KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

GEOGRAPHY P1

PREPARATORY EXAMINATION

SEPTEMBER 2021

MARKS: 150

TIME: 3 hours

This question paper consists of 12 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of THREE questions:

   SECTION A

   QUESTION : 1 CLIMATE and WEATHER (60 MARKS)

   QUESTION : 2 GEOMORPHOLOGY (60 MARKS)

   SECTION B

   QUESTION : 3 MAP SKILLS AND CALCULATIONS (30 MARKS)

2. Answer ALL THREE questions in the answer book provided.

3. ALL diagrams are included in the ANNEXURE.

4. Leave a line open between subsections of questions answered.

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

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

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

8. Where possible, illustrate your answers with labelled diagrams.

9. Write clearly and legibly.

10. You may use a magnifying glass.

11. The unit of measurement must be given in the final answer, where applicable, e.g. 10km, 4°C, east.

SECTION B

QUESTION : 3 MAP SKILLS AND CALCULATIONS (30 MARKS)

INSTRUCTIONS AND INFORMATION

1.   You are provided with a 1:50 000 topographical map (2527 CA RUSTENBURG (WEST) and an orthophoto map (2527 CA 15 TLHABANE) 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 formulae, where applicable. Marks will be allocated for these.

4.   Indicate the unit of measurement in the final answer of calculations.

5.   You may use a non-programmable calculator.

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

ENGLISH	**AFRIKAANS**
Aerodome	Vliegveld
Caravan Park	Karavaanpark
Diggings	Uitgrawings
Golf Course	Gholfbaan
Gap	Poort
Holiday Resort	Vakansieoord
Island	Eiland
Purification Plant	Watersuiweringsaanleg
River	Rivier
Sewage Works	Rioolwerke

SECTION A

QUESTION 1: CLIMATE AND WEATHER

1.1   Refer to FIGURE 1.1 showing a cross section of a mid-latitude cyclone.

    1.1.1   is the air warmer, at **A** or **B**?

    1.1.2   Name the cloud type labelled **C**.

    1.1.3   Identity the front labelled **D**.

    1.1.4   State the intensity of the rainfall being experienced at **X** and **Y**.

    1.1.5   State the general direction of movement of this system.

    1.1.6   Name the wind that steers this weather system.

(7 x 1) (7)

1.2   Refer to FIGURE 1.2 showing a synoptic weather map.

    1.2.1   Name the lines drawn on a synoptic weather map that depict (show) atmospheric pressure.

    1.2.2   Determine the atmospheric pressure of the line labelled **A**.

    1.2.3   Provide the name of the high pressure system labelled **B**.

    1.2.4   State the air circulation around pressure system labelled **B.**

    1.2.5   Give the general wind direction at station model labelled **C.**

    1.2.6   Name of the low pressure system labelled **D.**

    1.2.7   Name the season being depicted by the synoptic weather map.

    1.2.8   The synoptic map illustrates winter conditions. State the name of the local wind associated with the relatively higher temperature of 20°C at **E**.

(8 x 1) (8)

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1.3   Refer to FIGURE 1.3 showing Hurricane **Delta.**

    1.3.1   How many hurricanes preceded (occurred before) Hurricane Delta
        in 2020?   (1 x 1) (1)

    1.3.2   State two infrastructural damages caused by Hurricane Delta
        indicated in FIGURE 1.3.   (2 x 1) (2)

    1.3.3   Refer to the map and satellite image of hurricane Delta.

        (a)   Name the area labelled **A** which is the centre of the
              hurricane.   (1 x 1) (1)

        (b)   In which direction is the converging air circulating around
              the centre of the hurricane.   (1 x 1) (1)

        (c)   Suggest a reason why the centre of the hurricane is calm
              and cloud free.   (1 x 2) (2)

    1.3.4   In a paragraph of approximately 8 lines, explain why Hurricane Delta,
        weakened from a category 4 to a category 2 status and was finally
        downgraded, becoming a tropical low.   (4 x 2) (8)

1.4   Study FIGURE 1.4 which shows the development of a line thunderstorm
    in South Africa.

    1.4.1   Identify front labelled **A**.   (1 x 1) (1)

    1.4.2   Describe the position of the front labelled **A**.   (1 x 1) (1)

    1.4.3   Identify the winds labelled **B** and **C** that converge at front **A**.   (2 x 1) (2)

    1.4.4   Indicate which ONE of the two winds, **B** or **C,** mentioned in
        QUESTION 1.4.3 is colder and drier.   (1 x 1) (1)

    1.4.5   Give ONE reason for your answer to QUESTION 1.4.4.   (1 x 2) (2)

    1.4.6   Briefly explain why line thunderstorms develop east of the
        front labelled **A**.   (2 x 2) (4)

    1.4.7   Suggest TWO ways in which line thunderstorms can impact
        positively on the South African farming community.   (2 x 2) (4)

1.5   Refer to FIGURE 1.5 showing an urban heat island.

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

     1.5.2 Calculate the difference in temperature between the CBD and
             the rural areas with forest.   (1 x 1) (1)

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

     1.5.4 (a)   Draw a labelled diagram, showing the structure of a pollution
                      (dust) dome occurrence during the night for FIGURE 1.5.   (2 x 1) (2)

             (b)   Explain the impact of pollution dome on the heat island
                      effect.   (1 x 2) (2)

     1.5.5 Suggest TWO sustainable solutions city planners can introduce
             to reduce the temperature in the CBD.   (2 x 2) (4)
                                                                [60]

QUESTION 2: GEOMORPHOLOGY

2.1   Refer to the drainage basin and its profile in FIGURE 2.1 and answer the
        questions that follow. Write only the answer next to the question number
        (2.1.1 – 2.1.7) in the ANSWER BOOK. Example, 2.1.8 Run-off.

   2.1.1   Name the source of water for the drainage basin illustrated.

   2.1.2   State the term that is used to describe the starting point of a river labelled **A**.

   2.1.3   What term is used to describe the movement of water at **B**?

   2.1.4   Name the high-lying area **C** that separates two streams of the same river system.

   2.1.5   Name the fluvial feature that will develop at **D**.

   2.1.6   State the geomorphological (fluvial) process that gives rise to the alluvium being
           found at **E**.

   2.1.7   Give the term that describes the lowest point to which a river erodes.
                                                                        (7 x 1) (7)

2.2   Choose the correct word(s) from those given in brackets. Write only the
        correct word(s) next to the question number (2.2.1 – 2.2.8) in the ANSWER
        BOOK. Example, 2.2.9 parallel.

   2.2.1   A (delta/rapid) is formed where the river enters the sea.

   2.2.2   A (graded/ungraded) river profile is smooth and concave.

   2.2.3   The (superimposed/antecedent) drainage system maintains its
           original course over a landscape that has undergone uplift.

   2.2.4   The (trellis/rectangular) stream pattern forms in jointed igneous rocks.

   2.2.5   A (confluence/tributary) is a point along a river course where two
           streams meet.

   2.2.6   (Permanent/Periodic) rivers flow during rainy seasons.

