GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2023

10781

GEOGRAPHY

(PAPER 1)

TIME: 3 hours

MARKS: 150

20 pages

Stanmorephysics

GEOGRAPHY: Paper 1

10781E

X10

INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO SECTIONS:

   SECTION A
   QUESTION 1: CLIMATE AND WEATHER (60 MARKS)
   QUESTION 2: GEOMORPHOLOGY (60 MARKS)

   SECTION B
   QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES (30 MARKS)

2. Answer ALL THREE questions.

3. All diagrams are included in the QUESTION PAPER.

4. Leave a line between sub sections of questions answered.

5. Start EACH question at the top of a NEW page.

6. Number the answers correctly according to the numbering system used in this question paper.

7. Do NOT write in the margins of the ANSWER BOOK.

8. Draw fully-labelled diagrams when instructed to do so.

9. Answer in FULL SENTENCES, except when you have to state, name, identify or list.

10. Units of measurement MUST be indicated in the final answer, e.g., 1 020 hPa, 10 km, 4 ˚C, and 45 m.

11. You may use a non-programmable calculator.

12. You may use a magnifying glass.

13. Write neatly and legibly.

SPECIFIC INSTRUCTIONS AND INFORMATION FOR SECTION B

14. A 1 : 50 000 topographic map (3320 BB LAINGSBURG) and a 1 : 10 000 orthophoto map (3320 BB 17, 18, 22, 23 LAINGSBURG) are provided.

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

16. Marks will be allocated for steps in calculations.

17. You must hand in the topographic and orthophoto maps to the invigilator at the end of the examination session.

SECTION A: CLIMATE AND WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

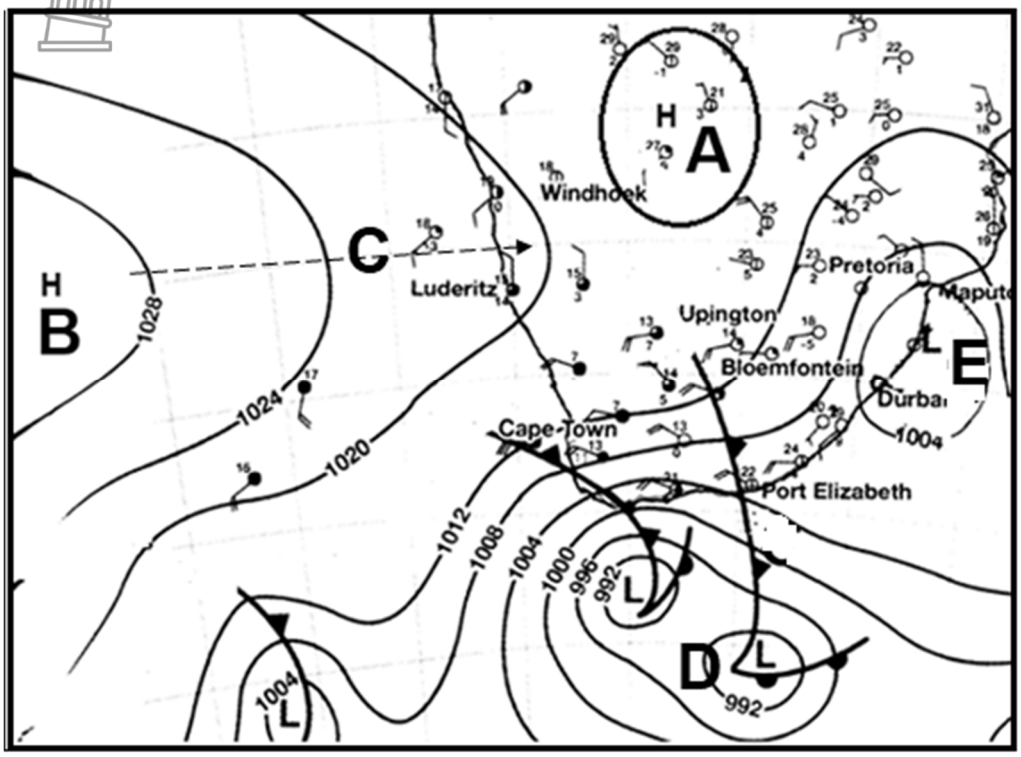
1.1 Complete the statements in COLUMN A with the options in COLUMN B. Write down only **Y** or **Z** next to the question numbers (1.1.1 to 1.1.7) in the ANSWER BOOK, e.g. 1.1.8 Y.

COLUMN A		COLUMN B	
1.1.1	The … refers to an area that does not receive perpendicular sunlight.	**Y** **Z**	zone of incidence shadow zone
1.1.2	At night, air on the valley slope cools rapidly due to … radiation.	**Y** **Z**	convectional terrestrial
1.1.3	If the dew point temperature is below freezing point in a valley, water vapour condenses directly into a … pocket.	**Y** **Z**	fog frost
1.1.4	In the mountainous regions of Cape Town, people tend to build their houses on the … facing slopes.	**Y** **Z**	north south
1.1.5	A warm layer of air with cold air above and below it causing an inversion is known as a ...	**Y** **Z**	frost pocket thermal belt
1.1.6	Plants that require more sunlight in winter grow best on the … facing slopes in the Northern Hemisphere.	**Y** **Z**	south north
1.1.7	The area of a valley which receives direct sunlight in winter is known as a …	**Y** **Z**	zone of incidence shadow zone

(7 x 1) (7)

1.2 Refer to the synoptic weather map below.

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 (1.2.1 to 1.2.8) in the ANSWER BOOK, e.g. 1.2.9 A.



