector of the interior of South Africa.

POSITIVE:
Line thunderstorms bring rain to irrigate crops. (2)
Line thunderstorms bring rain to irrigate pasture land for livestock. (2)
It can fill dams creating availability of water during dry periods (2)
It replenishes the ground water as well as rivers to be used for crops /cattle. (2)
Gives relief to droughts or semi-arid areas practicing agriculture. (2)

NEGATIVE:
Thunderstorms can damage/flood crops. (2)
Thunderstorms can injure/kill/drown cattle. (2)
The gusty wind, hail or rain can wash away/erode the fertile soil. (2)
Affect trading/production of food that impacts on the agricultural sector (2)
Damage to agricultural infrastructure due to flooding (2)
Silt is washed into dams, reducing their water holding capacity which is much needed for crops/livestock. (2)
[Any FOUR facts. Must include both positive and negative impacts]

(4 x 2) (8)

(16)

1.5 Refer to FIGURE 1.5 that shows methods to reduce the effects of a heat island.

1.5.1 Define the term *urban heat island*.

It is an urban area of higher temperature surrounded by rural areas of lower temperature. (2)
[CONCEPT] (1 x 2) (2)

1.5.2 Describe how the glass windows in FIGURE 1.5 will result in the increase of temperature in the urban area.

It lets heat in and acts as a greenhouse that traps the heat inside the building. (2)
It reflects heat between buildings. (2)
[Any ONE] (1 x 2) (2)

1.5.3 Explain TWO possible negative effects that urban heat islands have on the health of human beings.

It increases human discomfort because of high temperatures. (2)
Heat stress/stroke/cardiovascular illnesses during heat waves (2)
Urban smog reduces visibility and may cause accidents. (2)
Loss of energy to be productive in working environment(2)
Increases the number of insects such as mosquitoes and fleas which infect/irritate humans (2)
[Any TWO – must be a negative effect on humans] (2 x 2) (4)

1.5.4 Explain how the THREE strategies (**A**, **B** and **C**) evident in FIGURE 1.5, contributed to the reduction of the heat island effect.

A – By planting more trees, it reduces the amount of heat through absorbtion. (2)
Transpiration by trees lowers temperatures. (2)
Shadows of the trees will cool the temperatures. (2)
[Any ONE]

B – Dense buildings prevent air from moving freely between buildings, causing heat to build up. (2)
Space between buildings lowers temperatures because air moves freely and winds increase. (2)
Cooler winds increase between buildings with significant space. (2)
[Any ONE]

C – Water sources absorb heat and use it in evaporation. (2)
Evaporation of water uses heat and lowers temperatures. (2)
Water is cooler than surfaces such as sand, tar, concrete etc. (2)
[Any ONE]
[Must refer to A, B and C. All THREE must be explained.] (3 x 2) (6)

(14)
[60]

QUESTION 2: GEOMORPHOLOGY

2.1 2.1.1 ***Confluence (1)***

2.1.2 ***Drainage basin (1)***

2.1.3 ***River system (1)***

2.1.4 ***Catchment area (1)***

2.1.5 ***Surface run off (1)***

2.1.6 ***Interfluve (1)***

2.1.7 ***Water table (1)***

(7 x 1) (7)

2.2 2.2.1 ***D (1)***

2.2.2 ***E (1)***

2.2.3 ***F (1)***

2.2.4 ***B (1)***

2.2.5 ***C (1)***

2.2.6 ***I (1)***

2.2.7 ***H (1)***

2.2.8 ***G (1)***

(8 x 1) (8)

2.3 Refer to FIGURE 2.3 that shows the different types of drainage patterns.

2.3.1 Identify drainage patterns **A** and **B**.

A – Dendritic (1)
B – Radial (centrifugal) (1) (2 x 1) (2)

2.3.2 What is the dominant physical factor that determines the development of different types of drainage patterns?

Underlying rock structure (1) (1 x 1) (1)

