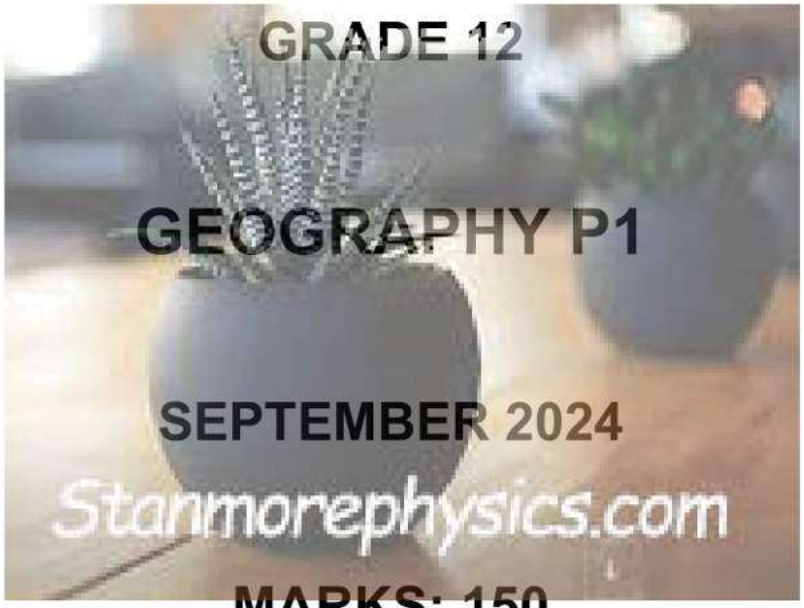
education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION



MARKS: 150

TIME: 3 HOURS

This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO SECTIONS:

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

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

2. Answer ALL THREE questions.
3. ALL diagrams are included in the QUESTION PAPER.
4. Leave a line between subsections 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 your 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. Write in full sentences when answering paragraph questions.
10. Units of measurement MUST be indicated in your final answer, e.g., 20 times, 10 m.
11. You may make use of a non-programmable calculator.
12. You may make use of a magnifying glass.
13. Write clearly and legibly.

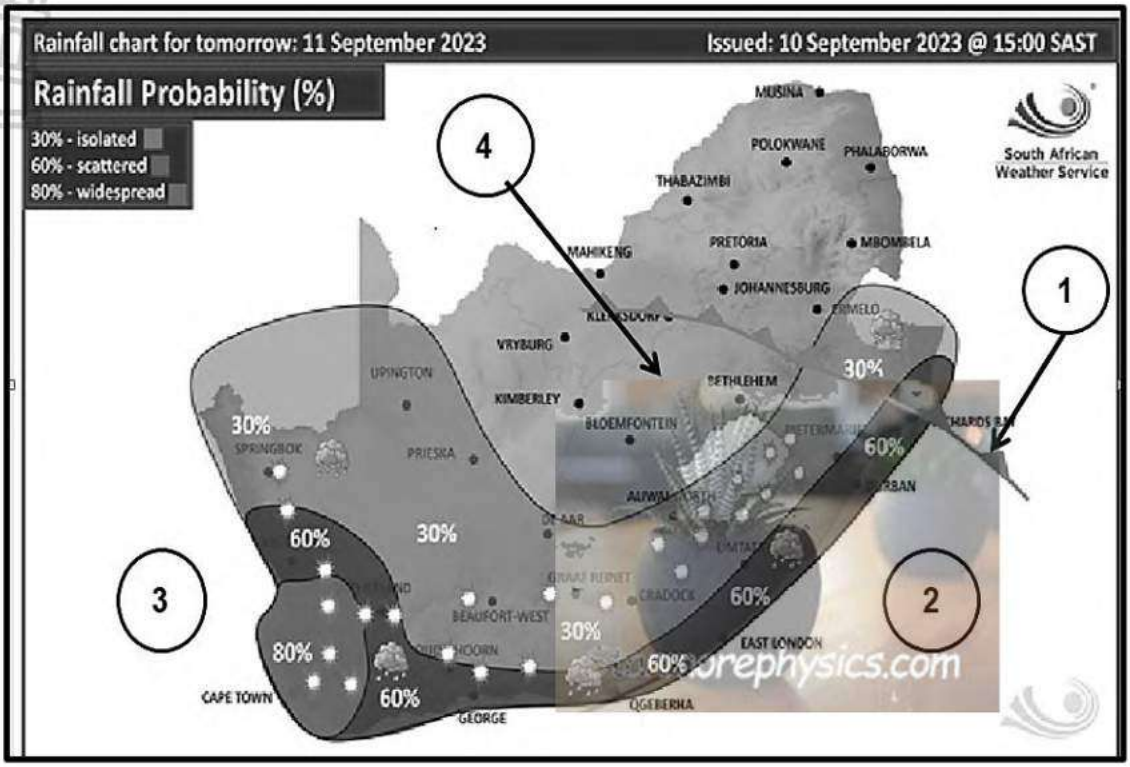
SPECIFIC INSTRUCTIONS AND INFORMATION FOR SECTION B

14. A 1:50 000 topographic map extract from 3025AD PHILIPPOLIS and a 1:10 000 orthophoto map from 3025AD 01 are provided.
15. The area demarcated in RED on the topographic 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 this examination session.