[Source: South African Weather Service]

1.2.1 The pressure cell labelled **A** is the …

A South Atlantic anticyclone.
B South Indian anticyclone.
C Kalahari anticyclone.
D Tropical cyclone.

1.2.2 The direction of surface air circulation around pressure cell **B** is …

A clockwise.
B anticlockwise.
C ascending.
D descending.

1.2.3 The area of elongated high pressure at **C** is a …

A ridge.
B trough.
C saddle.
D front.

1.2.4 Weather system **D** develops because of the impact of the Coriolis force on the air movement between the … cells.

A polar high pressure and subpolar low pressure
B subpolar low pressure and subtropical high pressure
C subtropical high pressure and equatorial low pressure
D equatorial low pressure and subpolar low pressure

1.2.5 The map shown above is an example of a … synoptic weather map because of the … rainfall experienced over Cape Town.

(i) summer
(ii) winter
(iii) frontal
(iv) convectional

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

1.2.6 Weather system **D** usually brings … conditions to Cape Town in winter.

A dry and windy
B warm and rainy
C cold and rainy
D cold and dry

1.2.7 The weather conditions associated with pressure cell **A** are …

A rainy conditions and floods.
B rainy conditions with clear skies.
C windy conditions with floods.
D dry conditions with clear skies.

1.2.8 The pressure at the centre of pressure cell **E** is … than 1 004 mb and moves from ... along the coastline.

(i) lower
(ii) higher
(iii) east to west
(iv) west to east

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

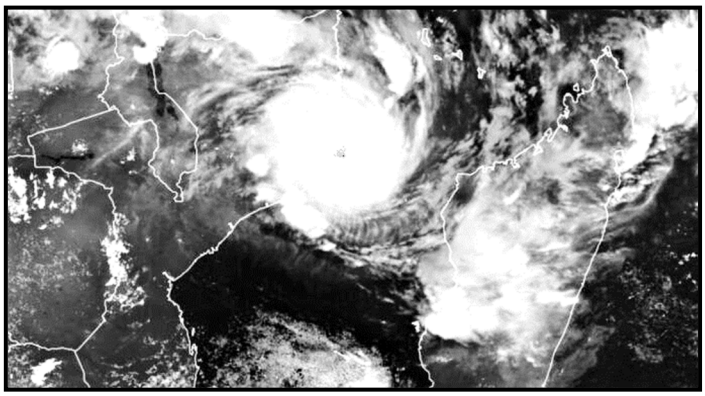
(8 x 1) (8)

1.3 Refer to the infographic on Tropical Cyclone Gombe below.

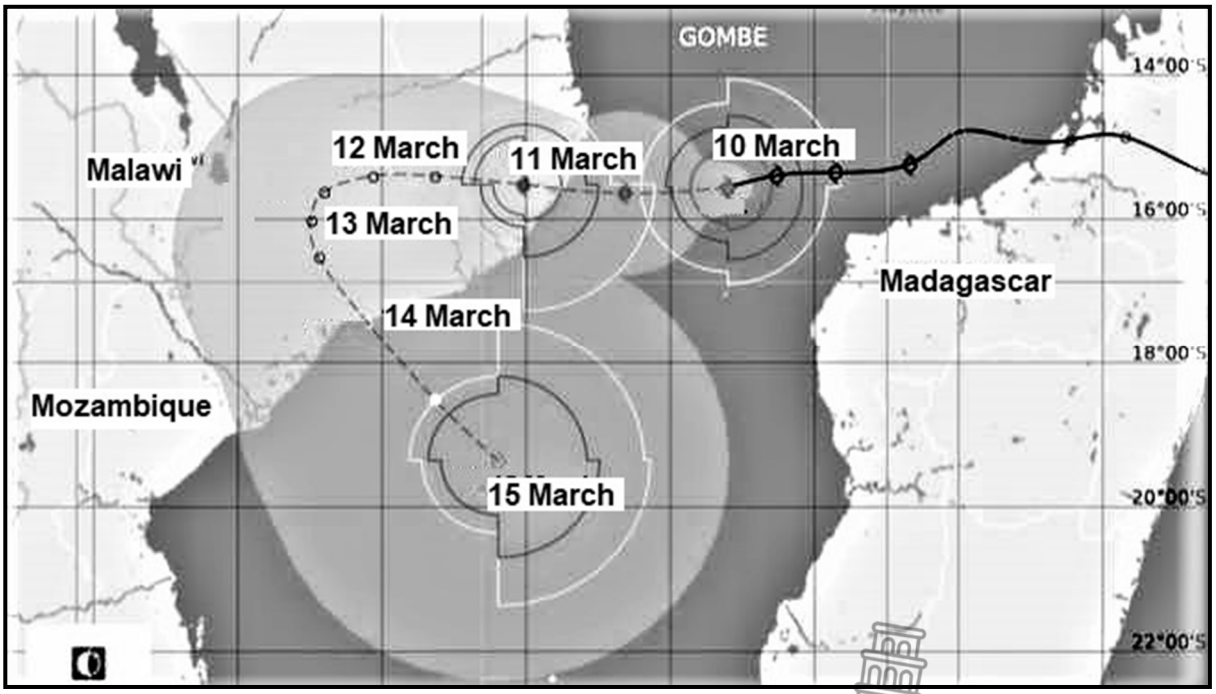
Mozambique: Cyclone Gombe

Tropical Cyclone Gombe has killed at least 53 people since the cyclone swept into northern and central areas of the country on Saturday, March 12, 2022. Data showed that the flooding associated with Gombe, destroyed a total of 141 854 houses along with 69 health centres, 21 water systems and 2 764 electricity poles. A total of 2 265 classrooms were damaged affecting a total of 216 003 pupils and 4 421 teachers. A total of 91 177 hectares of crops were lost while a total of 1 243 km of roads were severely damaged. Southern Africa has suffered repeated devastating cyclones of the type that used to be relatively rare in the past. Scientists believe climate change is fuelling their intensity via the warming of the Indian Ocean.