   2.2.7   A (levee/ox-bow lake) is a naturally raised bank of a river.

   2.2.8   (Stream discharge/Drainage density) refers to the amount of
           water in a river passing a specific point at a specific time.   (8 x 1) (8)

2.3 Study FIGURE 2.3, a photograph showing the course of a river.

    2.3.1 Identify the fluvial landform created by the river channel represented in FIGURE 2.3. (1 x 1) (1)

    2.3.2 In which course of the river is this fluvial landform predominant? (1 x 1) (1)

    2.3.3 Decribe the flow characteristic of this course of the river. (1 x 2) (2)

    2.3.4 Draw a rough cross-section from river bank **A** to river bank **B**. Label the slopes found along river bank **A** and river bank **B**. (3 x 1) (3)

    2.3.5 Provide reasons for the shape of the river bank **A**. (2 x 2) (4)

    2.3.6 Explain to a canoeist (someone who rows a small boat) why it is not recommended to follow the inner banks of the river in this course of the river. (2 x 2) (4)

2.4 Refer to FIGURE 2.4, showing river capture.

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

    2.4.2 Identify the feature of river capture labelled **A** evident in FIGURE 2.4. (1 x 1) (1)

    2.4.3 Why is stream **B** most likely to be the captor stream? (1 x 2) (2)

    2.4.4 Explain why the captor stream becomes rejuvenated after river capture. (1 x 2) (2)

    2.4.5 In a paragraph of approximately EIGHT lines, explain the physical and environmental impact that river capture will have on stream **C**. (4 x 2) (8)

2.5 Study FIGURE 2.5, a case study on human impact on the Vaal River.

    2.5.1 Which department is responsible for South Africa's water resources? (1 x 1) (1)

    2.5.2 Why has the pollution in the Vaal River become beyond acceptable levels? (1 x 1) (1)

    2.5.3 From which neighbouring country does South Africa import fresh water? (1 x 1) (1)

2.5.4 Excluding Gauteng, name TWO other provinces that depend
on the Vaal Dam.   (2 x 1) (2)

2.5.5 Assess the impact pollution in the Vaal River has on the
natural ecosystem of the river as well as recreational activities
along the river.   (2 x 2) (4)

2.5.6 Recommend possible strategies that can be put in place to
reduce the impact of sewage waste on rivers.   (3 x 2) (6)
                                                                      [60]

SECTION B

QUESTION 3: MAP SKILLS AND CALCULATIONS

The questions below are based on the GENERAL INFORMATION OF RUSTENBURG (FUGURE 3), 1:50 000 topographic map (2527CA RUSTENBURG WEST) as well as the orthophoto map (2527 CA 15 TLHABANE) as part of the mapped area.

3.1   MAP SKILLS AND CALCULATIONS

3.1.1   Calculate the length of the dam wall in block **C4** in metres.
Show all calculations.   (2 x 1) (2)

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

The true bearing of the railway station **4** from the school **2** on the orthophoto map is …

A   240º
B   120º
C   300º
D   60º   (1 x 1)(1)

3.1.3   Calculate the magnetic bearing of the railway station (4) from the school (2) on the orthophoto map for the current year.

Steps for magnetic declination:

1.   Difference in years.
2.   Mean annual change.
3.   Total change
4.   Magnetic declination for the current year.

Formula for magnetic bearing:
MB = TB + MD   (6 x 1) (6)

3.1.4   Why it is important to correct the magnetic declination when using A topographical map and a magnetic compass on a hike on the Magaliesberg?   (1 x 1) (1)
[10]

3.2   **APPLICATION AND INTERPRETATION**

   3.2.1   There are sections of greenery within and surrounding the area of
           Rustenburg West. With reference to climate explain the importance
           of these green areas to the city.   (1 x 2) (2)

   3.2.2   Refer to the orchards (fruit farms) at Rietvlei in block **G6** on the
           topographic map, located in a valley, and give reasons why it
           regularly experiences frost during winter nights.   (1 x 2) (2)

   3.2.3   Refer to the orthophoto map and topographic map. Suggest how the
           Townlands Platinum Mines can severely impact on the health of the
           people of the area of Tlhabane, especially if the prevailing wind is
           blowing from a north easterly direction.   (1 x 2) (2)

   3.2.4   Refer to the drainage basin in blocks **D1** and **D2** on the topographic
           map.

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

           The drainage pattern formed by the river system in blocks
           D1 and **D2** is ...

           A   Trellis.
           B   Rectangular.
           C   Dendritic.
           D   Radial.   (1 x 1) (1)

   (b)   State the underlying rock structure of the area found in blocks
           D1 and **D2**.   (1 x 1) (1)

   (c)   In which fluvial stage is the river?   (1 x 1) (1)

   (d)   The dominant river flow that one can expect in this stage of the
           river course is (laminar/ turbulent).   (1 x 1) (1)

   (e)   Give a reason for your answer to QUESTION 3.2.4 (d).   (1 x 2) (2)
                                                                                     [12]

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3.3 GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

3.3.1 Define the concept *attribute data*. (1 x 2) (2)

3.3.2 Refer to river marked **R** (block **C7**) on the topographic map.
Choose the correct word from those given in brackets. Write only
the correct word next to the question number in the ANSWER BOOK.
Example 3.3.2 (b) raster data

    (a)   What type of vector data is used to represent the river R in
block C7? (lines / polygon) (1 x 1) (1)

    (b)   Give ONE attribute of river **R**. (1 x 1) (1)

    (c)   Explain the importance of using vector data on topographic
maps. (1 x 2) (2)

3.3.3 Remote sensing refers to getting information about the earth's
surface from a vertical distance e.g. satellite images. How would
remote sensing assist environmentalists to evaluate the impact of
the Townlands Platinium mines (block **F9**) on the environment? (1 x 2) (2)

[8]

TOTAL: **30**
GRAND TOTAL: **150**

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GEOGRAPHY P1

ANNEXURE

SEPTEMBER 2021

PREPARATORY EXAMINATION

This Annexure consists of 7 pages.

