GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2022

10781
GEOGRAPHY
PAPER 1

TIME: 3 hours

MARKS: 150

17 pages

P.T.O.

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 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 your final answer, e.g. 1 020 hPa, 14 °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 2930AC and AD HOWICK and a 1 : 10 000 orthophoto map 2930AC 25 HOWICK are provided.

15. The area demarcated in RED/BLACK on the topographic map represents the area covered by the orthophoto map.

16. Show ALL calculations. Marks will be allocated for this.

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

P.T.O.

SECTION A: CLIMATE AND WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1   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 (1.1.1 to 1.1.7) in the ANSWER BOOK, e.g., 1.1.8 A.

1.1.1   The slope … is the angle at which the sun's rays strike a slope.

A   incidence
B   aspect
C   angle
D   gradient

1.1.2   In the Southern Hemisphere, the … -facing slope of a valley receives the most sunlight.

A   north
B   west
C   east
D   south

1.1.3   In the Southern Hemisphere, the … in a valley is the south facing slope.

A   shadow zone
B   insolation zone
C   thermal zone
D   inversion zone

1.1.4   Katabatic winds occur at night due to terrestrial … from the valley slopes.

A   insolation
B   convection
C   radiation
D   conduction

1.1.5   A temperature inversion occurs when a layer of cold air develops … a layer of warm air.

A   beneath
B   behind
C   above
D   ahead of

1.1.6   … is/are most likely to occur on the valley floor during winter.
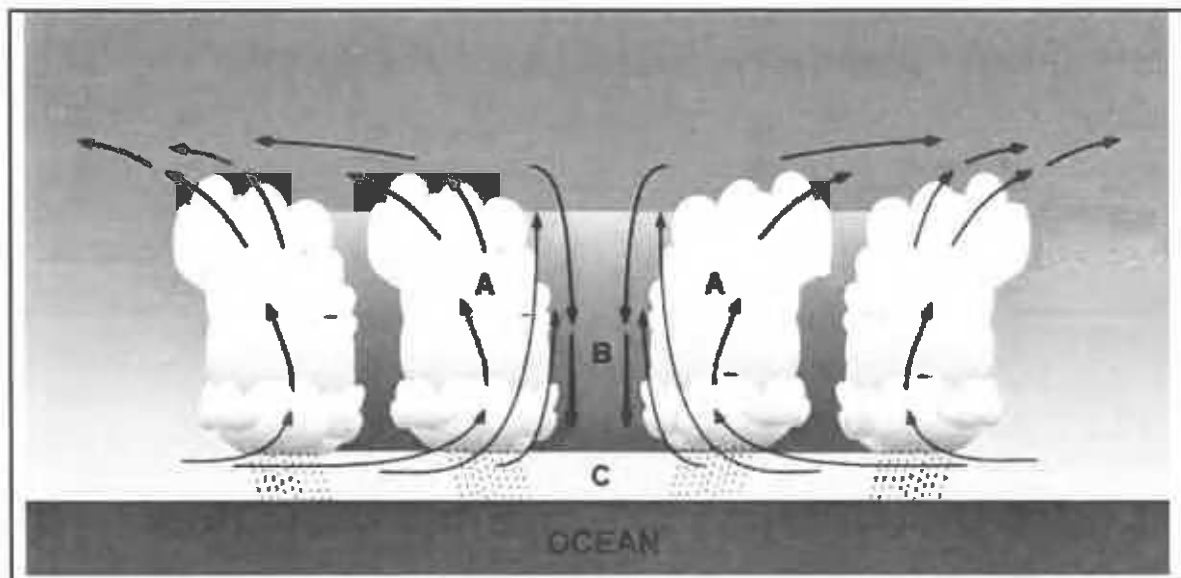
A   Radiation fog
B   Dew droplets
C   Advection fog
D   Frost pockets

P.T.O.

1.1.7   Radiation fog in a valley is formed by the process of ... of water vapour.

     A   sublimation
     B   condensation
     C   evaporation
     D   transpiration

(7 x 1)   (7)

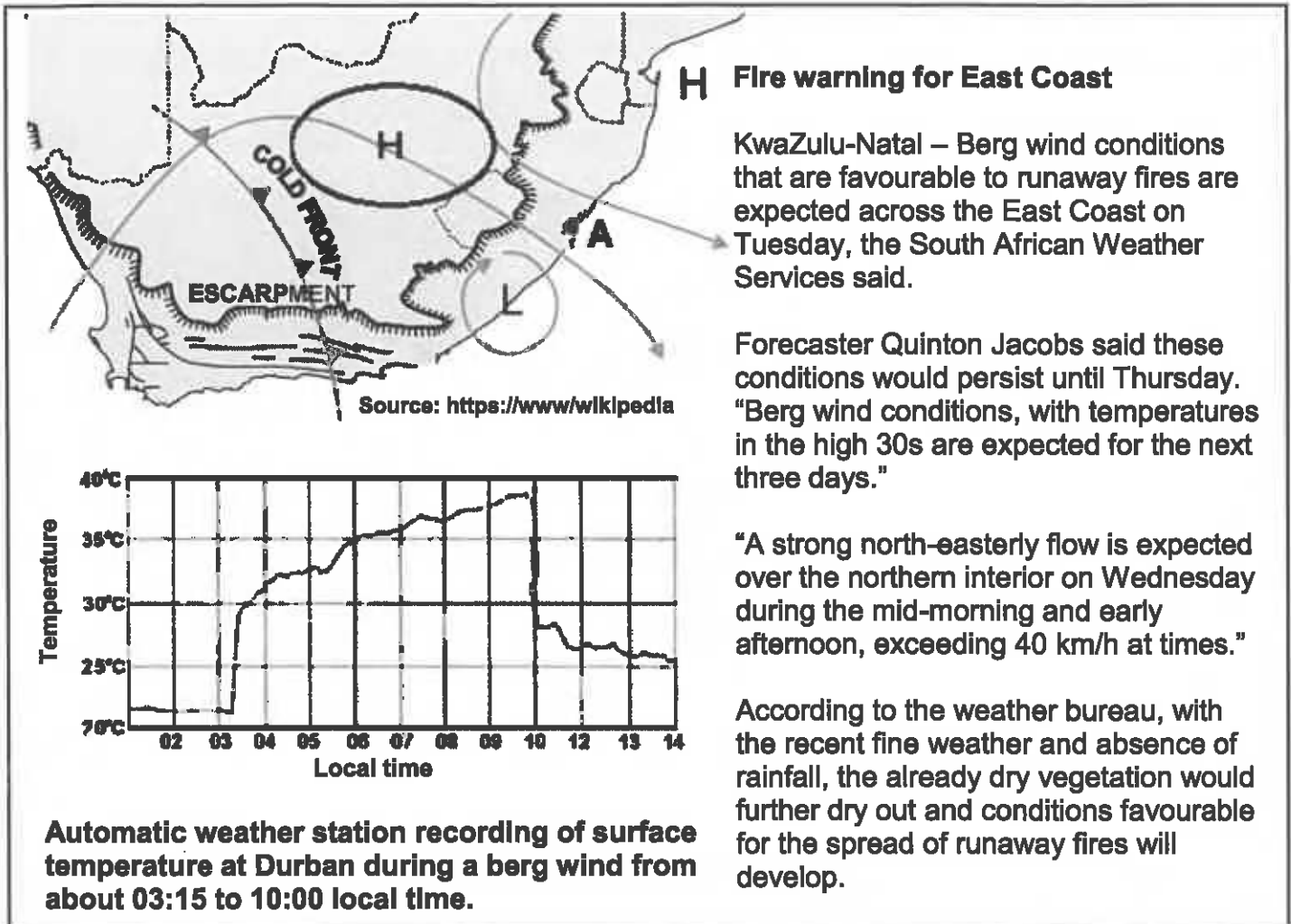1.2   Study FIGURE 1.2 below, based on a cross-section of a tropical cyclone in the Southern Hemisphere.