SECTION A: CLIMATE AND WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1 Refer to the sketch below showing South African weather



SAWeatherServices

1.1.1 Identify the front at **1**. (1x1) (1)

1.1.2 Name the oceans at **2** and **3** respectively. (2x1) (2)

1.1.3 What do we call the sector of a midlatitude cyclone at **4**? (1x1) (1)

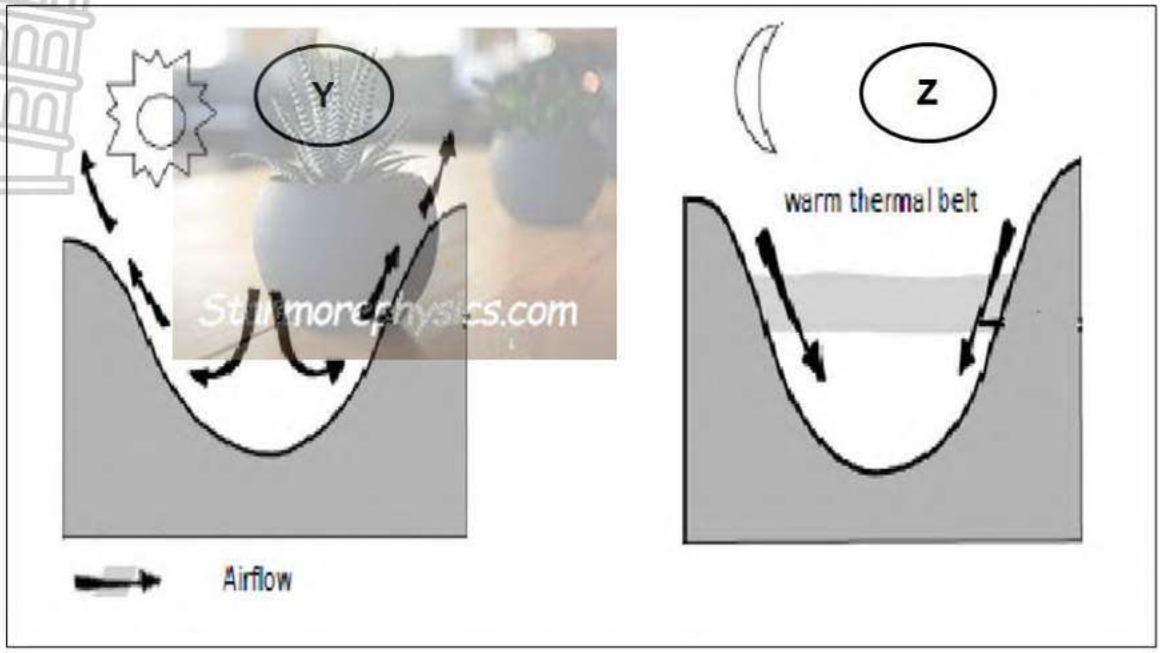
1.1.4 Which South African city experienced widespread rainfall on the 11th September 2023? (1x1) (1)

1.1.5 Will the Free State province experience rainfall on the 11th September 2023? (1x1) (1)

1.1.6 What was the rainfall probability forecast for East London? (1x1) (1)

(7x1) (7)

1.2 Refer to sketches below on valley winds. Match the statements in **COLUMN A** with either picture **Y** or **Z** in **COLUMN B**. Write down only Y or Z next to the question numbers (1.2.1 to 1.2.8).in the ANSWER BOOK, e.g. 1.2.9 Z.



www.elimuza.com

COLUMN A		COLUMN B
1.2.1	Katabatic winds.	Sketch **Y** Sketch **Z**
1.2.2	Pollutants are taken out of the valley.	Sketch **Y** Sketch **Z**
1.2.3	Bring cold temperatures to the valley.	Sketch **Y** Sketch **Z**
1.2.4	Leads to the development of frost pocket.	Sketch **Y** Sketch **Z**
1.2.5	Slopes and the air above are cooled.	Sketch **Y** Sketch **Z**
1.2.6	Warm air at the valley floor will be forced to rise.	Sketch **Y** Sketch **Z**
1.2.7	Slopes and air above them are heated.	Sketch **Y** Sketch **Z**
1.2.8	Pollution is trapped in the valley.	Sketch **Y** Sketch **Z**

(8x1) (8)

1.3 Read the extract below on Tropical cyclones.

Category 5 tropical cyclones may be headed for SA shores, Wits climate change researcher warns.
By Tony Carnie

South Africa is facing a heightened risk of sea storms as the Indian Ocean heats up from global climate change, exposing the country to more severe and potentially "catastrophic" damage from tropical cyclones.