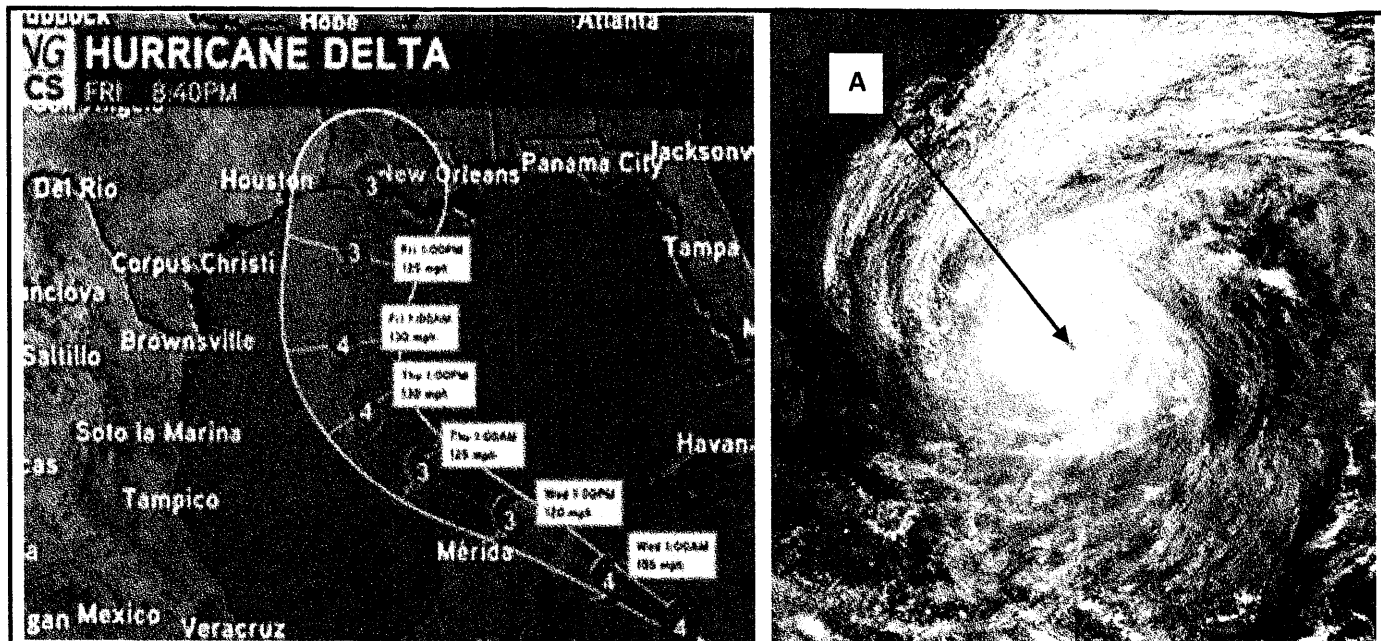**FIGURE: 1.1   CROSS SECTION OF A MID-LATITUDE CYCLONE**
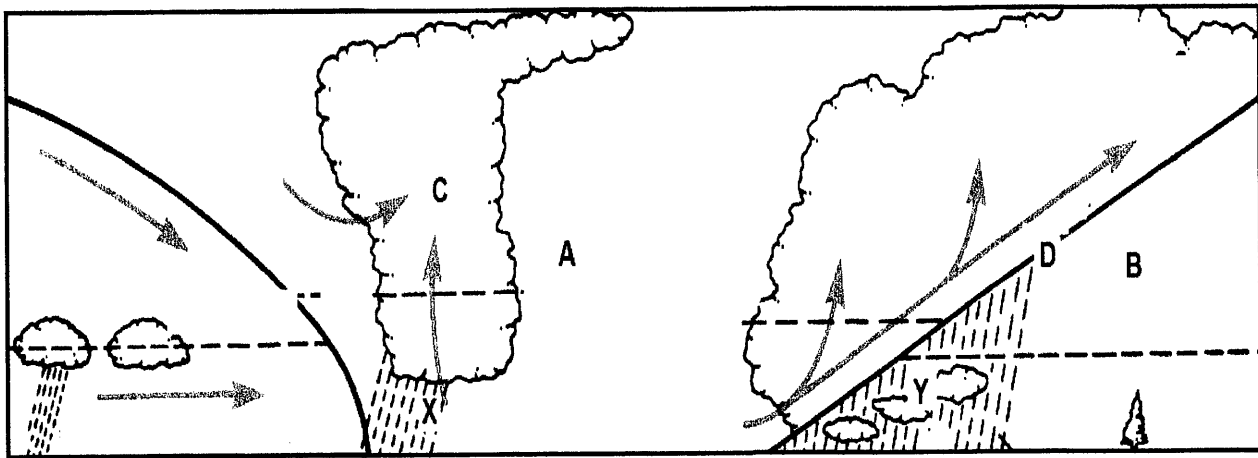
[Source: Adapted from South African Weather Patterns]

FIGURE 1.2 SYNOPTIC WEATHER MAP
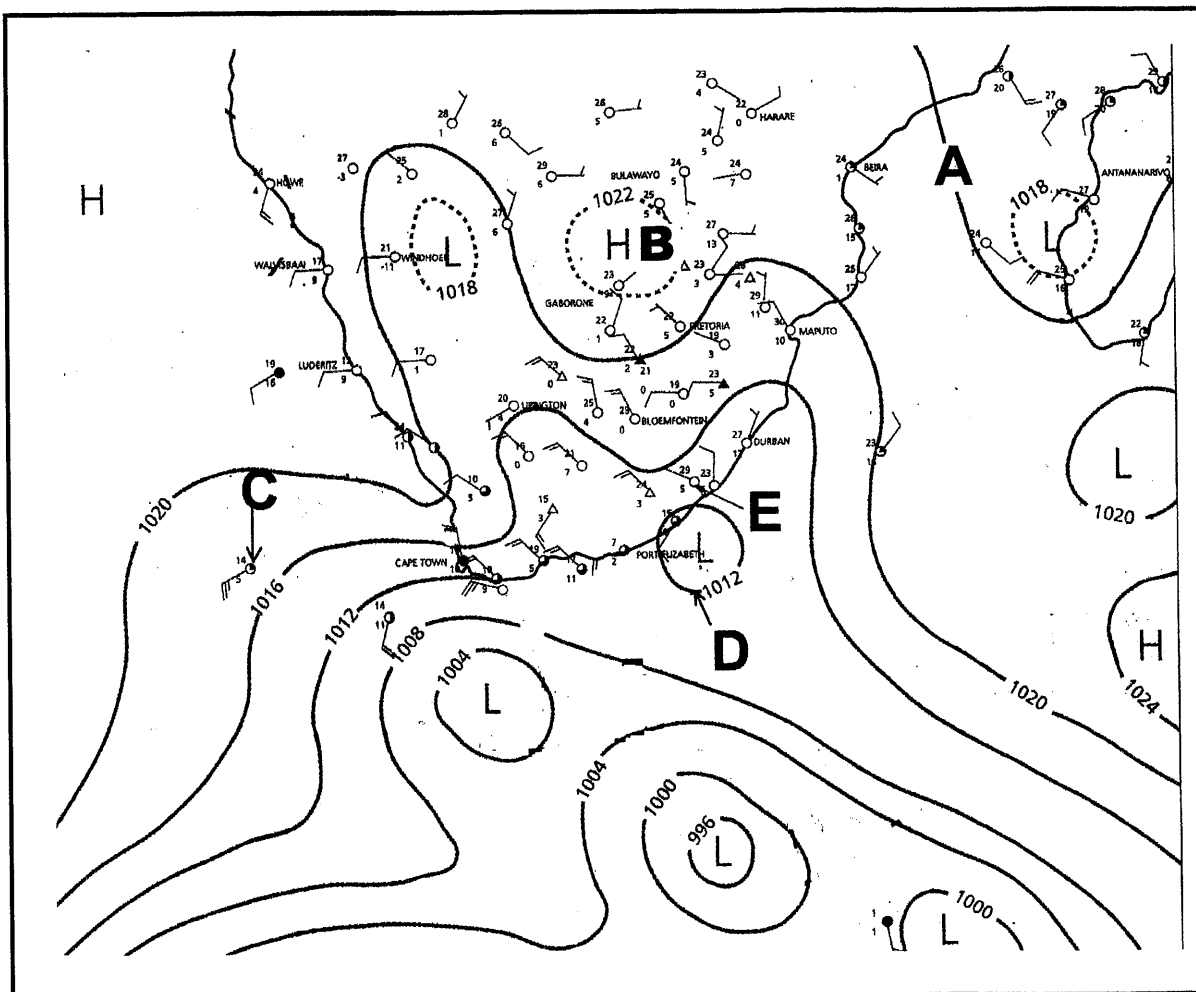
[Source: Adapted from South African Weather Services]

FIGURE 1.3: HURRICANE DELTA

Hurricane Delta nearing its secondary peak intensity east of <u>Texas</u> on October 8

Formed	October 5, 2020
Dissipated	October 12, 2020
Highest winds	230 km/h
Lowest pressure	953 <u>mbar</u> (<u>hPa</u>)
Fatalities	6 total
Damage	$3.09 billion (2020 <u>USD</u>)