[Adapted from: https://www.researchgate.net/figure/Hurricane-structure-courtesy-of-the-University-of-British-Columbia_fig2_282217676]

1.2.1   Indicate the season in which this tropical cyclone could occurred.

1.2.2   State the minimum ocean temperature required for the formation of this tropical cyclone.

1.2.3   In which general direction would this tropical cyclone move?

1.2.4   Name the cloud type found at **A**.

1.2.5   State the precipitation likely to occur from cloud type **A**.

1.2.6   Is the air surface pressure at area **C** low or high?

1.2.7   Would the airflow at **C** be described as diverging or converging?

1.2.8   At what stage of development will this tropical cyclone be, when it moves over land?

(8 x 1)   (8)

P.T.O.

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

H   Fire warning for East Coast

KwaZulu-Natal – Berg wind conditions that are favourable to runaway fires are expected across the East Coast on Tuesday, the South African Weather Services said.

Forecaster Quinton Jacobs said these conditions would persist until Thursday. "Berg wind conditions, with temperatures in the high 30s are expected for the next three days."

"A strong north-easterly flow is expected over the northern interior on Wednesday during the mid-morning and early afternoon, exceeding 40 km/h at times."

According to the weather bureau, with the recent fine weather and absence of rainfall, the already dry vegetation would further dry out and conditions favourable for the spread of runaway fires will develop.

Automatic weather station recording of surface temperature at Durban during a berg wind from about 03:15 to 10:00 local time.

Source: https://www/wikipedia

[Source: https://www.news24.com/news24/fire-warning-for-eastern-cape-20080527]

1.3.1   Which season is being depicted in the diagram?   (1 x 1)   (1)

1.3.2   Provide evidence from the infographic to substantiate your answer to
        QUESTION 1.3.1.   (1 x 2)   (2)

1.3.3   State TWO atmospheric conditions evident in the infographic that have
        resulted in the formation of berg winds.   (2 x 1)   (2)

1.3.4   With reference to the temperature graph, explain the process of
        temperature change from 03:15 to 14:00 as berg winds blow from the
        interior to the coast.   (1 x 2)   (2)

1.3.5   A weather station located at **A** has reported clear skies. Account for this
        current condition.   (2 x 2)   (4)

1.3.6   Explain why city **A**, which is situated on the East Coast, will be affected by
        the release of the fire warning.   (2 x 2)   (4)

                                                                                      (15)

1.4   Refer to the infographic below on mid-latitude cyclones.

Overview of the weather on 9 June

Weather forecaster, Mike Berridge, has predicted that the Cape's south-western mountains may receive up to 50 mm of rain on Wednesday, June 10, as a mid-latitude cyclone is expected to form near Cape Town.

Capetonians can expect rain for three days this coming week, with downpours falling on Tuesday [June 9], Wednesday [June 10], and Thursday [June 11].

There is a storm predicted to make landfall on Wednesday, and temperatures will range between 11 °C and 15 °C, along with 100% precipitation. On Thursday, temperatures will range between 8 °C and 13 °C with 100% precipitation.

[Source: https://www.capetownetc.com/cape-town/weather/cape-predicted-to-receive-50mm-rains/]

1.4.1   What climatological evidence indicates that this mid-latitude cyclone is occurring in the Southern Hemisphere?   (1 x 1)   (1)

1.4.2   Explain the concept *family of cyclones*.   (1 x 2)   (2)

1.4.3   Identify the stage that mid-latitude cyclone **A** is currently in.   (1 x 1)   (1)

1.4.4   Draw a labelled cross-section from point **B** to point **C** along the cold front. Indicate the cold front, the cold sector and the warm sector.   (3 x 1)   (3)

1.4.5   A group of tourists wants to attempt the hiking trail to the top of Table Mountain ahead of the cold front. In a paragraph of approximately EIGHT lines, advise the organisers of the hike why the event should be postponed by explaining the expected weather conditions and possible impacts thereof.   (4 x 2)   (8)

                                                                   (15)

P.T.O.

1.5   Refer to FIGURE 1.5 below showing a pollution dome.
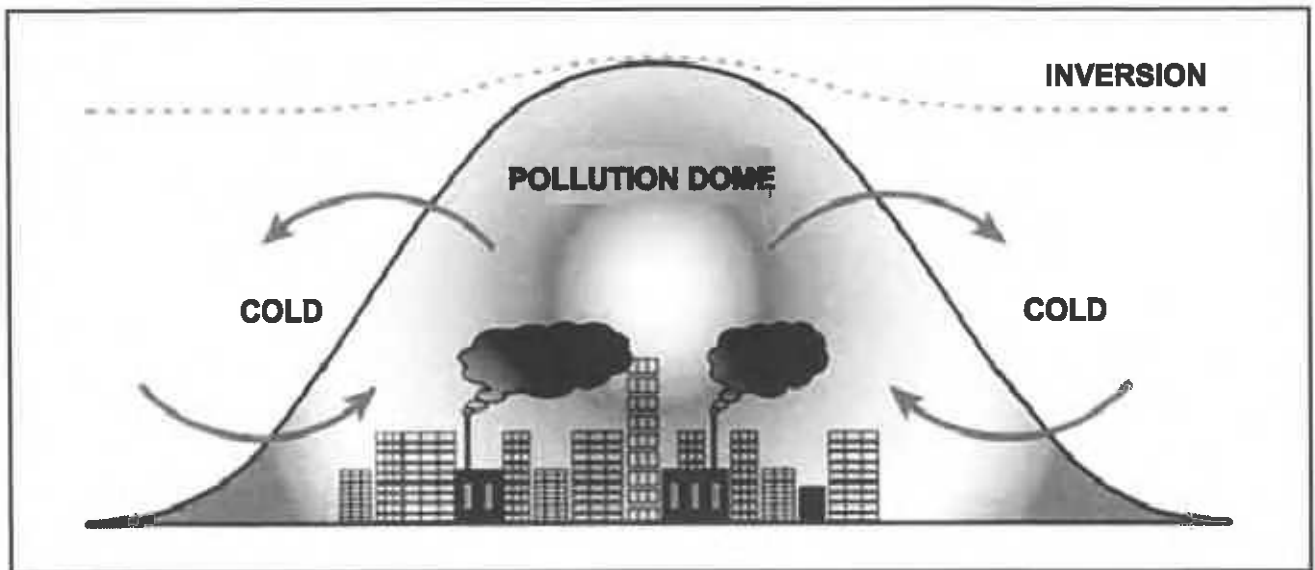
[http://www.ibgeographypods.org/uploads/7/6/2/2/7622863/ib_dp_geography_microclimates_urban
_heat_island_worksheet.pdf]

1.5.1   Define the term *pollution dome*.   (1 x 2)   (2)

1.5.2   At night, the pollution dome is lower in elevation (height) than during the
         day. Explain why this occurs.   (2 x 2)   (4)

1.5.3   State the environmental problem that results from a pollution dome,
         which develops close to the surface in a city.   (1 x 1)   (1)

1.5.4   Describe how the environmental problem identified in QUESTION 1.5.3
         develops.   (1 x 2)   (2)

1.5.5   Air pollution reduces the amount of a city's clean air at night. Explain this
         statement.   (1 x 2)   (2)

1.5.6   Provide TWO sustainable strategies that can be implemented in cities to
         minimise the effects of industries on the pollution dome.   (2 x 2)   (4)
                                                                                          (15)
                                                                                          [60]

QUESTION 2: GEOMORPHOLOGY

2.1   Read the following statements and choose the appropriate word in brackets that will make the statement TRUE. Write down only the question number (2.1.1 – 2.1.7) and the answer in your ANSWER BOOK.

　　　2.1.1   An increase in rainfall in the middle course of the river will result in increased (lateral/vertical) erosion.

　　　2.1.2   The amount of load that a river can carry is determined by its (gradient/direction) of runoff.

　　　2.1.3   The (volume/velocity) of water is higher in the upper course than in the middle course of a river.

　　　2.1.4   The V-shaped valley in the upper course of a river is a result of (lateral/vertical) erosion.

　　　2.1.5   At the mouth of a river, there is more (deposition/erosion) which results in the formation of a delta.

　　　2.1.6   (Lateral/Vertical) erosion in the middle course results in the migration of a meander downstream.