Satellite image of Tropical Cyclone Gombe



[Source:https://www.aljazeera.com/news/2022/3/18/mozambique-cyclone-gombe-death-toll-rises-to-53]



[Source:mozambique-httpswww.sabcnews.comsabcnewsdeath-toll-from-cyclone-gombe-rises-to-53-in-mozambique-80-wounded]

1.3.1 How many tropical cyclones have occurred before Tropical Cyclone Gombe? (1 x 1) (1)

1.3.2 According to the infographic, what is the scientific evidence fuelling the intensity of tropical cyclones in the Indian Ocean? (1 x 1) (1)

1.3.3 Provide evidence from the satellite image which suggests that Tropical Cyclone Gombe has reached the stage of maturity. (1 x 1) (1)

1.3.4 Discuss why Tropical Cyclone Gombe will decrease in intensity once it reaches the coastline of Mozambique. (2 x 2) (4)

1.3.5 Explain TWO weather elements of Tropical Cyclone Gombe, indicated in the infographic, that may have resulted in the damage caused to the infrastructure. (2 x 2) (4)

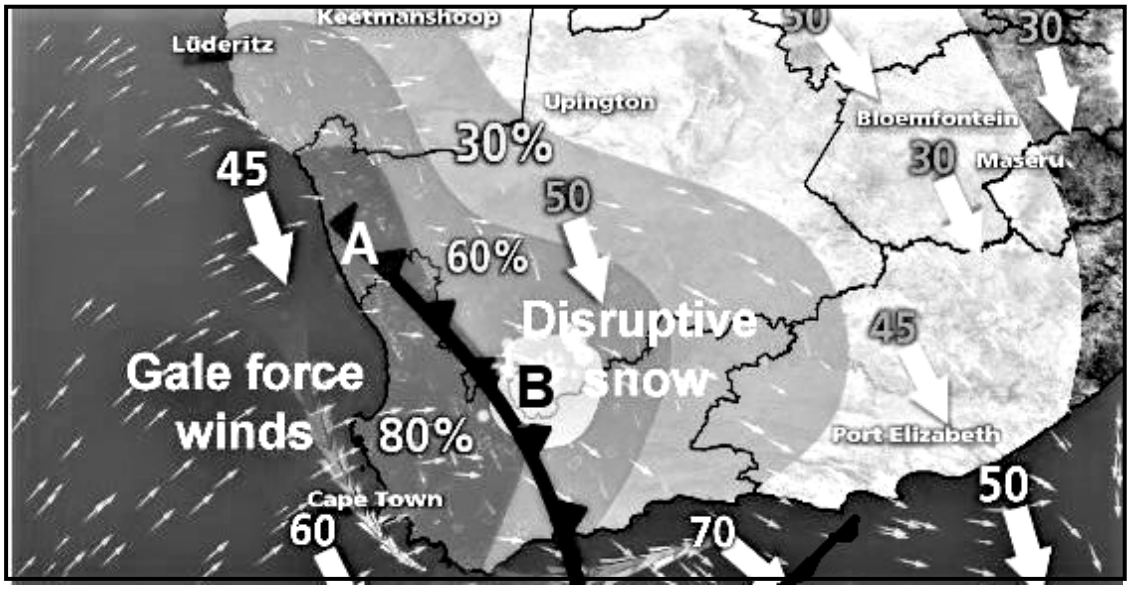
1.3.6 Suggest TWO precautionary strategies that can be implemented in this area to reduce the possible damage caused to the infrastructure during tropical cyclones by flooding, as mentioned in the article. (2 x 2) (4)

1.4 Study the information below.

WARNING OF SEVERE WEATHER

Cape Town - Batten down the hatches. Heavy rain, cold winds, severe flooding and even light snow are predicted as a battery of cold fronts head for the Western Cape that could bring discomfort and displacement in some areas. The South African Weather Service (SAWS) said this might cause thunderstorms, flooding of roads in both formal and informal settlements, damage to property and infrastructure, loss of livelihoods and livestock, damage to crops, disruption to essential services, and disruptions of traffic flow due to roads being flooded or even closed.

[Source: https://www.iol.co.za/capeargus/news/warning-of-high-impact-cold-fronts-as-rain-winds-and-snow-predicted-for-western-cape-4cceba02-eaa1-494a-804b-80ccc1f2157f]



[Source:https://ewn.co.za/2022/06/14/cold-front-to-be-expected-in-johannesburg]

1.4.1 Identify the weather system shown in the diagram, of which the cold front forms a part. (1 x 1) (1)

1.4.2 What is the main reason why these weather systems are more prevalent (common) over Cape Town during winter, as shown in the article? (1 x 2) (2)