Hurricane Delta was the record-tying fourth named storm of 2020 to strike Louisiana. Delta formed from a tropical wave.   The next day, the system was sufficiently organized to be designated as Tropical Depression and soon thereafter, Tropical Storm Delta. Extreme rapid intensification ensued throughout October 5 into October 6, with Delta becoming a Category 4 hurricane within 28 hours of attaining tropical storm status. The storm quickly weakened before making landfall in Puerto Morelos, Mexico, as a high-end Category 2 hurricane with winds of 175 km/h. States of emergency were declared in the U.S. states of Louisiana, Mississippi, and Alabama and several coastal and low-lying areas were ordered to evacuate. In Mexico, trees and power lines were blown down, and roofs were ripped off homes and other buildings. Louisiana and Southeast Texas were hit by heavy rain, high winds, and storm surge. Delta then began to turn more north-northeastward into an area of cooler waters, higher wind shear, and dry air, causing it to weaken back to Category 2 status. Delta then made landfall at 23:00 UTC near Creole, Louisiana with winds of 155 km/h and a pressure of 970 mb. The storm began to weaken more rapidly after landfall, becoming tropical low just 22 hours later.
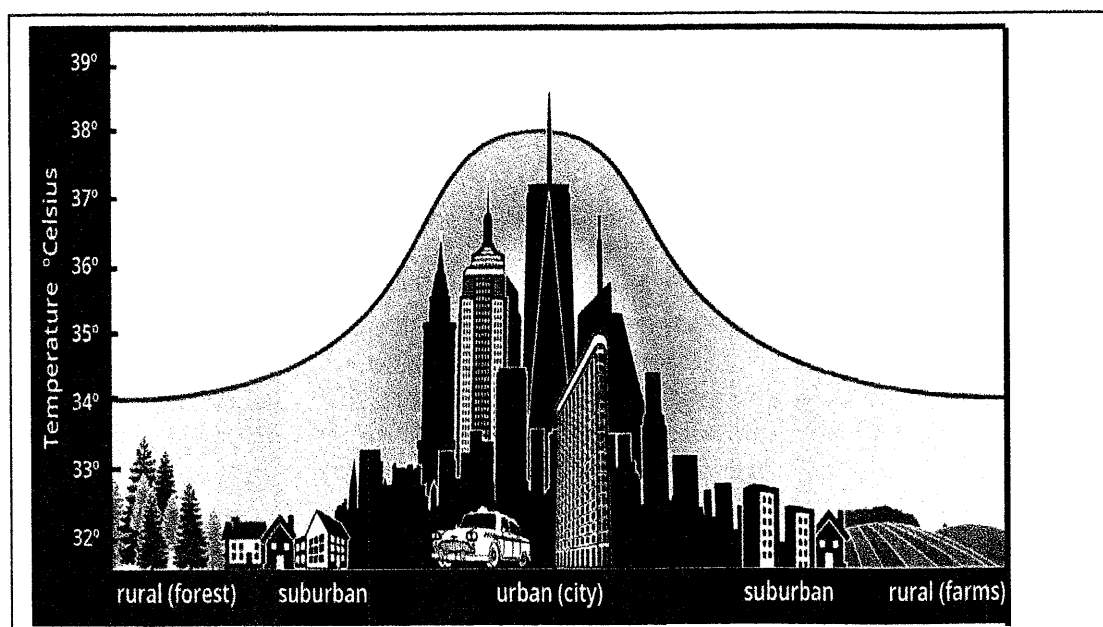
[Source: Adapted https://www.usgs.gov/special-topic/hurricane-delta]

FIGURE: 1.4 LINE THUNDERSTORMS

[Source: https://en.wikipedia.org/wiki/Thunderstorm]
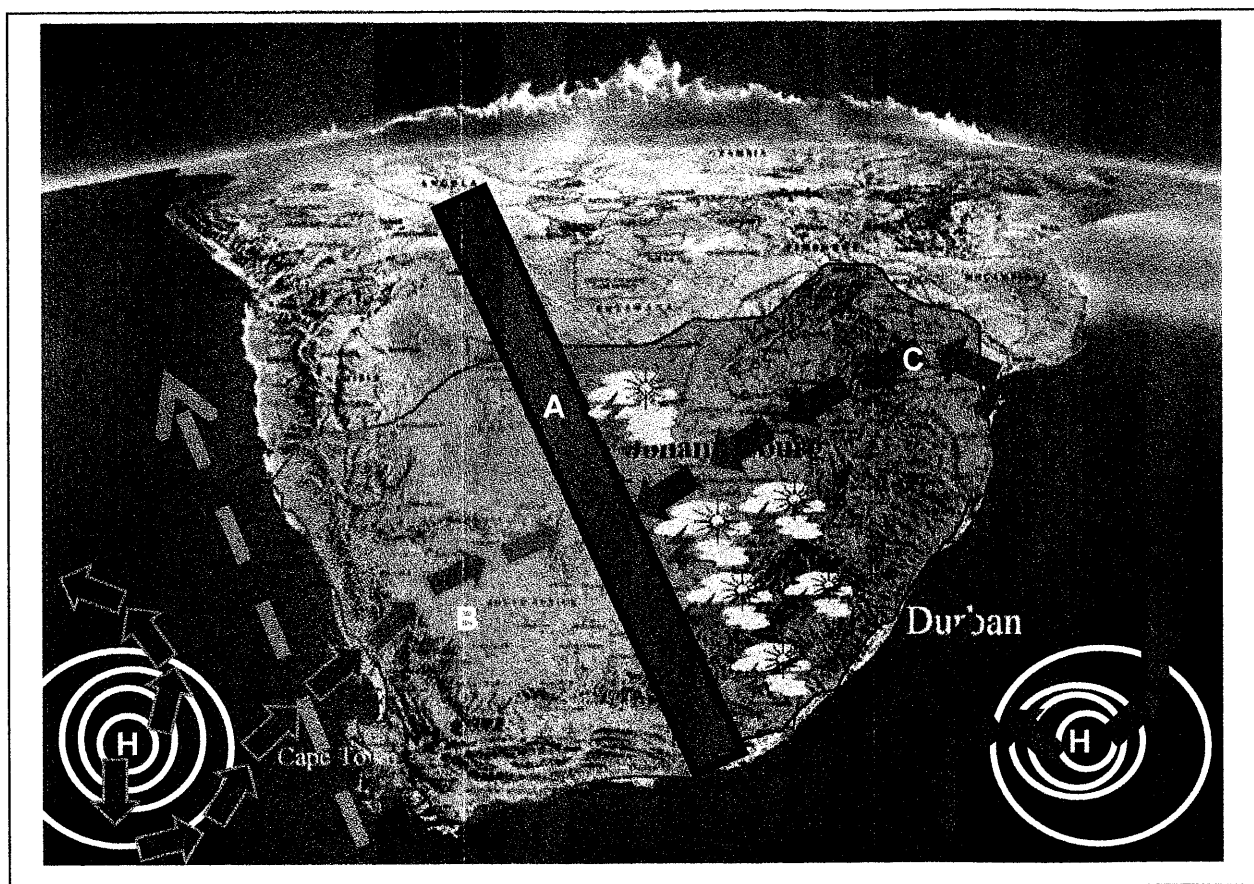
FIGURE 1.5: URBAN HEAT ISLAND

[Source: https://www.bing.com/images/search]