　　　2.1.7   Rejuvenation closer to the source of the river will result in more (erosion/deposition) in the lower course.   (7 x 1)   (7)

2.2 Refer to FIGURE 2.2 below and choose the correct letter (A – G) that matches the description of a specific drainage pattern. Write only the letter (A – G) next to the question numbers (2.2.1 to 2.2.8) in the ANSWER BOOK, for example 2.2.9 H. Letters A – G can be used more than once.
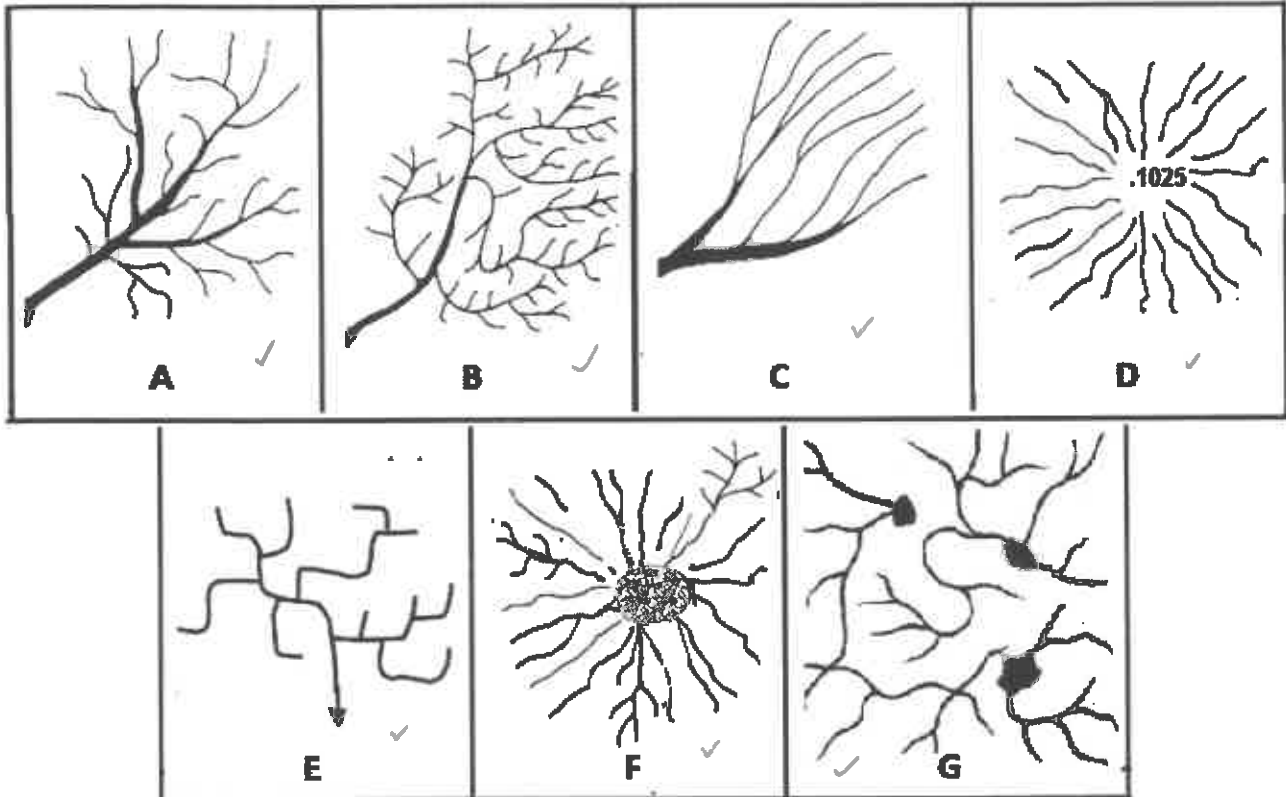

[Source: Adapted from lumenlearning.com/geo/chapter/reading-drainage-basins/]

2.2.1 Drainage pattern that formed from rivers flowing into a depression or lake

2.2.2 Drainage pattern formed from rocks of uniform resistance

2.2.3 Drainage pattern commonly found in melting ice regions

2.2.4 Drainage pattern that occurs on a common slope down a linear mountain range

2.2.5 Drainage pattern that develops on alternate layers of hard and soft rocks

2.2.6 Drainage pattern that commonly forms on areas of volcanic mountains

2.2.7 Drainage pattern formed where prominent ridges lie parallel to one another

2.2.8 Drainage pattern in which the main streams and their tributaries display many right-angle bends

(8 x 1)   (8)

P.T.O.

2.3   Refer to FIGURE 2.3 below which shows a meandering river.

[Source: https://za.pinterest.com/pin/405394403936861905/]
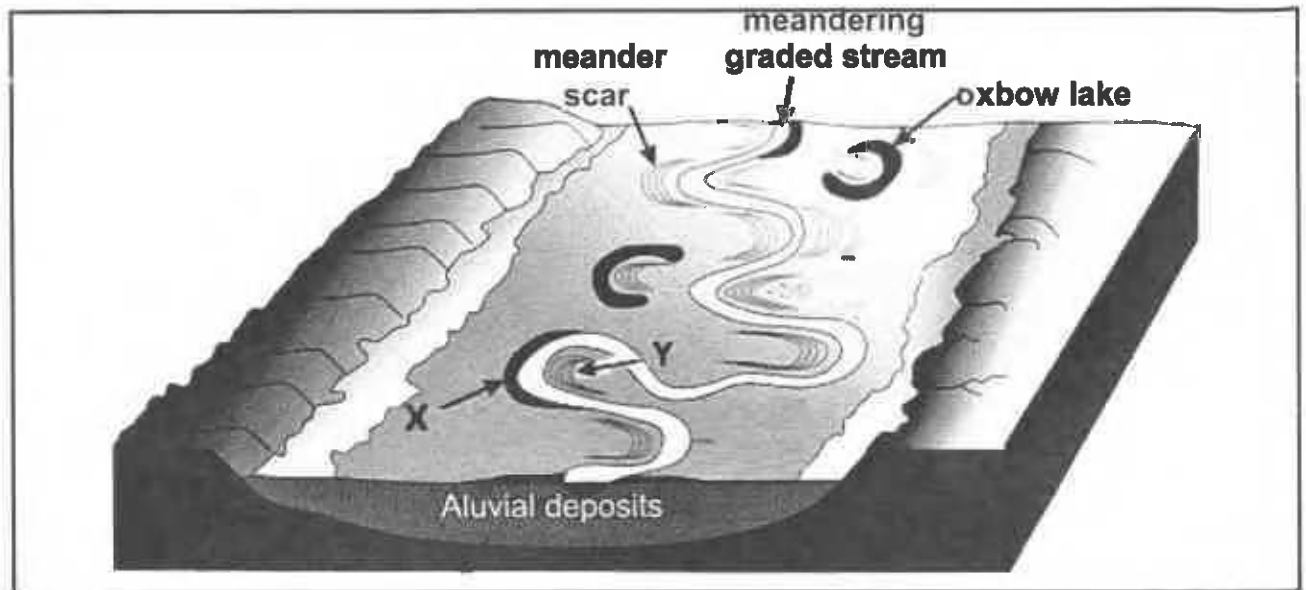
2.3.1   What is a *meander scar*?   (1 x 2)   (2)

2.3.2   In which stage of the river can a meander loop and meander scar
        develop?   (1 x 1)   (1)

2.3.3   Name the slopes that will develop at **X** and **Y** of the meander loop.
                                                                     (2 x 1)   (2)

2.3.4   At which slope, **X** or **Y,** will there be more deposition than erosion?
                                                                     (1 x 2)   (2)