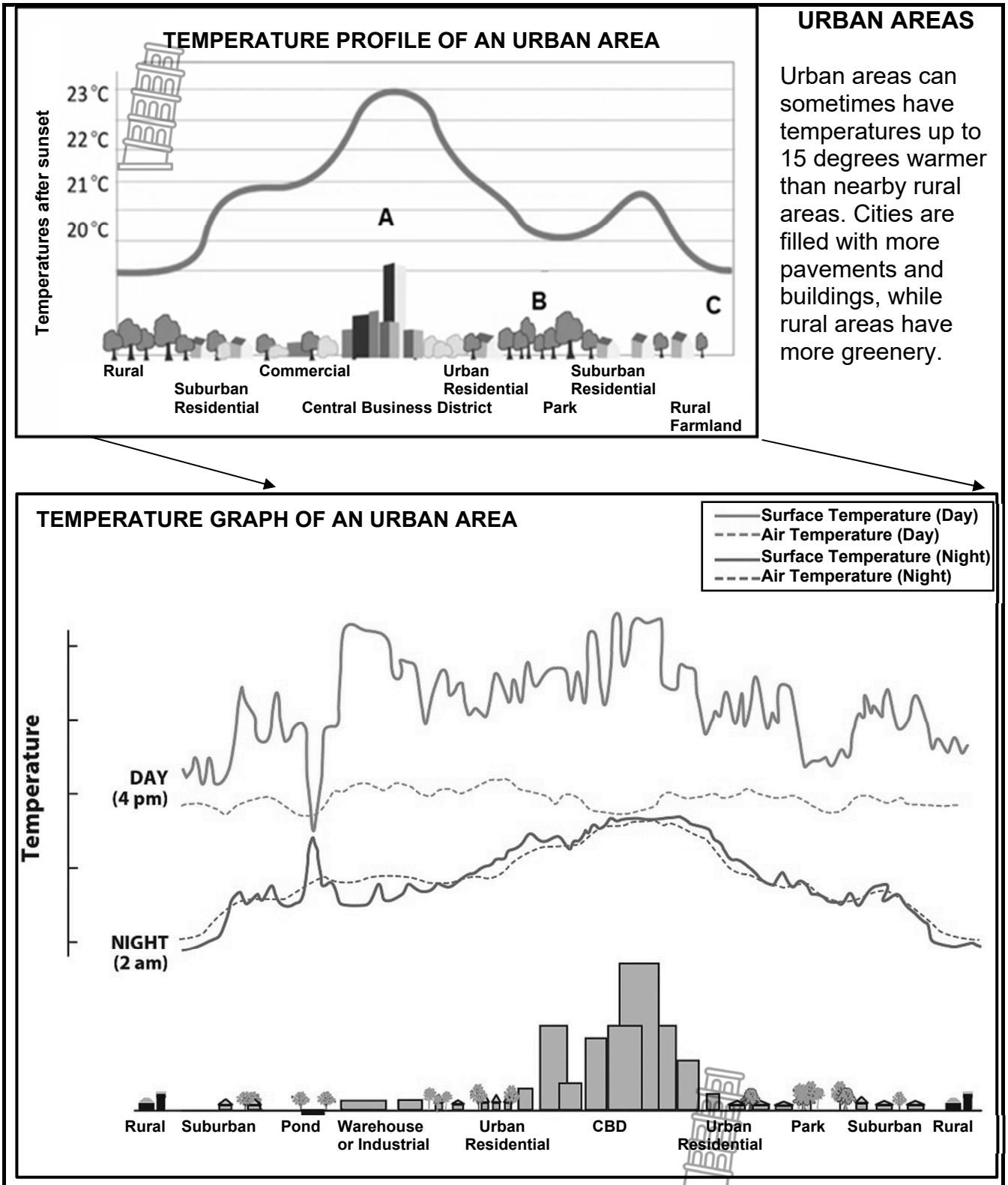
1.4.3 Draw a labelled, free-hand cross section through the cold front indicated as **A** in the diagram. Indicate the weather elements preceding the cold front on the cross section diagram. (3 x 1) (3)

1.4.4 Identify the type of cloud that will develop at **B** in the diagram. (1 x 1) (1)

1.4.5 Explain how the weather system identified in QUESTION 1.4.1 resulted in the development of clouds at **B**. (2 x 2) (4)

1.4.6 Predict the impact of the weather elements of this weather system on farming as it passes over the Western Cape. (2 x 2) (4)

1.5 Refer to the infographic below on urban heat islands.



[Source: https://www.metlink.org/fieldwork-resource/urban-heat-island-introduction/]

The difference in albedo leads to a difference in temperature resulting in the temperature curve being lower at night than during the day. To reduce the temperature in urban areas, we need to develop sustainable green cities.

[Adapted from: https://www.abc57.com/news/downtown-areas-hotter-than-rural-areas-urban-heat-islands]

1.5.1 What is the temperature over the central business district in the temperature profile diagram? (1 x 1) (1)

1.5.2 According to the article, why will an urban heat island develop at **A** rather than at **C**? (1 x 2) (2)

1.5.3 Give ONE reason for the lower temperatures experienced over the park area at **B.** (1 x 2) (2)

1.5.4 Refer to the temperature graph and give a reason why the temperature of the urban heat island is lower at night than during the day. (1 x 2) (2)

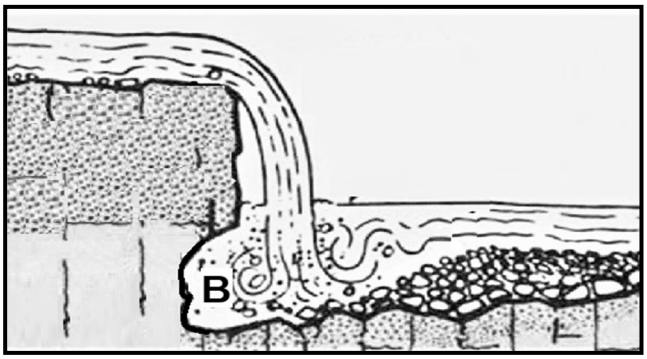
1.5.5 Explain in a paragraph of approximately EIGHT lines how the development of features using natural materials in cities can be used to reduce the urban heat island effect. (4 x 2) (8)

[60]

QUESTION 2: GEOMORPHOLOGY

2.1 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 (2.1.1 to 2.1.7) in the ANSWER BOOK, e.g. 2.1.8 D.