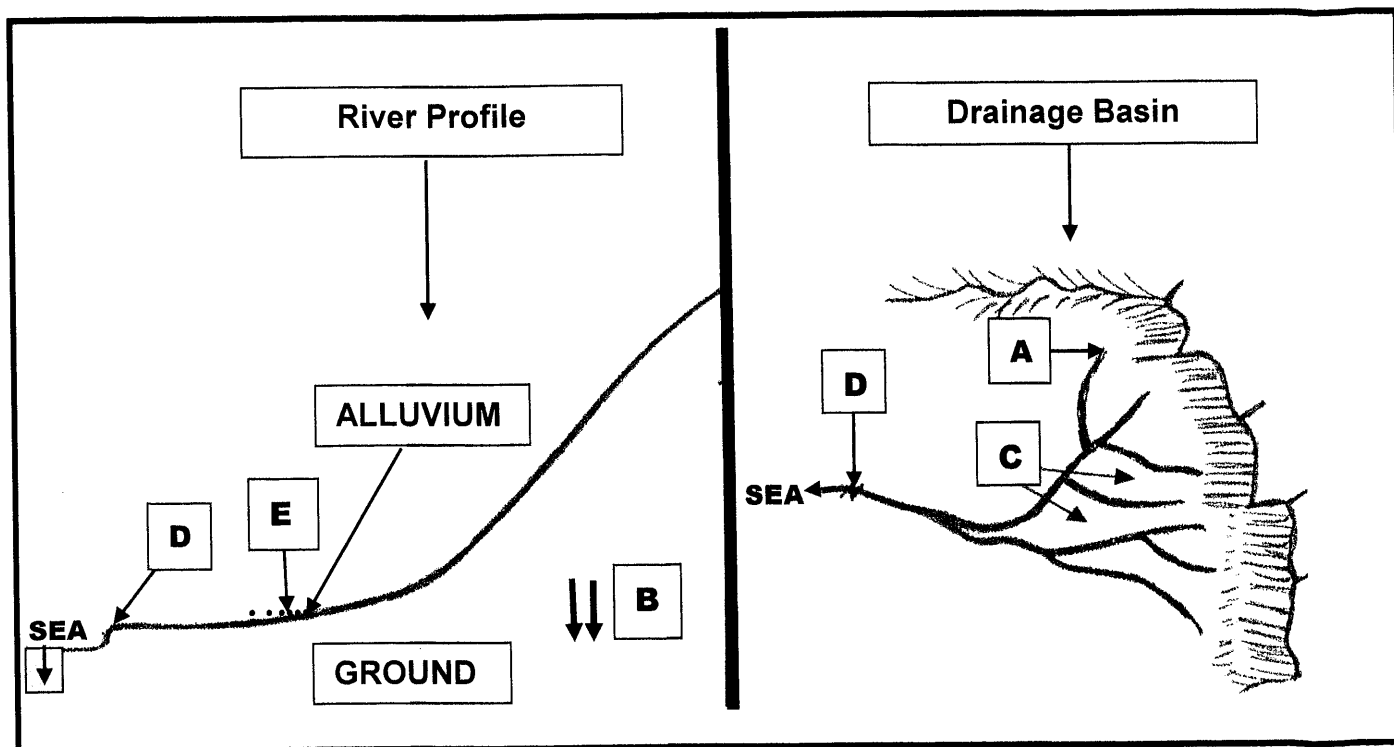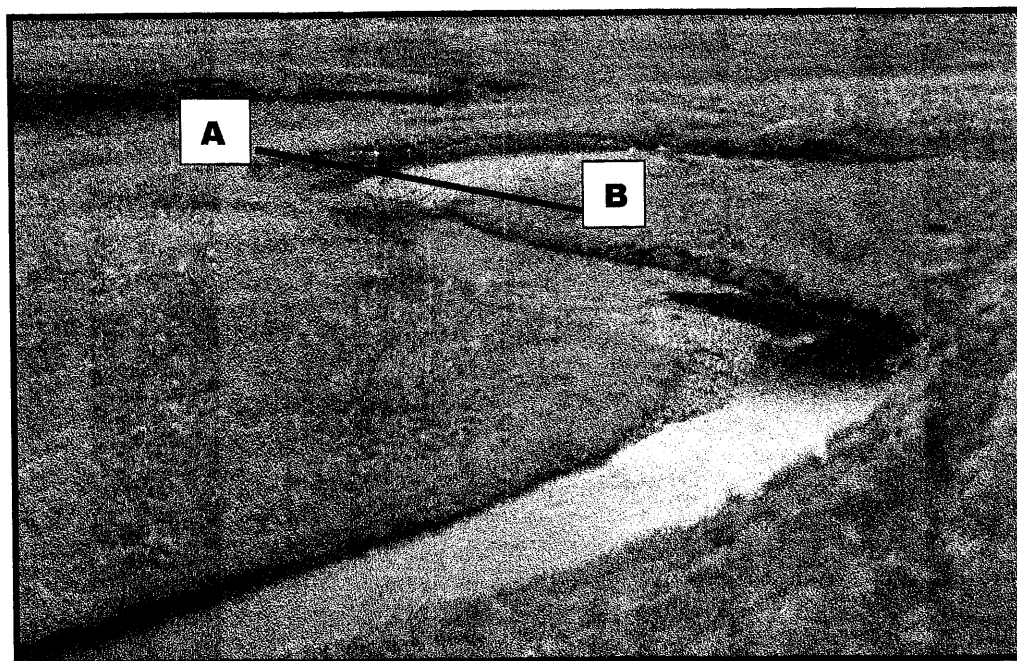Please Turn Over

FIGURE 2.1: DRAINAGE BASIN AND ITS PROFILE

Source: [Examiners own sketch]

FIGURE 2.3: COURSE OF A RIVER

Source: https://upload.wikimedia.org/wikimedia/commons/5/15/meander

FIGURE 2.4: RIVER CAPTURE
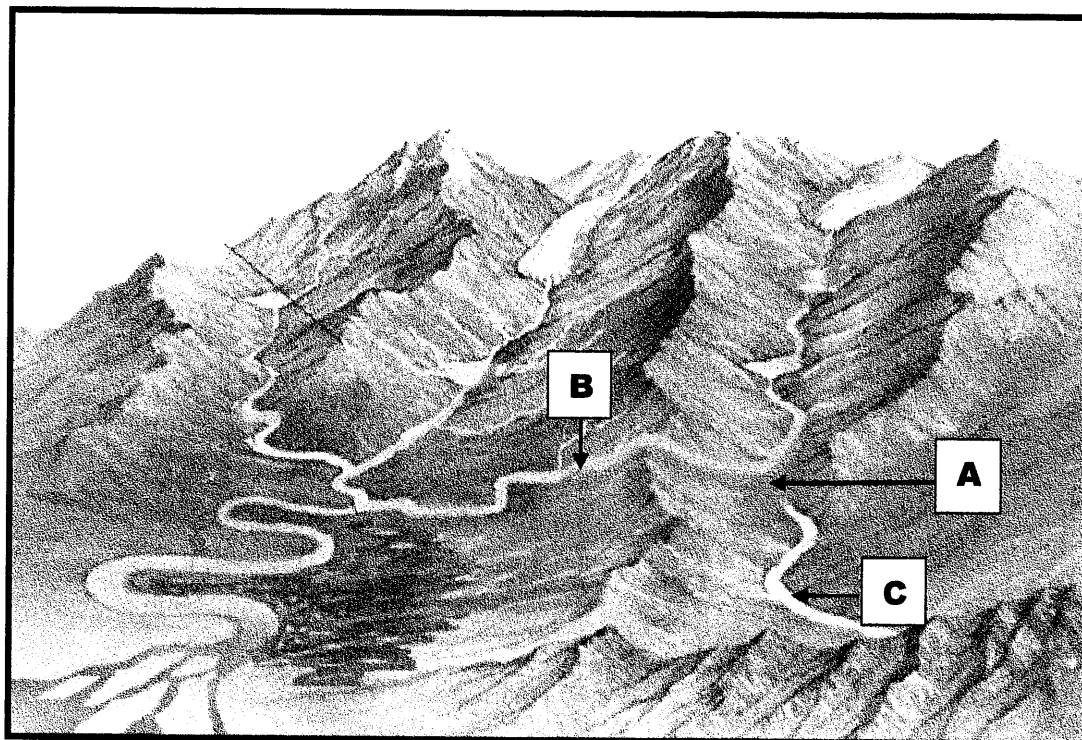
Source: http://www.bing.com/images/seaarch?q=River + Piracy