2.3.5   Give a reason for your answer to QUESTION 2.3.4.   (1 x 2)   (2)

2.3.6   Explain how a meander scar is formed.   (3 x 2)   (6)
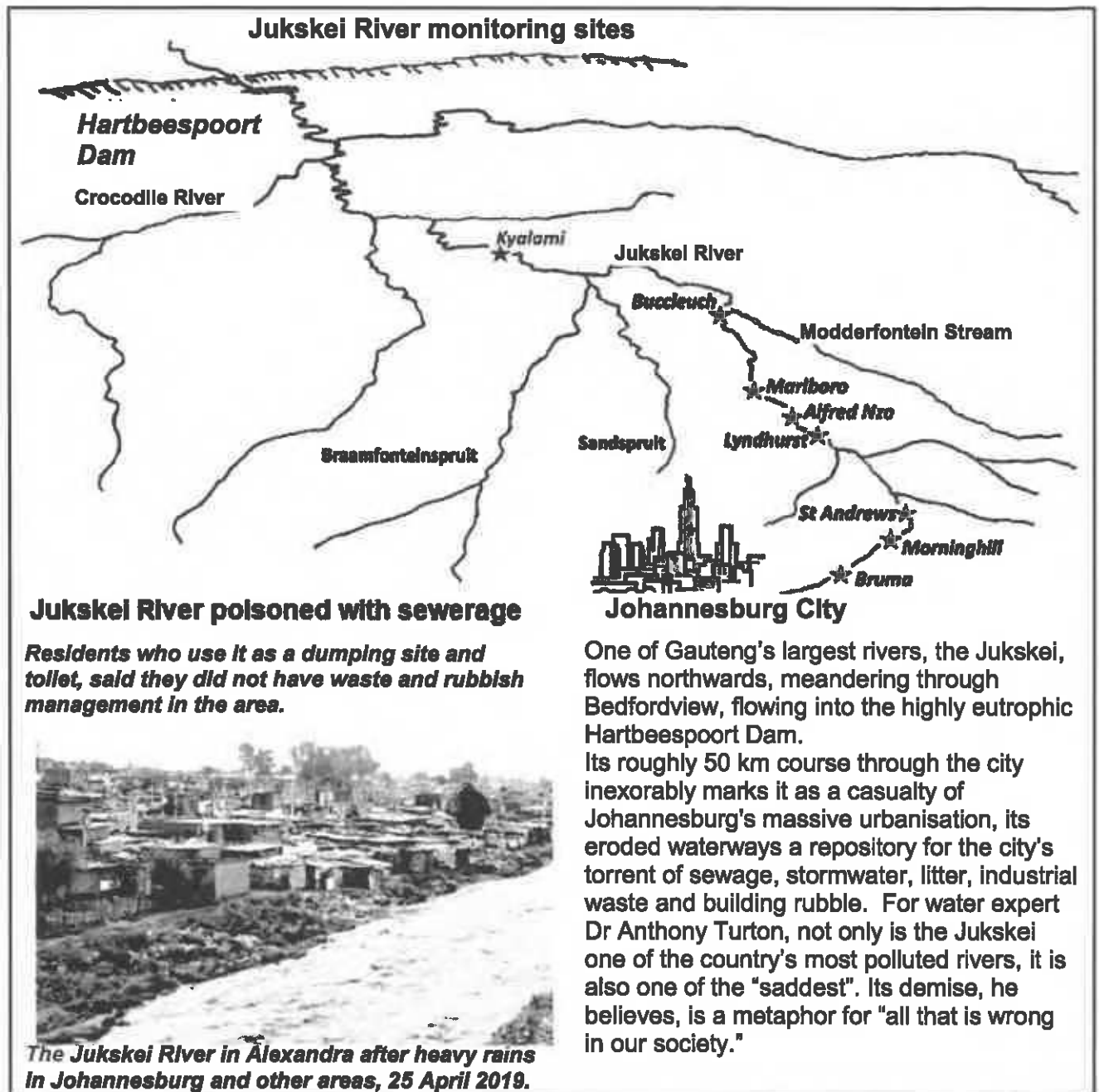   **(15)**

2.4   Study FIGURE 2.4 below on river capture.

Before River Capture	After River Capture
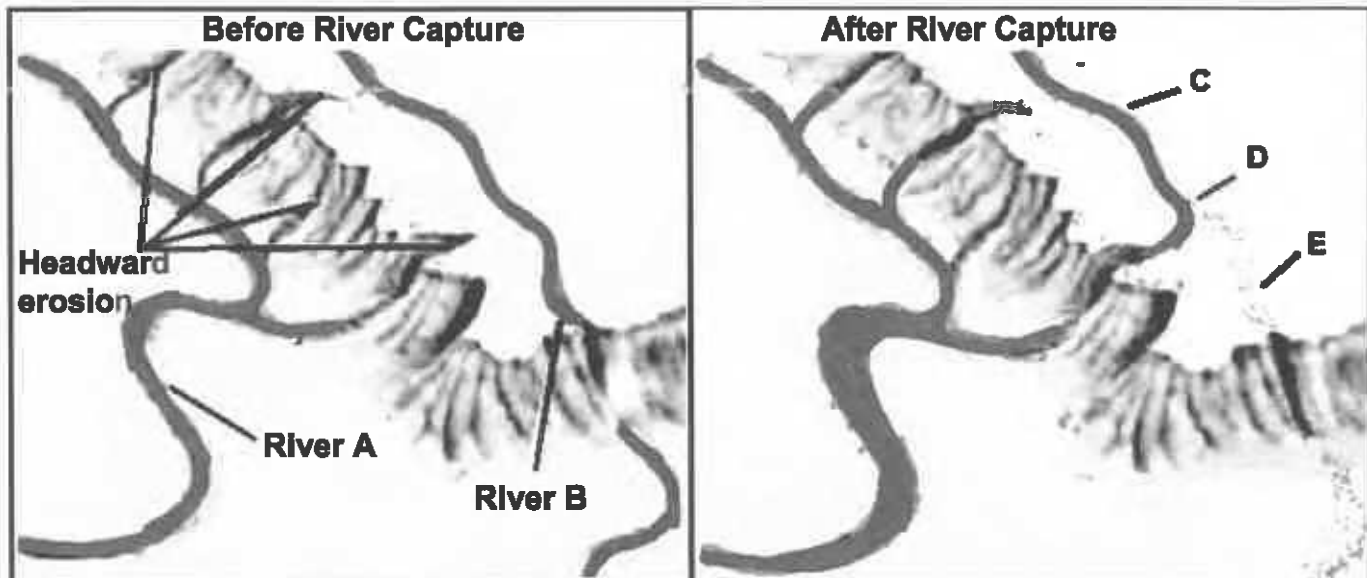
[Source: Adapted from 7ef562557e76281032f017d156b13e3c Brainly.com]

2.4.1	Define the term *headward erosion*.	(1 x 2)	(2)
2.4.2	Name ONE possible factor from FIGURE 2.4 that could have resulted in river **A** capturing river **B**.	(1 x 1)	(1)
2.4.3	Explain how the process of headward erosion contributes to river capture.	(2 x 2)	(4)
2.4.4	Give the geographical terms for features **D** and **E** which develop from river capture.	(2 x 1)	(2)
2.4.5	Discuss THREE physical changes that will occur in river **A** as a result of river capture.	(3 x 2)	(6)
			(15)

2.5 Study FIGURE 2.5 below which is an infographic on the Jukskei River catchment area.

Jukskei River monitoring sites

Hartbeespoort Dam

Crocodile River

Kyalami

Jukskei River

Buccleuch

Modderfontein Stream

Marlboro

Alfred Nzo

Braamfonteinspruit

Sandspruit

Lyndhurst

St Andrews

Morninghill

Bruma

Johannesburg City

Jukskei River poisoned with sewerage

Residents who use it as a dumping site and toilet, said they did not have waste and rubbish management in the area.

The Jukskei River in Alexandra after heavy rains in Johannesburg and other areas, 25 April 2019.

One of Gauteng's largest rivers, the Jukskei, flows northwards, meandering through Bedfordview, flowing into the highly eutrophic Hartbeespoort Dam.
Its roughly 50 km course through the city inexorably marks it as a casualty of Johannesburg's massive urbanisation, its eroded waterways a repository for the city's torrent of sewage, stormwater, litter, industrial waste and building rubble. For water expert Dr Anthony Turton, not only is the Jukskei one of the country's most polluted rivers, it is also one of the "saddest". Its demise, he believes, is a metaphor for "all that is wrong in our society."