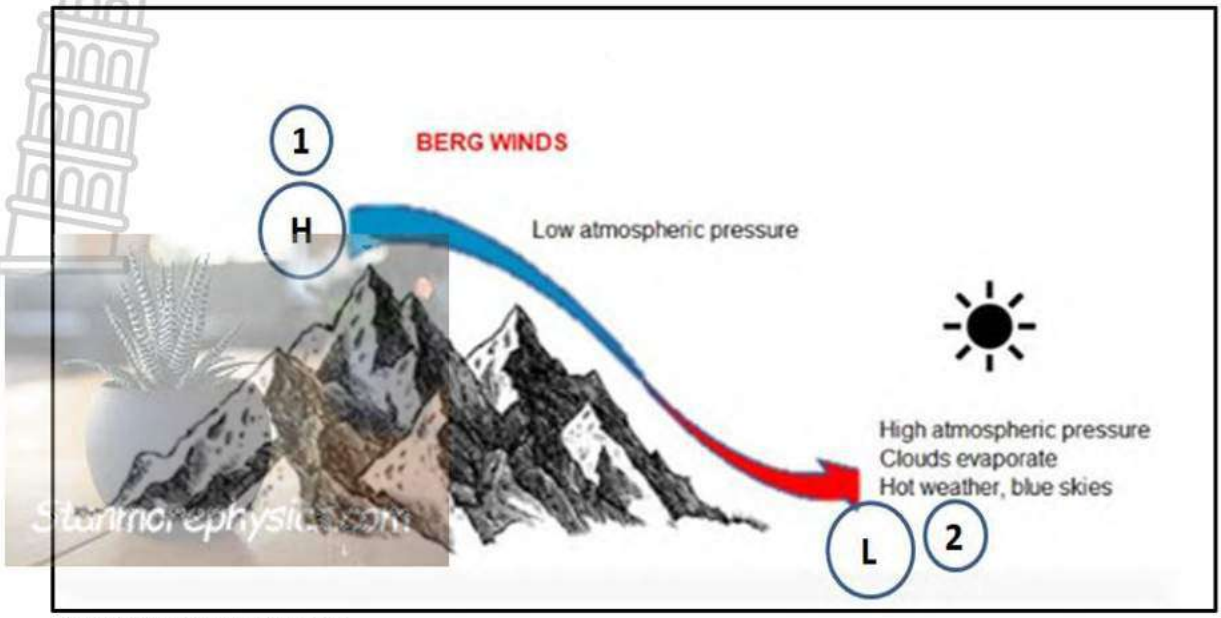
This is the warning from University of Witwatersrand climate change researcher Dr Jennifer Fitchett in the latest issue of the South African Journal of Science. She notes that South Africa's eastern coastline is presently protected from severe sea storms by the massive island landmass of Madagascar, which acts as a shield for the African mainland.

However, as the South Indian Ocean heats up due to global climate change, South Africa and Mozambique are increasingly likely to face the full fury of Category 5 (CAT 5) tropical cyclones as changing sea surface temperatures create conditions that would allow these cyclones to bypass Madagascar and pummel the African mainland.
All of the storms that make landfall have devastating impacts on the livelihoods, habitat, economy and natural environment of the country affected. High intensity storms would not only increase the potential for damage through the heightened wind speeds and rainfall, but storms of higher intensity additionally have a wider storm radius, increasing the region of damage on landfall," Fitchett concluded.

Adapted from www.dailymaverick.co.za

1.3.1	What is a tropical cyclone?	(1x2)	(2)
1.3.2	According to the extract what is responsible for the increase of tropical cyclones?	(1x1)	(1)
1.3.3	What is the importance of Madagascar to the eastern coastline of South Arica?	(1x2)	(2)
1.3.4	Explain the conditions necessary for the formation of tropical cyclones.	(2x2)	(4)
1.3.5	Discuss precautionary measures that can be taken to minimise devastating effects of tropical cyclone?	(3x2)	(6)
			(15)

1.4 Refer to the sketch below showing South African Berg winds.



www.gallagherschool.co.za

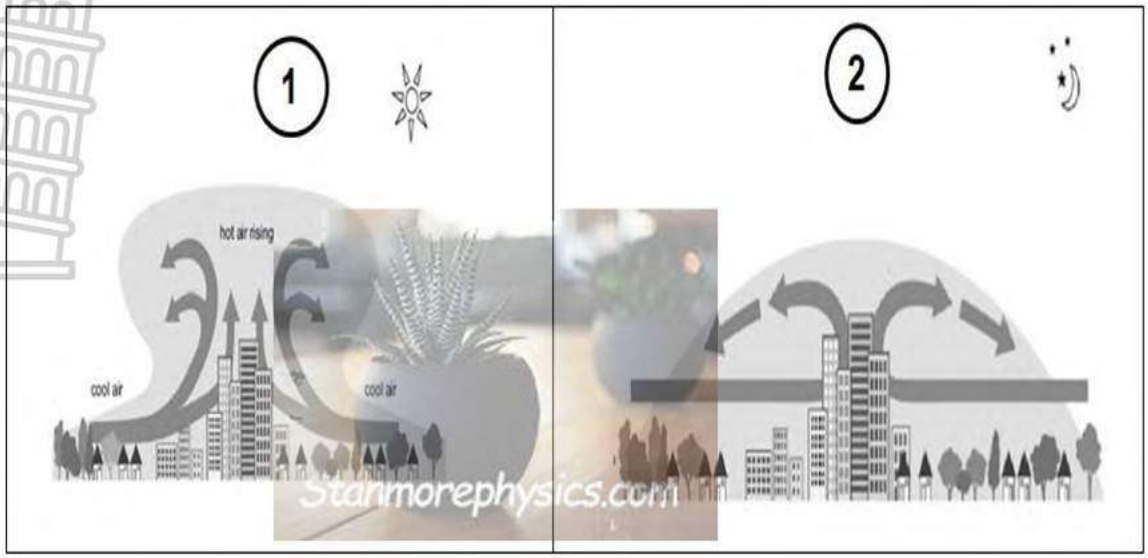
1.4.1 Explain the concept berg winds. (1x2) (2)