2.3.3 Give TWO visible characteristics of drainage pattern **A** on FIGURE 2.3.

Streams meet at acute angles. (1)
Looks like branches of trees (1) (2 x 1) (1)

2.3.4 Why would farming be more suitable in an area with drainage pattern **A**?

<u>Drainage pattern A:</u>
Water evenly distributed and more accessible for irrigation (2)
Easier to build storage dams at various locations (2)
Fairly flat land which facilitates the cultivation of soil (2)
[Any TWO] (2 x 2) (4)

2.3.5 Explain how physical factors limit the effective use of water in drainage pattern **B**.

Steep slopes result in more runoff and less infiltration. (2)
Steep slopes result in higher velocity of water flow and thus more erosion, resulting in silting of dams. (2)
Higher velocity and erosion cause water to flow into deep (2)
V-shaped valleys which reduces the accessibility of water. (2)
Uneven landscape results in uneven distribution of water. (2)
More resistant rock structure reduces infiltration and increases runoff. (2)
[Any THREE] (3 x 2) (6)
(15)

2.4 Refer to FIGURE 2.4 that shows river capture.

2.4.1 Define the concept *river capture.*

<u>River capture</u> – When a more energetic river captures the headwaters of a less energetic river (2)
(CONCEPT) (1 x 2) (2)

2.4.2 Name the main physical factor (natural factor) visible in FIGURE 2.4 that resulted in river capture taking place.

Gradient (1) (1 x 1) (1)

2.4.3 Identify features of river capture labelled **C** and **D** in FIGURE 2.4.

C – Elbow of capture (1)
D – Misfit stream (1) (2 x 1) (2)

2.4.4 State the impact that river capture will have on the volume of water in river **D.**

The volume will decrease (1) (1 x 1) (1)

2.4.5 Discuss how the process of river capture has led to the rejuvenation of river **F**.

Increased flow of water from captured stream E increased the volume. (2)
The increased volume increases the velocity and erosive power of river F. (2) (2 x 2) (4)

2.4.6 Explain the negative impact that rejuvenation will have on the economic activity visible next to river **F** on FIGURE 2.4.

Higher volume of water will result in flooding of the riverbanks. (2)
Flooding will damage crops grown on the floodplain and riverbanks. (2)
Damage of crops will result in lower production. (2)
Flooding will cause soil erosion of fertile soils and less economic activity. (2)
Higher volume and velocity cause damage to crops. (2)
[Any TWO] (2 x 2) (4)
(14)

2.5 Study the extract on Gauteng River Catchment Management in FIGURE 2.5.

2.5.1 Define the concept *river management.*

The planned and coordinated use of the river without compromising people's well-being and the environment (2)
(CONCEPT) (1 x 2) (2)

2.5.2 Give evidence from the extract that shows the importance of catchment management in Gauteng.

Healthy riverbanks maintain the form of the river channel. (1)
It provides habitat for species (aquatic and terrestrial) and filter sediment, minerals and light. (1)
Water quality includes the chemical; physical and bacteriological properties of water that determines its suitability for use. (1)
[Any TWO] (2 x 1) (2)

2.5.3 Identify TWO issues from the article that poses a challenge to effective river management.

The urban nature of Gauteng (especially the central part) (1)
Road networks across the province seal natural surfaces in a manner that does not allow natural infiltration of rainwater into the ground. (1)
This high run-off scenario during rainfall events coupled with pollution emanating from the urban environment (1)
[Any TWO] (2 x 1) (2)

2.5.4 Explain why aquatic life is affected by poor river management in Gauteng.

Rivers are home to aquatic life. (2)
Aquatic life feeds directly from the polluted rivers. (2)
Aquatic species have softer skins thereby exposing them more to chemical waste. (2)
[ANY TWO] (1 x 2) (2)

2.5.5 In a paragraph of approximately EIGHT lines, provide sustainable strategies that can be implemented to deal with problems associated with poor river management systems.