FIGURE 2.5: HUMAN IMPACT ON THE VAAL RIVER
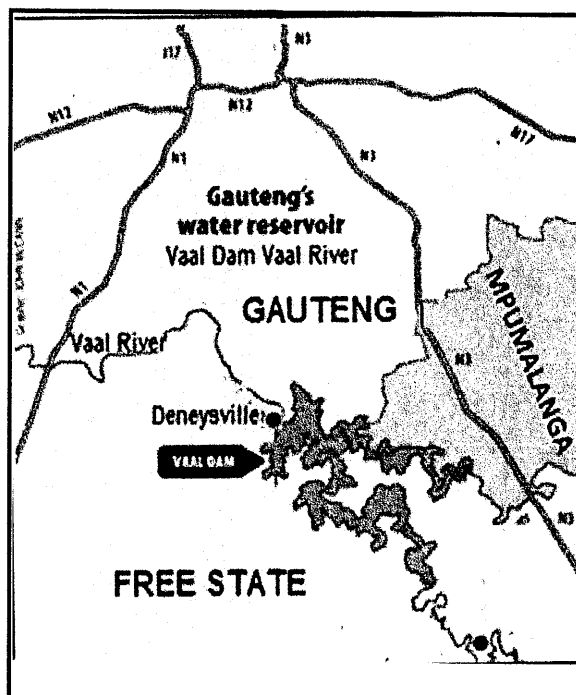
CASE STUDY:
Vaal River pollution is beyond acceptable levels

By Timeshare: 17 February 2021

Kilometres of untreated sewage entering the river because of dysfunctional wastewater treatment plants which have been unable to process sewage and other wastewater products. The Department of Water and Sanitation (DWS) has allocated 120 million to refurbish the treatment plant. Water from the Lesotho Highlands has been badly contaminated by the raw sewage spills. One of the consequences of pollution is on the natural ecosystem that directly depends on the water. Evidence provided and accepted regarding the decrease in tourism and recreational activities on the river is due to the severity of the pollution in the Vaal River.

[Adapted from www.fse.org.za]

FIGURE 3

GENERAL INFORMATION OF RUSTENBURG

Rustenburg was established in 1851 as a central place town to support a fertile farming area producing citrus fruit, tobacco, peanuts, sunflower seeds, maize, wheat and cattle. The area became a primary agricultural region with vast citrus estates due to the favourable climate.

Rustenburg is home to the two largest platinum mines in the world and the world's largest platinum refinery, which processes around 70% of the world's platinum.

Lately, the vast citrus estates in the region have been in constant decline due to pollution from increased smelting and beneficiating processes by the mines. (Beneficiation is when value is added to the raw materials.)

Rustenburg has a temperate climate, it has very warm summers and mild winters. Due to the altitude, summers are not quite as hot as one might expect. Precipitation occurs mainly in summer.

[Source: http://en.wikipedia.org/wiki/rustenburg]

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GEOGRAPHY P1

MARKING GUIDELINES

SEPTEMBER 2021

PREPARATORY EXAMINATION

MARKS: 150

This marking guidelines consists of 12 pages.

CLIMATE AND WEATHER

QUESTION 1

1.1

    1.1.1 A✓

    1.1.2 Cumulonimbus ✓

    1.1.3 Warm front

    1.1.4 X – heavy showers/torrential rainfall ✓   Y - moderate/light showers ✓

    1.1.5 West to east / easterly ✓

    1.1.6 Westerlies✓   (7 x 1) (7)

1.2

    1.2.1 Isobars✓

    1.2.2 1020 hPa/mb✓

    1.2.3 Kalahari/ Continental High✓

    1.2.4 Anticlockwise/Anticyclonic✓

    1.2.5 South West✓

    1.2.6 Coastal low✓

    1.2.7 Winter✓

    1.2.8 Berg winds✓

                                         (8 x 1) (8)

1.3

    1.3.1 3✓   (1 x 1) (1)

    1.3.2 power lines were blown down ✓
           roofs were ripped off homes and other buildings ✓   (2 x 1) (2)

    1.3.3

        (a)   Eye✓   (1 x 1) (1)

        (b)   Anticlockwise/Counterclockwise✓   (1 x 1) (1)

        (c)   The upward spiralling movement of air creates an
             artifical wall around the centre✓✓ This prevents surface
             air from rising and cooling, therefore no condensation
             occurs to produce clouds or rain✓✓
             As air descends in the eye it warms up adiabatically,
             no cloud formation ✓✓   (1 x 2) (2)
             (Any ONE)

1.3.4 At category 4 wind speed was 270 km per hour very destructive ✓✓
Delta began to turn more north-northeastward into an area of
cooler waters✓✓
Higher wind shear, and dry air, causing it to weaken back to
Category 2 status
When it made landfall it was cut off from moisture source. ✓✓
Friction of air moving over land decreased windspeed. ✓✓
System slowed down, wind speed decreased to 155 km/h and
finally classified as a tropical low ✓✓
Pressure increased to 970 mb ✓   (4 x 2) (8)
(Any FOUR)

1.4

1.4.1 Moisture front✓   (1 x 1) (1)

1.4.2
It extends from north west to south east ✓
Central part of South Africa ✓
(Any ONE)   (1 x 1) (1)

1.4.3 B - south westerly wind ✓
C - north easterly wind ✓   (2 x 1) (2)

1.4.4 B✓ - south westerly wind   (1 x 1) (1)

1.4.5 Wind B   blows   over the Atlantic Ocean which is colder/
South Atlantic High advects cold dry air✓✓
Due to cold Benguella current which brings cold dry
weather conditions✓✓   (1 x 2) (2)
(ANY ONE)

1.4.6 The cold dry south westerly wind and the warm north easterly
wind converge at the moisture front ✓✓
The cold, dry south air uplifts the warm,
moist air along the east of the front ✓✓
Rising air will therefore cool and condenses forming cumulonimbus
clouds which will result in line thunderstorms east of the
moisture front ✓✓
(Any TWO)   (2 x 2) (4)

1.4.7 Rains will fill dams and can be used for irrigation✓✓
Provide moisture for dry soil✓✓
Underground water reserves will increase causing water table to
rise✓✓
Flood waters will clear pollution in rivers✓✓
Nitrogen fixing from lightning makes the soil fertile ✓✓   (2 x 2) (4)
(Any TWO)