[Source: https://www.citizen.co.za/news/south-africa/2920185/jukskei-river-poisoned-with-sewage]

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

2.5.2 Of which river is the Jukskei River a tributary? (1 x 1) (1)

2.5.3 The water quality of the Jukskei River is deteriorating. Substantiate the statement by referring to the infographic. (2 x 2) (4)

2.5.4 In a paragraph of approximately EIGHT lines, suggest possible strategies that can be implemented to deal with the problems identified in QUESTION 2.5.3 in the Jukskei River. (4 x 2) (8)

(15)
[60]

TOTAL SECTION A: 120

P.T.O.

SECTION B

QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES

Study the background information on Howick below and answer the questions that follow.

BACKGROUND INFORMATION ON HOWICK

N

Co-ordinates: 29°28'S; 30°14'E

Howick is a town located in KwaZulu-Natal. The town is 1 050 m above sea level with warm summers and cool dry winters. A snappy chill descends upon Howick when snow falls on the nearby Drakensberg. The town is located along the N3 freeway, connecting it with the rest of South Africa. The town is the location of Howick Falls, which is a large waterfall that occurs when the Umgeni River falls 95 metres over dolerite cliffs on its way to the Indian Ocean.

[Adapted from https://en.wikipedia.org/wiki/Howick,_KwaZulu-Natal]

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
Estate	Landgoed
Golf Driving Range	Gholf-dryfbaan
Nature reserve	Natuurreservaat

P.T.O.

3.1 MAP SKILLS AND CALCULATIONS

Various options are provided as possible answers to questions 3.1.1 and 3.1.2. Choose the correct answer and write only the letter (A – D) next to the question numbers in the ANSWER BOOK.

3.1.1 In the topographical map index 2930AC, the 29 and 30 indicate …

A 29°N 30°W.
B 29°S 30°E.
C 29°W 30°N.
D 29°E 30°S   (1 x 1)   (1)

3.1.2 The Howick waterfall is located in … province.

A KwaZulu-Natal
B Limpopo
C Northern Cape
D Mpumalanga   (1 x 1)   (1)

3.1.3 What is the difference in height between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract?   (1 x 1)   (1)

3.1.4 Calculate the distance in metres, between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract.

Formula: **Actual distance x Map scale**   (2 x 1)   (2)

3.1.5 Use the answers in QUESTIONS 3.1.3 and 3.1.4 to calculate the average gradient in metres, between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract.

$$\textbf{Average Gradient} = \frac{\textbf{Vertical interval (VI)}}{\textbf{Horizontal equivalent (HE)}}$$ (2 x 1)   (2)

P.T.O.

3.1.6 Choose the correct answer from the options provided below. Write only the letter (A – D) next to the question number.

A cross section of the slope between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract is ....   (1 x 1)   (1)
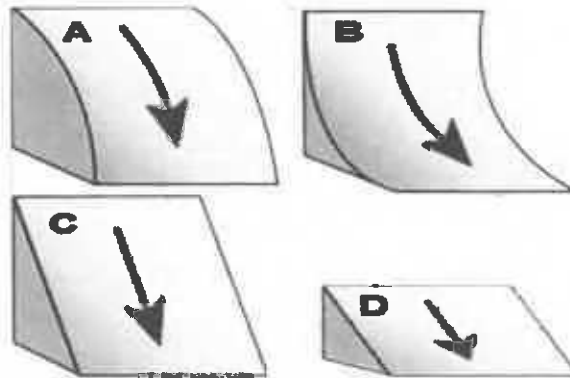
3.1.7 Give a reason for your answer to QUESTION 3.1.6.   (1 x 2)   (2)

(10)

3.2 MAP INTERPRETATION

Refer to the valley at **G** in block **B2** on the topographic map.

3.2.1 (a) Choose the correct answer from the options provided below. Write only the letter (A – D) next to the question number.

The nocturnal (night-time) wind that develops during the night in this area is called a ... wind.

A   berg
B   föhn
C   anabatic
D   katabatic   (1 x 1)   (1)

(b) Explain how the wind identified in QUESTION 3.2.1(a) promotes the formation of dense fog at **G**.   (1 x 2)   (2)

(c) How would the development of fog in this area impact early morning traffic on the secondary road at **G**?   (1 x 1)   (1)

Refer to the Mgeni River in the south of the topographic map.

3.2.2   (a)   In what general direction does the Mgeni River flow?   (1 x 1)   (1)

      (b)   Give evidence from the map to support your answer to QUESTION 3.2.2(a).   (1 x 1)   (1)

3.2.3   Identify the stream order at **H** in block **A4** on the topographic map.

                                                                         (1 x 1)   (1)

Refer to the orthophoto map.

3.2.4   Landform **8** on the orthophoto map is a …   (1 x 1)   (1)

A   gap.
B   spur.
C   valley.
D   saddle.

3.2.5   Identify the fluvial feature at the base of the Howick waterfall at **9** on the orthophoto map.   (1 x 1)   (1)

3.2.6   Refer to the freehand cross-section from **10 – 11** on the orthophoto.
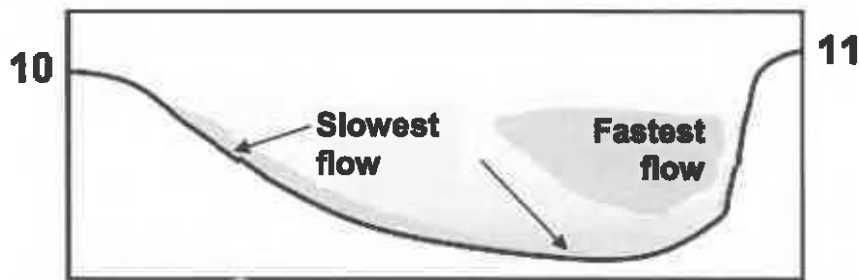
      (a)   Identify the fluvial landform of which the cross-section above is an illustration.   (1 x 1)   (1)

      (b)   Name the fluvial processes taking place at **10** and **11** respectively.   (2 x 1)   (2)

                                                                                              (12)

3.3 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Refer to block **B1** on the topographic map.

3.3.1   Vector data is data that consists of points, lines and polygons. Identify the following vector data in block **B1** that relates to conservation:

    (a)   A point feature   (1 x 1)   (1)

    (b)   A polygon feature   (1 x 1)   (1)

Refer to the Howick waterfall in block **E2**.

3.3.2   The location of the Howick Falls at **F** in block **E2** on the topographic map, is an example of (attribute/spatial) data.   (1 x 1)   (1)

3.3.3   Refer to the Mgeni River which runs through the town of Kwa Mevana in block **E1**.

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

    (b)   Do you think buffering was applied in the development of the town in block **E1**?   (1 x 1)   (1)

    (c)   Give a reason from the topographic map for your answer to QUESTION 3.3.3(b).   (1 x 2)   (2)
                                                                                      (8)

TOTAL SECTION B: 30

TOTAL: 150

END

PREPARATORY EXAMINATION

2022

MARKING GUIDELINES

GEOGRAPHY PAPER 1 (10781)

19 pages

PRINCIPLES FOR MARKING GEOGRAPHY – 2022

The following marking principles are developed to standardise marking processes.

MARKING
- ALL questions MUST be marked, irrespective of whether it is correct or incorrect.
- Where the maximum marks have been allocated for a particular question, place an 'M' over the remainder of the text to indicate the maximum marks have been achieved.
- A clear, neat tick must be used: √
  o If ONE mark is allocated, ONE tick must be used: √
  o If TWO marks are allocated, TWO ticks must be used: √√
  o The tick must be placed at the FACT for which the mark is being allocated.
  o Ticks must be kept SMALL, as various layers of moderation may take place.

- Incorrect answers must be marked with a clear, neat cross: **X**
  o Use MORE than one cross across paragraph/discussion style questions to indicate that all facts have been considered.
  o Do NOT draw a line through an incorrect answer.
  o Do NOT underline the incorrect facts.