1.4.2 What is the role of the pressure cell at **1** in the formation of berg winds? (1x1) (1)

1.4.3 Give an account for the atmospheric conditions experienced at 2 on the sketch. (2x2) (4)

1.4.4 In a paragraph of not more than eight lines, discuss the impacts of berg winds on the physical (natural) environment. (4x2) (8)

1.5 Study the sketch below showing pollution dome over a city.



1.5.1 What is a pollution dome? (1x2) (2)

1.5.2 Mention **ONE** cause of pollution dome over a city. (1x1) (1)

1.5.3 Explain why the pollution dome is lower in sketch **2**. (1x2) (2)

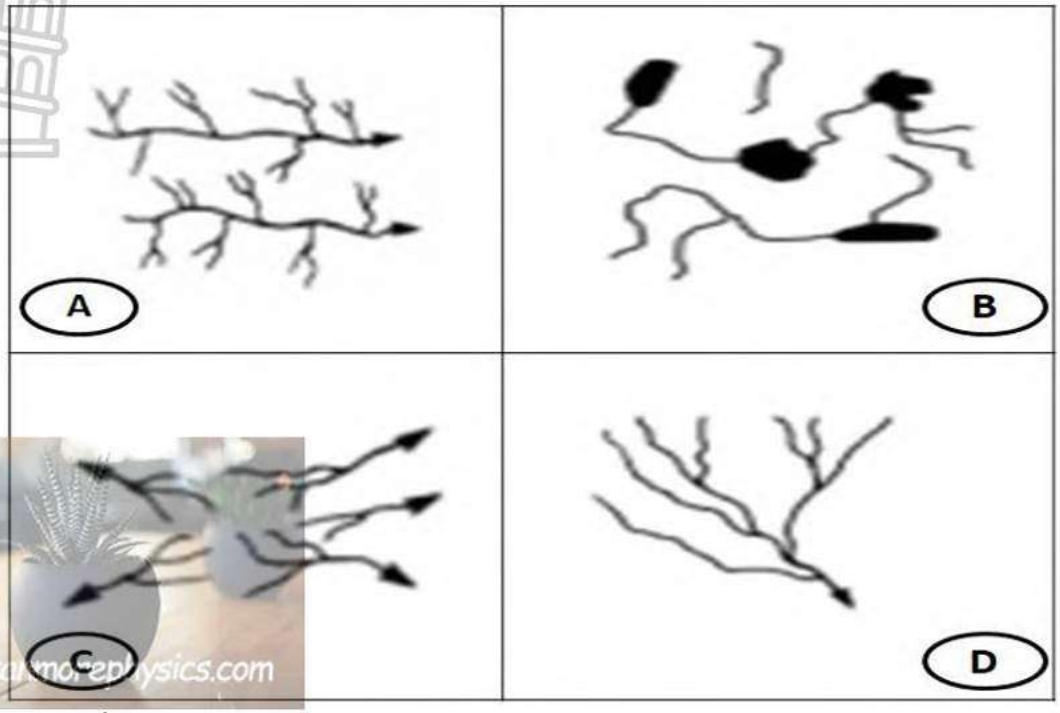
1.5.4 What negative effects do pollution domes have on humans? (2x2) (4)

1.5.5 Suggest sustainable strategies that can be implemented to reduce pollution domes over cities. (3x2) (6)

(15)
[60]

QUESTION 2: GEOMORPHOLOGY

2.1 The sketch below shows drainage patterns. Choose a pattern that best suite the descriptions in 2.1.You may choose one pattern more than once. Write only the letter of the pattern next to the question number. e.g. 2.1.9 E