1.5

1.5.1 Heat Island - Refers a region of higher temperatures in an urban
area surrounded by lower temperatures in the rural areas✓✓
[Concept]   (1 x 2) (2)

1.5.2 5/4 degrees celsius✓ (1 x 1) (1)

1.5.3 Heat is trapped by the buildings due to closely spaced building✓✓
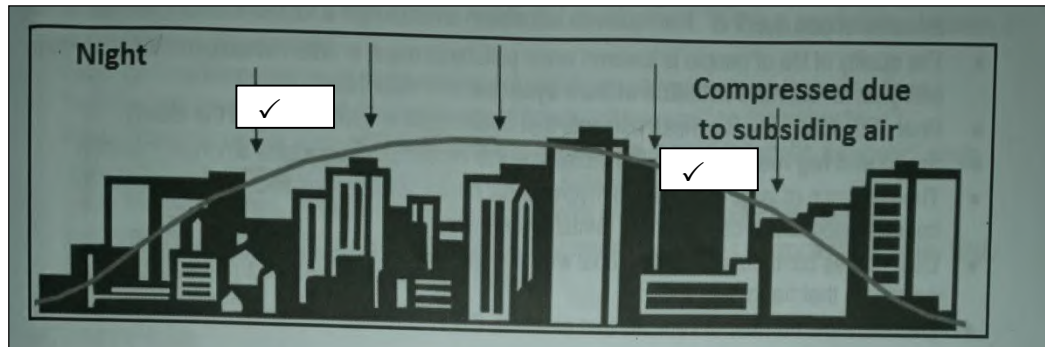Reflective heat is transferred between the buildings✓✓
Limited air flow to disperse of heat✓✓
Heat is absorbed by building✓✓
 (Any TWO) (2 x 2) (4)

1.5.4 (a)

Marks must be allocated for:
 Subsidence ✓
 Dome shape ✓

(2 x 1) (2)

(b) It traps more heat increasing the heat island effect✓✓ (1 x 2) (2)

1.5.5 Planting more trees in the urban areas to absorb carbon dioxide✓✓
Establishment of the roof gardens✓✓
The use of white reflective paints or surfaces to prevent heat from being absorbed✓✓
Commercial decentralization to move shoppers/workers to outlying areas
industrial decentralization to prevent pollution in cities✓✓
Limit industrial activities to daytime only✓✓
Legislation to limit pollution✓✓
Chimney stacks tall enough to release smoke above inversion layer✓✓
Increase the number of water features✓✓
Promote public transport to reduce the number of vehicles in the CBD✓✓
Increase eco-friendly buildings ✓✓
Encourage park and ride facilities✓✓

(Any TWO) (2 x 2) (4)
[60]

QUESTION 2: GEOMORPHOLOGY

2.1

    2.1.1 Precipitation/Rain✓

    2.1.2 Source ✓

    2.1.3 Infiltration/Percolation/Seepage ✓

    2.1.4 Interfluve✓

    2.1.5 Waterfall/Knickpoint ✓

    2.1.6 Deposition✓

    2.1.7 Sea level/Permanent base level/Ultimate base level/Base level of erosion✓

                                 (7 x 1) (7)

2.2

    2.2.1 delta ✓

    2.2.2 graded ✓

    2.2.3 antecedent ✓

    2.2.4 rectangular ✓

    2.2.5 confluence ✓

    2.2.6 Periodic/Permanent ✓

    2.2.7 levee ✓

    2.2.8 Stream discharge ✓   (8 x 1) (8)
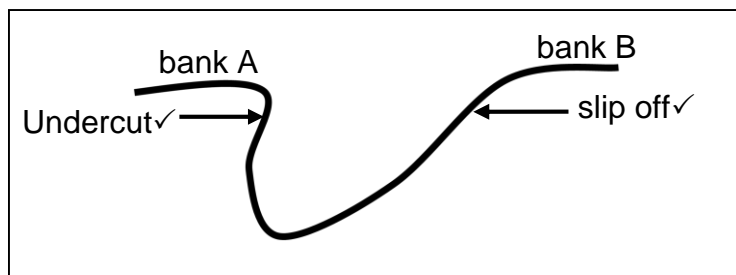
2.3

    2.3.1　Meander✓　　　　　　　　　　　　　　　　　　　　　　　　　(1 x 1) (1)

    2.3.2　Lower course ✓　　　　　　　　　　　　　　　　　　　　　(1 x 1) (1)

    2.3.3　laminar flow – river has a smooth flow/ flows in sheets/layers
          Flows without lateral mixing ✓✓　　　　　　　　　　　　(1 x 2) (2)
          (Any ONE)

    2.3.4

                              ✓　　　　　　　(3 x 1) (3)
      (ONE MARK MUST BE GIVEN FOR THE SHAPE OF THE SLOPES)

    2.3.5　River is fast flowing/flow has most energy due to greater friction ✓✓
          Greater erosion ✓✓
          The hydraulic force of the water is greater ✓✓　　　　　(2 x 2) (4)
          (Any TWO)

    2.3.6　Flow is slower, will reduce the speed of the boat ✓✓
          Greater deposition will result in shallow waters and the accumulation
          of deposited material could damage the bottom surface of the canoe/
          boat ✓✓
          The slower water deposits its load on a series of point bars causing
          obstruction in the course of the flow ✓✓
          Shallow water will make it difficult to paddle the boat ✓✓　　(2 x 2) (4)
           (Any TWO)

    2.4.1　Occurs when a more energetic river captures or intercepts
          the headwaters of less energetic river ✓✓　　　　　　　(1 x 2) (2)
          (Concept)

    2.4.2　A – Wind gap✓　　　　　　　　　　　　　　　　　　　　(1 x 1) (1)

    2.4.3　Flowing over a steeper gradient✓✓
          High drainage density due to high rainfall✓✓
          Cuts through the watershed (headward erosion) ✓✓
          Flows over softer rock✓✓　　　　　　　　　　　　　　　(1 x 2) (2)
          (ANY ONE)

2.4.4　The increase in volume results in the drainge basin increasing its energy
          to erode downward ✓✓　　　　　　　　　　　　　　　　(1 x 2) (2)

2.4.5 **Physical**

Stream will lose its water/headwater ✓✓
Beheaded stream ✓✓
Deposition increases ✓✓
The river becomes too small for its valley ✓✓
River becomes a misfit stream ✓✓
River start to dry up ✓✓

Environmental
The area surrounding the river will become drier ✓✓
The ecosystem will be distrupted /state of imbalance ✓✓
Affect aquatic life negatively ✓✓
Animals depending on the river will migrate ✓✓
Vegetation will dry up ✓✓
Ground water levels will drop ✓✓   (4 x 2) (8)
✓✓
(Any FOUR. Must mentioned both physical and environmental impact)

2.5.1 Department of Water and Sanitation ✓   (1 x 1 (1)

2.5.2 Sewage entering the river/
Dysfunctional wastewater treatment plants ✓
(Any ONE)   (1 x 1) (1)

2.5.3 Lesotho ✓   (1 x 1) (1)

2.5.4 Free State ✓ Mpumalanga ✓   (2 x 1) (2)

2.5.5 **Natural ecosystem**
Algae starts to grow in the water/ Algae will poison fish ✓✓/
Fish/birds/insects and other species that depend on the river will die ✓✓
Eutrophication takes place ✓✓
Water becomes contaminated/toxic ✓✓
Contribute towards acid rain ✓✓
The chemicals in the waste can be harmful to the pH balance of the
water and soils ✓✓
ground water will be affected ✓✓
Offensive odours ✓✓
Increase in viruses/bacteria ✓✓
River and surrounding areas will lose its aesthetic qualities ✓✓