NOTE THE FOLLOWING
- If the numbering is incorrect or omitted, candidates can be credited provided that the sequence of answers to questions is followed.
- Spelling errors: If the answer is recognisable, award the marks provided the meaning is correct.
- Be sensitive to the sense of an answer, which may be stated in a different way.
- In questions where a letter is the accepted response but the learner writes the actual answer, award the marks.

TOTALLING AND TRANSFERRING OF MARKS
- Each sub-question must be totalled.
  o Questions in **Section A** have FIVE sub-sections, therefore FIVE sub-totals per question are required. **Section B** has THREE sub-sections and THREE sub-totals.
  o Sub-section totals are to be written in the right-hand margin at the end of the sub-section and underlined.
  o Sub-totals must be written legibly.
  o Leave space where different levels of moderated marks may be written.
- Total sub-totals and transfer the total to the top, left-hand side of the page, above the question number.
- Transfer the total for each question to the cover of the answer book.

MODERATION
- Marking on each level of moderation is done in the same way as the initial marking. All guidelines for marking must be adhered to.
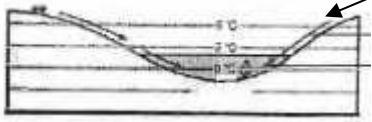
- If a mark for a sub-question is changed after moderation, the moderator must strike off the marker's mark and write down the new mark as follows, ~~12~~ 16.

- The total for the question must be re-calculated, and similarly be struck off, and the new total to be written down as follows, ~~26~~ 36.

SAMPLE FOR MARKING

QUESTION 1

(22)

1.1   1.1.1   A (South Atlantic High) √
        1.1.2   B (Kalahari High) √
        1.1.3   B (South Indian) X   2

1.2   1.2.1   Melting snow √
        1.2.2   Mouth X
        1.2.3   Third order √   2

1.3   1.3.1   Katabatic X

        1.3.2   1 occurs during the day while 2 occurs at night √√

                            √√
        1.3.3   Cold air rolls down into the valley and forms an inversion
                                      Air flows downslope √√

                                                6

1.4   1.4.1   Shape of front concave X
                   Steep gradient of front √

        1.4.2   Warm air undercuts the cold air X

                                 √√
        1.4.3   Air behind the cold front is colder than the air in front. Cold air moves faster
                  than wa**rm** air ahead of it. Cold front catches up with the warm front.   5
                    √√

1.5   1.5.1   (a)   A river that only flows all year-round X
                   (b)   The river channel is wide X
                           √√   √√
                   (c)   Regularity of rainfall and the soil type over which the streams flow.
                  √   X
        1.5.2   Gauteng and the Eastern Cape

        1.5.3   The cost of food production will increase as it is costly to buy purified
                   water. Farmers will have to buy more chemicals to pu**√√**rify water.
                   Chemicals are expensive, and this will increase production costs. It will
                   be costly to purify water for use in electricity generation. These costs will
                   be included in electricity prices. Costs will (M) increase the price of electricity
                   during production. There will be less clean water to generate
                   hydroelectricity.   7

SECTION A: CLIMATE AND WEATHER AND GEOMORPHOLOGY

QUESTION 1: CLIMATE AND WEATHER

1.1   1.1.1   *B (1)/aspect*

       1.1.2   *A (1)/north*

       1.1.3   *A (1)/shadow zone*

       1.1.4   *C (1)/radiation*

       1.1.5   *A (1)/beneath*

       1.1.6   *D (1)/Frost pockets*

       1.1.7   *B (1)/condensation*

                                                                        (7 x 1)   (7)

       1.2.1   *Summer/Late summer/Early autumn (1)*

       1.2.2   *26,5 °Celsius (C) – 27 °Celsius (C) (1)*

       1.2.3   *Westwards/East to West (1)*

       1.2.4   *Cumulonimbus (1)*

       1.2.5   *Thunderstorms/Hail/Heavy/(torrential) rainfall (1)*

       1.2.6   *low (1)*

       1.2.7   *converging (1)*

       1.2.8   *Dissipating / Decaying / Degenerating stage (1)*

                                                                        (8 x 1)   (8)

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

    1.3.1   Which season is being depicted in the diagram?

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

    1.3.2   Provide evidence from the infographic to substantiate your answer to QUESTION 1.3.1.

          Cold front moving over the interior (2)
          Dominant (Kalahari) high pressure over the interior (2)
          Presence of a Coastal Low Pressure along the south/east coast (2)
          Berg wind conditions are expected and it is associated with winter (2)
          South Indian High Pressure closer to land and further north (2)
          [Any ONE]   (1 x 2)   (2)

    1.3.3   State TWO atmospheric conditions evident in the infographic that have resulted in the formation of berg winds.

          The dominance of the (Kalahari) high pressure over the interior of the subcontinent/during winter (1)
          A low-pressure cell (coastal low/mid-latitude cyclone / cold front) along the southern or eastern coast (1)
          Pressure gradient between the interior and the coast resulted in offshore winds. (1)
          [Any TWO]   (2 x 1)   (2)

    1.3.4   With reference to the temperature graph, explain the process of temperature change from 03:15 to 14:00 as berg winds blow from the interior to the coast.

          Air subsiding down the escarpment heats up per the Dry Adiabatic Lapse Rate / (Adiabatic heating). (2)
          An increase in temperature of 1 °C per 100 m of descent (2)
          A sharp increase in temperature from 03:15 till 10:00 and then a sharp decrease until 14:00 (2)
          [Any ONE]   (1 x 2)   (2)

1.3.5   A weather station located at **A** has reported clear skies. Account for this current condition.

Clear skies at weather station A are because of higher evaporation of moisture when air warms up adiabatically. (2)
Stable conditions are experienced due to subsiding air. (2)
Relative humidity is low because of berg wind conditions. (2)
Wind blows from dry land to the ocean and has limited moisture. (2)
[Any TWO]   (2 x 2)   (4)

1.3.6   Explain why city **A** which is situated on the East Coast, will be affected by the release of the fire warning.

Impact of the berg wind conditions
During winter the vegetation is dry because of little/no rainfall. (2)
Berg winds are warm and dry winds would result in vegetation drying out further. (2)
Veld fires can easily be sparked because of dry conditions. (2)
Strong winds fan these fires and makes it uncontrollable. (2)

Impact of the release of the fire warning (Answer must relate to the impact that the warning will have on people.):

Evacuations may occur (2)
Inhabitants will prepare for berg wind conditions (2)
Mobilization of emergency services (2)
[Any TWO. Can refer to one or both aspects.]   (2 x 2)   (4)
                                                                                            (15)

1.4   Refer to the infographic below on mid-latitude cyclones.

1.4.1   What climatological evidence indicates that this mid-latitude cyclone is occurring in the Southern Hemisphere?

The rotation of the system is clockwise. (1)
Date indicating winter in southern hemisphere (1)
Winter rainfall in Western Cape (1)
Location of the cold front (mid-latitude cyclone) over the south of South Africa (1)
*Location of mid-latitude cyclone over the South Atlantic Ocean (1)*
Northerly position of South Atlantic and South Indian High Pressure (1)
[Any ONE]   (1 x 1)   (1)

1.4.2 Explain the concept *family of cyclones*.
**A series of mid-latitude cyclones occurring in succession (2)
CONCEPT** (1 x 2) (2)

1.4.3 Identify the stage that mid-latitude cyclone **A** is currently in.

Mature stage (1) (1 x 1) (1)

1.4.4 Draw a labelled cross-section from point **B** to point **C** along the cold front. Indicate the cold front, the cold sector, and the warm sector.