opentextbc.ca

2.1.1 Pattern found in areas with rocks that have a uniform resistance to erosion.

2.1.2 Pattern found in areas that have experienced glaciation.

2.1.3 Pattern found in areas that have a dome as an underlying structure.

2.1.4 Tributaries join the main stream at acute angles.

2.1.5 Pattern found in areas that have folded mountains.

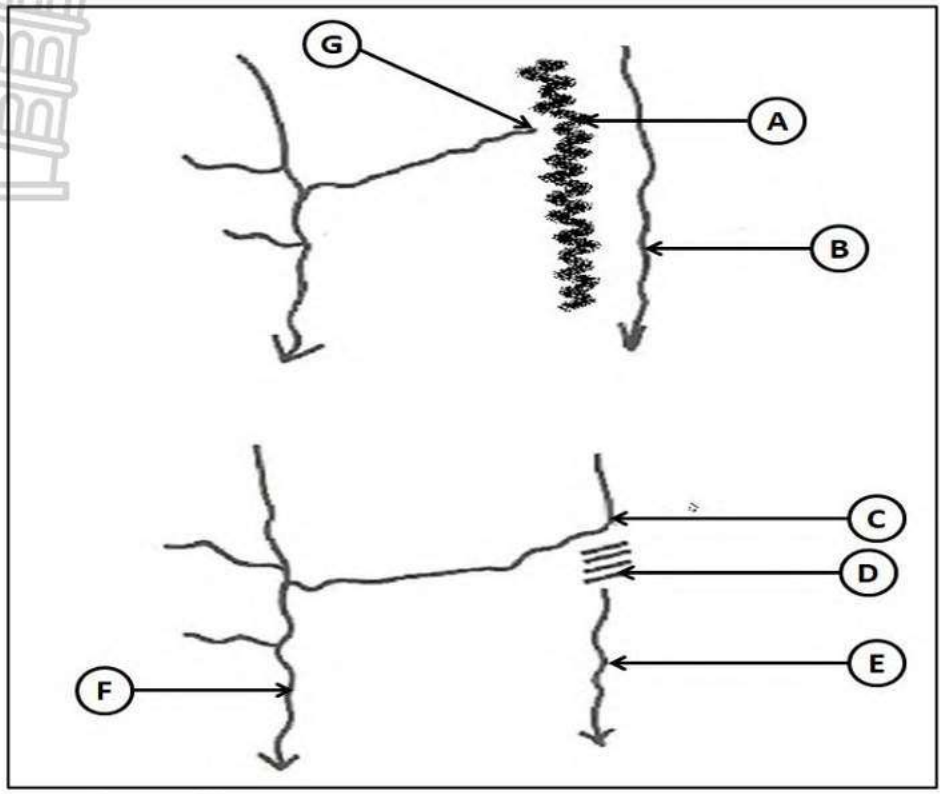
2.1.6 Short tributaries join the main stream at right angles.

2.1.7 Small streams that have no specific pattern.

2.1.8 Gently sloping alternating layers of hard and soft rocks.

(8x1) (8)

2.2 Complete labels to the sketch below on river capture by providing one word for the statements in question 2.2. Write only the correct word next to the question number. e.g. 2.2.8 river



www.advance-africa.com

2.2.1 Area dividing two rivers at **A**.

2.2.2 River that is flowing slower at **B**.

2.2.3 The point of capture where the change of flow direction occurs at **C**.

2.2.4 Area where water once flowed that is now dry as a result of river capture at **D**.

2.2.5 The river that has lost its headwaters as a result of capture at **E**.

2.2.6 The energetic stream that cuts back and intercepts the other river at **F**.

2.2.7 A fluvial process of erosion that lengthens a stream at **G**.

(7x1) (7)

2.3 Refer to the pictures below showing Fluvial landforms

A

geographyproject.weebly.com

B

images.nationalgeographic.org

2.3.1 Identify the fluvial landforms at **A** and **B** respectively. (2x1) (2)

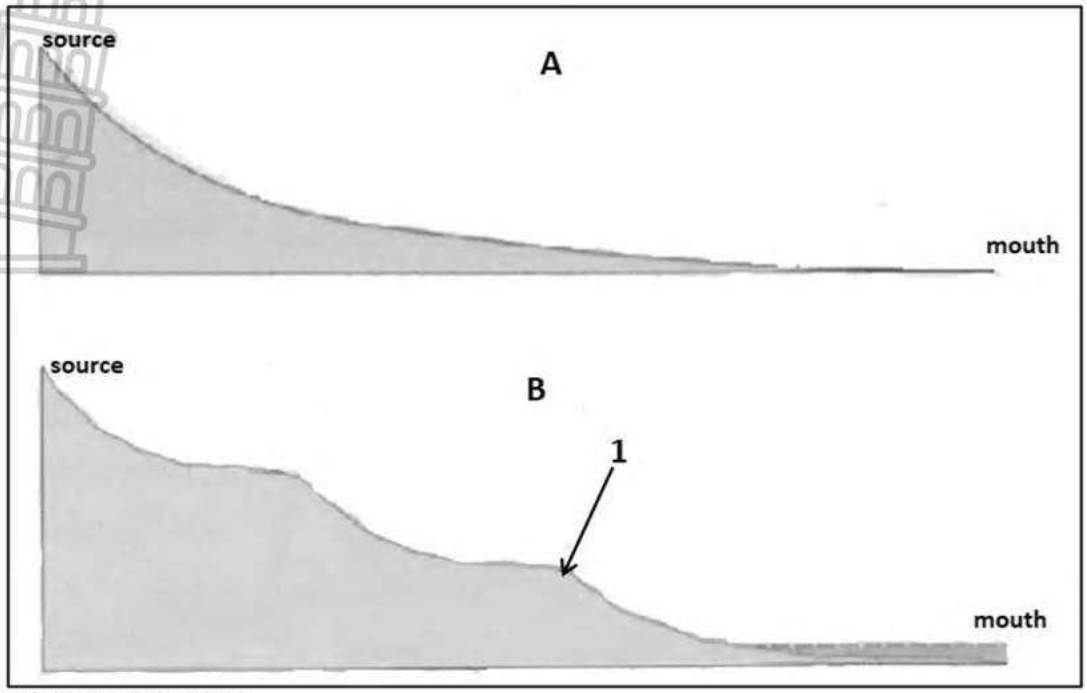
2.3.2 Where in the river will one find the fluvial landform at **B**? (1x1) (1)