Recreational Activities
Decrease in recreational activities ✓✓
Recreational activities rowing/swimming/canoeing/fishing may have to be
suspended due to waterborne diseases✓✓
Decrease in tourism especially to resorts along the river ✓✓
 (Any ONE)   (2 x 2) (4)
(Candidates must mention one point from both, natural ecosystem and
recreational activities)

2.5.6 Sewage need to be treated/Purified close to the source in septic tanks/
before it is disposed of ✓✓
Treat and use sewage waste since it contain nitrogen and phosphorous
that can be used as fertilizers ✓✓
Fix/repair pipelines connecting sewage waste/ Implement effective
maintenance and renovation of the sewerage pumps and waste water
works ✓✓
Fines for not properly maintaining equipment ✓✓
Install low flow toilet systems ✓✓
Reduce the amount of fats, oils and grease down drains ✓✓
avoid planting trees close to sewage pipes ✓✓
Improve the infrastructure ✓✓
Reuse/Recycle water ✓✓
Education/awareness programmes on Waste disposal ✓✓
Legislation prohibiting pollution around the Vaal River ✓✓
Implementation and policing of the National Water Act ✓✓
Making municipalities accountable for high quality drinking water ✓✓
Consulting and creating public participation around water needs ✓✓
River health programmes ✓✓
Regular monitoring and testing of the water quality ✓✓
Long term plan for sustainable water usage✓✓
Preventing settlement development ✓✓
Introducing efficient waste removal ✓✓
Erect buffer zones ✓✓
Use eco-friendly products ✓✓ (3 x 2) (6)
(Any THREE) **[60]**

QUESTION: 3

3.1   MAP SKILLS AND CALCULATIONS

3.1.1   Calculate the length of the dam wall in block **C4** in metres. Show all calculations.

0.8 ✓ **cm x 500 (Range: 0.7 cm – 0.9 cm)**
= 400m ✓ **(Range: 350 – 450m)**   (2 x 1) (2)

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

        The true bearing of the railway station **4** from the school **2** on
        the orthophoto map is …

        B   120º ✓

                                                                  (1 x 1) (1)

3.1.3   Calculate the magnetic bearing of the railway station (4) from the school
        (2) on the orthophoto map for the current year.

        1.   Difference in years: **2021- 2014 = 7 years** ✓
        2.   Mean annual change: **4'**
        3.   Total anual change: **4' x 7 years = 28 '** ✓
        4.   Magnetic declination for the current year:**17º 16' + 28' = 17º 44'** ✓

        Formula for magnetic bearing:
        MB = 120º + 17º 44' ✓
            = 137º 44' west of True North ✓✓   (6 x 1) (6)

3.1.4   Why it is important to correct the magnetic declination when using a
        topographical map and a magnetic compass on a hike on the Magaliesberg.

        To obtain the precise direction ✓
        To maintain a correct path during the hike ✓   (1 x 1) (1)
        (Any One)

                                                                        [10]

3.2　**APPLICATION AND INTERPRETATION**

3.2.1　There are sections of greenery within and surrounding the area of
Rustenberg West. With reference to climate explain the importance
of these green areas to the city.

Helps reduce the temperature within the town ✓✓
Provides oxygen ✓✓
Reduces carbon dioxide ✓✓
Filters pollution within the town ✓✓
(Any ONE)　　　　　　　　　　　　　　　　　　　　　　　　(1 x 2) (2)

3.2.2　Refer to the orchards (fruit farms) at Rietvlei in block **G6** on the topographic
map, located in a valley and give reasons why it regularly experiences frost
during winter nights.

**Katabatic winds cause cold air to descend from surrounding hills
down the slopes and as the dew point temperature falls below 0°C frost
develops** ✓✓　　　　　　　　　　　　　　　　　　　　　　(1 x 2) (2)

3.2.3　Refer to the orthophoto map topographic map. Suggest how the Townlands Platinum
Mines can severely impact on the health of the people of the area of Tlhabane,
especially if the prevailing wind is blowing from a north easterly direction.

(**North easterly winds) will carry dust and harmful gases towards the
area of Tlhabane** ✓✓
Air quality will decrease ✓✓
People will suffer from respiratory problems ✓✓
(Any ONE)　　　　　　　　　　　　　　　　　　　　　　　(1 x 2) (2)

3.2.4　Refer to the drainage basin in blocks **D1** and **D2** on the topographic
map.

(a)　The drainage pattern formed by the river system in blocks
D1 and **D2** is**…**

C　　Dendritic ✓　　　　　　　　　　　　　　　　(1 x 1) (1)

(b)　State the underlying rock structure of the area found in blocks **D1** and **D2**.

Rock of uniform resistance/Homogenous rocks ✓
Horizontal sedimentary rocks/massive igneous rocks ✓　　(1 x 1) (1)

(c)　In which fluvial stage is the river?
Youth stage/initial stage (upper course) ✓　　　　　(1 x 1) (1)

(d)   The dominant river flow that one can expect in this stage of the river course
       is (laminar/ turbulent).

       turbulent✓   (1 x 1) (1)

(e)   Give a reason for your answer to QUESTION 3.2.4 (d).

       Uneven river channel ✓✓   (1 x 2) (2)

                                                                          [12]

3.3   **GEOGRAPHICAL INFORMATION SYSTEMS (GIS)**

       3.3.1 Define the concept *attribute data*.

              **Descriptive data/describes the spatial objects or
              features** ✓✓   (1 x 2) (2)

       3.3.2 Refer to river marked **R** (block **C7**) on the topographic map.
              Choose the correct word from those given in brackets. Write only
              the correct word next to the question number in the ANSWER BOOK.
              Example 3.3.2 (b) raster data

              (a)   What type of vector data is used to represent the river R in block C7?

                     lines✓   (1 x 1) (1)

              (b)   Give ONE attribute of river **R**.

                     Non-perennial ✓
                     Flows in a north easterly direction ✓
                     Dendritic stream pattern ✓
                     Tributaries join the main stream at acute angle ✓
                     Flowing over a gentle gradient ✓
                     Low drainage density ✓   (1 x 1) (1)
                     (Any ONE)

              (c)   Explain the importance of using vector data on topographic
                     maps.

                     Symbols make the topographic map easier to read ✓✓   (1 x 2) (2)

3.3.3 Remote sensing refers to getting information about the earth's
surface from a vertical distance e.g. satellite images. How would
remote sensing assist environmentalists to evaluate the impact of
the Townlands Platinium mines (block **F9**) on the environment?

**Analyse, process and find solutions to the impact of air pollution
caused by the mines** ✓✓
**Analyse, process and find solutions to the impact of water pollution
caused by the mines** ✓✓
**Analyse, process and find solutions to the impact of the mines on the
quality of water in the rivers/ground water/dams** ✓✓
**Analyse, process and find solutions to the impact of noise pollution
created by the mines** ✓✓
Analyse the need for buffer zones ✓✓
**Analyse, process and find solutions on the impact of mining
on the biodiversity/flora and fauna** ✓✓
Analyse the impact of mining on the soil/rocks ✓✓ (1 x 2) (2)
(Any TWO)

[8]

TOTAL FOR SECTION B: [30]

GRAND TOTAL: 150