COLD FRONT (1)

WARM SECTOR (1)

COLD SECTOR (1)

B ———————————— **C**
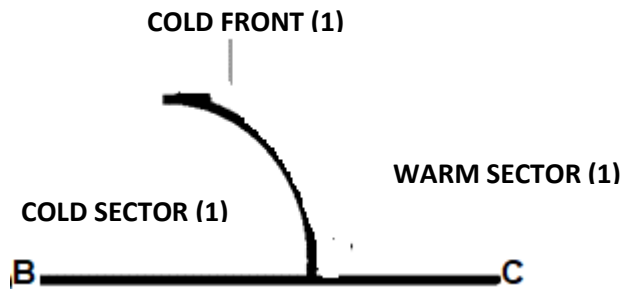
**One mark for the correct indication of the cold front √
One mark for the correct indication of the cold sector √
One mark for the correct indication of the warm sector √** (3 x 1) (3)

1.4.5   A group of tourists wants to attempt the hiking trail to the top of Table Mountain ahead of the cold front. In a paragraph of approximately EIGHT lines, advise the organisers of the hike why the event should be postponed by explaining the expected weather conditions and possible impacts thereof.

There may be heavy rainfall/or showers from cumulonimbus clouds which will cause dangerous trail conditions for hikers. (2)
There may be lightning from thunderstorms (cumulonimbus clouds) ahead of the cold front which may cause injury. (2)
There may be hail which may injure hikers and make the route/trail unsafe. (2)
There will be a drop in temperature as the cold front passes which will cause discomfort to the hikers. (2)
Cold conditions can result in snow, which can cause dangerous conditions on the trail. (2)
Snow conditions can cause hypothermia which is dangerous for hikers. (2)
There will be the possibility of flash flooding in the mountains from heavy rainfall which will cause unsafe conditions for hikers. (2)
There may be an increase in wind speeds which will cause unsafe conditions for hikers. (2)
Adverse weather conditions (hail, thunderstorms, and strong winds) will hinder communication if they require rescuing. (2)
Heavy rainfall can lead to rockfalls and mudslides which are dangerous for hikers. (2)
Increased cloud cover can result in poor visibility which can cause hikers to get lost. (2)
[Any FOUR - Learner must refer to weather element and impact for 2 marks]   (4 x 2)   (8)

                                                                            (15)

1.5   Refer to FIGURE 1.5 below showing a pollution dome.

1.5.1   Define the term *pollution dome*.

A mass of polluted air in and above a city or industrial complex which is prevented from rising by the presence of an inversion layer above it. (2) (CONCEPT)   (1 x 2)   (2)

1.5.2 At night, the pollution dome is lower in elevation (height) than during the day. Explain why this occurs.

Terrestrial radiation occurs during the night which lowers temperature in the city. (2)
Lower temperatures result in more subsiding air. (2)
The inversion layer is closer to the surface therefore lowering the elevation of the pollution dome. (2)
Less / no convection at night because of lower temperatures. (2)

<u>Can refer to daytime conditions. Must specifically include an indication of day conditions.</u>
Higher daytime temperature resulting in rising air. (2)
Inversion layer further from the surface therefore raising the pollution dome. (2)
More convection during the day because of higher temperatures. (2)
[Any TWO. May not refer to the same condition during night and day] *(*2 x 2) (4)

1.5.3 State the environmental problem that results from a pollution dome situated close to the surface in a city.

Increased air pollution – accept examples e.g., smog / acid rain (1)
Higher temperatures (1)
Poor air quality (1) – accept examples
[Any ONE] (1 x 1) (1)

1.5.4 Describe how the environmental problem identified in QUESTION 1.5.3 develops.

The lowering of the pollution dome results in the concentration of pollutants (2)
The combination of smoke or other atmospheric pollutants, mixed with fog, forms an unhealthy or irritating mixture. (2)
[Must be linked to environmental problem identified in Question 1.5.3]
(1 x 2) (2)

1.5.5   Air pollution reduces the amount of a city's clean air at night. Explain this statement.

Higher concentration of burning of fossil fuels (2)
Industrial pollution is concentrated in a smaller area. (2)
Cooler air results in a higher concentration of polluted air closer to the surface. (2)
Cleaner air is unable to enter city at night (because inversion layer lower) (2)
Pollution dome contracts at night therefore smog is trapped (2)
Air masses of different temperatures do not mix (2)
[Any ONE]   (1 x 2)   (2)

1.5.6   Provide TWO sustainable strategies that can be implemented in cities to minimise the effects of industries on the pollution dome.

Enforce stricter emission standards for industries. (2)
Decentralisation of industries (2)
Increasing efficiency of equipment to consume less energy (2)
Install longer chimneys to release the pollution above the inversion layer at night. (2)
Fines for industries who do not adhere to emission standards (2)
Monitoring of emissions (2)
Industries to have own greenbelts (2)
Incentives to reduce pollution (2)
Installing filtering systems in chimneys (2)
Green energy advocacy (2)
Education on danger of increased pollution (2)
Greener transport systems used by industries (2)
[Any TWO]   (2 x 2)   (4)
                                                                          (15)
                                                                          [60]

QUESTION 2: GEOMORPHOLOGY

2.1   Read the following statements and choose the appropriate word in brackets that will make the statement TRUE. Write down only the question number (2.1.1 – 2.1.7) and the answer in your ANSWER BOOK.

2.1.1   *lateral / vertical (1)*

2.1.2   *gradient (1)*

2.1.3   *velocity (1)*

2.1.4   *vertical (1)*

2.1.5   *deposition (1)*

2.1.6   *lateral (1)*

2.1.7   *deposition (1)*

(7 x 1)   (7)

2.2   Refer to FIGURE 2.2 below and choose the correct letter (A – G) that matches the description of a specific drainage pattern. Write only the letter (A – G) next to the question numbers (2.2.1 to 2.2.8) in the ANSWER BOOK, for example 2.2.9 H. Letters A – G can be used more than once.

2.2.1   *F (1)*

2.2.2   *A / B (1)*

2.2.3   *G (1)*

2.2.4   *A / B / C (1)*

2.2.5   *B (1)*

2.2.6   *D (1)*

2.2.7   *C (1)*

2.2.8   *E (1)*

(8 x 1)   (8)

2.3   Refer to FIGURE 2.3 below which shows a meandering river.

   2.3.1   What is a *meander scar*?

   A dried-up oxbow lake/When the oxbow lake completely fills with sediment it becomes a meander scar. (2) CONCEPT   (1 x 2)   (2)

   2.3.2   In which stage of the river can a meander loop and meander scar develop?

   Lower course (1) / Middle course (1)   (1 x 1)   (1)

   2.3.3   Name the slopes that will develop at **X** and **Y** of the meander loop.

   Y-slip off slope (1)
   X-cut off/scarp slope (1)   (2 x 1)   (2)

   2.3.4   At which slope, **X** or **Y,** will there be more deposition than erosion?

   Y (2)   (1 x 2)   (2)

   2.3.5   Give a reason for your answer to QUESTION 2.3.4.

   Gentle gradients reduce the velocity of the river (at Y) and (results in more deposition). (2)
   Where the river flow is slower (at Y), material is deposited as there is more friction. (2)
   Slower moving water (at Y) reduces the carrying power of the river to carry sediments. (2)
   [Any ONE]   (1 x 2)   (2)

   2.3.6   Explain how a meander scar is formed.

   Meandering takes place due to gentle gradient and starts eroding on the scarp slopes of the meander loop. (2)
   The meander neck becomes narrower due to continued erosion on the outer bank and deposition on the inner bank. (2)
   The river eventually cuts through the neck thereby creating an ox-bow on its side. (2)
   Over time, the ox-bow dries up and a meander scar is formed. (2)
   [Any THREE]   (3 x 2)   (6)
                                                            (15)

2.4 Study FIGURE 2.4 below on river capture.

2.4.1 Define the term *headward erosion*.

The lengthening of a river course as it cuts back into the source area (CONCEPT) (2) (1 x 2) (2)

2.4.2 Name ONE possible factor from FIGURE 2.4 that could have resulted in river **A** capturing river **B.**

Increased flow / volume (more energy/more erosion) of the captor stream (1)
Steeper gradient (1)
Tectonic uplift (1)
Higher rainfall (1)
Difference in height (1)
Less resistant rock (1)
[Any ONE] (1 x 1) (1)