2.1.1 The feature that develops at **B** at the waterfall below is the …



[Source: Schematic-of-a-waterfall- Adapted-from-USGS-diagram (2)]

A cliff.
B rapid.
C plunge pool.
D pothole.

2.1.2 A natural levee is formed by the …

A erosion of sediments within the river channel.
B repeated deposition of sediments within the river channel.
C repeated deposition of sediments on the banks of the river.
D erosion of sediments from the banks of the river.

2.1.3 A floodplain is an area in the … of a river which experiences flooding during periods of … discharge.

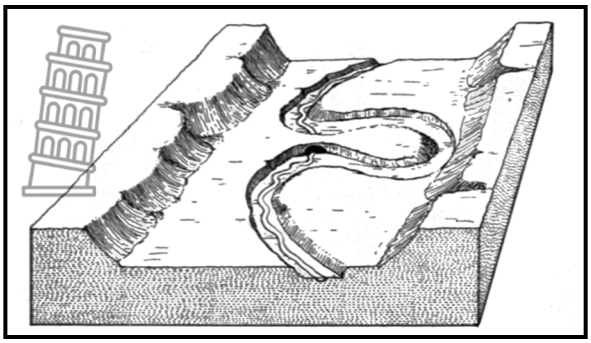
(i) lower course
(ii) upper course
(iii) low
(iv) high

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

2.1.4 Braided streams develop in the river's lower course due to …

A increased deposition.
B increased erosion.
C increased river volume.
D vertical erosion.

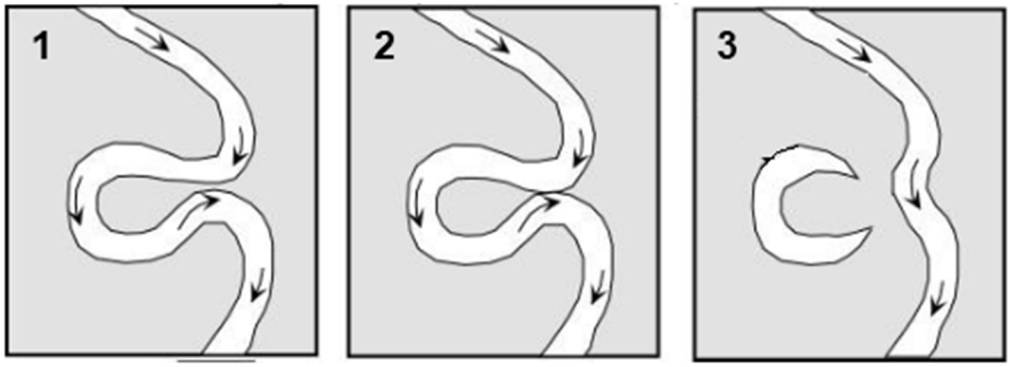
2.1.5 Identify the following fluvial feature.



[Source: https://commons.wikimedia.org/wiki/File:PSM_V78_D435_Natural_bridge_formation_of_an_entrenched _1.png]

A Terrace
B Meander
C Oxbow lake
D Source

2.1.6 The following sketch represents the formation of a/an …



[Source: https://en.wikipedia.org/wiki/]

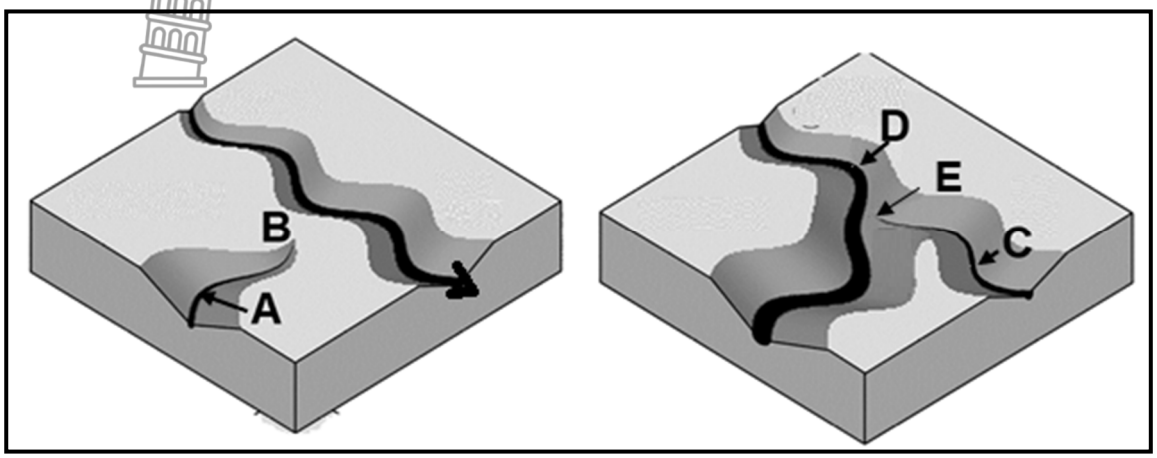
A incised meander.
B levee.
C flood plain.
D oxbow lake.

2.1.7 A delta can be described as …

A a plain that forms at the mouth of a river caused by deposition.
B deposits built up on the banks of a river after flooding.
C a plain that forms at the mouth of a river caused by erosion.
D deposits eroded from the banks of a river during flooding.

(7 x 1) (7)

2.2 Refer to the diagram below. Read the following statements and choose the appropriate word(s) in brackets which will make the statements TRUE. Write down only the question numbers (2.2.1 to 2.2.8) and the answer in your ANSWER BOOK, e.g. 2.2.9 Decreased.