2.3.3 Explain how the fluvial landform at **A** is formed. (2x2) (4)

2.3.4 Write a paragraph of not more than eight lines and discuss the significance (importance) of fluvial land form **B**. (4x2) (8)

(15)

2.4 The diagrams below depict river profile.



Examiners own sketch

2.4.1 Define the concept long profile of a river. (1x2) (2)

2.4.2 Contrast between profile **A** and **B** above. (2x2) (4)

2.4.3 Explain how the area marked **1** in profile **B** is formed. (1x1) (1)

2.4.4 Rejuvenation is responsible for changing the shape of profile **A** to **B**.
Name **TWO** factors that cause river rejuvenation? (2x1) (2)

2.4.5 Discuss the importance of rejuvenated landscapes to people. (3x2) (6)

(15)

2.5 Study the extract below on catchment management

Vaal River pollution is beyond acceptable levels: SAHRC.
BY TIMESLIVE

The Vaal River system, on which approximately 19 million people depend for drinking water and commercial use, is polluted beyond acceptable standards.

This is the finding of the SA Human Rights Commission (SAHRC), which set up an inquiry into long-running problems in the river system.

"In the absence of a timely and effective response from the multiple spheres of government, Gauteng's most vital water resource may very well have been irreparably damaged," said the commission.

"The cause [of the pollution] is the kilolitres of untreated sewage entering the Vaal because of inoperative and dilapidated wastewater treatment plants which have been unable to properly process sewage and other wastewater produced in Emfuleni, and from the city of Johannesburg metropolitan municipality and Midvaal municipality that is also directed towards the wastewater sewage systems situated in the Emfuleni municipality."

www.timeslive.co.za

2.5.1	What is a river system?	(1x2)	(2)
2.5.2	Why is it important to manage river systems?	(1x1)	(1)
2.5.3	According to the extract how many people depend on the Vaal river for drinking water?	(1x1)	(1)
2.5.4	State the cause of pollution of the Vaal river mentioned in the extract.	(1x1)	(1)
2.5.5	How will water pollution have an impact on the ecology of a river?	(2x2)	(4)
2.5.6	Suggest strategies that the Emfuleni municipality can implement to ensure that the Vaal river is not polluted.	(3x2)	(6)
			(15)
			(60)

TOTAL SECTION A: 120

SECTION B

QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES

BACKGROUND INFORMATION ON PHILIPPOLIS

After the mission station Toverberg was closed in 1818, Dr John Phillip, superindent of South Africa, gave his name to this new missionary outpost in 1823, making it the Free State's oldest town.

Adam Kok, a Griqua leader, settled here with his people in 1826, and was established as a protector of the mission. When the government of the Orange Free State agreed to sell the land to Britain for 400 pounds, Kok left with his people, and migrated 500km to Griqualand east.
Mixed farming is the town's principal industry. Philippolis is a town rich in history: Bushman, Griqua, Englishmen, Boer and Jew - each one of them made sure to leave their mark.

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

ENGLISH	AFRIKAANS
Diggings	Delwerye/Uitgrawings
River	Rivier
Estate	Landgoed
Nature Reserve	Natuurreservaat
Magnetic Declination	Magnetiese Deklinasie

3.1 MAP SKILLS AND CALCULATIONS

3.1.1 Philipolis is found in the ……. province.

A Gauteng
B Northern Cape
C Mpumalanga
D Free State (1 x 1) (1)

3.1.2 The main economic activity in Philippolis is ……

A Crop farming
B Stock farming
C Mixed Farming
D Industries (1 x 1) (1)

Refer to the topographic map

3.1.3 What is the bearing from spot height **1370** in **E9** to the windmill in F9? (1x2) (2)

3.1.4 What will the magnetic declination of the Philippolis map be in 2024? Show all calculations. (4x1) (4)

3.1.5 Use your answers in questions **3.1.3** and **3.1.4** to calculate the magnetic bearing of the Philippolis map for the year 2024. (1x2) (2)