2.4.3 Explain how the process of headward erosion contributes to river capture.

The river erodes backwards through headward erosion which elongates (lengthens) it through the watershed until it captures the other river. (2)
It then intercepts (steals) water from a high-lying river. (2) (2 x 2) (4)

2.4.4 Give the geographical terms for features **D** and **E** which develop from river capture.

D – Elbow of capture (1)
E – Wind gap (1) (2 x 1) (2)

2.4.5 Discuss THREE physical changes that will occur in river **A** as a result of river capture.

Increased volume of water in the river (wider river channel) (2)
Increased velocity of stream flow of water (2)
Increase in vertical erosion due to increased flow (2)
Results in rejuvenation of the river (2)
Increase in carrying capacity (2)
Incised meanders/Valley in a valley/Terraces develop because of increase in erosive power. (2)
Formation of knickpoint waterfall at point of capture (2)
Increase in size of drainage basin (2)
[Any THREE] (3 x 2) (6)

2.5   Study FIGURE 2.5 below which is an infographic on the Jukskei River catchment
       area.

    2.5.1   Define the concept *river catchment area.*

        **An area from where a river receives all its water/The area of land
        from which water flows into the river (2) (CONCEPT)**   (1 x 2)   (2)

    2.5.2   Of which river is the Jukskei river a tributary?

        Crocodile/Krokodil River (1)   (1 x 1)   (1)

    2.5.3   The water quality of the Jukskei river is deteriorating. Substantiate the
        statement by referring to the infographic.

        **Sewerage flows into water sources and pollutes the water. (2)
        Water pollution causes waterborne diseases. (2) Accept examples.
        Pesticides and insecticides in water wash into the river. (2)
        Industrial waste flows into rivers. (2)
        Chemicals wash into reservoirs killing aquatic life and the
        ecosystem. (2)
        Litter washes into the river and reduces the water quality. (2)
        [Any TWO]**   (2 x 2)   (4)

    2.5.4   In a paragraph of approximately EIGHT lines, suggest possible strategies
        that can be implemented to deal with the problems identified in
        QUESTION 2.5.3 in the Jukskei River.

        **Reuse, recycle before disposing of waste. (2)
        Educate people on environmental awareness. (2)
        Repair broken sewerage without delay. (2)
        Introduce by-laws to curb water and land pollution. (2)
        Cleaning campaigns to clear waste (2)
        Awareness programmes using all forms of the media. (2)
        Policing catchment areas to deal with by-law violators (2)
        Spot checks on companies to ensure compliance with the law (2)
        Improve general waste management. (2)
        Implement buffer areas close to the rivers. (2)
        Effective sewerage management (2)
        Plant trees near water sources. (2)
        Incentives for community clean-up programmes (2)
        [Any FOUR]**   (4 x 2)   (8)
                                                                                      (15)
                                                                                      [60]
                                                          TOTAL SECTION A: 120

SECTION B

QUESTION 3: GEOGRAPHICAL SKILLS AND TECHNIQUES

Study the background information on Howick and answer the questions that follow.

3.1 **MAP SKILLS AND CALCULATIONS**

3.1.1   *B (1)/29°S 30°E*   (1 x 1)   (1)

3.1.2   *A (1)/KwaZulu-Natal*   (1 x 1)   (1)

3.1.3   What is the difference in height between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract?

         1 030 m – 784 m = 246 m (1)   (1 x 1)   (1)

3.1.4   Calculate the distance in metres, between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract.

         Formula: **Actual distance x Map scale**

         3,3 (33) (cm) (1) x 500 m = 1 650 m (1)
         Range: (3,2 (cm) – 3,4 (cm) = (1 600 m – 1 700 m)   (2 x 1)   (2)

3.1.5   Use the answers in QUESTIONS 3.1.3 and 3.1.4 to calculate the average gradient in metres, between spot height 1030 in block **E3** and spot height 784 in block **D4** on the topographic map extract.

         Average Gradient =   Vertical interval (VI)
                                Horizontal equivalent (HE)

$$= \frac{246\ m}{1\ 650\ m}$$ *(1) For substitution using answers in Questions 3.1.3 and 3.1.4.*

       = 1: 6,7 (1)   Range: (1: 6,5 – 1: 6,9)   (2 x 1)   (2)

3.1.6   *A* (1)   (1 x 1)   (1)

3.1.7   Give a reason for your answer to QUESTION 3.1.6.

         The contours are gentle at the top of the slope and steeper at the bottom (convex) slope. (2)
         The contour lines are far apart at a high lying area (1030) and closer together at a low lying area (784). (2)
         [Any ONE]   (1 x 2)   (2)

                                                                     (10)

3.2   **MAP INTERPRETATION**

Refer to the valley at **G** in block **B2** on the topographic map.

3.2.1   (a)   ***D (1)***   (1 x 1)   (1)

           (b)   Explain how the wind, identified in QUESTION 3.2.1(a), promotes
                  the formation of dense fog at **G**.

                  ***Valley slopes cool at night and air sinks to the bottom of the
                  valley. (2)
                  Decrease in temperature results in condensation taking place
                  close to the surface in the morning. (2)
                  [Any ONE]***   (1 x 2)   (2)

           (c)   How would the development of fog in this area impact early
                  morning traffic on the secondary road at **G**?

                  ***It will result in poor visibility. (1)
                  It will slow down traffic./lengthen travel time (1)
                  Might cause accidents (1)
                  [Any ONE]***   (1 x 1)   (1)

Refer to the Mgeni River in the south of the topographic map.

3.2.2   (a)   In what general direction does the Mgeni River flow?

                  Northeast (1)   (1 x 1)   (1)

           (b)   Give evidence from the map to support your answer to QUESTION
                  3.2.2(a).

                  ***Decrease in height in north-easterly direction (1)
                  Tributaries join at acute angles in north-easterly direction (1)
                  Main river flows in a north-easterly direction downstream from
                  waterfall (1)
                  V of contour lines point in west/south-westerly direction (1)
                  [Any ONE]***   (1 x 1)   (1)

3.2.3   Identify the stream order at **H** in block **A4** on the topographic map.

           2 (1)   (1 x 1)

Refer to the orthophoto map.

3.2.4   Landform **8** on the orthophoto map is a …

        B / D (1)   (1 x 1)   (1)

3.2.5   Identify the fluvial feature at the base of the Howick waterfall at **9** on the orthophoto map.

        Plunge pool (1)   (1 x 1)   (1)

3.2.6   Refer to the freehand cross-section from **10 – 11** from the orthophoto.

    (a)   Identify the fluvial landform of which the cross-section above is an illustration.

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

    (b)   Name the fluvial processes that are taking place at **10** and **11** respectively.

            10 – deposition (1)
            11 – erosion (1)   (2 x 1)   (2)

                                                             (12)

3.3   **GEOGRAPHIC INFORMATION SYSTEMS (GIS)**

Refer to block **B1** on the topographic map.

3.3.1   Vector data is data that consists of points, lines and polygons. Identify the following vector data in block **B1** that relates to conservation:

    (a)   A point feature

            Lookout tower (1)   (1 x 1)   (1)

    (b)   A polygon feature

            Valley Nature Reserve / protected area / woodlands (1)   (1 x 1)   (1)

Refer to the Howick waterfall in block **E2**.

3.3.2   The location of the Howick Falls at **F** in block **E2** on the topographic map, is an example of (attribute/spatial) data.

               spatial (1)   (1 x 1)   (1)

3.3.3   Refer to the Mgeni River which runs through the town of Kwa Mevana in block **E1**.

   (a)   Define the term *buffering*.

Buffering is a zone that is drawn around any point, line, or polygon that encompasses all of the area within a specified distance of a feature e.g., river. (2) CONCEPT   (1 x 2)   (2)

   (b)   Do you think buffering was applied in the development of the town in block **E1**?

No (1)   (1 x 1)   (1)

   (c)   Give a reason from the topographic map for your answer to QUESTION 3.3.3(b).

Development of the town is against a riverbank with no indication of a buffer area on either side of the river. (2)   (1 x 2)   (2)

                                                                                            (8)

                                                              TOTAL SECTION B: 30

                                                                      TOTAL: 150