[Source: https://upload.wikimedia.org/wikipedia/commons/thumb/e/e8/Stream_capture.png/200px-Stream_capture.png]

2.2.1 Stream **A** is the (captor stream/captured stream).

2.2.2 (Lateral erosion/Headward erosion) is dominant at **B**.

2.2.3 River **C** is identified as the misfit stream because it is too (small/large) for its valley.

2.2.4 The elbow of capture at **D** is characterised by a (90 degree/45 degree) bend in the river.

2.2.5 **E** is known as the (wind gap/gravel gap).

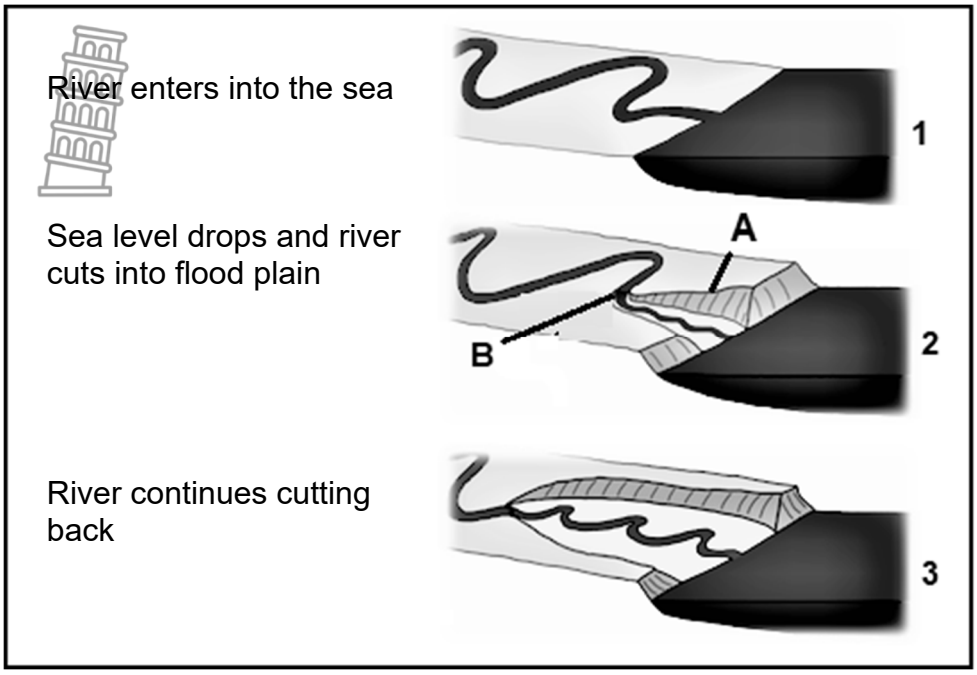
2.2.6 A possible cause of river capture is (isostatic uplift/reduced discharge).

2.2.7 After capture, river **A** will (increase/decrease) in volume.

2.2.8 River **C** will have a (larger/smaller) drainage basin after capture.

(8 x 1) (8)

2.3 Study the following diagrams on the process of river rejuvenation.



[Source: https://alevelrivers.weebly.com/rejuvination.html]

2.3.1 Choose the correct option in brackets.

River rejuvenation is when the erosive power of a river increases resulting in an increase of (lateral deposition/vertical erosion). (1 x 1) (1)

2.3.2 Determine the cause of river rejuvenation as shown in the diagram above. (1 x 1) (1)

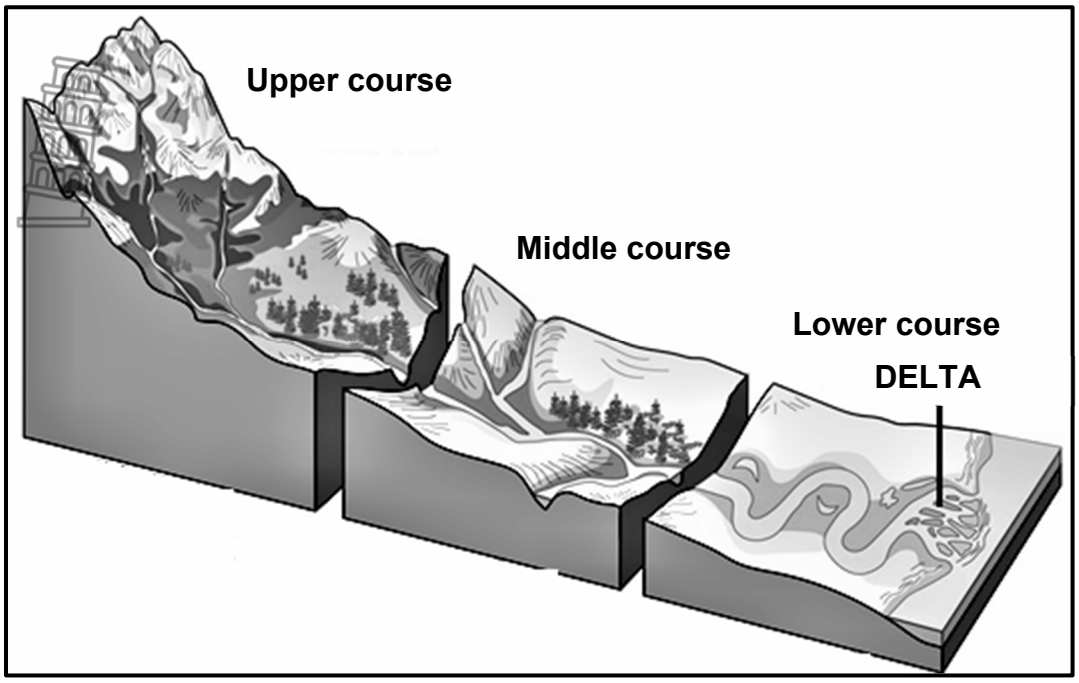
2.3.3 Explain how river rejuvenation results in the formation of river terraces at **A**. (2 x 2) (4)