3.2 MAP INTERPRETATION

Refer to the topographic map and the orthophoto

3.2.1 The slope in J3 on the topographic map is (convex/concave) (1x1) (1)

3.2.2 The man made feature in block **G1** is a (dam/reservoir) (1x1) (1)

3.2.3 Identify the drainage pattern in blocks **H3** and **H4** on the topographic map. (1x1) (1)

3.2.4 How is the underlying rock structure of the pattern identified in Question 3.2.3? (1x1) (1)

3.2.5 Provide **TWO** pieces of evidence from the topographic map to show that Philippolis receives low annual rainfall. (2x2) (4)

3.2.6 At what time of the day was the orthophoto taken? (1x2) (2)

3.2.7 Provide a reason to support your answer in Question 3.2.6 (1x2) (2)

3.3 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

3.3.1	The topographic map is an example of (vector/rasta) data	(1x1)	(1)
3.3.2	The (orthophoto/topographic map) is an example of remote sensing.	(1x1)	(1)
3.3.3	Why is it correct to regard the orthophoto as a map with high spatial resolution.	(1x2)	(2)
3.3.4	The maps we use are regarded as secondary data. Describe the advantages of using secondary data.	(2x2)	(4)

[30]

TOTAL SECTION B: 30
GRAND TOTAL: 150

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MARKS: 150

MARKING GUIDELINES

These marking guidelines consist of 9 pages.

SECTION A: CLIMATE AND WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1	1.1.1	Cold front	(1 x 1)	(1)
	1.1.2	**2**: Indian Ocean **3**: Atlantic Ocean	(2 x 1)	(2)
	1.1.3	Cold sector	(1 x 1)	(1)
	1.1.4	Cape Town	(1 x 1)	(1)
	1.1.5	No	(1 x 1)	(1)
	1.1.6	60%/scattered	(1 x 1)	(1) (7)
1.2	1.2.1	Z		
	1.2.2	Y		
	1.2.3	Z		
	1.2.4	Z		
	1.2.5	Z		
	1.2.6	Z		
	1.2.7	Y		
	1.2.8	Z	(8 x 1)	(8)
1.3	1.3.1	They are intense low-pressure systems that originate over warm tropical oceans and have maximum sustained wind speeds exceeding 119 kilometres per hour and heavy rains.	(1 x 2)	(2)
	1.3.2	Global warming/Climate change	(1 x 1)	(1)
	1.3.3	Madagascar shields/protects the eastern coastline from being hit by tropical cyclones.	(1 x 2)	(2)

1.3.4
- Sea surface temperatures must be above 27°C for evaporation to occur and produce latent heat.
- Coriolis force to cause spiralling winds.
- Converging winds near the ocean surface forcing air to rise and form storm clouds.

(ANY TWO) must qualify (2 x 2) (4)

1.3.5
- Monitoring the development of Tropical cyclones.
- Satellite tracking can monitor the development and path.
- Satellite sensors to collect details e.g., rainfall rates.
- Advanced weather predictions and warnings.
- Early warning and communication for people to prepare.
- Evacuate low-lying areas to protect people against floods.
- Ensure that infrastructure is of good quality.

(ANY THREE) (3 x 2) (6)

1.4 1.4.1 The hot, dry wind blows down the Great Escarpment from the high central plateau to the coast**. (Concept)** (1 x 2) (2)

1.4.2 Air blows from the cell towards the coast. (1 x 1) (1)

1.4.3 **Hot weather:**
A result of air being heated up as it descends the plateau.
The air moves downhill and is compressed as it warms.
Blue skies:
There is no formation of clouds as the air descends.
Air is not rising to form clouds; there are clear skies.
Stable conditions due to subsiding air.
Must refer to both conditions. (2 x 2) (4)

1.4.4
- They dry out the soil and remove its moisture.
- The cause of the spread of veld fires. (enhance the possibility of veld fires)
- Natural bush and grazing may be lost.
- Animals lose their natural habitats due to the spread of veld fires.
- Vegetation dries out (4 x 2) (8)

1.5 1.5.1 A pollution dome is a mass of polluted air in and above a city. **(CONCEPT)** (1 x 2) (2)

1.5.2
- Car exhaust fumes
- Industries
- Domestic fires
- Burning of fossil fuels

(ANY ONE) (1 x 1) (1)

1.5.3
- Descending cooler air at night results in pollution domes developing closer to the surface.
- The inversion layer is closer to the earth, and pollution cannot escape the dome.
- More stable conditions at night.

(MUST QUALIFY) (1 x 2) (2)

1.5.4
- Smog causes health problems e.g., lung infections and asthmatic attacks.
- Smog reduces visibility and causes accidents.
- Lead poisoning can result from petrol fumes.

(ANY TWO) (2 x 2) (4)

1.5.5
- Greening of cities by planting trees in gardens, onto pavements and in parks.
- Trees absorb carbon dioxide and release oxygen.
- Trees reduce energy costs as it has a natural cooling effect.
- Plant roof gardens to absorb the heat and pollution.
- Invest in energy-saving strategies e.g., solar panels and grass roofs.
- Develop sustainable public transport.
- Controlling the amount of pollution released by factories.