Strict local by-laws on disposal of waste from both domestic use and industry (2)
Buffering the area to prevent pollution (can give examples) (2)
Maintaining the natural vegetation and reducing deforestation (2)
Education and public awareness on environmental management (2)
Regular cleaning of riverbanks and surrounding areas(2)
Implementing of fines for violation of environmental regulations (2)
[Any FOUR] (4 x 2) (8)
(16)

[60]

TOTAL SECTION A: 120

SECTION B: MAPWORK AND APPLICATION

QUESTION 3: TOPOGRAPHIC AND ORTHOPHOTO MAP TECHNIQUES

3.1 Refer to the topographical map extract as well as the orthophoto map extract.

3.1.1 ***C (1)*** (1 x 1) (1)

3.1.2 ***B (1)*** (1 x 1) (1)

3.1.3 Use the following formula and steps to determine the magnetic bearing from the benchmark, **G** in block **D5** to trigonometrical beacon 93, **H** in block **C4.**

Magnetic bearing = magnetic declination + true bearing

(a) Difference in years: ***2021 – 2016 = 5 years (1)***

(b) *Mean annual change:* ***9'W (1)***

(c) Total annual change: ***9' x 5 years = 45' (1)***

(d) Magnetic declination: ***24˚26' + (1) 45' = 25˚11' W of TN***

(e) True bearing: ***329 ˚(1)***

(f) Magnetic bearing*:* ***329˚+ 25˚11' = 354˚(1)***

(7 x 1) (7)

3.1.4 Why is it important to calculate the current magnetic declination?

To determine the correct magnetic bearing (2) (1 x 1) (1)

(10)

3.2 Refer to the valley **I – J** on the topographical map.

3.2.1 (a) The wind that blows at night in the valley is a/an (anabatic/katabatic) wind?

katabatic wind (2) (1 x 1) (1)

(b) Describe the flow of the wind identified in QUESTION 3.2.1(a).

It flows downslope. (2) (1 x 2) (2)

(c) Identify the type of vegetation at **J**.

Woodlands (1) (1 x 1) (1)

(d) Explain the climatological factor that determined the location of the vegetation type at **J**.

It is located on the (cooler) south/southeast facing slope. (2)

(1 x 2) (2)

3.2.2 Refer to the uThukela River on the orthophoto map.

(a) Identify the fluvial landform created by the uThukela River on the orthophoto map.

Meander (1) (1 x 1) (1)

(b) Identify slope **5** and give a reason for your answer.

Undercut slope (1)

It is a steeper slope. (1)
More erosion that takes place (1)
[Any ONE] (1 + 1) (2)

(c) (Grass/Trees) are found at **6** on the orthophoto map.

Trees (1) (1 x 1) (1)

(d) Explain the positive impact that the vegetation at **6** will have on the cultivated land at **7**.

It will act as a windbreak./It will reduce the windspeed which might damage the crops. (1)
It will reduce erosion. (1)
It will increase soil fertility. (1)
[Any ONE] (1 x 2) (2)

(12)

3.3 GIS APPLICATION

3.3 Refer to both the topographical map and the orthophoto map.

3.3.1 (a) Does an orthophoto map consist of raster or vector data?

Raster (1) (1 x 1) (1)

(b) Motivate your answer to QUESTION 3.3.1(a).

It is developed from an aerial photo which consists of pixels. (2) (1 x 2) (2)

3.3.2 There is clear evidence of the application of buffering on both the topographic and orthophoto maps.

(a) What is *buffering*?

A demarcation of an area around a feature/location. (2) (1 x 2) (2)

(b) Provide evidence of how buffering was applied in block **D3** on the topographic map

There is an open space between the built up area and the river (2) (1 x 2) (2)

(c) Name ONE data layer that would have been consulted in the application of buffering in block **D3**.

Drainage (1)
Topography/Gradient (1)
Transport routes/Infrastructure (1)
Land use (1)
[Any ONE] (1 x 1) (1)

(8)

TOTAL SECTION B: 30

TOTAL: 150