2.3.4 Identify the landform at **B** associated with river rejuvenation. (1 x 1) (1)

2.3.5 Describe how erosion causes landform **B** to retreat (move) upstream over time. (2 x 2) (4)

2.3.6 Predict how the narrowing of the original floodplain will negatively impact agricultural activities. (2 x 2) (4)

2.4 Study the diagram below that shows the fluvial courses of a river.



[Source:https://www.nps.gov/subjects/geology/fluvial-landforms.htm]

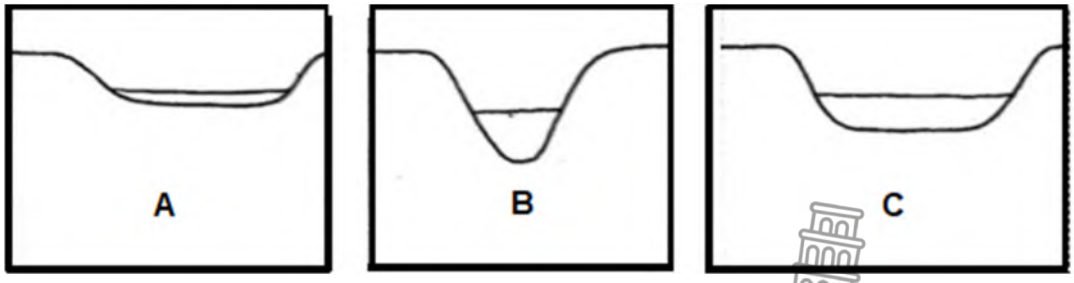
2.4.1 Would the flow in the upper course of the river be characterised as turbulent or laminar? (1 x 1) (1)

2.4.2 Provide evidence from the diagram to substantiate your answer in QUESTION 2.4.1. (1 x 2) (2)

2.4.3 Define the term *cross (transverse) profile*. (1 x 2) (2)

2.4.4 Refer to the middle and lower courses of the river.

(a) Which of the following cross-profiles represents the middle and lower courses respectively? (2 x 1) (2)



(b) Describe the shape of the river valley in the middle and lower courses. (2 x 1) (2)

2.4.5 Explain how fluvial processes throughout the river course result in the formation of the valley shape of the lower course described in QUESTION 2.4.4(b). (3 x 2) (6)

2.5 Study the information below on river management.

DURBAN'S RIVER-HEALING PLAN, A ROADMAP FOR AFRICAN CITIES TO COPE WITH CLIMATE FLOODS

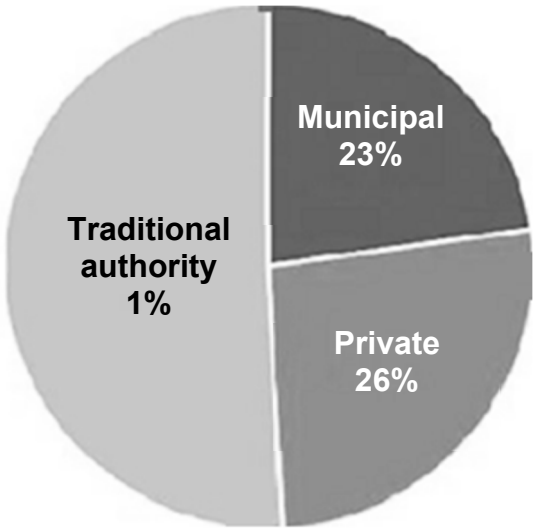
Water is the source of life — yet it is also one of the most terrifying forces of nature. This became clear during the recent torrential rains in Durban, when floodwaters in 18 local river courses ripped away hundreds of informal houses and dozens of carefully engineered steel and concrete bridges.

Instead of allowing the free flow of water, the accumulation of debris can turn bridges into the equivalent of dam walls. When that happens, the power of water is strong enough to smash down obstacles like bridges.

Geoff Tooley, eThekwini's senior manager for coastal stormwater and catchment management, estimates that more than 80% of the destructive river blockage in April was due to alien invader plants and litter.

eThekwini mayor Mxolisi Kaunda says: "Well-managed catchment areas provide over R4-billion in revenue for services to our city and its residents annually. These waterways are not only responsible for providing water, but they also help regulate the impact of heavy rains and floods if well managed."

OWNERSHIP OF DURBAN RIVERS



[Source: https://www.dailymaverick.co.za/article/2022-07-12-durbans-river-healing-plan-a-roadmap-for-african-cities-to-cope-with-climate-floods/]

2.5.1 Define the term *catchment management*. (1 x 2) (2)

2.5.2 Identify the human contribution to the flooding in Durban, from the article. (2 x 1) (2)

2.5.3 Use evidence from the pie graph to explain why the eThekwini Municipality has found it challenging to maintain catchment areas. (1 x 1) (1)

2.5.4 Why is the maintenance of catchment areas financially important for the eThekwini Municipality? (1 x 2) (2)

2.5.5 In a paragraph of approximately EIGHT lines, propose FOUR ways in which the eThekwini Municipality can ensure that residents of Durban can be encouraged to assist in catchment management. (4 x 2) (8)

[60]

TOTAL SECTION A: 120

SECTION B

QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES

BACKGROUND INFORMATION ON LAINGSBURG



Coordinates: 33°11′42″S 20°51′33″E

Laingsburg is situated along the N1 route, in the Western Cape province of South Africa. It is a relatively large agricultural town in the semi-arid Great Karoo. It was partially destroyed within minutes in a flash flood after a cloudburst in 1981. Before the flood, rain initially started with a light drizzle but, the soil of the area is of such a nature that it cannot absorb much rainwater. The consequence is that water drains directly into the rivers.