(ANY THREE) (3 x 2) (6)

[60]

QUESTION 2: GEOMORPHOLOGY

2.1
2.1.1 D
2.1.2 B
2.1.3 C
2.1.4 D
2.1.5 A
2.1.6 A
2.1.7 B
2.1.8 A (8 x 1) (8)

2.2
2.2.1 Watershed
2.2.2 Captured stream
2.2.3 Elbow of capture
2.2.4 Wind gap
2.2.5 Misfit stream
2.2.6 Captor stream/pirate stream
2.2.7 Headward erosion. (7 x 1) (7)

2.3
2.3.1 A: braided stream
B: delta (2 x 1) (2)

2.3.2 At the mouth of the river. (1 x 1) (1)

2.3.3
- Braided streams form where the sediment load is deposited as shifting islands or bars between the channels.
- When the river's carrying capacity is exceeded, the river deposits its load into the channel. (2 x 2) (4)

2.3.4 **Significance of DELTAS**
- Deltas are usually highly fertile areas and support extensive crop cultivation.
- Sand and gravel are also quarried from deltas and are utilized for a variety of purposes e.g., road and building construction.
- They are important industrial hubs.
- Large settlements often grow up in the delta regions.
- Deltas are a source of water.
- Deltas sustain all ecosystems.
- Deltas ensure biodiversity.
- Tourism (leisure activities) opportunities are created by deltas and contribute to the economy.
- It can be part of the water transport system.
- Deltas are a source of protein (fish)

(ANY FOUR) (4 x 2) (8)

2.4 2.4.1 Side view of the river from source to mouth.
(Concept) (1 x 2) (2)

2.4.2 **A:** Smooth and concave
It does not have points from source to mouth
Graded profile
Steep in the upper course and gentle in the lower course
B: The profile is not smooth concave
Ungraded profile
There is a temporary base-level
(ANY TWO must refer to both A and B) (2 x 2) (4)

2.4.3 Knick point: It is an area where the old profile meets the new profile. (1 x 1) (1)

2.4.4
- Drop in sea level
- Increase in rainfall
- Stream piracy/river capture
- Isostatic uplift
- Decrease in stream load

(ANY TWO) (2 x 1) (2)

2.4.5
- Landforms are good for tourist attractions.
- People can visit areas with terraces for recreation.
- Old flood plain suitable for crop farming.
- Water at the knick point waterfalls can be used for power generation.

(ANY THREE) (3 x 2) (6)

2.5	2.5.1	A mainstream and all its tributaries	(1 x 2)	(2)
	2.5.2	To store water and protect it for future use	(1 x 1)	(1)
	2.5.3	19 million	(1 x 1)	(1)
	2.5.4	Untreated sewage	(1 x 1)	(1)
	2.5.5	• Aquatic life threatened • Imbalance of the ecosystem • Reduced biodiversity • Increased nitrate encourages the growth of algae • Reduced oxygen levels **(ANY TWO)**	(2 x 2)	(4)
	2.5.6	• Deforestation must be controlled. • Greater care must be taken when altering river channels. • Educate the public on river pollution and water conservation. • Wetlands must be conserved. • Legislation to control what is discharged into rivers. • Vegetation must be maintained in areas close to rivers. • Impose fines on people who litter in the river. **(ANY THREE)**	(3 x 2)	(6)
				[60]

SECTION B

QUESTION 3

3.1	3.1.1	Free State	(1 x 1)	(1)
	3.1.2	Mixed farming	(1 x 1)	(1)
	3.1.3	145° (range 144°–146°)	(1 x 2)	(2)
	3.1.4	MD = 2024 - 2017 = 7yrs ✓x 8 w = 56' w ✓ = 23° 50' w +✓ 56' w = 24° 46' w✓	(4 x 1)	(4)
	3.1.5	24°46' w + 145°✓ 169°46 w✓	(1 x 2)	(2)
3.2	3.2.1	convex	(1 x 1)	(1)
	3.2.2	dam	(1 x 1)	(1)
	3.2.3	dendritic	(1 x 1)	(1)
	3.2.4	Rocks with uniform resistance to erosion	(1 x 1)	(1)
	3.2.5	• There are many reservoirs • Non perennial streams/river • Many Windmills • Many Dams	(2 x 2)	(4)
	3.2.6	14h00/afternoon	(1 x 2)	(2)
	3.2.7	Shadows are falling to the southeast	(1 x 2)	(2)
3.3	3.3.1	Vector	(1 x 1)	(1)
	3.3.2	orthophoto	(1 x 1)	(1)
	3.3.3	Features are clearer It has a large-scale	(1 x 2)	(2)

3.3.4
- Secondary data is usually available more cheaply.
- The collection of secondary data is generally significantly quicker and easier.
- Existing data are likely to be available in a more convenient form. In digital format, for example, the Internet.
- Using secondary data can give us access to otherwise unavailable organisations, individuals or locations.
- Secondary data allows the researcher to compare data on a 'time base' i.e., the origin of data to current data.
- Secondary data is likely to be pre-processed, thus eliminating the time-consuming (and hence costly) analysis stage.

(ANY TWO) (2 x 2) (4)

[30]

GRAND TOTAL: 150