The town's total rainfall is about 150 mm per year. The main water supply is a fountain in the Moordenaars Karoo area. Although the Buffels River runs right through the town, the river hardly ever has any water. Summers are extremely hot and dry, with temperatures usually exceeding 30 °C. Winters are crisp to sometimes very cold, with snow occasionally occurring in the surrounding region. The Seweweekspoort Pass is located along the R323 to the south of the town.

[Adapted from https://www.laingsburg.gov.za/]

The following English terms and their Afrikaans translations are shown on the topographic map.

ENGLISH	AFRIKAANS
Diggings	Uitgrawings
Golf course	Gholfbaan
River	Rivier
Sewerage works	Rioolwerke
Golf Driving Range	Golf-dryfbaan
Nature reserve	Natuurreservaat

3.1 MAP SKILLS AND CALCULATIONS

Refer to the topographic map.

3.1.1 The altitude of the reservoir located at **F** in block **A5** on the topographic map is … metres.

A 890
B 875
C 820
D 780 (1 x 1) (1)

3.1.2 The feature located at 33°11'32"S; 20°51'04"E on the topographic map is a …

A school.
B hospital.
C recreational area.
D national road. (1 x 1) (1)

3.1.3 Calculate the length of the bridge on the national road in block **C2** on the topographic map in metres (m).
Formula: Actual Distance = Map distance x Map scale (2 x 1) (2)

Refer to the orthophoto map.

3.1.4 Calculate the average gradient along the white line between trigonometrical station **103** (in block **D2**) and point **6** (in block **D3**) on the orthophoto map extract in meters.

Vertical Interval (VI): 731,5 m – 650 m = 80,5 m

$$\textbf{Average Gradient} = \frac{\textbf{Vertical Interval (VI)}}{\textbf{Horizontal Equivalent(HE)}}$$

(4 x 1) (4)

3.1.5 Draw a free hand cross section of the slope between trigonometrical station **103** (in block **D3**) and point **6** (in block **D4**) on the orthophoto map extract. (1 x 1) (1)

3.1.6 Identify the slope of the cross section drawn in QUESTION 3.1.5. (1 x 1) (1)

3.2 MAP INTERPRETATION

Refer to the settlement Goldnerville in block **C4** on the topographic map.

3.2.1 (a) Goldnerville experiences frost pockets during the night because of its ... location.

A valley
B altitude
C aspect
D longitude (1 x 1) (1)

(b) The wind that develops at night in block **C4** is a/an (anabatic/ katabatic) wind. (1 x 1) (1)

(c) How would the steep slope north of Laingsburg impact the wind identified in QUESTION 3.2.1 (b)? (1 x 1) (1)

Refer to the area indicated with black dots in block **B5** of the topographic map.

3.2.2 (a) Identify the predominant drainage pattern of the area indicated as **H** in block **B5** on the topographic map. (1 x 1) (1)

(b) Describe the underlying rock structure that is responsible for the drainage pattern identified in QUESTION 3.2.2 (a). (1 x 2) (2)

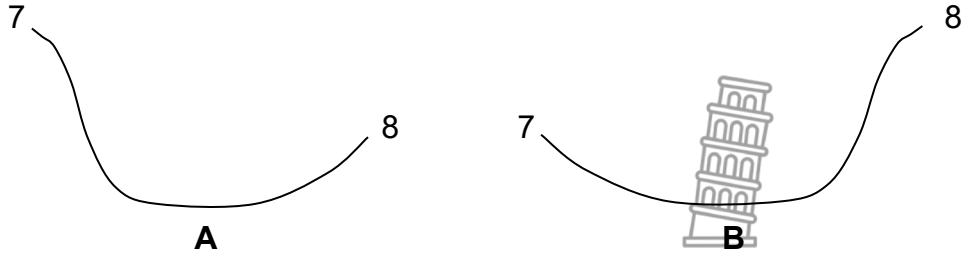
Refer to the area indicated as **J** in blocks **B1** and **B2** and **A1** and **A2** on the topographic map.

3.2.3 (a) Calculate the stream order of the river at **J** in block **B1**. (1 x 1) (1)

(b) Explain how the number of 1st order streams in the area indicated by **J**, is evidence of a dendritic drainage pattern. (1 x 2) (2)

Refer to the white line **7** – **8** on the orthophoto map in block **A1**.

3.2.4 (a) Which of the following diagrams represents a cross section from point **7** to point **8** on the orthophoto map? (1 x 1) (1)



(b) Identify the fluvial slope elements at **7** and **8** respectively. (2 x 1) (2)

3.3 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Laingsburg was partially destroyed within minutes in a flash flood after a cloudburst in 1981. Refer to the following image of the railway bridge and block **C3** on the topographic map.



[Source: https://www.laingsburg.gov.za/laingsburg-flood-1981-0]

3.3.1 The image above is classified as a … map.

A orthophoto
B topographic
C oblique photo
D vertical photo (1 x 1) (1)

3.3.2 (a) Can the photo above be identified as a low or high-resolution photograph? (1 x 1) (1)

(b) Explain your answer in QUESTION 3.3.2 (a). (1 x 2) (2)

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

(b) Give evidence from the topographic map that buffering was implemented after the 1981 flood as a strategy to prevent the same scale of damage during future flooding. (1 x 2) (2)

TOTAL SECTION B: 30

TOTAL: 150

END